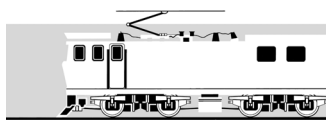
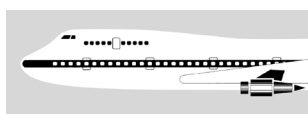


## M A R I N E   O C C U R R E N C E   R E P O R T

03-204

Report 03-204, restricted limit passenger vessel *Tiger III*,  
passenger injury, Cape Brett

18 March 2003



TRANSPORT ACCIDENT INVESTIGATION COMMISSION  
NEW ZEALAND

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## **Report 03-204**

**restricted limit passenger vessel  
*Tiger III***

**passenger injury**

**Cape Brett**

**18 March 2003**

### **Abstract**

On Tuesday 18 March 2003 at about 1455, during a scenic tour of the Bay of Islands, the restricted limit passenger vessel *Tiger III* encountered a steep wave with an unexpectedly deep trough behind it. The bow of the vessel rode up on this wave before dropping violently into the trough. Four passengers standing on the foredeck received serious injuries. There was no damage to the vessel.

Safety issues identified were:

- passenger access to the foredeck of the vessel during an open water passage
- the unpredictability of sea conditions
- non-compliance with Maritime Rule Part 31B - Crewing and Watchkeeping - Offshore, Coastal and Restricted (non-Fishing Vessels).

Safety recommendations were made to the Chief Executive Officer of Fullers Bay of Islands and the Director of Maritime Safety to address the safety issues.



*Tiger III*

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## **Abbreviations**

ADH	advanced deckhand certificate
CLM	commercial launchmaster's certificate
NIWA	National Institute of Water & Atmospheric Research
NZOW	New Zealand Offshore Watchkeeper certificate (endorsed)
UTC	coordinated universal time

## Data Summary

### Vessel Particulars:

Name:	<i>Tiger III</i>
Type:	restricted limits passenger vessel
Gross tonnage:	181
Length overall:	20.92 m
Beam:	8.75 m
Engines:	two 1210 kW Motoren-Werke Mannheim AG diesel engines each driving a fixed-pitch propeller
Passenger capacity:	240
Owner/operator:	Fullers Bay of Islands
<b>Date and time:</b>	18 March 2003 at 1455 <sup>1</sup>
<b>Location:</b>	Cape Brett
<b>Persons on board:</b>	crew: 4 passengers: 121
<b>Injuries:</b>	crew: nil passengers: 4 serious 3 minor
<b>Damage:</b>	nil
<b>Investigator-in-charge:</b>	Captain Doug Monks

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





# 1 Factual Information

## 1.1 History of the trip

- 1.1.1 On Tuesday 18 March 2003 at about 0700, at Opuia in the Bay of Islands, the skipper boarded the restricted limits passenger vessel *Tiger III* to prepare it for the day's sightseeing trips. After the usual start-up checks and procedures, and the arrival of the remainder of the crew, the skipper took the vessel to Waitangi arriving at about 0820, to pick up passengers. The *Tiger III* left Waitangi at about 0830 and went to Paihia and Russell, where it completed embarking passengers for the trip to the Hole in the Rock at Motukokako, commonly known as Piercy Island (see Figure 1). A total of 213 passengers were on board.
- 1.1.2 The Hole in the Rock trip was a scenic tour giving passengers some history of the Bay of Islands and, weather permitting, a trip through the Hole in the Rock.
- 1.1.3 That morning, the journey to the Hole in the Rock was uneventful and followed the normal routine. There was a moderate easterly wind, which had produced a combined sea and swell of 1 to 2 m, preventing the vessel going through the Hole in the Rock. Instead, the skipper remained outside the south-eastern end of the hole, turning the vessel through 360° to allow the passengers a clear view into and through the hole for them to take photographs. A number of passengers were feeling seasick, so the skipper returned to the calmer waters in the bay. The trip included a planned stop at Otehei Bay, Urupukapuka Island, to allow the passengers to take a trip on a semi-submersible vessel, take a walk or go to the cafe on the island. After this, the trip concluded with the passengers being disembarked at Russell and Paihia.
- 1.1.4 Soon after the last of the passengers from the morning trip had left the vessel at Paihia, passengers for the afternoon trip started to board. The vessel then returned to Russell where the remainder of the afternoon passengers were embarked. A total of 121 passengers took the afternoon cruise. As they were leaving Russell, the skipper welcomed the passengers onboard, explained the facilities on the vessel and gave a safety briefing, which included a warning about the vessel's movement and the need to remain seated or hold on, particularly when moving about the vessel.
- 1.1.5 As the vessel rounded Tapeka Point, it started to move as it encountered the prevailing easterly sea. The skipper said later that the sea conditions were not as rough as they had been in the morning. When the *Tiger III* arrived at Motuarohia, commonly called Roberton Island, they were in relatively sheltered waters, so the skipper allowed the passengers access to the foredeck. About 8 passengers took the opportunity to move onto the foredeck while the skipper continued the trip, giving a running commentary. The door to the foredeck remained open for the remainder of the trip.
- 1.1.6 When they had completed the passage around the inside of the islands, *Tiger III* passed through the Albert Channel into the bay. Before going through the channel, the skipper again warned the passengers that the boat was going into open water that might be choppy and that they should sit down or hold on. The skipper continued on into Deepwater Cove and then followed the coastline up to the landing, which lies in a narrow cleft between Cape Brett and Otuwhanga Island, under Cape Brett lighthouse (see Figure 2). At the landing, the skipper stopped and drifted and more passengers took the opportunity to go onto the foredeck to take photographs and enjoy the scenery.
- 1.1.7 When *Tiger III* left the landing at about 1455, there were about 15 passengers on the foredeck. The skipper again warned the passengers that they were about to cross open water and they needed to hold on or sit down. On leaving the shelter of the landing, the skipper did a slow turn to starboard and slowly increased speed. He continued to alter the course of the vessel around the western side of Otuwhanga Island, keeping about 100 m off the shore, and then headed towards Piercy Island.

- 1.1.8 There was a 0.5 to 1 m sea on top of a 1 to 2 m swell coming from an easterly direction. The vessel was heading almost directly into the sea. Generally the sea and swell was undulating and the boat was pitching easily into it. When abeam of the northern end of Otuwahanga Island *Tiger III* encountered 2 higher waves. The first caused the bow to lift slightly more than it had been but the second was considerably higher again. The bow rose up that wave but then fell violently into the near vertical trough behind it. The starboard hull of the catamaran fell slightly further than the port causing the vessel to heel to starboard. Even though the passengers on the foredeck were holding on, a number of them were lifted bodily off the deck. After reaching the bottom of the trough the bow started to rise rapidly, meeting the still falling passengers with considerable impact.
- 1.1.9 A number of the passengers landed awkwardly with their legs sliding out from under them resulting in several multiple injuries.
- 1.1.10 The skipper immediately turned the vessel around and returned to the sheltered water behind Cape Brett, while his crew administered first aid to the injured passengers. The skipper also requested that anyone with medical experience among the passengers go to the foredeck to assist the injured. A doctor and 2 people with nursing experience came forward and helped. As soon as the skipper had the vessel in sheltered waters, he put the engines in neutral and went to the foredeck to check the situation. He found that there were 3 seriously injured persons who were being made comfortable. One of the injured had pain in her back, so they immobilised her by supporting her with pillows. Blankets were used to cover the injured persons to keep them warm. A fourth person, who initially thought that she had only sprained her ankles, was later found to have fractured them and was cared for after the other injured persons had been stabilised.
- 1.1.11 At 1459, on his return to the wheelhouse, the skipper telephoned the marine operations manager at the operations base in Paihia to arrange for a helicopter to evacuate the injured. While the evacuation was being arranged the skipper started to head towards and through the Albert Channel and towards Otehei Bay, the most convenient place to effect an evacuation.
- 1.1.12 Meanwhile, the marine operations manager telephoned “111” for the emergency services and was connected to the ambulance service. They discussed the quickest and most prudent way to evacuate the injured people and decided that the *Tiger III* should go straight to Waitangi where it would be met by ambulances and paramedics. This plan was relayed to the skipper, who informed the passengers.
- 1.1.13 The *Tiger III* arrived at Waitangi at about 1545 and the 4 seriously injured persons were examined by paramedics and then taken to Kawakawa hospital. Two of the patients with more serious injuries were subsequently transferred to Whangarei Base Hospital.
- 1.1.14 Once the injured passengers had been taken off the vessel, the remaining passengers were disembarked at Waitangi and Paihia. *Tiger III* did not return to Russell that afternoon, the passengers that had boarded there were returned on another of the company’s boats.

