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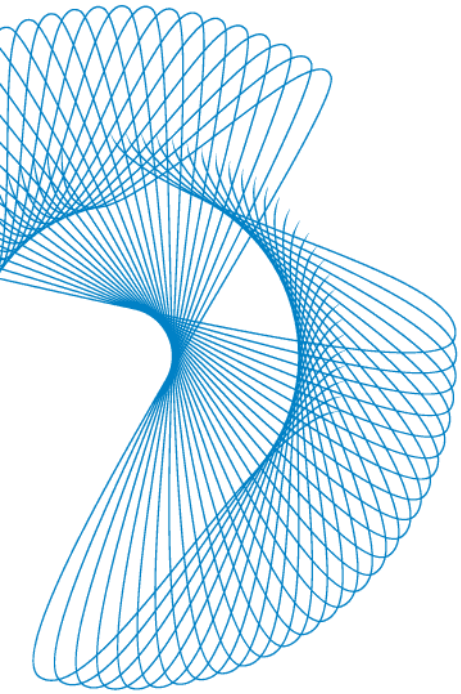

Accident Report

Failure of No. 2 Crane

Tasman Mariner

20 September 2005

Class B

REPORT NO.: 05 3847

TASMAN MARINER – CRANE FAILURE

On 20 September 2005, ***Tasman Mariner*** was moored port side to No. 6 berth, Mount Maunganui wharf, working cargo at No. 3 and 5 holds. At 0309 hours, New Zealand Standard Time (NZST), after loading packaged timber into No. 3 hold, No. 2 crane was being positioned over cargo on the wharf, when the topping lift wire rope parted, allowing the jib to fall onto the wharf. The crane was carrying no load at the time. There were no injuries but the crane jib, cargo block and hoist wire were severely damaged.

Photograph 1
Tasman Mariner departing Tauranga

Details of Vessel, Owner & Management, Classification, Navigational Equipment, Manning & Crew:

Name of Vessel:	*Tasman Mariner*
Vessel Type:	Semi-container ship
Port of Registry:	Hong Kong
Flag:	Hong Kong, People's Republic of China
IMO No.:	9103116
Built:	1995
Construction Material:	Steel
Length Overall (m):	184.90
Maximum Breadth (m):	27.60
Gross Tonnage:	18 468
Net Tonnage:	9 253
Propulsion:	Mitsubishi Kobe Diesel
ISM Certificate:	Lloyds Register of Shipping
Maritime Safety Inspector:	Ian Clarke

Owner Details

The China Navigation Company Ltd

ISM Certificate

Tasman Mariner had a Safety Management Certificate issued by Lloyds Register of Shipping on 5 May 2004, and due to expire on 25 February 2009

Master's Details

The Master held a Certificate as Master of a Foreign Going Ship issued in New Zealand, with a New Zealand endorsement and a Deck Officer Class 1 endorsement issued by the Marine Department of Hong Kong.

Chief Engineer's Details

The Chief Engineer held a British Class 1 Marine Engineer's Certificate and a Marine Engineer Officer Class 1 endorsement issued by the Marine Department of Hong Kong.

Chief Officer's Details

The Chief Officer held a Ukranian First Mate's Certificate and a Deck Officer Class 2 endorsement issued by the Marine Department of Hong Kong.

Crewing Details

There were 25 crew, which included the Master, 3 deck officers, 4 engineering officers and one electrical officer, 6 able seamen and 4 engine room ratings.

Navigational Equipment	
Magnetic Compass:	Tokimec SH Type Projection Magnetic Compass
Radar:	Tokimec Rascar 3400M – S Band Sperry Mariner – Brigdemaster – X Band
Depth Sounder:	JRC JFE – 570S
GPS/Satellite Navigation:	Koden KGP – 912
Electronic Chart Plotter:	Win-Chart Navigator

NARRATIVE

On 19 September 2005, at 2100 hours New Zealand Standard Time (NZST), ***Tasman Mariner*** arrived in the port of Tauranga and berthed port side to No. 6 berth, Mount Maunganui.

At 2200 hours, cargo work commenced at No. 3 and 4 holds using cranes Nos. 2 and 4. After unlashing, some empty containers and flat racks were transferred from one location to another on board the vessel and some were also discharged. Later, the gang from No. 4 hold moved to No. 5 hold and continued work using No. 4 crane.

