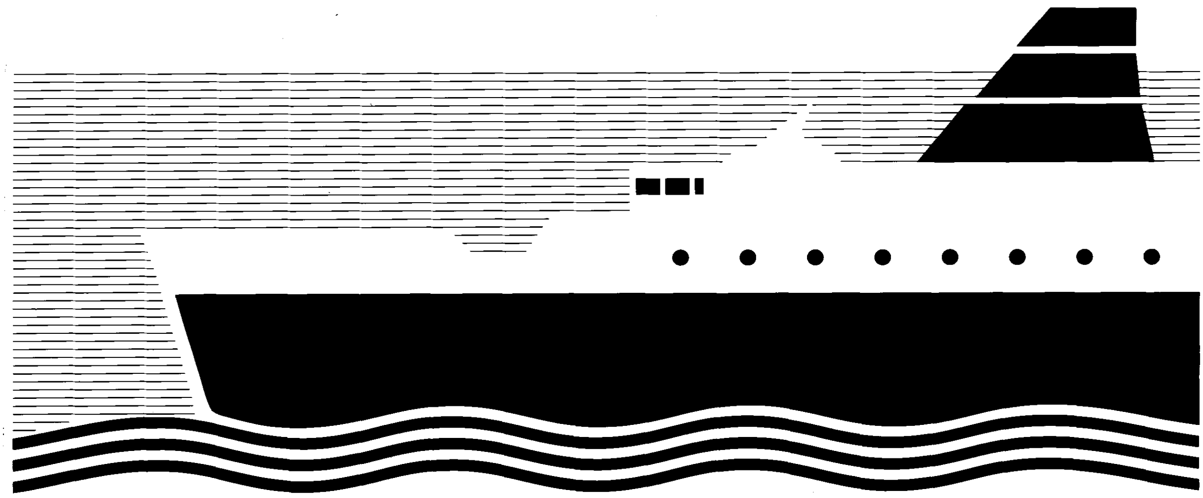
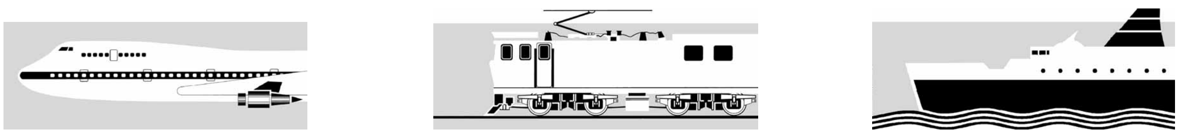


MARINE OCCURRENCE REPORT

04-212 Fishing vessel *Iron Maiden*, foundering, off Pandora Bank, Northland 16 August 2004



TRANSPORT ACCIDENT INVESTIGATION COMMISSION
NEW ZEALAND

Report 04-212

fishing vessel
Iron Maiden

foundering

off Pandora Bank
Northland

16 August 2004

Abstract

On Monday 16 August 2004, the restricted limit fishing vessel *Iron Maiden* foundered to the south of Pandora Bank, off the Northland west coast, with the loss of the 2 crew. The boat was on a delivery voyage from Mangonui on the east coast to Raglan about halfway down the west coast of North Island.

At 1908, the skipper of the *Iron Maiden* sent a distress signal, which was simultaneously received by Far North Coast Guard Radio and Taupo Maritime Radio. The skipper said that the boat was taking on water and that the crew were going to abandon ship in the near future. In his last transmission shortly after 1911, the skipper said they were to the west of Pandora Bank, but did not give a precise position. An extensive search and rescue operation was mounted and a helicopter located the boat's liferaft at about 2242. The helicopter pilot and observer could not confirm whether anyone was in the liferaft, and the weather conditions prevented winching operations.

One of the searching vessels recovered the body of the skipper at 0422 the following morning, but the body of the other crewman was not found.

The safety issues identified included:

- crew certification on restricted limit fishing boats
- the use of drugs while in command of a boat
- arrangements for the rapid freeing of water from the decks of a boat.

Safety recommendations were made to the Director of Maritime Safety and the General Manager Trade and Education of the Seafood Industry Council to address these issues.

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Abbreviations

CLM	commercial launchmaster
EPIRB	emergency position indicating radio beacon
ILM	inshore launch master
kg	kilogram(s)
kVa	kilovolt amperes
kW	kilowatt(s)
m	metre
mHz	megahertz
mm	millimetre(s)
MEC6	marine engineer certificate class 6
nm	nautical mile(s)
RCCNZ	Rescue Coordination Centre New Zealand
ROV	remote-operated vehicle
SSB	single side band
THC	tetrahydrocannabinol
USL	Australian Universal Shipping Laws
VHF	very high frequency

Glossary

ballast	weight put into a ship to improve its stability or its trim
bulwark	solid rail around the deck of a vessel to prevent things going overboard and seas coming aboard
coaming	vertical side of a hatchway
dog(ged)	a heavy latch used to secure hatches and watertight doors
free(ing)	the removal of water from the deck of a boat
free surface effect	the loss of stability caused by the movement of liquids within a compartment
hook bin	bin in which the traces and hooks that clip onto the long line are stowed
hydrostatic release	a water-pressure-operated fastening that secures a liferaft. It automatically releases when a sinking vessel reaches a pre-determined depth, usually between one and 5 metres
inclining experiment	deliberate listing of a vessel to determine its stability
Mayday	radiotelephone distress signal requesting immediate assistance
port	an opening in the ship's side through which water can flow overboard
port (side)	left hand side of a vessel when looking forward
scupper	an opening in a deck or a gap between the sheer strake and the bulwark, that allows water to run off the deck and drain back into the sea
seacock	ship side valve usually on the engine cooling and bilge pipe systems
sea door	door or gate in a bulwark for access onto or off a vessel
sheer strake	the uppermost line of hull side plating – where it meets the deck plating
side scan sonar	a device that maps the sea bottom by transmitting and receiving sound signals
slack tank	a tank that is less than full
slurry bin	a watertight container, in which a mixture of ice and water is kept. It is used to cool fish quickly to maintain its quality
stabilising arm	a structure that improves the sea keeping characteristics of a boat without necessarily improving its stability
starboard (side)	right-hand side of the vessel when looking forward
stern gland	the water seal where the propeller shaft emerges from the ship
stowed	secured away in an orderly manner
tetrahydrocannabinol	the active chemical in cannabis
transversely	at right angle to the fore and aft line of the ship, across the ship

Data Summary

Vessel particulars:

Name:	*Iron Maiden*
Type:	restricted limit fishing vessel
Safe ship management company:	Nortel (1998) Limited
Limits:	New Zealand coastal limits within 100 miles of the coast including Stewart Island and the Chatham Islands
Length:	18.28 m
Breadth:	5.24 m
Gross tonnage:	72
Built:	1980 at Seaford, Australia
Propulsion:	General Motors 8V 71N diesel engine, which developed 172 kW and drove a single fixed-pitch 3-bladed propeller
Service speed:	8.5 knots
Owner/operator:	Maritime Solutions Limited
Home port:	Tauranga
Crew:	2
Date and time:	16 August 2004 at about 1910[1]
Location:	off Pandora Bank Northland
Persons on board:	crew: 2
Injuries:	crew: 2 fatalities
Damage:	vessel sunk
Investigator-in-charge:	Captain Doug Monks

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

The *Iron Maiden*

The Commission acknowledges the invaluable assistance of the New Zealand Defence Force, and in particular, that of the Captain and crew of *HMNZS Manawanui* in searching for, finding and videoing the wreck of the *Iron Maiden.*

1 Factual Information

1.1 Narrative

1.1.1 On Sunday 15 August 2004, the owner of the *Iron Maiden* drove the skipper and deckhand to Mangonui for them to join the restricted limit fishing vessel. The skipper and deckhand were new to the boat and the owner had employed them to deliver the boat to Raglan.

1.1.2 At about 0930, the owner picked the skipper up from his house in Cambridge, Waikato, and they drove to Tauranga to remove a chart plotter, an autopilot and some tools from the *Infidel*, another fishing boat belonging to the owner. They then drove north, collecting the deckhand from Helensville on the way.

1.1.3 After buying some provisions, they arrived at Mangonui at about 1730.

1.1.4 The skipper of another boat, the *Liberty*, took the 3 men out to the *Iron Maiden*, which was on a mooring in the harbour. They spent about 45 minutes checking over the boat before the skipper and deckhand manoeuvred it to the wharf. The owner returned to the shore on the *Liberty*. The wharves at Mangonui were fully occupied, so the *Iron Maiden* tied up outside another fishing vessel, the *Brac*. The crew loaded their personal belongings and provisions, and the chart plotter and autopilot from the *Infidel*. The owner said that he went over the operation of the boat with the crew before he left to drive south at about 2030.

1.1.5 At about 2100, the skipper of the *Brac* saw the 2 crew members of the *Iron Maiden* working in the wheelhouse, but did not speak to them.

1.1.6 Early the next morning, 16 August, the *Iron Maiden* left Mangonui. No one actually recorded the time, but one estimate was that they sailed before 0600 and another was that they didn't sail until at least 0730.

1.1.7 Telephone logs of the skipper's mobile telephone show that during that day numerous people, including the owner and the skipper's partner tried, without success, to contact the skipper on his mobile telephone.

1.1.8 No radio calls were received from the crew of the *Iron Maiden* by coastal radio stations.

1.1.9 At 1908 the skipper made a Mayday call on very high frequency radio (VHF), channel 16, saying that they were taking on water and they couldn't control it and that they were abandoning ship within 5 minutes. The distress call was initially answered by the operator of Far North Coast Guard Radio before Taupo Maritime Radio took over control of the operation.

1.1.10 The last transmission from the *Iron Maiden* was received at 1911. In that call the skipper said that they "were going down in 2 minutes". A search and rescue operation was launched immediately. Nearby vessels were tasked and the Police Northern Communication Centre was informed.

1.1.11 A helicopter was tasked by the Police Northern Communication Centre but delays were experienced getting it airborne. It departed from Whangarei shortly before 2100.

1.1.12 At 2032 the first emergency position indicating radio beacon (EPIRB) alert was received giving a position of 34° 38'S 172° 31E with an 87% probability. A resolved EPIRB position 34° 39'S 172° 31E was received at 2052.

