Incidents at sea

Departmental investigation into the collision between the Australian Flag tanker BARRINGTON and the tug AUSTRAL SALVOR in the Brisbane River, Queensland on 27 April 1998

MIIU

COMMONWEALTH DEPARTMENT OF TRANSPORT AND REGIONAL SERVICES

Contents

Navigation Act 1912

Navigation (Marine Casualty) Regulations

investigation into the collision between the Australian Flag tanker

Barrington and the tug Austral Salvor

in the Brisbane River, Queensland on 27 April 1998

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Summary

The Australian tanker *Barrington* was inbound to **the** Ampol Wharf in the Brisbane River in the afternoon of 27 April 1998 with a pilot conducting navigation of the vessel. The vessel was in ballast and was to load a cargo of petroleum products including premium and leaded petrols, aviation and diesel fuels. *Barrington* negotiated Pelican Banks Reach and entered Lytton Rocks Reach where she was to make fast the tug *Austral Salvor*, prior to turning at the turning basin and berthing starboard side alongside.

Austral Salvor had left her berth at Whyte Island Tug Base at 1635 and waited off Clara Rocks for *Barrington* to approach. A trainee tugmaster was at the controls of the tug with a supervising Tugmaster close at hand. When *Barrington* was off Clara Rocks, the tug approached the vessel from astern on the port side.

The tug approached within ten metres of the ship close to where she was to secure a line to the ship. The trainee tugmaster adjusted the tug's speed to enable him to position the tug correctly off *Barrington*. While the tug was closing with the ship, the trainee tugmaster was in the process of reducing the speed further, when he noticed the bow of the tug sheering to starboard towards the ship.

The Tugmaster took control of the tug and attempted to arrest the sheer. The sheer of the bow was halted, but the stern swung in and the tug rolled, making contact with the ship just above the waterline. The shell plating on *Barrington* was holed at the point of contact, in way of a fuel oil storage tank, spilling fuel into the river.

The tug made fast to the ship at 1650, and *Barrington* was secured to the berth at 1736. Meanwhile, ship's staff had reacted promptly, transferring oil from the ruptured tank and were informed by the tug**,** at 1730, that the leak had stopped. The Port authorities had been alerted and initiated the Port of Brisbane Oil Spill Contingency Plan.

Permanent repairs were carried out to the damaged area at a repair berth in Brisbane and the vessel was able to load its cargo and proceed on the next voyage shortly after the incident.

Sources of Information

The Master, officers and crew of *Barrington*

The Pilot

The Tugmaster, trainee tugmaster and crew of *Austral Salvor*

Queensland Tug and Salvage Co Pty Limited

Acknowledgement

The Inspector acknowledges the assistance of the

Tugmasters and crew of the tug *Redcliffe* in conducting

trials after the incident to determine behaviour of a tug

in close quarters with a ship.

The Inspector also acknowledges the assistance of the

Principal Naval Architect with AMSA, the designer of the tug

Austral Salvor, the Head, Naval Architecture &

Ocean Engineering at the Australian Maritime College; the Head, Naval Architecture Section at the University of New South Wales and, Mr R Herd, Naval Architect.

Portion of chart Aus 237 reproduced by permission of the Hydrographic Office, RAN.

Graphs of tug-ship interaction reproduced from the paper ‘Some aspects of tug-ship interaction’ by Dr IW Dand presented at the Fourth International tug Convention, New Orleans, October 1975.

Narrative

Barrington

Barrington is an Australian flag tanker of 33,239 tonnes summer deadweight at a draught of 10.674 m. The ship, built in 1989, is owned by Barrington Pty Ltd, operated by Teekay Shipping Ltd, and managed by Australian Tankships Pty Ltd. It is 180.5 m in length, has an extreme breadth of 26.8 m, an extreme depth of 16.4 m and is powered by a 5-cylinder B&W diesel engine developing 6,032 kW.

At sea, the bridge is manned in the traditional four-on/eight-off watchkeeping system. The engine room is an unmanned machinery space (UMS), with engineers working during the day and a duty engineer on call during the silent hours. The ship's control room is manned during manoeuvring operations.

The ship's complement of 18 is made up of the Master and three watch keeping mates, a Chief Engineer and three other engineer officers, a Chief Integrated Rating and six integrated ratings, and catering staff. Two crews operate the ship on a "swing" system of six weeks on then six weeks off.

Austral Salvor

The motor tug Austral Salvor was built and entered service in 1986 for Queensland Tug & Salvage Co Pty Ltd of Brisbane. It is 33.92 m in length overall, has a moulded breadth of 10.82 m, a moulded depth of 5.39 m and a light displacement of 613 tonnes. Two eight-cylinder Yanmar diesel engines, each generating 1790 kW at 720 rpm, drive two "Z" drive Duckpeller assemblies with two 4-blade propellers in Kort nozzles aft. The bollard pull generated is 64 tonnes when towing from the stern hook and 61 tonnes when connected over the bow, their normal mode of operation when manoeuvring ships in port.

