



AUSTRALIAN TRANSPORT SAFETY INVESTIGATION REPORT
 Marine Occurrence Investigation No. 230

Crew member fatality on board *Probo Bear*

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This investigation was carried out by the Australian Transport Safety Bureau (ATSB) utilising investigation information provided by the Maritime Administrator of the Republic of the Marshall Islands (International Registries).

On 10 April 2006, an able bodied seaman (AB) was fatally injured when he was struck by a mooring line while operating a winch on the forecastle of *Probo Bear* during a shift ship operation.

Probo Bear

Probo Bear is a Marshall Islands registered, double hulled products/oil/bulk/ore carrier. The ship is 182.91 m long, has a beam of 31.97 m and a depth of 18.01 m. At its summer draft of 13.085 m, the ship has a deadweight of 47 950 tonnes (Figure 1).

The ship was built in 1997 in Pusan, Korea by Korea Shipbuilding & Engineering. It has seven cargo holds located forward of

the accommodation and is fitted with two travelling jib cargo cranes.

At the time of the incident the ship was classed with Lloyds Register (LR) and managed by Prime Marine Management of Athens, Greece.

Probo Bear's complement of 22 crew consisted of 20 Croatian, one Russian and one Ukrainian national.

The master had 40 years experience at sea. He had been master of *Probo Bear* and its sister ships for about two and a half years.

The deceased AB had joined *Probo Bear* in November 2005 as an ordinary seaman. He had been promoted to the rank of AB during his time on the ship. The ship's training records show that he had been familiarised with his duties and he held a Marshall Islands qualification as AB.

Figure 1: *Probo Bear*



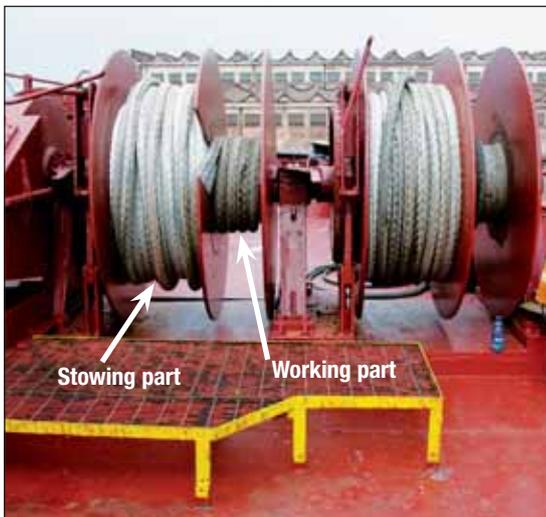
The aft end of the ship's forecastle is a very congested area. It contains two large windlasses, a double drum winch, the foremast and a small deckhouse to protect the ladder access down to the forecastle store (Figure 2).

Figure 2: Aft end of forecastle



The two drum winch for the forward spring lines is positioned on the ship's centreline, with the mooring lines leading from the top of the drums when the ship is starboard side alongside. The two drums are in line on a common axle, and are powered using the same hydraulic motor. Each of the two drums is divided into two sections, the stowing part and the working part (Figure 3).

Figure 3: Forward mooring winch



Each of the winches is loaded with a length of eight inch circumference twenty four strand braided polypropylene/polyethylene mooring line.

A flange with a slot over a sector of about 25 degrees separates the stowing and working parts of each drum. The mooring line is passed through the slot to lead it from the stowing part to the working part, and vice versa. Before the winch is placed in the self-tensioning mode the mooring line should be divided such that one layer is on the working part of the drum, while the remainder is on the stowing part.

Port cargo operation

The manganese ore loader in the port of Groote Eylandt is fixed in one position. Ships using the loader are moved during loading operations so that each cargo hold is positioned under the loader as required.

The incident

After discharging a cargo of caustic soda solution at Gove, Australia, *Probo Bear* sailed to nearby Groote Eylandt to load a cargo of manganese ore. The ship arrived and anchored off the port on 25 March 2006 and waited for the berth to become available.

Probo Bear was brought alongside with the assistance of a pilot on the morning of 9 April. The arrival drafts were 5.8 m forward and 7.65 m aft. By 0930¹ the ship was all fast starboard side to the jetty. The ship's number five hold was in line with the shore loader.

Two head lines had been made fast on the northern mooring dolphin, two forward and two aft breast lines on the two dolphins adjacent to the jetty, and the stern lines on the southern dolphin. The forward spring line was made fast on the jetty to a quick release hook under the loading boom. The aft spring line was made fast on the jetty to one of three bollards south of the loading boom (Figure 4).

