# Report 99-207

# bulk log carrier *Pacific Princess*

# grounding

# Pania Reef, Napier

# 15 May 1999

## Abstract

At about 1245 on Saturday, 15 May 1999, the bulk log carrier *Pacific Princess* grounded on Pania Reef outside Napier Harbour. The vessel had departed Port Napier with a harbour pilot on board; before disembarking he had briefed the master with regard to navigating clear of the reef. Despite the briefing the master misidentified the 2 cardinal buoys that marked the north and south extremities of the reef and altered the course of his vessel onto the reef. After the grounding the pilot re-boarded the vessel, and with the assistance of 2 tugs the vessel was refloated. There were no injuries but the *Pacific Princess* sustained extensive underwater damage.

Safety issues identified included:

- the lack of harbour passage planning by the master of the *Pacific Princess*
- the poor standard of bridge resource management on the bridge of the *Pacific Princess*
- the language barrier between the master and the crew, and the master and the pilot
- the high authority gradient between the master and the crew owing to their cultural differences
- low compliance with the requirements of the International Safety Management Code by the operator and crew of the *Pacific Princess*.

The Transport Accident Investigation Commission is an independent Crown entity established to determine the circumstances and causes of accidents and incidents with a view to avoiding similar occurrences in the future. Accordingly it is inappropriate that reports should be used to assign fault or blame or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

The Commission may make recommendations to improve transport safety. The cost of implementing any recommendation must always be balanced against its benefits. Such analysis is a matter for the regulator and the industry.



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## Contents



## Figures

## List of Abbreviations

| | |
|---|---|
| ARPA | automatic radar plotting aid |
| BRM | bridge resource management |
| GPS | global positioning system |
| IMO | International Maritime Organisation |
| ISM Code | International Safety Management Code |
| kW | kilowatt |
| m | metres |
| mm | millimetres |
| STCW | International Convention on Standards of Training Certification and Watchkeeping (IMO) |
| SMS | safety management system |
| SOLAS | International Convention for Safety of Life At Sea |
| t | tonnes |
| VHF | very high frequency |

## Glossary

| | |
|---|---|
| abeam | direction at right angles to the centreline of a ship |
| aft | rear of the vessel |
| azimuth mirror | instrument used to obtain a bearing of an object |
| ballast | weight, usually sea water, put into a ship to improve stability |
| bilge | space for the collection of surplus liquid |
| bridge | structure from where a vessel is navigated and directed |
| chart datum | zero height referred to on a marine chart |
| class | category in classification register |
| double bottom tank | tank at the bottom of a ship formed by the inner and outer bottom plating of hull |
| draught | depth in water at which a ship floats |
| forecastle | raised structure on the bow of a ship |
| fore peak tank | tank forward of collision bulkhead |
| frame | rigid profile providing strength to the hull of a vessel |
| gross tonnage | a measure of the internal capacity of a ship; enclosed spaces are measured in cubic metres and the tonnage derived by formula |
| hand lead line | graduated rope with lead weight used to determine the depth of water |
| knot | one nautical mile per hour |
| leading light(s) | light(s) that identify the safest track in a channel |
| lee | area sheltered from the wind |
| log | instrument to determine the speed of a vessel |
| nett tonnage | derived from gross tonnage by deducting spaces allowed for crew and propelling equipment |
| port | left hand side when facing forward |
| 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 |
| starboard | right hand side when facing forward |
| telegraph | device used to relay engine commands from bridge to engine room |
| track | the path intended or actually travelled by a ship |

# Marine Accident Report 99-207

## Data Summary

**Vessel particulars:**

| | |
|---|---|
| Name: | *Pacific Princess* |
| Type: | bulk log carrier |
| Classification: | Nippon Kaiji Kyokai NS★ MNS★ |
| Class: | VII Foreign going cargo vessel (SOLAS) |
| Length overall: | 161.2 m |
| Breadth moulded: | 27.2 m |
| Summer draught: | 9.74 m |
| Departure draught: | forward 6.30 m, aft 7.09 m |
| Gross tonnage: | 16 722 t |
| Nett tonnage: | 10 435 t |
| Construction: | steel |
| Built: | Imabari Shipbuilding Company Limited, Japan, July 1991 |
| Propulsion plant: | one 5928 kW, Hitachi B&W 5S50MC, diesel engine |
| Service speed: | 13.9 knots |
| Owner: | Green Island Shipping S.A. |
| Operator: | Shikishima Kisen KK, Japan |
| Port of Registry: | Panama |

| | |
|---|---|
| **Persons on board:** | crew: 21 |
| **Injuries:** | nil |
| **Damage:** | extensive to bottom plating, fore part of vessel |
| **Location:** | Pania Reef, Napier |
| **Date and time:** | Saturday, 15 May 1999, at about 1245[1] |
| **Investigator-in-Charge:** | Captain Billy Lyons |

[1] All times in this report are in New Zealand Standard Time; Universal Time Co-ordinated +12 hours and are expressed in the 24 hour mode.


***Pacific Princess*** photo courtesy of Iain Lovie

# 1. Factual Information

## 1.1 History of the voyage

1.1.1 The *Pacific Princess* departed in ballast from Kawasaki, Japan bound for Tauranga and Napier, New Zealand to load logs in bulk. On 7 May 1999, the port rotation was changed, making Napier the first port of call.

1.1.2 The vessel had departed from Japan with the charts required for the voyage to Tauranga on board. The master had intended to obtain charts NZ 571 and NZ 5712, Approaches to Napier and Napier Harbour, on arrival in Tauranga. The largest scale chart on board the *Pacific Princess* for arrival at Napier was NZ 56, Table Cape to Blackhead Point, which covered all of Hawke Bay and about 90 miles out to sea from Cape Kidnappers. Chart NZ 56 did have the number one pilot boarding ground marked on it. (See Figure 1.)

1.1.3 The *Pacific Princess* arrived at the number one pilot boarding ground off Napier on Thursday, 13 May 1999. At 0835 a Port of Napier harbour pilot boarded and introduced himself to the master. He then checked the position of the vessel and explained his passage plan, the positioning of the tugs and berthing details to the master. The master indicated to the pilot that he had understood the information. In return the master gave the pilot a pilot card showing the relevant particulars of the vessel and the manoeuvring information.

1.1.4 As part of the berthing information, the pilot informed the master that once the *Pacific Princess* was in the swinging basin, 2 port company employees would board the vessel via the pilot ladder to assist the crew with the mooring of the vessel, using the hurricane wires supplied by the port.

1.1.5 The bridge was manned by the pilot, master, third mate and helmsman. The pilot noticed that while he and the master were exchanging information the third mate was listening but was not actively involved in the discussion. The pilot could not recall the master communicating directly with the crew on deck, but noticed that the third mate was passing any instructions from himself or the master to the crew speaking Filipino.

