



Report 01-210

coastal container ship

Spirit of Enterprise

grounding

Manukau Harbour

28 July 2001

Abstract

On Saturday 28 July 2001 at about 0512, the coastal container ship *Spirit of Enterprise* was outbound from Onehunga in Manukau Harbour with 11 crew and a harbour pilot on board when it grounded in soft mud on the starboard side of Wairopa Channel. Initial attempts to refloat the ship failed and it was eventually refloated on the rising tide at about 1437 the same day. There were no injuries and the ship suffered no structural damage. Owing to the infrequent demand for pilotage services on Manukau Harbour and the lack of pilot licence currency requirements, the pilot was not sufficiently familiar with the channel to conduct the pilotage in darkness. There was also an absence of effective bridge resource management techniques among the bridge team.

Safety issues identified included:

- there being no legislative requirements for harbour pilots to maintain some form of currency for the areas for which they were licensed to operate
- neither the Auckland Regional Council nor Ports of Auckland Limited having a policy to require some form of pilot currency despite there being no legislative requirement to do so
- the breakdown of effective bridge resource management by the bridge team on the *Spirit of Enterprise*
- the suitability of the navigational marks in Wairopa Channel for navigation in darkness.



Spirit of Enterprise

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List of Abbreviations

GPS	global positioning system
kW	kilowatt(s)
m	metre(s)
MSA	Maritime Safety Authority
nm	nautical mile
POAL	Ports of Auckland Limited
SOLAS	International Convention for Safety of Life At Sea
t	tonnes
TEU	20-foot equivalent unit (containers)
UTC	universal time (co-ordinated)

Glossary

abeam	direction at right angles to the length of a ship
ballast	weight, usually sea water, put into a ship to improve stability
beam	width of a ship
becker rudder	rudder with a flap on the trailing edge
bridge	structure from where a ship is navigated and directed
chart datum	zero height referred to on a marine chart
class	category in classification register
command	take over-all responsibility for a ship
con	direct the course and speed of a ship
double bottom	tank at the bottom of a ship formed by the inner and outer bottom plating of the hull
draught	depth in water at which a ship floats
ebb tide	falling tide
gross tonnage	a measure of the internal capacity of a ship; enclosed spaces are measured in cubic metres and the tonnage derived by formula
heel	angle of tilt caused by external forces
knot	one nautical mile per hour
list	angle of tilt caused by internal distribution of weights
pivot point	imaginary point around which a vessel turns under helm
port	left-hand side when facing forward
quarter	that part of a ship between the beam and the stern
shoulder	the part of a ship on each side of the bow where the straight sides begin
sounding	measure of the depth of a liquid
stability	property of a ship by which it maintains a position of equilibrium, or returns to that position when a force that has displaced it ceases to act
starboard	right-hand side when facing forward
track	the path intended or actually travelled by a ship
trim	difference between forward and aft draught

Data Summary

Vessel particulars:

Name:	<i>Spirit of Enterprise</i>
Type:	coastal container ship
Classification:	Bureau Veritas
Class:	VII: foreign going cargo ship (SOLAS)
Length overall:	113.8 m
Beam:	16.2 m
Gross tonnage:	4529 t
Summer draught:	6.63 m
Built:	1999 at Gelibolu Shipyard, Turkey
Propulsion:	a single 4320 kW, MAK M32 diesel engine driving a single controllable pitch propeller, through a reduction gearbox
Bow thruster:	560 kW Berk
Owner:	Ali Riza Askoy Denizcilik, Turkey
Charterer/Operator:	Pacifica Shipping (1985) Limited
Port of Registry:	Lyttelton, New Zealand

Location: Wairopa Channel, Manukau Harbour

Date and time: Saturday 28 July 2001 at about 0512¹

Persons on board:
crew: 11
pilot: 1

Injuries: nil

Damage: minor to hull

Investigator-in-charge: Captain W.A. Lyons

¹ All times in this report are New Zealand Standard Time (UTC + 12 hours) and are expressed in the 24-hour mode.

1. Factual Information

1.1 History of voyage

1.1.1 The *Spirit of Enterprise* made fast starboard side alongside the Onehunga Wharf at 1420 on Thursday 26 July 2001 and cargo operations started at 1530. The master had earlier conned the ship across the Manukau Bar and embarked a Ports of Auckland Limited (POAL) harbour pilot off Te Pirau Point for the transit of Wairopa Channel. The master and pilot exchanged relevant information and the pilot gave the master a passage plan.

1.1.2 About a week before the ship had arrived in Onehunga the master had calculated and submitted to Pacifica Shipping (1985) Limited (Pacifica) the latest possible departure times from the berth to enable the ship to transit Wairopa Channel on the high tide predicted for 0410, on Saturday 28 July 2001, at a height of 3.7 m above chart datum. As it was commercially desirable for the ship to load the maximum number of containers within the restraints of draught and tide, the company checked and agreed with the master's calculation.

1.1.3 In the calculation the master allowed for a maximum draught of 6 m and a minimum underkeel clearance of 0.8 m. In the vicinity of beacon 15, near Shag Point, was a minimum depth of 3.6 m above chart datum. The master had allowed 50 minutes to reach this area from the time the ship let go from the wharf. The times he had calculated were as follows:

draught	latest departure time
6.0 m	0340
5.9 m	0410
5.8 m	0425
5.7 m	0440
5.6 m	0450

1.1.4 The sailing time had been posted for 0330, on Saturday 28 July 2001. Cargo operations were running to schedule until, at 0130, one of the 2 forklifts handling containers on the wharf broke down. This slowed the loading rate of containers, and soon it became apparent to the master that cargo operations would not be completed by the planned departure time. Loading continued with the chief officer monitoring the draught and keeping the master informed of progress.