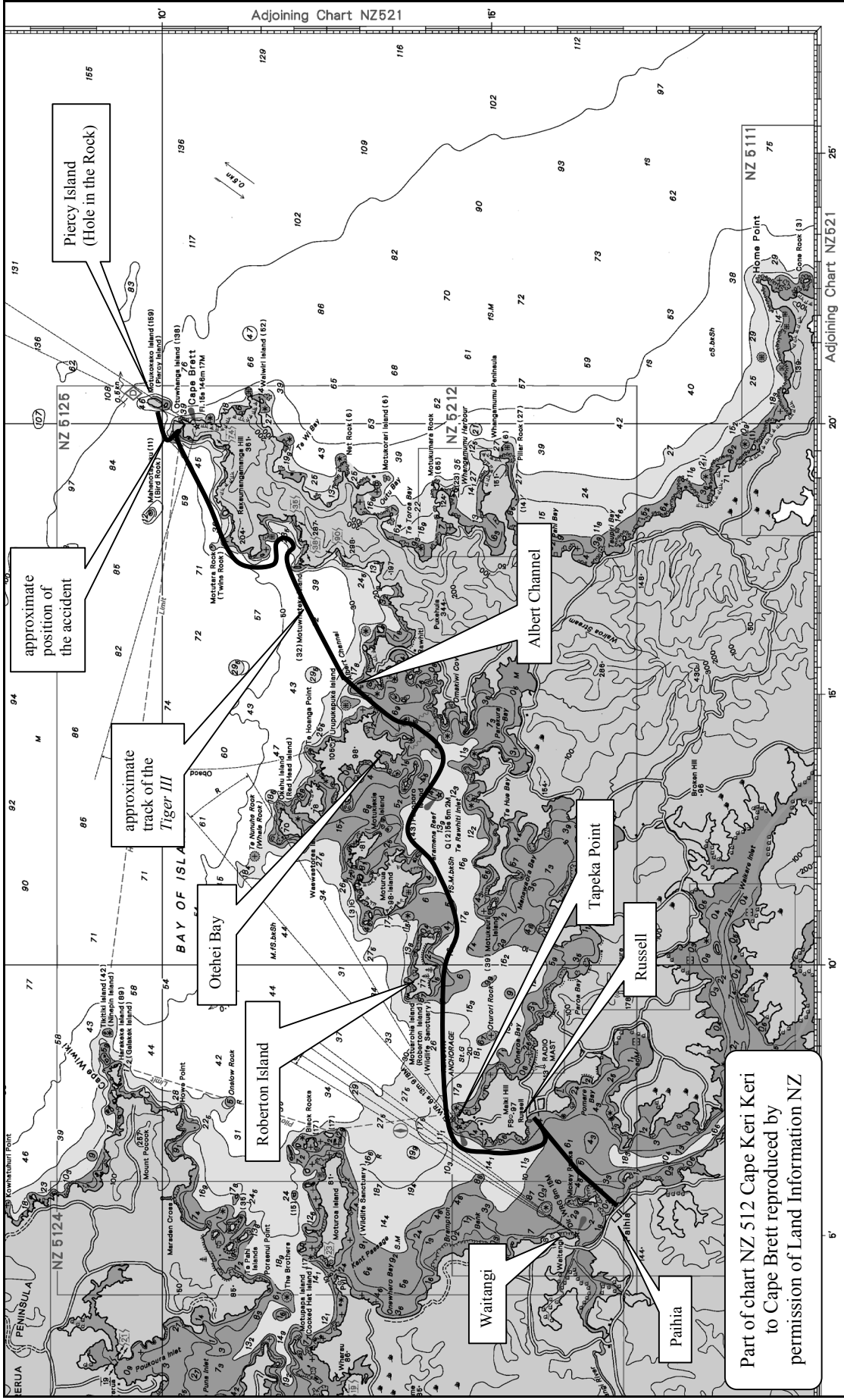
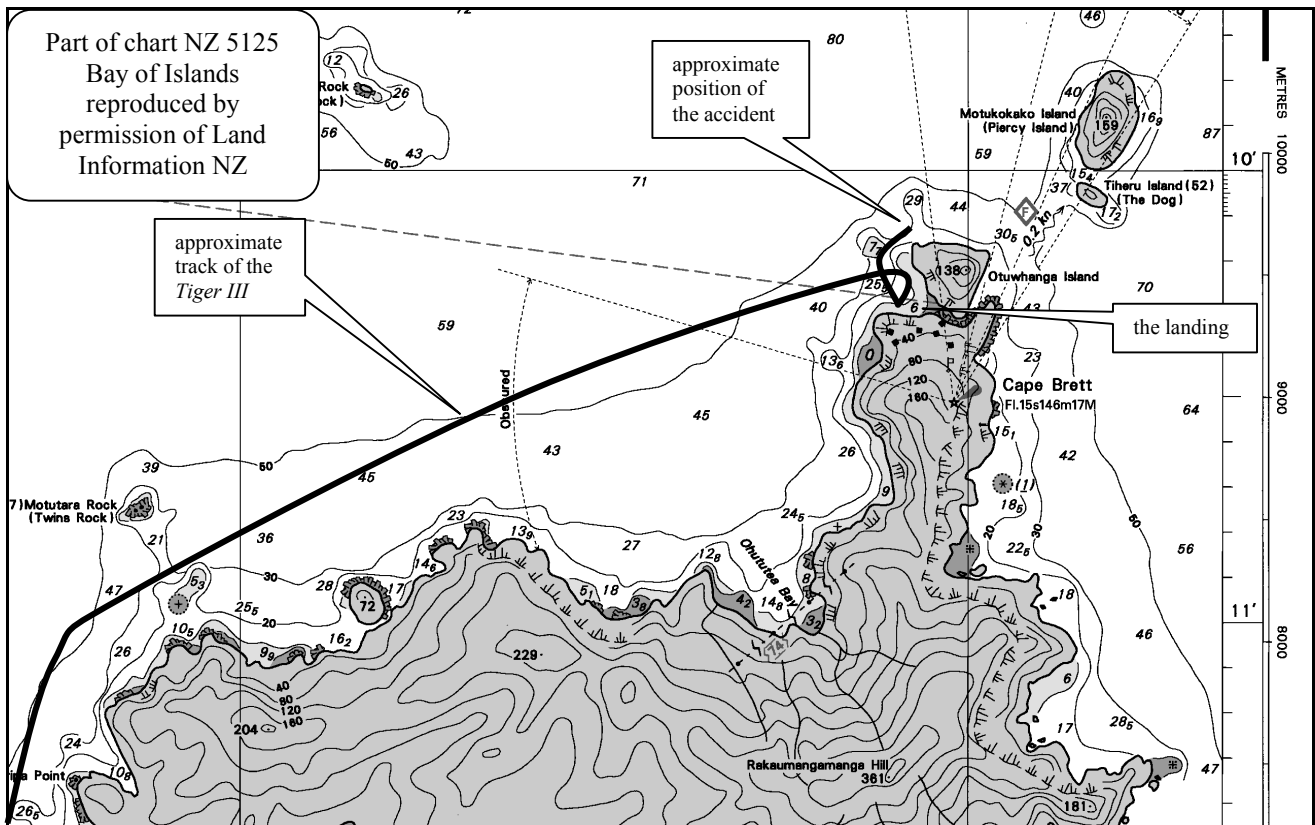