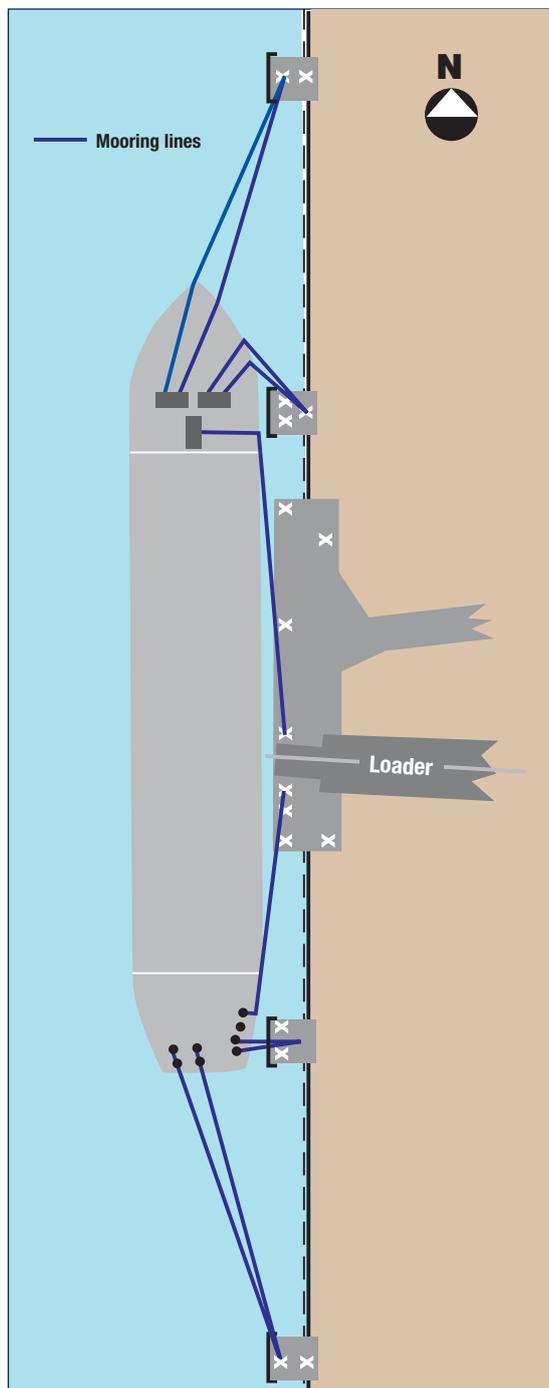
For the berthing and subsequent shift ship operations, the master and chief mate were stationed on the bridge. The third mate,

¹ All times referred to in this report are in Australian Central Standard time, coordinated universal time (UTC) + 9 ½ hours.

boatswain, fitter, two ABs and the deck boy were stationed on the forecastle. The second mate and five crew were stationed at the stern mooring station.

Although a pilot and tugs are required when the ship initially berths alongside and when it departs, they are not normally required when

Figure 4: Initial mooring arrangement



the ship is moved along the jetty. However, linesmen are always available on the jetty if it becomes necessary to run additional mooring lines, or to change the bollards that existing mooring lines are made fast to.

When loading into number five hold was completed at 1710 on 9 April, it was necessary to move the ship astern to load number three hold. The main engine was made ready and the crew were stationed forward and aft.

The ship was moved and was made fast in its new position by 1730. Similar moves took place from number three hold to number four hold between 2240 and 2255 on 9 April; from number four hold to number six hold between 1030 and 1045 on 10 April; and from number six hold to number one hold between 1530 and 1645 on 10 April.

When the ship was moved to place number six hold under the loading boom, it was found that the aft spring line had an insufficient lead forward. Later that morning, after the linesmen had been stood down; a second aft spring line with a longer lead forward was run out by the ship's crew.

While the first three moves of the ship were completed in 20 minutes or less, the move from number six hold to number one hold took 75 minutes. This was partly due to an adverse current of about 0.5 knots. During this operation a second forward spring line was run out to assist the ship's astern movement. This spring line had a longer lead aft than the original spring line and was made fast to the bollard south of, and closest to, the loading boom.

Preparations were next made to move the ship to position the loading boom at number seven hold when loading into number one hold was nearing completion. The crew arrived at stations at 2150. The master arrived on the bridge at 2200 and the main engine was tested in the ahead direction for 20 seconds at 2202. The chief mate arrived on the bridge at 2210, when loading was suspended.

