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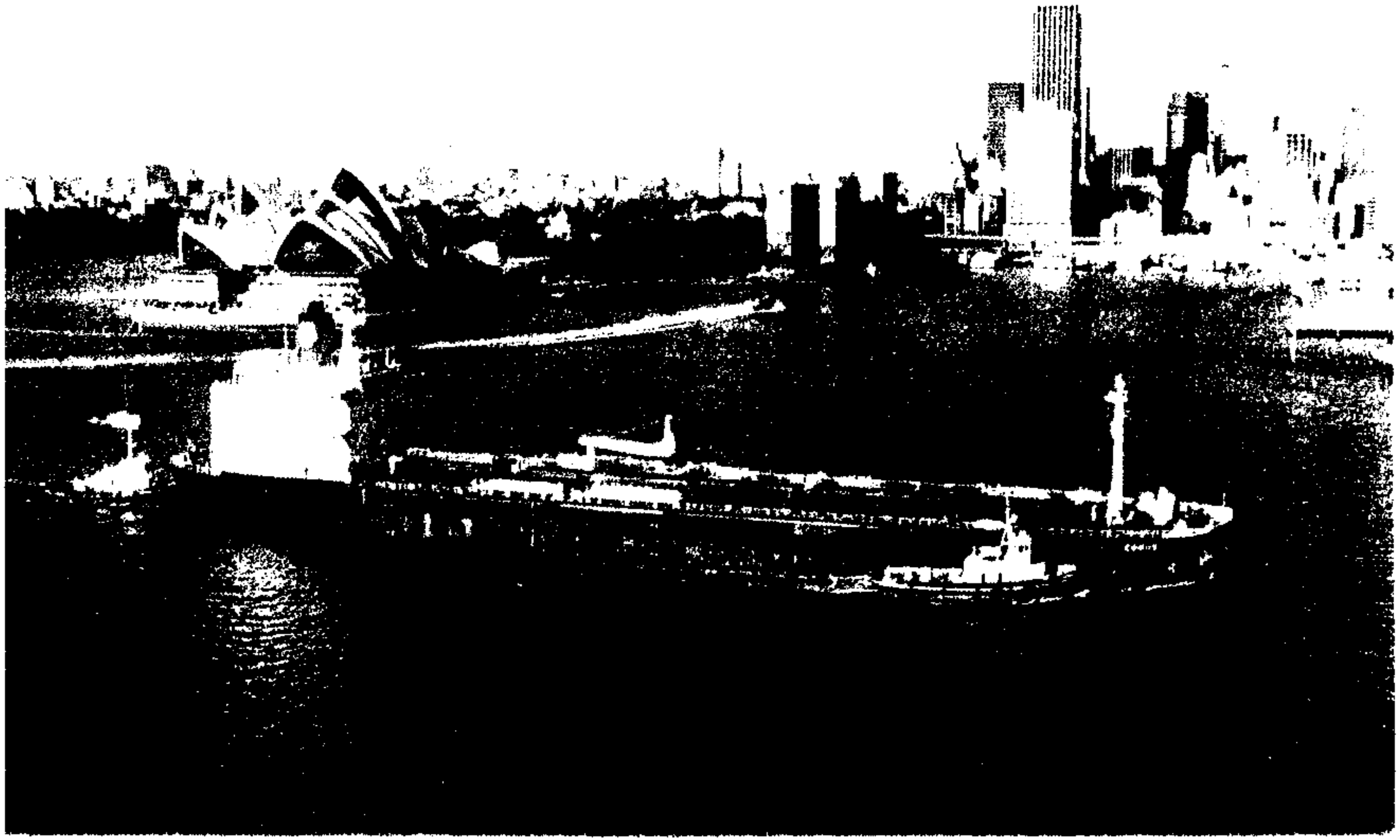


Conus entering Sydney Harbour

Summary

A little before 1700 on 12 January 1995, the Australian flag tanker Conus sailed from the tanker berth, Townsville Harbour, under the direction of a pilot.

In navigating the narrow entrance channel the vessel was set to the north and west by the east-south-easterly wind, blowing at 16 to 20 knots and the flood tide. The vessel first touched the side of the channel about 500 metres from the harbour entrance, and then came into contact with a channel marker beacon before coming to a stop just over 1000 m from the entrance.

Nobody was hurt as a result of the grounding. The sea bed on either side of the approach channel is soft mud and no apparent damage was sustained by the ship, no pollution resulted, and the risk of pollution in the circumstances was minimal.

After about 45 minutes the ship was refloated with the ship's main engine and bow thruster and assistance from the two harbour tugs. At 1758 the vessel had regained the channel and at 1815 the tugs were dismissed. The ship cleared the pilotage area, disembarking the Pilot by 1836.

Sources of Information

The Master, Pilot and crew of the Conus.
Harbour Master, Townsville.

Acknowledgement

Portion of charts; Aus 827, Cape Bowling Green to Palm Isles and Aus 257, Townsville Harbour and Ross River Entrance, reproduced by permission of the Hydrographic Office, RAN

Narrative

Conus

The Australian tanker Conus is owned by the Shell Company of Australia and managed on behalf of the owners by ASP Ship Management.

Built in 1981 by Mistsubishi Heavy Industries Ltd, Kobe, Conus is 177.71 m in length, it has a maximum beam of 26.83 m and a summer deadweight of 31,950 at a draught of 12.018 m. The ship has 21 cargo tanks protected by an inert gas system and segregated ballast tanks. It is powered by a Sulzer diesel engine generating 7,547 kW (10,260 break horse power) driving a single shaft and a fixed pitch propeller, giving a service speed of about 14.5 knots. The vessel is also fitted with a bow thrust motor and propeller for port manoeuvring.