1.1.6 Somewhere in the line of communication the instruction from the pilot to the master concerning the 2 men boarding the vessel to assist with the mooring lines was misunderstood. As a result the crew brought in the pilot ladder and it had to be re-rigged for the men to board the vessel.

1.1.7 While the vessel was being secured alongside the wharf the pilot requested that the master ask the first mate on the forecastle to secure one of the mooring lines. The pilot stated that the master could not understand what was required. Meanwhile, the vessel was moving out of position. The pilot repeated the order in a louder voice which the third mate overheard. The third mate then contacted the first mate and passed on the request without any word from the master.

1.1.8 The *Pacific Princess* was secured alongside at 0950. The loading of logs commenced shortly after.

1.1.9 The cargo operations were completed at 0930 on Saturday, 15 May 1999. The crew then commenced lashing the deck cargo. At 1100 the third mate tested the bridge equipment and recorded it to all be in working order. The 2 missing charts had been obtained while the vessel was in Napier and were displayed on the chart table, with the first course line to Tauranga drawn from the number one pilot boarding ground.

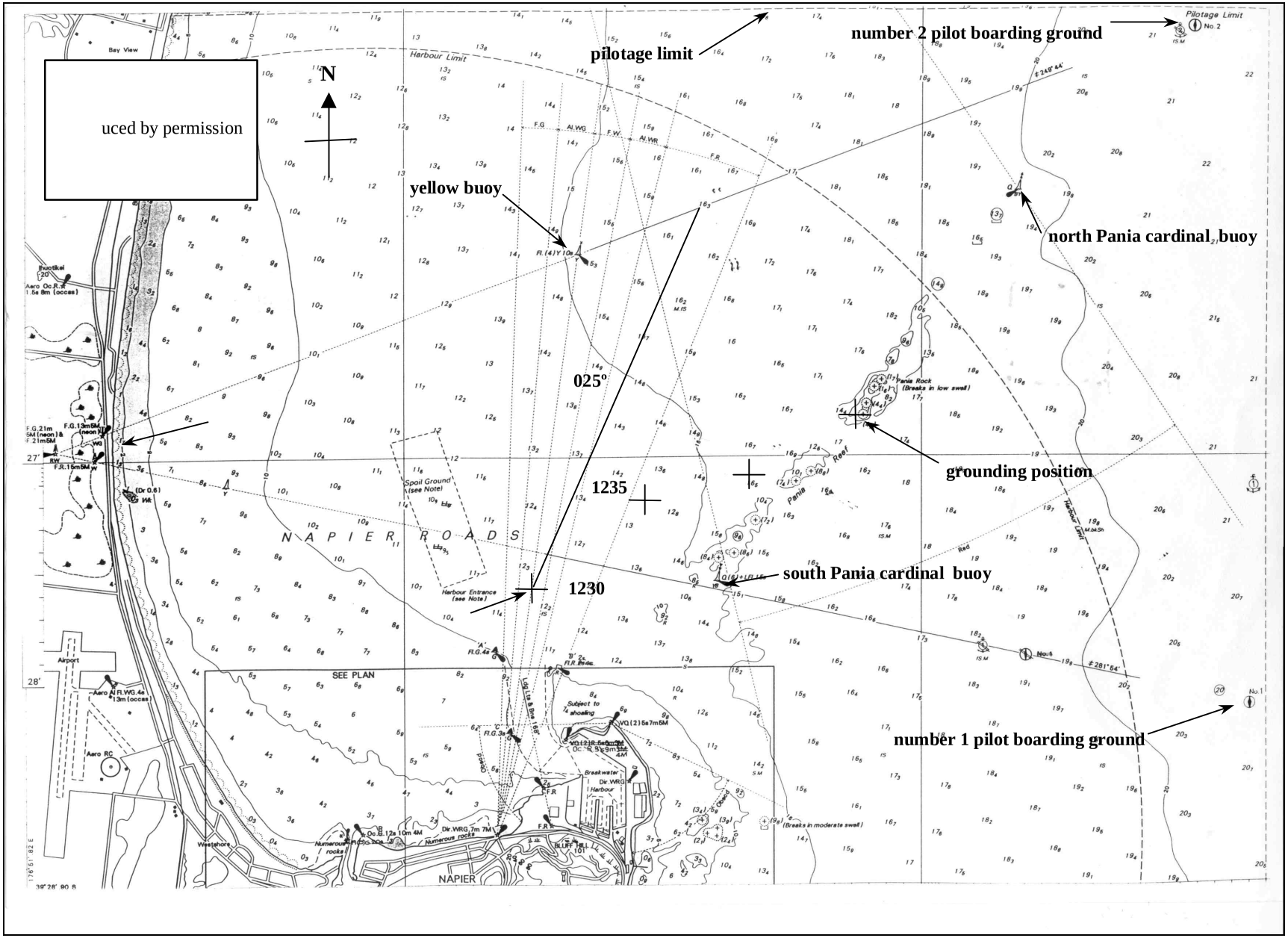


**Figure 1**
**Part of chart NZ 5712 showing relevant information**

1.1.10 The same pilot boarded the *Pacific Princess* at 1200 and made his way to the bridge. He asked the master the maximum draught of the vessel to which he thought the master had replied 7.9 m. The master gave the pilot the pilot card, which had been altered to reflect the sailing condition of the vessel.

1.1.11 The actual departure draught was 6.30 m forward and 7.09 m aft. The pilot card had the correct draught entered on it but the aft draught was entered before the forward one. The pilot looked at the first draught entered on the card of 7.09 m, and registered it as the forward draught. Without looking at the other draught he assumed the departure draught of the *Pacific Princess* was 7.09 m forward and 7.9 m aft.

1.1.12 The maximum permitted draught for vessels using the number one pilot boarding ground was 7.3 m. As the pilot thought the maximum draught of the *Pacific Princess* was 7.9 m he planned to take the vessel out via the number 2 pilot boarding ground.

1.1.13 On this premise the pilot discussed his passage plan with the master for a departure via the number 2 pilot boarding ground. The third mate was listening to the exchange of information but again was not actively involved. The pilot went over all aspects of the departure and gave the master a chartlet with the recommended courses to pass clear of Pania Reef drawn on it. (See Figure 2.)

1.1.14 The pilot explained the chartlet to the master and showed him where he would disembark. He told the master that after he had disembarked the master should steer 025 degrees true until the yellow buoy on the port side was in transit with the leading lights on shore, then to alter course to 070 degrees true until clear of the north cardinal buoy[2] marking the northern extremity of Pania Reef before setting the first course for Tauranga. When he had completed the information exchange he gave the master a copy of the latest weather map, which the master studied with intense interest.