No. 2 crane was used to discharge three empty forty foot containers and 12 empty twenty foot containers from No. 3 hold.

Between 2330 hours and midnight, cargo work stopped for a rest period.

On 20 September, at 0040 hours, No. 2 crane commenced loading packets of timber into No. 3 hold. Each lift was made up of 4, 6 or 8 packets, as determined by the space available in the hold. On the wharf, heavy duty webbing slings were placed around the packets of timber and attached to chain slings that hung from the hook beneath the cargo block. Each packet weighed about 3 tonnes, so the maximum lift would have been about 24 tonnes.

Work continued without incident until 0309 hours, when No. 2 crane suffered a major failure. After placing a 4.2 m long sling-load of packaged timber into the forward port wing of No. 3 hold, the cargo block, hook and chain slings were hoisted to clear the hatch-coaming and the crane jib was slewed to port and luffed-out until the chain slings were plumbed over the next lift which had been made up on the wharf. The crane completed slewing and luffing-out and the block and slings were being lowered when, without warning, the jib fell onto the wharf. As it fell, one of the wire ropes in the crane rigging struck the crane-driver's cab, smashing the window.

At the time of the accident, the Crane Driver was at the crane controls. Two stevedores were on the wharf, near the timber that was ready to be loaded. Two stevedores were in No. 3 hold. On deck, the Second Officer was between No. 3 and No. 5 holds and an Able Seaman was standing on the port side abaft No. 3 hold. There were no other persons in the vicinity of the crane. No one was injured.

Cargo work stopped. The Ship's Master and officers and the Stevedore Supervisor assessed the situation. The jib of No. 2 crane had become detached from its gooseneck and was resting on the wharf and across the raised hatch-cover at the after end of No. 3 hold (*See Photograph 2*). Although its movement was restrained by the hoist wire, it was liable to settle and fall with movement of the ship, making it dangerous to approach. Low water was at 0219 hours and the tide was rising. The wharf near the crane was cordoned off with hazard tape and the stevedores asked the Port Company to notify ships to reduce speed while passing No. 6 berth (*See Photograph 3*).

Photograph 2
No. 2 crane resting on the wharf and the No. 3 hatch cover

Photograph 3
No. 2 crane showing area cordoned off with hazard tape.

Later in the day, an engineering company used two mobile cranes to support the jib at both ends while an operator in a personnel cage suspended over the jib from a third mobile crane cut the hoist wires. The jib was taken ashore for repair or replacement.

After assessing the damage to No 2 crane, a Lloyds Register Classification Society Surveyor inspected No's 1, 3, 4 and 5 cranes. These were found in good order and, at 1800 hours, the ship was permitted to resume working cargo.

Photograph 4
No. 4 Crane (SWL 35 tonnes)

The rigging shown in *Photograph 4* is the same as for No. 2 crane. The topping lift wire rope was attached to the head of the crane, from where it was rove through the sheave fitted approximately four tenths of the length of the jib from its base. The wire rope then led back to a sheave at the crane head and from there to a sheave in the head of the jib. From the jib, it was led to another sheave at the crane head, then down through a guide to the topping winch.

On 22 September at 1000 hours, ***Tasman Mariner*** left port.

FINDINGS

On inspection of the crane after the accident, it was found that:

- Both topping lift and hoist wire ropes had parted
- The jib was detached from its gooseneck
- All eight flange bolts holding the jib to the gooseneck had sheared.
- The jib was resting on the wharf and the open hatch-covers, and was bent in five places
- The cargo block, jib head and sheaves were damaged
- The crane window was broken
- There was a slight dent on the right hand side of the driver's cab.
- A hand rail on top of the cab was bent
- Steel components from the crane and its attachments were found 30 to 50 metres away from the point of impact of the jib
- There were 17 turns of wire rope around the topping lift drum
- The topping lift wire had parted about four metres above the drum, inside the cab.
- In the region where it had parted, the topping lift wire rope was badly damaged, but the remainder of the rope appeared well greased and in good condition.

Given that:

(a) the cargo block was being lowered and was well clear of the jib when the accident happened, and
(b) the jib fell forward from its gooseneck attachments,

it is surmised that the topping lift wire parted first and the momentum of the jib falling onto the cargo block broke the hoist wire. The shock of the jib striking the wharf would have sheared the flange bolts on the gooseneck plates.