Townsville

Vessels approach the port of Townsville through Cleveland Bay, bound by Cape Cleveland to the south and Magnetic Island to the north. This area of the Queensland coast is subject to a prevailing south easterly wind, which freshens in the afternoon, with the increasing atmospheric pressure differential between the sea and land, as the land heats up.

Entrance to, and departure from, Townsville is by a single narrow channel which extends for 7 miles. The outer channel is known as the Sea Channel, about 3.5 miles in length, it has a depth of 11.6 m below datum and the inner channel is known as Platypus Channel, about 3.5 miles in length with a depth of 11.4 m below datum. Both Channels are dredged to a width of 92 m, the channel markers in Platypus Channel being set 44 m outside the dredged channel.

The harbour itself is based on the Ross Creek, with man made breakwaters making up the three seaward arms of the harbour, the Container berths, the Eastern Breakwater and the Western Breakwater. Within the harbour is a turning basin dredged to 12 m and inside the Eastern Breakwater is the tanker berth, dredged to 12.5 m. The tanker berth has a relatively high occupancy rate with three regular coastal tankers and imports of heavy fuel oil for the nickel works.

Pilotage for the port of Townsville is compulsory. Ships must take a licenced pilot unless the ship's master holds a pilotage exemption for the port.

The incident

Conus arrived in Townsville just before 0615 on 11 January with a cargo of fuel oils, gas oil and motor spirit. The vessel berthed starboard side to, with the bow pointing towards the harbour entrance on a heading of 324°.

Conus completed discharge of cargo at 1518 on 12 January 1995 and the bridge and engine room equipment was tested, in preparation for sailing, between 1545 and 1620. The Second Mate completed and signed the departure check list attesting to checking the equipment, which included aligning the course recorder, setting the time (UTC) and notating the port of departure.

The Second Mate also completed the tidal information on a passage (departure) plan for Townsville, detailing the times of high and low water, channel depth and the under keel clearance anticipated, based on the sailing draught of 5.3 m forward and 7.7 m aft.

The Pilot boarded at 1630. He estimated that the wind was blowing at between 15 and 20 knots and that it was from between north-east and east.

The same Pilot had directed the vessel's departure on previous occasions and the Master did not discuss the departure plan in any detail with him, nor did they discuss the wind or tidal conditions. They did discuss, however, the deployment of the tugs, agreeing that the after tug, Burdekin, should not be made fast but would push on the starboard quarter as soon as possible after letting go. They also discussed the operation of the forward tug. The Master stated that he had been requested by the ship's agent to use only one tug for the departure, but he declined. However, in consultation with the Pilot, agreed that the tug Giru would be made fast forward, but would not be asked to take any weight unless necessary and the bow thruster would be used in lieu.

The engine was put on 'stand-by' at 1642 and the crew went to stations at 1647. The forward tug was made fast at 1650, on a short line to the port shoulder. The tide was on the flood, 2 hours before high water and the wind, as established by recordings from the harbour anemometer, was blowing from the east-south-east at between 16 and 20 knots.

For clearing from the berth, the Master and Pilot positioned themselves on the starboard bridgewing. The Mate was stationed at the engine control, located on the starboard side of the wheelhouse and a seaman was stationed at the wheel. At 1656, all the moorings were let go and clear of the water. Using the bow thruster to push to port and with the wind on the large area of the accommodation the ship moved bodily off the berth.

The forward tug took no weight during the operation. The stern tug moved to the starboard quarter and using full power started to push the stern to port, to manoeuvre the stern through the necessary 66 degrees to align the ship with the exit channel. The rudder was put hard to starboard and at 1657, with the vessel about 50 m off the berth and heading 335°, the engine was put to 'slow ahead'. At 1658, with the ship heading about 006°, the engine was put to 'half ahead' and the rudder amidships.

Once the ship was clear of the berth, the bow thruster was used to keep the bow pointing towards the harbour entrance. As the ship's head passed through 010°, at about 1659, the Pilot used the bow thruster to ensure the bow would not get too close to no.16 beacon. The Master and Pilot moved into the wheelhouse, the Master taking up his usual position by the 'autoplot' table, to port of the wheel and where the GPS provided him with a reading of real time track and speed data, and

the Pilot took up station on the centre line.

At 1659, the rudder was again put hard to starboard until, at 1700, the ship was on a heading of 031°, with the bow passing the Eastern Breakwater into the channel. The helmsman counteracted the swing with 10 degrees and then 8 degrees of port rudder. Steadied on course, the helmsman noted that the ship immediately started to 'crab' to port.