1.1.5 At about 0315 the same POAL harbour pilot boarded the *Spirit of Enterprise* for departure. He was informed that the sailing would be delayed and discussed with the master the latest departure time from the berth with regard to draught, squat¹ and tide. At 0345 the master tested the bridge gear and found it all to be operating correctly except for the starboard radar, which had been unserviceable for about 3 weeks, awaiting parts from overseas. The port radar was operating, but the chief officer stated later that the picture was fading in and out owing to a problem with the tuning on low ranges.

1.1.6 At 0420, after further discussion with the pilot, the master ordered cargo operations to cease, which resulted in some containers not being loaded. The pilot went ashore to check the draught, which was 5.70 m forward and 5.93 m aft, and returned to the bridge. At that draught the ship should have departed the berth at about 0400 according to the master's calculations.

¹ sinkage due to interaction between ship and seabed

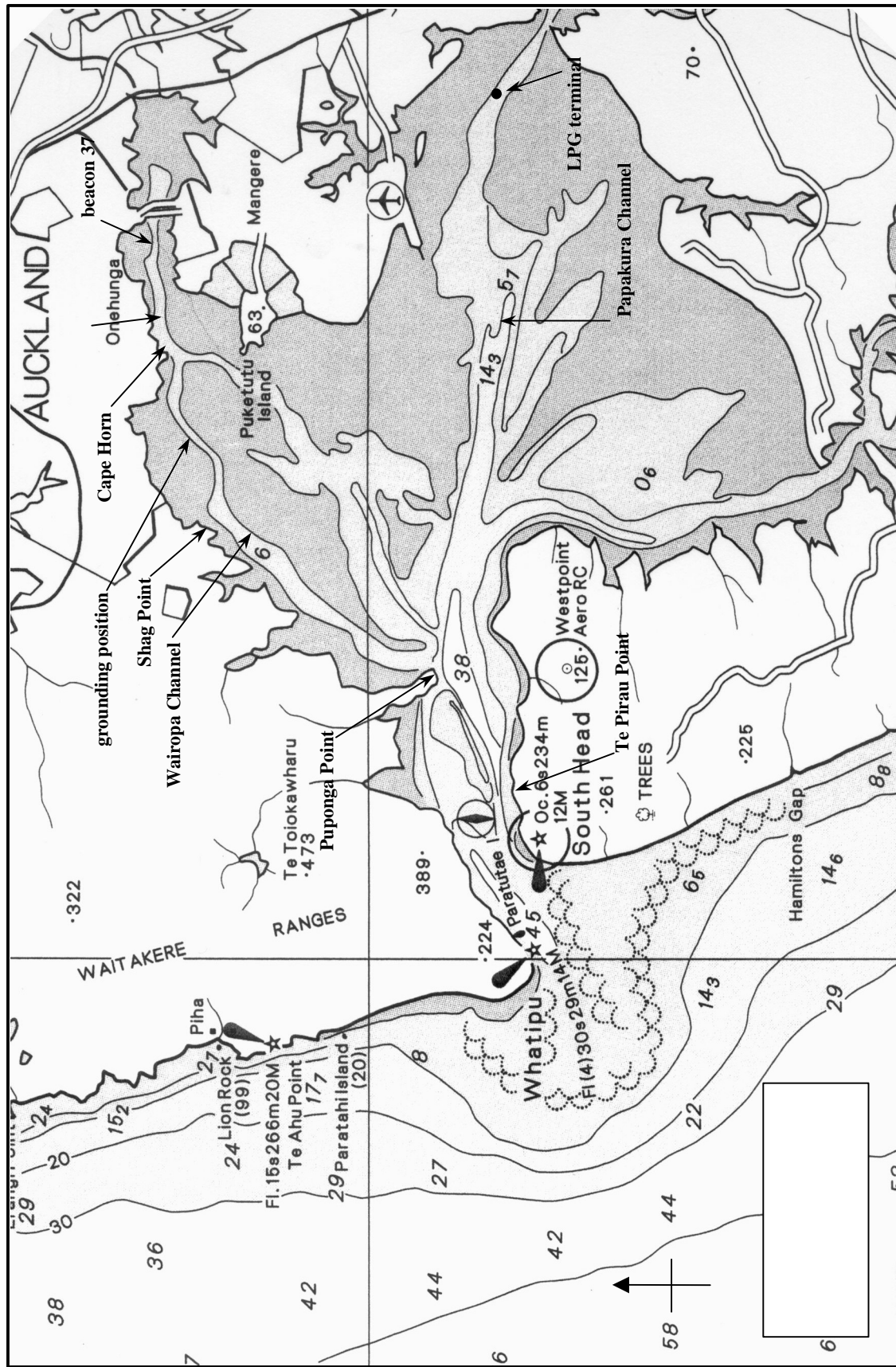


Figure 1
Part of chart NZ 43 showing Manukau Harbour and Bar

- 1.1.7 At 0430 the last line was let go and the *Spirit of Enterprise* was manoeuvred off the wharf and started the transit of Wairoa Channel. On the bridge for departure were the master, pilot and helmsman. The helmsman was hand steering and adjusting the engine setting to the pilot's orders. Shortly after the ship cleared the wharf the chief officer arrived on the bridge and was instructed by the master, who was monitoring the echo sounder, to plot the ship's position regularly and to keep the pilot informed of the ship's speed over the ground, as indicated by the global positioning system (GPS). The ship passed beacon 37 at 0440.
- 1.1.8 On the foremast were 2 floodlights that usually faced aft to light the fore deck. Before departure they had been turned to shine forward to illuminate the retro-reflective tape fitted to the unlit channel markers. The switch for the floodlights was situated in the deck office at main deck level. If the lights needed to be switched off, the deck watchkeeper had to be contacted by radio.
- 1.1.9 The weather conditions were partly cloudy and calm with good visibility. The moon was in its first quarter and had set at 0048, consequently it was a dark night.
- 1.1.10 The pilot estimated that the ebb tide was running at about 2 knots as the ship continued down the channel, passing beacon 29 at 0450 and Cape Horn at 0455. At about this point the helmsman indicated to the pilot that the ship was sluggish in responding to the helm, so the pilot ordered an increase in speed to about 7 knots.