1.1.15 The pilot later stated that due to the language difficulties he had experienced on the in-bound passage he had explained everything to the master in simple "pidgin" English, repeating everything twice, but still felt that the master either was not paying attention or did not fully understand his instructions. The pilot stated he was so concerned that he decided that when he got ashore he would call the Tauranga pilots and warn them of the problems he had experienced.

1.1.16 The second mate had planned the passage from the Napier pilot boarding ground to the Tauranga pilot boarding ground and had drawn the relevant courses on the charts. He chose to plot the first course from the number one pilot boarding ground because that was where they had picked up the pilot on arrival at Napier. He later stated that the master checked these courses but did not require him to plan from the pilot boarding ground to the berth. The master did not discuss that part of the voyage with the second mate. The second mate thought the master planned this section himself. The master later stated that he had not made a harbour passage plan or consulted the New Zealand Pilot (NP51) as he thought the approach to Napier was relatively uncomplicated, despite not having the large scale charts on board for the arrival.

1.1.17 The pilot told the master that the tugs would hold the vessel alongside the wharf after the hurricane wires had been let go to allow the 2 men who had assisted the crew with the wires to disembark from the vessel. He asked the master if he had understood all the instructions, to which the master nodded in the affirmative. The master then tested the engines ahead and astern, which the pilot observed. The bridge was manned by the pilot, master, third mate and helmsman.

[2] A buoy conforming to the International Association of Lighthouse Authorities, (IALA) Maritime Buoyage System (Region A) which indicate in which direction safe water lies, in this case to the north of the buoy.

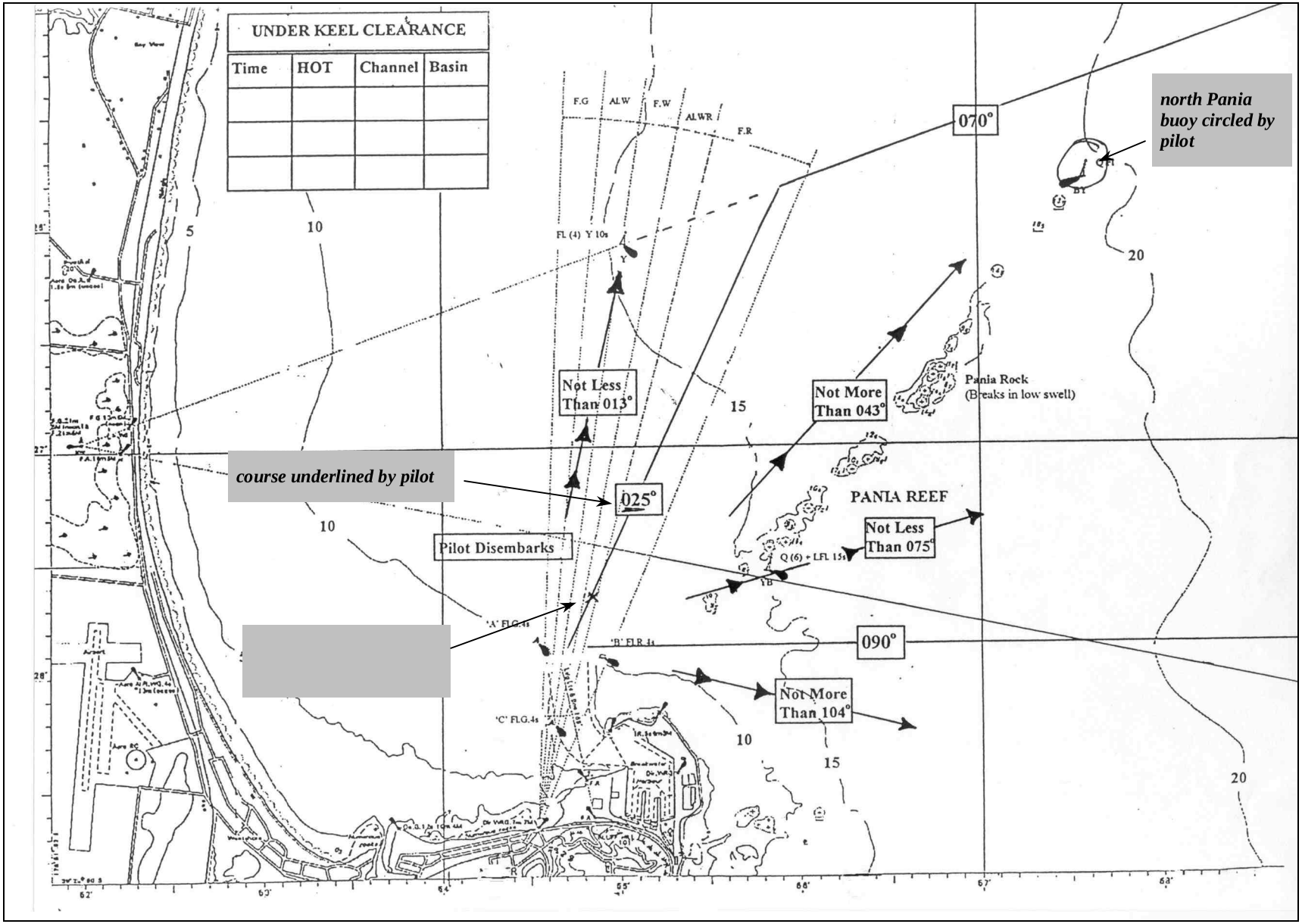


**Figure 2**
**The chartlet given to the master of the *Pacific Princess* by the pilot**

1.1.18 After the pilot had exchanged information with the master, and without being instructed by the master, the third mate contacted the fore and aft mooring stations and told them where the pilot wanted the tugs secured. At 1204 both tugs were made fast. At 1216 the last line was let go and the 2 shore linesmen disembarked. The tugs pulled the vessel off the berth and were then released.

1.1.19 The *Pacific Princess* proceeded outwards without incident. Once clear of the channel the pilot ordered full ahead on the engine and steadied the vessel on 025 degrees true. He then pointed out the yellow buoy to the master, which was visible on the port bow, and repeated the instructions he had given the master earlier. The north cardinal buoy was not visible to the naked eye but the pilot indicated its position to the master by circling it on the chartlet.

1.1.20 The pilot then pointed out to the master an inbound vessel, the *Maritime Master*, which was clearly visible about 3 miles east of the number 2 pilot boarding ground. He explained to the master of the *Pacific Princess* that the *Maritime Master* was approaching the number 2 pilot boarding ground and that he would be boarding it straight after disembarking from the *Pacific Princess*. He indicated to the master on his passage plan that he expected the vessels to pass each other off the north cardinal buoy and told him they should pass "red to red".

