



Accident Report  
*Arahura*  
Mechanical Failure in Tory  
Channel on 14 December 2004  
Class B



## REPORT NO.: 04 3626

# ARAHURA – MECHANICAL FAILURE

On the afternoon of 14 December 2004, *Arahura* departed Picton for Wellington.

Whilst *Arahura* was transiting Tory Channel (Figure 1), a shore based Electrical Contractor was tracing/eliminating earth faults in the vessel's main engine room. These faults had been the cause of previous spurious alarms on the CSI alarm and monitoring system. The function of the system was to monitor the sensor outputs from the four diesel driven alternators (PE's – Figure 2 ). The PE's provided electrical power to four electric propulsion motors (PM's – Figure 2 ).

The Contractor mistakenly removed two wires from the CSI alarm system that were monitoring unit PE 4. This caused PE's 1 and 3 to shut down.

The above action caused a loss of electrical power to the starboard propulsion motor, which then stopped. *Arahura* still had power to the port propulsion motor (PM1).

The Master and bridge team implemented emergency contingency plans to ensure the continued safety of the vessel and persons on board. The vessel cleared Tory Channel without incident and continued on passage to Wellington.

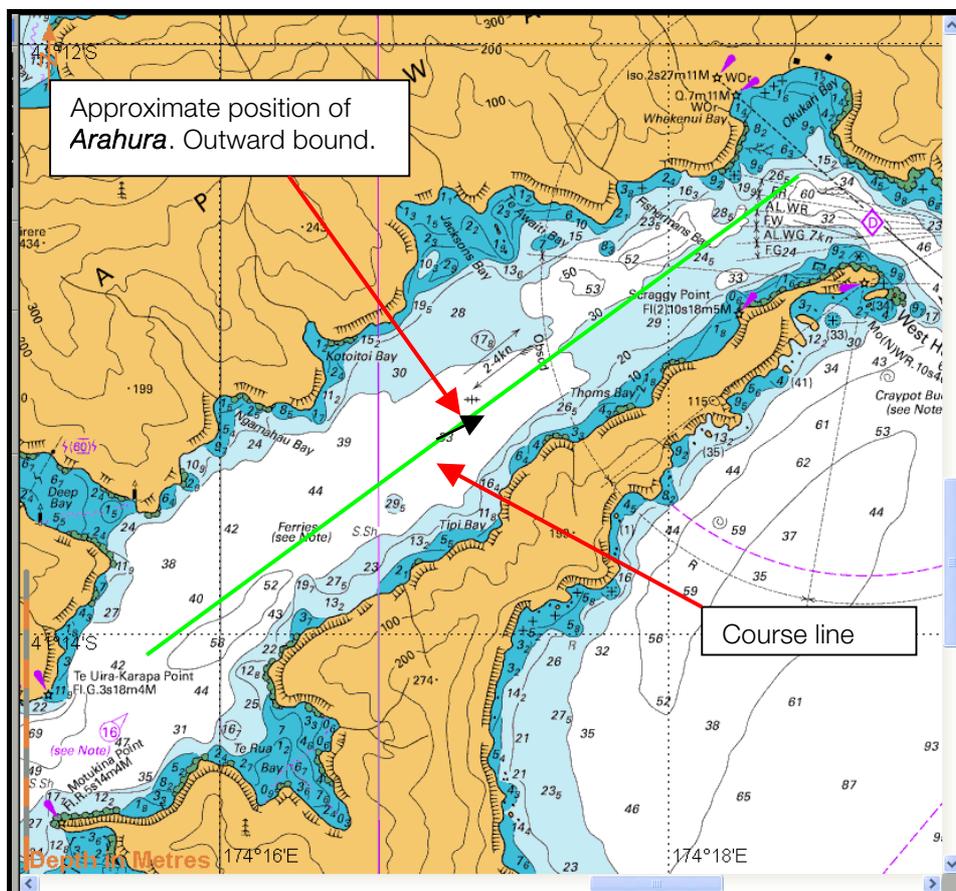


Figure 1

## DETAILS OF VESSEL, OWNER & MANAGEMENT, CLASSIFICATION & CREW:

Vessel Name:	<i>Arahura</i>
Vessel Type:	Passenger Ro-ro
Port of Registry:	Wellington
Flag:	New Zealand
IMO No.:	8201454
Official No.:	394929
Built:	1983
Construction Material:	Steel
Length Overall (m):	148.37
Maximum Breadth:	20.25
Gross Tonnage:	13 621
Net Tonnage:	4 086
Propulsion:	4 Diesel Electric developing 10 400kW
Classification Society:	Det Norske Veritas
Accident Investigator:	David Billington



- **Owner Details**

*Arahura*, a New Zealand registered SOLAS passenger vessel, is owned by Toll (NZ) Consolidated Ltd (Toll) and operated and managed by Interislander. Toll took over the operation of the ferry service in early January 2004 from Tranzrail.

- **Crew Details**

All the ship's officers and crew were appropriately qualified and held the necessary certification as required by the Flag State.