1.1.13 In addition to the helicopter a number of fishing boats and an oil tanker assisted with the search.

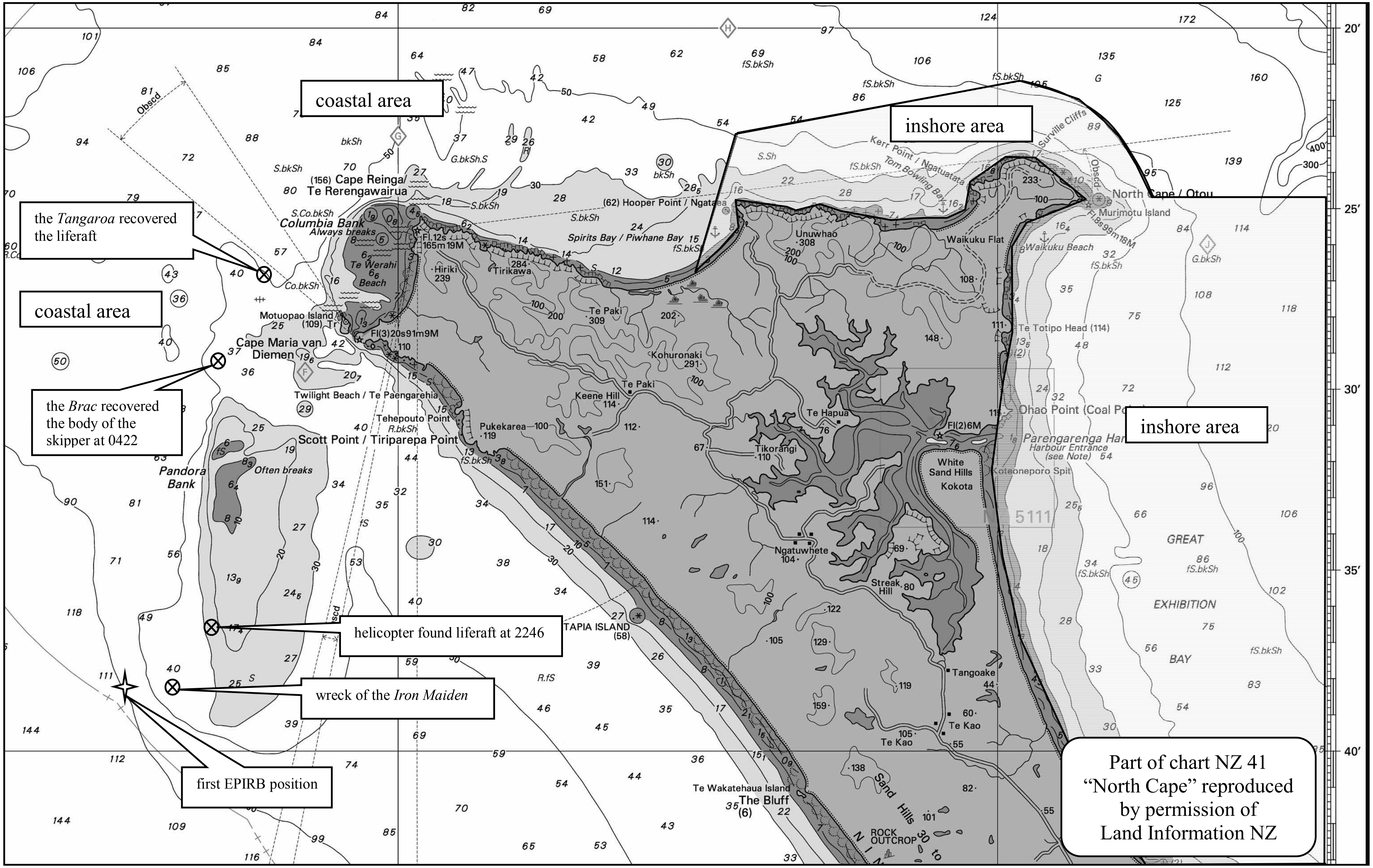


Figure 1
Part of chart NZ 41 North Cape

1.1.14 After refuelling at Kaitaia the helicopter was in the search area at about 2205 and commenced homing in on the EPIRB signal. At 2242 the helicopter sighted the liferaft in position 34° 36.50'S 172° 33.76'E. The prevailing weather conditions prevented winching a helicopter crewman down to the liferaft. The pilot informed the search coordinator that an intermittent light could be seen in the liferaft and that it possibly flashed towards the aircraft. The helicopter crew could not confirm whether there were people in the liferaft.

1.1.15 At 2258 the helicopter had to return to Kaitaia to refuel. The helicopter arrived back at the search area at 0058, 17 August 2004 and tried to relocate the liferaft. Despite receiving a strong signal from the EPIRB the helicopter was unable to relocate the liferaft and at 0136 was released from the search and it returned to Whangarei. A P3 Orion airplane had been tasked and arrived on station at about 0220.

1.1.16 There was a strong signal from the EPIRB, but when the searching aircraft passed directly over the beacon the liferaft could not be seen. This led the searchers to conclude that the EPIRB was no longer connected to the liferaft.

1.1.17 The Orion dropped smoke floats to guide the fishing vessel *Brac* to the position of the EPIRB. At 0422 the *Brac* located the body of the skipper of the *Iron Maiden*. He was wearing a lifejacket and had the EPIRB tied to his wrist.

Figure 2
The lifejacket the skipper was wearing

1.1.18 At 0731, the Orion located the liferaft and guided the research vessel *Tangaroa* towards it. The *Tangaroa* recovered the liferaft about one hour later.

1.1.19 At 1111 the sea search was abandoned. Shoreline searches continued for another 2 days.

1.2 Vessel information

1.2.1 The *Iron Maiden* was built by Efficient Engineering Property Limited of Tyabb Australia in 1980. It was built under the supervision of Lloyds Register of Shipping and was granted an interim certificate of class on 16 December 1980 as a +100A1 Fishing Vessel DS 10/80, with the Class Notation of LMC 12/80 TS/OG 10/80. The boat was initially named *Kimijoy* and was used to fish off the Queensland coast. Later in its life, the Australian Navy used it as a dive tender.

1.2.2 The boat was powered by a General Motors 8V 71N diesel engine, which developed 172 kW and drove a single fixed-pitch 3-bladed propeller. The *Iron Maiden* also had 2 Ford Lees auxiliary engines driving two 40 kVa generators. Its service speed was 8.5 knots, with a maximum speed of about 10.5 knots.

1.2.3 In the early 1990s the boat's name was changed from *Kimijoy* to *Schameel* and in 1995 it was bought by a New Zealand company and brought to New Zealand. The *Schameel* entered safe ship management with M&I safe ship management company on 9 July 1997.

1.2.4 In 2004, when the present owner bought the *Schameel* he decided to change the safe ship management provider to Nortel (1998) Limited. The *Iron Maiden* was issued with a safe ship management certificate on 28 April 2004, which was valid until 28 April 2005.

1.2.5 The current owner had never registered the *Iron Maiden* with the Registrar of Ships at the Maritime Safety Authority as he was required to under the Ship Registration Act 1992. The Registrar of Ships had made efforts to contact him and had also sent emails to his safe ship management company for it to inform him of the need to register the vessel's change of name.

1.2.6 When a vessel changed ownership its safe ship management certificate became void, and a new owner was required to have the vessel re-surveyed. The owner had done this with the *Iron Maiden.* However, when he bought his other boat, the *Infidel,* in October 2003, he never had that boat surveyed and had run it without the appropriate certification.

1.2.7 Previous skippers of the *Iron Maiden* said that the boat was more complicated than similar boats of its size, and therefore more difficult to operate. It had been built under Lloyds Register of Shipping supervision, and the machinery systems, particularly the bilge and cooling water systems, were more of the kind found on bigger ships rather than on a fishing boat.

1.2.8 The boat had been used for many types of operations during its life, some of which required structural changes. For example the engine room hatch was moved to the port side of the afterdeck, the fish hold was extended forwards into the old below-decks accommodation area, the access to that accommodation was removed and a hatch fitted. Many of these alterations occurred in Australia and were not recorded in the ship's file. Consequently, the investigation was reliant on photographic evidence and previous operators' memories.

1.2.9 Beside the Seiwa plotter and TMQ autopilot that the skipper had taken from the *Infidel* and installed on the *Iron Maiden* in Mangonui, the boat was fitted with the following navigation and communication equipment:

- Furuno radar
- Furuno echo sounder
- computer-based Seaplot track plotter
- VHF radio
- single side band (SSB) radio
- Furuno GPS
- Sky Eye (a satellite weather mapping system).

What systems were working during the voyage is not known.

1.2.10 The boat carried an 8-man RFD Seasava Plus 8 liferaft, which had last been serviced at RFD Auckland on 29 April 2004. The liferaft was stowed in a cradle on the starboard side of the wheelhouse deck and was secured with a Hammar H20 hydrostatic release.

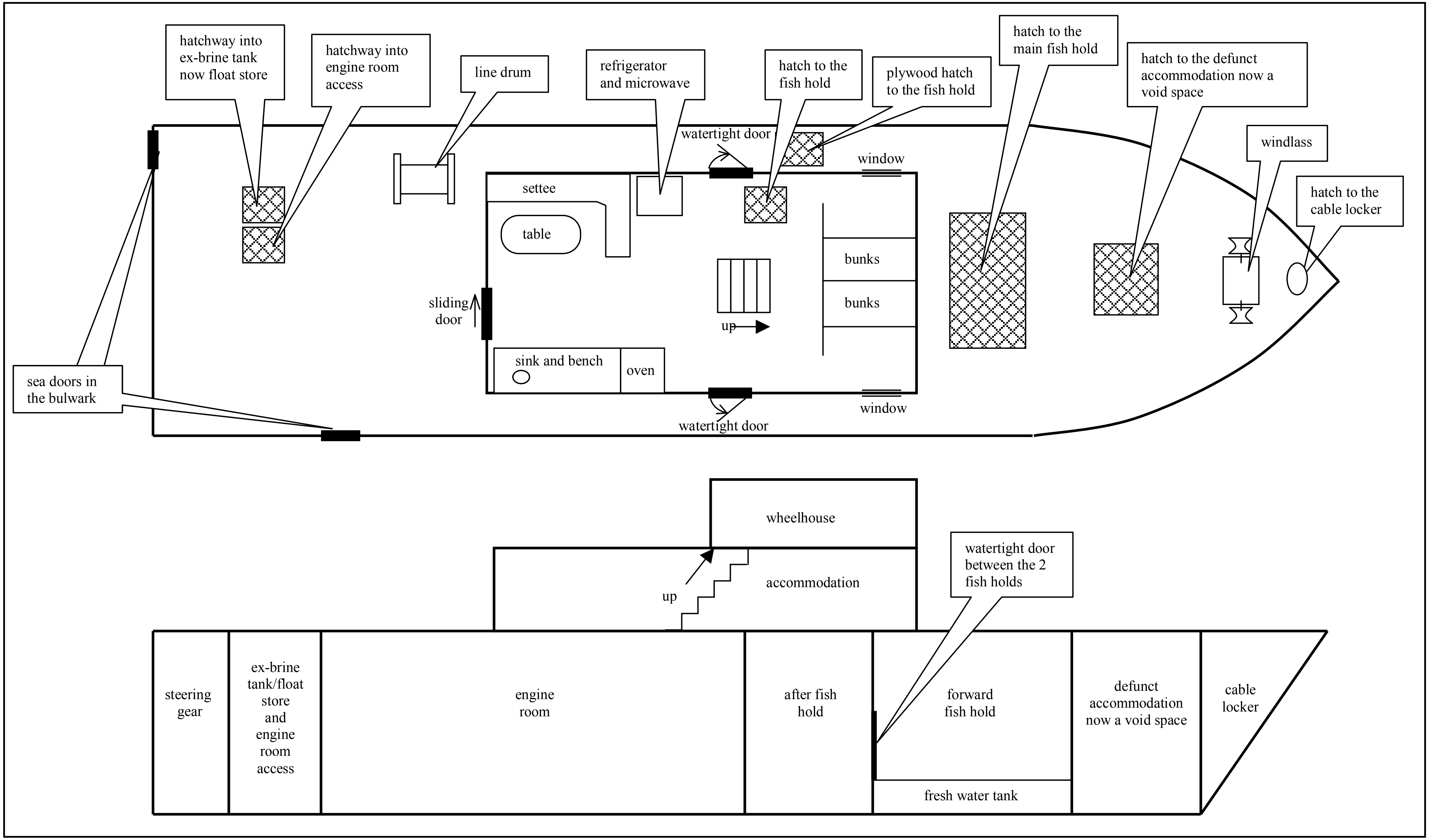


Figure 3
Layout of the *Iron Maiden*

1.3 Stability

1.3.1 In January 1981, after the boat was launched, an inclining experiment was carried out and from that a stability booklet was prepared. The naval architect acting on behalf of the owner questioned the initial inclining experiment, expressing concern that the boat would reach a critical condition on its arrival at the fishing grounds with less than 60% fuel and water remaining and fish being on deck. Amended stability calculations were made in June 1981 which showed that the boat did meet the stability requirements of the Australian Universal Shipping Laws (USL) code under most conditions.

1.3.2 When the boat arrived in New Zealand, the safe ship management company required that hydrostatic data for the current condition of the boat be presented. The philosophy behind this decision was that the original boat only just complied with New Zealand stability requirements and that modifications had been made during the boat's life. An inclining experiment was carried out in April 1996, but this was found to be flawed. Another inclining experiment had to be organised, but this took a considerable time, almost 3 years, to complete. While waiting for the stability information to be calculated, M&I safe ship management company issued interim certificates, which were subject to restrictions on the use of the vessel specified in a letter to the owner dated 18 October 1996. The restrictions were:

i) The craft shall be operated in the role of long line fishing only.

ii) Equipment, spare gear, etc shall be stowed as low as possible and kept to a minimum. It is strongly recommended that items are not stowed on the upper deck behind the wheelhouse.

iii) The 500 Kg of bait shall be stowed in the below decks freezer and only a ready use supply for each individual fishing operation shall be stowed within the blast freezer.

iv) Maximum fish cargo shall be 5 tonne in total.

v) The craft shall not operate in any loaded condition with less than 25% consumables on board, i.e. fuel, and fresh water.

vi) A set of line plans or table of offsets shall be forwarded to M&I as soon as possible to enable an amended stability information booklet to be produced.

1.3.3 In December 1997, a naval architect lifted the vessel's lines to determine the boat's underwater shape from which he prepared a plan and a table.

1.3.4 In April 1999, a second inclining experiment was conducted and a stability booklet prepared later that same month. This included 5 typical loading conditions:

- light ship
- departure for the fishing grounds
- departure from the fishing grounds
- arrival at home port with a full catch
- arrival at home port with only 20% catch.