The tug normally has a complement of four, a master, an engineer and two ratings, but on this occasion there was a trainee tugmaster on board as well.

Azimuthing stern drive tugs such as the *Austral Salvor* have propulsion systems at the stern, using two azimuthing propellers in nozzles that can rotate through 360°. The angle that the nozzles make with the

fore and aft line is controlled by the unilever. This is a single control lever on the wheelhouse console that is used to control direction of the tug as well as speed for a giver throttle setting.

The general principle is that the tug will go in the direction in which the unilever is placed. With the unilever forward or aft in the centreline, the nozzles drive the tug directly ahead or astern. With the lever placed off the centreline, a control system rotates the nozzles, so that the tug travels in the direction in which the lever is placed.

The Incident

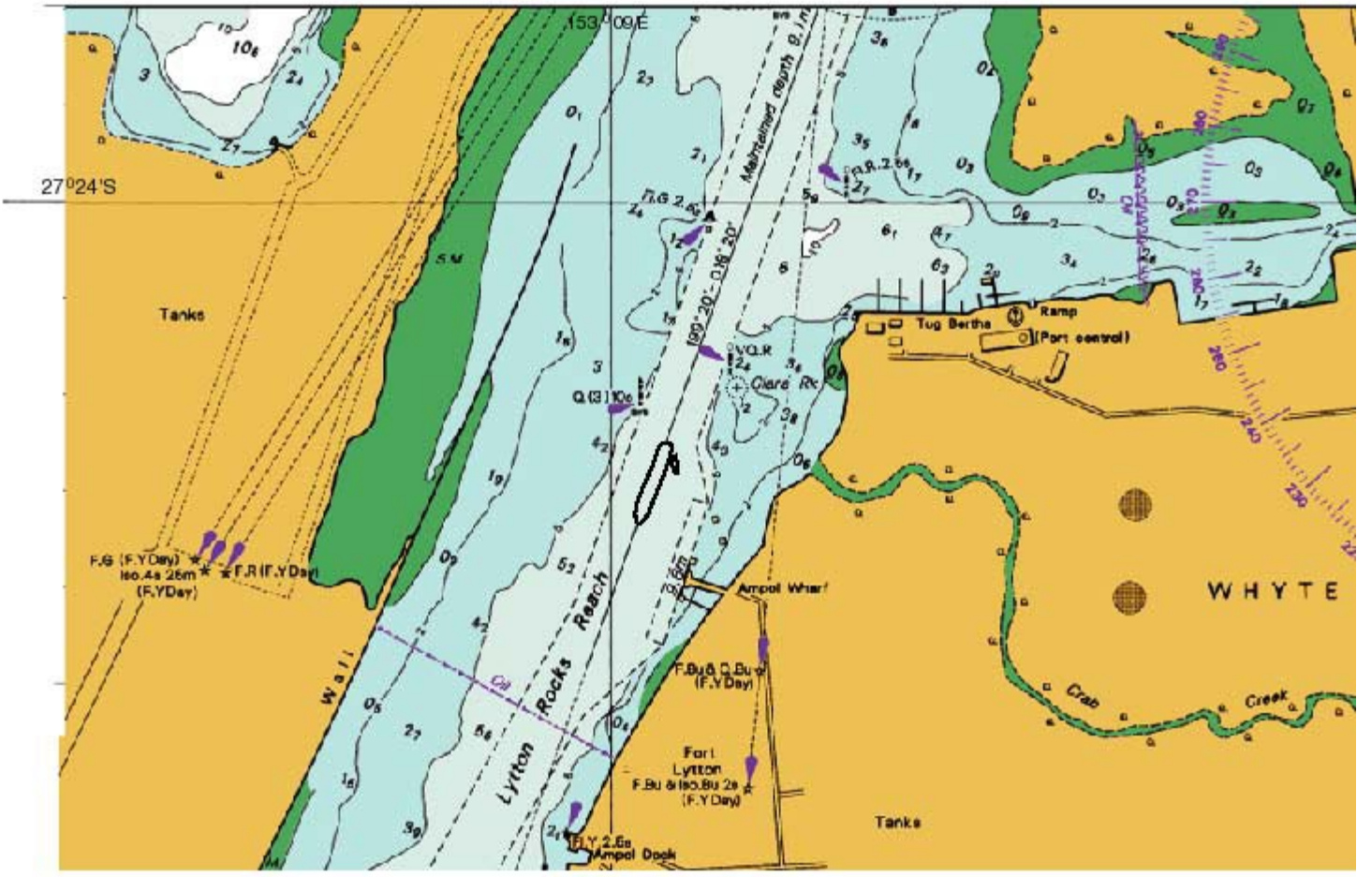
Barrington was bound for **the** Ampol Wharf in the Brisbane River after a ballast passage from Mackay. The draught was 5 m forward and 7.3 m aft. The vessel embarked a pilot off Point Cartwright at 1230 on 27 April 1998 and proceeded in for the Bay passage on the ebb tide, at a speed of about 12.5 knots. The Master was on the bridge for the entire pilotage passage. The 2nd Mate was on watch on the bridge from 1200 till 1600 and monitored the vessel's progress as it made its way in to the wharf.

