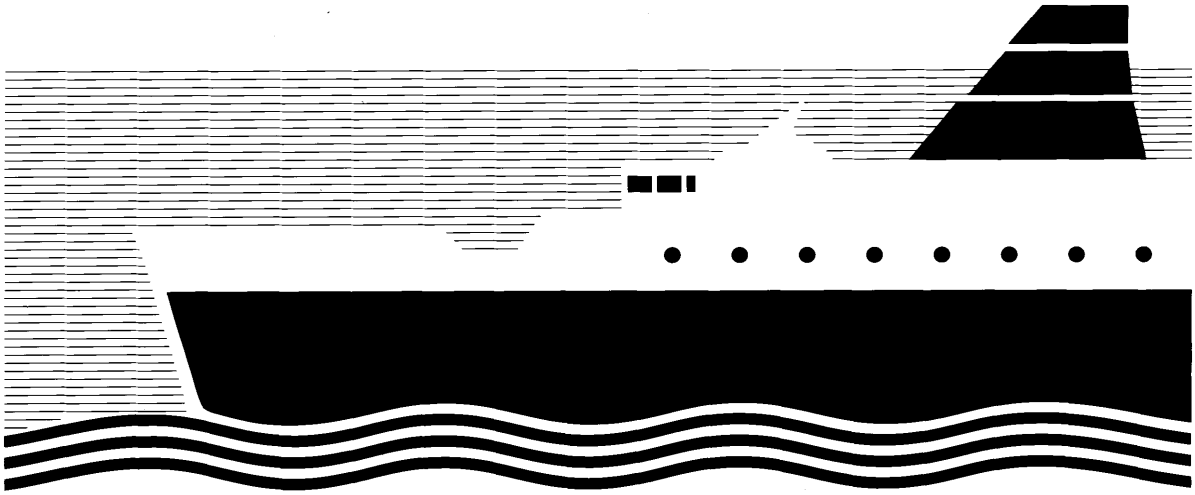
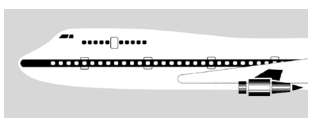
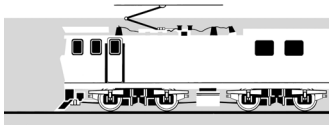


MARINE OCCURRENCE REPORT

04-203 **Coastal passenger and freight ferry *Arahura*, heavy weather incident, Cook Strait** **15 February 2004**


TRANSPORT ACCIDENT INVESTIGATION COMMISSION
NEW ZEALAND

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.

Report 04-203

coastal passenger and freight ferry *Arahura*

heavy weather incident

Cook Strait

15 February 2004

Abstract

On Sunday 15 February 2004 at about 1655, the coastal passenger and freight ferry *Arahura* rolled heavily while altering course to enter Wellington Harbour. Damage was sustained to several vehicles on the car and rail decks and to 3 electronic games machines on the passenger decks. Injuries sustained by the passengers were confined to minor scrapes and contusions.

Safety issues identified included:

- securing of vehicular cargo on car and rail decks
- securing of heavy items of equipment in passenger accessible areas

In view of the safety actions taken by Tranz Rail Limited and the development of Maritime Rule Part 24B Carriage of cargoes – stowage and securing, and a New Zealand standard for lashing points on road vehicles, no safety recommendations have been made.

The passenger rail ferry *Arahura* in the Marlborough Sounds

Contents

Figures

Abbreviations

ARPA	automatic radar plotting aid
GPS	global positioning system
hp	horse power
kW	kilowatts
m	metres
nm	nautical miles
Ro-Ro	roll on – roll off
rpm	revolutions per minute
t	tonne(s)
VHF	very high frequency

Glossary

✠ 1A1, R2	a vessel built to the relevant Det Norske Veritas rules for which periodical surveys are stipulated in relation to special (main) periodical survey intervals of 5 years. A service area restriction notation has been assigned representing the maximum distance from nearest harbour or safe anchorage as stipulated in the classification rules
abaft	in the or towards the stern half of a ship
active stabilising fins	fins extending from the side of a ship where the trailing edge is controllable to help stabilise the movement of the ship
ARPA	automated system to plot and monitor targets on radar
beam	width of a vessel
bollard pull	a measure of the static pull a vessel can exert
bow	front of a ship
bow thruster	a small athwartships propeller mounted in a tunnel at the forward part of a ship, used to manoeuvre a ship at slow speeds
bulkhead	the term given to a wall on a ship
course	direction steered by a ship
curtain sided	the generic term for a range of manufactured vehicle bodies that have sliding side wall curtains rather than solid fixed walls.
deckhead	nautical term for a ceiling
Doppler log	a device that uses Doppler effect to measure a ship's speed
easting	the distance travelled or the angle of longitude measured eastward from either a defined north south grid line or a meridian
echo sounder	a device for measuring the depth of water below a ship's bottom
fairway	a navigable channel
helm	the amount of angle that a rudder is turned to port or starboard to steer a ship
leading lights	light(s) that identify the safest track in a channel. Used by the mariner to monitor and maintain a ship's position within a channel
Metservice	New Zealand government meteorological service
perigee	the point in a body's orbit at which it is nearest the earth
port	left hand side when facing forward
rake	a number of rail wagons coupled together to form a length that will fit on a particular ship
ship's head	the direction in which the bow of the ship is pointing
starboard	right hand side when facing forward
steerage	the slowest speed at which a ship steers

Data Summary

Vessel Particulars:

Name:	*Arahura*
Type:	passenger and freight ferry (roll-on roll-off)
Class:	II (coastal passenger)
Classification:	Det Norske Veritas ✠ 1A1, R2 (NZ coastal waters) Car and Train Ferry A
Length (overall):	148.4 m
Breadth (extreme):	20.5 m
Tonnage (gross):	13 621
Built:	Denmark, 1983
Propulsion:	4 diesel-driven 3800 kW generators supplying power to 2 electric propulsion motors coupled to 2 shafts, each with a 4-bladed controllable-pitch propeller.
Service speed:	19 knots
Owner/Operator:	Tranz Rail Limited
Port of Registry:	Wellington, New Zealand
Minimum crewing requirement	44
Maximum passenger capacity:	997
Persons on board:	crew: 66 passengers: 988
Date and time:	15 February 2004 at about 1655[1]
Location:	Cook Strait
Injuries:	crew: nil passengers: some minor scrapes and contusions
Damage:	minor to vehicles, vehicle deck deckhead and deck 7, passenger area bulkhead.
Investigator-in-charge:	Captain I M Hill

[1] Times in this report are New Zealand Daylight Time (UTC + 13 hours) and are expressed in the 24-hour mode