1.3.5 In 1999, Maritime Rules Part 40D Design, Construction and Equipment – Fishing Ships, which among other things prescribed the stability requirements for fishing boats, was in its consultative phase. The intact stability for a vessel was considered satisfactory if the following righting levers (GZ curves) were met in the 5 typical loading conditions:

(i) the area under the righting lever curve (GZ curve) must not be less than 0.055 metre-radians up to 30° angle of heel and not less than 0.090 metre-radians up to 40°. Additionally, the area under the righting lever curve (GZ curve) between the angles of heel of 30° and 40° or between 30° and Ø, if this angle is less than 40° must not be less than 0.03 metre-radians. Ø is the angle of heel at which openings in the hull, superstructure or deckhouses that cannot rapidly be closed weathertight begin to immerse; and

(ii) the righting lever (GZ) must be at least 200 millimetres at an angle of heel equal to or greater than 30°; and

(iii) the maximum righting lever (GZmax) must occur at an angle of heel preferably exceeding 30° but not less than 25°; and

(iv) the initial metacentric height (GM) must not be less than 350 millimetres for single deck ships. For ships of 70 metres in length and over with complete superstructure, the metacentric height may be reduced to the satisfaction of the surveyor referred to in rule 40D.33(1), but is in no case to be less than 150 millimetres; and

(v) the range of positive stability must not be less than 60°. The effects of enclosed deck erections with openings closed by approved weathertight fittings may be taken into account in determining the range of positive stability.

The *Iron Maiden* met all the above stability criteria for each of the typical loading conditions.

1.3.6 The stability booklet prepared in 1999 included a "Special Notice to Masters", which stated:

1.1 Compliance with the stability criteria does not ensure immunity against capsizing regardless of the circumstances, or absolve the Master from his responsibilities. Masters should therefore exercise prudence and good seamanship, having regards to the season of the year, weather forecasts and the navigational zone. The master should observe carefully the following:

Keep bilge system in good order, and pump bilge on a regular basis.

Keep watertight doors and hatches in good working order, and exercise good judgment in when these should be used. If in doubt, keep them closed.

Free surfaces may have a large effect on stability. Where possible minimise free surfaces by keeping tanks either full or empty.

Do not allow accumulated gear to add to the top weight on the vessel.

The vessel is not to be operated at sea with less than 10 tonne total deadweight on board, which may be made up of a combination of cargo in fishing holds, fuel and fresh water.

Catch is permitted to be on deck for a short period of time. When operating at sea the catch is to be stored in the fishing holds.

Over the boat's life solid ballast had been carried, removed and replaced. The type of ballast had varied between chain, lead ingots and cement and was usually stowed in the steering gear or the engine room or both. The amount of ballast at the time of the foundering could not be accurately determined, but in the years immediately after the last inclining experiment the following changes in ballast had been noted:

- in 1999, about one tonne of cement was removed from the after peak and 1.5 tonnes of lead ingots were fitted

- in November 2001, 100 feet of ¾" stud chain were removed from the after peak. Shortly after, an undetermined amount of cement was put into the after peak.

SGS M&I safe ship management company was not advised of any of these changes, so no changes had been made to the stability data of the boat.

1.3.7 In May 2004, the owner fitted a stabiliser arm to the port side of the boat. The arm consisted of a horizontal plate, or foot, at the lower end of a solid arm, which was attached to a gantry that was horizontal when the stabiliser was deployed and vertical when stowed. When deployed, the arm and the gantry were locked in position so that the resistance on the foot produced when the boat rolled was transferred to the boat and so reduced the rate and therefore the extent of the roll.

Figure 4
A stabiliser arm, in the stowed position, similar to that fitted to the *Iron Maiden*

1.3.8 The gantry was stowed by unlocking the arm and the gantry, and hoisting them up vertically so that the arm rested against the gantry (see Figure 4). The immediate past skipper of the *Iron Maiden* said that once stowed, he lifted the foot onto the upper deck where it was secured. This allowed the boat to berth port side to a wharf.

1.3.9 The designer of the stabiliser arm indicated that it weighed between 350 and 400 kg. The immediate past skipper said that in order to compensate for the list induced when the stabiliser arm was deployed, he moved fuel from the port side to the starboard side.

1.3.10 No allowance had been made for the adverse effect the arm had on the stability of the vessel, which would be greatest when it was stowed. Nortel safe ship management company had not been advised that the arm had been installed, nor had the surveyor noticed the modification when he inspected the boat when it entered its safe ship management.

1.3.11 The condition of the boat on its last journey was not precisely known. However, using the stability model created in 1999, SGS M&I assisted in calculating the vessel's condition. Estimated weight and the centre of gravity for each of the items known to be on board when it sailed, including the stabiliser arm, were used. An estimate of the tank contents and an allowance for the free surface effect of slack tanks were also used. The calculation showed that the boat met only half of the 6 requirements for fishing boat stability.

Required criteria	Required Value	Actual Value	Status
Area under the GZ curve up to 30° angle of heel	Not less than 0.055 metre-radian	0.062 metre-radian	Pass
Area under the GZ curve up to 40° angle of heel	Not less than 0.090 metre-radian	0.089 metre-radian	Fail
Area under the GZ curve between 30° and 40° angle of heel	Not less than 0.030 metre-radian	0.027 metre-radian	Fail
GZ at an angle of heel equal to or greater than 30°	Not less than 200 mm	185 mm	Fail
Maximum GZ to occur at:	Not less than 25°	26.7°	Pass
Initial GM	Not less than 35 mm	37.1 mm	Pass

Basic stability principles and terminology are contained in Appendix 1, and the full stability calculation carried out for the estimated departure condition of the boat is contained in Appendix 2.

1.4 Personnel information

1.4.1 The skipper was 23 years old and had been fishing from a very young age; his parents and grandparents fished in and around the Kaipara Harbour. He started commercial fishing in about 1996 on a fishing boat out of the Kaipara Harbour. After about 2 years he bought his own boat, the *Kaipara Star,* which he fished inside and outside the Kaipara Harbour. On 28 July 1999 he gained his commercial launchmaster certificate (CLM). In 2002 and 2003 he worked on a barge, which harvested mussels in the Hauraki Gulf. Earlier in 2004, he had done 2 trips as a deckhand on the *Infidel*, the other boat owned by the owner.

1.4.2 About 2 years before this accident, the skipper had delivered the *Kaipara Star* from Whitianga to the Kaipara Harbour around the northern coast of New Zealand.

1.4.3 The deckhand was 25 years old and was the skipper's cousin. He had had a similar upbringing to the skipper and had fished from an early age, but had never taken any formal training and held no maritime qualifications. The cousins had sailed together on numerous occasions.

1.4.4 The owner went to sea in 1984 and had worked on numerous fishing boats. He had gained his CLM in February 1993 and his marine engineer certificate class 6 (MEC6) in May 2003. He had also been skipper, engineer and operations manager of the river boat *Waipa Delta* on the Waikato River in Hamilton between 1994 and 1996. At the time of the accident he owned 2 fishing vessels, the *Iron Maiden* and *Infidel*, but the latter was laid up in Tauranga.

1.4.5 The owner was in financial difficulties, which he said were due to insufficient fish being caught to meet the loans and running costs of the boats. The immediate past skipper of the *Iron Maiden* said that he decided to leave the boat because payment for the fish he caught was slow and he believed the owner owed him several thousand dollars. The owner said that he had paid the previous skipper for the fish he had caught and did not owe him anything. Numerous other marine contractors and suppliers said that payment was overdue for their services.

1.4.6 As part of cost-cutting measures, the owner had decided to reduce his fishing operation to one boat. He intended to sell the *Infidel* and transfer the set net equipment to the *Iron Maiden* to fish for dogfish off the Raglan coast. Initially he intended to send the *Infidel* from Tauranga to Mangonui to transfer the fishing gear, but changed his mind on the Saturday before the accident, deciding instead to send the *Iron Maiden* to Raglan to where the *Infidel's* fishing gear would be trucked and installed on the other boat.

1.4.7 The owner expected the loss of the *Iron Maiden* to bankrupt him, because there was a shortfall between the expected insurance claim and the money he owed the finance company.

1.5 Certification and qualifications

1.5.1 The standard of certification required for a restricted limit fishing vessel depended upon the area in which the boat was intended to operate. The intended route of the *Iron Maiden* from Mangonui to Raglan would have started in the inshore area and then crossed into the coastal area when it was abeam of Hooper Point, midway between North Cape and Cape Reinga (see Figure 1). From that position, the rest of the journey would have been in the coastal area.

1.5.2 Maritime Rules Part 31C - Crewing and Watchkeeping Fishing Vessels, required the master of a fishing boat of more than 6 m but less than 20 m operating in the inshore area to hold a minimum qualification of an inshore launch master (ILM) certificate. If the engine was less than 750 kW, and there were fewer than 4 systems for which an engineer would be responsible, an engineer was not required, but where an engineer was required it could be the master. The minimum number of crew was one.

1.5.3 The same rule required that the master of a fishing boat of less than 20 m operating in the coastal area hold the minimum qualification of a New Zealand offshore watchkeeper certificate endorsed with an ILM command endorsement. If the engine was less than 750 kW, an engineer holding an MEC6 was required, but this could be the master. The minimum number of crew was 2; the other of whom did not need to hold any marine qualification.

1.5.4 Maritime Rules Part 31C.5 listed equivalent certification that was acceptable in lieu of the prescribed certificates. A CLM certificate was equivalent to an ILM certificate and an ILM certificate was equivalent to an MEC6.

1.5.5 CLM certificates were endorsed on their reverse with a list of maximum-sized boats that the holder was allowed to operate; included in this list was an inshore fishing boat of less than 15 m.

1.5.6 Maritime Rules Part 20 defined inshore limits as:

> (a) the inshore limits set out in Appendix 1 [a table of prescribed inshore areas]; and
>
> (b) in relation to a ship, any defined section of the coastal limits not beyond the limit of the territorial sea of New Zealand which has been assigned to that ship by a surveyor under rule 20.5(1), subject to rule 20.5(4)

The table of inshore limits in (a) above did not include any areas on the west coast of North Island.

1.5.7 The operating limits designated on the *Iron Maiden*'s safe ship management certificate were:

> NZ restricted coastal limits within 100 miles of the coast including Stewart Island and the Chatham Islands.

1.5.8 A number of recent accidents and incidents investigated by the Commission identified improper manning or insufficient certification. These have included:

03-204 Restricted passenger vessel *Tiger III*, passenger injury, Cape Brett, 18 March 2003. The master did not hold the minimum certificate required and there were no other qualified crew as required by Maritime Rule Part 31B - Crewing and Watchkeeping - Offshore, Coastal and Restricted (non-Fishing Vessels)

03-207 Fishing vessel *Solander Kariqa*, fire 300 nm west of Suva, Fiji, 5 May 2003. The master was properly qualified but the engineer held a lesser certificate to that required and the remainder of the crew were unqualified

04-202 Restricted limit passenger vessel *Queenstown Princess*, grounding, Lake Wakatipu, 13 February 2004. The master did not hold any maritime qualification recognised in New Zealand

04-204 Restricted limit passenger vessel *Freedom III*, grounding, Lake Manapouri, 12 February 2004. The master did not have the *Freedom III* endorsed on his local launchmaster certificate

04-207 Fishing vessel *Poseidon*, grounding, north of Manukau Harbour entrance, 15 April 2004. Prior to the accident the master had operated the boat outside the inshore area, which was outside the limits of his CLM certificate.

1.5.9 Within the tuna fishing industry, it was widely accepted that boats, often under the command of skippers with CLM certificates, regularly followed schools of fish outside the inshore area.

1.6 Human factors

1.6.1 The financial situation of the owner seemed to be well known by the fishing fraternity in Tauranga. The owner was under pressure to find some profitable employment for the *Iron Maiden* in order to meet the loan repayments on his 2 boats. He convinced the skipper that he would be able to catch enough dogfish off the Raglan coast to make a reasonable profit, so ensuring the viability of the *Iron Maiden* and providing the skipper with a good income.

1.6.2 The skipper's partner was pregnant with their first child. In the weeks before the accident they had discussed his immediate work options and decided that he would stop fishing and start working ashore as a painter with one of his partner's relatives. He had been due to start painting on the Monday of the accident, but on the Friday before, the owner had convinced him to reposition the *Iron Maiden* and had promised continued employment as skipper of the boat. The skipper's partner said that he felt that the opportunity to fish the relatively large boat was too good to miss. So the skipper decided to forego the shore employment and return to fishing, a vocation he considered he was good at and enjoyed.