The weather was fine with a light wind. The chief mate calculated the drafts at this time to be about 11.92 m forward and 12.13 m aft.

The master judged the current to be about 0.1 knots against the ship's forward movement. The view of the forecastle from

the bridge was partly obscured by the ship's forward travelling crane, which was positioned on the starboard side between holds two and three, but the master, stationed on the starboard bridge wing, could see the mooring lines over the ship's side.

At 2212, the master ordered the forward spring lines and stern lines be slackened, and to commence heaving on the head lines and aft spring lines. The main engine was run slow ahead for about ten seconds to start the ship moving ahead. The ship started moving ahead at about 0.5 knots.

Between five and ten minutes later the master noticed that one of the forward spring lines was becoming taut, but he was unable to determine which of the two spring lines it was. He ordered the third mate to slacken the taut spring line, but he did not receive a reply, and the spring line did not become slack. The master ordered dead slow astern on the main engine to halt the ship's movement. Slightly less than one minute later, when he noted that the taut spring line had suddenly become slack, he ordered the engine stopped.

The boatswain, who was stationed at the port windlass on the forecastle, noticed that the second forward spring line had become taut. At about the same time the third mate passed on the master's order to the AB operating the second spring line winch. The boatswain left his position to check the condition of the second spring winch brake that was being operated by the AB. He found the brake tight and he released the brake while he admonished the AB for not operating it correctly. When the spring started to slacken, he returned to his position and resumed heaving on the two head lines.

Between 30 seconds and one minute after the boatswain returned to his position he heard a sound that he believes was a mooring line moving swiftly through the air, followed by a 'pop'. The fitter, stationed at the starboard windlass, heard the same noises and believes he saw, in his peripheral vision, a loop of mooring line flying in the air above the spring winch.

The AB operating the number one spring line was facing forward, having turned to his left in order to move to the slightly higher part of

the platform near the winch control, when he was struck by something on his left leg.

The AB operating the number two spring line was found lying on the deck to the port side of the spring winch platform. He had severe head injuries and his safety helmet had been split in half.

The third mate reported to the master that immediate medical assistance was required on the forecastle. A medically trained crew member was sent to the forecastle while the master informed the local authorities.

The ship still needed to move about 25 m ahead. The move was completed by 2300 without further use of the main engine.

Paramedics boarded the ship when it was all fast and the AB was confirmed dead at 2304.

The ship completed its cargo operations without further incident and sailed from Groote Eylandt on 12 April.

Analysis

The Australian Transport Safety Bureau (ATSB) did not attend *Probo Bear* before it sailed from Groote Eylandt, but agreed to combine resources with the Maritime Administrator of the Republic of the Marshall Islands, the ship's Flag State, and carry out a collaborative investigation.

A Marshall Islands investigator attended *Probo Bear* and interviewed the master and directly involved crew members at its next port of call in China. Copies of relevant documents were obtained, including log book entries, procedures and statutory certificates. Evidence, including police interview transcripts, was obtained from the Northern Territory Police.

While it has not been possible to determine the AB's actions just before the incident, it is possible that he may have lost his footing while reaching for the winch brake handle, overbalanced, and fallen forward, putting his head in close proximity to the winch drum, and that he was hit in the head with a loose turn or loop of mooring line rotating at high speed.

The mooring lines

A second forward spring line was run during the move of the ship before the incident because the lead from the first spring line was too short to effectively assist the ship during its movement astern. There were now six mooring lines to tend on the forecastle.

The third mate was supervising the operation and the deck boy was instructed to stand clear and observe. The boatswain was tending two head lines, the fitter two breast lines and each of the ABs was tending a spring line.

The extra spring line had added complexity and workload for the forecastle crew and reduced the third mate's effectiveness in monitoring all of the activities on the forecastle.

Re-positioning the original spring line, rather than running out an extra spring line, would have reduced the workload and complexity on the forecastle, while still providing the pull required to move the ship.

Preparedness

The two ABs were working to release the turns from the smaller working part of the winch drum when the master called for the spring lines to be slackened off. To release the turns the two men had to slacken the winch until the lead from the smaller working drum to the larger stowing drum was free. This would have involved clutching in the winch motor and rotating the turns of mooring line off the working drums.

The test run of the main engine for 20 seconds at 2202 had the effect of tensioning the spring lines. This may have added to the difficulty the two ABs experienced readying the winch. The process probably became even more difficult when the master ran the engine ahead before the winch was ready.