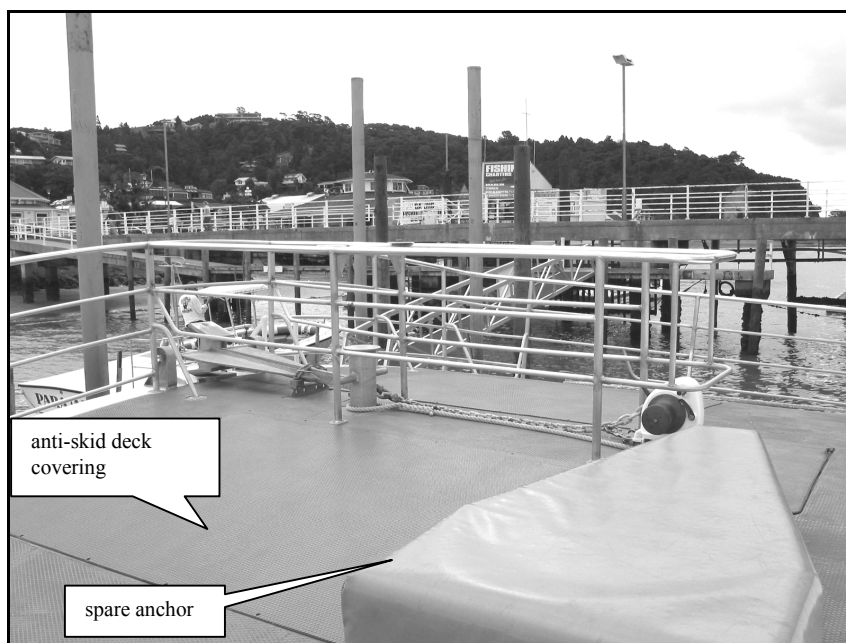
Figure 1  
 Extract of Chart NZ 5125 showing the approximate track of the *Tiger III* on its voyage to the Hole in the Rock



**Figure 2**  
**Extract of chart NZ 5125 showing the approximate track of the *Tiger III* to the Hole in the Rock**

## 1.2 Vessel and trip information

- 1.2.1 The *Tiger III* was a twin-hulled restricted limit passenger vessel built in 1985. It was 20.92 m in length, 8.75 m beam and had a gross tonnage of 181. It held a safe ship management certificate issued by Maritime Management Services on 19 August 2001 that was valid, subject to periodic inspection, until 28 July 2005. It was certified to carry 240 passengers and carried lifesaving appliances for 304 persons.
- 1.2.2 The marine operations manager said it was company policy to restrict the number of passengers to about 210 in order to prevent overcrowding, although this was not stated in the policy or procedures manuals.
- 1.2.3 The vessel was propelled by two 1210 kW Motoren-Werke Mannheim AG diesel engines through fixed-pitch propellers. The engines were controlled from the bridge.
- 1.2.4 The foredeck was mostly clear of obstacles with the anchor and windlass in the centre of the deck, surrounded by railings (see Figures 3 and 4). The only other encumbrance was the spare anchor that was covered by a box with a padded top, which could be, and often was, used as a seat. The railings were stainless steel and of welded construction. The foredeck of the *Tiger III* was covered in a non-slip matting to assist the passengers and crew maintain their footing.



**Figure 3**  
**Foredeck of the *Tiger III* showing the windlass, anchor and spare anchor**

- 1.2.5 When the skipper saw the unusually deep trough he considered what action he could take to minimise the impact. He was concerned that if he slowed down the bow might drop more severely, if he increased speed the bow might crash into the next sea and if he adjusted the course a sideways impact might result. In the event, there was not sufficient time for the skipper to take any action that might have changed the outcome.



**Figure 4**  
**Foredeck of the *Tiger III* from the access to the passenger cabin**

### **1.3 Cape Brett and the Hole in the Rock**

- 1.3.1 The Hole in the Rock completely penetrated Piercy Island from east to west near the southern end of the rock. Another hole near the northern end of the island, on its western side, did not completely penetrate the rock and so formed a large cave, known as Cathedral Cave. When

weather and sea conditions permitted, vessels went through the hole, otherwise they remained outside the entrance to the hole to allow photographs to be taken. The scenic vessels always remained outside Cathedral Cave.

1.3.2 In addition to the usual scenic tours, 2 other companies ran adventure trips to the hole in smaller, fast boats. These boats were designed to power over waves to give the passengers a bumpy, thrilling ride. Weather permitting they transited the Hole in the Rock and entered Cathedral Cave.

1.3.3 Piercy Island was about 550 m to the north-east of Otuwanga Island.

#### **1.4 Personnel details**

1.4.1 The skipper of the *Tiger III* had worked for Fullers Bay of Islands since 1996. He held a commercial launchmaster's certificate (CLM) that had been issued in 1992. He was usually skipper of the dolphin-watching vessel *Tutunui* but regularly relieved on other vessels in the Fullers Bay of Islands fleet. He was the preferred relief skipper for the *Tiger III* when one of the normal skippers was not available.

1.4.2 Beside the skipper, there were 3 crew on the *Tiger III*. The No. 1 deckhand/cabin attendant had been with Fullers Bay of Islands for 15 years and had worked on the vessels for 10 of those. The No. 2 deckhand/cabin attendant had worked for Fullers Bay of Islands for 6 years and the No. 3 deckhand/cabin attendant had worked for Fullers Bay of Islands for about 6 months before the accident.

1.4.3 All the seagoing personnel with Fullers Bay of Islands were rotated through the various vessels in the fleet, which included a car ferry that ran between Opua and Russell and the various scenic cruise boats.

1.4.4 During 2002, Fullers Bay of Islands had trained a number of deckhand/cabin attendants, including the No. 1 and No. 2 deckhands on board the *Tiger III*, for the advanced deckhand certificate (ADH) through a unit standard course run by the Northland Polytechnic. All the students had passed the unit standards but had not collated the necessary documentation for them to apply to the Maritime Safety Authority for a permit to sit the requisite oral examination.

1.4.5 The crews took part in monthly emergency drills on board the vessels. Crewmembers were trained to be able to manoeuvre the vessels and be able to get back to Paihia should the skipper become incapacitated.

