AUSTRALIAN TRANSPORT SAFETY BUREAU

MARINE SAFETY INVESTIGATION

REPORT 173

Independent investigation into the lifeboat
accident and injury to crew aboard the
Panama flag bulk carrier

Cape Kestrel

at Dampier, Western Australia
on 12 October 2001

COMMONWEALTH DEPARTMENT OF TRANSPORT AND REGIONAL SERVICES

Department of Transport and Regional Services
Australian Transport Safety Bureau

Navigation Act 1912
Navigation (Marine Casualty) Regulations
investigation into
the lifeboat accident and injury to crew
aboard the Panama flag bulk carrier
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Cape Kestrel

Summary

At 1915 on 11 October 2001 the Panama flag bulk carrier *Cape Kestrel*, in ballast, anchored off the port of Dampier, Western Australia, waiting for a berth to load a cargo of iron ore for China. The next morning, the master decided to conduct a lifeboat drill and to lower the port lifeboat to the sea. Since the vessel was to berth port side to the ore loader, his intention was to also lower the starboard boat while alongside.

At about 0845, the boat, with the mate and four crewmembers on board, was lowered to the water where the hooks were disengaged. The release mechanism for the boat was checked and the engine was run ahead and astern. When the hooks were reconnected, a seaman on deck operated the remote control to recover the boat.

The remote control, however, did not start the winch motor, and the mate asked the first engineer, who was on deck at the time, to hoist the boat. The first engineer went to the starter panel for the lifeboat winches, located in the air conditioning room aft in the accommodation, and started the winch by manually depressing the main contactor for the motor.

Hoisting was stopped at the main deck, where the master, who had been watching from the bridge wing, ordered the mate to arrange for the occupants of the boat to disembark before swinging the boat in. The mate replied that the boat was too far from the deck for people to disembark safely and that it could be hoisted to the boarding platform with its crew on board.

Despite the master's protests, hoisting of the boat resumed with the first engineer depressing the contactor in the starter panel. The davits came in, past the limit switches and up against the stops, with the winch still running. The forward fall parted, followed by the after fall, causing the boat to fall about 20 metres to the water. Four crew members in the boat were injured, three of them seriously.

The mate's injuries were the most serious and he was taken ashore by pilot boat. He was examined at the hospital at Karratha and transferred to a hospital in Perth for treatment.

Three other crewmembers in the boat were taken ashore by helicopter for treatment at the hospital at Karratha. Two of them were repatriated after treatment, while the remaining crewmember rejoined the ship before it sailed. The bosun, who had also been in the boat, suffered only bruising to his forehead.

The boat was later recovered. New falls were fitted to the davits and cracks in the boat were repaired. Broken windows were scheduled for repair at the earliest opportunity.

The Panama Maritime Authority authorised the vessel to sail for a period of 30 days until 12 November 2001 while repairs to the boat were arranged, provided that liferafts of the same capacity were provided on board. Before the vessel sailed from Dampier, a suitable liferaft was fitted on board.

Sources of information

The master and crew of *Cape Kestrel*

Australian Maritime Safety Authority

References

MIIU Report No. 130, *City of Burnie* lifeboat accident

Transport Accident Investigation Commission, New Zealand, Report No. 01-203 on *Nicolai Maersk* lifeboat accident.

Acknowledgment

Photographs of ship and port lifeboat courtesy of Zodiac Maritime Agencies Ltd, London, UK

Narrative

Cape Kestrel

Cape Kestrel is a Panama flag bulk carrier of 161 475 tonnes deadweight at a summer draught of 17.52 m. The vessel, owned by Avalon Shipping Inc, is managed by Zodiac Maritime Agencies Ltd in London, UK.

Cape Kestrel, which is classed with Lloyd's Register of Shipping as ✠100A1, bulk carrier strengthened for heavy cargoes, ✠LMC, UMS, was built in 1993 by Hyundai Heavy Industries in Ulsan, South Korea. The vessel has an overall length of 280 m, a moulded breadth of 45 m and a moulded depth of 23.8 m. Propulsive power is provided by a 6-cylinder B&W single acting, 2-stroke, diesel engine of 14 254 kW. The main engine drives a single fixed-pitch propeller, which gives the ship a service speed of 12.5 knots.

The ship is of standard bulk carrier design with 9 cargo holds located forward of the accommodation superstructure.

Cape Kestrel had a complement of 21 with a master and three mates, a chief and two engineers, an engineer cadet, a boatswain and five deck ratings, five engine room ratings, a cook and a steward. The master was a Croatian national. The remainder of the complement was made up of 13 Bulgarians, three Turks, two Romanians, a Russian and another Croatian.

The mates maintained a traditional 4 on, 8 off, watchkeeping routine, both when at sea and while the ship was at anchor.

The master had a Panamanian master's licence. He had been at sea since 1951 and had obtained a Yugoslav master's licence in 1960. He had sailed as master since 1971 and had been with the present company since 1989.

The mate had a Panamanian mate's licence, issued in May 2001. He had been promoted to mate when he joined *Cape Kestrel* on 9 July 2001, about three months before the incident. He had been with the company since 1994, when he joined as a deck cadet.

The chief engineer had a Panamanian first class engineer's licence and had joined the company in 1988 as first engineer. He was promoted to chief engineer in 1995 and had sailed aboard *Cape Kestrel* since 25 August 2001.

The first engineer, who had joined the company as a cadet in 1995, had a Panamanian first grade marine engineer's licence. He had been a first engineer since December 2000 and had sailed aboard *Cape Kestrel* since 18 February 2001.

Lifeboats

Cape Kestrel is equipped with two 26-person totally enclosed lifeboats. The lifeboats, stowed in davits on each side of the main deck, are type HDL65CT boats, designed by M+R (Holland) and constructed by Hyundai Precision & Ind. Co., Ulsan, South Korea.

The boats, constructed of glass reinforced plastic, are 6.5 m in length, 2.4 m in breadth and have a depth of 1.05 m. The unladen weight of each boat, fully equipped, is 2 930 kg and 4 880 kg fully laden.

The coxswain's seat, located aft, is raised to allow all-round vision from a small conning bubble on top of the boat. All the boat's controls are accessible from this position, including the davit remote release cable and the on-load hook release lever. Seats for the crew are located around the inside of the boat and along the centre-line forward of the coxswain's position. There are access hatches located amidships on the inboard and outboard side of each boat and additional hatches at the forward and after ends to enable the crew to reach the falls and hooks.

Propulsive power for the boats is provided by BUKH-DV24RM diesel engines, which give each boat a fully laden speed of 6.1 knots.

Cape Kestrel's lifeboats are fitted with Titan on-load fall release systems manufactured in the United Kingdom by William Mills (Marine) Ltd. This system is designed for operation by one person with simultaneous release of both hooks occurring when the release handle is actuated. The system is fitted with an hydrostatic interlock, designed to prevent the actuation of the hooks until the boat is waterborne. The interlock may be manually by-passed in an emergency to release the hooks if the boat is clear of the water.

Cape Kestrel's davits incorporate a winch, wire falls, cradles and cradle stoppers, frames, forward and aft suspension blocks and gripes to secure the boats when stowed. The boats are designed to be boarded from boarding platforms at the stowed position, obviating the need to use bowsing tackles at deck level. Each boat is suspended in cradles by floating blocks with the falls running from each block to the winch.

The davits are gravity davits, free to pivot on pins, rotating outboard when lowering the boats and inboard at the final stages of raising the boats (see diagram below).