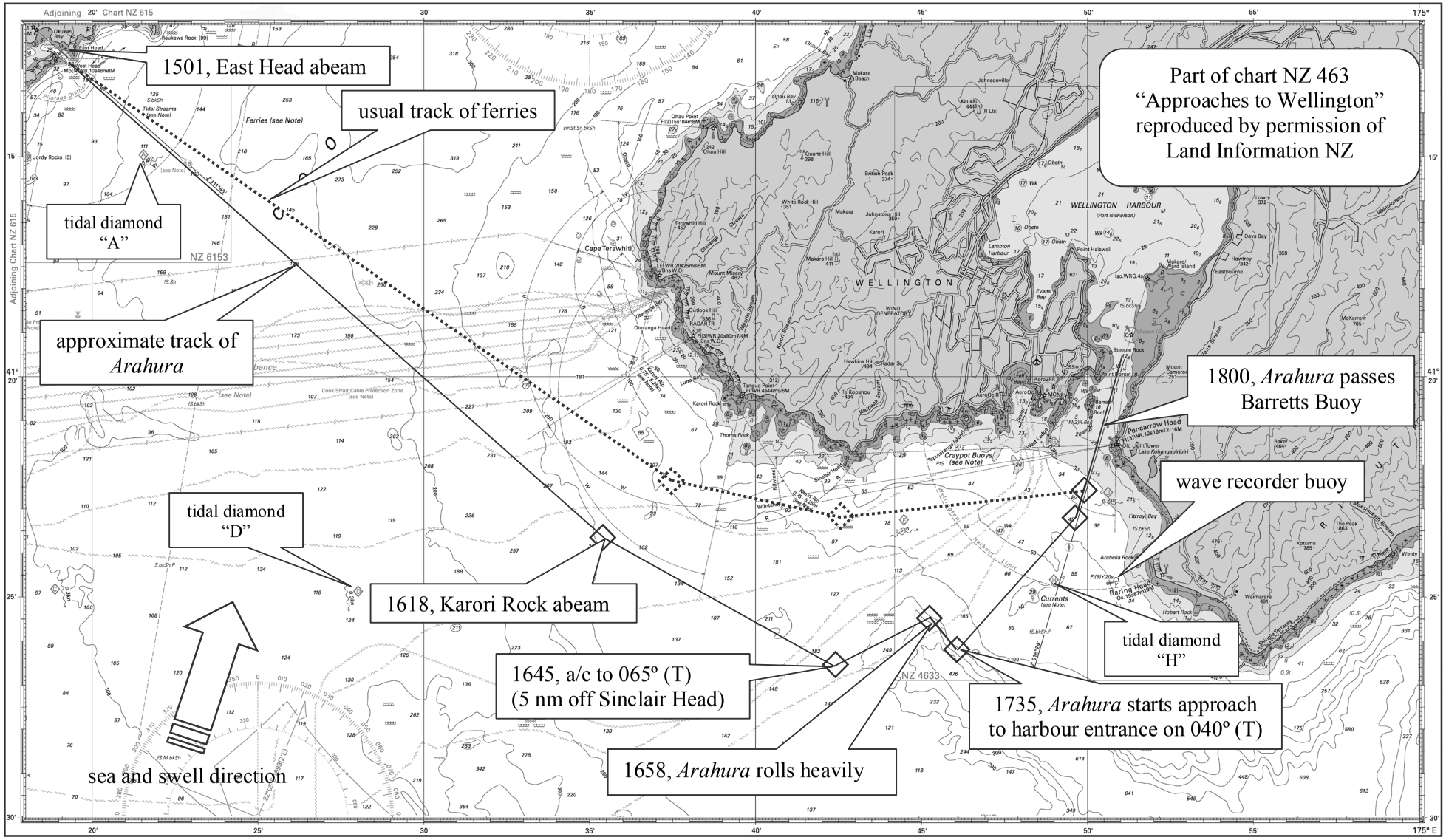


Figure 1
General area of the occurrence

1 Factual Information

1.1 History of the event

1.1.1 On Sunday 15 February 2004 at about 0945 the coastal passenger and freight ferry *Arahura* departed from Wellington ferry terminal bound for Picton with 980 passengers on board. The weather had been forecast to worsen during the day and the master and watch-keeping officers monitored the weather on the voyage. The voyage to Picton was uneventful and the ship arrived at 1300.

1.1.2 While the *Arahura* was in Picton the master studied the weather forecasts and contacted a forecaster at the New Zealand Meteorological Service (Metservice) office in Wellington for a more recent update to the weather, and Beacon Hill signal station (Wellington Harbour Radio) to ascertain the actual sea state and weather at the entrance to Wellington Harbour. The master decided that as the weather and sea state were forecast to deteriorate that he would have to implement the operator's heavy weather procedures (see Appendix 1).

1.1.3 At about 1400, cargo operations were completed, 988 passengers had been embarked and the ship was readied to depart. Due to the large number of passengers and vehicles, both private and commercial, no rakes of rail wagons were loaded. At 1404 the *Arahura* left the Rail Ferry Terminal at Picton and at 1501 cleared the Tory Channel and entered Cook Strait.

1.1.4 As forecast, the weather had worsened with the swell estimated to be 3 m in height. The master decided to take a more southerly route than usual as was normal under such sea and weather conditions. Such a course kept the swell on the starboard bow until the ship's course could be altered to make Wellington Harbour entrance with the swell abaft the beam. Prior to leaving the shelter of Tory Channel the master implemented the company's heavy weather procedures.

1.1.5 Initially, after leaving the Tory Channel the ship started to pitch and roll, but was able to maintain full speed using all 4 motors as the movement was not excessive. However, the weather progressively worsened and the head swell increased, so the master had to reduce the ship's speed as the movement increased.

1.1.6 At about 1645, when the *Arahura* was about 5 nm off Sinclair Head (see Figure 1), the master altered the ship's course to bring it to a position approximately 2 nm south of Wellington Harbour entrance. This course alteration put the swell between 40º and 50º abaft the beam. However, the swell continued to increase and at about 1658, the *Arahura* made a succession of 3 slow, heavy rolls, the maximum of which was observed to be 30º to either side.

1.1.7 After the heavy rolling, the hospitality staff advised the master and the third officer who comprised the navigating team on the bridge that 3 of the electronic games machines in the passenger area had fallen over and help was required to secure them until the ship reached Wellington. The master and navigating team were also advised by the duty mate that 3 of the luggage vans stowed on the rail deck had been damaged and that an articulated truck on the vehicle deck had also moved.

1.1.8 The master said he needed to alter the ship's heading to reduce the risk of more heavy rolling, but he could not turn to port because it would have put the ship too close to the western side of the entrance. He therefore turned to starboard by reducing the pitch to zero on the starboard propeller and applying full starboard helm, which brought the ship's head into the wind and swell, at which time he reduced the ship's speed to a minimum to allow steerage.

1.1.9 The master slowly increased the speed of the ship and put the swell onto the starboard bow, enabling the ship to make a greater easting. At about 1735, the master, concerned that he may have had to remain in Cook Strait overnight with the consequences for passenger safety and comfort, calculated that he could alter the course of the ship towards the harbour entrance with the swell further abaft the starboard beam. The master said that after observing the swells, he

calculated the correct moment, altered course hard to port bringing the ship onto a course of about 040º (T) and increased speed sufficiently for the active fin stabilisation to become effective. The motion of the ship reduced and the ship was able to make Wellington Harbour entrance without further incident, passing Barrett Buoy at about 1800, and berthed at Rail Ferry Terminal 2 at about 1836.