1.6.3 The skipper and the deckhand had been brought up in seafaring communities and had both experienced incidents at sea. But they had always managed to overcome the problems without injury.

1.6.4 The body of the skipper was sent to Auckland where a post mortem examination was performed. Other than minor bruising there was no physical trauma to the body. Because of significant water in the lungs, the pathologist was of the opinion that death was caused by drowning.

1.6.5 Once they had joined the boat, neither of the crew communicated with anyone even though they had mobile telephones and VHF radio. Consequently, they had not told anyone of their intentions or why they left Mangonui early on the Monday morning, heading into forecast heavy weather on the west coast of North Island.

1.6.6 The owner had not checked that the skipper had the necessary experience to make the voyage from Mangonui to Raglan. He assumed that because the skipper had worked extensively in and around the Kaipara Harbour he was familiar with the west coast of North Island.

1.6.7 The owner had little experience of the *Iron Maiden*, only ever going across the harbour in it with another skipper. He had never been to sea on the boat.

1.7 Drug impairment

1.7.1 Toxicological tests carried out as part of the post mortem examination of the skipper detected no alcohol or any evidence of amphetamine, benzodiazepine or opiate type drugs. However, they did show 0.7 micrograms per litre of blood of tetrahydrocannabinol (THC). THC is the active ingredient of cannabis.

1.7.2 The pathologist made the following comments with regard to the level of THC:

> A blood THC level of 0.7 micrograms per litre is consistent with the skipper smoking the equivalent of a single cannabis cigarette from about 1 hour to about 8 hours prior to his death.
>
> Subjective symptoms of cannabis intoxication usually peak 10 to 15 minutes after smoking cannabis and last about 1.5 to 4 hours. Occasionally subjective symptoms may last much longer than 4 hours.
>
> Blood THC levels produced by smoking a cannabis cigarette and the rate at which the levels decrease vary widely between individuals and are dependant on a number of factors. These factors include frequency of use, smoking technique and experience, the size and potency of the cannabis cigarette and the individual's body weight.
>
> Cannabis cannot easily be classified as a sedative or stimulant since it can have different effects in different people and it's effect generally vary over time. Its main psychological and behavioral effects are euphoria and relaxation and impairment of perception and cognition and loss of motor coordination.
>
> Summary
>
> Blood THC levels are a poor indicator of cannabis intoxication. It is not usually possible to determine whether a subject was intoxicated from blood levels alone. The level of THC in the skipper's blood is such that it is not possible to determine if he was affected by the drug at the time of his death.

1.7.3 On 21 October 2003, the Commission published a report into a rail accident (Occurrence report 02-116 express freight train 533 derailment, near Te Wera on 26 July 2002), which resulted in the death of a driver and serious injury to his assistant. The report found that the driver had consumed alcohol before his shift. Research carried out in the course of that investigation identified that in New Zealand there was a lack of statistics on drug and alcohol use in the workplace. A paper entitled "Implementing Effective Alcohol and Drug Programmes in New Zealand Businesses" given by Matt Beattie of Instep Limited 2003 to the New Zealand Institute of Safety Management Expo in Tauranga identified that overseas trends could indicate the extent of the problem in New Zealand. For example in the United States:

> - 70% of abusers have jobs
> - Abusers are five times more likely to cause accidents involving themselves and their workmates
> - 40% of industrial fatalities are caused by impaired workers…

1.7.4 Many industries, and companies within industries, identified that alcohol, and both recreational and prescription drugs were responsible for accidents in the workplace and they had put in place policies to manage the associated risks. Generally, the policies centred on pre-employment, post-accident and random testing, but usually had an employee assistance and rehabilitation programme working in parallel.

1.7.5 The operator of the New Zealand coastal tanker fleet was required by its principals to have a drug and alcohol policy in place. The Oil Companies International Marine Forum published guidelines for the control of drugs and alcohol on board ships, and this provided the basis of the tanker fleet policy (see Appendix 3).

1.7.6 Deep-sea fishing was another part of the industry that had put in place strict drug and alcohol policies, where random testing and instant dismissal on a positive result were normal. A number of companies in the general shipping industry had put in place drug and alcohol policies, but generally found it difficult to negotiate testing regimes with employee representative groups.

1.7.7 In the aviation industry there was no requirement for random or post-accident drug and alcohol testing but the rules did provide that aircrew should not be intoxicated or incapacitated while on duty. Civil Aviation Rule 19.7 required that:

> No crew member while acting in his or her official capacity shall be in a state of intoxication or in a state of health in which his or her capacity so to act would be impaired by reason of his or her having consumed or used any intoxicant, sedative, narcotic or stimulant drug or preparation.

Practically, the Civil Aviation Authority required that an operator show how they would comply, and this would form part of their exposition when they applied for their operator's certification.

1.7.8 The railway legislation at the time of this accident did not contain any provision for drug and alcohol policies. But a new Railways Act, which was passed by parliament on 13 April 2005, coming into force on 20 July 2005, did contain the requirement for operators to have drug and alcohol policies in place as part of their safety case. Section 30 Contents of Safety Case stated:

> (k) the policies in place to ensure that the rail participant's rail personnel--
>
> (i) are fit for duty; and
>
> (ii) are not suffering impairment or incapacity as a result of fatigue, illness, medication, drugs, alcohol, or any other factor:

1.7.9 Nothing in the Maritime Transport Act 1994 or Maritime Rules addressed incapacitation due to drugs and alcohol or required operators to have policies in place to address drug and alcohol impairment. There was no provision for random or post-accident testing for drug or alcohol impairment. Consequently, there had been no statistical data gathered to show if or how much of a problem drug and alcohol impairment was in the maritime industry.

1.8 Meteorological, topographical and tidal conditions

1.8.1 Pandora Bank was a sand bank that lay to the west of the north western tip of New Zealand. The northern end of the bank was about 4 nm south south west of Cape Maria van Diemen and the bank itself, that part that was shallower than 30 m, extended in a southerly direction for about 9 nm. The average width of the bank was about 3 nm.

1.8.2 The Admiralty Sailing Directions NP51 (the New Zealand Pilot) contained the following warning for mariners navigating in the vicinity of Pandora Bank:

> In strong S to W winds steep seas build up on the windward side of Pandora Bank; they break heavily on the shoaler part and confused seas develop in depths less than about 75 m.

Depths of less than 75 m extend at least 2 nm to the west of the bank.

1.8.3 The New Zealand Pilot stated that the surface tidal streams were variable and could reach rates of up to 4 knots. Below the surface the streams were equally strong and variable.

1.8.4 The weather forecast for the Kaipara meteorological area, which extended from North Cape to below Kaipara Harbour on the west coast, issued at 0429 on the morning of the sinking was for:

> Southwest 30 knots. Sea rough. Southwest swell rising to 4 metres. Poor visibility in heavy showers from late afternoon.
>
> Outlook following 12 hours: Southwest 30 knots easing to 20 knots.

That forecast remained in force throughout the day until 1639, when a new forecast upgraded the wind force to 35 knots, which was not expected to ease until the following morning.

1.8.5 A weather station situated at Cape Reinga recorded the following details:

Time NZST	**Wind Direction °(T)**	**Wind Force Knots**
1200	220	42
1500	230	39
1800	210	41
2100	210	40

1.8.6 Masters of the search and rescue craft and the pilot of the helicopter described the conditions as atrocious, reporting waves in excess of 10 m on the bank, with visibility reduced by wind-blown spume.

1.8.7 In the 3 days prior to the accident there had been strong westerly winds over the north of North Island. Gale warnings had been in force for the Kaipara meteorological area for the entire period except between 1640 on 15 August 2004 and 1246 on 16 August 2004. Throughout the period rough seas and swells of up to 4 m were forecast.

1.8.8 Various skippers who were experienced in working in the vicinity of Pandora Bank said that they would give it a very wide berth, up to 5 miles off, in south west to west seas. They did say that it was possible to pass between the bank and the mainland as the bank gave some protection from the prevailing weather, but suggested that this should not be attempted without extensive local knowledge and experience. Generally, the consensus was that in a boat of the *Iron Maiden's* size they would not have ventured onto the west coast until the weather had abated.

1.8.9 The *Tangaroa* recorded a sea temperature of 14.5°C at 0400 on the morning after the sinking.

1.8.10 The *Iron Maiden* was headed to Raglan, further down the west coast. That harbour is protected by a bar, which becomes impassable in westerly sector weather. The entire west coast from Cape Reinga to Raglan is generally low lying and is without shelter for ships when a westerly sea is running.

1.9 Navy search

1.9.1 Soon after the accident the Commission requested the Commander of the Maritime Component of the New Zealand Defence Force to assist in locating the wreck of the *Iron Maiden*. The Rescue Coordination Centre of New Zealand (RCCNZ) calculated possible foundering positions of the boat by applying tidal and wind data to the position of the helicopter's first sighting of the liferaft and the position in which the skipper's body was recovered. From these possible foundering positions a search area was determined.

1.9.2 The naval dive tender *HMNZS Manawanui* left Onehunga on 13 October 2004 and headed to the search area. The search started at 1200 on Friday 15 October using a towed side-scan sonar. Technical difficulties necessitated the search be temporarily stopped and the *HMNZS Manawanui* returned to Devonport naval base in Auckland. The sea bottom around Pandora Bank was smooth and undulating, making the ship's staff optimistic about locating the wreck, so they recommended continuing the search.

1.9.3 The *HMNZS Manawanui* resumed the search at 1345 on Wednesday 27 October, and at 0800 on Friday 29 October a vessel-shaped contact was detected on the sonar. A remote-operated vehicle (ROV) was deployed to take video footage of the wreck to confirm its identity. During its first run the ROV experienced strong bottom currents, which made controlling the ROV difficult, and swirling sediment made the visibility poor. But the operators were able to get sufficient video footage to confirm that the wreck was that of the *Iron Maiden*. The second run of the ROV started at slack water and the quality of the video footage was excellent and provided good information on the condition of the boat.

Figure 5
Bow of the wreck of the *Iron Maiden*

1.9.4 The boat was found in about 45 m of water, upright and sitting squarely on its keel. The hull was largely intact with few obvious signs of damage, except for the stern, which had been set in. The video footage revealed the following points:

- the stern was set in and the awning support damaged

Figure 6
Set-in stern and damaged awning support

- the engine room hatch lid was missing and the hatch open to the sea

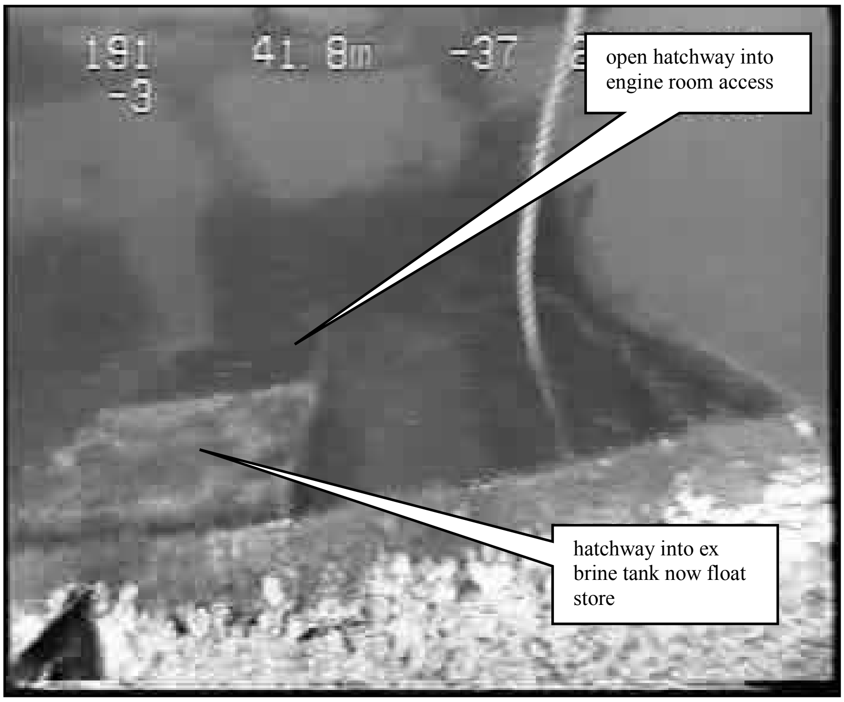


Figure 7
Afterdeck hatches

- the watertight door on the starboard side of the accommodation was closed and securely dogged

- the watertight door on the port side of the accommodation was open and the dog on its trailing edge looked to be misaligned

Figure 8
Port watertight door

- the window for the cabin on the starboard forward side was missing

Figure 9
Cabin window, starboard side (note bunk visible)

- the fish hatch immediately in front of the accommodation was open and laying back against the bridge front. There was no visible distortion to the hatch lid and the securing catches for this hatch were not visible

Figure 10
Foredeck hatches

- the hatch to the old accommodation area forward of the fish hold was in place and securely dogged
- the stabiliser arm gantry was in the stowed position, with the arm hanging vertically down the side of the boat

Figure 11
Port side showing the stabiliser arm

- there was an arced score mark on the hull where the foot of the stabiliser arm had rubbed

Figure 12
Port hull

- boards were fixed across the after mooring ports on the port and starboard quarters, thus preventing the free flow of water onto and off the afterdeck

Figure 13
Starboard after mooring port

- except across the transom, the scuppers between the bulwark and the sheer strake had been blocked by lengths of timber, further restricting the flow of water onto and off the deck

Figure 14
Scupper between bulwark and sheer strake

- the sea door in the after starboard bulwark was missing
- the sea door in the port transom bulwark was askew but still attached
- the awning framework that covered the afterdeck was set forward and severely bent

Figure 15
Damaged awning structure

- both wheelhouse doors were missing
- a cable running from the port side outside the wheelhouse to inside the wheelhouse was visible, possibly the aerial wire for the Seiwa plotter installed by the crew at Mangonui

- the rudder was slightly to port, possibly 5° to 10° of port helm
- the propeller appeared undamaged
- on the seabed there was a hook bin on the starboard side and a slurry bin on the port side
- the radar mast and antennae were intact but a large whip aerial was missing (this was later recovered from Twilight Beach, on the mainland slightly to the north of Pandora Bank).

