Isle of Man Government

Department of Trade & Industry

Casualty Investigation Report CA73

BEN VARREY - Fatal Accident

07/09/2001

1. Summary

1.1 Ben Varrey is a small coastal single hatch dry cargo vessel. She called at the salt loading jetty at Kilroot in Belfast Lough on 7th September 2001 to load a full cargo of rock salt.

1.2 The weather conditions at the time were rough but within seamanlike limits for the ship at this jetty.

1.3 On completion of loading the Chief Officer went forward to collect the receipt book from the jetty representative. The jetty top was some 2 metres above the bulwark top at this time and the Chief Officer, in undertaking this exercise fell between the jetty fender and the ship's side. The ship moved rapidly back against the fender, trapping the Chief Officer and inflicting major injuries.

1.4 Two crew members working nearby pulled him inboard but he died shortly afterwards from his injuries.

1.5 Two fast ferries were transiting the area at the time.

1.6 Two recommendations are made.

2. Introduction.

2.1 Ben Varrey is a single hold dry cargo vessel of 997 Gross Tons with a length of 64 metres and built in 1986. She is owned by the Ramsey Steamship Company of the Isle of Man. The ship is registered in Ramsey (Isle of Man) and operates in the coastal trades around the Irish Sea and UK/North Sea.

2.2 She is generally employed in the bulk trades.

2.3 The ship is arranged conventionally for this class of vessel with accommodation aft and a single hold forward closed by a MacGregor type folding hatch cover in sections. She has a raised forecastle and raised poop. The main deck is fitted with steel sockets designed to take uprights at the outboard side when carrying timber deck cargoes. The sockets stand about 250mm above the level of the deck plating.

3. Evidence and investigation.

3.1 The accident was notified to the Marine Administration about 2 hours after the initial incident. The Company has an emergency plan and this plan was followed and shown to be effective. It included notification to the Marine Administration.

3.2 The same evening the investigating officer accompanied by the Superintendent of the Mercantile Marine Office, responsible for death enquiries, arrived in Belfast to investigate.

3.3 The investigators managed to board the ship the next morning at anchor and examined the physical evidence as well as conducting interviews with all possible witnesses on board. A subsequent visit to the jetty with the co-operation and assistance of the jetty owners allowed photographs and measurements to be taken of the jetty area. One witness, an employee of the jetty was not available and it was not possible to interview him.

3.4 The Royal Ulster Constabulary acting for the Coroner gave assurances that this jetty employee, who may have further evidence relating to the accident, would be interviewed and his evidence provided to the investigators. The Police have not done this at the time of publication. However a brief statement that he made to his employers has been made available and has been used.

3.5 The exact time of the accident has not been determined with accuracy. Surrounding times of other events have been determined with reasonable accuracy and from this evidence a best estimate of the actual time of the accident has been devised. It is believed to be correct to within ± 5 minutes maximum.

3.6 The draft version of this report was submitted to all interested parties, and where comment or clarification has been received, this has been incorporated in the production of the final draft.

3.7 A provisional recommendation was sent to the operators of the jetty on 5th November 2001 after preliminary analysis of the accident.

4. **Factual Narrative**.

4.1 Ben Varrey sailed from Birkenhead on September 3rd to the Irish Salt Mining and Exploration Company jetty at Kilroot in Belfast Lough. There she loaded a full cargo of rock salt for discharge at Corpach in Scotland. The voyage was uneventful and after discharge she returned to Kilroot for a further identical cargo.

4.2 The Master joined the ship in Birkenhead and had considerable experience both with this cargo, and with the jetty at Kilroot.

4.3 On Friday 7th September Ben Varrey arrived back in Belfast Lough and berthed starboard side to the Kilroot jetty at 1055.

4.4 On berthing the wind was Westerly force 6 or 7 and a moderate swell was running. There was a bit of protection from the weather alongside the jetty but the ship was still moving appreciably when alongside.

4.5 No accommodation ladder or gangway was rigged for three reasons:-

(a) it is not normal practice to do so at this jetty given the short time expected alongside.