1.2 Post incident investigation

1.2.1 The electronic games machines had been repositioned from deck 8 down to deck 7 during the vessels dry-docking in 2002. The suppliers of the machines secured them in place when they were relocated. The ship's safety officer conducted an inspection after the dry-docking and although the method of securing appeared adequately robust, without dismantling the attachments he was not able to inspect their strength.

1.2.2 The 3 electronic games machines had been secured using aluminium angle bar between the deck and the side of the machine, and an upper retaining arm attached to the top of the machine bolted to the bulkhead (see Figure 2). Inspection found that:

- the self tapping screws that were used to secure the aluminium angle bar between the side of the games machine and the ship's deck were of insufficient length to penetrate the fitted floor coverings and gain a reasonable hold in the metal deck underneath.
- the upper retaining arm was bolted through the adjacent bulkhead and to a short length of aluminium angle bar in the locker behind. The adjacent bulkhead was constructed of a pair of thin-faced decorative panels separated by a fibrous mat and was not load supportive (see Figure 4).

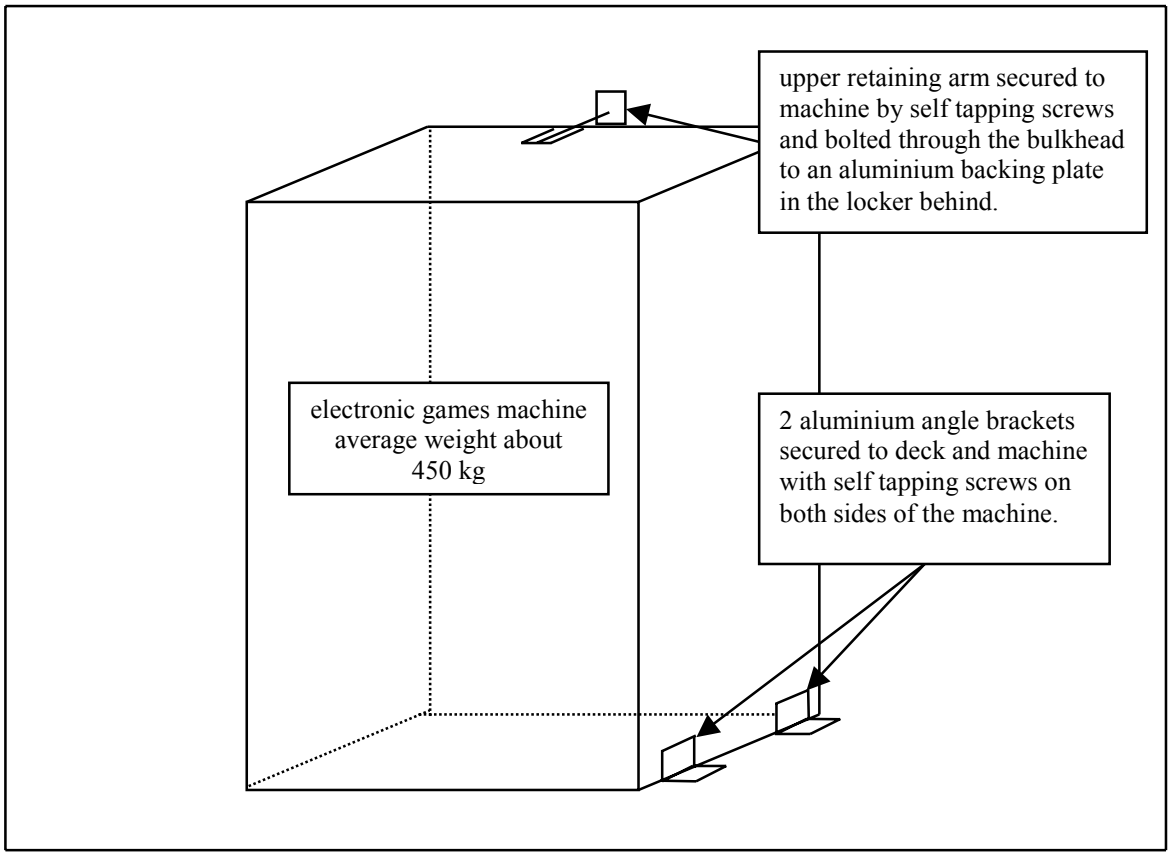


Figure 2
Diagram of securing arrangements for the games machines (not to scale).

1.2.3 The safety officer's required record of inspection detailed certain items he considered to be unsafe and to be made safe. However, the electronic games machines were not included in the list.

1.2.4 Security video cameras were mounted on the vehicle and rail decks . The movement of the luggage vans and a B train[2] was recorded and the following observations made:

- one of the luggage vans rocked heavily and then toppled sideways on the driver's side and into the side of a second van
- another of the luggage vans moved forward and then sideways to the right colliding with the underneath of the chassis of the other toppled luggage van
- the B train was curtain sided[3] and the contents of the trailer could be seen to push against the sides. The trailer slid sideways before rocking into the side of the vehicle next to it.

1.2.5 The luggage van that moved forwards was driven off the ferry at Wellington by a terminal employee. He said that when he entered the van's cab he noted that the handbrake was not applied but could not remember if the van had been left in or out of gear.

1.3 Ship and equipment information

1.3.1 The *Arahura* was a purpose built Ro-Ro passenger and freight ferry, which plied between Wellington and Picton. It was built in Denmark for New Zealand Railways[4] in 1983. The ship operated on a scheduled 24-hour service across Cook Strait, and was certified to carry a total of 997 passengers. The ship was registered in New Zealand and had valid certificates issued by or on behalf of that Government and Det Norske Veritas (DNV) classification society and was certified to operate in New Zealand coastal waters.