At 1600 the Mate took over the watch from the 2nd Mate and, at 1602, the vessel passed the Entrance beacons. At this point the Pilot reduced speed to manoeuvring revolutions. At 1611, the vessel passed between Coffee Pot beacons.

The vessel passed the Inner bar beacons at 1622 and Luggage Point at 1630. While the vessel was approaching Pelican Banks Reach, the Pilot saw *Austral Salvor* leave its berth and spoke to the tug on VHF. He wished the Tugmaster good day and asked him to tie up on Barrington's port quarter. He saw the tug move up the Boat Passage, then he lost sight of it as the ship went past. The Mate saw *Austral Salvor* leave its berth and radioed to the 3rd Mate to go out on deck and make the tug fast.

Events on Austral Salvor

On *Austral Salvor*, the trainee tugmaster (Trainee) was at the controls with the Tugmaster beside him. The Tugmaster asked the Trainee to move the tug up from astern of *Barrington* and approach the parallel port side of the ship. The tug approached the ship until it was about ten metres off, proceeding faster than the



Portion of chart Aus 237 showing location of collision

ship. The Tugmaster advised the Trainee to reduce speed as they were going past the lead through which the tug's line was to be passed. The Pilot had reduced speed on *Barrington* anticipating the turn in the river to approach the berth.

The Trainee reduced speed by adjusting propellor revolutions until the tug was parallel with the ship and still about ten metres off. At this time he sensed interaction between the ship and the tug. Barrongton's speed was still decreasing as the Pilot prepared to turn the ship and berth starboard side to. The Trainee realised that he would have to slow the tug further, so he moved the unilever towards the neutral position to achieve the required speed reduction. The tug dropped back to a position where both he and the Tugmaster were satisfied. The Trainee pointed out to the Tugmaster a position on the ship where he wanted the bow to be and started to move the tug toward the ship in stages, using the unilever. He used small movements of the unilever, to starboard and back to the centreline, two or three seconds at a time.

They closed in on *Barrington* and the Trainee estimated that *Austral Salvor* was about eight metres off and almost parallel to the ship. He edged the tug over again with the unilever and was adjusting its speed when he noticed the bow sheer to starboard toward the ship. He attempted to correct the movement of the bow using the unilever to port for a period of about two seconds, but this had no effect. He brought the lever back to the centreline and then repeated the actionto port again, a bit further to port this time.

He was still unable to correct the sheer and the Tugmaster took the controls from him. The unilever was on the centreline and ahead when the Tugmaster took the controls; the Trainee estimated that the tug was five metres off the ship at this stage. The Tugmaster reacted swiftly to arrest the sheer by increasing revolutions on the port propeller and by pulling the unilever back, but the stern then swung in toward the side of the ship. To counteract the swing of the stern toward the ship the Tugmaster increased revolutions on the starboard propeller and pushed the unilever forward. However the tug rolled to starboard and its stern contacted the ship heavily near the waterline just aft of the bridge front. The ship logged the time of collision as 1642.

The tug pulled away from the ship and the Trainee looked aft and noticed oil on the after deck of the tug. Two ratings on the forecastle of the tug thought that the bow tug had also made contact with the ship before the stern.

The engineer on *Austral Salvor* was passing through the interior accommodation of the tug when he felt a bump. He did not think the bump was excessive, but when he got out on deck they were abeam of *Barrington* and he could see oil spilling from the ship. An engineer on *Barrington* called to him and asked him where the plating was holed and he pointed to the tank just aft of the cofferdam. The tank was marked on the ship's shell plating 'HFOS'; the port heavy fuel oil storage tank.

The Tugmaster told the engineer to check for damage to the tug and he found that there was a small split in the weld in a bracket at the side of the tug aft. He checked the steering flat to make sure that there were no dents or ingress of water and informed the Tugmaster that there was no significant damage.

Events on Barrington

After *Barrington* passed Clara Rock beacon, the Pilot had leaned over the bridge wing and saw the stern of *Austral Salvor* directly beneath him, with the wheelhouse of the tug forward of the ship's bridge front. Immediately after this he saw the stern of the tug strike the ship and heard a loud bang after which the tug listed to starboard and the funnel belched smoke. He noticed oil on the tug's deck after the collision.

In response to a question about the bang from the Master, the Pilot replied that the tug had hit the ship. The Master saw *Austral Salvor* move away from the ship, and noticed that the wash at the tug's stern had oil on it. Th ship logged the time of collision as 1642.

The 1st Engineer had witnessed the collision and informed the Chief Engineer that oil was leaking from the ship. The Chief Engineer phoned the bridge to say that there was oil going over the side and the Master instructed the Mate to have a look at what had happened.