1.1.21 The *Maritime Master* had a Chinese master and crew. The pilot had already contacted it on very high frequency (VHF) radio and had experienced some language difficulties when passing his boarding instructions.

1.1.22 The pilot explained to the master of the *Pacific Princess* that he expected to board the *Maritime Master* before the vessels passed each other, and once aboard he would call the *Pacific Princess* on VHF radio. He informed the master that the *Maritime Master* was listening on VHF radio channel 12. The pilot then asked the master if he had understood the instructions to which the master nodded and repeated "red to red".

1.1.23 The pilot later stated that he was aware that the 2 vessels were heading for the same area and wanted to make sure that the master of the *Pacific Princess* understood his intentions as he doubted if the masters of the 2 vessels would be able to effectively communicate with each other on the VHF radio.

1.1.24 The pilot exchanged farewells with the master and was escorted to the pilot ladder by the second mate. As he left the bridge the pilot noted that the log indicated a speed of 8 knots. He disembarked at 1230 onto the pilot launch when the *Pacific Princess* was abeam of the south cardinal buoy, which marked the southern extremity of Pania Reef.

1.1.25 The third mate had listened to the pilot/master exchange of information and was aware of the instructions given to the master by the pilot. The vessel was being hand steered by the helmsman to the master's instructions.

1.1.26 Almost immediately after the pilot disembarked, the master began instructing the helmsman to alter the course to starboard, 10 degrees at a time, until the vessel was steering 070 degrees true. He did not alter the engine setting. The third mate did not challenge the master on this deviation from the pilot's instructions, instead he plotted the position of the vessel at 1235 using a single radar range and bearing of the end of the breakwater. He showed this position to the master and was told to re-check it, which he did with a similar result.

1.1.27 The master then realised that something was wrong and ordered 15 degrees of port helm to bring the course back to port. At about the time the heading had returned to 025 degrees true, the vessel grounded on Pania Rock. The time of the grounding was logged as 1245, although the time the engine was stopped was timed at 1242 on the engine movement recorder.

1.1.28 Meanwhile, the pilot launch had been proceeding at about 18 knots to the south of the south cardinal buoy and then turned northwards to proceed to the *Maritime Master*. Due to the north westerly wind and slight swell the pilot launch was taking heavy spray over the port bow, which was impairing the visibility; consequently, the pilot and crew of the launch were unable to observe the course of the *Pacific Princess*.

1.1.29 At 1248 when the pilot launch was abeam of the north cardinal buoy, the pilot heard the master of the *Pacific Princess* calling Napier pilots on VHF radio reporting that they were aground. The initial reaction of the pilot was "they can't be". The launch master immediately reduced speed and turned the launch so that they could observe the *Pacific Princess*. It appeared to the pilot that the *Pacific Princess* was heading in a direction of about 025 degrees true, but from his aspect the pilot could not determine the position of the *Pacific Princess* relative to the reef.

1.1.30 The pilot called the *Pacific Princess* on VHF radio to confirm the vessel was aground. Initially the master replied and then the third mate took over the communications and confirmed that the vessel was aground. The pilot then called the tugs and asked them to stand by; he also called the *Maritime Master* and requested that it remain outside the pilotage limit.

1.1.31 The pilot launch proceeded towards the *Pacific Princess*. As it approached the line of the north and south cardinal buoys it became obvious to the pilot that the *Pacific Princess* was well to the east of the track he had instructed the master to keep.

1.1.32 The pilot launch approached the *Pacific Princess* from its port side and passed around the stern. The pilot boarded the vessel at 1258 and proceeded to the bridge. When he arrived on the bridge it appeared to the pilot that the master had taken no action other than stopping the engine and was waiting for him to take control.

1.1.33 The pilot instructed the tugs to proceed out to the *Pacific Princess*. At the pilot's request the third mate provided a list of the ballast on board. The pilot told the master to commence pumping out the fore peak tank and number 5 double bottom tank port and starboard, he also asked that the crew take soundings around the vessel using the hand lead line. The pilot also requested that the pilot launch take soundings around the *Pacific Princess*.

1.1.34 The pilot then went to fix the position of the ship by visual bearings, but he found the azimuth mirrors were not on the gyro repeaters. The global positioning system (GPS) indicated the position was 39º 26.81' south 176º 56.64' east. The pilot asked the third mate how they normally ascertained the position of the vessel, to which he replied "by using the GPS". After the grounding there was a position marked on the chart timed at 1240. The pilot was sure this position was not plotted on the chart when he re-boarded the vessel.

1.1.35 The tug *Ngahue* arrived at 1318 and the pilot instructed the skipper to make fast on the port quarter. When it had made fast the pilot instructed the tug master to take some weight on the towline. As soon as the tug started pulling the stern of the *Pacific Princess* swung to port, indicating to the pilot that the stern was still in deep water. He instructed the third mate to stop de-ballasting number 5 double bottom tank and to concentrate on the fore peak tank.

1.1.36 The hand soundings taken by the crew of the *Pacific Princess* were all taken down the starboard side and indicated a depth of 11 m; the pilot requested they sound around the starboard bow. They eventually came back with a sounding of 7 m, which was confirmed by the pilot launch. This indicated to the pilot that the vessel was aground in that area.

1.1.37 At 1325 the second tug *Maungatea* arrived, made fast on the port shoulder and lay alongside the *Pacific Princess* in order to pull directly astern. The 2 tugs began to pull together in conjunction with the ships engine being operated astern and the fore peak tank being de-ballasted. At 1350 the *Ngahue* was re-positioned and made fast through the centre lead aft and the tugs again began to apply power. The *Pacific Princess* was re-floated at 1400.

1.1.38 The tugs were released at 1405 and the *Pacific Princess* proceeded to anchor about 1.5 miles north-west of the north cardinal buoy. The pilot disembarked at 1437. After the vessel had anchored the crew began checking the tanks for damage and ascertained that number one double bottom tank starboard was taking water.

1.1.39 The master arranged through the ships agent for the *Pacific Princess* to return to Napier in order for divers to inspect the hull and conduct temporary repairs. At 2055 the same pilot boarded the vessel and it proceeded back into Napier without incident and made fast at 2218.

1.1.40 After the accident the master was interviewed. When asked why he altered course straight after the pilot had disembarked he said that he had mistaken the south cardinal buoy for the north one and thought he was clear of Pania Reef and could safely alter course to 070 degrees true.

## 1.2 Damage

1.2.1 On 16 May 1999, divers inspected the hull of the *Pacific Princess* and found the following damage:

- 5 m long, 150 mm wide split in the shell plating in way of number one starboard double bottom tank, 1 m above the turn of the bilge
- internal framing visibly buckled and broken
- minor denting and buckling from the bow to the aft end of number 2 hold.