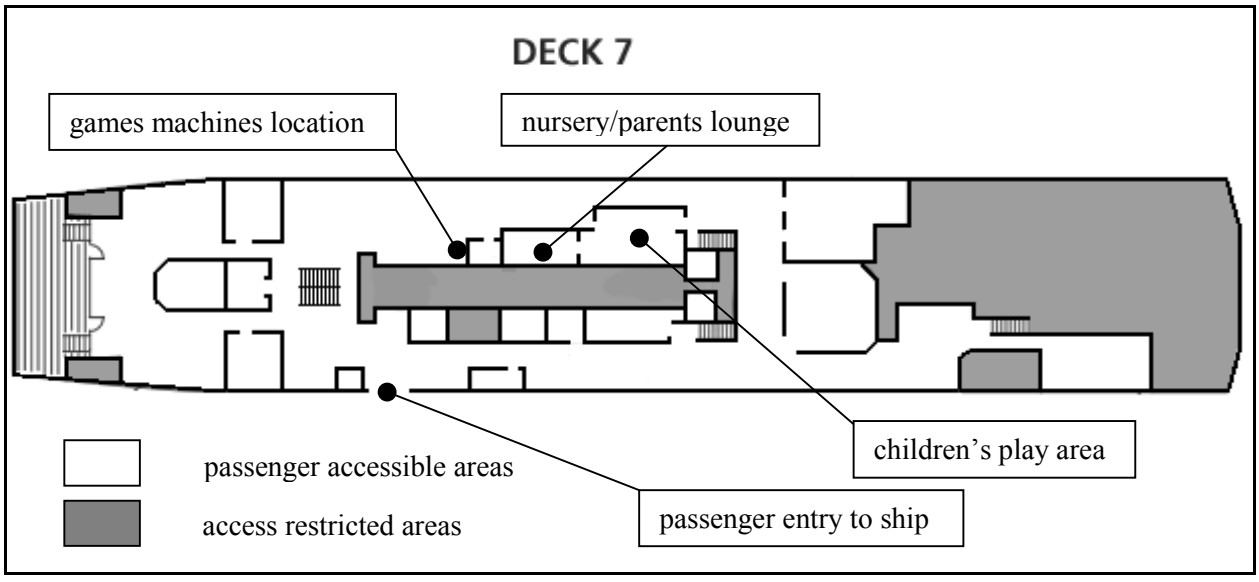


Figure 3
Layout of deck 7 showing the location of the electronic games machines

[2] a rigid vehicle attached to two semi-trailers connected at two points of articulation, where the forward distance of the longer trailer divided by the forward distance of the shorter trailer does not exceed 1.3.
[3] The generic (general) term for a range of manufactured vehicle bodies that have sliding side wall curtains rather than solid fixed walls.
[4] New Zealand Railways underwent several changes of standing as a company since 1987, as did the rail ferry division. The current names, Tranz Rail for the company and The Interisland Line for the rail ferry division have been used throughout this report for consistency.

1.3.2 The *Arahura* had 2 cargo decks, the lower (rail) deck was equipped for the carriage of up to 60 rail wagons and was timber sheathed so it could accommodate up to 132 private cars. The upper vehicle deck was equipped to carry up to a maximum of 27 trucks or 100 private cars. Because of the heavy weather experienced in the Cook Strait, the cargo decks were designed with hook-up points on every frame for rail wagon tie-down and vehicle lashings.

1.3.3 The *Arahura* carried sufficient lashings to place 8 heavy weather lashings on every truck or trailer carried. However, as the Arahura carried the maximum number of passengers in The Interisland Line ferry fleet the vehicular cargo was usually mainly private vehicles and a maximum of 14 trucks or trailers.

1.3.4 Ships are loaded to maintain sufficient stability for the safety of the ship, and its crew, passengers and cargo. The transverse stability of a ship determines, among other things its roll period. A ship with a high transverse stability is said to be "stiff" and has a short roll period, whereas a ship with a low transverse stability is said to be "tender" and have a longer roll period. Decreasing the stability too far would make a ship unstable and unsafe.

1.3.5 The *Arahura* was designed to have adequate transverse stability in all states of loading. When the ship had a full complement of passengers and the consequent number of private vehicles on the vehicle and rail decks the transverse stability of the ship was slightly reduced. The reduction in the transverse stability was due to the position of the passenger and vehicle decks in relation to the centre of gravity of the ship.

1.3.6 The rail deck was at or about the level of the centre of gravity of the ship, thus the carriage of rail wagons or cars on this deck had little effect on the stability. The vehicle deck was above the level of the centre of gravity, thus vehicles on this deck would raise the centre of gravity and lower the stability, however, this was normal for the ship's loaded condition. The passenger decks were even further above the centre of gravity, thus the weight of a full complement of passengers would slightly raise the centre of gravity and lower the stability. However, the transverse stability of the *Arahura* did not vary greatly in any loaded condition.

1.3.7 The duration of a fair weather voyage from berth to berth was about 3 hours and comprised 3 sections: a 60-minute passage through the Marlborough Sounds, an 80-minute crossing of Cook Strait, and a 40-minute transit of Wellington Harbour. The turn-around time at each end of the voyage was about one hour.

1.3.8 The *Arahura* was 148.4 m in length and 20.5 m extreme breadth. The navigating bridge was situated about 20 m from the bow. The ship was powered by a diesel electric system, comprising four 5565 hp [4194 kW] diesel engines each driving a 3800 kW alternator, these supplied power to two 6700 kW propulsion motors, 1 on each of the 2 shafts each of which drove an inward turning controllable pitch propeller at a constant speed of 214 rpm.

1.3.9 Steering was provided by 2 spade rudders, one aft of each propeller. In addition the *Arahura* was fitted with 2 bow thrusters each of 1200 hp [895 kW], giving a combined bollard pull equivalent to 30 t. The *Arahura* was also fitted with a pair of active stabilising fins to reduce rolling and enhance passenger comfort, however active fins became progressively less effective as the ship's speed reduced.

1.3.10 The navigating bridge was fitted with the following equipment:

- 2 x Automated Radar Plotting Aid (ARPA) radars, 1 x 10 cm and 1 x 3 cm
- 2 x very high frequency (VHF) radios
- 1 x Global Positioning System (GPS) navigator
- 1 x echo sounder
- 1 x Doppler log

- 2 x gyro compasses
- 2 x rudder angle indicators
- 1 x weather facsimile machine.

1.3.11 Every truck and trailer carried by The Interisland Line was required to have lashing points available on the chassis, these were a requirement of The Interisland Line but were not covered by any New Zealand or International standard at the time of the incident.

1.4 Personnel

1.4.1 The master of the *Arahura* had started his seagoing career in 1957, and gained his master's foreign going certificate in 1968. He joined The Interisland Line in 1971 and was promoted to master in 1974. Apart from a period of 18 months when he had acted as a loading master in the north of Scotland he had been continuously employed with The Interisland Line since 1971. He had been in command of the *Arahura* for its maiden commercial voyage to Picton.

1.4.2 The third officer of the *Arahura* had started his seagoing career in 1985 working on fishing boats in Scotland. He then worked on oil industry stand-by boats in the North Sea for 3½ years before moving to New Zealand and working on deep sea fishing boats for a further 3½ years. He gained his Second Mates Foreign Going Certificate in 2000, and commenced employment with The Interisland Line in January 2001 as a third officer, the rank he held at the time of the incident.

1.5 Damage

1.5.1 Three electronic games machines were badly damaged, such that the owners replaced them.

1.5.2 Part of the bulkhead in the games machine area was damaged where the securing arrangements for the machines was pulled through the bulkhead. The self-tapping screws securing the games machines into the deck tore out.

1.5.3 Three small luggage vans had damage to their bodywork; none of the passengers' luggage inside the vans was damaged.

1.5.4 A passenger coach received minor damage to its bodywork where a B-Train slid against it.

Figure 4
Damage sustained to one cargo van and to the games machines upper retaining arm

1.6 Climatic and tidal conditions

1.6.1 The coastal waters amended forecast issued at approximately 0900 15 February 2004 and valid until midnight 15 February 2004 for sea area Cook was as follows:

STORM WARNING IN FORCE Southerly 50 knots, rising to 60 knots in the evening. Sea becoming very high. Southerly swell rising to 3 metres. Poor visibility in periods of rain. OUTLOOK FOLLOWING 12 HOURS: Southerly easing to 35 knots.

1.6.2 The coastal waters amended forecast issued at approximately 1238 15 February 2004 and valid until midday 16 February 2004 for sea area Cook was as follows:

STORM WARNING IN FORCE Southerly 50 knots, rising to 60 knots this evening and easing to 45 in the western Strait late morning. Sea becoming very high for a time. Southerly swell rising to 4 metres. Poor visibility in periods of rain.
OUTLOOK FOLLOWING 12 HOURS: Southerly easing to 15 knots throughout.