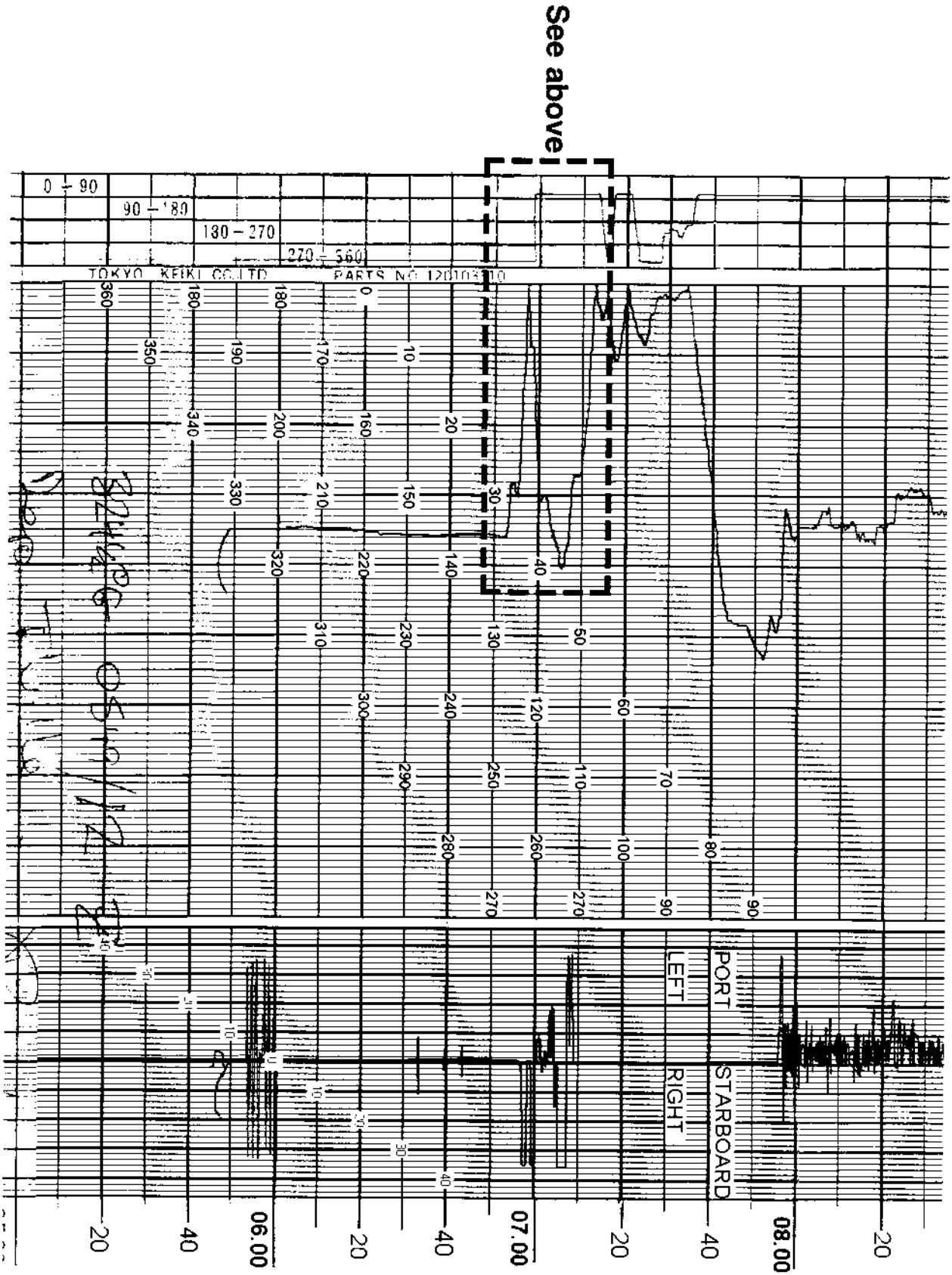
At 1702, as the bridge passed the Eastern Breakwater, the Pilot realised that the vessel was not on the centre line of the channel, but was towards the western, port hand side and setting bodily to port. He ordered 'full ahead' and a course correction to starboard, to 034°. The helmsman did not have to apply any starboard rudder, as the bow paid off to starboard due to the effect of the wind on the starboard quarter. As the ship continued to be set towards the port hand side of the channel, the Pilot ordered a further course adjustment to 036°.

The bow tug was let go at 1704 and recovered its line with the intention of staying on station close to the port bow. However, because Conus was setting to the west and the tug was concerned about the depth of water available to the tug, the tug Skipper requested clearance from the bow and passed ahead of Conus.

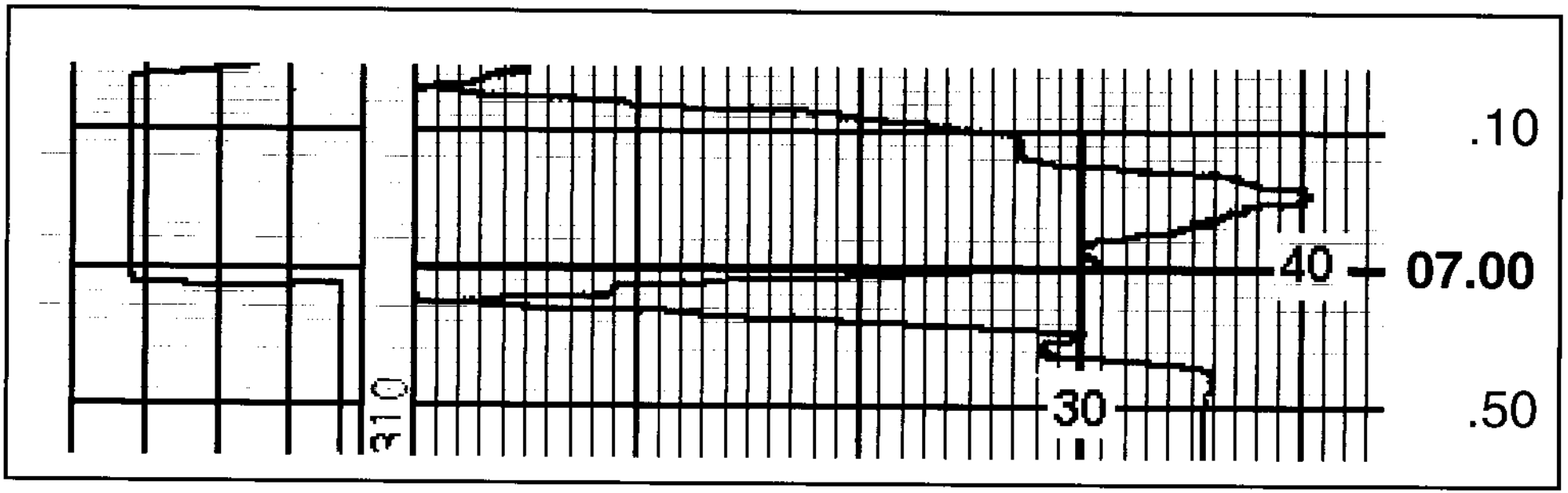
As the tug's line was let go, the Master noted the speed indicated on the GPS as 5 knots and increasing. Looking astern, he saw that the ship was well to the west of the leads, but before he could say anything, the Pilot ordered full starboard rudder. Shortly after this, the vessel listed to starboard. The initial reaction of both the Master and Mate was that cargo valves had opened, allowing ballast to flow into an empty tank. However, they soon realised that this was not the case and the ship had touched the channel's edge.