- 1.1.11 At 0501 unlit buoy number 23 was passed, "giving it good clearance due to concerns about shoaling", the master stated later in his report to Pacifica. The pilot was aware that masters of other ships had reported shoaling in the area and he discussed it with the master during the inward passage. The course was altered to 260 degrees true and the ship proceeded at about 7 knots towards the "gateway" between unlit buoy number 14 and lit beacon number 21 still to the north side of the channel (see Figure 2).
- 1.1.12 The pilot had a hand-written list of the navigation marks and the courses between them and as the ship passed each one he noted the time. The crew had drawn straight-line courses on the chart between each navigation mark. The channel approaching Motukaraka Bank had several course alterations in quick succession that required the pilot to frequently adjust the course.
- 1.1.13 As the ship approached navigation marks 14 and 21 the pilot ordered a course change to 234 degrees true. In the vicinity of number 19 buoy the master observed the underkeel clearance on the echo sounder decrease from about 4 m to about 2 m, so he went to the chart table to check the chart. The pilot recalled sighting unlit buoy number 19 and had noted the time of passing it as 0510. He also recalled sighting lit beacon number 10 ahead in the distance but did not recall sighting unlit buoy number 12.
- 1.1.14 From that point the recollections of the bridge team regarding course alterations varied. The pilot recalled ordering minor adjustments to the course. Meanwhile, the helmsman was having difficulty keeping the ship on the courses ordered by the pilot. The ship was inclined to sheer off to port. The helmsman reported to the pilot that the ship was not responding to starboard helm. The helmsman stated later that he had applied 25 degrees of starboard helm to try and maintain course.
- 1.1.15 The chief officer had been monitoring the radar and had picked up the channel markers on the screen as the ship proceeded down the channel. He identified number 12 buoy on the radar fine on the port bow and then observed it visually before reporting to the pilot that it was fine on the port bow. The pilot ordered the engine to half ahead and shortly afterwards full ahead. The pilot stated that he also ordered the helm be put hard to port, but the helmsman could not recall the order nor did he put the helm hard to port.