#### **1.5 Minimum crewing for the *Tiger III***

1.5.1 In 1994 the Maritime Transport Act superseded the Shipping and Seaman Act 1952. The underlying regulations supporting the Shipping and Seaman Act 1952 were allowed under transitional provisions to remain in force for a certain period to allow new Maritime Rules to be developed and enacted. When preparing the new rules relating to safe crewing, the principles recommended by the International Maritime Organization for minimum manning were used and the methodology was to write overarching rather than the prescriptive legislation that was used in the old regulations. In the case of Maritime Rule Part 31B - Crewing and Watchkeeping - Offshore, Coastal and Restricted (non-Fishing Vessels), this resulted in operators having to identify the minimum crewing necessary to operate the vessel safely, taking into account all aspects of their operation. There was also a recognition that the type of vessel and the numbers of passengers carried had changed over the years, resulting in more passengers being carried on smaller, usually multi-hulled, vessels. Engineering was approached in a similar way with the number of major engineering systems on the vessel and the engine horsepower being the factors taken into account when determining the level of qualification required on board.

- 1.5.2 Maritime Rules Part 31B was signed by the Minister of Transport on 18 December 2000 and came into force on 1 February 2001. A delayed enactment date was provided for 3 sections of Part 31B. They were:
- The requirements in rule 31B.8(4) for medical training come into force on 1 February 2002.
  - The requirements in Tables 2 to 8 for vessels of less than six metres in length overall come into force on 1 February 2003.
  - The requirement in Table 4 for the carriage of deckhands comes into force on 1 February 2003.
- 1.5.3 Part 31B, 6.2b required that a vessel carrying more than 50 passengers in the inshore area be issued with a minimum safe crewing document by the Director of Maritime Safety. The Acting Director of Maritime Safety had issued the *Tiger III* with such a document on 28 November 2002.
- 1.5.4 When in the inshore area and carrying between 115 and 178 passengers, as the *Tiger III* was at the time of the accident, the minimum safe crewing document required that it have the following personnel:
- a master with New Zealand Offshore Watchkeeper (endorsed)
  - a mate with Inshore Launchmaster
  - one crew member with Advanced Deckhand
  - one other crewmember.
- 1.5.5 The *Tiger III*'s minimum safe crewing document was endorsed to the effect that the 2 regular skippers, who were named in the document, were able to operate the vessel in inshore limits with the lesser certificate of CLM but all other masters were required to hold a minimum of a New Zealand Offshore Watchkeeper certificate (endorsed) (NZOW). The NZOW was a certificate for persons in charge of a navigation watch but not in command of a vessel. The "(endorsed)" referred to the requirement that when used by a skipper in the inshore area, that person was required to have held and used a CLM certificate, indicating that they had previous command experience
- 1.5.6 In addition to the requirement to have a minimum safe crewing document, Part 31B generally required higher qualified personnel and increased the crew to passenger ratio than that required under the Shipping (Manning of Restricted-Limit Ships) Regulations 1986. For example a person who operated a vessel carrying over 100 passengers in the inshore area was required under the Regulations to hold a CLM, while under Part 31B the next level of certification, a NZOW, would be required. There was also the requirement to carry an engineer on some vessels where the engineering component of the CLM used to suffice; this was not the case for the *Tiger III*. The increased personnel and the consequential increase in running costs caused the Marine Transport Association and a number of operators to challenge the new legislation. In response to the concerns of the operators, the Maritime Safety Authority completed a cost benefit analysis and an international benchmarking study in May 2003. The results of these reviews were compiled into a discussion document that was circulated to the principal operators and their association. A meeting between interested parties to discuss possible amendments to the rule and the way it was administered was planned for 23 July 2003.
- 1.5.7 On 23 July 2003, the "Target B" (the Maritime Safety Authority's strategic goal of a 50% reduction in the number of fatalities, accidents and mishaps involving New Zealand passenger vessels by the year 2006) advisory group met. This group consisted of representatives from the industry, the Maritime Safety Authority and the Marine Transport Association. The Part 31B discussion document including the benchmarking study and cost benefit analysis were

discussed. A working group was formed and comprised Maritime Safety Authority staff and industry representatives to formulate the principles that should be followed when assigning minimum manning, laying down guidance for risk assessment of boats applying for the minimum safe crewing document and to modify and finalise an "indicative manning scale" for the advisory circular to accompany Part 31B.

- 1.5.8 The advisory group also discussed the ADH qualification. The Maritime Safety Authority recognised that there were several anomalies with this qualification. The Maritime Safety Authority was charged with the task of determining whether the requirement for the ADH came from the Maritime Rule or from the advisory circular. In addition, they were tasked with looking generally at manning issues in the New Zealand passenger vessel industry, in particular the way Part 31B is applied and the qualifying sea service required for the ADH certificate as contained in Maritime Rules Part 32. The next meeting for the advisory group was planned for 8 October 2003, by which time the non-legislative tasks were scheduled to be completed.
- 1.5.9 Maritime Rules Parts 31B and 32 were scheduled for amendment and the provisional timetable for the legislative process was that the amendment would be released for public consultation in March 2004, and the final draft would then be published in June 2004, with probable enforcement towards the end of 2004.
- 1.5.10 Despite operators and individuals raising concerns over the availability of ADH and NZOW courses, a number of ADH courses offered by training providers were cancelled during 2002 because of insufficient interest in the courses.
- 1.5.11 Both the ADH and NZOW could be gained by either attending a training facility or completing the prescribed unit standards remotely. An oral examination by a Maritime Safety Authority approved examiner was required in either case before a certificate was issued.
- 1.5.12 The Maritime Safety Authority approved 5 nautical education providers who offered the ADH course either in block form at the colleges or through correspondence learning. The college based courses were at set times and required a guaranteed number of trainees for them to run. The colleges that offered that type of training offered about 10 courses per year between them, plus one college offered the course "on demand". Correspondence learning was less restrictive but the final oral examination had to be co-ordinated so that the external examiner could examine all the students during one visit. A total of 4 NZOW block courses were offered annually by 3 training providers throughout the country but correspondence learning was more readily available for this certificate than the ADH.
- 1.5.13 On 20 June 2003, the Maritime Safety Authority database indicated that there were 79 NZOW and 32 ADH certificates valid in New Zealand. At the same time it was estimated that there were about 25 restricted limit passenger vessels able to carry more than 100 passengers in the inshore area.
- 1.5.14 After finding that the personnel on *Tiger III* did not meet the requirements of the operator's minimum safe crewing document and being told that the operator was having difficulty complying with Part 31B, the Commission investigated whether there were any other operators in a similar situation. Several respondents from industry said that at times the majority of operators in the restricted limit passenger industry experienced difficulty complying with the provisions of Part 31B. Operators indicated that even where staff training was a priority, staff turnover often resulted in there being insufficient suitably qualified persons to comply fully with the provisions of the rule or the vessel's minimum safe crewing document, particularly because the industry was seasonal and it was often not possible to train temporary staff to provide compliance.



## 1.6 Procedure and policy manuals

1.6.1 Fullers Bay of Islands operated a Safe Ship Management System provided by Maritime Management Services Limited. The principal documentation was a Policy Manual describing the overview of the company's business and its operation, and Operation Manuals detailing the procedures for the day-to-day running of each of the vessels.

1.6.2 Section 7.1 of the Operations Manual for the *Tiger III* detailed its operating parameters. This included:

- Operations at Motukakako Island (Piercy Island) to be in accordance with company policy – procedure manual.

The company Policy Manual had an additional section that covered the Cape Brett operation and concentrated on the precautions that should be taken when transiting the Hole in the Rock. This was not a controlled and numbered part of the manual and did not cover passenger access to the foredeck and limiting sea and weather conditions.