Under full starboard rudder, the ship's head swung 4 degrees to starboard from 036°, to a heading of 040°, and then at 1705, although full starboard rudder was still applied, the ship's head slowly swung to port. At 1706, the Pilot requested more engine speed and the Master moved across to starboard and rang 'navigation full ahead' (full sea speed) on the telegraph.

At 1707, with the ship's head on 035° and the vessel setting to the west, it seemed that collision with beacon no.13, marking the western side of the channel, was inevitable and the pilot ordered full port rudder, to try and swing the ship's stern clear to minimise any damage to the rudder and propeller from contact with the beacon. At 1708, with the ship's head on 027°, the engine was stopped and the rudder returned to an angle of about 3 degrees, before being returned to maximum port rudder, as the beacon passed down the port side. However, at 1709, the port side of the ship came into contact with the beacon about 10 m forward of the bridge front, 52 m from the stern. The ship was slowing and at about 1711 it came to a stop in soft mud about 50 m north of the



Section of course recorder



Enlargement with correction to the real time of the incident

beacon, in an approximate position 19°14´S 146°50´E where the depth of water should have been about 5.5 m. The ship's head then paid off to port to lie in a northerly direction.

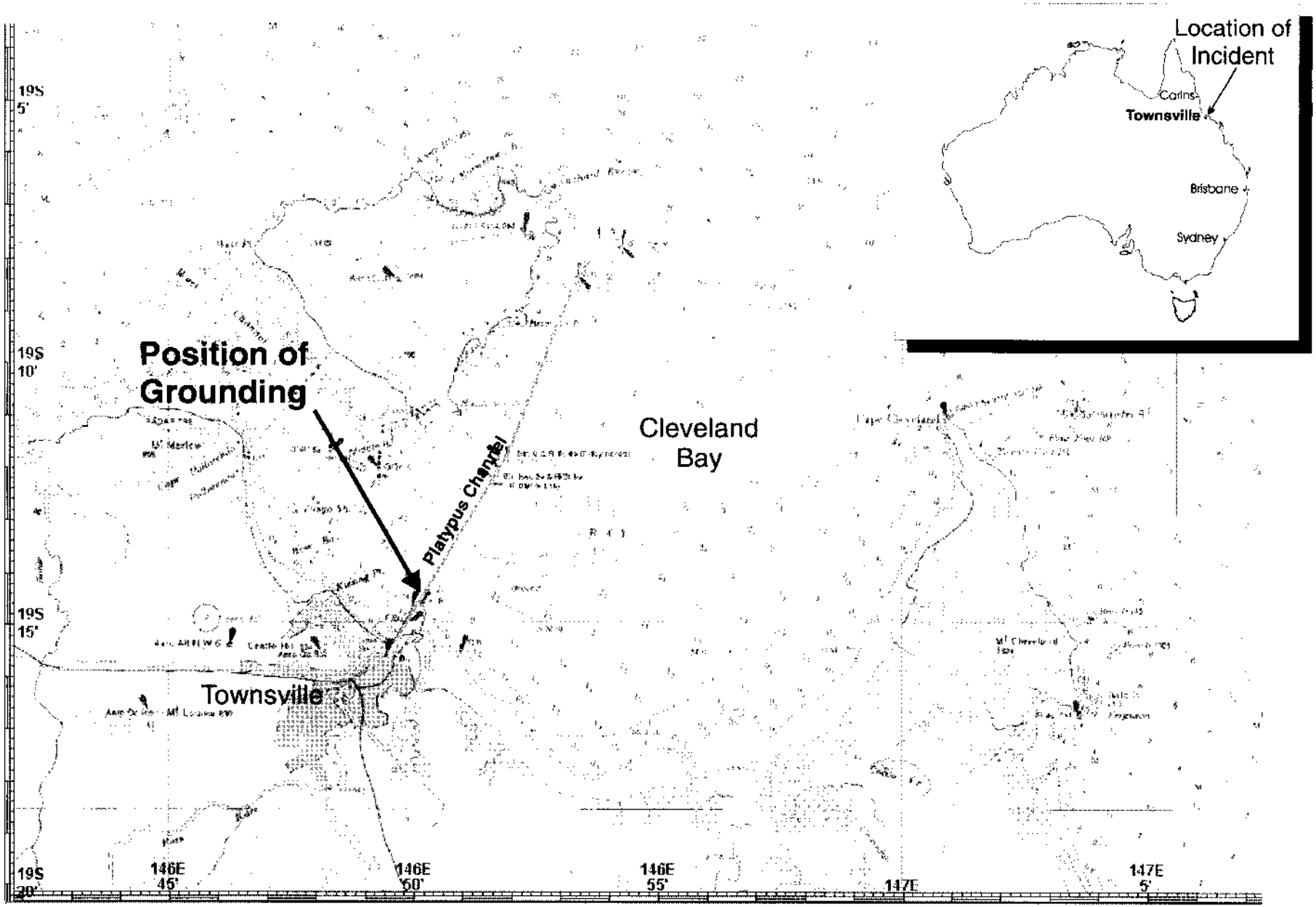
At about 1715, the harbour tug Giru, with a 47 tonne bollard pull, and which had earlier been made fast to the port bow of Conus, made fast to the starboard bow. At 1716, the tug Burdekin, which was called from the harbour, was made fast aft. The ship's engine was put to 'slow astern' and the bow thrust to starboard. At 1722 the stern power was increased to 'full astern', however, the ship did not move and after four minutes, the engine was stopped to prevent a build up of mud under the ship.