(b) the construction of the jetty allied with the rapid rate of loading and the rise and fall of tide make the rigging of an effective and safe means of access extremely difficult.

(c) there is normally no requirement for personnel transfer between shore and ship or vice versa.

4.6 It was about half tide when Ben Varrey berthed on a flood tide with high tide expected at 1430.

4.7 Loading commenced at 1155 and the ship expected to load approximately 1500 Tonne, with an expected completion in between 1 and 1½ hours.

4.8 Loading proceeded normally and was complete at 1310. During the course of loading the weather deteriorated in line with the forecast with the wind increasing from the West and the seas rising. By the completion of loading the vessel was moving significantly, mainly in sway, and banging heavily against the fenders. The wave period was such that she was not rolling appreciably or surging and most of the motion was confined to the athwartships movement in sway, restrained by the jetty fenders. While loading was in progress the Chief Officer was on deck supervising although he went to the wheelhouse from time to time to observe from there.

4.9 The Master considered that, by the time loading was complete, the weather and ship motions had reached a point where it was imperative to leave the berth as soon as possible to avoid damage to the ship. He planned to sail as soon as the loading formalities were complete and the hatches closed.

4.10 At about midday a relief engineer arrived at the ship. No-one saw him board. When he arrived the ship was approximately level with the jetty top and he stepped aboard without difficulty.

4.11 Within a few minutes of the completion of loading the Chief Officer came up to the Master's cabin to let him know that loading was complete. As soon as he had passed the message he went back out on deck to supervise the cleaning of spilt cargo from the hatch coamings in preparation for closing the covers.

4.12 After the Chief Officer's call the Master went up to the wheelhouse to start preparations for getting underway and to refresh his memory on the chart of the area in readiness for sailing. He planned, in view of the weather, to pull off the berth and anchor somewhere suitable until the weather moderated.

4.13 On deck the Chief Officer instructed the two deck ratings to start brushing spilt cargo off the hatch coamings in preparation for closing the covers. The two men started forward on the starboard side (the side towards the jetty), and worked towards aft. The most forward section of the hatch cover was not opened for loading and the portable gangway was stowed on top of it. They started cleaning from a position aft of the foremost section.

4.14 As they started work the Chief Officer passed them walking forward along the starboard side of the main deck. He was talking to a man ashore as both he and the man ashore walked towards the bow.

4.15 The two men continued brushing loose salt off the coaming, both facing aft. The time then was about 1320 (± 5 minutes).

4.16 At 1306 two fast ferries were in the vicinity. An HSS Class vessel (a large catamaran type fast craft) was outward bound from Belfast in a position 114º (T) x 2.0 miles from the Kilroot jetty on a heading of approximately 046º and starting her acceleration phase from a reduced speed of 24 knots. At 1306 she was making about 27.2 knots.

A 74m Seacat Class vessel (a 74m length wavepiercing catamaran type fast craft) was in a position 114º (T) x 1.55 miles from the Kilroot jetty inward bound to Belfast on a heading of 222º and making about 31 knots.

These two vessels passed eachother such that the two fast craft and the jetty were in line at this time, the Seacat 1½ miles off the jetty and the larger HSS craft 2 miles off.

4.17 The Master looked up briefly from his study of the chart in time to see the Chief Officer standing on what appeared to be one of the timber upright sockets on the outboard side of the main deck reaching towards the man on the jetty. He saw nothing untoward and presumed that the Chief Officer was collecting the cargo receipt book which has to be signed by a ship's representative for the cargo shipped and then returned to the shore. He returned to his study of the chart.

4.18 A few minutes after the Chief Officer passed the two crew members at work on the hatch coaming, they both heard a shout and turned to see the Chief Officer outside the bulwark, facing forward and clearly trapped from the waist down between the bulwark and the jetty fendering.