# NARRATIVE

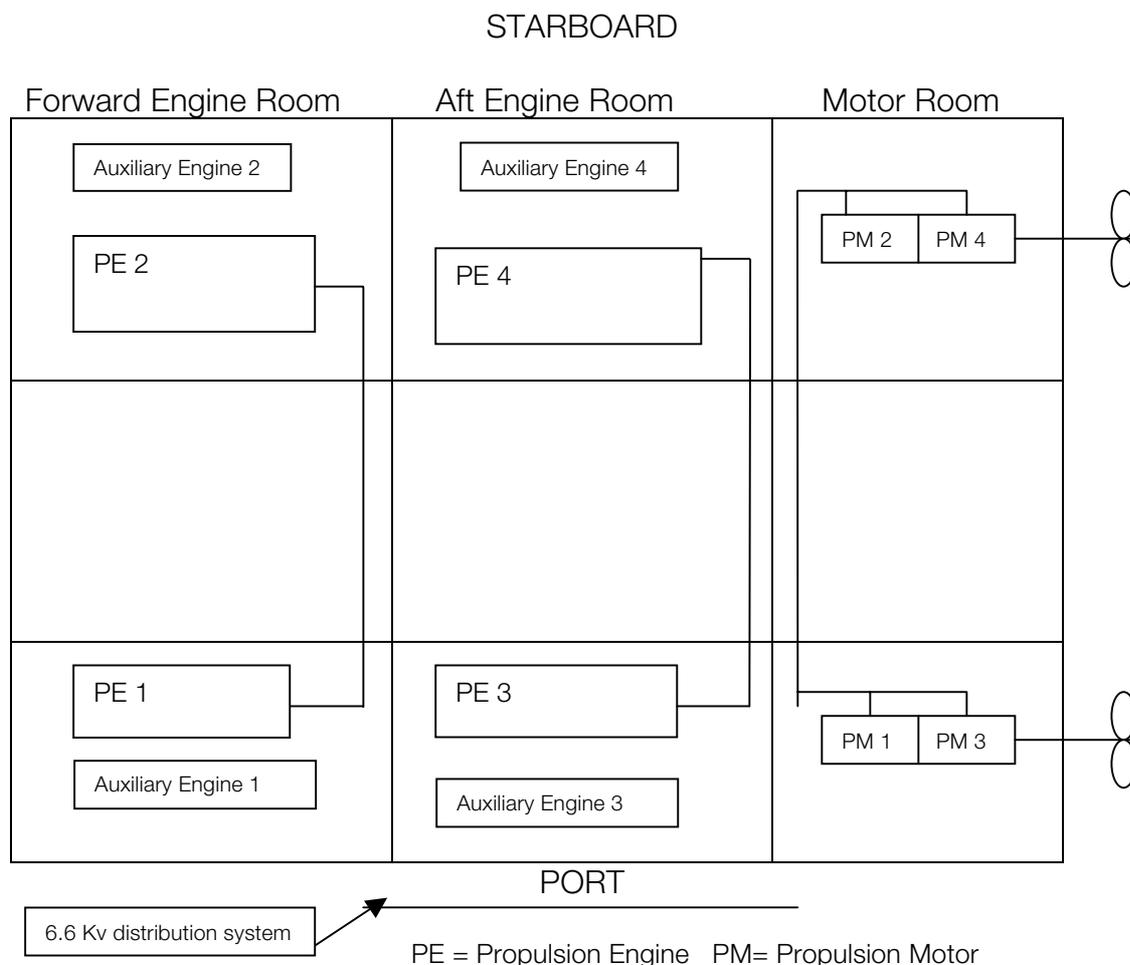
**Arahura** had experienced technical earth faults on the CSI<sup>1</sup> alarm and monitoring system over a period of 6 months. One of the functions of this system was to monitor the sensor information outputs from the PE's, which supplied electrical power to the four PM's. The sensors supplied the following information to the alarm and monitoring panel:

- Engine temperatures - exhaust, lube oil, fuel oil, turbo and fresh water cooling
- Engine revolutions
- Engine pressures - lube oil, turbo, fuel and cooling water.

The sensor information was compared with the manufacturers preset alarm values to ensure the vessel's running machinery remained within the manufacturers specifications. If a breach of these preset values occurred, the system was designed to alarm and alert the duty watch keeper.

On previous voyages, a number of earth faults were identified in the alarm systems, which included the main engine RPM<sup>2</sup> signal.

On instructions from Interislander, a shore based Electrical Contractor was instructed to trace and isolate/eliminate the earth faults. The Contractor was experienced, fully trained, and qualified for the electrical system on **Arahura**.



**Figure 2 – Machinery Layout onboard Arahura**

<sup>1</sup> CSI name of a Dutch alarm manufacturer

<sup>2</sup> Revolutions per minute

## THE INCIDENT

On 14 December, a shore based Electrical Contractor boarded **Arahura** at Wellington. After reporting to the Chief Engineer, he completed a permit to work, as per the Interislander Safety Manual.