1.9.5 Extensive searches were made of 90 Mile Beach, the beach on the mainland that extends south, and Twilight Beach, during which a considerable amount of flotsam was recovered. This included:

- a lifejacket, of the same type worn by the skipper

Figure 16
Lifejacket found on Twilight Beach

- an activated Hammer H20 hydrostatic release

Figure 17
Hydrostatic release found on Twilight Beach

- a large whip aerial in 2 pieces

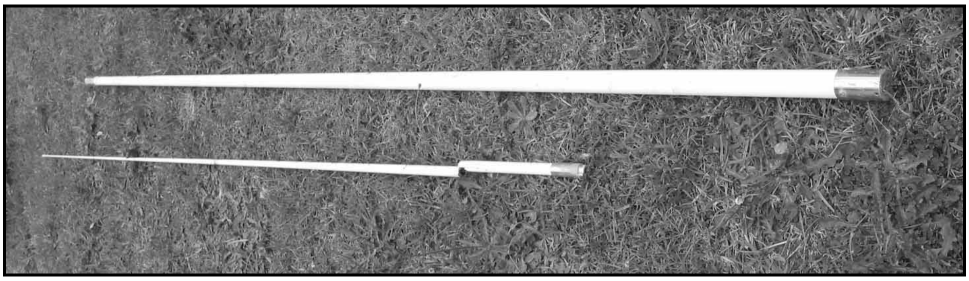


Figure 18
Two pieces of a whip aerial

- a damaged waterproof container containing pyrotechnics, a distress sheet and emergency rations
- a slurry bin, 2 float containers and 3 fish boxes
- a first aid box

Figure 19
First aid box

- detergent and oil containers
- mattresses, both from the bunks and those used to protect the fish when they were landed
- an ice shovel
- various pieces of plywood structure and the frames of the wheelhouse doors

1.9.6 Two former skippers of the *Iron Maiden* assisted the investigation by identifying parts of the boat and the recovered flotsam as shown in the Navy ROV video and photographs.

1.10 Survivability and search and rescue

1.10.1 Given a seawater temperature of 14.5°C, a clothed, uninjured survivor could be expected to survive up to 90 minutes in smooth water before losing consciousness due to hypothermia and drowning (US Coastguard). However, a survivor who was not in a liferaft would, even with a lifejacket, be required to make considerable efforts to stay afloat and maintain a clear airway in extremely rough seas, and would become physically exhausted before the expected survival time for smooth seas. Exhaustion would have resulted in swim failure due to excessive muscle fatigue, and could have led to drowning within an hour.

1.10.2 The research vessel *Tangaroa* recovered the liferaft, however in doing so it caused significant damage to the canopy. When the liferaft was landed ashore, the manufacturer's authorised representative inflated it and prepared a report on the liferaft's condition. He determined that the painter had released from its connection at the hydrostatic release. Once re-inflated, the liferaft remained inflated for several days, the canopy support arch being the first section to partially deflate after 2 days.

1.10.3 A red substance found on the floor of the liferaft was forensically examined. Tests determined that the substance was not of human origin, rather it was diphenyl diisocyanate, a component in man-made material.

1.10.4 Taupo Maritime Radio received the Mayday call at 1908 and almost immediately contacted the Police Northern Communication Centre and the RCCNZ was informed. The Whangarei rescue helicopter was tasked soon after, but confusion by the Police over its capabilities led to it being stood down again at 1933. The helicopter was again tasked at 1956, but had to wait for enhanced direction-finding equipment and an additional crew member. It finally departed from Whangarei at 2110, and refuelled in Kaitaia before heading to the search area where it arrived at just after 2200, a little less than 3 hours after the Mayday call.

1.10.5 Shortly after 0300, the RCCNZ determined that the liferaft was no longer with, or in close proximity to, the EPIRB because the helicopter and the Orion had both been directly over the beacon without sighting the liferaft, which they would have expected to do even in the prevailing conditions. Later, the Orion used smoke flares to guide surface vessels to the EPIRB position. This was how the fishing vessel *Brac* found the body of the skipper, which was still attached to the EPIRB.

1.11 Events leading up to the accident

1.11.1 Prior to the *Iron Maiden* being purchased by the current owner, it had been unused for most of the previous 18 months and had been laying at a berth in Tauranga. Consequently, there were an unusual number of small breakdowns in the first 3 months of renewed operation. The immediate past skipper thought he had got on top of the problems and was confident in the boat's machinery.

1.11.2 The structural changes made by the new owner since April included fitting the stabiliser arm and replacing the corroded hatch coaming for the old accommodation.

1.11.3 Since the change of ownership, the boat had fished for bluefin tuna on the west coast of South Island for about 2 months before early July when it headed north to Mangonui targeting big eye tuna. On Thursday 5 August the *Iron Maiden* returned to Mangonui from its last fishing trip before the accident.

1.11.4 The immediate past skipper of the *Iron Maiden* left the boat because he said he was not receiving his wages in a timely manner. During his time on the boat he had installed some of his own equipment to replace the boat's equipment which was either malfunctioning or of inferior quality to his own. The equipment included a computer monitor for the Seaplot track plotter, an autopilot, a mobile telephone and some GPS locating buoys.

1.11.5 The immediate past skipper and his crew had made the decision to leave the boat about 3 weeks before the accident, but had intended to complete 2 more fishing trips. However, in the days following their return to Mangonui on Thursday 5 August after the first of those trips, it was mutually agreed with the owner that they would not undertake the second trip. On Friday 13 August, the immediate past skipper returned to Mangonui and removed his equipment from the boat.

1.11.6 When the boat returned to Mangonui on 5 August, it was tied up at Mangonui wharf. The immediate past skipper had gone to Auckland to discuss the future of the boat with the owner. One of his crew had been left on board to look after the boat. Once the decision was made that the boat was not going to sea again, the owner asked the immediate past skipper to put it on a mooring off the wharf.

1.11.7 Before leaving the *Iron Maiden* on the Friday before the accident, the immediate past skipper had greased the stern gland to prevent any seepage, and had left the fish hatches ajar and the door connecting the 2 fish holds open to allow air to circulate. The skipper thought that he had left small pieces of timber between the hatches and the coamings to ensure continued ventilation. The seacocks were left open.

1.11.8 The immediate past skipper could not remember how he had left the valves for the fuel system, but thought it probable the valves were set to draw fuel from the starboard tank and return to the port tank.

1.11.9 Soon after he had joined the *Iron Maiden*, the immediate past skipper had asked 2 previous skippers to come to the boat to show him around and explain its intricacies, particularly the fuel and bilge systems. He said that despite holding a 2nd class diesel trawler engineer certificate he found the bilge system complicated.

1.11.10 A maintenance engineer who had worked on the boat 2 years before said that the watertight door between the engine room access and the engine room was usually bolted in the open position. The immediate past skipper agreed that this practice continued up to and during his time on the boat.

1.11.11 The immediate past skipper suggested that there were a number of engineering problems that the crew may have encountered on the day of the sinking including blocked fuel filters and poor fuel suction from a partially empty fuel tank. Any such problem would require the crew to go down into the engine room, leaving the engine room hatch open and vulnerable to shipping a sea into the engine room.

1.11.12 Even though he had taken his monitor, the immediate past skipper said there was an older monitor on board that could have been connected to the computer so that the Seaplot could be used, but he had not installed it before leaving. There were also sufficient paper charts on board to enable the crew to sail from Mangonui to Raglan.

1.11.13 The distance from Mangonui to the position where the sunken boat was found was about 80 nm. This corresponds to the boat making good an average speed of about 7.5 knots.

1.12 Previous flooding occurrences on the *Schameel* or *Iron Maiden*

1.12.1 Since arriving in New Zealand the *Schameel* or *Iron Maiden* had experienced a number of accidents. In April 1997 the plastic hull fitting for a sea temperature sensor fractured, flooding the fish hold. The boat was slipped, the sensor discarded, and the hull penetration plugged and welded.

1.12.2 In December of the same year, the boat made water in the engine room. This was investigated on the slipway. PVC debris was found under the seat of the non-return valve on the engine room emergency bilge suction.

1.12.3 On 16 February 2001, the *Schameel* grounded while anchoring near White Island. The hull was not penetrated and no major hull damage was noted.

1.12.4 On 10 June 2001, the boat lost hydraulic pressure to the gearbox so could not engage forward or reverse gear. The cause of the pressure loss was not determined but was probably due to a blockage in the hydraulic system.

1.12.5 On 30 September 2001, the engine room of the *Schameel* flooded while fishing. About 9 tonnes of water entered the engine room and reached a level above the top of the main engine. Most of the machinery in the engine room required overhaul. The cause of the flooding could not be positively determined, but again it was suspected that debris obstructed the valve on the engine room emergency bilge suction or one of the other bilge suction valves, allowing water to backflow into the engine room through the direct suction.

2 Analysis

2.1 The loss of the *Iron Maiden* appears to have resulted in it sinking stern first. This is supported by the only visible structural damage being at the stern of the boat, with the hull and awning framework in that area being set-in. Such damage would have required a considerable impact, which most likely occurred when the stern hit the sea bottom. Once the stern of the boat landed on the sea bottom, the tidal flow of up to 3 knots near the bottom would have been sufficient to topple the boat, on this occasion allowing it to land upright on its keel. The boat would have sunk stern first because the after end was the first to flood. It is probable that water entered the hatchway into the engine room access, flooding that compartment. The watertight door between the engine room access and the engine room was routinely secured in the open position and would allow free movement of water into the engine room.

2.2 The glass in the starboard cabin window was most probably blown out by air pressure from within the boat as it sank. The watertight door on the port side appeared to have a misaligned dog on its trailing edge; this was possibly caused when the door was blown open or was an existing fault that allowed the air pressure to open that door while the starboard one directly opposite remained securely closed. It is unlikely that in those weather conditions the crew would have had that door open. It would be expected that the crew would have battened down the large fish hatch forward of the accommodation, but it showed no sign of the deformation that would be expected had it been blown open by the air pressure from the combined fish holds. The Navy ROV video did not show the securing clasps for that hatch and it may be that these failed. The immediate past skipper did say that he had left the hatch ajar to ventilate the hold and so some doubt as to whether the hatch was securely fastened exists. The condition of the hatches and doors when the boat left Mangonui could not be determined.

2.3 One potential area of down flooding that was not visible on the Navy ROV video was the plywood hatch on the port side deck. Although this hatch would have been vulnerable in heavy seas, the boat heading in a southerly direction would have had the sea on the starboard side so the plywood hatch would have been on the leeward side and so somewhat protected.

2.4 In the absence of testimony from the crew, the events leading up to the sinking of the *Iron Maiden* will remain unclear and so any theory will have an element of conjecture.