1.6.3 The meteorological notes in the New Zealand Almanac for 2003/2004 stated that coastal weather forecasts are a general indication of average conditions expected in a particular coastal area. The forecasts are for open waters to within 60 nm of the coast and do not apply to enclosed areas such as small bays and harbours.

1.6.4 Metservice provided an aftercast of the weather that would have been experienced in the Cook Strait at the time of the incident as shown below:

- **Situation**. At 6pm on 15 February 2004, a large depression was centred just east of North Island, and was intensifying. A very strong south to southeast airflow covers central New Zealand.
- **Weather conditions:** Cook Strait and the sea area south of Wellington between 3pm and 6pm
  Wind: Southerly, 30 to 35 knots, increasing to 35 to 40 knots
  Momentary gusts were in the range of 45 to 55 knots.

  Sea state: Very rough (waves 4 metres, occasionally 5.5 metres) becoming high (waves 5.5 metres, occasionally 7.5)
  Swell: Southerly, about 3 metres, rising
  Combined Waves: waves 5 metres, occasionally 7 metres, increasing to 6 metres occasionally 8 metres.

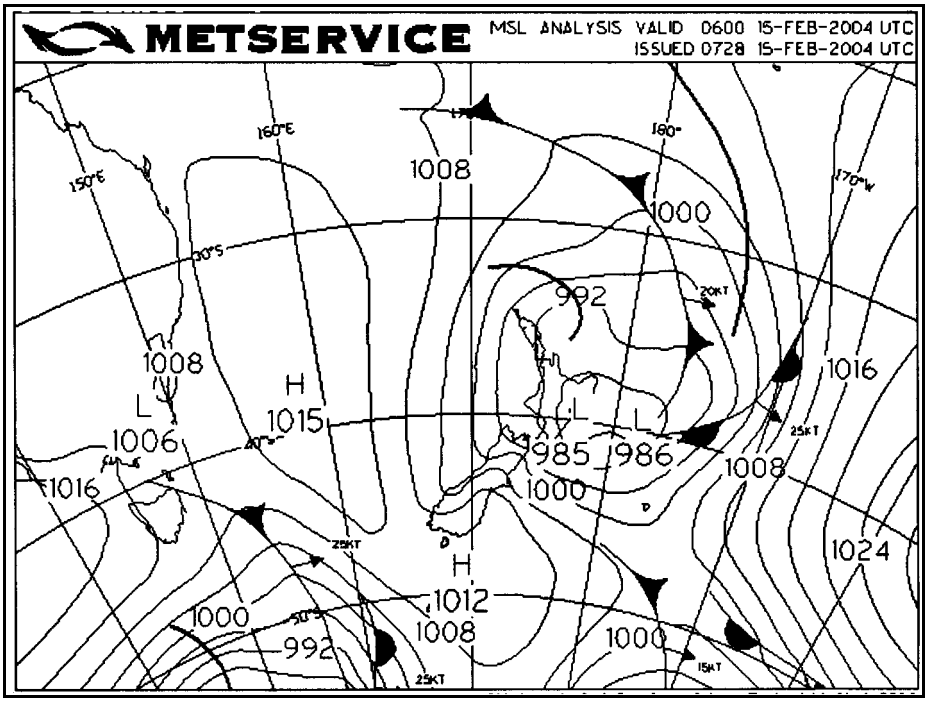


Figure 5
Mean sea level analysis synoptic chart for 1800 15 February 2004

1.6.5 The predicted tides for Picton and Wellington detailed in the New Zealand Nautical Almanac for 15 February 2004, was:

Picton							
High Water		Low Water		High Water		Low Water	
0323	1.2 m	0955	0.4 m	1508	1.2 m	2054	0.4 m

Wellington							
High Water		Low Water		High Water		Low Water	
0041	1.7 m	0706	0.5 m	1308	1.6 m	1920	0.5 m

1.6.6 The range of tides tabulated in the New Zealand Nautical Almanac for Wellington was 1.03 m for the spring range and 0.93 m for the neap range. The range at the time of the incident was 1.1 m and therefore a large spring tide.

1.6.7 Tidal stream rates were shown on the chart for specific geographical positions designated by a magenta diamond shape enclosing a letter, known as a tidal diamond. The rates shown are for average spring or neap tides referred to high water at Wellington. If the tidal range is greater than normal (e.g., full or new moon coinciding with perigee) the rates will be increased roughly in proportion. The spring rates for relevant diamonds as shown in Figure 1 were:

Position	Time	Direction	Rate
Diamond "A"	1508	051º	1.2 kt
Diamond "D"	1608	358º	1.0 kt
Diamond "H"	1708	305º	0.7 kt

1.6.8 The New Zealand Nautical Almanac states in the section concerning tidal streams the following:

> The tidal streams in and around Cook Strait are unreliable, and masters are warned to exercise every precaution when navigating in the vicinity. The streams often run in one direction for 8 to 10 hours, while cases have been reported of them going so for 18 hours and more. When the streams have been running in one direction, for say 8 to 10 hours, it has been found that the opposite stream is much weaker and, in some cases, hardly noticeable. The maximum rates shown on the chart, which are usually attained at springs, are also liable to be experienced at any other time. In the vicinity of Karori Rock and Cape Terawhiti a rate of up to 7 knots is frequently experienced, but as a rule it does not last for more than about an hour. Small vessels are warned to keep well clear of tide rips, as they may lose steerage way and may, in extreme cases, capsize.

1.6.9 When a tidal stream runs against a sea and swell it causes the sea to steepen and the wave period to decrease. Conversely when a tidal stream runs with a sea and swell it causes the sea to flatten and the wave period to increase.

1.6.10 The National Institute of Water and Atmospheric research (NIWA) maintained a wave rider buoy situated off Baring Head in position 41º 21.14' S 174º 50.85'E (see Figure 1). Data from the buoy was available to the master of the *Arahura* either from The Interisland Line, Beacon Hill signal station or from the Metservice duty forecaster. Readings on the 15 February 2004 were:

Date	Time	Maximum wave height (m)	Significant wave height. (m)
15-Feb-2004	1330	7.371	4.319
15-Feb-2004	1400	5.543	4.237
15-Feb-2004	1430	6.590	4.264
15-Feb-2004	1500	7.336	4.863
15-Feb-2004	1530	8.487	5.372
15-Feb-2004	1600	8.934	5.254
15-Feb-2004	1630	8.971	5.753

15-Feb-2004	1700	7.800	5.598
15-Feb-2004	1730	8.045	5.915
15-Feb-2004	1800	9.865	6.227
15-Feb-2004	1830	10.439	7.180
15-Feb-2004	1900	9.360	6.245

1.6.11 The Admiralty Sailing Directions New Zealand Pilot (NP51) states the following about Cook Strait:

> Cook strait is particularly affected by the frequency and strength of NW and S to SE winds due to the close proximity of high land on both sides producing a funnel effect; these are the only violent winds but they give rise to the worst storms experienced in New Zealand waters, averaging about 25 each year. Strong to gale force NW winds are very localised, but S gales affect the whole strait. Gales from SE, which are experienced more often, are strongest in the W part of the strait around Cape Campbell, and over the N parts of Marlborough Sounds.
>
> Broken water is experienced in Cook Strait; this may in part be due to the influence of a cold bottom current being forced to the surface. When the flow is strong, heavy tide rips occur in the vicinity of the deep submarine canyons in the strait.
>
> During gales, very rough seas are a feature of Cook Strait. The heaviest seas are caused by S gales, which can produce very high and dangerous swells, particularly across the strait S of Wellington Harbour and N and S of The Brothers islands.