The Incident

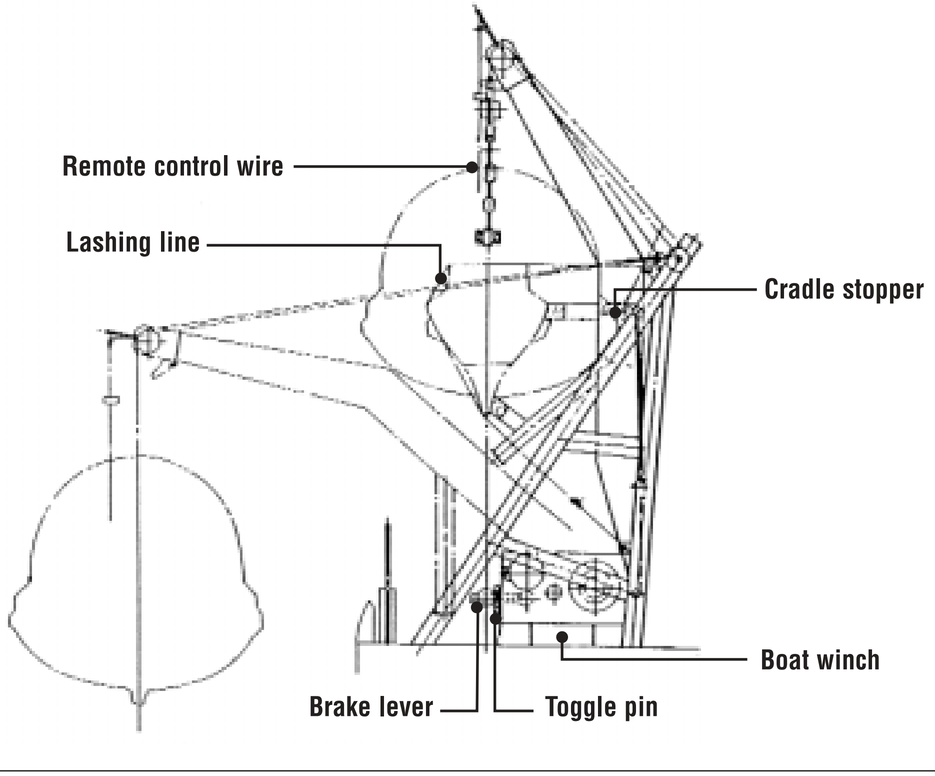
At 1915 on 11 October 2001, *Cape Kestrel* arrived in ballast at the anchorage, about 16 miles north of Dampier in Western Australia, to load a cargo of iron ore for China. Its previous ports of call had been Oita, Japan and Singapore.

Next day, the master decided to take the opportunity to lower the port lifeboat, which was also the rescue boat, to the sea for a boat drill. The starboard lifeboat was to be lowered and tested after the vessel was berthed port side to the wharf.

Weather conditions were good. There was little wind, the sea was calm and there was a low swell, estimated by the mate at about 30 cm.

The mate and master discussed the details of the drill and, after breakfast, the mate ordered the

FIGURE 2:
Diagram of *Cape Kestrel's* lifeboat



bosun to prepare the boat for lowering. Before the boat was lowered, the second engineer checked the starter panel for the davit winch, making sure that the power to the winch to hoist the boat was on. He also checked the remote control that operated the winch and saw that the indicator was lit, indicating that there was power at the control for hoisting.

The mate, the third mate, the bosun, an ordinary seamen (OS) and the second engineer embarked at the embarkation platform. Each crewmember was wearing a helmet and a lifejacket. At about 0845, the mate used the remote release to lower the boat as the master watched from the bridge.

After the boat took the water, the hooks were released. The boat was secured alongside the ship with painters forward and aft. The engine was run ahead and astern slowly. On board the ship, two seamen greased the falls and sheaves. After about half an hour, the hooks were re-connected and secured in position. The mate informed the master by hand-held radio that the boat was ready and the master instructed him to hoist the boat.

An able-bodied seaman (AB) was standing by to recover the boat using the remote control unit for the winch motor. When told by the master to recover the boat, the AB pushed the hoist button, but nothing happened. The boat was rolling in the swell and there was tension in the falls, so the mate told the AB to tell the 1st engineer of the problem.

The first engineer went to the starter panel for the winches, located in the air conditioning room, where he saw that the circuit breaker had tripped. He reset the circuit breaker but, when the AB tried the remote control, the breaker tripped again. The first engineer then informed the mate by radio that the boat would have to be lifted manually.

The AB started to recover the boat using the winding handle. The rate of recovery was very slow and the first engineer, after a discussion with the mate by radio, decided it might be possible to locate the problem in the remote control.

The AB stopped manually hoisting the boat while the first engineer asked the AB to listen for any unusual noises from the winch motor. The AB heard nothing unusual, nor was there anything to indicate a problem with the motor.

When the mate asked why they had stopped hoisting the boat, the first engineer replied that he would hoist the boat from the lifeboat starter panel as the problem with the remote control probably had something to do with the control circuit itself.

The first engineer asked the AB to remain near the davit and to tell him when the boat was at the main deck level. He then depressed the contactor in the winch motor starter box, thus manually operating the motor electrical circuit, and started to hoist the boat.

As the boat was coming up, the master ordered the mate to ensure that everyone left the boat at the main deck.

While the boat was being hoisted, the bosun was at the fore end of the boat, the second engineer was seated on the port side amidships with the third mate, the mate was aft in the cockpit and the OS was seated on the starboard side. The mate, the third mate and the second engineer were reportedly secured by their seat belts.

When the boat was at the main deck level the first engineer heard a signal from the AB and stopped recovery of the boat by releasing the contactor. Though the master had ordered disembarkation of the boat at the main deck, the mate now told him that the boat was too far from the deck. The mate added that the boat was designed so its crew could embark and disembark at the boarding platform.

At this point, the master instructed the mate, who was looking out of the hatch at the side of the boat, to use tackles to bowse the boat in to the side of the ship. However, despite the master protesting angrily to him, the mate, expecting that the limit switches would operate to stop the winch before the cradles came up against the stops on the supporting frames, told the first engineer to continue the hoisting.

The first engineer resumed hoisting the boat, intending to stop when he heard the noise that would tell him that boat had been turned in.

The master recalled that he thought that the boat was coming in too fast and the limit switches did not seem to operate. The cradles reached the stops with the winch motor running and the forward falls parted. The boat was hanging almost perpendicular when the after fall also parted and the boat fell about 20 metres, bow first, into the sea.

The time was about 0930.

Inside the boat, the mate remembered the boat falling. The bosun heard the noise of the falls parting. As the boat hit the water, glass in the forward hatch broke and water flowed into the boat, but stopped as the bow rose. The second engineer had landed on top of the OS on the starboard side. The third mate, despite being injured, used the bilge pump to rid the boat of water. The mate was slumped in his seat, his eyes half open. The OS, with the bosun, went over to the mate and tried to make him comfortable, before the OS, in some pain, had to sit down. The second engineer went back to his seat and was sick.

The bosun moved the mate to the seats at the side of the boat before using the mate's radio to tell the master what had happened. The mate lay on the seats, crying out with pain. The master rushed down from the bridge as the chief engineer lowered a ladder from the main deck so that he could get down to the boat.

The chief engineer had been to the bridge at about 0900 to discuss some work on the main engine with the master, when he heard the mate tell the master on the radio that there was a problem with hoisting the boat. He went down to the main deck where the first engineer advised him that the main switch for power to hoist the boat was tripping. He watched the first engineer operate the contactor for the lifeboat winch motor in the starter panel to hoist the boat and then watched the boat as it was hoisted inboard.

After the boat had fallen overboard, the chief engineer put the lifeboat ladder over the side as fast as he could and climbed down to the boat where he opened the side hatch and looked in. The mate was lying on his back in great pain, the second engineer was on the port side of the boat and the OS, on the starboard side, was complaining of severe pain in his chest. The bosun looked uninjured. The third mate, who had been operating the bilge pump, had blood on his forehead and over one eye. The helmet that he had been wearing had split but, in taking the impact of his contact with a part of the boat, it had probably saved his life.

FIGURE 3:
Third mate's helmet after the accident

The chief engineer went back up the ladder to the deck and informed the master of the injuries to the crew. Using the provisions crane, a basket and a stretcher, the second engineer and the OS were lifted to the ship's deck. At about 1000, the master asked Hammersley Iron, the operators of the berth at which the ship was to load, for a doctor and a helicopter.

The helicopter arrived at about 1120, just after the pilot boat had arrived alongside with two doctors. One of the doctors checked the mate's condition and, after having him transferred to the pilot boat, accompanied him to the hospital at Karratha. The other doctor checked the rest of the lifeboat's crew and, at 1130, the OS was taken ashore by helicopter, then to the hospital at Karratha. The helicopter returned to the ship at about 1330 and took the second engineer and the third mate ashore for treatment at the same hospital.

The mate was transferred the same day, by the Royal Flying Doctor Service, to the Royal Perth Hospital for treatment to a broken pelvis and a damaged eye socket. After extensive treatment for his injuries, he left Australia on 12 February 2002, just over four months after the incident.

The third mate returned to the ship before it sailed. The OS and second engineer were repatriated to their home ports.

The lifeboat was recovered after new falls were fitted and the vessel berthed at the ore berth at Parker Point at 0140 on 15 October. It sailed at 0800 on 16 October, after loading 157 660 tonnes of iron ore for Yantai in China.

Cape Kestrel received authority from the Panama Maritime Authority to sail for a further 30 days until 12 November 2001 while repairs to the lifeboat were arranged, provided that additional liferafts of the same capacity were fitted on board. A liferaft, of suitable capacity, was fitted on board before the vessel sailed from Dampier.