2.5 It is unknown why the crew sailed from Mangonui in such haste, or why they continued the voyage once the adverse weather conditions became obvious when they rounded Cape Reinga. The skipper certainly had many things on his mind including his partner's pregnancy and his future employment. He was probably aware of the owner's precarious financial situation and may have put pressure on himself to get the boat to Raglan as soon as possible. He probably also wanted to get home to be with his partner.

2.6 Although qualified as a skipper and engineer, the owner was not the best person to familiarise the new skipper with the operation of the boat. He had never sailed on it and did not really understand the complexity of the engine systems. There were no hand-over notes for any of the operations involving the machinery.

2.7 It is not known why the crew did not communicate with anyone once they had joined the boat. They had mobile phones that would have had some coverage around the coast and they had VHF and SSB radios that they could have used to inform the coast radio stations of their intentions. It is usual for skippers to send a trip report to the coast radio station and to routinely listen to the weather forecasts broadcast by the maritime radio stations. On this occasion, no trip report was posted, and the crew ignored the weather forecast, didn't receive it or were not aware of the effect a strong persistent westerly quarter wind on the west coast had on the sea state. The owner said he knew the weather on the west coast was poor, but had not discussed it with the crew. He assumed, reasonably, that the skipper would decide if the weather was suitable for the voyage.

2.8 It appears that the owner did not put any overt pressure on the skipper to rush the voyage, but the poor financial situation of the fishing company may have subconsciously affected the skipper's decision making. The crew members had talked about putting to sea on the Sunday evening, but the owner had recommended that they not leave until at least the next morning.

2.9 The *Iron Maiden* was more complicated than would normally be expected of a fishing boat of less than 20 m. Even the immediate past skipper, who was qualified as an engineer, found the systems complex and had benefited from the advice of previous skippers. The 2 crew members only had Sunday evening and Monday while steaming to familiarise themselves with the boat and its systems. With west coast sea conditions of 4 m generally, rising to 10 m on Pandora Bank, a well found boat with a familiar crew would have found it taxing but the crew of the *Iron Maiden,* who were not fully conversant with their vessel, would have found the conditions intolerable.

2.10 The Navy ROV video showed the stabiliser arm and frame in the vertical position. The immediate past skipper said that he had left the frame in the vertical, stowed position with the foot of the arm lifted onto the upper deck, where it was secured with some light rope. There was a scar on the hull of the boat that was indicative of the stabiliser arm hitting and scraping it, possibly when it broke free from the upper deck. For whatever reason, the crew had never deployed the arm. This had 2 effects, first the stability was reduced by the weight of the arm high above the keel, and secondly the arm did not improve the boat's handling capability as it was designed to.

2.11 The stability of the *Iron Maiden* had always been close to the minimum required for a fishing vessel of less than 20 m. However, when tested in 1999 the resulting stability booklet showed that the boat met the requirements of Maritime Rules Part 40D, even though at that time the rule was not yet in force. The stability information booklet contained special guidance for masters, however it is unlikely that any of the skippers, particularly the skipper at the time of the accident, had looked at the stability information.

2.12 Modifications to the boat, including the adding and removal of solid ballast, had not been reported to the safe ship management companies and so the actual condition of the boat at the time of the accident voyage was not accurately known. The estimated stability at the time of foundering showed that even though the boat probably did not completely meet the stability requirements it would have been sufficiently stable to operate in sheltered waters. The criteria that it did not meet were those concerning its ability to right itself after being inclined by an external force, for example rough seas.

2.13 In an effort to keep waves from washing across the afterdeck when the crew were hauling the long line, pieces of timber had been fixed over the scupper between the bulwark and the sheer strake. Plywood sheets had been fixed across the after mooring ports in the bulwark, further restricting the passage of waves onto the afterdeck. The restrictions not only limited the amount of water washing onto the afterdeck, but more importantly also prevented any water on the afterdeck being quickly cleared, or freed. This would rapidly and seriously reduce the stability of the boat and would also increase the chance of water entering the engine room access compartment as it washed across the deck. These restrictions had been in place for many years so the boat had been vulnerable for that length of time.

2.14 If the boat had suffered any mechanical problem it would have been necessary for the skipper or deckhand to go down into the engine room. The hatch on the after deck was the only access and inevitably whoever went below would not have closed it after them, thus exposing the boat to the risk of flooding from a wave taken over the afterdeck.

2.15 The owner paid only scant regard to maritime legislation. He had never had his other boat surveyed, he did not bother to ensure that his crew were suitably qualified and experienced, he had not registered the *Iron Maiden* or formally changed its name from *Schameel* and he had never informed the safe ship management company of the modifications he had made to the boat.

2.16 The 2 crew members were friends and relatives, so it may have been difficult for the deckhand to question the skipper's decision to sail, if it had concerned him. Additionally they may have put peer pressure on each other to keep on going even in the face of deteriorating weather conditions.

2.17 The crew members had faced many challenges at sea and in life in general and had come through them unscathed. This may have given them a certain amount of over-confidence in their ability to withstand any conditions that the sea might throw at them.

2.18 The skipper had spent a lot of his formative years working in the Kaipara Harbour and in the coastal waters close by. He had successfully delivered a boat that he had purchased from the east coast to the Kaipara, albeit in good weather conditions. This may have given him false confidence in his ability to handle the sea conditions on the exposed west coast.

2.19 The Mayday call did not give the exact position of the boat nor did it adequately describe its situation. The terminology "flooding, taking on water" would normally infer that the hull was breached and there was an ingress of water, but it could also mean waves were swamping the decks.

2.20 The duration of the Mayday call was a little over 3 minutes during which the situation deteriorated rapidly. In the last of those 3 minutes, the skipper estimated that they would sink in 5 minutes, and 30 seconds later revised that estimate to 2 minutes. Immediately after that transmission, contact with the boat was lost, indicating that whatever overcame them was rapid and catastrophic.

2.21 In the prevailing weather conditions anyone in the sea would most likely have been overcome by the size of the waves in a very short time even without the effects of hypothermia. A combination of fighting for breath and the cold would have been impossible to withstand for an extended period. The water in the skipper's lungs indicated that he drowned rather than succumbed to exposure.

2.22 Had the survivors been able to gain access to a covered liferaft, they would have had some limited protection from being physically overwhelmed by the waves. However, in such extreme seas the liferaft would probably have been tumbled and any occupant would have run the risk of being overcome by water inside the liferaft and being drowned.

2.23 The hydrostatic release unit had activated, indicating that the liferaft had deployed automatically when the boat sank. In addition, the slipknot securing the canopy was still in place showing that no one had tried to close the canopy, further suggesting that neither of the crew had managed to board the liferaft.

2.24 The fact that the liferaft was released hydrostatically indicated that whatever occurred on the boat, happened sufficiently quickly for the crew not to be able to deploy the liferaft and board it. However, the skipper did manage to don a lifejacket and tie the EPIRB to himself.

2.25 The condition of the recovered liferaft showed that it was serviceable, but the crew had not boarded it. The red substance found in the bottom of the liferaft was confirmed not to be of human origin, most likely it was minute frayed particles that had come from the wind-stripped canopy.

2.26 The search and rescue effort was hampered by the remoteness of the area and the imprecise Mayday position. There was also confusion over the capabilities of the rescue helicopter. Once underway, the participants of the search performed admirably in atrocious weather conditions. The delay in the helicopter becoming airborne probably did not change the ultimate outcome of this tragedy.

2.27 The intermittent light inside the liferaft seen by the helicopter crew was most probably a sea cell light, which was automatically activated when the cell came in contact with sea water. Liferafts are usually equipped with an internal and external sea water activated light. The description from the helicopter pilot suggested that they saw the internal light through the canopy door, the intermittent nature of the light being produced as the raft moved in the rough seas.

2.28 The pathologist commented in the autopsy report on the skipper that a blood THC level of 0.7 micrograms at the time of death indicated recent ingestion of cannabis, estimated to be roughly the equivalent of one joint at a time one to 8 hours prior to death. Intoxication and impaired performance may last from one to 4 hours after ingestion. Had ingestion occurred 4 to 8 hours prior to death, the effect of cannabis might have impaired his mental performance and judgement at the time the boat passed Cape Reinga. Cannabis is known to induce euphoria, altered perception of time and space and a loss of inhibition. This might have significantly modified the skipper's decision-making process when confronted with rapidly deteriorating weather and sea conditions. Not appreciating the danger of continuing the voyage may have prevented the skipper from being properly able to consider the benefits of interrupting the voyage and returning to a safe anchorage to await improved weather conditions. Once the decision to proceed had been made, it is unlikely that he would have been able to maintain control of the vessel in the prevailing conditions, even if he was not impaired.

2.29 There was no specific legislation relating to the use of drugs and alcohol in the maritime industry. Consequently, it was impossible to determine the extent of the problem or to what extent drugs or alcohol have contributed to past accidents and incidents. The only drug and alcohol testing carried out was during the post mortem examination of someone who had died in a maritime accident, as in this case, or if those involved requested to be tested. So, it was occasionally noted that drugs or alcohol or both were present following an accident, but the full extent of the problem within the maritime industry could not be quantified.

2.30 Maritime Rules regarding the manning of fishing vessels were not completely clear. On one hand they stated that a CLM was equivalent to an ILM, while on the other hand the CLM itself was endorsed that the holder could only operate boats of less than 15 m. Consequently, the skipper was possibly operating the *Iron Maiden* without the correct certification, but that was open to interpretation and would need to be tested in law. In the absence of clear manning legislation, it is likely that vessels could be in the hands of people who are not sufficiently trained or experienced.

2.31 Furthermore, there was confusion about the extent of the inshore limit. Maritime Rules Part 20 Appendix 1 details the inshore limits, but there were no such limits on the west coast of North Island. However, part (b) of the definition of inshore limits in the same rule stated that any defined section of the coastal limits not beyond the territorial sea of New Zealand which has been assigned to that ship by a surveyor under rule 20.5(1) subject to rule 20.5(4) was inshore limits. Having 2 meanings for the same definition, one of which was user defined, created confusion.

2.32 The closeness of the EPIRB signal, when the helicopter located the liferaft, would indicate that the skipper was close to the liferaft at that time. He had possibly grasped the grab lines on the outside of the liferaft. The sea conditions would have been such that it would have been extremely difficult to board a liferaft from the sea, even with the boarding ladder that was fitted to the raft. When the helicopter returned to the area after refuelling, it homed in on the EPIRB signal but could not find the liferaft. This would indicate that by that time, the liferaft and the skipper had become separated. At night and in those conditions it would have been almost impossible to find a man in the water.

2.33 The body of the deckhand was never recovered; it is possible that he became trapped and wasn't able to evacuate the vessel when it foundered or he may have got free but was carried, unfound by the searchers, to the north of New Zealand and into the Pacific Ocean. The track between the foundering position and where the skipper's body was found indicated that he too would have probably been swept into the open ocean had he not been attached to the EPIRB, which enabled him to be found.

2.34 Even if the autopilot and the plotter fitted in Mangonui had not worked, the boat was equipped with enough navigation equipment, including paper charts, for the skipper to navigate safely to Raglan.

2.35 Surface vessels are not usually fitted with direction-finding equipment capable of homing in on either a 121.5 mHz or a 406 mHz EPIRB. Consequently, searching vessels were reliant on aircraft directing them towards a beacon.

3 Findings

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

3.1 The *Iron Maiden* foundered, probably sinking stern first, having been overcome by the extreme weather conditions.

3.2 The skipper and deckhand were not familiar with the boat, and they were only experienced operating close to the Kaipara Harbour and not on the exposed northern west coast of North Island.

3.3 There may have been a number of factors that contributed to the flooding of the *Iron Maiden*, but principally the vessel should not have been on the west coast with an unfamiliar crew, particularly in the extreme weather conditions at the time.

3.4 Once past Cape Reinga and heading into the worst of the weather, some event, or a chain of events, led to flooding, probably of the aft spaces and the sinking of the vessel.

3.5 There were several possible reasons for the flooding:

- a re-occurrence of past accidents in which the engine room flooded, although there was no evidence to support or deny this possibility
- some engine malfunction which caused the engine to stop, the vessel to lay to the sea and waves to break over the deck
- some engine problem which required the crew to go below to the engine room, thus leaving the hatch open to the ingress of water as waves broke over the deck
- the vessel was allowed to venture too close to Pandora Bank and it was engulfed and possible rolled or swamped by the huge confused seas that had built up there.