1.2.2 A classification society surveyor attended the vessel and inspected the damage. Due to the size of the split and the complex shape of the surrounding buckled plating, it was considered impractical to make temporary repairs with a doubling plate. As a result the extremities of the split were stop-holed by the divers and the vessel was permitted to continue the voyage to Japan, via Tauranga where permanent repairs would be carried out.

## 1.3 Weather and tidal information

1.3.1 The weather at the time of the grounding was a 20-knot north-westerly wind, slight to moderate sea with an easterly swell of about 0.5 m. The sky was partly cloudy and the visibility was good.

1.3.2 On 15 May 1999, low water at Napier was predicted for 1103 at a height equal to chart datum. High water was predicted for 1715 at a height of 1.8 m above chart datum.

## 1.4 Port information

1.4.1 The Port of Napier is situated in Hawke Bay and comprises Breakwater Harbour and Inner Harbour. Breakwater Harbour is an artificial harbour which was constructed by land reclamation after an earthquake in 1931 caused the natural harbour to fill in. On the eastern side of the harbour the reclaimed land extends north and then west to form a breakwater and mole that provides shelter from the prevailing swell in the bay.

1.4.2 Vessels berthed in Breakwater Harbour were moored with hurricane wires provided by the port to counter any surge the prevailing swell may cause. These wires were passed to the vessel from the shore and tensioned using a purchase system and a tractor from the wharf. The port company placed 2 employees aboard vessels to assist the crew with the setting up and letting go of these moorings.

1.4.3 Pania Reef extends from about 0.8 miles north-east of the breakwater in a direction of 038/218 degrees true for a distance of 3.2 miles. The northern and southern extremities of the reef were marked with cardinal buoys. Pania Rock was situated approximately midway

between the buoys and was marked on the chart with the note "breaks in low swell". The area around Pania Reef was known as Napier Roads.

1.4.4 Pilotage was compulsory for vessels over 40 m in length. There were 2 pilot boarding grounds: number one, which was 2.85 miles east of the breakwater, and number 2 which was 1.1 miles north-east of the north cardinal buoy. Two sets of leading lights were positioned on the mainland west of Napier Roads. These lights were for guiding vessels from each of the respective pilot boarding grounds, clear of the reef, until they reached the main leading lights marking the channel into the harbour. Only vessels with a draught less than 7.3 m were permitted to enter or depart the port via the number one pilot boarding ground.

1.4.5 About 1.5 miles west-north-west of Pania Rock a yellow light buoy had been placed where the line of the leading lights from number 2 pilot boarding ground intersected the main channel leading lights. This buoy was to assist vessels making the transition from one set of leads to the other. Vessels passed to the east of this buoy.

1.4.6 On 21 April 1998, the Hawkes Bay Regional Council, by way of the Harbour By-Laws, recognised the positions of the pilot boarding grounds, moved the anchorages, and extended the outward pilotage limit. As a result the following changes were made to the chart:

- number one pilot boarding ground was moved one mile seaward, along the line of the leading lights
- number 2 pilot boarding ground was officially recognised
- the outward bound pilotage limit was extended from the original line running west from the end of the breakwater to the shore, to a line running west from south Pania buoy to the shore for north bound vessels, and a line running south from south Pania buoy to Town Reef for eastbound vessels
- the designated anchorages were moved.

1.4.7 The change to the number one pilot boarding ground was made to allow a longer period for the pilot to exchange information with the master after boarding and provide more sea room for vessels to make a lee for the pilot launch or abort the approach if necessary. The extension to the outward pilot limit was made to ensure that outward bound vessels were clear of the entrance and steadied on a safe course seaward before the pilot disembarked. The anchorages were moved to facilitate these changes.

## 1.5 Personnel information

1.5.1 The pilot was 48 years old. He commenced his sea-going career as a cadet with Bank Line in 1967 and gained a master foreign going certificate in 1977. He remained with Bank Line until 1986, and then spent one year on roll-on roll-off vessels in the United Kingdom before coming to New Zealand, where he was master on a vessel trading from New Zealand to the Pacific Islands for 5 years.

1.5.2 He was employed by the port company in 1992, initially as a tug master. After 18 months he commenced pilotage training and was promoted to senior pilot/tug master in 1994.

1.5.3 The master of the *Pacific Princess* was 54 years old and commenced his sea-going career after graduating from a maritime college in Japan. He spent about 20 years with Sanko Line of Japan and was subsequently employed by 2 other companies before commencing his employment with Shikishima Kisen KK. Since commencing his employment with Shikishima Kisen KK he had been master on bulk carriers for 3 years and master of the *Pacific Princess* for 3 months before the grounding.

1.5.4 The third mate was 43 years old; he commenced his sea-going career as a cadet and had sailed as third mate for a total of 5 years with Shikishima Kisen KK. He had been on the *Pacific Princess* for 3 months before the grounding.

1.5.5 The master and mates of the *Pacific Princess* all held valid flag state qualifications commensurate with their rank.

1.5.6 The *Pacific Princess* was manned in excess of the requirements of its safe manning certificate.

## 1.6 Vessel information

1.6.1 The *Pacific Princess* was a 5 hold bulk log carrier, 161.2 m in length. Four 30 t cranes were fitted on deck to enable self loading and discharge. It was equipped with ship-side stanchions for the full length of the main deck to enable logs to be carried and secured on deck.

1.6.2 Propulsion was by one 5928 kW, Hitachi B&W diesel engine driving a fixed-pitch, 4-bladed, right-hand-turning propeller. The service speed was 13.9 knots.

1.6.3 The table below shows the manoeuvring speeds, telegraph settings and corresponding engine revolutions as detailed on the pilot card. The revolutions for astern movements were the same as those for ahead movements.

| telegraph setting | rpm | speed (knots) loaded | speed (knots) ballast |
|---|---|---|---|
| navigation full ahead | 104 | 13.9 | 14.4 |
| full ahead | 70 | 10.0 | 10.6 |
| half ahead | 55 | 7.8 | 8.4 |
| slow ahead | 45 | 6.4 | 7.0 |
| dead slow ahead | 35 | 5.0 | 5.6 |

1.6.4 The steering gear was capable of moving the balanced rudder from hard to port to hard to starboard (35 degrees each side) in 23 seconds.

1.6.5 Navigation aids on board the *Pacific Princess* included the following:

- 2 radar sets (one fitted with ARPA)
- one echo sounder
- 2 VHF radio sets
- engine movement recorder
- automatic pilot
- gyro compass (no apparent error)
- magnetic compass (last adjusted 6 March 1999).

The vessel was not fitted with a course recorder.