## 1.7 Weather, tides and currents

1.7.1 An automatic weather station was situated on the Purerua Peninsula, 35.117° S 174.017° E, about 16 miles to the west of the accident position. Data from that station, supplied by the National Institute of Water & Atmospheric Research (NIWA), indicated that over the 2 days before the accident the wind was predominantly from the easterly quarter. The average wind for the hour preceding the time of the accident was 12 knots from 080° (T).

1.7.2 NIWA were commissioned to supply tidal data for the Cape Brett area for the time of the accident from a computer model. The graph of that data is contained in Figure 5. From the upper graph it can be seen that the accident occurred shortly after low water. At that time the current was flowing towards the east at a rate of less than 0.1 knots.

1.7.3 High water at Auckland was at 1936 on 18 March. The tidal stream information contained on Chart NZ 5125, Bay of Islands indicated that at 5 hours before high water Auckland the current would be flowing 119°(T) at 0.2 knots, similar to that shown by the NIWA tidal model.

1.7.4 The New Zealand nautical almanac predicted a low water of 0.3 m at 1327, at the secondary port of Whangamumu Harbour, about 5 miles south of Cape Brett.

## 1.8 Safety briefing

1.8.1 When *Tiger III* left Russell, where the last passengers joined them, the skipper gave the statutory safety briefing over the personal address system. The requirement that the skippers give the briefing and the content of that briefing were contained in the ship's Operations Manual, section 3.2. which stated, in part:

“All passengers are instructed to take great care and ensure they are holding on securely whilst moving around the vessel.”

1.8.2 Passengers on the trip confirmed that the skipper did give a full briefing, which included where the lifejackets were stowed and the need for passengers to hold on securely at all times, particularly when moving about the vessel.

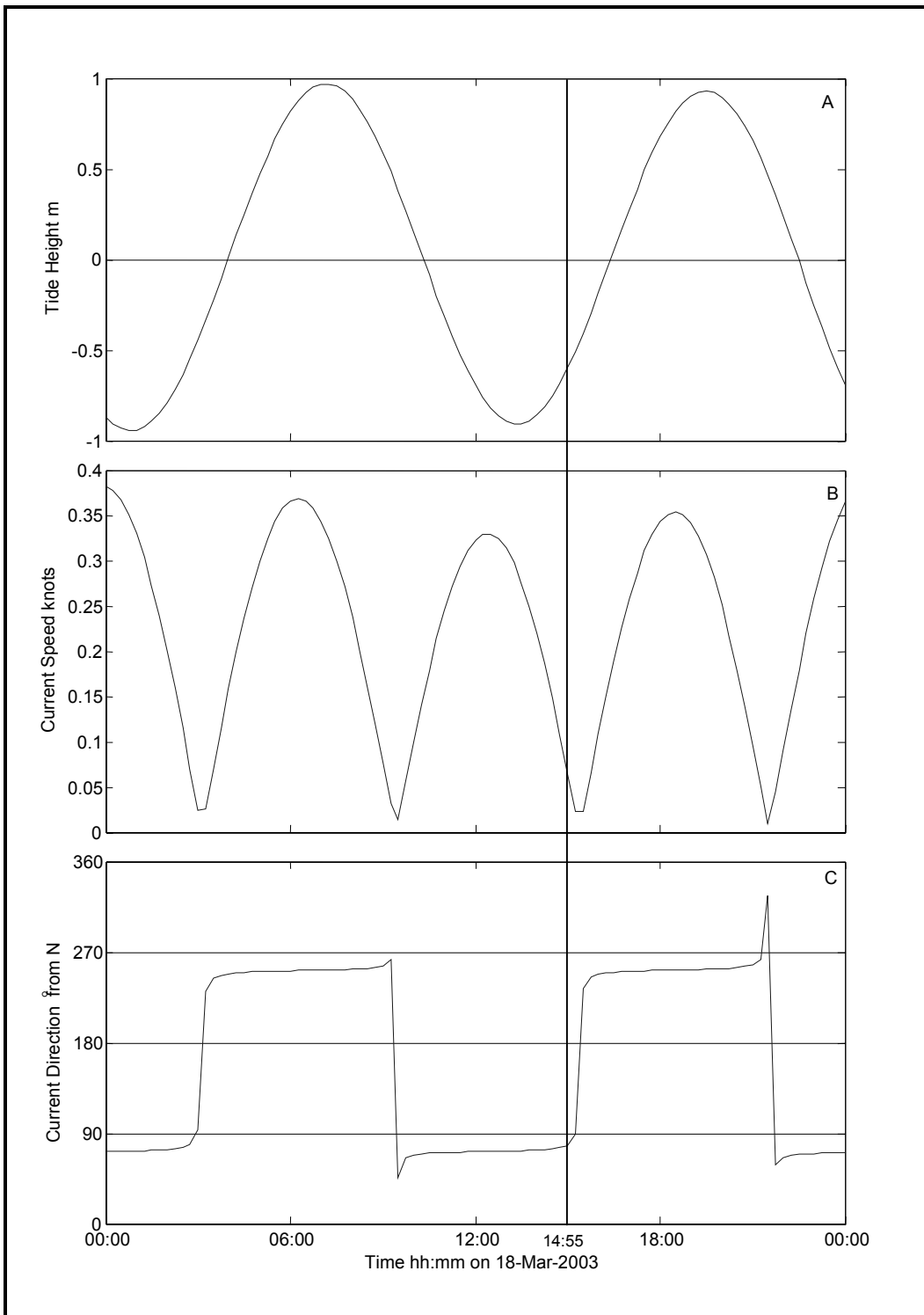
1.8.3 During the voyage, the skipper repeated the warning to hold on several times, including when the door to the foredeck was initially opened at Robertson Island, before the vessel went through the Albert Channel and on leaving the landing on the way out to Piercy Island.

## 1.9 Waves<sup>2</sup>

- 1.9.1 One of the passengers was videoing the trip and had his camera pointing forward over the bow immediately before and at the time the vessel fell into the trough. The video footage clearly shows a prevailing moderate sea of between one and one and a half metres from the direction of Piercy Island. As the vessel was clearing Otuwhanga Island a wave with a slightly higher crest appeared, which caused the bow to rise up slightly before falling into the following trough, which was not unusually deep. The following crest was higher again, over 2 m and the bow rose up this crest but there was a deep and steep trough behind it. The bow of the vessel fell sharply into the trough and when it landed, the passengers that had levitated in the reduced gravity caused by its rapid descent, crashed into the now rising deck.
- 1.9.2 The formation of waves is a complex process. They are formed by wind blowing across the surface of the sea. The longer and stronger the wind blows the more the resultant waves increase in size and frequency. The direction of the wind determines the direction of the developing waves. In practice, however, the height and direction of waves are a combination of sea and residual waves.
- 1.9.3 When a wave encounters an island the part of the wave close to the island is slowed while those parts in the deeper water continue at their original speed. This results in the wave being refracted around each side of the island. As the wave splits around the island, the directions of the wave trains passing on either side are turned towards each other. When 2 waves merge, their sinusoidal forms can synchronise or oppose each other resulting in increased wave height or decreased wave height respectively (see Figure 7). When the 2 wave trains rejoin after they have passed around an island they create a confused sea where the wave heights can vary from almost zero to twice that of the original wave. These are called clapotic waves (see Figure 6). Consequently, the often expected protected area on the leeward side of the island can be unexpectedly rough.