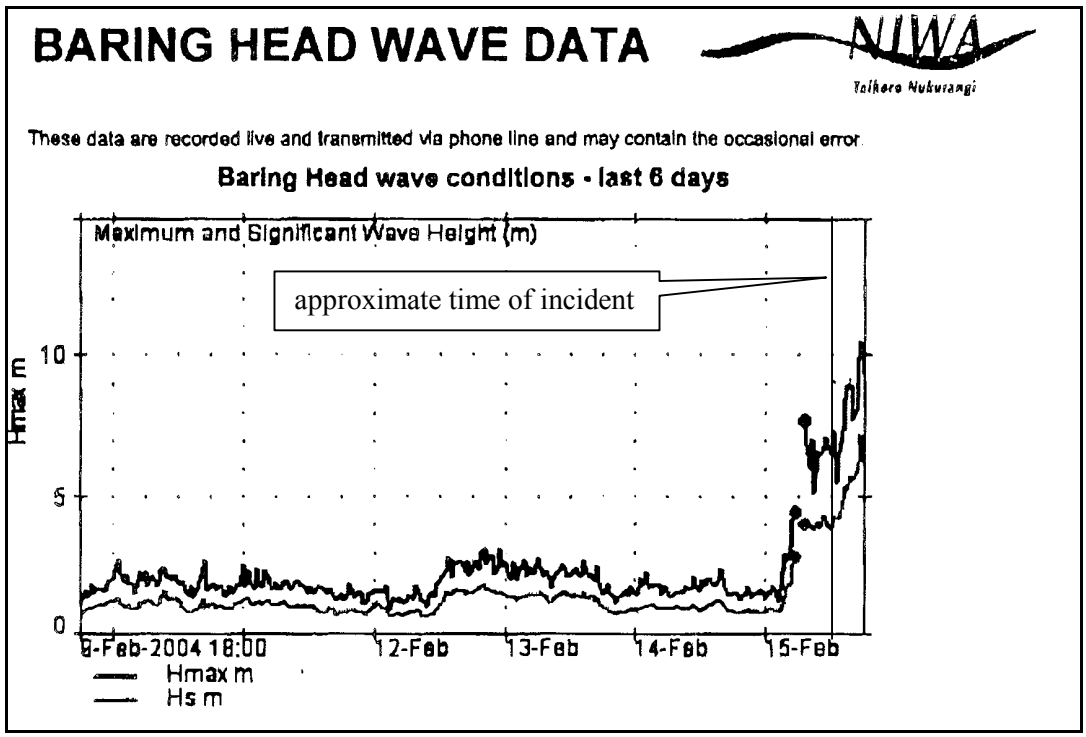


Figure 6
Graphical representation of data obtained from Baring Head wave rider buoy

1.7 Operating procedures and requirements

1.7.1 Heavy weather procedures for the *Arahura* were detailed in the operations manual, in addition to the normal departure checks, with references to the safety manual (see appendix 1).

1.7.2 The Interisland Line did not lay down limiting criteria for the sailing of the ship but left the master to assess whether he considered it to be safe for the ship to sail. The master's authority was designated in the introduction to the safety manual as follows:

- MASTER'S AUTHORITY
  The masters are appointed by, and derive their authority from, the managers of the ship. They are at all times the manager's senior representative on board.
  Nothing in this manual removes from the master their authority to take any steps and issue any orders, whether or not they are in accordance with the contents of this manual, which they consider necessary for the preservation of life, the safety of the ship, cargo or for pollution prevention.
  GOOD SEAMANSHIP
  Nothing written in this manual relieves the master and his crew of their legal responsibilities and their duty to act in accordance with good seamanship and their own skills and judgement. Indeed if the particular circumstances require it they must depart from the requirements of this manual

1.7.3 Although the masters of the conventional ferries occasionally aborted sailings, such cancellation decisions were taken on the basis of passenger safety and comfort rather than what the ship itself could withstand.

1.7.4 The Interisland Line provided the ship and master with tools to assist in assessing the situation. It had contracted with Metservice that the master could consult with a duty weather forecaster at any time to determine the expected weather. The Interisland Line had also contracted with NIWA and the Wellington Regional Council to be able to access the data from the wave rider buoy off Baring Head. They also encouraged masters to communicate between ships at sea and in port for updates on the weather conditions being experienced.

1.7.5 Procedures for the loading and lashing of cars and commercial vehicles were contained in The Interisland Line loading and discharging manual.

1.7.6 Luggage staff were responsible for driving the luggage trucks, vans and tow tractors onto and off the vessel.

1.7.7 Section 7.2.1. of the loading and discharging manual contained details of securing of cargo/commercial vehicles to deck, and stated:

- all commercial vehicles, semi trailers, road trains, buses, luggage trucks and similar vehicles must be secured with lashings. Jacks and chocks should be used as required
- lashings should be attached to the securing points on the vehicle in such a way that the angle between the lashing and the horizontal and vertical planes lies between 30 degrees and 60 degrees
- wheels should be chocked to provide additional security in adverse conditions
- vehicles should be left in gear and brakes applied; and
- semi trailers must not be supported on their landing legs during sea transport unless they are specifically designed for that purpose and so marked.

1.7.8 One of the mates is appointed to be in charge of the vehicle deck and one in charge of the rail deck during loading and discharging operations, their responsibilities as laid down in the cargo and securing manual included:

- to take charge of the rail deck or vehicle deck during loading and discharging as required

- when in charge to ensure that cargo is safely and efficiently discharged or loaded; and
- after completion of loading to check that all cargo is properly secured.

A vehicle deckman is also appointed to the vehicle deck his duties are to:

- to take instructions from the mate in charge and convey this to the crew. They are also responsible together with the duty officer and the crew for directing, stowing and lashing of trucks and cars on the vehicle deck.

1.7.9 International Standards Organization (ISO) standards ISO 9367-1 Lashing and securing arrangement on road vehicles for sea transportation on ro-ro ships - Part 1 commercial vehicles and combinations of vehicles, semi trailers excluded, and ISO 9367-2 - Lashing and securing arrangement on road vehicles for sea transportation on ro-ro ships - Part 2 Semi trailers, cover the international standard for lashing points on trucks and trailers.

1.7.10 At the time of the incident there was no New Zealand standard applicable to the lashing points for the truck and trailer chassis' to be secured to a ship's deck. Nor did all the New Zealand truck and trailer fleet comply with the ISO standard.