4.19 Both men rushed forward and grabbed the Chief Officer, one by the back of his overalls and one under his arms. They tried to

pull him inboard but were unsuccessful for several seconds until the ship surged off the fender. As soon as it was possible they lifted him onboard and laid him on the deck. One of the ratings shouted to the jetty personnel to call an ambulance and the other ran aft to alert the Master. At the time the jetty top was about 2 metres above the bulwark coaming.

4.20 The rating who ran aft to call the Master, alerted him by shouting up from the bottom of the stairway, and the Master went straight out on deck and forwards. He found the Engineer attending to the Chief Officer who was lying on deck facing forwards. He left the Engineer to continue attending to the Chief Officer and went back aft to ensure that an ambulance was on the way. He established, in a VHF call with the jetty operator, that an ambulance and a fire engine were already en route. The jetty operators had called the fire engine in light of the possibility that someone was trapped.

4.21 The Master went back to the Chief Officer where he found him barely conscious. After about 10 minutes he lost consciousness and appeared to stop breathing and the Master checked his airways before starting resuscitation. After some minutes it appeared that there was no sign of a pulse. Resuscitation continued until the arrival of two paramedics with the ambulance who took over care of the Chief Officer.

4.22 The two paramedics determined that the Chief Officer was, in fact, dead and made arrangements to have his body landed ashore. The Northern Ireland Police and a representative from the Health and Safety Executive attended shortly afterwards. Both organisations took photographs and the Police took videos of the scene and interviewed witnesses in a process which took some considerable time during which the Chief Officer's body lay on deck to the great distress of the remaining crew members. At the same time the Master was concerned with the worsening weather and wished to get his ship off the berth as quickly as possible before damage occurred.

4.23 Eventually the Chief Officer's body was landed ashore and permission was granted for the ship to sail. The Master left the berth safely and anchored a short distance off.

4.24 A subsequent post mortem examination revealed that the Chief Officer had died of severe crushing to the pelvis and lower body

with major damage to internal organs. There was no possibility that any available resuscitation or treatment on board or ashore could have saved his life.

5. **Analysis and comment**.

5.1 There are three key questions to be answered in this investigation:-

(a) How did the Chief Officer manage to get into a position outboard of the bulwark?;

(b) What was the Chief Officer doing that put him in this position?; and

(c) Did the transit of the two fast ferries have any effect on the events or the Chief Officers actions?

5.2 Looking at the first question - the Chief Officer was last observed apparently standing on one of the timber upright sockets. At the time he was presumed to be attempting to reach for the receipt book. This is normally the sole transfer between ship and shore. Once loading is completed, the jetty staff pass a small receipt book to the ship showing the total weight loaded. A ship's representative signs this, tears out a copy and passes the book back.

5.3 At the time the jetty top was about 2 metres above the bulwark so that it is unlikely that he could have reached high enough from this position to receive the receipt book from a person ashore. The jetty representative first intended to exchange the book at the aft set of fenders but when the Chief Officer proceeded forwards, he climbed back up to the jetty top and also walked forward.

5.4 No-one saw the Chief Officer after this moment until the accident. Given the relative heights between the bulwark top and the jetty, the only way in which a person of normal stature could have effectively reached high enough to pass an object between the ship and a person on the jetty would have been to stand on the bulwark capping. The raised forecastle provided enough height to do it but the shape of the ship's bow and the positioning of the jetty fenders meant that the horizontal distance between a person on board on the forecastle and a person ashore was too far to reach. Similarly, aft, the fender positions, well proud of the jetty face, meant that the ship's bridge wing was also too far off horizontally to pass anything by hand.

Basic Construction of the Kilroot Salt Jetty

5.5 It is established that it is normal practice to pass the receipt book over by hand and a number of pieces of evidence suggest that this is what the Chief Officer was endeavouring to do:-

(a) The two ratings saw him walk past them talking to a man on the jetty;

(b) The man on the jetty confirms that he was attempting to get the loading details book signed and that he saw the Chief Officer walking forwards on deck to do this. He also moved forwards to the forward set of fenders.