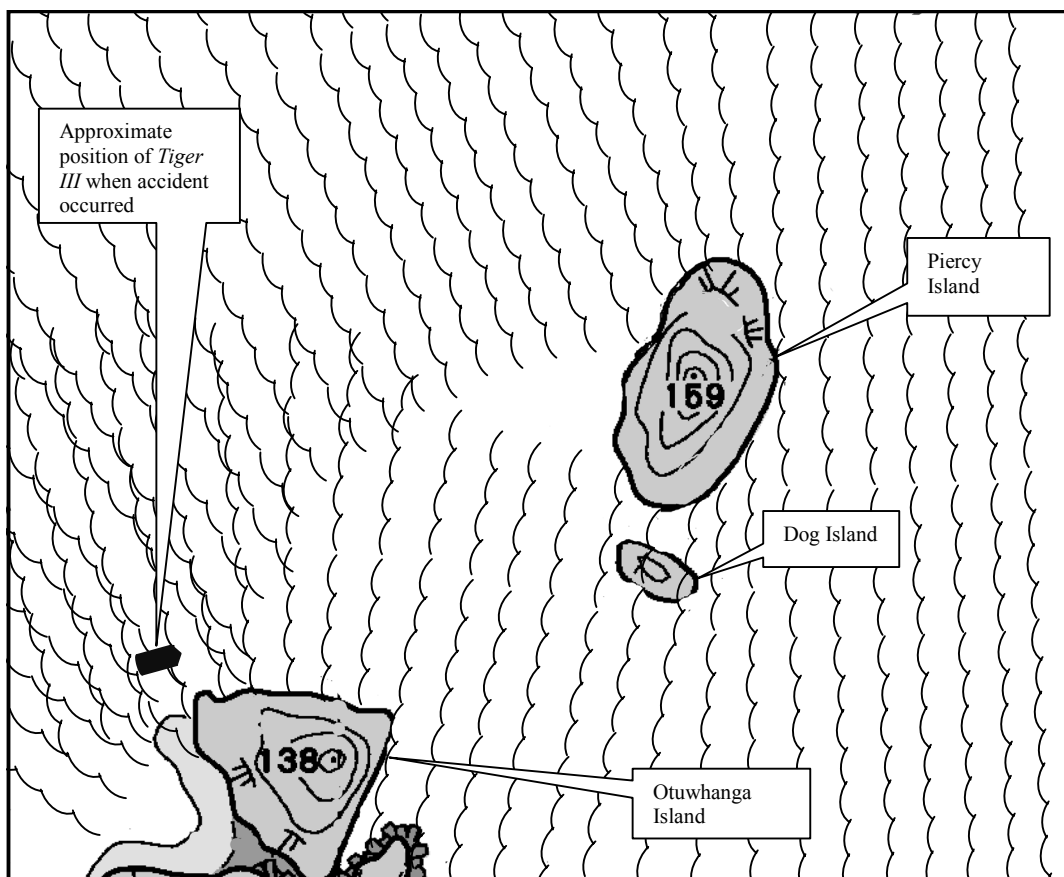
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<sup>2</sup> Reference: Fast Boats and Rough Seas by Dag Pike 1989 and Introduction to Waterways by Prof. G D Crapper 1984

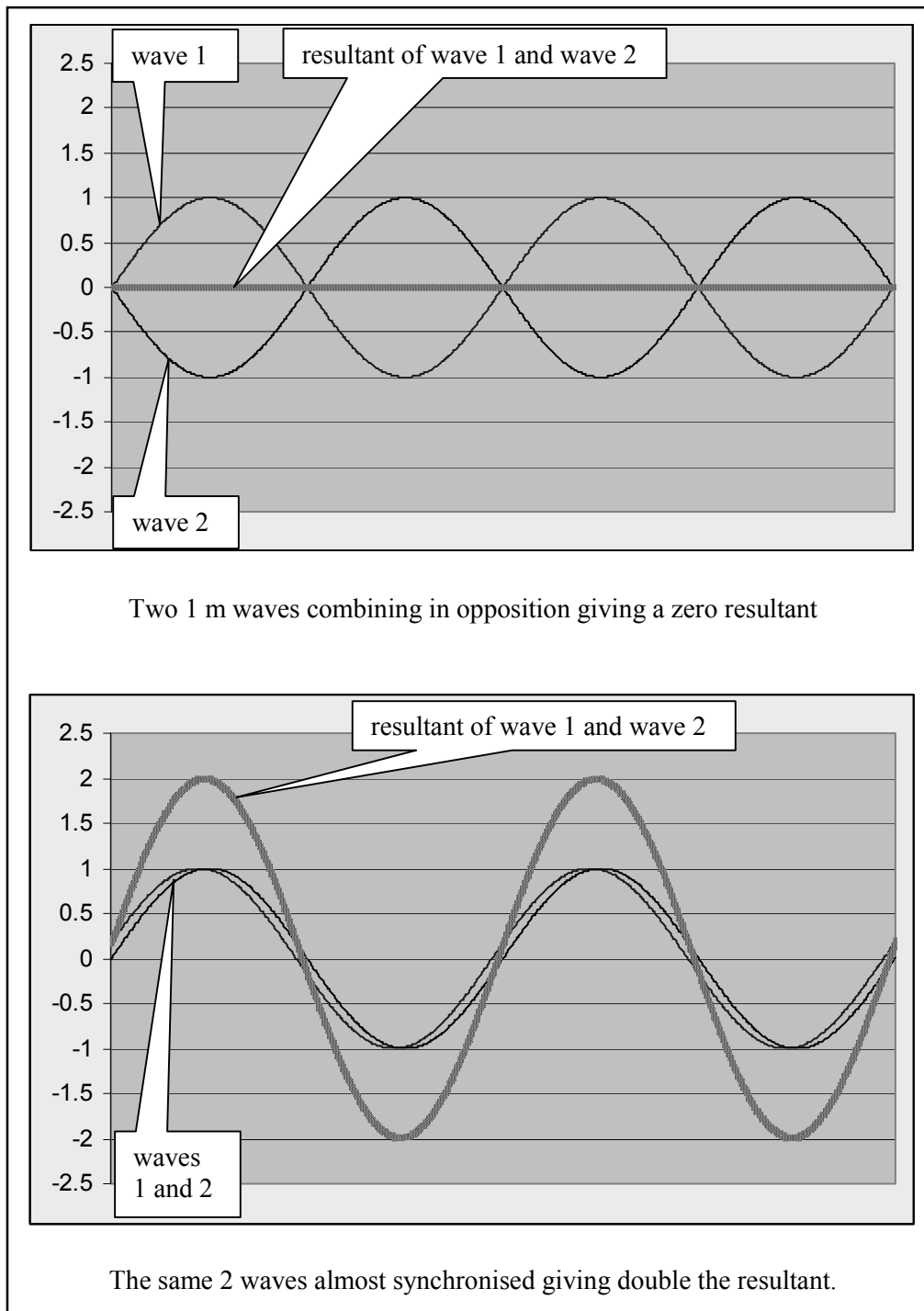


**Figure 5**  
**Tide height, current speed, and current direction for position of the accident.**  
**The vertical line indicates the time of the accident**

- 1.9.4 When a mass of water encounters a shelving sea bottom, the part of the water mass in contact with the bottom is slowed through friction, which causes the waves to slow, reducing the wavelength and increasing its gradient. Eventually, as seen on beaches, the wave becomes unstable and breaks.
- 1.9.5 In the Cape Brett area an easterly sea divides around Piercy Island and comes together again in the vicinity of the northern tip of Otuwhanga Island. The video footage of the accident indicated that the sea was coming from the direction of Piercy Island. The waves approaching Cape Brett would be affected by the landmass of the headland and the islands and also by the shoaling bottom. Figure 6 indicates the possible paths of wave trains in an easterly sea in the vicinity of Cape Brett.
- 1.9.6 When talking about waves it is normal to focus on the height of the crest of a wave but because of their sinusoidal form, each crest must have a corresponding trough, which will be of similar depth to the height of the crest. However, where an unusually high crest can be seen easily at a distance an unusually deep trough may not be seen until it is imminent.
- 1.9.7 The National Institute of Oceanography produced figures on the unpredictability of waves. One wave in 23 will be twice the average height, one in 1175 will be 3-times the average height and one in 300 000 will be 4 times the average height.