The Mate confirmed the oil leak to the Master and told him that the ship's engineers were arranging to transfer oil from the damaged tank to the starboard storage tank. The Master asked him to contact the company pager to activate the company's oil spill response. The Pilot advised Harbour Control that the ship was leaking oil into the river so that the Port's Authority oil spill response could be initiated.

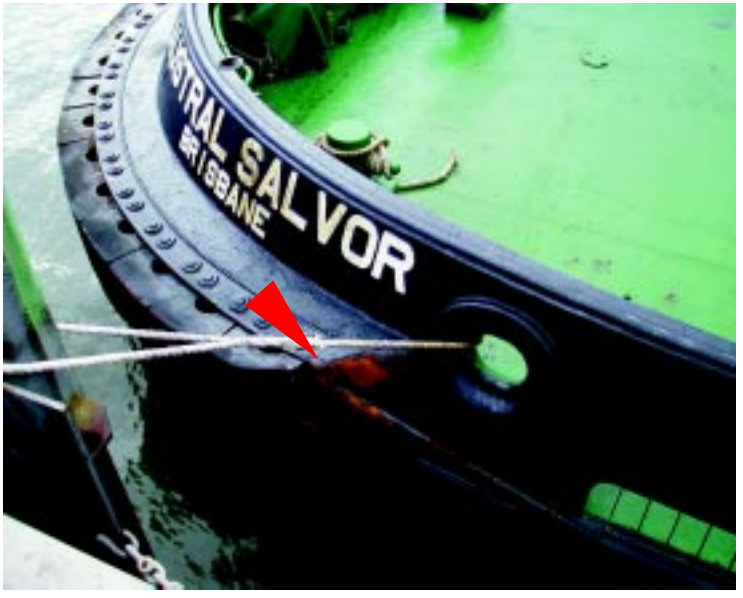
The berthing operation continued. The tug was made fast at 1650. At 1654 the ship commenced pumping iol from the damaged port tank to the starboard heavy fuel oil storage tank. Transfer of oil was completed at

0320 next day.

The Master advised Harbour Control that the ship was likely to lose about 20 tonnes of fuel so that an appropriate response to the spill could be made.According to the ship's log, the tug informed the ship at 1730, that the oil leak had stopped.

Barrington was made fast at in the berth at 1736 and it was later calculated that the ship had lost 22 tonnes of fuel oil.

On 29 April the ship shifted to Cairncross Dockyard where permanent repairs were carried out. Repairs were completed on 1 May and the ship moved back to the Ampol Wharf the same day to load its cargo, eventually sailing from Brisbane on the night of 2 May 1998.



Bracket on Austral Salvor that caused damage to shell plating on Barrington

Location of holed shell plating on Barrington

Comment and analysis

The Evidence

Austral Salvor carries no engine or manouvering monitoring equipment that may have assisted in the analysis of the collision. *Barrington* is equipped with a course recorder and data logger. From recorded information it was established that *Barrington* was on a steady course. About 15 seconds before the collision *Barrington's* shaft revolutions were reduced from about 70 rpm to 45 rpm. Based on best estimates, this would mean *Barrington's* speed was between 5 and 5.5 knots at the time of the collision.

The time of the collision was recorded on *Barrington* as 1642. *Austral Salvor* recorded the time as 1643.

Other objective evidence, such as VHF traffic recordings, is of little relevance. The investigation relies on eyewitness accounts of the Tugmaster, Trainee, the deckhand and the AB as well as the tug's engineer and those accounts differed in detail.

Damage to *Barrington* occurred in way of the port fuel oil storage tank. The damage was caused by a steel bracket on *Austral Salvor's* starboard quarter landing against *Barrington*, breaching the hull.

Eyewitness accounts of the collision are basically uniform up until the time *Austral Salvor* was established on a parallel course to, and about ten metres off, *Barrington*. Thereafter, the accounts differ in detail.

The collision

Barrington's logbook indicates that the collision occurred off Clara Rocks at 1642. The Trainee on *Austral Salvor* indicated that the collision took place when the ship was just about abeam of Ampol Wharf, a difference of some 360 metres.

The Pilot's evidence was that the ship was clear of the narrowest part of the channel. He went to the port bridge wing and saw the tug immediately before the collision about two metres off the ship.

The collision probably occurred as the ship approached, or was abeam of Ampol Wharf.

Barrington had been on a steady course of about 199° at the time of the incident, there were no helm orders out of the ordinary and there were no problems with the steering. The pilotage was quite normal and there had been no unusual engine orders. There is no evidence that any action taken by those on *Barrington* contributed to the collision.

The investigation centered on *Austral Salvor* and the action of the Tugmaster and Trainee. Mechanical failure, incorrect handling of the controls and interaction between the two vessels were examined as possible causes for the sheer of the tug's bow.

The Tugmaster

On *Austral Salvor*, the Tugmaster's while the tug was approaching the ship, he advised theTrainee's to go alongside the parallel side of the ship and drop back and lash up, as the Pilot advised, on the port quarter.