1.6.6 The *Pacific Princess* had a valid safety management certificate issued by Nippon Kaiji Kyokai. Part of the requirement for the issue of this certificate was to have a documented safety and procedures manual. The sections in the manual relating to passage planning read as follows:

> **Passage Plan**
> Responsibility of passage planning:
> Master has the responsibility on passage plan and he can consign 2nd officer (2/O) the planning of passage plan.
>
> Development of passage plan:
> 1 Use the newest chart and hydrographic publications that are corrected exactly. Keep proper chart for entering emergency areas.
> 2 Confirm weather and sea conditions.
> 3 Consider efficient operation.
> 4 Consider ships capacities of manoeuvring and engine and so on.
> 5 Confirm the peculiarity and effecting onto manoeuvring capacities at the navigating areas.
> 6 Consider the effecting of heeling, trim, specific gravity of sea water, and singe [sinkage] during navigation against bottom clearance.
> 7 Consider the position reporting system of each country.
> 8 Consider the routing and navigation hours for dispute and possible area of pirate.
> 9 Avoid exercise (military) areas.
> 10 In case, when there was the same navigation route before, shall not only adopt the old record but make possible improvement for efficiency operation in the extend not effect ship's safety operation.
> 11 When passing through an island or reef, keep minimum 5 miles even it clear on radar or easy can see, and if it hard to catch by radar and not easy to catch the sight of clear marks, it need to keep at least 10 miles from shore.

1.6.7 The *Pacific Princess* underwent a port state inspection on 18 March 1999, in Fremantle, Australia. There were 2 deficiencies noted, neither of which were considered to have contributed to the grounding.

## 1.7 International Safety Management Code

1.7.1 In the late 1980s the International Maritime Organisation (IMO) became concerned that poor management standards in shipping were becoming a major contributing factor to accidents. In 1987 the IMO adopted a resolution which required the Maritime Safety Committee to develop guidelines concerning shipboard and shore-based management. From these the International Safety Management (ISM) Code was developed.

1.7.2 The purpose of the code was to provide an international standard for the safe management and operation of ships and for pollution prevention. The code was adopted by the IMO in 1993 and was to be implemented on all bulk carriers by 1 July 1998, regardless of their date of construction.

1.7.3 For a ship to be issued with a safety management certificate the operator must first have been issued with a document of compliance. Both of these certificates were issued by the government of the state whose flag the ship was entitled to fly (the administration), or by an organisation recognised by the administration, or at the request of the administration by another contracting government.

1.7.4 The document of compliance was issued to the operator following verification that its safety management system complied with the requirements of the ISM Code , and determination of objective evidence proving that it was being effectively implemented.

1.7.5 The safety management certificate was issued to a ship following initial verification that the shipboard safety management system complied with the requirements of the ISM Code and

determination of objective evidence proving that it was being effectively implemented. This included verification that the document of compliance for the operator of the ship was applicable to that type of ship.

1.7.6 The document of compliance and safety management certificate were valid for 5 years. Both the ship and the operator were subjected to periodic audits to verify that their respective safety management systems were being operated and maintained in accordance with the requirements of the ISM Code . Either certificate could have been withdrawn by the administration if there was evidence of major non-conformity with the ISM Code . If the document of compliance was withdrawn the safety management certificate became invalid.

1.7.7 The ISM Code had 13 clauses and a preamble that outlined some general precepts. The structure was as follows:

Preamble:

1 General
- 1.1 Definitions
- 1.2 Objectives
- 1.3 Application
- 1.4 Functional requirements

2 Safety and environmental protection policy

3 Company responsibility and authority

4 Designated person(s)

5 Master's responsibility

6 Resources and personnel

7 Development of plans for shipboard operations

8 Emergency preparedness

9 Reports and analysis of non-conformities, accidents and hazardous occurrences

10 Maintenance of the ship and equipment

11 Documentation

12 Company verification, review and evaluation

13 Certification, verification and control.

1.7.8 Each clause listed above detailed the provisions of the ISM Code . The clauses relevant to on-board communication were:

**1.4 FUNCTIONAL REQUIREMENTS FOR A SAFETY-MANAGEMENT SYSTEM**

Every company should develop, implement and maintain a safety management system (SMS) which includes the following functional requirements:

.3 defined levels of authority and lines of communication between, and amongst, shore and shipboard personnel;

**3 COMPANY RESPONSIBILITIES AND AUTHORITY**

3.2 The company should define and document the responsibility, authority and interrelation of all personnel who manage, perform and verify work relating to and affecting safety and pollution prevention.

**5 MASTER'S RESPONSIBILITY AND AUTHORITY**

5.1 The Company should clearly define and document the master's responsibility with regard to:

.3 issuing appropriate orders and instructions in a clear and simple manner;

**6 RESOURCES AND PERSONNEL**

6.6 The Company should establish procedures by which the ship's personnel receive relevant information on the SMS in a working language or languages understood by them.

6.7 The Company should ensure that the ship's personnel are able to communicate effectively in the execution of their duties related to the SMS.

**8 EMERGENCY PREPAREDNESS**

8.3 The SMS should provide for measures ensuring that the Company's organization can respond at any time to hazards, accidents and emergency situations involving its ships.

### 1.8 Language

1.8.1 English is the designated international standard language for communications at sea, and as such it is a requirement under SCTW 95 for the master and officers of a foreign-going ship to have an adequate understanding of both written and spoken English.

1.8.2 Although the Japanese master and chief engineer on the *Pacific Princess* communicated with the Filipino crew members in English, and they had a mutual understanding of basic shipboard terminology, it was apparent that conversation outside this scope was virtually impossible.

1.8.3 When interviewed about the grounding, the master required an interpreter and demonstrated very limited knowledge of English. The Filipino officers and crew interviewed did not require an interpreter and had a reasonable command of English.

1.8.4 The master and chief engineer could not speak Filipino and the officers and crew could not speak Japanese.

## 2. Analysis

2.1 The *Pacific Princess* departed from Japan without a full set of charts for the intended voyage. The master and operator of the vessel would have been aware that due to the availability of logs it would not be unusual for the port rotation to be changed. It would have been prudent to have either obtained the 2 large scale charts for Napier in Japan before departure or to have ordered the charts and had them brought out to the vessel by the pilot on arrival at Napier.

2.2 As the master of the *Pacific Princess* did not have the large scale charts for Napier on board before the vessel arrived, he could not familiarise himself with the approaches to the port and adequately make a passage plan from the pilot boarding ground to the berth. However, there was a vast amount of information available to the master in the New Zealand Pilot book, to which he could have referred, but chose not to. He appeared content to rely solely on the pilot's expertise, a practice that does not conform with the principles of good bridge resource management (BRM) or the instructions contained in the operators safety and procedures manual.