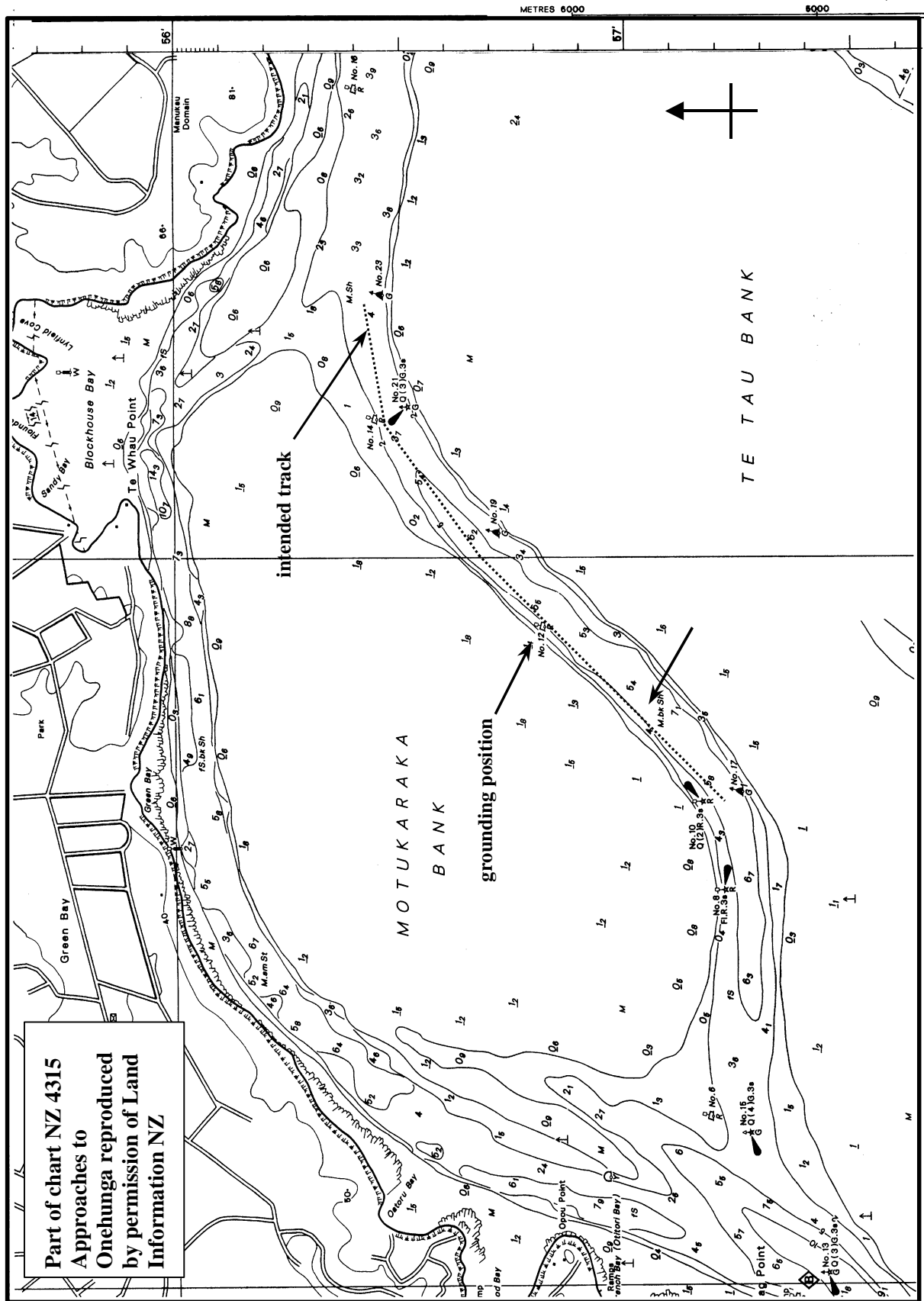


Figure 2
Part of chart NZ 4315 showing area of grounding

- 1.1.16 Shortly afterwards the chief officer reported that the speed was dropping. He then went to the wheelhouse window and could see number 12 buoy on the port side of the ship, abeam of number one hatch. The bridge team then realised that the ship had grounded and the pilot ordered the engine to be stopped. The time of the grounding was recorded in the log book as 0512. The helmsman recalled the ship's head was 231 degrees true at that time.
- 1.1.17 The master and pilot briefly discussed trying to refloat the ship. The pilot called the signal station and informed the signalman that the ship was aground and then he called the tug *Busby*, which was doubling as pilot boat and had proceeded ahead of the ship, and requested that it return to assist.
- 1.1.18 In the attempt to refloat the ship, the engine was manoeuvred astern and the bow thruster to port and starboard. At the same time the chief officer was heeling the vessel to port and starboard using the cargo heeling tanks but the ship remained fast in the mud.
- 1.1.19 The master decided to lighten the ship forward and requested the chief officer to check the stability before de-ballasting number one double bottom tanks port and starboard. The *Busby* arrived and made fast to the port quarter to assist with the refloating. As the bow rose owing to the de-ballasting, the *Spirit of Enterprise* moved about 20 m astern before becoming stuck fast again.
- 1.1.20 At 0720 the master decided to stop trying to refloat the ship until the next high tide, which was predicted for 1642. The master was concerned how the ship would lie as the tide ebbed so he requested that all hands be mustered on deck while soundings were taken around the ship. The soundings indicated the ship was aground fairly evenly on both sides and that it should remain more or less upright.
- 1.1.21 The dredge *Tasman Bay* arrived to assist and in preparation for refloating the ship it ran the ship's port anchor back into the channel at an angle of about 45 degrees.
- 1.1.22 At about 1400 the *Spirit of Enterprise* started to move with the rising tide. The engines were restarted and the *Tasman Bay* made fast to the port quarter while the *Busby* pushed on the starboard quarter. The engine was manoeuvred astern and the *Spirit of Enterprise* was refloated at 1437. The anchor was recovered and number one double bottom tank was refilled, which returned the ship back to its sailing draught. The *Spirit of Enterprise* continued its passage outwards, passing Shag Point at 1515.
- 1.1.23 The pilot disembarked off Puonga Point at 1620 and the *Spirit of Enterprise* crossed the bar at 1645 bound for Lyttelton. While the *Spirit of Enterprise* was in Lyttelton on 30 July 2001 divers inspected the hull, propeller, rudder and sea suction. Other than patches of paint having been scraped from the hull they found no damage.

1.2 Personnel information

- 1.2.1 The master started his sea-going career in 1965 as a cadet and gained a master foreign going certificate in 1979. Apart from working ashore for about 2 years, he was continuously employed at sea by the Union Steam Ship Company of New Zealand Limited until he joined Pacifica in February 1999 as chief officer of the *Spirit of Resolution* and transferred to the *Spirit of Enterprise* in August 2000. He had been promoted to master of the *Spirit of Enterprise* on 13 July 2001. Apart from a short period as master of an ocean-going tug, this was his first appointment as master. He had attended a Bridge Resource Management course in August 2000.