The Contractor commenced work on the CSI<sup>3</sup> alarm system in the engine control room, which was situated in the forward engine room. He traced an earth fault leading to PM 2 RPM signal. There were no technical or mechanical problems with the running machinery during this time. The Contractor ceased work shortly before the vessel arrived at Picton.

When **Arahura** left Picton, three of the four PE's were operating namely numbers 1, 3 and 4. Of the four propulsion motors, PM's 1, 2 and 3 were running and No. 4 was shut down. The Contractor, who was in the engine control room, started to isolate what he believed to be part of the alarm system to PM 2 RPM sensor, using a Shinko converter<sup>4</sup>.

At about 1420 hours, whilst the Contractor was still working on the CSI alarm systems, the Engine Room Watch Keeping Officer (EO) in the engine control room, was alerted by PE 4 over speed shut down alarm sounding.

The EO was aware the Contractor was working on the alarm panel and verbally reported the alarm to him.

The Contractor realised the two wires he had just removed from the alarm system must have been monitoring PE 4 and not PE2. He immediately removed the Shinko unit and reconnected the wires. However, the over-speed alarm indicator for PE 4 continued to sound whilst the engine remained running still on load. However, PE's 1 and 3 came off load and shut down leaving PE4 on load by itself. The reason for this was unknown.

PM's 2 and 3 then stopped, leaving only PM 1 running on the port shaft.

At about 1423 hours, the EO contacted the bridge by telephone and told them that all propulsion drive had been lost. When he realised, after looking at the power distribution board, that PM 1 was still running, he immediately told the bridge.

The Master activated the bridge emergency procedures checklist as follows:

- 1424 Hours - Emergency contingency plans activated.
- 1427 Hours - Anchors cleared.
- 1429 Hours - Navigational warning sent to all vessels.

The Master considered the following in consultation with the Bridge Team:

- Taking all way off the vessel and anchoring or,
- Continuing on passage through the eastern entrance of Tory Channel.

The Master decided to continue on passage, having taken account of the following:

- Prevailing weather conditions
- Tidal influence

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<sup>3</sup> CSI - name of the Dutch alarm manufacturer

<sup>4</sup> The Shinko converter is an electronic device that converts one type of signal to another and provides isolation between input and output. In the case of **Arahura** it was being used to convert a 0-10 V signal to 4-20mA and provide isolation between the two pieces of equipment, which allowed isolation of the earths from each other.



- Other traffic
- Previous experience of manoeuvring when operating on only one shaft.

The Chief Engineer (CE) proceeded to the engine control room after being told what had happened. At this stage, only PE 4 and PM1 were running.

At about 1430 hours, the CE, EO, and Electrical Officer re-started PE 2 and put it on load. At the Master's request, power was supplied to the bow thrusters to assist in manoeuvring the vessel, if required.

At about 1435 hours, PM 3 was started, which supplied power to the port shaft and was put on load. Subsequently, the Engine room informed the bridge that they had two motors on the port shaft.

PE's 1 and 3 were then started and put on load. Attempts to start PM 2 failed.

At about 1443 hours, **Arahura** cleared Tory Channel. She was still operating on only the port shaft but with both PM's in operation.

At about 1505 hours, PM2 was started. The bridge was told they now had one motor on the starboard shaft. Power to the bow thrusters was switched off at this time. **Arahura** continued to Wellington without further incident.

At about 1510 hours, the Master told the duty manager of Interislander about the incident. Interislander then notified Maritime New Zealand.



## FINDINGS

- The Electrical Contractor was working on the CSI alarm system to PE 2. When the EO informed the contractor that an over speed alarm had sounded for PE4 the Contractor realised he had mistakenly removed the RPM monitoring wires for PE 4.
- PE's 1 and 3 shut down after the wires were removed from PE 4. As the Contractor had ascertained that earth faults existed in the RPM sensors, it is probable that the removal of these wires caused an electrical spike. This then caused the voltage to rise high enough to trigger an over speed shut down of the three operating propulsion engines. This was the conclusion reached by the contractor.
- When in port, the engine room team tried to replicate the fault using the same engine configuration at the time of the incident. The same two wires were removed from the RPM sensor to PE 4. The alarm activated as expected on the CSI alarm panel. However, engine shut down did not occur. The only factor that was different was that the engines were not running on load.
- **Arahura** has limited lay over periods due to her operating schedule. Onboard senior engineering officers felt that it would be beneficial to roster more lay over periods for planned maintenance. They felt this would help to reduce the risk of any technical/mechanical breakdown, whilst undertaking maintenance on passage.



## SAFETY RECOMMENDATIONS

1. Interislander responded to the incident by putting out a fleet memorandum; prohibiting work on any system, when the vessel was on passage in enclosed waters, which affected or could affect the propulsion of the ship, no matter how remote. This included any alarms and control systems relating to the propulsion of the vessel.
2. It is recommended that the above procedure be documented in the company's safety procedure manual and drawn to the attention of all engineering staff.
3. It is further recommended that Interislander give consideration to reducing the period between maintenance layovers to allow senior engineering officers to progress planned maintenance.