Supervision and communication

The forecastle was under the supervision of the third mate, who had ultra high frequency (UHF) radio contact with the bridge. He had positioned himself at the forward end of the forecastle between the head and breast lines where he had a clear view of the head lines. However, he could not see the spring lines or the two men working to ready the winch. At

no time did the third mate report to the bridge that the forecastle was not ready for the shift ship operation.

The master communicated his requirements when he ordered the slackening of the forward spring lines before he kicked the main engine ahead, and later when he told the third mate that the spring line was taut. However, he did not brief the crew prior to the shift ship or ask if the forward and aft stations were ready before he started the move.

Control of the winch brake

Shortly before the incident the boatswain had to leave his station on the windlass to release the second spring line winch brake and admonish the AB for not operating it correctly. This indicates that, notwithstanding his qualifications and familiarisation on board the ship, the AB was not completely familiar with the task at hand.

Just a short time later the incorrect use of the winch brake led to the AB sustaining fatal injuries.

The kinetic energy built up in the long length of spring line under tension would have been extreme if the winch brake was not controlled correctly. Release of the winch brake under these conditions would have resulted in high speed recoil, as the energy in the mooring line was released. The winch drum would have started to rotate and then accelerate rapidly. For a time the winch drum would have spun faster than the speed at which the mooring line could run out. This action may have led to the formation of slack turns or loops of mooring line which would have been rotating with the drum. It was probably one of these loops of mooring line that struck the AB in the head causing his fatal injuries.

Spring winch working platform

The working platform for the winch is in two parts. A higher section behind the winch motor controls and a lower part behind the winch drums that gives access to the winch brakes (Figure 3). The platform extends aft as far as the mid-section of the stowing part of the aft drum, and thus does not provide adequate support for those accessing the aft brake handle.

It is possible that the AB may have lost his footing while reaching for the winch brake handle, overbalanced, and fell forward, putting his head in close proximity to the winch drum.

Findings

Based on the evidence available, the following factors are considered to have contributed to the death of the crew member on board *Probo Bear* on 10 April 2006.

- The second spring line added unnecessary complexity to the forecastle operations.
- A lack of preparedness and communication led to the shift ship operation starting before the crew on the forecastle were ready.
- The third mate's position during the shift ship operation meant that he did not have a clear view of the spring lines or the crew members operating the spring winch.
- The crew member was struck in the head by a section of mooring line at high speed.
- The incorrect use of the winch brake may have led to the formation of fast spinning turns or loops of mooring line.

ATSB Recommendations

MR20060036

Prime Marine Management and *Probo Bear's* masters should review mooring practices and procedures with a view to improving preparedness and communication.

MR20060037

Ship managers and masters should ensure that personnel supervising mooring operations are stationed such that they can clearly sight all operations that they are responsible for.

Media Release

Crew member fatality on board a ship in Groote Eylandt

A joint investigation carried out by the Australian Transport Safety Bureau and the Marshall Islands Maritime Authorities has found that a lack of preparedness, communication and supervision; and the incorrect use of the mooring winch brake were contributing factors in the death of a crew member on board the Marshall Islands flagged ship *Probo Bear* on 10 April 2006.

At 2150 on 10 April, the crew on board the products/oil/bulk/ore carrier *Probo Bear* prepared to shift the ship forward, to position its number seven cargo hold under the Groote Eylandt jetty fixed loading boom. The weather was fine with light winds and there was little tidal flow.

At 2212, the master ordered the forward spring lines and stern lines be slackened, and to commence heaving on the head lines and aft spring lines. The main engine was run slow ahead for about ten seconds to start the ship moving.

During the shift ship operation one of the forward spring lines became taut. The master ordered the forward mooring crew to slacken the taut spring line, but it did not slacken off. The master ordered dead slow astern on the main engine to halt the ship's movement. Just under a minute later, when he noted that the taut spring line had suddenly become slack, the master ordered the engine stopped.

A short time later, the crew member operating the number two forward spring line was found lying on the forecastle deck to the port side of the spring winch platform. He had severe head injuries and his safety helmet had been split in half. None of the crew on the forecastle had seen what had happened, but they had heard what sounded like a mooring line moving swiftly through the air.

A medically trained crew member was sent to the forecastle while the master informed the local authorities. The crew completed the mooring operations and paramedics boarded the ship when it was all fast at 2300. The crew member was confirmed dead at 2304.

The ship completed its cargo operations without further incident and sailed on 12 April 2006.

The investigation report makes recommendations to ship managers and masters in relation to the need for preparedness, communication and supervision during mooring operations.