- 1.2.2 The master had visited Manukau Harbour on about 40 previous occasions while employed on the *Spirit of Resolution* as chief officer, but in that capacity he was not on duty on the bridge for many transits of the harbour. He had been on duty for about 4 previous transits of the harbour as chief officer on the *Spirit of Enterprise*. When he joined the *Spirit of Enterprise* as master the ship was in Onehunga. The master he relieved conducted the outbound pilotage as far as Puponga Point and disembarked; the master then took the ship across the Manukau Bar. On the ship's return to Onehunga the master decided to take a pilot for the inward and outward transits of Manukau Harbour, which was when the grounding occurred.
- 1.2.3 The chief officer started his sea-going career in 1990 as a cadet. In 1995 he obtained a British class 3 certificate and worked for a ship management company trading worldwide for a number of years before obtaining a British class 2 deck officer certificate. He joined Pacifica about 18 months before the grounding as chief officer and had been employed on the *Spirit of Enterprise* since Pacifica acquired the ship in August 2000.
- 1.2.4 The chief officer had visited Manukau Harbour on about 5 previous occasions. The grounding trip was the first time he had transited the harbour in darkness and the first time with a pilot on board. He had not attended a Bridge Resource Management course.
- 1.2.5 The helmsman was chief integrated rating of the *Spirit of Enterprise*. He had been at sea since 1974 and had been employed by the company for about 12 years. He had extensive experience as helmsman and had transited Manukau Harbour in that capacity many times.
- 1.2.6 The pilot had started his sea-going career in 1971 as cadet and spent the following 14 years with the same company, obtaining a master foreign going certificate in 1981. He was then employed by Auckland Harbour Board as tug master for 6 years before becoming a pilot in 1991. He had recently been promoted to senior pilot, which entailed being in charge of one of the 2 pilot rosters. He had completed a Bridge Resource Management and an Advanced Marine Pilotage course.
- 1.2.7 The pilot had obtained a pilot licence for Manukau Harbour in 1998 and for the Manukau Bar in 2000. Since obtaining his licence he estimated that he had piloted ships on Manukau Harbour about 24 times, of which fewer than half had been made in darkness. The trip on the *Busby* to meet the *Spirit of Enterprise* was the first time the pilot had transited the channel for 12 months. The inward trip on the *Spirit of Enterprise* was the first time he had piloted a ship in the channel for the same period. He had however piloted the *Spirit of Enterprise* on the Waitemata Harbour on a number of occasions.
- 1.2.8 Before undertaking the pilotage of the *Spirit of Enterprise* the pilot had researched the information available on the pilotage of the harbour and revised his passage plan. He also made up a trip sheet detailing the navigation marks and the courses between them.
- 1.2.9 All personnel later stated that they were adequately rested and were not fatigued at the time of the grounding, which was confirmed by a study of their work/sleep history. The study showed that although the master had been aboard the *Spirit of Enterprise* for the previous 15 days, the ship had been in Onehunga for 38 hours, during which time he was able to get adequate rest. The chief officer had joined the ship the day of the grounding after having 2 weeks' leave.

1.3 Ship information

- 1.3.1 The *Spirit of Enterprise* was a container ship capable of carrying 486 TEU containers. It was bareboat chartered from its Turkish owners by the company in August 2000. When the *Spirit of Enterprise* arrived in New Zealand it originally traded on the east coast. At the same time the company had a smaller vessel trading on the west coast. In June 2001 the company decided to alternate the schedule of the east and west coast ships to provide a more efficient schedule and to even up the steaming times of the 2 ships.

- 1.3.2 The *Spirit of Enterprise* was 113.8 m long with a service speed of 15.5 knots. The accommodation and engine room were situated aft with the bridge 7 decks above the main deck. The bridge was totally enclosed with good all-round visibility from the wheelhouse windows, obstructed only by 2 cranes situated on the port side of the ship. Manoeuvring aids included a becker rudder and 560 kW bow thruster.
- 1.3.3 The wheelhouse had a walkway between the centre console and the windows. The centre console housed, amongst other equipment, the steering controls, radars, echo sounder and engine and bow thruster controls. The chart table and GPS were situated on the port side of the bridge and the communications equipment on the starboard side.

1.4 Port information

- 1.4.1 Manukau Harbour provides access to Auckland from the west coast of New Zealand. At the entrance to the harbour is a shifting bar with banks and shoals extending 5 miles seaward. Inside the bar the harbour is almost filled with mud and sandbanks that dry at low water. After crossing the bar there is a natural channel up to Huia Bank which splits at Puponga Point into 4 navigable channels. The 2 main channels are Wairopa Channel, which accesses Onehunga, and Papakura Channel, which accesses the liquefied petroleum gas terminal.
- 1.4.2 Manukau Harbour was administered by POAL and managed by a port co-ordinator based at Onehunga. Situated on South Head at the entrance to the harbour was a signal station manned by a signalman who resided on site. His main function was to advise vessels of the bar conditions and monitor their progress when crossing the bar.
- 1.4.3 Wairopa Channel was about 11 nm long. There were 3 areas where the water depth was less than 4 m at chart datum: from the berth at Onehunga to an area of 3 submerged pipelines about 1.3 nm away, from Cape Horn to about light beacon 21 and in the vicinity of light beacon 15.
- 1.4.4 From the submerged pipelines outbound the channel was relatively wide for the size of ship that transited and was marked by a combination of light beacons and lit and unlit buoys. The unlit buoys were marked with retro-reflective tape. Tidal flows ran broadly in the direction of the main channel.
- 1.4.5 The New Zealand Pilot 15th edition 2001 stated the maximum permissible draught for the port of Onehunga was 6 m. About 3 weeks after the grounding occurred POAL conducted a hydrographic survey of the area and compiled sounding charts. In the immediate area where the *Spirit of Enterprise* grounded the water depth had increased to over 5 m. This was thought to have been caused by the *Spirit of Enterprise* sitting on the bottom at low tide and the tidal flow scouring the mud from around the hull (see Figure 3).
- 1.4.6 The sounding charts showed the depth of water on the port side of the channel in the vicinity of buoy 23 to be more or less constant at about 3.5 m, with no shoaling evident in the area.