As the tug moved forward to the Panama lead, at the after end of the main deck, where they were to pass a line to the ship, the Tugmaster believed the revolutions on the propellers were about 550 rpm. At that stage they were they were about ten metres off the ship and he was satisfied with the manoeuvre. As they passed the Panama lead, under direction from the Tugmaster, the Trainee made two reductions in speed by pulling back the throttles. The Tugmaster estimates that the propeller revolutions were then about 500 rpm. When the tug went past the lead, he told the Trainee once more to reduce speed and he thought that the Trainee would have done that by pulling back the unilever.

Then, as he looked toward the ship, the tug sheered to starboard and rolled. It all happened quickly and he reached over and took the controls from the Trainee. He used the unilever and throttles to stop the sheer of the bow to starboard, but the stern swung in and he was unable to prevent it contacting the side of the ship.

The Trainee

According to the Trainee, he had manoeuvred the tug to within ten metres of the ship on the ship's port side. His opinion was that he had reduced speed to 400 rpm on each engine by pulling back the throttles. This was the lowest speed at which the tug could be operated without declutching the engines. He started to

edge the tug toward the ship using the unilever, five or six times to starboard and back to the centerline, until he estimated that they were about eight metres off.

When the Tugmaster agreed that they should go alongside the ship, he adjusted the speed using the unilever. He manipulated it five or six times to starboard and back to the centreline, until he eatimated that they were about eight metres off.

Shortly after this, the tug sheered to starboard toward the ship. The Trainee attempted to correct the sheer twice, by manipulating the unilever to port, but this had no effect. He told the Tugmaster they were in trouble and the Tugmaster took the controls when the tug was, by the Trainee's estimate, about five metres from the ship.

The Trainee thought the Tugmaster had the tug under control but the stern swung in contacting the ship's side heavily, just above the waterline.

Both the Trainee and the Tugmaster were of the opinion that the bow of the tug had not made contact with *Barrington.* The Trainee thought that interaction had caused the tug to sheer toward the ship. He suggested later that mechanical failure might have caused the sheer.

The Ratings

According to the general hand, who was on the bow of the tug with the AB preparing to pass a line to the ship and said that the tug had not come alongside normally. According to him, when they were about level with Ampol Wharf, the tug's bow hit *Barrington* heavily and the tug rolled to port, shaking them. As he looked up to see what was going on, he saw the Tugmaster take the controls. The tug bounced off the ship and rolled to starboard, then its stern came in and struck the side of the ship. He ran aft and noticed that oil was leaking from the ship and that some of the oil was on the after deck of the tug.

The general hand stated that under normal circumstances, they did not feel the contact as the tug went alongside the ship. On this occasion, they struck the ship heavily as they went alongside. Prior to this, they had been closing on the ship progressively dropping back at the same time and from about two meters out,

the tug seemed to have come in too quickly.

According to the AB, the tug approached the ship normally and was closing in to pass up a line when the starboard bow of the tug hit the ship. The tug bounced off, heeled to port and, after the second impact, when the stern struck the ship, rolled to starboard. He noticed oil on the deck of the tug and told the general hand that there was oil leaking from the ship.

Of the accounts given by the crew on *Austral Salvor*, it is not possible to determine which is the most accurate. All were honestly given and described a time of period of less than 60 seconds. The Inspector is satisfied that the Tugmaster took the controls before the collision. If only because of his experience the Tugmaster's description is relied on to a geater extent than other accounts.

The Pilot

The Pilot gave evidence that he went to the port bridge wing after the ship had cleared the narrow channel off Clara Rock. At that time he saw *Austral Salvor* two metres off the ship with its stern closing rapidly contacting the side of the ship.

The Pilot's evidence is accepted and it is probable that only the stern of *Austral Salvor* struck *Barrington*.

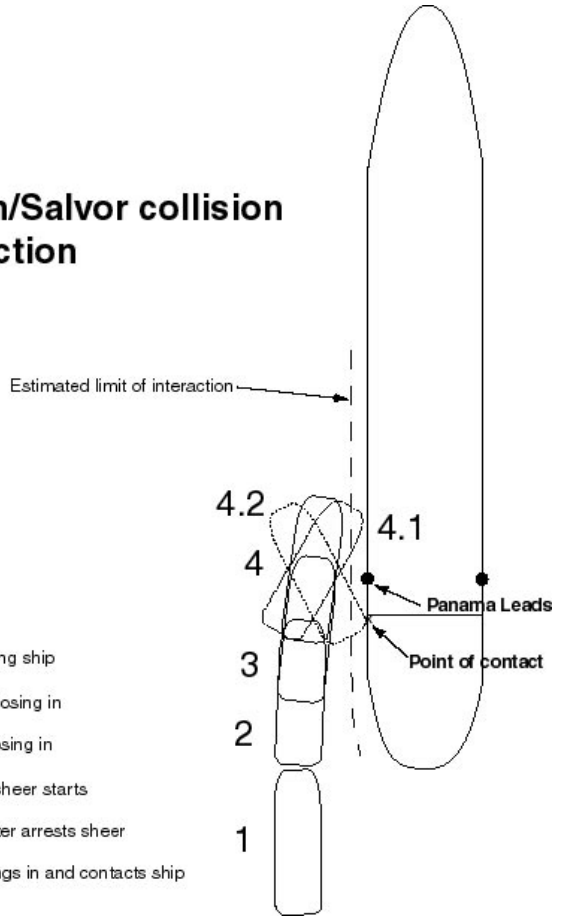
Mechanical Failure

The Trainee mentioned that there had been instances of mechanical failure of components of control systems on the tug and that such a failure may have occurred on this occasion, leading to the sheer.