**Figure 6**  
**Piercy Island and Otuwhanga Island showing wave refraction around landmasses and shoal areas**



**Figure 7**  
**Diagram to show the minimum and maximum resultant**  
**of 2 waves combining**

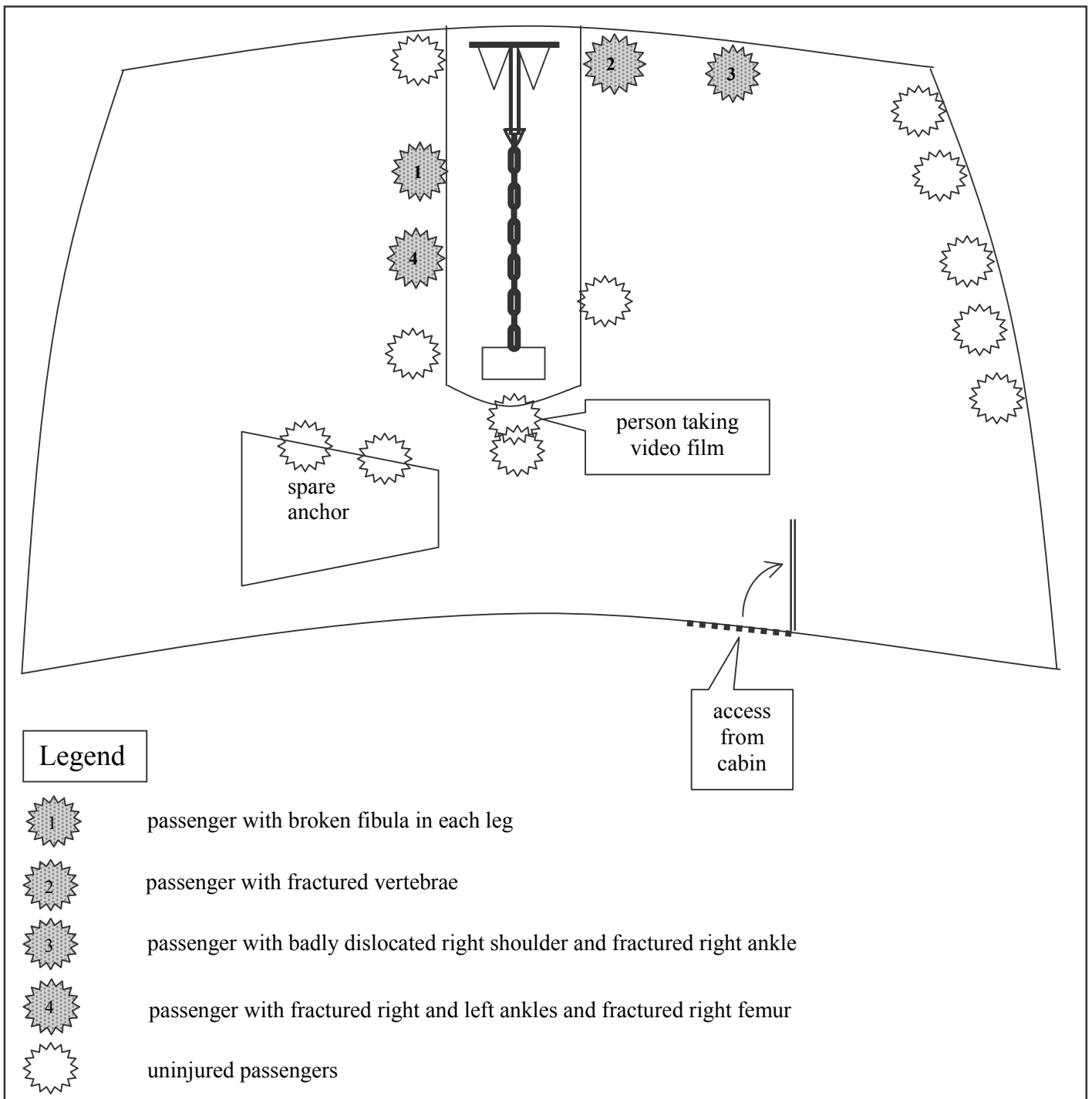
## 1.10 Injuries sustained by the passengers

1.10.1 Four passengers on the foredeck (see Figure 8) sustained serious injuries. They were:

- broken fibula in each leg
- fractured vertebrae
- badly dislocated right shoulder and fractured right ankle
- fractured right and left ankles and fractured right femur.

Three other passengers reported minor injuries that were checked but did not require further medical treatment.

1.10.2 Apart from those on the foredeck, no other passengers suffered any injuries.



**Figure 8**  
**Foredeck of the *Tiger III* showing position of injured passengers**

## 2 Analysis

- 2.1 In accordance with the company's operation procedures, a comprehensive safety briefing was given to the passengers and they were reminded at pertinent times about the need to hold on while the vessel was moving. From the video footage it appeared that most of the passengers were in fact holding on, particularly those who were injured. However, when the bow fell away it was sufficiently sudden and violent to surprise the passengers, some of whom were unable to maintain their footing.
- 2.2 The formation of waves and their resulting size, frequency and direction is a complex process and dependent on many variables. A simple wave formed when a steady wind blows over the sea surface does not remain simple for long as other factors alter its size and shape. On this occasion, the predominant easterly wind during the previous 48 hours had been interspersed with brief periods of wind from other directions resulting in a mainly easterly sea with smaller secondary waves from other directions. When the waves encountered the coastline and islands they suffered refraction and also ran onto shoaling beaches where their form was changed. Added to this, the wind-driven waves merged with swell waves further modifying the combined waveform. The resultant was a wave of irregular height, frequency and direction. The wave that caused the accident was identified by the passengers and crew of the *Tiger III* as a rogue or freak wave. However, an understanding of the formation of waves and knowledge of the prevailing conditions might have alerted an observer to the possibility that unusual waves could be expected in the area between Piercy Island and Otuwhanga Island.
- 2.3 The sudden and unexpected appearance of the unusually deep and steep trough made it almost impossible for the skipper to take any action to reduce the impact. Once the higher than usual wave was seen, any action taken by the skipper would not have had time to affect the outcome.
- 2.4 The current at the time of the accident was negligible and was unlikely to have had any effect on the sea conditions.
- 2.5 The accident happened soon after the vessel had departed the landing and was altering course around the northern end on Otuwhanga Island. It was not travelling particularly fast, between 10 and 12 knots, which might have been a reasonable speed for such a vessel in the prevailing sea conditions, but not with people on the foredeck.
- 2.6 The injuries sustained by the passengers were consistent with the vertical and horizontal impact forces sustained when they hit the foredeck. The compression forces of impact caused one vertebral fracture, and there were a number of limb injuries caused either by compression or flailing. The dislocated right shoulder was consistent with the person being violently swung around while holding on with that arm.
- 2.7 The foredeck of the *Tiger III* was free of obstacles except for the spare anchor. The railings were of a suitable height and size to give a firm handhold. The non-slip matting on the foredeck of the *Tiger III* should have assisted the passengers in keeping their footing but the forces involved were sufficient to prevent this. The matting would have provided a limited amount of cushioning on the aluminium deck but was not sufficient to prevent the severe impact injuries.
- 2.8 The personnel on board the *Tiger III* did not hold the necessary minimum qualifications required by the vessel's minimum safe crewing document for the number of passengers carried. The vessel had the correct number of crew but they did not hold the appropriate certification. The qualifications of the crew met the minimum manning that was required under the superseded manning regulations rather than that required by the minimum safe crewing document. The skipper held a CLM, the same certificate that the regular skippers were exempted to operate with, but he had not been similarly exempted. The No. 1 and No. 2 deckhand/cabin attendants had completed the unit standard sections required for ADH but had not submitted the relevant documentation to the Maritime Safety Authority for the issue of a permit to sit the oral examination and so had not been able to sit that examination. All