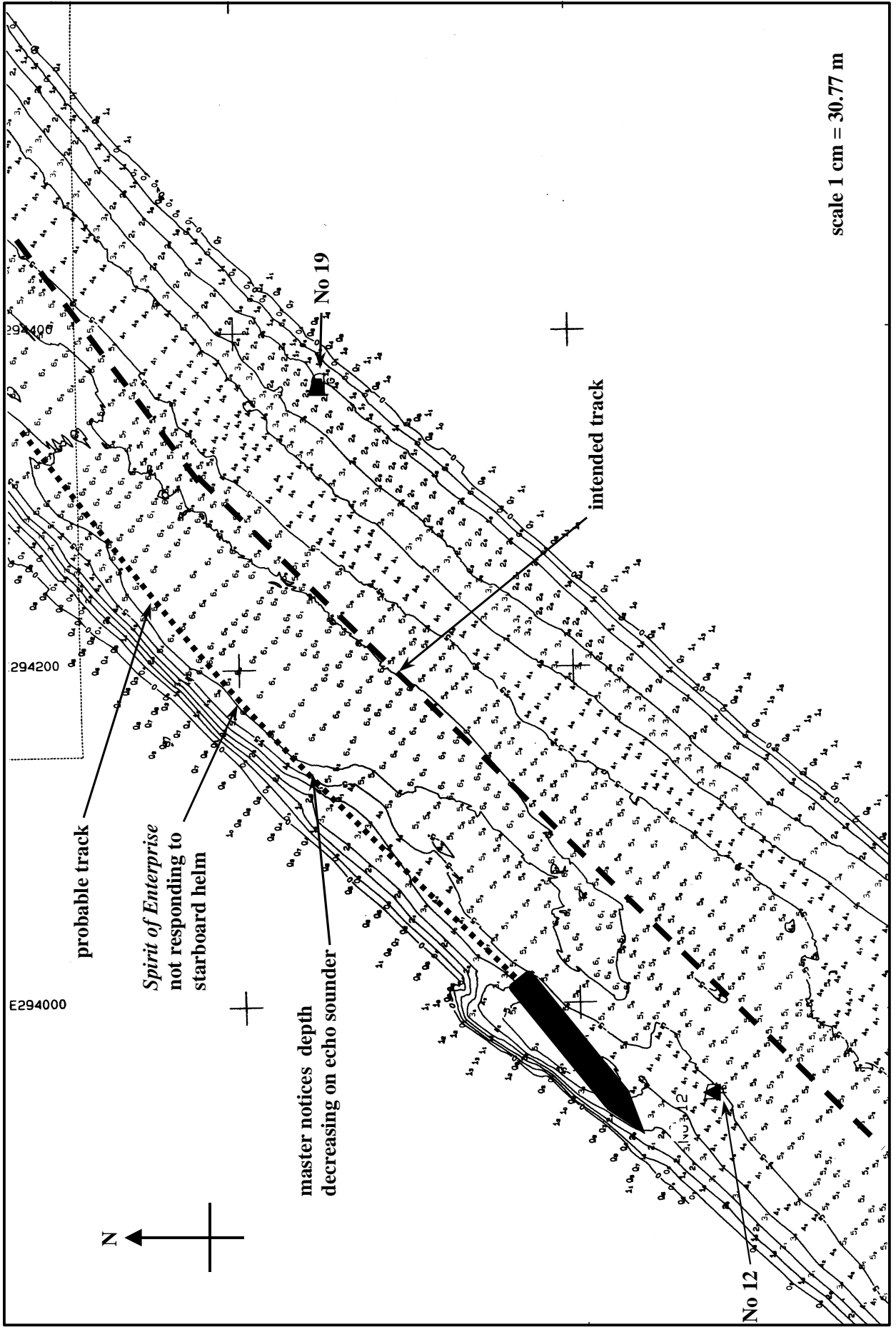


Figure 3
Sounding chart in area of grounding

1.5 Interaction

- 1.5.1 When a ship is travelling in calm, open, deep water the pressure system around the hull reaches equilibrium. If the ship moves into shallow or confined water this equilibrium can become upset as the pressure system around the hull interacts with the seabed or channel sides.
- 1.5.2 Squat is the term given to the increase in draught and/or trim a ship can experience owing to its movement through the water. The water accelerates as it flows past the hull to fill the hole the ship has left in its wake. This increase in velocity causes a decrease in water pressure under the hull and an increase in draught. This effect is usually more pronounced in shallow water where the flow of water past the hull can be restricted by the seabed.
- 1.5.3 In much the same way as a ship squats towards the seabed, a ship travelling close to the side of a channel can experience bank effect. An increase in water pressure at the bow forms a cushion between the bow and the bank, deflecting the bow towards the centre of the channel. At the same time, aft of the pivot point, the flow of water accelerates between the bank and the side of the ship, drawing the stern of the ship towards the bank. If not compensated for with counter helm, the resultant forces may cause the ship to sheer across to the other side of the channel.
- 1.5.4 The influence that squat and bank effect have on a ship varies with the square of the speed of the ship. Therefore a small reduction in speed will dramatically reduce the effects of squat and bank effect.

1.6 Pilotage history

- 1.6.1 Prior to 1998 pilotage on Manukau Harbour and Manukau Bar was not compulsory for any ships. In 1998 foreign ships started to use the liquefied petroleum gas terminal in Manukau Harbour and it was recognised that it was necessary to make pilotage compulsory for them. As a result separate pilotage licences were developed for Manukau Harbour and Manukau Bar. The pilot aboard the *Spirit of Enterprise* at the time of the grounding was one of the first to be granted each of the licences.
- 1.6.2 For other ships using Manukau Harbour, pilotage was not compulsory and their masters did not require a pilot exemption but relied on local knowledge and assistance from the signal station. Pilots were available for all ships on request from POAL. The pilots provided were Waitemata Harbour pilots who also held Manukau Harbour and Manukau Bar licences.
- 1.6.3 The vast majority of ships using Wairopa Channel to Onehunga, including the *Spirit of Enterprise*, were regular traders and did not usually require a pilot. As a result the POAL pilots with Manukau Harbour licences were not piloting the channel frequently nor was there any legislation in force that required them to complete a certain number of transits in order to keep their licences valid. After the grounding the marine services manager for POAL stated that both he and the pilot felt that the 2 daylight trips on the harbour and the pilot's research were adequate for him to undertake the pilotage of the *Spirit of Enterprise*.
- 1.6.4 At the time of the grounding the Maritime Safety Authority (MSA) was drafting Maritime Rules parts 90A and B which were due to come into force in early 2003. Part 90A was entitled Maritime Pilots. Section 90A 9 stated:

90A.9 Licence Currency

- (1) A maritime pilotage licence is only current whilst being used under a monitoring and currency system operated by the local authority responsible for pilotage in that area.
- (2) The monitoring system required by rule 90A.9(1) must include-
 - (a) competency audits at intervals not exceeding 2 years; and
 - (b) a check in emergency situations in a ship simulator at intervals not exceeding 5 years.