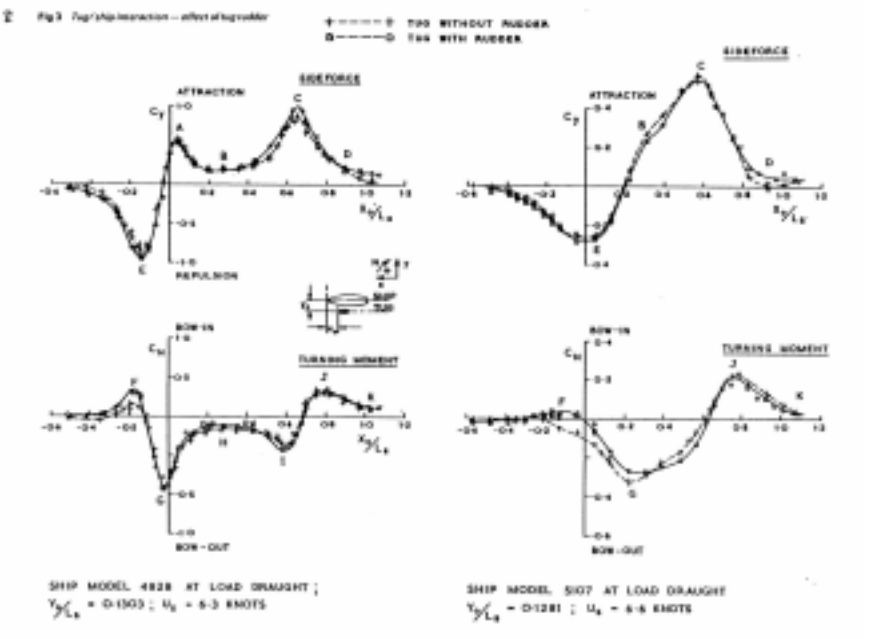
Mechanical failure could have resulted in

- A misalignment of the propeller nozzles.
- Differential fuel supply to the engines.
- Steering pump failure.

Barrington/Salvor collision reconstruction



1 1640 approaching ship
2 1641 10m off, closing in
3 1642 8m off, closing in
4 1642½ 6m off, sheer starts
4.1 1642¾ Tugmaster arrests sheer
4.2 1643 Stern swings in and contacts ship



Tug/ship interaction: side force and turning moments

Mechanical failure could have resulted in a mismatch of the nozzle alignments for any given setting on the unilever controls causing unequal thrust from each nozzle. If the starboard nozzle rotated to an athwartship position, or even astern, while the port nozzle remained in its original ahead position the tug could sheer to starboard.

Differential fuel supply to the engines could reduce the propeller rpm on one engine as compared with the other engine. This would result in unequal thrust from each nozzle and could cause a sheer.

Failure of a steering pump could also cause a sheer to develop. A few weeks after the collision between *Austral Salvor* and *Barrington*, while *Austral Salvor* was assisting another ship, one of the two steering pumps failed without, it appears, any audible alarm to indicate that there was a fault in the system. Though the ship being assisted had stopped, it was not possible to stop the tug without declutching the affected engine and using an alternate system to regain control to a limited extent. The fault affecting the steering pump had to be rectified immediately and the tug was withdrawn from service to enable this to be done.

After the collision on the 27 April the Tugmaster encountered no problems while handling the tug for the remainder of that day. The Inspector considers it unlikely that the tug would have eaperienced a momentary mechanical failure of a component of the control system.

Their is no evidence is that mechanical failure of *Austral Salvor's* equipment did not occur and mechanical failure is not considered to be a factor in this incident.

Incorrect handling of the controls

The Tugmaster suggested that incorrect handling of the controls was the reason for the sheer of the bow of *Austral Salvor* toward *Barrington*.

While the Trainee was at the controls of the tug, the Tugmaster stood about a metre behind on his right hand side, so he could watch the Trainee operate the controls as well as monitor the approach to the ship. The only controls the Tugmaster was unable to see were the throttles, with the Trainee's hand on them, but he was able to see the indicators for the propeller revolutions.

When the sheer started, the Tugmaster estimated that the tug was about ten metres from the ship. He had instructed the Trainee three times to reduce speed. As the tug closed on *Barrington* he expected that after he told the Trainee to reduce speed on the third occasion, the Trainee would have brought the unilever back. The Tugmaster said it was possible that the Trainee brought the unilever back toward the neutral position, but off-centre and to starboard, rather than along the centre line. With propeller revolutions of about 500 rpm, this would have caused the tug to sheer sharply to starboard. At lower speeds the same directional thrust would have been generated, but it would have been less pronounced.

