OTSI Office of Transport Safety Investigations

FERRY SAFETY INVESTIGATION REPORT

SYSTEMIC INVESTIGATION INTO INCIDENTS OF COLLISION INVOLVING FRESHWATER CLASS VESSELS OPERATED BY SYDNEY FERRIES CORPORATION

OCTOBER 2004 – OCTOBER 2005

Photo of Sydney Ferries *Freshwater*, courtesy of NSW Maritime

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Office of Transport Safety Investigations
Level 17, 201 Elizabeth Street
Sydney NSW 2000

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GLOSSARY OF TERMS AND ABBREVIATIONS

AIMPE	Australian Institute of Marine and Power Engineers (AIMPE), NSW District, which represents the Engineers working on Sydney Ferries' 'Outer Harbour' vessels
AMOU	Australian Maritime Officers' Union (AMOU), which represents the Masters of Sydney Ferries' vessels
AMSA	Australian Maritime Safety Authority
Backboards	Timber buffers comprising heavy beams set on frames supported by piles driven into the seabed, adjacent to dead end berths used by vessels securing at locations such as Circular Quay
BHP	Brake Horse Power. A measure of engine power output at the output shaft, before any reduction gearing
Bow	Front area of vessel
Bridge	The location from which the Master exercises control of the vessel. This location is also sometimes referred to as the "Wheelhouse"
CCTV	Closed Circuit Television equipment used for monitoring and recording
CPP	Controllable Pitch Propeller. A propeller that has the thrust resulting from its constant rotation varied ahead or astern by pitch adjustment from a remote location, such as a vessel's bridge control console
CRM	Crew Resource Management. Training designed to ensure the use of all available resources to achieve safe and efficient operations by enhancing communication, teamwork and the capacity to respond to emergencies.
DIPs	Directly Involved/Interested Parties
Ebb	Periodic reduction of seawater level due to decreasing tidal forces
Evolutions	Ferry crew training drills and procedures undertaken by Sydney Ferries as programs forming part of its Safety Management System (SMS)
FERP	Sydney Ferries' Fleet Emergency Response Plan

Ferry	A vessel which carries more than 8 adult persons, as defined by the *Passenger Transport Act NSW 1990*
GPH	General Purpose Hand, or 'Deckhand'. A qualified crew member not engaged in navigational or engineering duties
ICAM	Incident Cause Analysis Method
IMO	International Maritime Organisation
ISM Code	International Safety Management Code. The purpose of this Code is to provide an international standard for the safe management and operation of ships and for prevention of pollution at sea. Promulgated by the International Maritime Organisation (IMO)
ITSRR	The NSW Independent Transport Safety & Reliability Regulator
Kamome	The manufacturer of the propulsion control system fitted to the *Collaroy*
Knot	Unit of speed - one nautical mile per hour - about 1.85 km/h.
kW	Kilowatt
LIPS	The Lipstronic propulsion control system, manufactured by Wartsila, used on the three other Freshwater class vessels: *Freshwater*, *Narrabeen* and *Queenscliff*
Lloyds Register	One of the international ship classification societies. Ship Classification is a system for safeguarding life, property and the environment at sea. Society approval entails verification of a vessel's criteria against a set of requirements during its design, construction and operation for purposes such as insurance
MA	The NSW Maritime Authority
MCR	Machinery Control Room. A manned space below deck adjoining the vessel's engine room, from which operation of the vessel's power and steering equipment can be monitored and controlled
MoT	The Ministry of Transport accredits ferry operators as a prerequisite to obtaining a service contract for regular passenger services under the *Passenger Transport Act 1990*