2. Analysis

- 2.1 At a departure draught of 5.93 m the master had calculated the latest departure time from the berth to be about 0400. The actual time of departure from the berth was 0430, which according to the calculations equated to a maximum draught of about 5.76 m, about 0.17 m lighter than the actual draught. As there was an allowance for underkeel clearance of 0.8 m the master and pilot felt this was adequate. High tide was predicted for 0410; consequently, the ebb tidal flow in the channel would increase the later the departure time from the berth.
- 2.2 The sailing time had been posted for 0330, still on the rising tide, which is preferable when navigating a channel with underkeel clearance limitations. When the forklift broke down and slowed cargo operations the master had to try and load as much cargo as possible within the tidal window. As the times had been calculated as the latest departure times and the ship was nearly at the maximum draught permitted for the harbour, it would have been prudent to ensure that the ship had departed the wharf by the calculated time regardless of the commercial considerations.
- 2.3 Giving unlit buoy number 23 a wide berth put the ship over to the starboard side of the channel as it straightened up in the channel after passing between lit beacon number 21 and unlit buoy number 14. The following ebb tide estimated at 2 knots probably carried the ship further across to starboard in the turn. Initially, nobody in the bridge team detected that the vessel was so close to the starboard side of the channel.
- 2.4 The chief officer was the first to notice unlit buoy number 12 was on the port bow when it should have been fine on the starboard bow, but by that time the helmsman was struggling to maintain course as the ship began interacting with the side of the channel, causing the ship to want to sheer to port. The helmsman by all accounts did a good job of maintaining course, and unwittingly had put the helm over in the standard manner used to control direction when suffering bank effect. Had either the master or pilot been fully aware of the ship's lateral position in the channel, and understood what was happening to the ship, they could have reduced the starboard helm and allowed the ship to veer back out into the channel in a controlled manner. Using bank effect and counter helm is a recognised technique for controlling ships moving downstream in fast-flowing river ports. Had the helmsman put the helm hard to port as the pilot thought he had requested, it is highly likely the ship would have taken an uncontrollable sheer across the channel and possibly grounded on the port side of the channel.
- 2.5 Depth under the keel is an important piece of information to monitor, as it gives the navigator an idea of how the ship may interact with the seabed with regard to squat, but it may have been prudent for the master to assist the pilot in keeping a lookout for the navigation marks and checking the echo sounder occasionally rather than concentrating on the echo sounder alone.
- 2.6 It would have taken about 5 minutes at 7 knots for the *Spirit of Enterprise* to travel from navigation marks 14 and 21 to the grounding position. During that time each of the bridge team had an indication that things were amiss but this information was not collated in time to avert the grounding. The principles of bridge resource management are designed to reduce the chance of one-man errors by encouraging teamwork, communication, challenge and response, planning and monitoring to increase situational awareness. Both the pilot and master had attended Bridge Resource Management courses but the principles were not being adequately adhered to in that the bridge team were operating more as individuals than as a team.
- 2.7 If a channel is intended to be navigated in darkness it stands to reason that a navigation mark placed in a channel to aid navigation in daylight should have a light on it to aid navigation in darkness. If for instance the light on beacon 21 was extinguished, the channel would have to be navigated for a distance of about 2 miles, encompassing 4 course alterations, using unlit buoys and beacons. Had number 12 buoy been lit, the pilot would have been able to see that the ship was over to the starboard side of the channel and could have taken early corrective action.