Attempts were made to refloat using the tugs alone, but this was also unsuccessful and resulted in the tow line to the forward tug carrying away at 1728, however the tug was quickly reconnected.

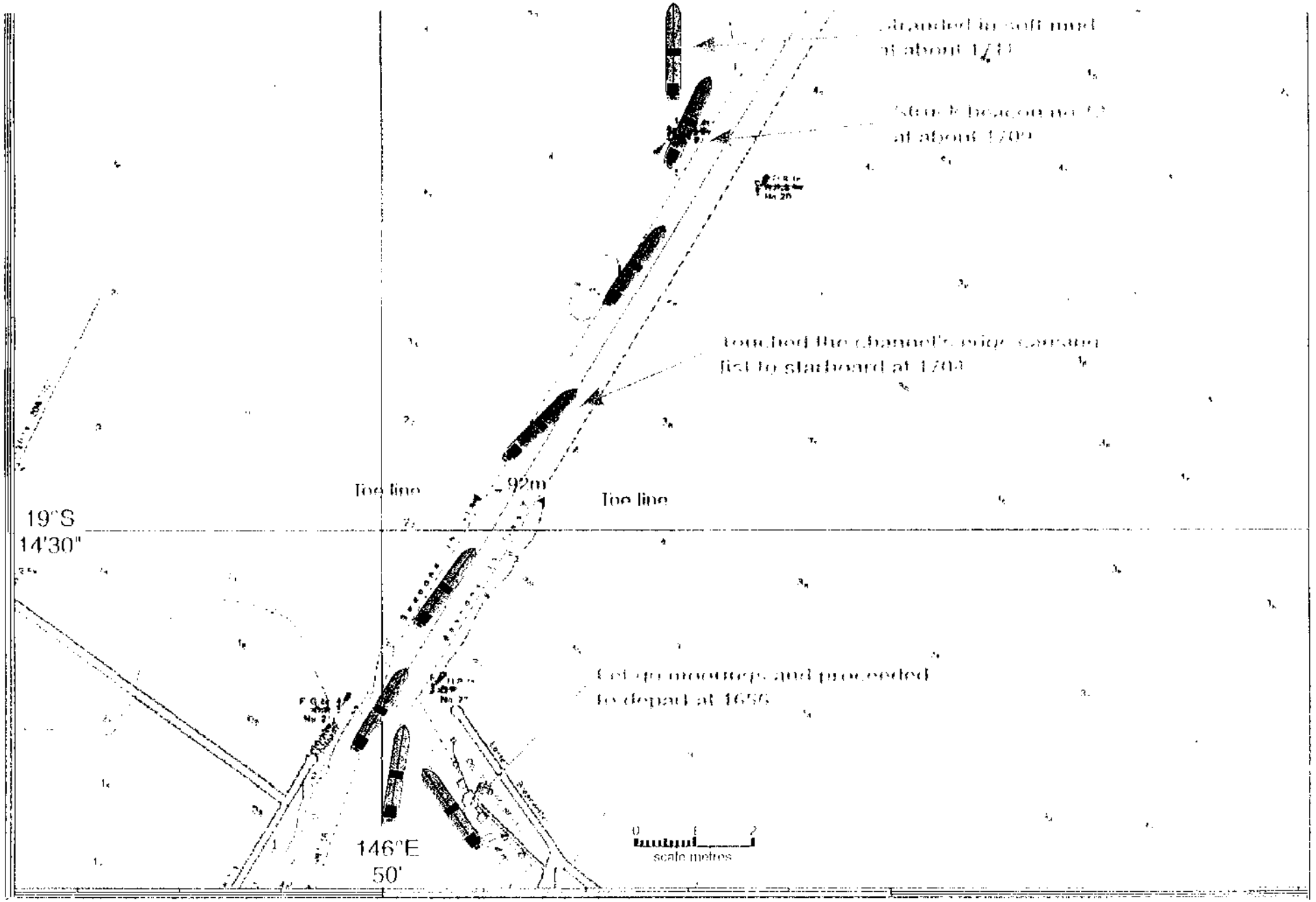
At about 1743, the after tug was able to pull the stern back into the channel, then, using the bow thruster and the forward tug, the ship was pivoted to head about 050°. At 1752, the ship's engine was put to 'half ahead' and the ship started to move ahead. At 1753, the engine was put to full ahead and, with the assistance of the tugs, the ship regained the channel.

By 1805, Conus had gained sufficient headway to continue unassisted. At 1806, the tugs had released their lines and, at 1815, the tugs were dismissed. At 1830, the Pilot disembarked and Conus was full away on passage at 1836.

Nobody was injured as a result of the incident and no pollution resulted.



Portion of chart Aus 827 showing general position of grounding



Reconstruction of Conus leaving Townsville - 12 January 1995

Comment and Analysis

General

Outside some general rules of ship handling, it is neither safe nor possible to be prescriptive as to how ships should be handled and piloted. Much depends on the individual features of the ships, the weather and tidal conditions. However, all ships require a certain momentum or speed to, firstly gain steerage way and, secondly, to offset the effect of any tidal flow or wind on the ship's hull.

The width of Platypus and Sea Channels is not untypical of other port approach channels and although they are narrow, both channels are straight (with a 10 degree alteration between the Platypus and Sea Channels).