FIGURE 4:
***Cape Kestrel*; port lifeboat**

Comment and analysis

Evidence

The master, the occupants of the boat, the chief and first engineers and the AB were interviewed by an investigator from the ATSB. Copies of relevant ship's documents were obtained including the lifeboat instruction manuals, lifeboat certificates of survey and lifeboat maintenance records. Records of drills and on-board safety training were also obtained.

The broken ends of the lifeboat falls and a separate length of the falls were taken from the ship for inspection and testing. A copy of the original test certificate for the wire rope was also acquired. The falls had been fitted to the davits in April 1998. They were changed end-for-end in September 2000 and were due for renewal in April 2003.

The lifeboat falls

The ATSB recovered and examined samples of the falls, including the fractured ends. The wires were examined by the Technical Analysis Team of the ATSB. A portion of the falls was also tested to destruction by a testing house. The report of the examination and test of the wires is attached to this report (Appendix 1).

All rope samples were heavily coated with grease, but visual inspection showed that the grease was in poor condition, discoloured and with large amounts of hard particle contamination. After the ropes were degreased, the external strands around the fractures were found to be extensively corroded. The extent and severity of the corrosion damage varied along the length of the ropes, the most noticeably damaged regions being in the location of the failure.

The sample of rope that was tested to destruction showed a breaking load of 134 kN, appreciably lower than the 162.8 kN reported on the test certificate. Based on the original 5:1 factor of safety specified on the test certificate, the maximum safe working load had been reduced by approximately 18%, to 26.8 kN.

The limit switches

In the past, the master had never permitted any crew to remain in a boat beyond the main or boat deck, since he considered it unsafe to rely on limit switches to stop the hoisting only 30 cm from the stowed position. On this occasion, he had told the mate to disembark the entire crew at the main deck. He was not aware that the first engineer had been using the contactor on the starter panel to hoist the boat. Neither was he aware that, by using the contactor on the starter panel, the limit switches, which halt the cradles before they come up against the stops, had been bypassed.

The fact that the master had ordered the mate to disembark the boat's crew at the main deck would not necessarily have prevented the falls from parting if his orders had been followed. It would, however, have prevented injury to the crew. Even if the crew had disembarked at the main deck, hoisting of the boat by using the winch motor contactor should have been stopped before the limit switches were reached. The limit switches are designed to stop the winch when the boat is about 300 mm from the stowed position. The boat should then have been restowed safely by winding in the davits manually.

The design of the control circuitry for the lifeboat winch motor incorporates limit switches to stop the winch motor just short of the stowed position and to prevent over-stressing of the wire falls. The control circuitry operates a contactor to switch on and off the heavy current required by the winch motor. By manually actuating the contactor, which then bypassed the control circuitry, the protection against overstressing of the falls, normally provided by the limit switches, was removed (see fig 4).

Later, after the falls had been renewed, the remote control operated without fault and the boat was recovered from the water in the normal manner.

Operating instructions

According to the operating instructions for the boats, the davits for both craft were designed to recover the boats, with equipment and six persons, from the water to a stowed position, during favourable weather conditions.

The procedure for recovery of the boat described in the lifeboat manual is:

1. Set the toggle pin at the brake lever of the winch
2. Hang the suspension blocks on each hook of the boat
3. Put the starter main switch (on the starter panel) on
4. Use the hoist button on the remote control

   ----- The davit can hoist the boat with two persons (the life/rescue boat with 6 persons)

   CAUTION- When turning in the life/rescue boat, turn the change lever to the low direction
5. When the limit switches activate, fit the manual handle to the winch and wind in the boat to the stowed position
6. Fit the cradle stopper
7. Connect the slip hook of boat lashing line and fasten the turnbuckle to the life boat
8. Put the starter main switch off.

The port lifeboat, which was also the rescue boat, was designed to be hoisted from the water line to the main deck at a rate of 36 metres per minute. From that level to the stowed position the boat should have been turned in at 16 metres per minute. The change in winch speed would have been effected by changing the position of the clutch lever on the winch motor as described in step 4 of the instructions for hoisting the boats.

It is not clear if, on the day of the incident, the clutch lever was correctly positioned while the boat was being turned in. The master's opinion was that the boat came up too fast and that the cradles went through the limit switches, reaching the top with a bang that was audible on the bridge. It is probable that the clutch lever had not been moved to the correct position for turning the boat in.

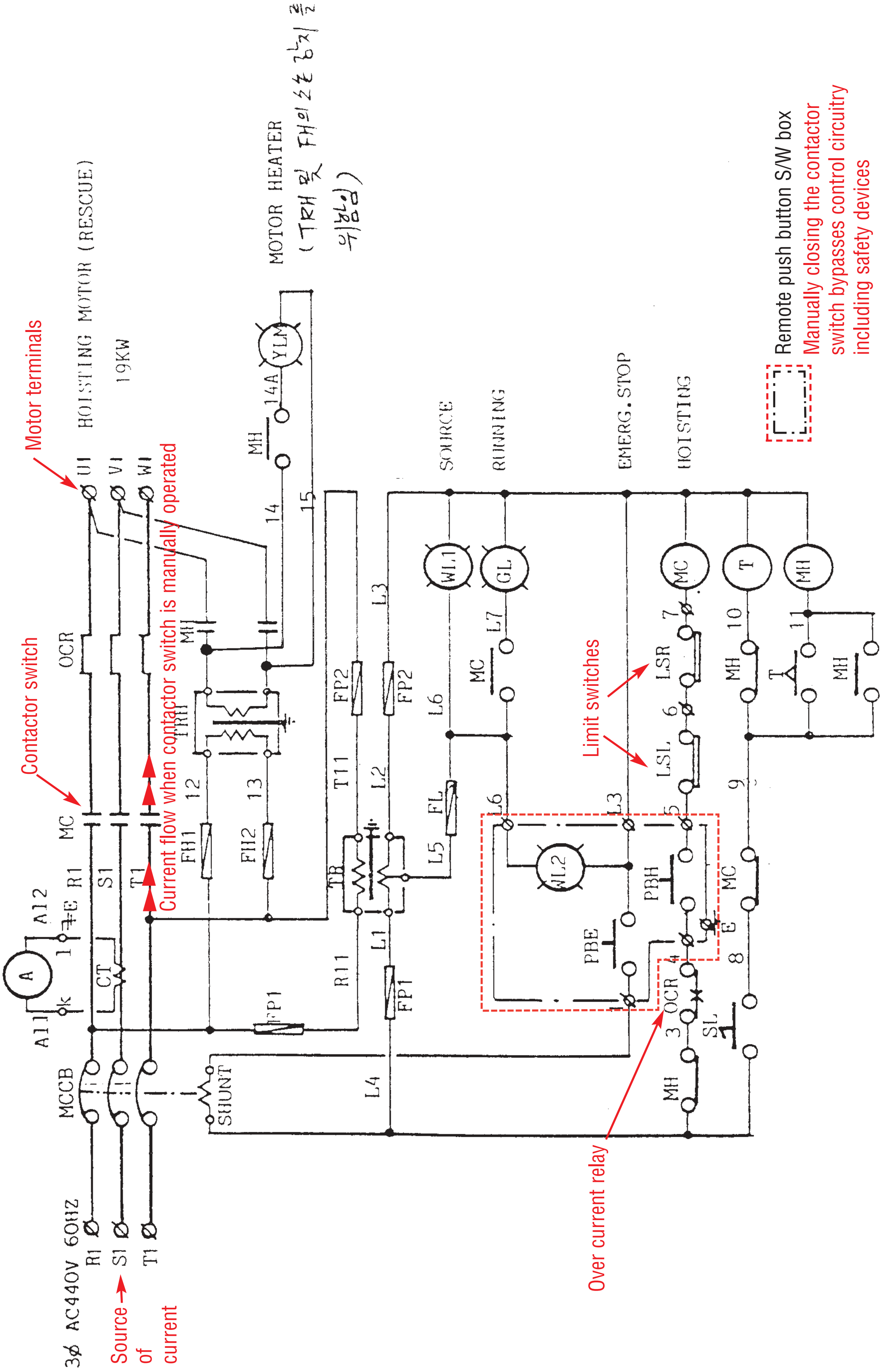
FIGURE 5:
Clutch lever for hoisting winch for port lifebaot

Lifeboat recovery

The third mate, who had been with the ship for about six months, was in charge of the maintenance of safety equipment. He stated that the boats had been swung out once a week and, while he had been on the ship, the remote control had always been used to recover the boats without causing any problems. Records on the ship supported the third mate's statement.

The first engineer seemed unaware that operating the winch with the motor contactor meant that all the electrical safety interlocks, which were provided to prevent damage to the davits and the boats, had been bypassed. The chief engineer, who was aware of the manner in which the boat was being hoisted, should have warned the first engineer that hoisting of the boat should have been stopped before the limit switches were contacted.