(c) The Master saw him on deck forward standing on one of the timber upright sockets;

(d) The jetty representative thought the Chief Officer was going to climb up on to the jetty to sign the book and stepped back from the edge to allow him room to do so;

(e) There was time pressure to get everything completed and the ship off the berth in view of the deteriorating weather, the Chief Officer was aware of this and signing the cargo receipt was the last necessary task before leaving the berth;

(f) The Master was in the wheelhouse and had no plans to undertake the receipt signature, he assumed the Chief Officer would do it;

(g) The jetty staff are accustomed to having it signed by "a ship's officer" and the Chief Officer was the obvious officer on deck;

(h) A position on the starboard side forward was the position which placed a person on board closest to being able to reach a person on the jetty than any other location at that time given the jetty construction, the relative heights and the ship's trim.

5.6 It is concluded that, at the time of the accident, the Chief Officer was engaged in trying to either collect the receipt book from a member of the jetty staff, with the intention of signing it and returning the book to the shore or to climb up to the jetty to sign it there.

5.7 A determination of how the Chief Officer came to be outboard is more difficult. However, it is clear that in view of the relative heights between ship and the small platform on top of the fender, the vertical distance would have been too far to safely pass the book over. Even standing on one of the sockets, as the Master saw him do, the additional height would have been insufficient.

5.8 When the two ratings were alerted to the accident, they saw the Chief Officer trapped between the fender and the ship's bulwark, facing forwards, and trapped approximately from the waist down. He could not have reached this position from a position on deck, even standing on something considerably higher than the timber socket.

5.9 There were no items of portable equipment in the vicinity on which he could have stood to gain more height and it must be concluded that he stood on an item of ships structure.

5.10 It is also inconceivable that he could have fallen outboard in an upright position had he stood on the top of any of the air vent heads, (the cylindrical items visible just below bulwark height in the picture) or on any other piece of structure below bulwark height.

5.11 On the other hand, if he stood on the bulwark capping, leaning against the fender, which was flush with the ship's side, he would have had sufficient height to reach the fender top and a slip from this position could have resulted in him falling vertically downwards when the ship moved away from the fender. It is established that the ship was moving vigorously on and off the fenders with a bodily sideways motion. It is therefore concluded that the Chief Officer, having failed to reach high enough from the deck fittings, climbed on to the bulwark top, supporting himself on the fender to reach the jetty representative and collect the receipt book. From this position he slipped and dropped vertically between the ship and the fender as the ship moved off the fender becoming trapped and crushed when the ship moved back in again.

5.12 The influence of the two passing high speed ferries is also difficult to estimate. There has been a long record of ships being influenced at this berth and at the neighbouring coal berth by the wash effects of such craft. There have been a large number of reported instances of ships surging on the berth and breaking mooring ropes and damaging accommodation ladders under the influence of ferry wash. In response to complaints and following studies of the phenomenon agreed procedures are in place between the Harbour operators, the berth operators and the ferry operators. Transiting ferries are required to notify their positions and speeds before passing the Kilroot jetties and there are agreed maximum speeds for each class of vessel when passing the area if there is a ship berthed.

5.13 Both the ferries in the area on 7th September were observing the agreed procedures as regards notification and speed limits.

5.14 The phenomena of critical and supercritical wave generation from high speed craft in shallow water has been the subject of much research in recent years and that research has been applied to determining the maximum allowable speeds in certain areas.

5.15 In summary the wash effect is dependent on various interdependent factors including, for example:

(a) speed;

(b) heading in relation to the shore line;

(c) water depth;