Interaction

Just past Clara Rock, in the opinion of the Trainee, the tug was parallel with the ship and about ten metres off. A vessel making headway creates positive pressure forward of the pivot point, while aft of that point, there is an area of low pressure. In narrow channels or while close to other vessels, these areas of high and low pressure affect the behaviour of both the ship itself and other craft within these pressure areas.

In narrow channels the effect on a ship is accentuated by loss of pressure, associated with increased velocity of water, in the restricted space between the vessel and the bank, or between two vessels. *Austral Salvor* and *Barrington* were in a narrow channel. The channel width varied between 120 and 200 metres and the ship was in, or close to, the middle of the channel with the tug estimated to be about ten metres off.

Interaction affects ships close to one another moving at speed so that, when two ships are involved, the pressure fields around the ships combine or are modified and cause one or both ships to be swung off course, or cause lateral displacement toward or away from each other. The effects of interaction are of greater importance when both vessels are moving in the same direction, as the forces will be acting over a longer period than if the vessels were passing on opposite courses. The Trainee believed he sensed interaction when the tug was ten metres off the ship.

However, advice received from the designer of the tug suggests that the effects of interaction should have been experienced when the two vessels were 3 ½ - 4 metres apart, given the low speeds of both vessels. On this basis, interaction wowuld not hace occured until the Tugmaster took the controls.

The Pilot on *Barrington* estimated the ship's speed was close to 5 knots and the tug's speed, as it closed on the ship, was just over 5 knots. The tug was approaching *Barrington* near the last of the ebb tide. The ebb was running at a rate of about 0.5 knots and there would have been no significant effect on interaction because of the flow of the tide.

In assessing the effects of interaction, the Unit used guided by a paper,[1] by Dr I W Dand on Tug-Ship Interaction.

Scale model experiments on a full form tanker-type hull in shallow water at load draught and a tug at speeds of 6.3 knots provided data on turning moments as the tug approached the tanker from astern. Bow-in turning moments were experienced as the tug was in the vicinity of the stern of the tanker increasing to a maximum when the tug was near the aft shoulder. Thereafter the turning moment reduced to zero when the distance from the bow of the tug to the bow of the ship was 0.7 times the ship's length. From this point forward, there was a bow-out turning moment as the tug drew forward towards the bow of the tanker.

In relating this information to the present incident, certain differences were evident. The models did not accurately represent *Barrington* and *Austral Salvor,* and the speed of the actual ship and tug were less than the speeds of the models. *Barrington* was in ballast and would have had greater underkeel clearance than the model tanker. Data on sideforce and turning moments would thus have to be used as a guide only in assessing the effects of interaction on *Barrington* and *Austral Salvor.*

The graph of turning moments suggested that, at the time the sheer took place on *Austral Salvor,* the moment would have been close to zero or that there would have been a bow-out moment away from the ship.

On the evidence available, it is probable that the initial sheer was not caused by interaction. However, once the tug's stern had closed within a few metres of the ship after the sheer of the bow had been corrected, there may well have been a stern-in turning moment caused by interaction.

With the tug only a few metres off the ship and closing rapidly, any sheer would have been difficult to correct in the seconds before the collision.

The Tugmaster's actions

The Tugmaster attempted to correct the initial sheer of the bow to starboard by pulling back the unilever, which would have rotated the nozzles from their present position to near athwartships. He also increased revolutions on the port propeller to push the stern in and assist with arresting the sheer of the bow.

When the Tugmaster realised that the tug's stern was closing rapidly with the ship, he pushed the unilever forward. Using the throttles, he reduced port thrust and increased starboard thrust to keep the stern off and to get the tug away from the ship. The tug was close enough at this time for interaction to draw its stern toward the ship and the Tugmaster could not prevent contact between the two vessels, causing the shell plating of the ship to be holed.

While this was happening, the Tugmaster noticed that the ship seemed to be moving past the tug and was concerned that the tug would be drawn in under the counter at the stern of the ship. By pushing the unilever forward, reducing port thrust and increasing starboard thrust he had been attempting to keep the stern of the tug off the ship as well as to drive the tug away from the ship. Although he was unable to prevent the collision, he was able to get the tug away from the side of the ship before further damage was caused.

Training the Trainee

The Trainee has a Master Class 1 certificate. He had sailed as Master of a cement carrier for about six weeks before he commenced training with the tug company on 6 April 1998, three weeks before the collision. He had sailed as Master on a rig tender, at which time he had a Master Class 3 certificate. He had also driven twin screw craft at an offshore oilfield to carry out crew changes on ships that were under way.

Queensland Tug & Salvage Co Pty Limited issued the Trainee with a letter of appointment to the company. The letter informed him that he would be required to undertake a structured training programme. The training was to familiarise himself with different tug types that he would command and to enable him to become competent in their handling and safe operation. He would be required to demonstrate satisfactory knowledge of operating procedures, practices and the port environs. Throughout the training period, he would be under the direct supervision of experienced tugmasters, who would progressively hand over

control of the tug to him when they felt confident to do so.