FIGURE 6:
Control circuit for rescue boat winch


Motor terminals
Contactor switch
Current flow when contactor switch is manually operated
Limit switches
Over current relay
Source of current
Remote push button S/W box
Manually closing the contactor switch bypasses control circuitry including safety devices

As the ship carries no electrician, the engineers should have had sufficient electrical knowledge to be aware of the hazards associated with manual operation of the contactor to hoist the boat.

Communications

When the boat had been hoisted to the main deck, the AB signalled the first engineer to stop hoisting.

When the mate decided that it was not safe to disembark at the main deck, he told the first engineer to resume hoisting the boat. The mate's altercation with the master possibly focused his attention away from the crew recovering the boat. He did not seem to be aware that the first engineer was not using the remote control to hoist the boat and, even if he was aware where the boat was being hoisted from, he was not aware that the limit switches would not operate.

The first engineer's version of events was that the AB advised him to resume hoisting the boat to turn it in from the embarkation deck level.

The noise inside the air conditioning room would have made it difficult to hear the mate on the radio and the first engineer later claimed to have been relying on the AB to tell him when to stop hoisting the boat. Not having received any such signal from the AB and appearing unaware that the limit switches had been bypassed, the first engineer, who had been manually operating the contactor for two or three seconds at a time, heard the davits hitting the stops and then a series of 'unusual noises'. The unusual noises would have been the sounds of the falls parting and the cradles falling outboard, dropping the boat.

Failure of the remote control

While it is not clear why the remote control did not operate to hoist the boat in the first instance, there are a number of possible causes for this, including:

- The two limit switches in the control circuit not being properly 'closed' or 'made'
- The over-current relay in the control circuit tripping. Possible reasons for this are incorrect setting of the over-current relay, or that incorrect lubricant or insufficient lubrication had been used on sheaves or the drive train of the winch motor, resulting in excessive friction and the drawing of larger than normal amounts of current.

The appropriate action, after the remote control did not operate, would have been to determine what caused the problem, rectify it and then hoist the boat using the remote control. The boat could have been hoisted just clear of the water manually while the problem with the remote control was resolved.

Similar accidents

The Bureau is aware of two very similar lifeboat accidents which have occurred relatively recently, one aboard the ro-ro vessel *City of Burnie* and the other aboard the container vessel *Nicolai Maersk*.

The accident aboard *City of Burnie*, on 15 March 1998 at Burnie, Tasmania (Report No. 130), was investigated by the ATSB (at that time the Marine Incident Investigation Unit, MIIU). On that occasion, after the boat was lowered with its crew, the hoist control failed to operate and the boat was recovered by pushing in the contactor for the lifeboat winch motor. The second mate, who had been supervising the recovery of the boat, had expected the limit switches to operate to stop the winch. However, this did not happen. The davits came up against the stops and the falls parted, dropping the boat into the harbour. Most of the crew of the boat suffered injuries, some serious, but there were no fatalities.

On 13 February 2001, *Nicolai Maersk* had lowered a lifeboat with seven crewmembers during a drill at Auckland, New Zealand. When the mate tested the winch to hoist the boat, he found that it did not work.

The electrician saw that the power source indicator light on the remote control was not lit. He went to the lifeboat starter panel one deck below, where he noticed that the circuit breaker had tripped, so he reset it and pushed the button on the main contactor several times until the lifeboat neared its stowed position, at which position the winch ran smoothly. The davits came up past the limit switches to the top where the falls parted and the boat fell. It landed on the edge of the boat deck with the davit arms on top of it, then it rolled over into the sea landing upside down. A crew member was killed when the stowing chock of the aft davit pierced the boat where he had been seated. Two others were seriously injured and the rest received minor cuts and bruises.

This incident was investigated by the Transport Accident Investigation Commission of New Zealand. The report included an analysis of the design of the cradle stoppers, concluding that it would have been relatively simple to make the cradle stoppers self-latching when the boat was stowed, preventing such accidents.

On *Cape Kestrel*, cradle stoppers (see fig 5) were fitted between the fixed structure of the launching apparatus and the davit arms, or cradles. If these had been designed to engage automatically, they would have prevented the davit arms from swinging outboard when the falls parted, thus preventing the floating blocks, from which the lifeboat is suspended, from dropping off the davit arms.

Reviews of lifeboat accidents

A number of reviews of lifeboat safety have been carried out, including those by OCIMF (Oil Companies International Marine Forum) and, in the UK, the MAIB (Marine Accident Investigation Branch).

Papers have also been submitted by Australia to IMO on the topic of lifeboat safety.

There are several reasons why, for seafarers, lifeboats are becoming a predominant cause of deaths and injuries. To meet the requirements for enclosed lifeboats to be remotely released, release mechanisms for davit launched lifeboats have become elaborate and sophisticated. Such sophistication has been accompanied by engineering tolerances that require to be maintained in salt laden atmospheres. Maintenance instructions and procedures do not match the levels of sophistication of systems that have been designed. Neither is there any standardisation in the design of release mechanisms.

Problems are often encountered because of:

- The complex designs of on-load release hooks
- Lack of maintenance
- Operating and maintenance manuals that are not adequate for the purpose
- Inadequate training and the fact that many ships carry crews who do not share a common language.

The MAIB review revealed that, in the UK jurisdiction over the last nine years, the number of lives lost (12) in those lifeboat accidents, equalled the number lost in the other worst accident types – entering confined spaces and falls overboard. During the same period, 71 injuries were caused by the operation of lifeboats or their launching systems.

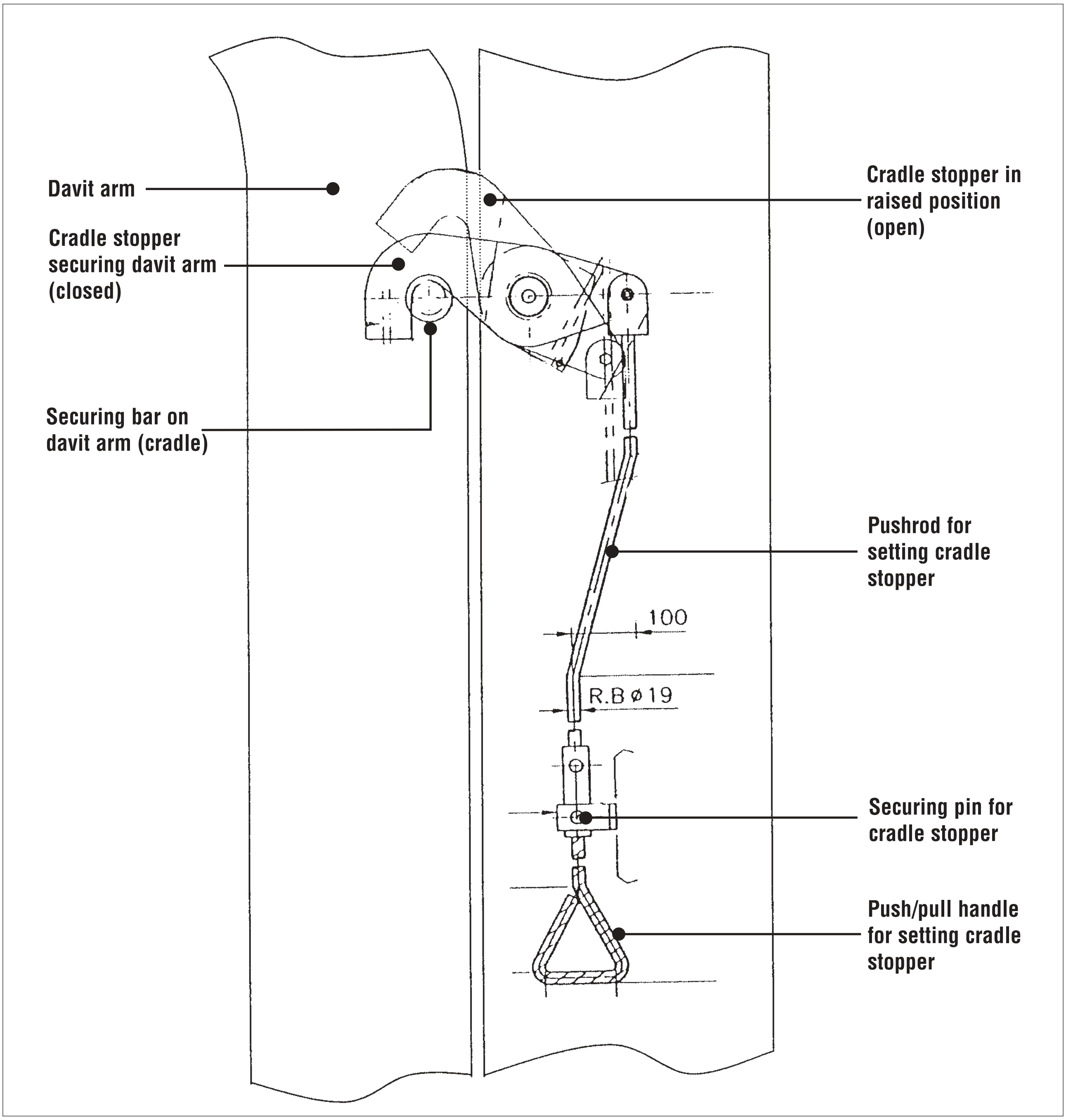
In the last two years, the ATSB has received notification of six serious lifeboat accidents within Australia’s jurisdiction.