1.7.11 The Maritime Safety Authority of New Zealand (MSA) had discussed with Standards New Zealand the development of a joint Australian and New Zealand standard based on the ISO standard for lashing points. However, agreement could not be reached on a joint standard so Standards New Zealand and the MSA had agreed to continue to develop a New Zealand standard from about July 2004.

1.7.12 The MSA had issued a consultative draft Maritime Rule, part 24B carriage of cargoes – stowage and securing, with an invitation for interested parties to comment. The draft included the requirement for trucks and trailers to have suitable points to enable lashing to a ship's deck. These lashing points would be required to comply with the requirements of ISO 9367-1 and ISO 9367-2. Responses to the draft rule were due by 21 November 2003 and MSA anticipated that the rule would become final and come into force in early 2005.

1.7.13 Other than a ship operator's responsibility to ensure the safety of a ship, its crew and its passengers, there was no known standard covering the securing of general equipment on ships or items fitted for passenger hospitality and entertainment. Generally, equipment should be secured under a master's authority in accordance with good seamanship, and the judgement of those senior officers to whom the tasks were delegated. All areas of a ship were subject to regular inspection by the nominated ship's safety officer. Additionally, the master, chief engineer and shore management also carried out regular inspections.

2 Analysis

2.1 The master was aware that the weather and sea conditions were expected to deteriorate, and he used all the appropriate means at his disposal to ascertain the conditions in Cook Strait before departure.

2.2 The Interisland Line did not specify any limiting conditions on the operation of the conventional ferries, rather they provided the ships and therefore the masters with equipment and procedures to best gain information on the prevailing conditions. This information coupled with the experience of the master and the other navigating officers enabled a decision of whether to sail or not.

2.3 The master was one of the most experienced masters on the run and had conned the ship across the strait in many differing conditions. He was the best placed person to form an overall picture of the conditions and how they would affect the handling characteristics of the *Arahura*.

2.4 The master based his decision to sail on the forecasts he had received and from information gathered from other ships in the strait. Drawing on his knowledge and experience he considered that, as the tidal stream would be running in the same direction as the sea and swell it would reduce the height of the sea and swell.

2.5 The master knew that he had a nearly full complement of passengers on board and as such the stability would be slightly lower than normal. However, he also knew that the ship with this loading had adequate transverse stability for safety, and that the slight reduction in transverse stability would increase the ship's roll period and make the movement slower therefore increasing the passengers safety and comfort in heavy weather.

2.6 As the *Arahura* exited the Tory Channel into the strait the height of the sea and swell was, from observation onboard, about 3 m. However as is shown in the data from the NIWA wave rider buoy at Baring Head the sea and swell increased quickly as the ship travelled across the strait.

2.7 The wave rider buoy at Baring Head can be masked by the lay of the land in certain weather conditions, especially with the wind and swell from the north. However, the buoy is open to sea and swell from the south and so this data on the day of the incident would have been accurate.

2.8 The master decided to take a more southerly route across the strait than was normal in good weather. This allowed him to then bring the ship around and on a course for the Wellington Harbour entrance keeping the sea and swell on the starboard bow and then on the starboard quarter, thereby giving a small angle of attack to the prevailing weather and the smoothest ride for the passengers and cargo.

2.9 Had the master allowed the *Arahura* to continue on its original track for a longer period of time he may have been able to bring the ship around and place the *Arahura* on a more northerly track towards Wellington Harbour entrance with the sea further on the quarter, possibly reducing the amount of roll experienced.

2.10 Immediately the ship rolled heavily the master was concerned for the passengers well being and brought the *Arahura* back to stem the sea and swell. This allowed the ship to make headway and slowly get to a position where the course could be altered towards Wellington Harbour entrance with the sea further on the starboard quarter. It also allowed time to secure the electronic games machines and cargo.

2.11 From observation of the security videotape of the car and rail decks it was evident from their movement that none of the small luggage vans had their chassis lashed. However the movement of one van also suggested that the handbrake had not been correctly engaged, but the van did appear to have been left in gear.

2.12 The fact that the rear section of the B Train moved indicated that either the required lashings had not been attached, the lashings had not been tightened sufficiently, one of the chassis or ship lashing points had failed, or that one of the lashings broke. There was no evidence of a failed lashing point or lashing on the ship. The trailer had already been discharged so it could not be examined nor could the state of the lashings from the trailer to the ship be verified.

2.13 The 3 electronic games machines had been secured in place by the machine suppliers to a standard that was adequate for a machine in a land-based situation. The machine suppliers may not have been aware of the potential forces that could be exerted on the heavy machines when the ship was moving heavily. The contract did not specify securing arrangements, only specifying that the site was to be fitted out in accordance with the machine suppliers fit-out standards as far as practicable given the unique demands of the designated area.

2.14 Had the ship's staff at the dry-docking sighted the games machines securing arrangement as it was being fitted rather than after completion of the job, it is probable that stronger fixings would have been used in what otherwise appeared to be a satisfactorily robust arrangement.

2.15 The safety officer's record of inspections made no mention of the electronic games machines, indicating that he considered that the securing arrangements, as far as he could determine, were satisfactory.

2.16 With the usual heavy train wagons replaced by lighter private vehicles on the rail deck the period of roll that the *Arahura* experienced during the incident was slower than it might have otherwise been.

3 Findings

Findings are listed in order of development not in order of development

3.1 The *Arahura* was correctly certified and manned at the time of the incident

3.2 The *Arahura* did not suffer any damage that affected its seaworthiness or navigability.

3.3 The decisions made by the master, regarding the decision to sail, the navigation of the voyage, and the conduct of the voyage, of the *Arahura* were appropriate in view of the information available to him.

3.4 The *Arahura* rolled heavily when it encountered several larger than anticipated swells as it approached Wellington Harbour entrance

3.5 Had the master continued on his original course for a longer period before altering towards Wellington Harbour entrance the incident would possibly have been averted.

3.6 The securing of the electronic games machines was not sufficiently robust for the potential forces that could be exerted on the machines.

3.7 The luggage vans were not lashed to the deck of the ship

3.8 One of the luggage vans did not have its hand brake applied correctly but was probably left in gear.

3.9 The rear of the B train trailer was probably incorrectly lashed or not lashed.

3.10 At the time of the incident there were no specific guidelines for securing heavy items of equipment in passenger spaces.

3.11 At the time of the incident there was a consultative draft Maritime Rule covering the securing of trucks and trailers on board ships but it had not come into force.

3.12 At the time of the incident although there was an international standard covering the lashing points for securing trucks and trailers on board ships but there was no applicable New Zealand standard.