- 2.8 The practice of turning the floodlights to face forward to double as “headlights” is an unusual practice and highlights the need for the unlit navigation marks to be identified at night. While the light may increase the visibility of unlit buoys by illuminating the retro-reflective tape, it may also hinder the visibility of lit beacons and other vessels’ navigation lights, or prevent other vessels from identifying the navigation lights of the *Spirit of Enterprise*.
- 2.9 The master of the *Spirit of Enterprise* chose to take a pilot for the inward and outward transits of Manukau Harbour as he felt he was not sufficiently familiar with the harbour to conduct the pilotage himself. Pilots are employed for their local knowledge and expertise and as such should be completely familiar with the waters in which they operate. Although the pilot mainly operated on the Waitemata Harbour he held a licence for Manukau Harbour but had not piloted a ship in Wairoa Channel in darkness for about 12 months.
- 2.10 Before undertaking the pilotage the pilot conducted research and transited the harbour twice in daylight. It is debatable whether this preparation adequately prepared the pilot for transiting the harbour in darkness. As part of his preparation for the transit of the channel, the pilot had compiled a trip sheet, which he constantly referred to during the passage. Any planning and preparation that may assist a pilot is commendable but it is unusual for a pilot to have to refer to a written plan in order to conduct the pilotage of a channel, which further indicates that he was not sufficiently familiar with the channel to navigate it in darkness.
- 2.11 To become familiar and experienced in a particular port a pilot needs to be regularly piloting ships in that port under differing conditions of weather, tide and visibility. Only then can the pilot become, and remain, fully conversant with the various conditions that may be experienced and the effect they may have on a ship or the pilotage. The masters of ships that regularly trade to Onehunga, including the *Spirit of Enterprise*, often transit Manukau Harbour in darkness without a pilot. On one of the few occasions that a ship employs a pilot for his local knowledge and expertise, it ran aground. Although the pilot was vastly experienced in piloting the Waitemata Harbour he was not sufficiently familiar with Manukau Harbour.
- 2.12 This was the second grounding in Manukau Harbour that the Commission had investigated in 3 months. The first was the grounding of the liquefied petroleum gas carrier *Boral Gas* in Papakura Channel on 15 April 2001 (report 01-206). In that report the Commission found the pilot’s experience, local knowledge and technique in that channel were arguably insufficient to deal with circumstances leading to the grounding. These 2 groundings indicate that the authorities responsible for licensing, monitoring and currency of pilots operating on Manukau Harbour need to review their requirements.
- 2.13 At the time of the grounding there was no legislation in place requiring pilots to complete a set number of trips in order to keep their licence current nor did POAL have its own requirements. Draft Maritime Rule Part 90A stipulated that the local authorities would be responsible for monitoring and currency of pilots in their areas. This should, in theory, introduce the requirement for pilots to undertake a set minimum number of transits of a harbour over a predetermined period of time, both in daylight and darkness, in order for their licences to remain valid.
- 2.14 Of concern is that both this pilot and his employer were of the opinion that he was adequately current to safely pilot the *Spirit of Enterprise* out of Manukau Harbour in darkness, when he clearly was not. This demonstrates that the providers of a pilot service and/or the authority with the responsibility for endorsing a pilot’s licence as current under the proposed legislation could potentially set a deliberately low standard for commercial or other reasons. Recognising that each port in New Zealand is different and might require different levels of training and familiarisation for pilots, there is a need for legislation to set minimum standards for pilot familiarisation and currency or for the MSA to be required to approve and audit local authorities’ pilot monitoring and currency systems to ensure an appropriate standard is met.

3. Findings

Findings and safety recommendations are listed in order of development and not in order of priority.

- 3.1 The *Spirit of Enterprise* grounded when the pilot intentionally conned the vessel toward the starboard side of the channel to avoid reported shoaling near beacon number 23, and the following ebb tide probably carried the vessel further to starboard, unnoticed by the bridge team.
- 3.2 The bank effect on the ship as it closed with the channel side did not contribute to the grounding, but instead could have been used by the bridge team to avoid the grounding had the bridge team fully appreciated where the ship was in the channel and the effect it was having.
- 3.3 Individuals in the bridge team were independently monitoring the progress of the ship, but the low standard of bridge resource management resulted in poor communication of information and an eventual loss of situational awareness.
- 3.4 The number and disposition of navigation marks in Wairopa Channel, particularly as some were unlit, made it unsuitable for transiting in darkness.
- 3.5 The pilot was not sufficiently current with Manukau Harbour to provide an appropriate level of pilotage service.
- 3.6 Future legislation governing standards of monitoring and currency for harbour pilots may need to set minimum standards to ensure commercial and other factors do not compromise the standard of pilotage service.

4 Safety Actions

- 4.1 All unlit navigation marks in Wairopa Channel have been lit.
- 4.2 After the grounding a hydrographic survey of the area was undertaken and sounding charts produced.
- 4.3 The tug *Busby* has been replaced by the tug *Tika*, which has more bollard pull.
- 4.4 POAL and Auckland Regional Council are to review radio communications on the Manukau Harbour.
- 4.5 POAL and Auckland Regional Council are reviewing pilotage of Wairopa Channel in darkness.
- 4.6 POAL and Auckland Regional Council intend to conduct a risk assessment of Manukau Harbour.
- 4.7 A recommendation to the chief executive of Pacifica Shipping (1985) regarding training in bridge resource management was made in the Commission's report 01-205.
- 4.8 An electronic chart plotter, which included the Manukau Harbour chart, was fitted to the *Spirit of Enterprise*.

5. Safety Recommendations

- 5.1 On 18 February 2002 the Commission recommended to the marine manager of POAL that he:
- 5.1.1 Introduce a system to ensure that the pilots who operate on the Manukau Harbour are sufficiently familiar and experienced with the harbour to undertake the pilotage. (079/01)
 - 5.1.2 Ensure that the pilots employed by his company promote and adhere to the principles of bridge resource management. (080/01)
- 5.2 On 12 March 2002 the marine manager of POAL replied:
- 5.2.1 [079/01] POAL has an interim measure withdrawn its pilot service for night transits of Manukau Harbour. POAL is in the process of conducting a risk assessment of Manukau Harbour. Part of that risk assessment will consider how POAL can provide appropriately experienced and current pilots for its Manukau Harbour service.
 - 5.2.2 [080/01] All POAL pilots have attended a recognised bridge resource management course, and more recently, all have attended an Advanced Marine Pilot course. This demonstrates POAL's commitment to promoting and adhering to the principles of bridge resource management.
- 5.3 On 18 February 2002 the Commission recommended to the director of maritime safety that he:
- 5.2.1 Include in an advisory circular to Maritime Rule Part 90A the minimum standards that a monitoring and currency system for maritime pilots must meet. (088/01)
- 5.3 On 22 February 2002 the director of maritime safety replied:
- 5.3.1 This recommendation will be forwarded to the Manager, Safety and Environmental Services of MSA, for inclusion in the development process for Maritime Rule 90.

Approved for publication 05 February 2002

Hon. W P Jeffries
Chief Commissioner