The issue of lifeboat safety

Papers submitted to IMO by Australia, the UK and others document the fact that seafarers have been killed and injured during lifeboat exercises. Lifeboat accidents have occurred during training exercises, testing, or Port State Control inspections, even though experienced, qualified seafarers were performing or supervising the operations.

Australia submitted a note dated 14 October 1999 to the IMO Sub-Committee on Flag State

FIGURE 7:
Cradle stopper



Implementation with a summary of nine lifeboat accidents which occurred between 1991 and 1998. Over half the incidents investigated by Australia identified issues of design, equipment and training as being contributory factors to these incidents.

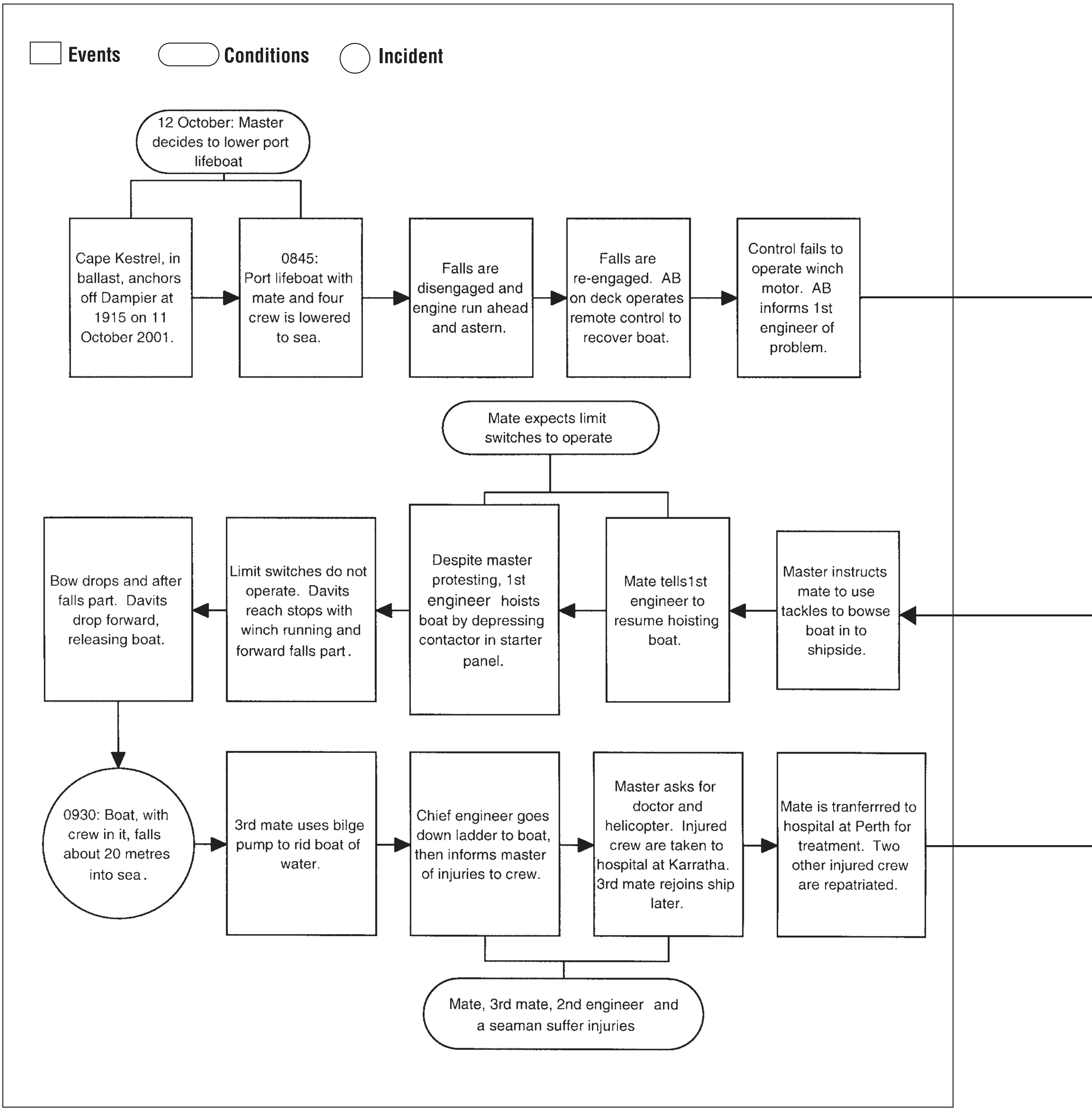
Of six lifeboat accidents in Australian waters since 1994, two accidents occurred during Port State Control inspections. The other four accidents occurred during lifeboat drills.

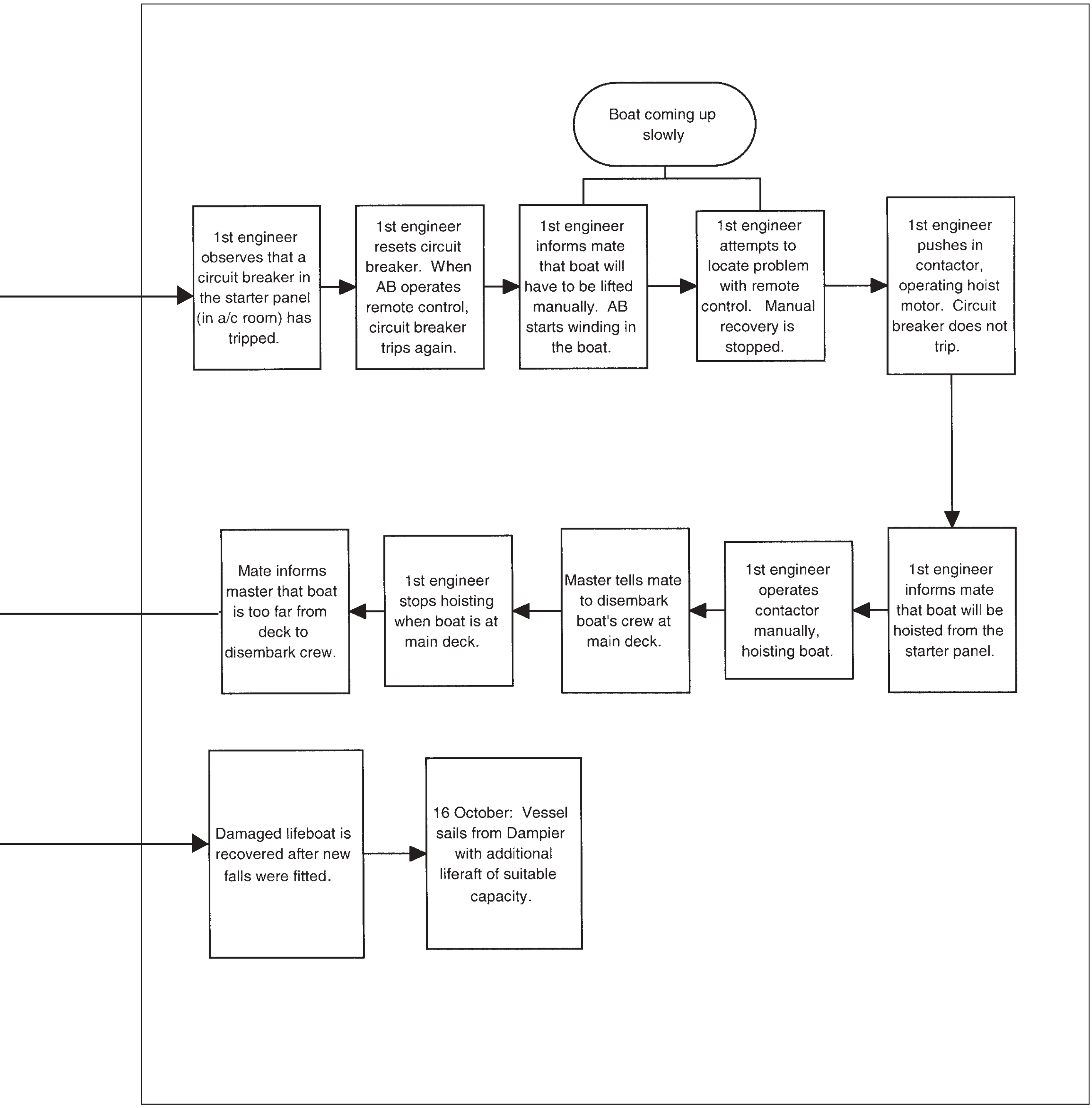
A paper, DE 45/17/2, on measures to prevent accidents with lifeboats, submitted by Australia on 11 January 2002 to the IMO Sub-Committee on Ship Design and Equipment, noted that there were a number of categories of such accidents, including unsafe practices during lifeboat drills and inspections. The paper mentioned that a significant number of incidents were associated with the operation of the davit winch by depressing the contactor in the starter box within the superstructure, usually from where the boat could not be observed.