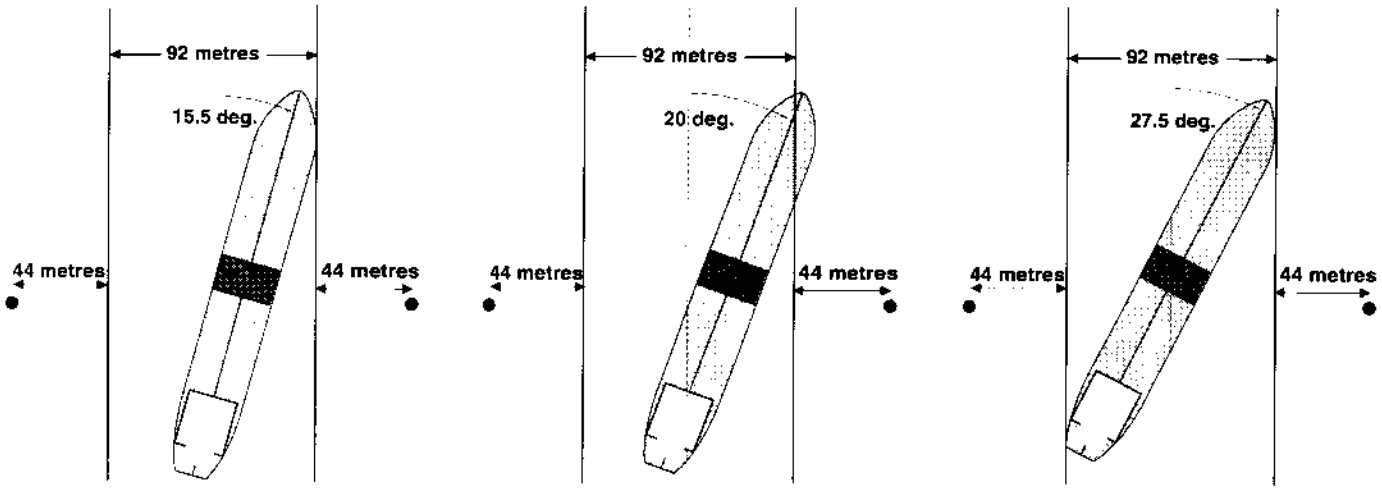
The width of the channels can cause problems when manoeuvring relatively large ships. Pilots of the larger, deep draught vessels must balance the need to maintain a speed that will allow steerage way and be sufficient to counter any set and drift, against excessive speed, that may lead to the ship becoming unmanageable through bank effect[1] or, when inward bound, lead to problems of stopping the ship when it reaches the harbour[2]. On large ships with light draughts and increased windage (the 'sail area' of the hull) sufficient speed must be achieved to counteract the set of the tide (if any) and the drift caused by any wind. Larger ships in ballast may also feel the bank effect despite being at a reduced draught and would need to stay in the centre of the channel. Excessive helm movements tend to slow ships, and makes the ship more difficult to align with the channel. The need for excessive helm movements may indicate that the vessel is not in the centre of the channel and the stern is being attracted by the near bank of the channel.

These factors are well understood and the channel approaches to the Harbour have provided a safe fairway, which is aided by the nature of the seabed being soft mud.

The amount of leeway that can be applied by ships of 180 m in length is limited. Because the channel width of 92 m is relatively narrow, a ship of 180 m in length and 28 m beam, maintaining the centre of the bridge on mid channel would ground the bow on the side of the channel if 15.5 degrees of leeway or more was applied. In practical terms this would limit the amount of leeway to 10 degrees, and that would be extremely disconcerting for those on the bridge.

[1] Bank effect, a streamlining or venturi effect due to the restricted water on one side of the ship increasing in velocity with a resultant drop in pressure, because of the ship's shape the stern tends to be attracted towards the bank.

[2] The water displaced by a vessel moving ahead is restricted by the channel banks causing a build up of water at the bow and a lowering of water at the stern. As the vessel slows or stops the water astern "catches up" with the ship causing it to surge forward,



'Conus' in Platypus Channel, Townsville

The Pilotage

The Pilot on board on 12 January had twelve years experience with the Queensland Pilot Service and had over three years experience of piloting vessels of all sizes into, and out of, Townsville. He had piloted Conus on at least five occasions in 1994, each one of those with the Master in command at the time. The Master had confidence in the Pilot's experience and he and the bridge team relied solely on the Pilot's direction.

The Master did not hold an exemption for the port but had completed a number of qualifying voyages towards such a certificate.

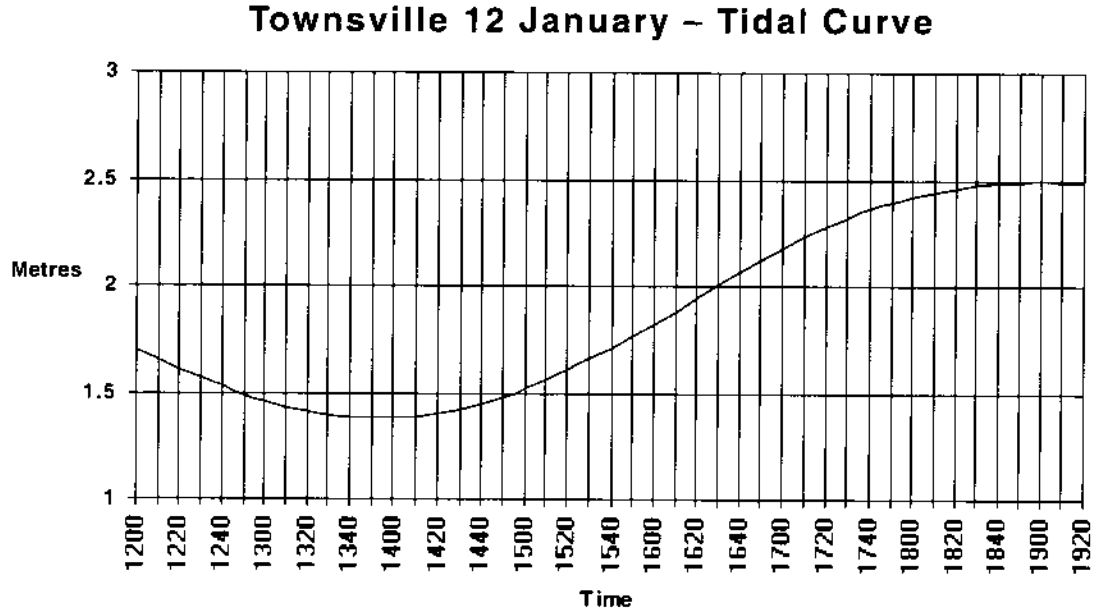
When the Pilot boarded, he noted that the afternoon wind, while not unusual, was stronger than it had been for some time. He did not seek to establish the actual strength from the harbour control tower or the ship. His estimation of the direction (from between the north-east and east) was somewhat imprecise and casual.