4 Safety Actions

4.1 Since the incident Tranz Rail Limited have implemented the following actions:

- constructed a heavy steel framework around the bulkheads surrounding the games machine area. The games machines have been securely attached to this structure to the satisfaction of the *Arahura's* master and chief engineer (see Figure 7)
- constructed a similar framework on The Interisland Line's other conventional ferry the *Aratere*

- included in the contract between the games machine supplier and The Interisland Line a clause requiring that future installations of similar equipment be secured to the satisfaction of the ship's chief engineer
- noted that the same clause as above will be included in contracts with any other future suppliers of heavy equipment
- checked the securing of other existing equipment and determined it was properly secure
- investigated the lashing of luggage trucks and vans during a recent internal audit, and as a result issued a fleet memorandum changing the instructions in the loading and discharging manual to require that, due to the high centre of gravity when loaded, all luggage trucks and vans to be lashed irrespective of the weather
- fitted all the smaller luggage vans with dedicated lashing points
- reviewed The Interisland Line's policy on making weather-related decisions to sail, and the amount of information available to the master to make the decision. The Interisland Line determined that its policy and the amount of available information was sufficient

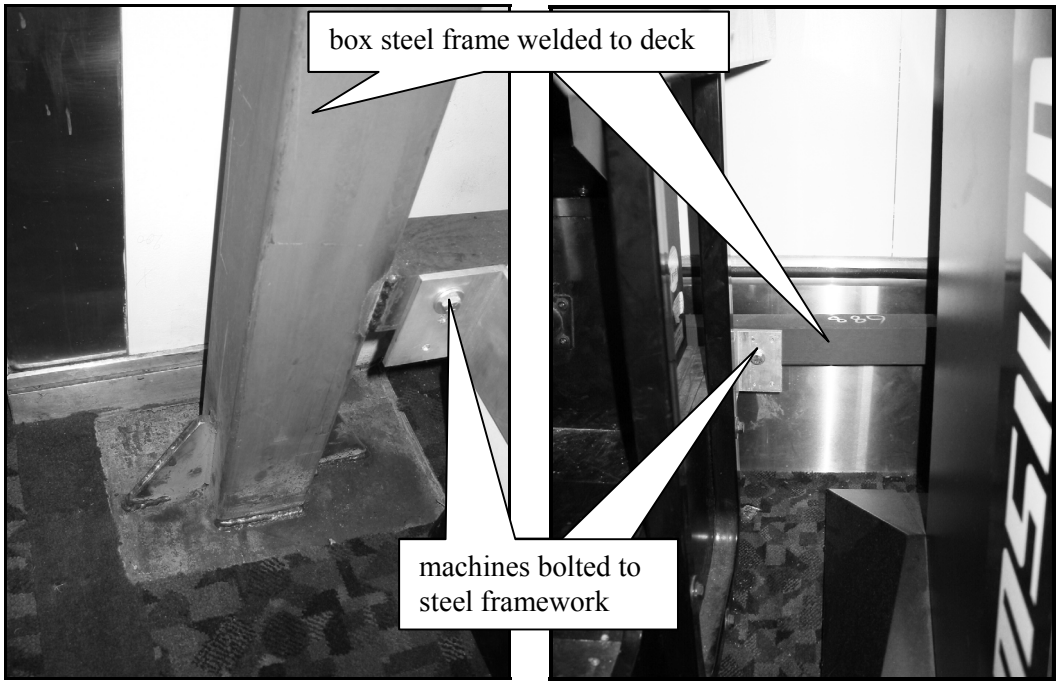


Figure 7
Parts of the electronic games machine new securing arrangements

4.2 In view of the safety actions taken by Tranz Rail Limited, no safety recommendations have been made to the operator.

4.3 The MSA had completed consultation on draft Maritime Rule Part 24B carriage of cargoes – stowage and securing, and was currently developing the rule ready for the Minister's consideration.

4.4 The MSA and Standards New Zealand were developing a standard for lashing points on trucks and trailers.

4.5 In view of this no safety recommendations have been made to the Director of Maritime Safety.

Approved on 30 July 2004 for publication

Hon W P Jeffries
Chief Commissioner

Appendix 1

HEAVY WEATHER

This procedure applies when there is, or when there is expected to be, adverse sea or wind conditions which may affect the safety of the ship, cargo or passengers.

MASTER RESPONSIBLE FOR:

- ❑ Ship and cargo secured ready for any expected weather conditions
- ❑ All departments informed
- ❑ Announcement to passengers, (see heavy weather announcement in safety manual.

DUTY MATE RESPONSIBLE FOR:

- ❑ Rounds made prior to leaving sheltered waters with particular attention to the securing of:
  - ♦ stern door, gangway doors, bunker doors and portholes
  - ♦ cargo, rubbish bin, funnel doors, loose equipment
  - ♦ forecastle hatches and door, anchors and mooring lines
  - ♦ lifeboats and liferafts, (lifeboat drain plugs out); and,
  - ♦ equipment in galley, pantries and restaurants
- ❑ Ventilators and air pipes, covered/closed as necessary
- ❑ Scuppers and drains clear
- ❑ Rounds made as the ship reaches the open sea and frequently thereafter until the ship reaches sheltered waters, entry made in the bridge log book.
- ❑ I.R's on continuous cargo watch when required.

THE BRIDGE OFFICER OF THE WATCH IS RESPONSIBLE FOR: -

- ❑ Speed and/or direction the ship is heading is adjusted to reduce excessive pounding or rolling
- ❑ Stabilisers operating if beneficial, (if in doubt put them out).

ENGINE ROOM WATCHKEEPER RESPONSIBLE FOR: -

- ❑ Equipment in the engine room spaces is adequately stowed and secured.
- ❑ Stabilisers are in an operable condition
- ❑ Fuel tanks, lub. oil storage and service tank levels are such that overflowing may only occur under extreme conditions.
- ❑ Duty service tanks have sufficient content so that the outlet/rundown to running machinery will not be exposed and allow air to enter service lines during extreme motion of the vessel.
- ❑ Standby fuel is sufficiently full as above.
- ❑ Engine room casing doors are shut, so that water will not enter engine room spaces.
- ❑ Train deck floodwater drain tanks are empty and that equipment to pump them out is in an operable condition.

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03-211	oil tanker, *Eastern Honor*, grounding, Whangarei Harbour, 27 July 2003
03-210	passenger freight ferry *Aratere*, collision with moored fishing vessel *San Domenico*, Wellington Harbour, 5 July 2003
03-209	container vessel *Bunga Teratai 4* and fishing vessel *Mako*, collision, Tasman Bay, 4 July 2003
03-207	fishing vessel *Solander Kariqa*, fire, 300 nautical miles west of Suva, Fiji, 5 May 2003
03-206	tanker *Capella Voyager*, grounding, Whangarei, 16 April 2003
03-204	restricted limit passenger vessel *Tiger III*, passenger injury, Cape Brett, 18 March 2003
03-203	jet boats *Wilderness Jet 3* and *un-named private jet boat,* collision, Dart River, Glenorchy, Queenstown, New Zealand, 2 February 2003
03-202	launch *Barossa* and trimaran *Triptych*, collision, Hauraki Gulf, 18 February 2003
03-201	passenger ferry *Harbour Cat*, engine room fire, Auckland Harbour, 16 January 2002
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02-201	bulk log carrier, *Jody F Millenium*, grounding, Gisborne, 6 February 2002
02-204	coastal cargo ship *Kent*, collision and flooding, Wellington Harbour, 14 July 2002
02-203	tug *Purau* grounding, Lyttleton Harbour, 1 March 2002
01-214	coastal cargo ship *Kent* and passenger freight ferry *Arahura*, close-quarters incident, Tory Channel entrance, 14 September 2001
01-213	commercial jet boat *Shotover Jet 21*, engine failure and collision with rock face, Shotover River, Queenstown, 3 1 August 2001

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