A paper, DE 45/17/4, on the same subject, was submitted on 25 January 2002 to IMO by the Oil Companies International Marine Forum (OCIMF), the International Association of Independent Tanker Owners (INTERTANKO) and the Society of International Gas Tanker and Terminal Operators (SIGTTO). The paper notes that many of the davit-launched fully enclosed lifeboats fitted to vessels do not appear to be fit for purpose.

The Chief Inspector of MAIB, in a foreword to a Safety Study 1/2001, a Review of Lifeboat and Launching Systems Accidents, recommended that IMO undertake a study on the present value, need and desirability of lifeboats. If such a study concluded that lifeboats and launching systems were necessary, IMO should give consideration to formulating the requirements for safe lifeboat launching systems in merchant ships.

FIGURE 8:
***Cape Kestrel:* Events and causal factors chart**




Boat coming up slowly
1st engineer observes that a circuit breaker in the starter panel (in a/c room) has tripped.
1st engineer resets circuit breaker. When AB operates remote control, circuit breaker trips again.
1st engineer informs mate that boat will have to be lifted manually. AB starts winding in the boat.
1st engineer attempts to locate problem with remote control. Manual recovery is stopped.
1st engineer pushes in contactor, operating hoist motor. Circuit breaker does not trip.
1st engineer informs mate that boat will be hoisted from the starter panel.
1st engineer operates contactor manually, hoisting boat.
Master tells mate to disembark boat's crew at main deck.
1st engineer stops hoisting when boat is at main deck.
Mate informs master that boat is too far from deck to disembark crew.
Damaged lifeboat is recovered after new falls were fitted.
16 October: Vessel sails from Dampier with additional liferaft of suitable capacity.

Conclusions

These conclusions identify the different factors contributing to the incident and should not be read as apportioning blame or liability to any particular individual or organisation.

Based on the evidence available, the incident occurred due to a combination of the following factors:

1. When the hoist button on the winch remote control unit did not operate, the boat was hoisted by manually pushing in the winch motor contactor in the starter panel.
2. The fault that prevented the hoist button on the remote control from working was not identified and rectified.
3. Communication between the mate and the first engineer was hampered by the noise in the air conditioning room and, from that position, the first engineer was unable to see the boat station.
4. The master's instructions to disembark the boat's crew at the embarkation deck were ignored by the mate.
5. While neither the master nor the mate were aware of how the boat was being hoisted, they were also unaware that the consequence of manually using the contactor to hoist the boat was to bypass safety systems, including the limit switches, designed to protect the falls, the boat and the davits.
6. It is probable that the clutch lever was not in the correct position for turning the boat in and that, as a result, the boat came in too fast.
7. The first engineer and the chief engineer should have known that it was imperative that hoisting of the boat should cease before contact was made with the limit switches on the frame of the davits. From that point onward the boat should have been turned in manually.
8. The first engineer did not seem to be aware that the limit switches had been bypassed and neither was he warned of this by the chief engineer. The electrical knowledge of all involved appears to have been less than adequate.

Recommendations

1. Warning notices should be posted at the starter box for all lifeboat winches drawing attention to the hazard of operating the winch with the contactor, particularly if there are personnel in the boat.
2. Shipowners and operators should ensure that:
   - All appropriate documentation for the maintenance and adjustment of lifeboats, launching appliances and associated equipment is on board in accordance with section 11 of the ISM Code
   - Personnel undertaking inspections, maintenance and adjustment of lifeboats, launching appliances and associated equipment are fully trained and familiar with these duties in accordance with section 6 of the ISM Code
   - Maintenance of lifeboats, launching appliances and associated equipment is carried out in accordance with procedures established under section 10 of the ISM Code and
   - Lifeboat drills are conducted in accordance with SOLAS Regulation III/19.3.3 and procedures established under section 8 of the ISM Code for the purpose of ensuring that ship's personnel will be able to safely embark and launch the lifeboats in an emergency
   - Particularly in the case of vessels carrying no electrician, engineers be trained to a suitable standard of electrical knowledge to ensure the safety of all personnel when operating and maintaining electrical systems aboard ship.
3. Manufacturers of lifeboat launching systems should consider fitting self-latching cradle stoppers to prevent the davits dropping in the event of broken fall wires.

Submissions

Under sub-regulation 16(3) of the Navigation (Marine Casualty) Regulations, if a report, or part of a report, relates to a person's affairs to a material extent, the Inspector must, if it is reasonable to do so, give that person a copy of the report or the relevant part of the report. Sub-regulation 16(4) provides that such a person may provide written comments or information relating to the report.

The final draft of the report, or relevant parts thereof, was sent to the following:

Zodiac Maritime Agencies Ltd, London, UK and the master, mate, chief, first and second engineers of *Cape Kestrel*.

Submissions were received from the master, the mate and the first engineer and the report was amended where necessary.

In addition, the first engineer also commented, in relation to operation of the limit switches:

> …I would like to remind you that the boat had been hanging for a few minutes about 15 metres above the water and it was not the proper time to go into details about control and power circuits and what had been bypassed. It is correct that I did not warn the mate and the AB of the danger of bypassing limit switches as I assumed that it was clear that the hoisting had been carried out under extraordinary circumstances requiring extra attention and precautions.
>
> That was the reason for me to instruct the AB for a signal to stop when the boat was turned in, but before the limit switches were reached. …In addition, I indicated (to the AB) that position.
>
> After this, the mate got into the boat again and I went to the air conditioning room. I pressed the contactor button, expecting a signal. Instead, seconds later, I heard a sound as from a drum. I released the button…and rushed toward the boat station. The boat was down and water was foaming around…

Cape Kestrel

IMO No.	9036014
Flag	Panama
Classification Society	Lloyd's Register of Shipping
Vessel type	Bulk carrier
Owner	Avalon Shipping Inc
Year of build	1993
Builder	Hyundai Heavy Industries Co Ltd, South Korea
Gross tonnage	81 589
Summer deadweight	161 475 tonnes
Length overall	280 m
Breadth, moulded	45 m
Draught (summer)	17.52 m
Engine	B&W 6S70MC
Engine power	14 254 kW
Service speed	12.5 knots
Crew	21 (2 Croatian, 13 Bulgarian, 1 Russian, 3 Turkish, 2 Romanian)

Technical Analysis report No: 04/02
Reference No: BE/200100027

Examination of Fractured Lifeboat Davit Wire Rope

MV Cape Kestrel

EXAMINATION OF FRACTURED LIFEBOAT DAVIT WIRE ROPE

MV Cape Kestrel

1. FACTUAL INFORMATION

1.1 Introduction

On 12 October 2001, the crew from the bulk carrier MV Cape Kestrel were using powered davits to raise a lifeboat following testing exercises. Nearing completion of the raising procedure, the wire ropes from both forward and aft davits failed, dropping the vessel to the sea and causing injury to the crew on-board the lifeboat.

To determine the cause of the failure, the ATSB recovered and examined samples of the rope from both davits, including the fractured ends (figures 1 & 2). A copy of the original test certificate for the rope installed in the davits was also provided for reference (attachment A).

Figures 1 & 2. Davit wire rope samples as-received. Left are the samples from around the fracture; right is the two-metre length for mechanical testing.

1.2 Visual examination and fractography

1.2.1 Rope construction

Initial examination identified the wire rope supplied as a 16-millimetre diameter, 18 strand, 7 wires-per-strand construction, with a right regular lay and a fibre core. The rope was a non-rotating design, as evident by the opposite (left) lay of the inner strands, and used galvanised wire throughout. This identification met the specification details listed on the test certificate.