Note:

(a) eliminates the possibility that the accident was caused by hoisting the cargo block hard up against the jib, and
(b) eliminates the possibility that the gooseneck gave way first, otherwise tension in the rigging would have forced the jib back against the cab.

Tasman Mariner was fitted with five Mitsubishi electro-hydraulic deck cranes. The safe working load (SWL) of No. 1 and 5 cranes was 26 tonnes and the SWL of No's. 2, 3 and 4 cranes was 35 tonnes.

On 15 July 2005, in Bangkok, Lloyds Register of Shipping had carried out the five yearly thorough examination of the deck cranes.

The company's policy was to replace hoist wires after five years and topping lift wires after six years in service.

The ship's records indicated that the luffing and hoist wire ropes were certificated and replaced as shown below:

Crane	No. 1	No. 2	No. 3	No. 4	No. 5
Luffing Wire					
Certificate Date	13-07-95	13-07-95	11-07-00	21-09-95	09-05-01
Replacement Date	14-12-02	July 2000	09-11-01	11-11-01	13-11-01
Hoist Wire					
Certificate Date	13-7-95	13-7-95	11-7-00	09-05-01	09-05-01
Replacement Date	22-08-03	July 2000	05-11-01	07-08-01	12-11-01

The manufacturer's specification for hoist wire ropes for No's. 2, 3 and 4 cranes was: 31.5 mm diameter, 6 x Fi (29), class C, IWRC, galvanized, Z lay.

Test certificate No RP 95 KB 331, issued on 13 July 1995 by NKK for No. 2 hoist wire rope was for a 6 stranded, 29 wires per strand, galvanized steel wire rope with nominal diameter 31.5 mm, length 116 m and weight 506 kg. The sample broke at test load 726 KN.

Between 21 and 24 December 2004, the cranes had been checked by Marico Engineering (S) Pte. Ltd of Singapore. The record of inspection for No 2 crane was as follows:

> *"Check the pressure settings, hoisting relief valve pressure, luffing and slewing relief valve pressure and unloading valve and measure the hoisting and luffing brake cylinder stroke length and adjusted to have standard. (hoisting 65 mm before and 50 mm adj) and luffing 70 mm before and 53 mm adj. Check the UMT switch system and found in good working order. Check the slewing gear and oil leakage. Record all pressure reading with data logger. Luffing brake was still slipping after ad".*

In accordance with the ship's Ship Safety Management system, the Chief Engineer had overall responsibility for maintenance. The Electrical Officer was responsible for the maintenance, testing and operational overriding of limiting devices of electrically operated shipboard cranes, and the Chief Officer was responsible for the inspection and lubrication of wire rope, wire guides, sheaves and hooks.

Greasing of wires was carried out at six monthly intervals, using Rocol wire lubricant. Inspections and maintenance were recorded in the ship's computer data base. The last entry for No. 2 crane, on 1 September 2005, was as follows:

WIRE ROPE:
- entire length of wire rope appeared in good condition and well greased
- hard eyes and machine spliced ends are in good condition.

WIRE GUIDE:
- provides proper spooling onto drums in winch room.

SHEAVES:
- all sheaves have no significant signs of wear, scoring and grooving
- sheaves found securely mounted

HOOK:
- hook and sheave appeared in good condition.

Photograph 5
The broken topping lift wire from the No. 2 crane

Photograph 6
Inside the No. 2 crane, showing the broken topping lift wire.

The witnesses described the events as follows:

The Second Officer came on duty at midnight and was monitoring cargo operations. He had watched timber being loaded into No. 3 hold using No. 2 crane and was making his way along the port side of the deck towards No. 5 hold when there was a sound of metal striking something. He turned to see the jib had collapsed onto the wharf. After checking that no one was injured, he called the Chief Officer. He stated that, before the accident, the crane appeared to be working normally and there was no indication of anything wrong.

The Able Seaman on duty with the Second Officer was standing on the port side of the deck, by the catwalk abaft of No. 3 hold, when he heard a noise like wire running quickly through sheaves. Then he saw the crane falling onto the wharf.

The stevedores had started work at 2200 hours on 19 September.