personnel employed on the vessels took part in monthly emergency drills and were trained to manoeuvre the vessels so that they could take over in the event of a skipper's incapacitation.

- 2.9 Following the accident the crew took appropriate measures to stabilise and comfort the injured persons. The response to the emergency situation by the skipper, crew and shore base was timely and effective.
- 2.10 The overarching style of Maritime Rules compared to the prescriptive way the old regulations were written changed the way that the Maritime Safety Authority addressed the issues relating to the way vessels were manned and operated. Among other things, Part 31B addressed the increase in passenger numbers on smaller vessels and required operators to provide sufficient trained crew to be able to safely handle any emergency. This generally resulted in an increase in the number of crew or required them to hold higher qualifications or a combination of each. There was a 2-year gap between the date the rule came into force and the date on which the carriage of crew with ADH certificates came into effect. However, during that time there had not been sufficient urgency placed by operators or the Maritime Safety Authority, on training the required number of people to meet the demand. Consequently, at the time of this accident a number of operators were having difficulty fully complying with manning requirements with particular regard to the carriage of crew with ADH certificates.
- 2.11 For operators to fully comply with the provisions of Part 31B and their minimum safe crewing document, they had to either cease operations or reduce passenger numbers or reduce the regularity of their service or a combination of these measures. The alternative was to continue operating, while their staff sat the required qualifications and the Maritime Safety Authority consulted with industry to address the issues surrounding Part 31B, with the same crew numbers and qualifications as they had been doing before Part 31B came into force and remain in breach of the rule.
- 2.12 The Maritime Safety Authority had put in place a process of consultation with industry and their representatives to discuss and progress issues arising from Part 31B. That rule and also Part 32 – Qualifications, were programmed to be reviewed by March 2004, with implementation later that year.
- 2.13 The company and vessel procedure and policy manuals were controlled documents but they did not fully reflect the operation of the vessel. In addition, sections had been added, for example the Cape Brett Operation, which were additional to the controlled documents.
- 2.14 The video tape evidence showing the sudden and rapid increase in the sea conditions assisted identifying the sequence of events leading to the accident.

### **3 Findings**

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

- 3.1 *Tiger III* encountered a sudden increase in the size of the waves and their associated troughs, resulting in the bow of the vessel falling violently into a trough. As the foredeck started to rise again, passengers crashed into the deck and were subjected to impact and flailing injuries.
- 3.2 The injuries sustained by the passengers were commensurate with the forces imparted on them by the falling and rising foredeck of the *Tiger III*.
- 3.3 The skipper and crew of the vessel managed the post accident situation competently.
- 3.4 The sudden increase in wave size was described as a rogue or freak wave but the conditions prevailing at the time should have alerted the skipper that such large waves might be expected in that area.



- 3.5 The crewing of the *Tiger III* did not meet the requirements of Part 31B - Crewing and Watchkeeping - Offshore, Coastal and Restricted (non-Fishing Vessels) and the minimum safe crewing document.
- 3.6 The lack of certification did not contribute to the accident or detract from the care that was available to the injured parties.
- 3.7 Operators in the New Zealand restricted limits passenger industry often found it difficult to comply with Part 31B as it was drafted and administered. However, the Maritime Safety Authority had put in place a consultation process with industry representatives with a view to reconciling the practical and financial problems that were being faced.

## 4 Safety Actions

- 4.1 Immediately after the accident Fullers Bay of Islands added a paragraph to the company Policy Manual section that covered the Cape Brett operations, which stated:

Use of Foredeck Area – *Tiger III/Tangaroa*

All skippers must employ extreme caution before allowing passengers to travel on the foredeck of our vessels. Flat water or a low evenly spread swell are generally acceptable conditions but at all times good seamanship and a vigilant lookout MUST be maintained. In any other conditions the foredeck will be closed to passengers.

- 4.2 The Maritime Safety Authority prepared a cost benefit analysis and an international benchmarking study, which was completed in May 2003. In July 2003, they convened the "Target B" advisory group where a working group was formed to investigate the difficulty complying with Part 31B being faced by the industry and to put in place guidelines on risk assessment and principles on which manning levels may be assigned. In addition, the process of drafting amendments to Parts 31B and 32 was commenced.

## 5 Safety Recommendations

Safety recommendations are listed in order of development and not in order of priority.

- 5.1 On 24 September 2003, the Commission recommended to the Chief Executive Officer of Fullers Bay of Islands that he:
- 5.1.1 In conjunction with the safe ship management company, review and revise the operations manual for the *Tiger III* and the policy manual for the company to reflect the actual practices and procedures. This should include the operation at Cape Brett and the conditions in which passengers are allowed onto the foredeck. (039/03)
- 5.1.2 In conjunction with the Maritime Safety Authority fully implement the provisions of Maritime Rule Part 31B - Crewing and Watchkeeping - Offshore, Coastal and Restricted (Non-Fishing Vessels) and ensure that all company vessels are operated with the appropriate number of suitably qualified personnel. (040/03)
- 5.2 On 2 October 2003, the Chief Executive Officer of Fullers Bay of Islands replied, in part, as follows:

As per your letter, there is a definite need for further work to be carried out before this safety recommendation can be implemented, and therefore I understand the status of this recommendation will remain "Open", in the interim.

5.3 On 24 September 2003, the Commission recommended to the Director of Maritime Safety that he:

Urgently consult with industry and put in place temporary measures that will enable those operators who are having difficulty complying with the present manning requirements to continue operating, so long as the temporary measures are consistent with safe operation. These measures should be in place until the amendments to Part 31B - Crewing and Watchkeeping - Offshore, Coastal and Restricted (Non-Fishing Vessels) and Part 32 – Qualifications, come into force in 2004. (041/03)

5.4 On 20 October 2003, the Director of Maritime Safety replied, in part, as follows:

I would also confirm that the MSA accepts the Commissions final recommendation 041/03 and notes that MSA has been working alongside industry for some time and has developed more effective measures to implement the intent of Rule 31B.

This has included a recent meeting of 8 October where a minimum crewing assessment template was agreed between industry and MSA, and a new qualification for deckhands was proposed to allow for new entrants to enter the industry and an alternative training path.

Approved for publication 24 September 2003

Hon W P Jeffries  
Chief Commissioner



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