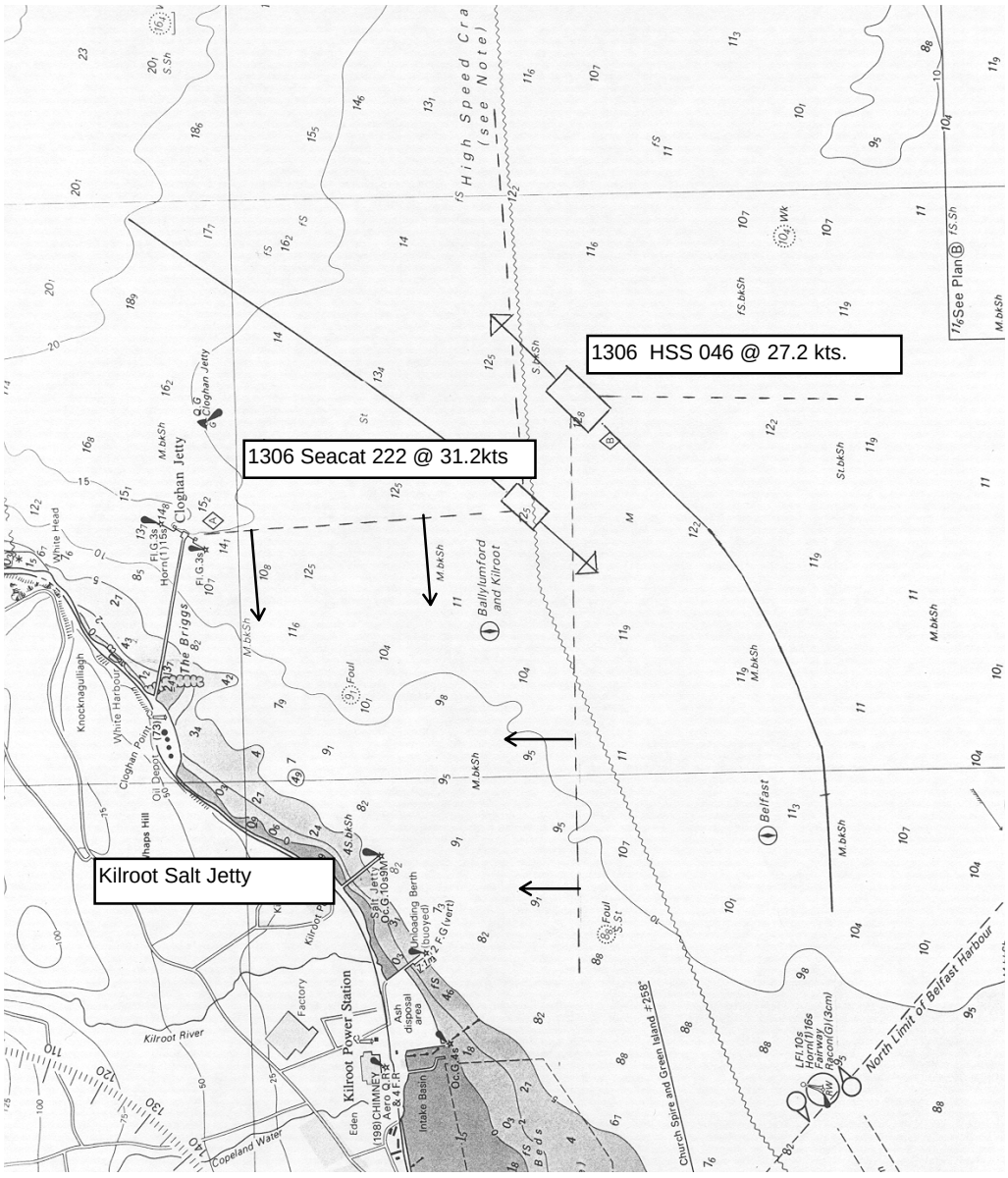
(d) alterations of course (which can produce a focusing effect of the wash towards the inside of the turn;

5.16 On this occasion the complexity of the wave generation effect is compounded by the fact that two fast craft on opposing courses were passing eachother within two miles of the jetty.

5.17 Both vessels were generating wash effects, but the analysis of the combined effects is extremely complex. The larger of the two vessels, the HSS class ship was just starting her acceleration phase and had not yet reached a supercritical speed in relation to the available water depth. At below supercritical speed she would have been generating a conventional sub-critical ship wash. This vessel, at this speed, could be expected to produce an outward traveling wave front at an angle of between 40° and 50° to her fore and aft line. For simplicity an angle of 45° is assumed without significant errors given the necessary approximation in the time of the accident.