1.2.2 Condition

All rope samples received carried a heavy grease coating over the full length. Visual inspection showed the grease to be in poor condition, with a large amount of hard-particle contamination and a brown discolouration.

Examination after degreasing found the external rope strands around both fractures to be extensively corroded (figure 3). Appreciable proportions of the original cross-section had been lost on many of the individual wires, with the outer surfaces showing an uneven, pitted appearance. Between the wires, much of the galvanised zinc coating had also been lost to the effects of corrosion, producing large amounts of white corrosion product (figure 4). The strands from the internal windings generally showed more limited corrosion damage (figure 5). The extent and severity of the corrosion damage appeared to vary along the length of the ropes, with the most noticeably damaged regions being associated with the location of failure.

Figure 3 (top left). Illustrates the extent of the corrosion damage to the outer wire strands adjacent to the fracture.

Figure 4 (above). Closer view of a single external wire strand – note the white zinc corrosion product between the wires.

Figure 5 (left). **Inner wire strand from the rope – notably less corrosion damage.**

1.2.2 Failure

Figure 6 shows the fractured ends from the forward (F) and aft (A) davit wires. Both showed the unravelling of the outer strands for around 30 centimetres back from the point of failure, exposing the inner strands which typically splayed outward for only 5 centimetres (figure 7). Each of the eighteen fractured rope strands was examined individually at low magnification. In all cases, the wire elements showed evidence of localised plastic deformation or 'necking' of the material at the point of fracture. This was most evident on the core wire of each strand (figure 8), however the corroded outer wires also showed the effect (figure 9). Localised reduction of area (necking) at the point of fracture is a characteristic indication of tensile overload in ductile materials.

Figure 6. Forward and aft davit ropes at the point of failure. Note the splaying of the outer strands.

Figure 7. Inner wire strands at the point of failure.

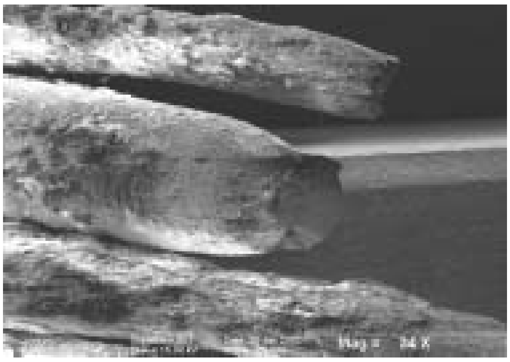
Figure 8. Ductile 'necking' of a strand core wire. Classic cup-cone style tensile fracture.

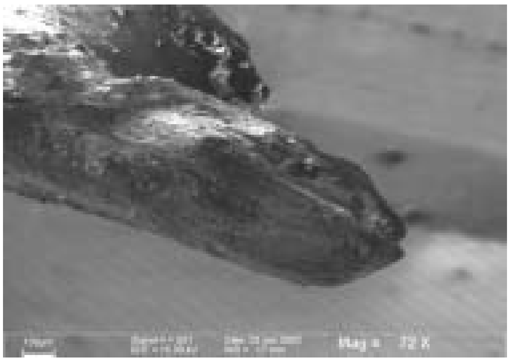
Figure 9. Strand outer wire also showing localised necking.

1.3 Electron microscopy and micro-analysis

Samples of failed wires from both davit ropes were examined using the scanning electron microscope. This study confirmed the visual observations relating to the ductile tensile overload failure of the wires (figures 10 & 11).

Analysis of the corrosion products present on the wire surfaces indicated the presence of significant levels of chloride and oxide compounds – both commonly associated with marine corrosion (figure 12).





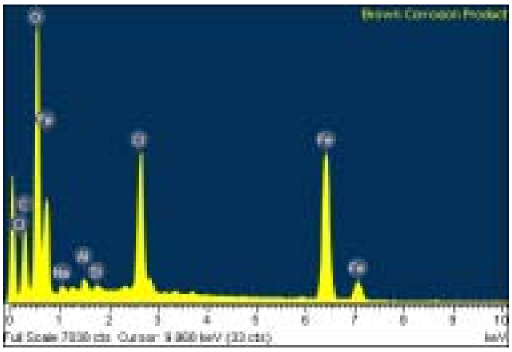


Figure 12. Microanalysis spectra from a corroded wire surface. Note the large chloride and oxide peaks.

1.4 Mechanical testing

An external testing authority (Bullivants Pty Ltd) carried out breaking load tests on a two-metre length of the davit rope. The test report for this work is presented as attachment B, with the results showing a breaking load for the test sample of 134 kN. This result was appreciably lower than the 162.8 kN reported on the original test certificate (attachment A). Based on the original 5:1 factor of safety specified on the original certificate, the maximum safe working load (from the single test) had been reduced by approximately 18%, to 26.8 kN (2,734 kg).

2. ANALYSIS

2.1 Failure mechanism

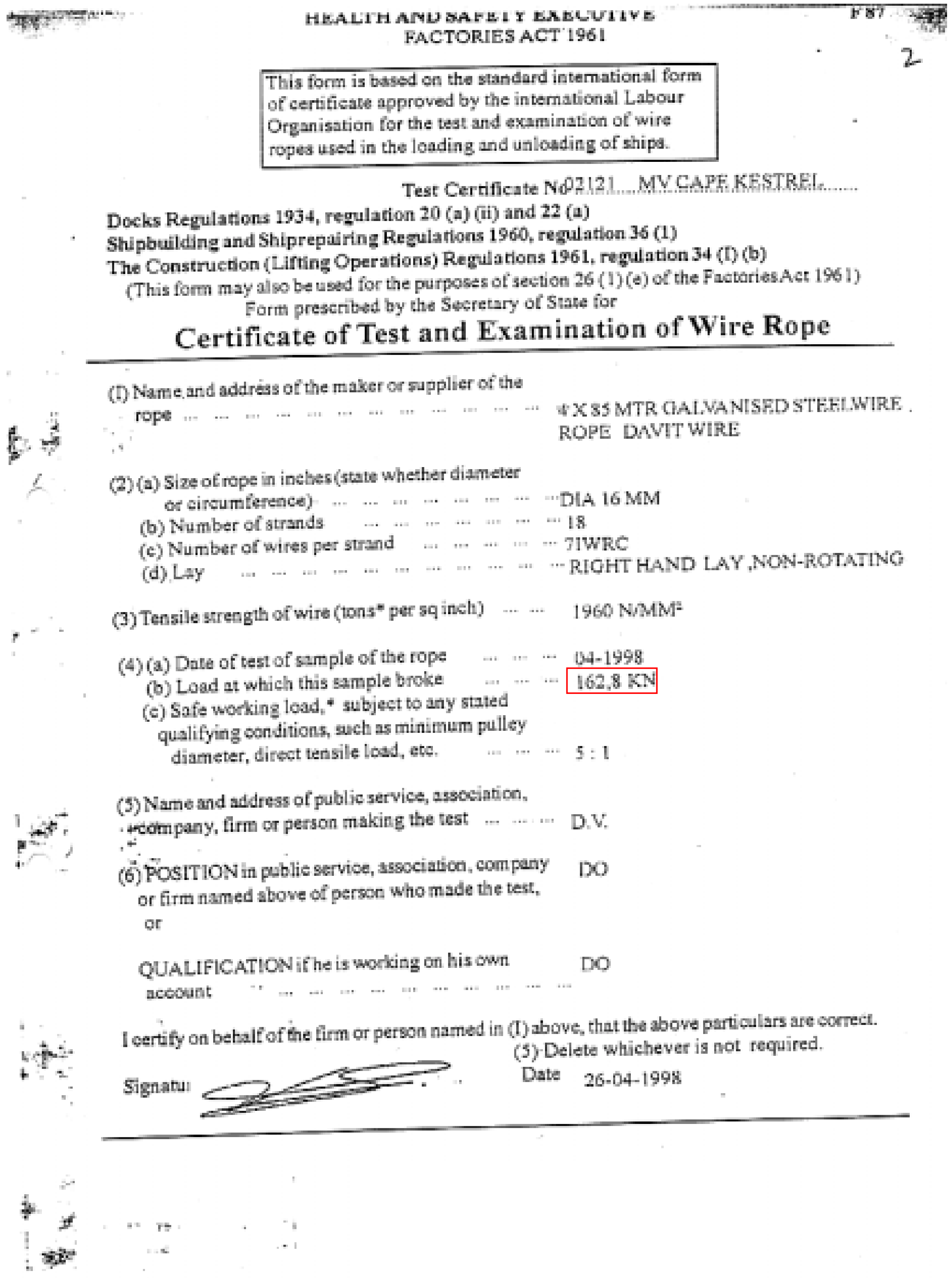
From the examinations conducted and reported herein, it was apparent that both the forward and aft lifeboat davit ropes had failed under tensile overloading conditions. The characteristic ‘necking’ or reduction in area visible on most wire elements was typical of this mechanism.