The Crane Driver had worked as a Signaller at No. 3 hold until midnight, after which he took over operating No. 2 crane. He said that on taking over, he checked the lights and visibility and the luffing, hoisting and slewing controls. Although the window was reasonably clear, he had it open to give clear vision into the hold. At 0040 hours, they started loading packaged timber and worked continuously until the time of the accident. He mentioned that there were the normal creaks and groans made by all cranes, but that everything appeared in order. Before the accident, he had completed slewing the jib towards the wharf and was luffing out when he felt a thump. He said he felt a jolt in the cab – just a quick jerk. At the time, the cargo block was about level with his eyes. Then the jib fell forwards and hit the hatch cover. Next, a wire rope came flying back towards him to smash the cab window. Ducking to one side, he covered his face with his arms to protect it from flying glass. The Stevedore Foreman called him on the radio to ask if he was all right, after which he climbed down and disembarked from the ship.

Two stevedores were in No 3 lower hold, stowing packets of timber and assessing the space remaining to order appropriately sized packets. On the lift before the accident, they had landed three packets of timber. At the time, they were standing on the fourth tier of timber. The crane lifted the empty chain slings clear of the hatch coaming, then slewed to port and luffed out over wharf. The men were walking towards the after end of the hold when they heard the noise of wire rope running through sheaves. It was an unusual sound that they had never heard before. Then, seeing the jib falling down, they ran to the after end of the hold.

Two stevedores were on the wharf by No. 3 hold when the accident happened. Between 2200 hours and midnight, they had been unlashing and moving empty containers, which involved using a spreader fitted with a man-cage suspended by No. 2 crane to gain access the tops of containers. From 0040 hours onwards, they were stationed by No.3 hold, making up slings of 8 packets or less. Up to the time of the accident, they had loaded about 150 packets. They commented that everything seemed normal and there was nothing to make them think the jib would fall. While the crane was lifting, they remained in a tally hut, which they described as a safe zone. As the block and chains came over the cargo for the next lift, they walked towards the stacked timber. The crane failure happened as they were about to attach the webbing slings to the chains. They said they heard a loud, continuous noise. One of them looked up to see the jib falling. There were sparks, possibly from the sheaves or from the jib hitting the wharf, and the sound of glass breaking. Diving for cover, they remained there until there was no more noise.

The Stevedore Foreman began his shift on 19 September, at 2100 hours. He had walked around the deck to check the safe working load of the cranes and had noted nothing unusual. The cargo was being stowed near the cranes, so that they were topped right up and not under great stress. Normally he would be on board all the time but, shortly before the accident, he had gone to the portaccom on the wharf to change his radio battery. As he left the portaccom, he heard a whine and saw the crane falling. He radioed the Stevedore Supervisor to tell him what had happened, but the Foreman on the ship ahead had seen it happen and had already informed him. He checked that no one was injured and stopped work at No. 5 hold. The stevedores then held a meeting to review what had happened.

CONCLUSIONS

1. The accident was the result of No 2 crane topping lift wire rope parting. Since:

   - The crane was not lifting any load
   - Undamaged parts of the wire rope appeared in good condition
   - The wire rope was of a type specified by the manufacturer
   - The crane and attachments had been subjected to the prescribed maintenance and inspection,

   the cause of the wire rope failure was not determined at the time of the investigation.

   A sample of the broken wire rope was sent to MPT Solutions for microscopic examination.

   Microscopic examination revealed that:

   - The cable failed due to severe abrasive wear predominantly of the crown wires of the outer strands. However, considerable wear also occurred in wires below the surface in the outer strands and on inner (core) strand wires.

   - The cause of the wear was not determined. However, it is very likely to be associated with rotation of the cable relative to one or more contacting component(s).

   - The material of manufacture was unlikely to have contributed to the failure.

   - Fatigue was not observed to have been a significant factor in the failure.

2. The design of the crane was such that the failure of a single wire rope led to a major accident. It was fortunate that there were no serious injuries.

3. The accident demonstrates that lifting appliances which are apparently in good condition may suddenly fail and that vigilance is needed while working in the vicinity of cranes, even when they are not under load.

SAFETY RECOMMENDATIONS

1. It is recommended that the China Navigation Company Ltd urgently reviews its ISM procedures for the inspection and replacement of wire ropes to take account of these findings. It is requested that the Company advises Maritime New Zealand in writing of any steps taken to prevent a recurrence of this type of accident within two months of the final report being published.

2. It is also recommended that copies of this report be sent to all New Zealand stevedoring companies and to Mitsubishi Heavy Industries Ltd.