The letter also stated that investigations into accidents involving tugs revealed that most accidents would have been avoided if correct procedures and company standing orders had been observed. Part of his assessment would focus on his ability to demonstrate thorough understanding of a list of manuals, circular letters and forms as well as their practical application.

He was required to maintain a book recording each job undertaken by him and the attending tugmaster was to sign the book after each job. At the end of his training period he would be assessed by Check Captains in consultation with management prior to being given command of a tug.

Since 6 April 1998 the Trainee had attended some 55 tug manoeuvres, 31 of these operating the controls under supervision. On seventeen occasions, he took the controls on *Austral Salvor,* or its sister tug *Redcliffe,* assisting inbound ships on about half of these occasions.

The Tugmaster, who was with the Trainee on 27 April, had often taken over the controls from other trainees in such circumstances. Of the Trainee, the Tugmaster had worked with him before on other jobs and was happy with his ability.

Company training manuals

The tug company training manual states that, since the introduction of omni-directional tugs, contact damage had occurred during berthing and unberthing as well as while landing alongside stationary and moving vessels.

The manual warns that the failure by tugmasters to look aft while manoeuvring had led to their being unaware of the sideways movement of the tug's stern and consequent damage. Excessive speed when berthing also led to damage and it was pointed out that this class of tug could be effectively handled at slow speed with minimum engine power.

It points out that it was not good practice to go alongside a moving ship whose speed demanded tug propeller revolutions in excess of 75 percent of the maximum, warning that there would be interaction

between the two vessels, increased steering sensitivity at higher speeds and little or no reserve power to clear a ship if required. It stated that steering corrections made at high speed might cause considerable rolling moments and lead to the tug's mast, funnel or rails contacting the ship.

The manual advises that it was safer to land the tug on the parallel side of a moving ship and, after that the tug's structure was clear of the ship's overhang, to move the tug to the tie-up position.

The Trainee followed the procedures laid down in the manual. He had planned to land *Austral Salvor* son the parallel side of *Barrington* and drop back to a position just forward of the ship's bridge. However, before the manoeuvre could be completed, *Austral Salvor* sheered toward the ship resulting in a collision.

Conclusions

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

Based on all the evidence available, the following factors are considered to have contributed to the incident:

1 In handling the unilever to adjust the speed of the tug, the Trainee left on a component of starboard thrust,causing a sheer to starboard.

2 The Tugmaster corrected the sheer of the bow to starboard. However, as the stern of the tug closed within four metres, interaction forces contributed to the tug's momentum towards the ship causing the stern of the tug to make contact with the ship's side.

3 On balance, the probability is that only the tug's stern made contact with *Barrington*.

4 No action by Barrington contributed to the collision.

It is also noted that

5 The collision caused indentation and penetration of *Barrington's* hull in way of the port heavy oil storage tank. Both the indentation and penetration of the shell plating were caused by contact with a steel bracket on the tug, which was used to attach the after fender to the stern of the tug.

6 The training regime, training manual and instructions provided for prospective Tugmasters would seem to be comprehensive and were not contributing factors in this incident.

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:

The Pilot, the Tugmaster and Trainee on *Austral Salvor* and the Master of *Barrington.*

The Pilot acknowledged receipt of the draft report and advised the Inspector that he had no comments or further information to provide.

Submissions were received from the Master of Barrington and the Trainee on Austral Salvor and the text was amended where necessary.

Details of Barrington

Former name	Australia Sky
IMO No.	8716356
Flag	Australian
Classification Society	Lloyd’s Register of Shipping
Ship type	Oil Tanker
Owner	Barrington Pty Ltd
Operator	Teekay Shipping Ltd
Year of build	1989
Builder	Samsung S’bldg & Hvy Industries Co Ltd
Gross tonnage	21718
Net tonnage	9098
Summer deadweight	33239 tonnes
Length overall	180.5 m
Breadth extreme	26.82 m
Draught (summer)	10.674 m
Engine	B&W 2SA 5Cy 500 X 1910
Engine power	6032 kW
Crew	18

Details of Austral Salvor

Flag	Australian
Classification Society	American Bureau of Shipping
Ship type	Stern drive omni-directional tug
Owner	Queensland Tug and Salvage Co Pty
Operator	Queensland Tug and Salvage Co Pty
Year of build	1986
Builder	Carrington Slipways, Newcastle
Gross tonnage	470
Net tonnage	141
Light displacement	613 tonnes
Displacement max	966 tonnes
Length overall	33.91 m
Breadth extreme	10.85 m
Depth moulded	5.41 m
Draught (summer)	5.20 m
Engine	Two Yanmar 8Z280-ET (280 x 360)
Engine power	2 x 1790 kW
Bollard pull (stern hook)	64 tonnes
Bollard pull (bow)	61 tonnes
Crew	4 and a Trainee