2.1 Effect of corrosion damage

The samples of rope examined showed extensive metal loss from corrosion; most notably on the outer strands from around the fracture location. The protective galvanised (zinc) coating had oxidised away completely in many areas, leaving the steel wires in the rope prone to corrosive attack. Marine environments are particularly aggressive in terms of corrosion damage, due in part to the high proportion of chloride compounds in seawater. The microanalysis conducted on the corroded wire surfaces confirmed the high level of chloride compounds present.

The most significant physical effect of the corrosion damage to the lifeboat davit ropes was a net reduction in the available wire cross-section to carry the applied loads. This was reflected clearly in the reduced tensile strength of the tested specimen. A reduction in tensile strength serves to reduce the factor of safety available for protection against transient overloads. Based on the tensile test results, the factor of safety for the rope sample tested had reduced from 5:1 to approximately 4:1 for the same safe working load. Given the observed variability of the corrosion damage to the rope samples however, the tensile test result cannot be considered representative of the full length of the davit ropes. It is likely that the actual breaking load of the rope during the accident was somewhat lower than the test result, given that the corrosion was comparably more extensive in the fractured areas. The inherent irregular nature of the corrosion damage prevented the determination of the actual loads at which the davit ropes failed.

Attachment A. Original test certificate for the davit rope (as supplied).



HEALTH AND SAFETY EXECUTIVE
FACTORIES ACT 1961

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This form is based on the standard international form of certificate approved by the international Labour Organisation for the test and examination of wire ropes used in the loading and unloading of ships.

Test Certificate No 02121 MV CAPE KESTREL

Docks Regulations 1934, regulation 20 (a) (ii) and 22 (a)
Shipbuilding and Shiprepairing Regulations 1960, regulation 36 (1)
The Construction (Lifting Operations) Regulations 1961, regulation 34 (I) (b)
(This form may also be used for the purposes of section 26 (1) (e) of the Factories Act 1961)
Form prescribed by the Secretary of State for

Certificate of Test and Examination of Wire Rope

(I) Name and address of the maker or supplier of the rope … 4 X 85 MTR GALVANISED STEELWIRE ROPE DAVIT WIRE

(2) (a) Size of rope in inches (state whether diameter or circumference) … DIA 16 MM
(b) Number of strands … 18
(c) Number of wires per strand … 7IWRC
(d) Lay … RIGHT HAND LAY ,NON-ROTATING

(3) Tensile strength of wire (tons* per sq inch) … 1960 N/MM²

(4) (a) Date of test of sample of the rope … 04-1998
(b) Load at which this sample broke … 162,8 KN
(c) Safe working load,* subject to any stated qualifying conditions, such as minimum pulley diameter, direct tensile load, etc. … 5 : 1

(5) Name and address of public service, association, company, firm or person making the test … D.V.

(6) POSITION in public service, association, company or firm named above of person who made the test, or

QUALIFICATION if he is working on his own account … DO

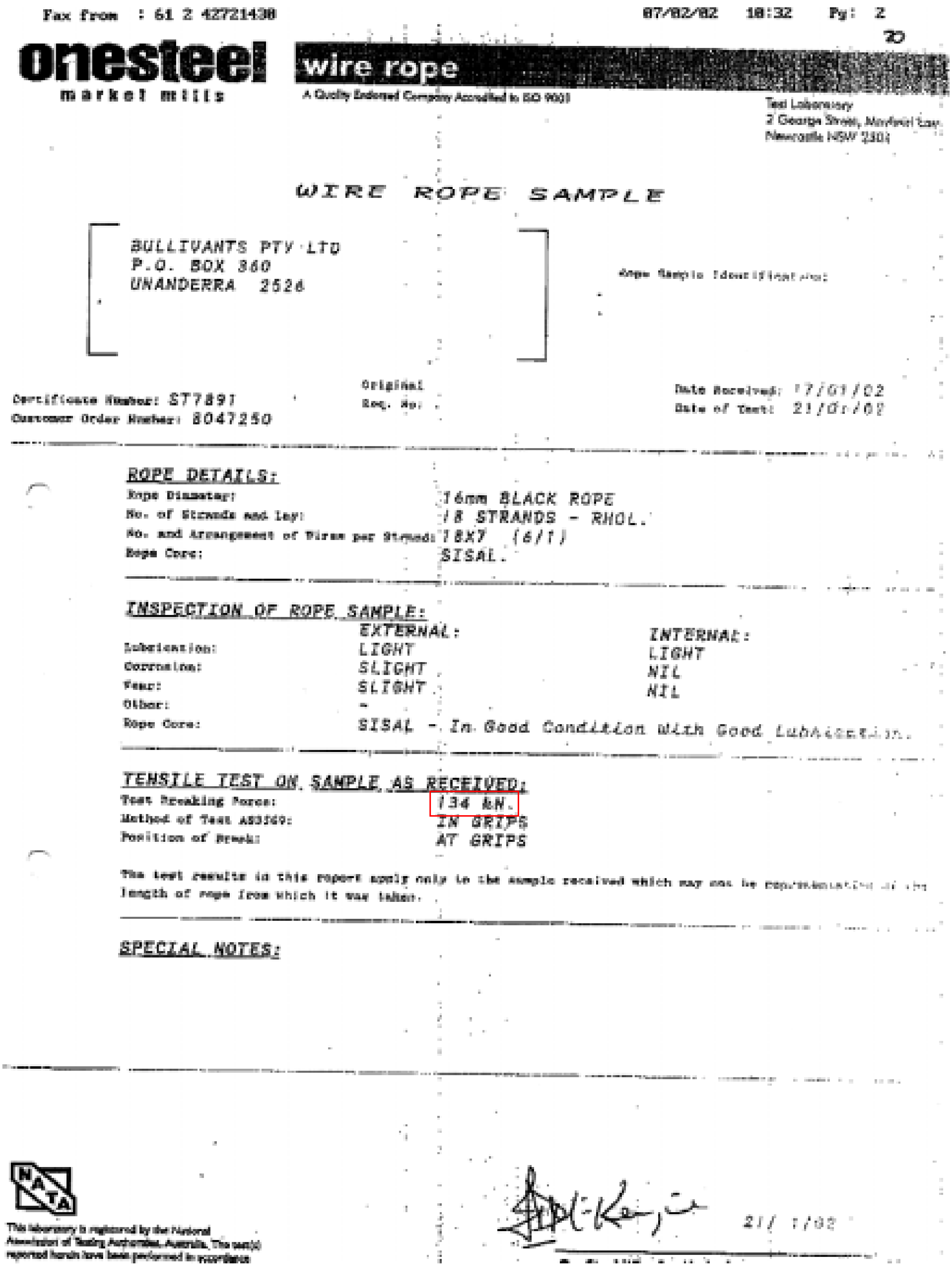
I certify on behalf of the firm or person named in (I) above, that the above particulars are correct.

(5) Delete whichever is not required.

Signatu

Date 26-04-1998

Attachment B. Test certificate for the evaluation of the supplied rope sample.



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wire rope

A Quality Endorsed Company Accredited to ISO 9001

Test Laboratory
2 George Street, Mayfield East
Newcastle NSW 2304

WIRE ROPE SAMPLE

BULLIVANTS PTY LTD
P.O. BOX 360
UNANDERRA 2526

Rope Sample Identification:

Certificate Number: ST7891
Customer Order Number: 8047250

Original
Req. No:

Date Received: 17/01/02
Date of Test: 21/01/02

ROPE DETAILS:

Rope Diameter: 16mm BLACK ROPE
No. of Strands and Lay: 18 STRANDS - RHOL.
No. and Arrangement of Wires per Strand: 18X7 (6/1)
Rope Core: SISAL.

INSPECTION OF ROPE SAMPLE:

	EXTERNAL:	INTERNAL:
Lubrication:	LIGHT	LIGHT
Corrosion:	SLIGHT	NIL
Wear:	SLIGHT	NIL
Other:	-	

Rope Core: SISAL - In Good Condition With Good Lubrication.

TENSILE TEST ON SAMPLE AS RECEIVED:

Test Breaking Force: 134 kN.
Method of Test AS3569: IN GRIPS
Position of Break: AT GRIPS

The test results in this report apply only to the sample received which may not be representative of the length of rope from which it was taken.

SPECIAL NOTES:

NATA

This laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance

21/1/02

Independent investigation into the lifeboat accident and injury to crew aboard the Panama flag bulk carrier Cape Kestrel at Dampier, Western Australia on 12 October 2001

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