3.6 Once flooding occurred, there were several possible reasons why the vessel or its crew were unable to withstand or manage the flooding, which included:

- water on the deck was retained because the after mooring ports and the majority of the scuppers were blocked by timber. This would reduce the already marginal stability, possibly to a negative value
- the stabiliser arm was in the stowed vertical position, its weight high up would reduce the boat's stability, and would have stopped any roll dampening the arm may have provided

- the engine room hatch was open, whether opened by the crew to gain access or for some other reason, which allowed free flow of water into that space
- the door between the engine room access and the engine room itself was fastened open and would have allowed the free flow of water into the engine room
- the door between the fish holds had been left open and the hatches had been left ajar to ventilate the hold. If the doors and hatches were still in this condition it would have made it easier for water to enter the boat and flow between the holds
- the crew were not familiar with the complex machinery and bilge system and may not have been able to operate it to best effect.

3.7 The handover afforded to the crew of the *Iron Maiden* was not sufficient for them to have gained an adequate working knowledge of the boat. The time taken to reach the north of North Island was equally inadequate to familiarise themselves with the boat.

3.8 The skipper was ultimately responsible for the safety of the boat and its crew. The preparation and execution of the voyage were less than optimal. Why he chose to leave Mangonui in such haste, apparently disregarding the weather forecast, without any communication until his Mayday call and without deploying the stabiliser arm cannot be known. However, they are examples of inexperience and poor seamanship.

3.9 Once the *Iron Maiden* rounded Cape Reinga, the skipper would have been presented with the full fury of the gale ahead of him. Why he chose to continue cannot be known, however:

- he may have been anxious to return home, where his partner was expecting their first child
- he may have felt pressure to continue because he knew of the owner's financial difficulties and his own career prospects depended on the *Iron Maiden* starting set net fishing as soon as possible
- the role that cannabis ingestion had in the skipper's decision-making is uncertain, but the level of THC in his blood indicated that he was likely to have been impaired when making the decision to round Cape Reinga and continue with the voyage
- the deckhand was unlikely to challenge the skipper, as they were cousins and friends who had previously faced challenges together and had built up trust and confidence.

3.10 From the timing and content of the skipper's distress call, it was apparent that the final demise of the *Iron Maiden* was swift and catastrophic.

3.11 The skipper indicated an intention to abandon ship, but the liferaft was automatically set free from the vessel by its hydrostatic release, indicating that the crew did not launch the liferaft.

3.12 The skipper did have time to don a lifejacket and tie the EPIRB to himself and at some point the skipper was close to, or possibly clinging to, the liferaft. The sea conditions would have made it extremely difficult if not impossible to board the liferaft. It was the EPIRB which was tied to the skipper that led the searchers to the liferaft.

3.13 The body of the deckhand was not recovered. Whether he was trapped on board or abandoned the sinking boat at the same time as the skipper could not be ascertained.

3.14 In the sea temperature and conditions, a person entering the water would be highly unlikely to survive more than one hour, but possibly they would have succumbed much sooner.

3.15 While there were some delays in the search and rescue craft, particularly the helicopter, reaching the area, those delays did not alter the tragic outcome of this accident.

4 Safety Recommendations

4.1 On 27 May 2005, the Commission recommended to the Director of Maritime Safety that he:

4.1.1 continue to consult with industry over the use of alcohol and drugs on ships with the objective of developing a comprehensive drug and alcohol policy to be included in all safe ship management manuals. (027/05)

4.1.2 draft legislation for consideration by the Minister of Transport that will provide the necessary legislative framework to support the industry and individual operators in their implementation of a comprehensive drug and alcohol policy. (037/05)

4.1.3 in order to reduce confusion and the possibility of misinterpretation, develop a policy to rationalise and simplify the current maritime rules concerning the crewing and watchkeeping requirements for non-SOLAS vessels, and the limits in which they operate. (028/05)

4.1.4 while policy and any legislative changes are being developed, consult with industry to develop a communication and education strategy to ensure that masters, owners, operators, surveyors and inspectors are aware of the validity of the present qualifications and the minimum crewing requirements for all vessels and their relevant operating areas. (029/05)

4.1.5 by way of a marine notice remind safe ship management company surveyors, maritime safety inspectors, owners, operators and ships' staff of the need to be vigilant of the freeing arrangements on vessels and the adverse effect trapped water on deck can pose to a vessel's stability. (030/05)

4.2 On 8 June 2005, the Director of Maritime Safety replied that:

4.2.1 This recommendation is not accepted in its current form.

As explained in our letter of 21 April to the Commission, the Maritime Safety Authority would accept a recommendation which required MSA to "continue to consult with industry over the use of alcohol and drugs on ships with the objective of developing a generic drug and alcohol policy, supported by appropriate legislative frame work for the transport sector". (027/05)

4.2.2 This recommendation is not accepted.

It is the role of the Ministry of Transport, not the Director of MSA, to advance any proposal to Government for legislative change. This was clearly stated to the Commission by the Ministry in its letter of 9 May and for this reason the subject recommendation should be addressed to the Ministry of Transport. (037/05)

4.2.3 Maritime Rules 31B and C are currently being amended. MSA is prepared to accept this recommendation, provided suitable funding is obtained in its 06/07 rules bid to extend this work. (028/05)

4.2.4 MSA accept this recommendation and will consult with industry through its publication :Safe Seas, Clean Seas". (029/05)

4.2.5 MSA accepts the intent of this recommendation, but not the specific requirements of the issue of Maritime Notice, as in our view there are better methods to communicate with a wider cross section of industry and specific sectors, other than a Marine Notice. MSA will arrange such communication in its publications and correspondence with Safe Ship Management (SSM) companies. (030/05)

4.3 On 27 May 2005, the Commission recommended to the General Manager, Trade and Education of the Seafood Industry Council that he:

4.3.1 include an article in the Seafood New Zealand magazine featuring the report into this tragic accident highlighting the part played by minimal stability and the consumption of cannabis. (031/05)

4.4 On the 8 June 2005, the General Manager, Trade and Education of the Seafood Industry Council replied that:

4.4.1 We intend publishing a summary of the 04-212 report in the July or August issue of Seafood NZ magazine. (031/05)

Approved for Publication 26 May 2005

Hon W P Jeffries
Chief Commissioner

Appendix 1

Basic stability terminology and principles

- Figure 1 shows a hull immersed in water with the buoyant force from the water pressure acting through the centre of buoyancy (B). This force is equal and opposite to the displacement (Δ) of the vessel which acts downwards through the centre of gravity (G).

- Figure 2 shows a hull rolled to an angle of heel (θ), to the waterline (WL). The centre of buoyancy (B), which was initially on the centreline, moves to point B_1 as the immersed underwater hull changes. At this angle the lines of action of the forces of buoyancy and displacement are separated by the horizontal distance GZ, the righting lever.

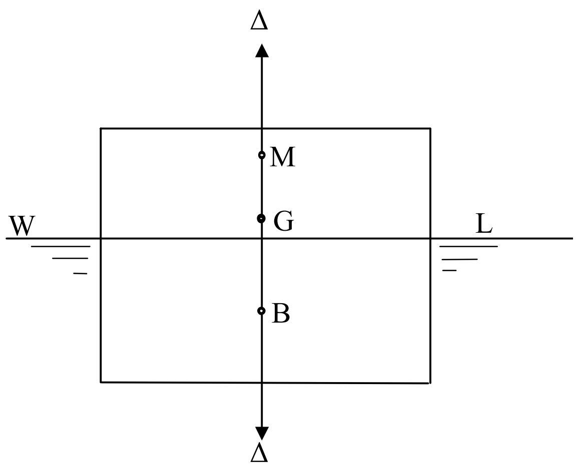


Figure 1

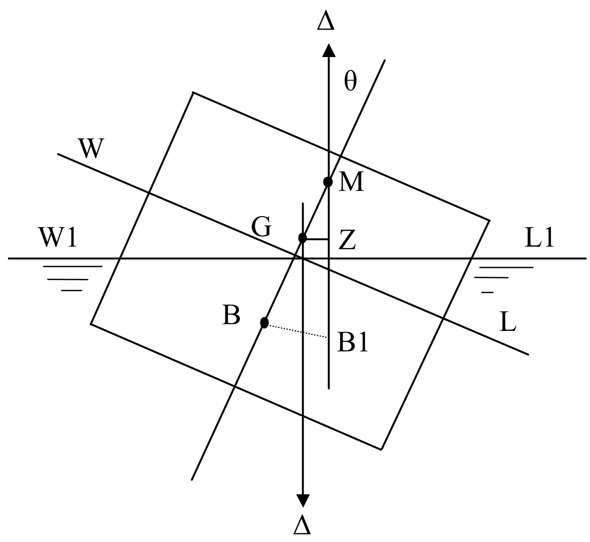


Figure 2

- Where the vertical line through the centre of buoyancy (B_1) intersects with the centreline of the vessel is the metacentre (M). At small angles of heel the GM or metacentric height is a good indicator of a vessel's stability; a large GM indicates a stiff vessel, a small GM indicates a tender vessel and a negative GM indicates an unstable vessel. At small angles of heel the GZ is equal to GMsin θ.

- The GZ is an important indication of the vessel's ability to return to the vertical from an angle of heel; this is particularly important with angles of heel above 10°. Large values of GZ mean a large righting lever and a vessel will return to the upright quickly. A small righting lever means a vessel will return to the upright more slowly and a negative righting lever means the vessel will capsize.

Appendix 2

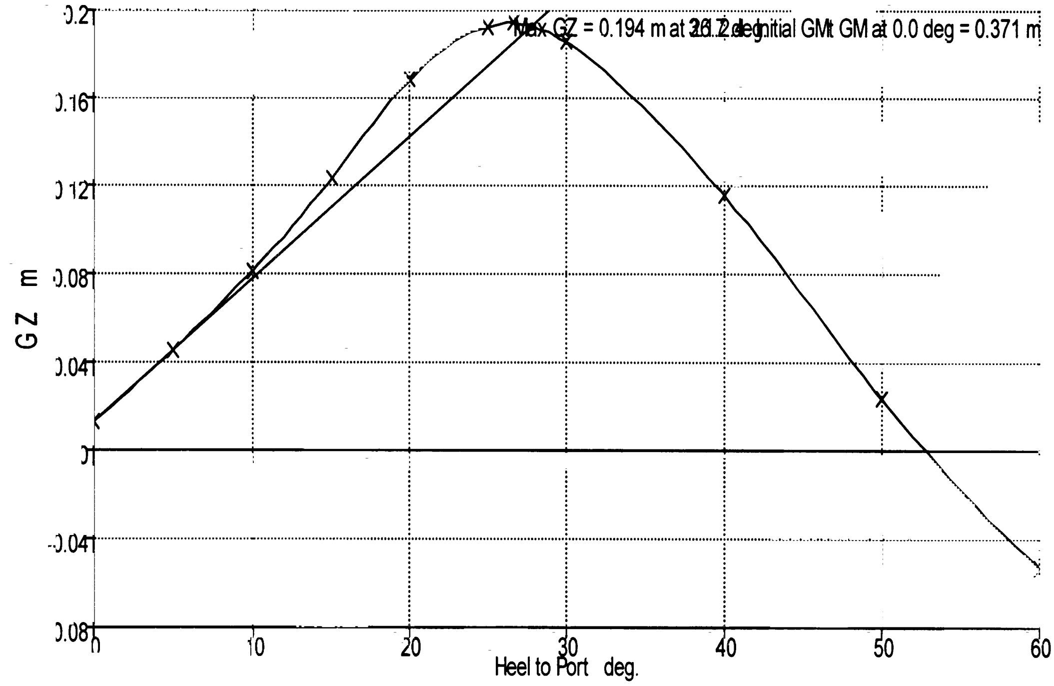
Stability information for the estimated departure condition of the *Iron Maiden,* calculated by SGS M&I from the 1999 stability model for the vessel.