2.3 The *Pacific Princess* had a valid safety management certificate. As part of the requirement for the issue of this certificate the company must have proved to an administration that all the requirements of the ISM Code had been complied with, both ashore and aboard the *Pacific Princess*. One of the basic requirements for such a system to function efficiently on a vessel with a multi-national crew is that they can communicate effectively in a language common to both races. This was not the case on the *Pacific Princess*.

2.4 The master and chief engineer of the *Pacific Princess* had a poor understanding of English. The Filipino officers and crew had a reasonable understanding. This situation was far from ideal and by not actively including the third mate in the pilot/master exchange the master deprived himself of the benefit of the third mate's better understanding of English.

2.5 Traditionally there has been a steep hierarchical structure on board ships, regardless of race or creed. The master was often regarded as an autocrat. With the recent development of crew resource management there has been a trend to break down this tradition, tending towards an environment where seafarers work as a team. The change from autocratic to democratic management of ships is still in its early days, with some cultures finding the transition easier than others.

2.6 Filipino culture places paramount value on the family and within the family there is a strict hierarchy in which a subordinate will rarely question their superior. This can transpose itself into the work place and become an organisational culture where, in this case, the third mate would be reluctant to question the master's actions.

2.7 The Japanese master and chief engineer appeared to be of the "old school" and would have had a feeling of superiority over the Filipino crew members and as such did not appear to encourage a challenge and response environment on board the *Pacific Princess*.

2.8 The communication loop among the bridge team was more or less non-existent. The master and the pilot exchanged information with the third mate listening in the background. The master then permitted the third mate to pass orders directly to the crew in Filipino, a language the master could not speak or understand. As a result the master had no knowledge of what instructions the third mate was giving or if they were correct. This method of information sharing satisfied the master's need to appear to maintain total authority when handicapped by his poor understanding of English.

2.9 The company safety management manual had a section covering passage planning, for which the master was responsible. However, it made no mention of the master's obligation to plan the passage while a pilot was on board. The master did not instruct the second mate to plan the passage from the pilot boarding ground to the berth or vice versa, nor did he do it himself. Had this part of the passage been planned the master would have been more aware of the navigational features in Napier Roads.

2.10 The missing charts were supplied while the *Pacific Princess* was in Napier. The master had ample time to develop a passage plan for the departure and familiarise himself with the approaches to the port. He did not discuss the departure with the second mate and as such the second mate assumed the vessel was departing via the number one pilot boarding ground and drew the first course for Tauranga from there.

2.11 The master and officers on board the *Pacific Princess* were working as individuals, not as a bridge team. The master did not include the officers in the pilot/master exchange of information nor did he discuss any aspects of the voyage with them. This could have been caused partly by their cultural differences and language difficulties.

2.12 BRM is defined as the use and co-ordination of all the skills, knowledge, experience and resources available to the bridge team to accomplish or achieve the established goals of safety and efficiency of the passage. On the bridge of the *Pacific Princess* BRM was not being practised in the following respects:

- there was no structured bridge team
- the language difficulties between the master and officers prohibited an effective communication loop
- the master did not include the officers in the pilot/master exchange

- the master did not form or discuss a passage plan with the officers
- no environment was set for challenge and response due to the steep authority gradient
- there was no balance between authority and assertiveness
- there was no plan developed for the arrival and departure.

2.13 The breakdown in the communication loop became evident to the pilot on the inbound passage, when the instructions regarding the pilot ladder were misinterpreted and the master could not understand a simple request from the pilot without the third mate's intervention. This however, did alert the pilot to the language and organisational problems on board the *Pacific Princess*. Given this awareness, it would have been prudent for the pilot to have verified the departure draught. If he had been aware of the actual draught, the vessel could have departed via the number one pilot boarding ground. Had this been the case there would have been no conflicting traffic and less opportunity for the grounding to occur.

2.14 Even though it was not necessary for the *Pacific Princess* to depart via the number 2 pilot boarding ground, the instructions and chartlet the pilot gave to the master were sufficient for the vessel to safely depart by this route. If the master had made a passage plan for the departure and listened attentively to, understood and followed the pilot's instructions he would have been more familiar with the area and conscious of the hazards he was likely to encounter.

2.15 Once clear of the breakwater, the pilot steadied the *Pacific Princess* on the first course of 025 degrees true. He then visually identified for the master the relative buoys and the inbound vessel. He repeated his instructions and the courses to steer and again asked the master if he understood. Again the master answered in the affirmative. The attitude of the master to the pilot's instructions, the fact that the master did not plan the passage for the departure, and his comments after the accident, suggest that he treated the departure with a degree of complacency.

2.16 The pilot disembarked, at the outward pilotage limit and intended to proceed straight to the inbound vessel. He was concerned that the 2 vessels were approaching the same area and that the masters would not be able to communicate effectively with each other. Under the international collision regulations the *Pacific Princess* was the give way vessel and would be required to alter its course to starboard to avoid the *Maritime Master*. The master of the *Pacific Princess* would have been aware of this.

2.17 At the time the pilot disembarked, the master of the *Pacific Princess* had very low situational awareness and immediately began altering the course to starboard, contrary to the pilot's instructions. The third mate, who had overheard the pilot's instructions and was aware of the situation, did not question the master's actions but instead plotted the position of the vessel on the chart. When he eventually alerted the master to the position the master told him to recheck it.

2.18 By plotting the position of the *Pacific Princess* and bringing it to the attention of the master, the third mate was indirectly questioning the master's actions, without undermining his authority. The master chose to challenge the third mate instead of taking heed. Only after the third mate had checked the position of the vessel and again brought it to the attention of the master did the master realise something was not right. This delay in response made the avoiding action the master took too late to avert the grounding.

2.19 The master and officers on the *Pacific Princess* did not routinely monitor the position of the vessel by using all available means. The azimuth mirrors were not in place on the gyro repeaters and the 2 positions the third mate plotted were obtained by a single radar range and bearing. The third mate stated that they usually navigated by using the GPS.

2.20 Between the 1230 and 1240 positions marked on the chart the *Pacific Princess* headed broadly in a direction of 070 degrees true at about 7 knots. As these positions were obtained using a single radar range and bearing they may not have been accurate, but they do indicate that the master began to alter course almost immediately after the pilot disembarked.

2.21 On the chart Pania Reef shows prominently, but visually from the bridge of the *Pacific Princess* the master would have been able to see only the buoys marking the extremities of it. The wind was of sufficient strength to have caused whitecaps, and any swell breaking on Pania Rock would have been obscured.

2.22 Although there were few visual cues ahead of the vessel, the instructions the pilot had given to the master, together with efficient use of the radar and a team approach to the monitoring of the progress of the vessel, should have made the departure relatively simple.