5.18 The Seacat Class vessel produces her maximum wash effect in this water depth at about 28 knots. She was traveling at more than this speed and was in the supercritical range for her speed, length and water depth but this vessel is known, from physical studies and experimental research, to produce a smaller wash effect that the much larger HSS Class vessel.

5.19 Her speed at the time was within the limits established for her in this location with a ship berthed at Kilroot. Generating a supercritical wash effect a reasonable approximation of the angle of wave propagation to fore and aft line is 35°[1] without introducing significant errors.



[1] Professor T. Whittaker QUB.

5.20 For both vessels, given the short distances involved it is reasonable to use a basic wave propagation formula to estimate the speed of travel of the wash effect and compute its arrival time at the jetty. A reasonably accurate result can be obtained from:

$$\text{wave propagation speed} = \sqrt{gh}$$

where h is the water depth in metres.

5.21 Plotting the relative positions of the two fast craft at 1306 and assuming the wave angles of 45 degrees for HSS and 35 degrees for Seacat, the wave from Seacat has approximately 2500 metres to travel to the jetty in a mean water depth of 10 metres. Similarly, at 1306 the wave from the HSS craft had 1500 metres to travel in a mean depth of 8 metres. The respective maximum wave propagation velocities are:

8.8 $m.s^{-1}$ in 8 metres mean depth, (HSS)
9.9 $m.s^{-1}$ in 10 metres mean depth, (Seacat)

From which it may be expected that the wave effect from the Seacat Class vessel will arrive at the jetty at 13:10:00 (nearest ½ minute.) while that from the HSS Class vessel will arrive at 13:09:00 (nearest ½ minute). The wash effect from the Seacat Class vessel, although a supercritical wash has a low amplitude while that from the HSS class vessel is a subcritical wash effect and subject to sea state attenuation.

5.22 These calculations are very approximate and subject to errors from:-

(a) estimates of mean water depth.

(b) approximations in position determination

(c) non consideration of refraction effects..

(d) reflection and attenuation effects.

(e) other errors.

5.23 However, the magnitude of the errors is acceptable in relation to the time approximation in determining the time of the accident. The calculation indicates that wave effects from either of the two craft, or from both of them combined would most likely have arrived at the jetty between 1310 and 1315 at the latest.

5.24 The best estimate for the time of the accident is 1325 (± 5 minutes). The tide was nearly full which has the effect of increasing water depth over the figures used, which in turn reduces the propagation time of the wave and leads to an earlier wave arrival time.

5.25 It seems reasonable, therefore, to conclude that any unexpected ship motions associated with the passage of the two fast craft had already occurred when the accident happened and, had such motions been noticeable in the prevailing conditions, the Chief Officer would already have noticed them.

5.26 It is therefore concluded that the wave effects from the two fast craft played no significant part in this accident.

6. Conclusions

6.1 At the time of the accident the Chief Officer was attempting to either exchange the cargo receipt book with a jetty representative or to climb up to the jetty

6.2 To achieve sufficient reach to do this he stood on the bulwark capping supporting himself against the fixed jetty fender.

6.3 The vessel was moving appreciably in the prevailing weather conditions.

6.4 During the process the Chief Officer slipped and fell between the ship's side and the fender just as the ship moved bodily back against the fender.

6.5 The remaining ship's crew did everything reasonably possible to recover him back on board and to administer first aid. Nothing they could have done would have affected the final outcome.

6.6 The wash effects of the two passing high speed ferries are unlikely to have had any significant effect on the movements of Ben Varrey at the time of the accident.

7. **Recommendations**.

7.1 To the Jetty operators.
That they examine the procedures for transfer of paperwork between the jetty and ships alongside, and develop and implement a means of transfer which can be used in any weather and sea conditions to swap paperwork between jetty and ship without the necessity for either jetty personnel to approach too closely to the edge or ship's personnel to leave a safe place on deck.

7.2 To the owners of Ben Varrey.
That, unless a safe means of access to ships at this jetty can be rigged, they make no further crew changes at this berth.