Stability Calculation – MFV 'Iron Maiden' – Ex 'Schameel'

Loadcase - adjust dep1
Damage Case - Intact

Free to Trim
Relative Density (specific gravity) = 1.025; (Density = 1.0252 tonne/m^3)
Fluid analysis method: Use corrected VCG

Item Name	Quantity	Weight tonne	Long.Arm m	Vert.Arm m	Trans.Arm m	FS Mom. tonne.m	FSM Type
Lightship	1	72.96	8.021	3.060	0.000	0.000	
	2	3.500	4.270	2.100	0.000	0.330	
	1	0.8000	11.410	0.725	0.000	0.120	
	1	0.0000	9.047	2.400	0.000	0.000	
	1	0.0000	9.100	1.850	0.000	0.000	
	1	0.0000	11.800	1.950	0.000	0.000	
	1	0.0000	7.550	3.650	0.000	0.000	
	1	0.4000	8.700	4.900	0.000	0.000	
	1	0.4500	5.000	7.000	2.300	0.000	
	Total Weight=	**81.61**	**LCG=7.719**	**VCG=2.986**	**TCG=0.013**	**0.78**	
				FS corr.=0.01			
				VCG fluid=2.995			



Heel to Port degrees	0.0	5.0	10.0	15.0	20.0	25.0
Displacement tonne	81.61	81.61	81.61	81.61	81.62	81.62
Draft at FP m	2.435	2.433	2.427	2.419	2.405	2.376
Draft at AP m	2.603	2.601	2.597	2.588	2.578	2.589
WL Length m	16.854	16.853	16.849	16.844	16.834	16.817
Immersed Depth m	2.327	2.317	2.286	2.233	2.164	2.092
WL Beam m	5.073	5.093	5.152	5.252	5.369	4.974
Wetted Area m^2	104.672	104.734	104.924	105.248	106.578	108.278
Waterpl. Area m^2	69.062	69.338	70.181	71.616	70.398	64.823
Prismatic Coeff.	0.651	0.651	0.652	0.654	0.657	0.661
Block Coeff.	0.400	0.400	0.401	0.403	0.407	0.455
LCB from Amidsh. (+ve fwd) m	-0.706	-0.707	-0.709	-0.707	-0.706	-0.709
VCB from DWL m	-0.657	-0.659	-0.664	-0.672	-0.686	-0.710
GZ m	0.013	0.046	0.081	0.123	0.169	0.193
LCF from Amidsh. (+ve fwd) m	-0.992	-0.992	-0.992	-0.990	-0.763	-0.452
TCF to zero pt. m	0.000	-0.258	-0.514	-0.769	-0.960	-1.137
Max deck inclination deg	0.6	5.0	10.0	15.0	20.0	25.0
Trim angle (+ve by stern) deg	0.6	0.6	0.6	0.6	0.6	0.7

Heel to Port degrees	30.0	40.0	50.0	60.0
Displacement tonne	81.62	81.62	81.62	81.62
Draft at FP m	2.333	2.220	2.069	
	2.613	2.682	2.729	
	16.793	16.730	16.647	16.512
	2.073	2.320	2.480	2.534
	4.448	3.836	3.984	4.430
	109.729	111.586	113.251	115.795
	59.385	53.891	53.597	56.653

LCB from Amidsh. (+ve fwd) m	-0.713	-0.722	-0.727	-0.727
VCB from DWL m	-0.740	-0.806	-0.853	-0.866
GZ m				
LCF from Amidsh. (+ve fwd) m	-0.220	-0.026	0.066	0.081
TCF to zero pt. m	-1.319	-1.709	-2.139	-2.564
Max deck inclination deg	30.0	40.0	50.0	60.0
Trim angle (+ve by stern) deg	1.0	1.6	2.2	2.9

Code	Criteria	Value	Units	Actual	Status
A.749(18) Ch3 - Design criteria applicable to all ships	**3.1.2.1: Area 0 to 30**				**Pass**
	shall not be less than (>=)	**3.151**	**m.deg**	**3.574**	**Pass**
A.749(18) Ch3 - Design criteria applicable to all ships	**3.1.2.1: Area 0 to 40**				**Fail**
	angle of vanishing stability	52.8	deg		
	shall not be less than (>=)	**5.157**	**m.deg**	**5.109**	**Fail**
A.749(18) Ch3 - Design criteria applicable to all ships	**3.1.2.1: Area 30 to 40**				**Fail**
	shall not be less than (>=)	**1.719**	**m.deg**	**1.535**	**Fail**
A.749(18) Ch3 - Design criteria applicable to all ships	**3.1.2.2: Max GZ at 30 or greater**				**Fail**
	angle of max. GZ	26.7	deg		
	shall not be less than (>=)	**0.200**	**m**	**0.185**	**Fail**
A.749(18) Ch3 - Design criteria applicable to all ships	**3.1.2.3: Angle of maximum GZ**				**Pass**
	shall not be less than (>=)	**25.0**	**deg**	**26.7**	**Pass**
A.749(18) Ch3 - Design criteria applicable to all ships	**3.1.2.4: Initial GMt**				**Pass**
	shall not be less than (>=)	**0.350**	**m**	**0.371**	**Pass**

Equilibrium Calculation - MFV 'Iron Maiden' - Ex 'Schameel'.

Loadcase - adjust dep1
Damage Case - Intact

Free to Trim
Relative Density (specific gravity) = 1.025; (Density = 1.0252 tonne/m^3)
Fluid analysis method: Use corrected VCG

Item Name	Quantity	Weight tonne	Long.Arm m	Vert.Arm m	Trans.Arm m	FS Mom. tonne.m	FSM Type
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	2	3.500	4.270	2.100	0.000	0.330	
	1	0.8000	11.410	0.725	0.000	0.120	
	1	0.0000	9.047	2.400	0.000	0.000	
	1	0.0000	9.100	1.850	0.000	0.000	
	1	0.0000	11.800	1.950	0.000	0.000	
	1	0.0000	7.550	3.650	0.000	0.000	
	1	0.4000	8.700	4.900	0.000	0.000	
	1	0.4500	5.000	7.000	2.300	0.000	
	Total Weight=	**81.61**	**LCG=7.719**	**VCG=2.986**	**TCG=0.013**	**0.78**	
				FS corr.=0.01			
				VCG fluid=2.995			

Draft Amidsh. m	2.519
Displacement tonne	81.61
Heel to Starboard degrees	
Draft at FP m	
Draft at AP m	
	-0.706
	-0.992
	1.868
	0.533
	2.0
Trim angle (+ve by stern) deg	0.6

Appendix 3

OCIMF

OIL COMPANIES INTERNATIONAL MARINE FORUM

GUIDELINES FOR THE CONTROL OF DRUGS AND ALCOHOL ONBOARD SHIP

June 1995

The OCIMF mission is to be recognised internationally as the foremost authority on the safe and environmentally responsible operation of oil tankers and terminals.

GUIDELINES FOR THE CONTROL OF DRUGS AND ALCOHOL ONBOARD SHIP

Drug and alcohol abuse and its adverse effects on safety is one of the most significant social problems of our time. It is, appropriately, receiving attention both in the public eye and in government legislation. An example, specific to the marine industry, of government attention to this issue is the U.S. Coast Guard (USCG) regulations on the testing of personnel on national and foreign flag ships:

Recognising the potentially serious impact of marine incidents, the Oil Companies International Marine Forum (OCIMF), and the marine industry in general, have over the years developed guidance aimed at encouraging safe ship operation and protection of the environment. Whilst tanker companies have generally operated with strict policies related to drug and alcohol use onboard their ships, OCIMF considers it timely that the industry as a whole reassesses the control of drugs and alcohol onboard ships.

OCIMF recommends that shipping companies should have a clearly written policy on drug and alcohol abuse that is easily understood by seafarers as well as shore-based staff. In order to enforce their policy, companies should have rules of conduct and controls in place, with the objective that no seafarer will navigate a ship or operate its onboard equipment whilst impaired by drugs or alcohol. It is recommended that seafarers be subject to testing and screening for drugs and alcohol abuse by means of a combined programme of un-announced testing and routine medical examination. The frequency of this un-announced testing should be sufficient so as to serve as an effective deterrent to such abuse.

The misuse of legitimate drugs, or the use, possession, distribution or sale of illicit or un-prescribed controlled drugs on board ship cannot be condoned and should be prohibited. In addition, any use of a prescribed controlled drug which causes, or contributes to unacceptable job performance or unusual job behaviour should require the seafarer to be excused from duty until such times as he is repatriated, or treatment and its after-effects cease.

The suggested list of substances to be prohibited should include, but not be limited to, marijuana, cocaine, opiates, phencyclidine (PCP) and amphetamines and their derivatives. In this regard, the International Chamber of Shipping (ICS) has published guidelines on recognition and detection of drug trafficking and abuse entitled "Drug Trafficking and Drug Abuse: Guidelines for Owners and Masters on Recognition and Detection".

Company policy should provide for control of onboard alcohol distribution and monitoring of consumption. This policy should support the principle that officers and ratings should not be impaired by alcohol when performing scheduled duties.

OCIMF recommends that officers and ratings observe a period of abstinence from alcohol prior to scheduled watchkeeping duty or work periods. This may be either a fixed period, such as the 4 hours required by the USCG, or a minimum period of 1 hour of abstinence for each unit of alcohol consumed (refer to table 1 for examples of approximate alcohol unit conversions). Whichever method is used to determine the abstinence period, the objective should always be to ensure that, prior to going on scheduled duty, the blood alcohol content of the seafarer is theoretically zero. Officers and ratings should be aware that local regulations may be in place and where this is the case, it is recommended that these be strictly adhered to where they exceed these guidelines.

Recognising that all seafarers must be able to respond at any time to an emergency situation, the International Maritime Organization (IMO) is considering including guidance to administrations on maximum permissible blood alcohol content (BAC) and abstinence periods in Part 'B' of the Code which is to be annexed to the revised STCW Convention.

However, whilst some administrations have already established national legislation in this regard, in the absence of national or international requirements, companies should advise seafarers in their employment of the maximum permissible blood alcohol content (BAC) permitted whilst on board their ships.

In the interest of health and safety, seafarers should be actively encouraged not to exceed consumption levels which could affect long term health. Information should be provided to seafarers on alcohol consumption in relation to impairment, its impact on behaviour and health, and the availability of rehabilitation programmes.

OCIMF is firmly of the opinion that it is in the best interest of all sectors of the maritime industry to positively respond to these guidelines and thus work to ensure a safe workplace for seafarers and to protect the safety and well being of the public and the environment.

	Volume	Units
Beers, Cider and Lagers		
Extra Strength	10oz.	2.5
(>4.0% <6.0% Alc. by Vol.)	30cl.	2.5
Ordinary Strength	10oz.	1.0
(>1.0% <4.0% Alc. by Vol.)	30cl.	1.0
Low Alcohol	10oz.	0.5
(>0.05% <1.0% Alc. by Vol.)	30cl.	0.5
Table Wines, Others	10cl.	1.0
(>6.0% <12% Alc. by Vol.)	1 litre bottle	10.0
Sherry, Fortified Wines, Others	6cl.	1.0
(>12% < 16% Alc. by Vol.)	1 litre bottle	16.0
Spirits, Liquor, Liqueurs, Others	1oz.	1.0
(>16% < 40% Alc. by Vol.)	3cl.	1.0
Any Other Low Alcohol Beverage	10oz.	0.5
(>0.05% < 1.0% Alc. by Vol.)	30cl.	0.5

TABLE 1: APPROXIMATE ALCOHOL UNIT CONVERSIONS

Recent Marine Occurrence Reports published by
the Transport Accident Investigation Commission
(most recent at top of list)

04-212	Fishing vessel *Iron Maiden*, foundered off Pandora Bank, Northland, 16 August 2004
04-213	restricted limits passenger ferry *Superflyte*, engine room fire, Motuihe Channel, Hauraki Gulf, 22 August 2004
04-211	coastal cargo vessel *Southern Tiare,* loss of rudder, off Mahia Peninsula, 4 July 2004
04-210	restricted limit passenger vessel *Esprit de Mer,* fire, Milford Sound, 30 June 2004
04-209	fishing vessel *Joanne* and motor tanker *Hellas Constellation,* collision, entrance to the Port of Tauranga, 19 May 2004
04-208	jet boat *CYS*, propulsion failure and capsize, Waimakariri River, 13 May 2004
04-207	fishing vessel *Poseidon,* grounding, north of Manukau Harbour entrance, 15 April 2004
04-205	fishing vessel *Bronny G*, grounding, Banks Peninsula, 26 March 2004
04-204	restricted limit passenger vessel *Freedom III*, grounding, Lake Manapouri, 24 February 2004
04-203	coastal passenger and freight ferry *Arahura*, heavy weather incident, Cook Strait, 15 February 2004
04-202	restricted limit passenger vessel *Queenstown Princess*, grounding, Lake Wakatipu, 13 February 2004
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

Transport Accident Investigation Commission
P O Box 10-323, Wellington, New Zealand
Phone: +64-4-473 3112 Fax: +64-4-499 1510
E-mail: reports@taic.org.nz Website: www.taic.org.nz

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