2.23 After the vessel grounded the master stopped the engine and informed the pilot that they were aground. It took about 15 minutes for the pilot to return to the *Pacific Princess.* During this time the master had taken little action to ascertain the condition and predicament of his vessel. It appears the master was content to await the return of the pilot and take instructions from him.

2.24 When asked, the only explanation that the master could give as to why the *Pacific Princess* grounded in favourable weather conditions on a clear day, was that he had mistaken the 2 cardinal buoys. While this simplistic statement may well be true, the indications are that there were a number of deeper systemic issues that contributed to the grounding.

2.25 The language difficulties and cultural differences between the master and officers of the *Pacific Princess* appeared to inhibit the formation of an effective bridge team.

2.26 The ISM Code was introduced to provide an international standard for the safe operation and management of ships. As stipulated in the code, for a ship to be operated safely one of the basic requirements is that the crew can communicate effectively. Before issuing a safety management certificate the administration is obligated under the code to ascertain that effective communication can be achieved. The situation on board the *Pacific Princess* indicates that a review of the safety management certificate issued to the vessel, and the document of compliance issued to the operator, may be required.

# 3. Findings

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

3.1 The master and crew of the *Pacific Princess* held the appropriate qualifications for their respective positions.

3.2 The pilot was adequately qualified and experienced for his position.

3.3 The master, crew and pilot were adequately rested and not fatigued at the time of the grounding.

3.4 All statutory certificates for the *Pacific Princess* and its crew were valid and in accordance with flag state and convention requirements.

3.5 Mechanical or equipment failure did not contribute to the grounding.

3.6 The weather and tidal conditions did not contribute to the grounding.

3.7 The *Pacific Princess* grounded on Pania Rock when a starboard turn was made too early.

3.8 The master of the *Pacific Princess* did not follow the instructions of his company as laid down in its procedures manual with regard to passage planning.

3.9 Before disembarking the pilot gave the master adequate information for the master to safely navigate the *Pacific Princess* clear of Pania Reef. That information, if used, would have constituted a passage plan.

3.10 The master did not follow the pilot's advice after the pilot had disembarked; instead he followed a predetermined course of action at a time when his situational awareness was negligible.

3.11 The master did not structure an effective bridge team and follow the principles of bridge resource management. The steep authority gradient between the master and the crew together with language difficulties hindered effective communication and made the application of effective crew resource management difficult.

3.12 The third mate was monitoring the progress of the *Pacific Princess*. If he had been more assertive and directly challenged the master when he altered course too early, the grounding may have been averted.

3.13 Cultural differences led to the steep authority gradient between the third mate and the master, and to the third mate's lack of assertiveness, both of which indirectly contributed to the grounding.

3.14 The standard of management, both on the *Pacific Princess* and between the *Pacific Princess* and the shore management, leaves some doubt as to the validity of the safety management certificate issued to the vessel.

## 4. Safety Recommendations

4.1 On 19 April 2000 the Commission recommended to the managing director, Shikishima Kisen KK that he:

4.1.1 ensure that the multi-national crews aboard vessels operated by his company can communicate effectively and have a mutual understanding of the differences in their respective cultures (008/00); and

4.1.2 ensure bridge resource management principles are being practised on vessels operated by his company (009/00).

4.2 On 27 April 2000 the managing director for Shikishima Kisen KK responded in effect:

4.2.1 We have already investigated and evaluated safety recommendations 008/00 and 009/00.

We have visited the vessel at the first port in Japan after the accident and investigated the cause of the accident.

We have established and evaluated the following:

a) Japanese captain and crew members communication is good.

b) The multi-national crews aboard vessels managed by our company can communicate effectively and have a mutual understanding of their respective cultures.

c) Bridge resource management principles are being practised on vessels managed by our company.

4.3 On 6 April 2000 the Commission recommended to the general manager, Ship Management Assessing Division, of Nippon Kaiji Kyokai that he:

4.3.1 undertake random audits of vessels which have a safety management certificate issued by your company in order to check that the requirements of the International Safety Management code, with respect to on-board communication, are being complied with in practice (010/00); and

4.3.2 re-evaluate the safety management certificate issued to the *Pacific Princess* to ensure that the International Safety Management code is being fully complied with. In the event of there being a change of management of the vessel, pass on this safety recommendation to the new administration issuing the certificate. (011/00)

4.4 On 25 April 2000 the general manager, Ship Management Assessing Division, of Nippon Kaiji Kyokai responded in part:

4.4.1 The following actions are being undertaken as part of steps to adopt SR 011-00.

- A visit has already been made on 9 March 2000 of the company that managed the subject ship at the time of the incident (Shikishima Kisen K.K.) to confirm the adequate implementation of its SMS with particular emphasis on shipboard communication. Recommendations were made that the company is currently working to resolve.

- Additional audits are to be carried out for all ships under the management of Shikishima Kisen K.K. (currently eight vessels) to ensure compliance with company SMS and ISM Code requirements with particular attention to steps taken to ensure effective communications onboard. The company has already agreed to the audits (expected to be completed within about six months or so depending on ship schedules, etc.).

- The Pacific Princess has already undergone a full SMS audit along with the company that is now managing the vessel, which was completed on 17 November 1999 in Korea. Thus, this part of SR 011-00 is considered to have been already implemented.

- Based on a careful analysis of the incident as presented in your report and our own information, ClassNK has been reviewing and expanding the current checklist used to conduct ISM audits, especially with respect to confirming the steps taken by companies to ensure effective shipboard communication. This also includes the preparation of a special checklist for carrying out the additional audits of the ships described above.

- A circular is being issued to all auditors emphasizing the need for special attention to onboard communications and reminding them of the importance of exercising proper care in the conduct of all audits. A copy of this circular is enclosed for your reference. [ClassNK Circular, No 0041, dated 25 April 2000].

I would like to make the following observations concerning the adoption of SR 010-00. The need to further ascertain proper compliance of the SMS with ISM Code requirements during the effective period of the DOC has already been recognized, and the efforts are currently underway at both IACS and the IMO to address this issue on a broader spectrum. IACS has been preparing a draft proposal for submission to the IMO setting forth, amongst other things, circumstances under which additional verification audits can be carried out of a company and its ships. This includes development of a new requirement for implementation of annual audits of all ships detained by PSC for ISM Code related deficiencies for a period of at least three years. ClassNK fully supports these efforts. It might also be pointed out that such audits could also serve as a means of targeting problematic ships better than the random audits suggested in SR 010-00. When conducting such annual audits, special care can also be given to the steps taken by the company to ensure adequate communication onboard ship.

Approved for publication 12 April 2000

Hon. W P Jeffries
**Chief Commissioner**