A wind from the north east would have been about 15 degrees on the starboard bow. As it was, between 1654 and 1712 the wind blew from between 110-102 degrees, putting the wind almost directly on the starboard beam.

The International Chamber of Shipping, 'Bridge Procedure Guide' recommends under the chapter on passage planning:

> 2.2.2 *After his arrival on board, the pilot, in addition to being advised by the master of the manoeuvring characteristics and basic details of the vessel for its present condition of loading, should indicate the passage plan he intends to follow. The general aim of the master should be to ensure that the plan is safe and the expertise of the pilot is fully supported by the ship's bridge personnel.*

The Pilot and Master, apart from discussing the deployment of the tugs, did not discuss any departure plan. It was a case of 'business as usual'



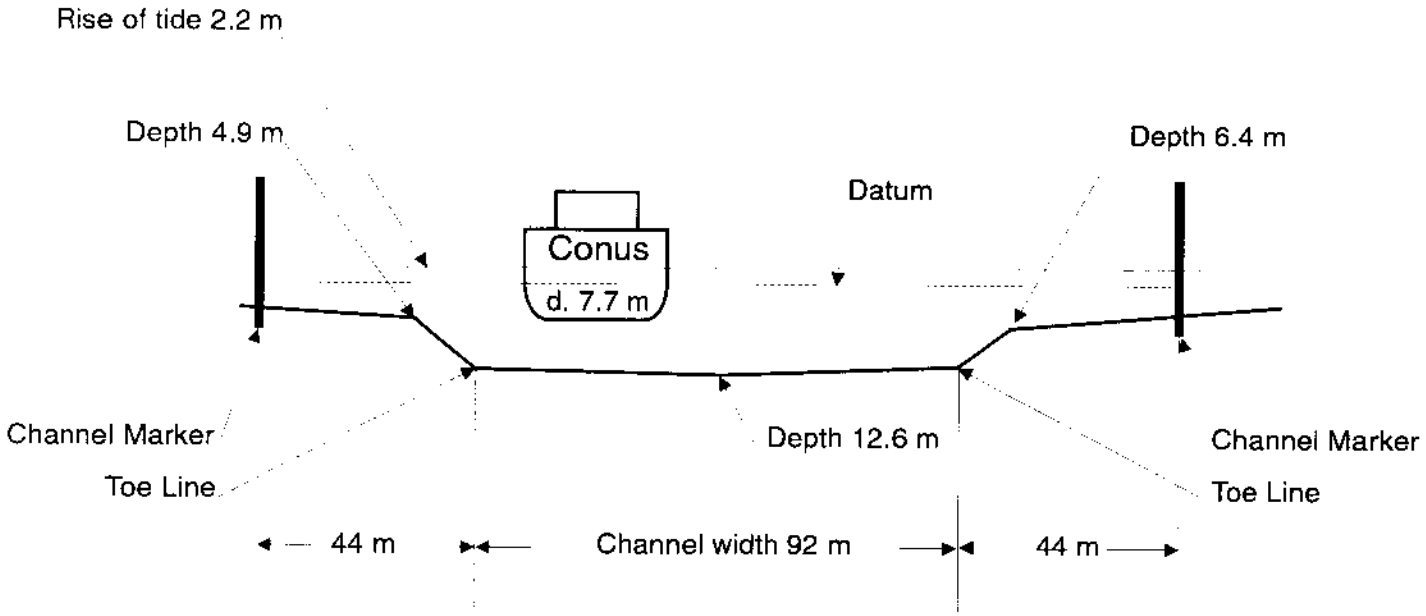
treating the departure as a 'standard' or routine departure, rather than consciously taking time to consider whether any special conditions existed that should be taken into account. Neither the Master nor the Pilot critically considered the 'normal' departure in the context of the wind or tidal stream.

High water was predicted for 1905 at a height of 2.5 m. At 1700, the tide was at about 2.18 m and rising, resulting in a relatively strong set to the west and across the channel. While it is possible to quantify the wind force and direction, there is no means to know the strength of the tidal set, as there are no records of the rate of tidal flow and there is no current meter. Pilots have always accepted that the tidal flow was pronounced, countering the tide by guess work and the set experienced at the time, adjusting the ship's head by as much as ten degrees.

Conus was 'flying light' at a draught of 5.3 m forward and 7.7 m aft. The ship's side, not counting the large accommodation block, presented a solid wall of about 1800 m² to a wind blowing at 20 knots marginally forward of the starboard beam.

The ship steadied on a course of 030° about 90 seconds before the bridge passed no.16 beacon at the end of the Eastern Breakwater. At this time the bow was passing no.16 beacon and the ship was making forward speed of between 90 m/min and 120 m/min (3 to 4 knots). Although steady on the channel course for about one minute the ship would have travelled less than one ship's length. Also, the momentum or rotation of the ship's hull through altering course through 60 degrees, the effect of the wind on the hull and accommodation, and the effect of the tide on the forward part of the ship as it cleared the harbour entrance, would have set the ship bodily to port, although initially maintaining a steady heading.

The ship's speed was steadily increasing. The Pilot estimated the ship was moving at about 5 knots as the



Cross section of Platypus Channel (approx 1700 – 12 Januaary 1995)

bridge cleared the entrance at 1702. However, it is probably more in the region of 4 knots or 123 m/min, as two minutes later, at 1704, when the forward tug was let go, the Master noted the speed on the GPS screen as 5 knots.

The Pilot immediately realised that the vessel was being set to the north-west. Instead of making one bold alteration immediately, he applied corrections in two degree increments. The helmsman found that the ship's head was paying off to starboard and he did not have to apply any starboard rudder, only port rudder to check the swing.

The critical period of the pilotage was within the harbour. Although the Pilot had the ship aligned with the channel while in the harbour, the ship had not gained sufficient headway and was subject to the residual rotation from the undocking manoeuvre. Insufficient leeway was applied immediately to counter the wind on the hull and accommodation and the effect of the tide as the ship emerged from the harbour entrance. Once in the channel, but off centre towards the western bank, the set to the north, through wind and tide, may have been compounded by the attraction of the bank. However, regardless of the degree of bank effect, the wind on the accommodation, pivoting the stern to port, meant that the helmsman did not have to apply starboard wheel, until directly ordered to do so at about 1705.

The ship actually took the ground about 500 m from the harbour entrance, when the ship's port quarter touched the shoal water outside the toe line, causing the ship to heel to starboard. Although the rudder was hard to starboard at this time, the ship pivoted aft and the bow swung steadily to port, while the ship continued to make headway along the channel.

Once the stern touched the northern limit of the channel control over the ship was effectively lost and there was no practical manoeuvre that could be undertaken to stop the ship's bow swinging to port, and the eventual contact with beacon no.13.

About one minute after the stern first made contact with the channel bank, the engine was put to full sea speed to endeavour to gain more headway. Under normal operational conditions the increase in revolutions from manoeuvring full ahead to full sea speed is controlled by a load program which compares the engine load with the propeller rpm and controls the increase in fuel, commensurate with engine rpm, to prevent overloading the engine. In an emergency this program can be overridden to allow a faster increase in revolutions. In this case the Master appears to have overlooked the operation of the override. In any event this would have made no difference to the outcome of the grounding.

Bridge Operation

The ship's Master did not hold a pilotage exemption however, he had been master of the Conus for 14 months and in the previous year had visited Townsville on five occasions.

The 'Townsville Check List' used by the ship had been drawn up by another master, who held an exemption and undertook the Townsville pilotage. His check list took the form of a pilotage plan, detailing the use of tugs and the positions within the harbour that he recommended for a safe departure, given the width of the channel. The relevant extracts from the instructions are as follows:

'1. .....

2. Make GIRU fast centre lead aft and BURDEKIN to stand by on the port shoulder.

3. After letting go, GIRU to pull the stern to port until close to the blue leads (019T) and keep the bow pointing at the breakwater entrance using bow thruster or for'd tug.

4. During the above operation, use dead slow astern to back into the harbour until the bow is abeam the "T" on the western breakwater. In strong winds from the east be alert to the stern swinging too close to the western breakwater.

5. Go to half ahead, let go tug once headway is achieved.

6. Using no more than 10 st'bd rudder, be on a course 031T to exit the harbour, using the leads in Ross Creek astern.

7. Steer 031T/032T to proceed down Platypus Channel, the flood tide sets to the east, the ebb tide sets to the west.'

The departure plan quoted above was one favoured by one particular exempt master, who had found it suitable for him. The key to the plan was to align the Conus with the channel while well inside the harbour and minimise the rudder angle that was required in the channel, while gaining as much speed as possible.

The rating on the wheel was an experienced helmsman who carried out the Pilot's orders efficiently.

Although not holding a pilotage exemption for Townsville, the Master visited the port regularly and was eligible to apply for pilotage exemption, he did not query the Pilot's manoeuvre, which varied from that of the plan aboard Conus and notated by the Second Mate that afternoon. Also, he showed no understanding of the tidal set, which was wrongly shown on the departure form as setting to the east on the flood tide, and which suggests an incomplete knowledge of the pilotage factors relevant to the port.

Refloating

Once aground, both the Pilot and the Master appreciated the problems that could be caused, by a build up of mud, if the engines were put astern for a prolonged period. With the assistance of the tugs, whose masters responded rapidly to the situation, the ship was refloated in the most effective way possible.

Conclusions

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

1. The Pilot did not plan the undocking and take full account of the wind strength and direction.

2. The Pilot and Master did not jointly consider any sailing plan for Conus, taking into account the prevailing conditions, rather they relied on a 'standard' departure which did not take into account the possible effect of the wind or tide.

3. The prevailing wind conditions were not severe or unusual, but they were such that the ship's position and speed at the harbour entrance were critical to a safe transit of the Platypus Channel.

4. The ship had not gained sufficient speed at the harbour entrance to counteract the ship setting to the port side of the channel.

5. The correction for leeway and drift in increments of two degrees over a three minute period, rather than an immediate alteration of ten degrees, was inappropriate in the circumstances.

6. No accurate assessment could be made of the tidal stream, given the absence of any tidal meter monitoring the tide in Platypus Channel.

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 the 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 report was sent to the Master and Mate of Conus, and to the Harbour Master and Pilot, Port of Townsville, .

The only submission received was that from the Mate of Conus, who provided technical information.

Details of Ship

Name	Conus
Flag	Australian
Lloyd's Number	7918244
Owners	Shell Company of Australia Ltd
Type	Motor tanker
Builder	Mitsubishi Heavy Industry Ltd
Classification Society	Lloyd's
Length	177.71 m
Beam	26.83 m
Gross Tonnage	24,124
Nett Tonnage	13,328
Summer deadweight	31,950 tonnes
Summer draught	12.018 m
Engine	Sulzer 6 cy.
Engine Power	7,547 kW
Crew	32