MUA	Maritime Union of Australia (MUA), which represents the General Purpose Hands on Sydney Ferries' vessels
NMSC	National Maritime Safety Committee
NSCV	National Standard for Commercial Vessels: a proposed replacement for the Uniform Shipping Laws Code. Both codes aim to ensure that a national standard is applied to the construction of all commercial vessels
NSW	New South Wales
NSW Maritime	"NSW Maritime" is the trading name of the NSW Maritime Authority, the body which regulates maritime activities in NSW
OTSI	The Office of Transport Safety Investigations
Port	The left-hand side when facing forward on a vessel
ProCon	Programmable Logic Controller
PTA	*Passenger Transport Act NSW 1990*
Public Passenger Service	The carriage of passengers for a fare or other consideration by means of a vessel within New South Wales waterways
Revalidation	The periodic reissue of a certificate or authorisation. This may be carried out at the same time as, or in lieu of, an audit
Rexroth	A company, within the Bosch group, that manufactures various components on a variety of hydraulic systems used on Sydney Ferries' vessels
RPM	Revolutions Per Minute of running equipment and machinery
Sheltered Waters	Ferry operational limits as defined by the NSW Maritime Authority
SHP	Shaft Horse Power. A measure of engine power at the output shaft after any reduction gearing

SMS	Safety Management System is the requirements, policies, procedures and activities as the means by which safety management is undertaken by an organisation
SOPs	Standard Operating Procedures. Procedures that describe the way in which specific actions are to be performed in order to ensure that vessels are operated in a consistent, safe and efficient manner
STA	State Transit Authority
Starboard	The right-hand side when facing forward on board a vessel
Stern	Rear area of vessel
Sydney Ferries	Sydney Ferries Corporation
TAA	*Transport Administration Act 1988*
Taylor Report (2001)	A report commissioned by the Minister for Transport in 2001 and prepared by the then Waterways Authority, entitled "Independent Review of the Operations of Sydney Ferries"
USL Code	Uniform Shipping Laws Code. The current maritime standard applied throughout Australia in respect of safety matters and specifically vessel construction, equipment, crewing and operation
VOM	Vessel Operations Manual. The prime reference, issued by Sydney Ferries, containing technical information and operating instructions for each class of ferries
'X-Y Lever'	Ferry propulsion control devices fitted at each navigational station console that set propeller and rudders to provide longitudinal and transverse thrust as ordered by the vessel's Master

EXECUTIVE SUMMARY

Throughout the period October 2004 to October 2005, Freshwater class vessels operated by Sydney Ferries Corporation, more commonly known as Manly ferries, were involved in 11 reported collisions. All of these reported collisions were the subject of some form of investigation, either by Sydney Ferries Corporation, the NSW Maritime Authority and/or the Office of Transport Safety Investigations (OTSI). However, in view of what appeared to be an adverse safety trend and recurring safety issues, and in the interests of public transport safety, the Chief Investigator initiated a systemic investigation into the incidents.

In reviewing the series of Freshwater class accidents, it became apparent to OTSI that many of the factors which contributed to the cause of those accidents, were also present in investigations into incidents involving other classes of vessels operated by Sydney Ferries throughout the same period. These factors were largely organisational in nature and many of them had been the subject of comment in previous reports. The fact that some of these factors remain at issue reflects a lack of satisfactory progress in remedial action in some instances, and inherent complexity in others.

Nevertheless, OTSI acknowledges that throughout 2005 and 2006, Sydney Ferries initiated a number of projects to improve the safety and reliability of its vessel operations and it is important to note that the last incident involving a Freshwater class collision occurred on 17 October 2005. Some of these initiatives were in direct response to the Freshwater collisions and others were in response to Sydney Ferries' internal reviews, together with the recommendations from various external organisational review and accident investigation reports. These initiatives, and their implementation status, are described in Part 4 of this report.

Number of Incidents

At the outset of this systemic investigation, OTSI had been advised that there were 12 incidents involving Freshwater Class collisions in the subject period of October 2004 to October 2005. However, as the investigation progressed, it was established that one of the reported incidents did not involve a collision, and so it was not considered further as part of the systemic inquiries. The remaining 11 incidents constitute the basis for this investigation.

Context

The 11 incidents of collision involving Freshwater class vessels, and 23 incidents involving

other classes of vessels operated by Sydney Ferries throughout the period October 2004 to October 2005, have attracted significant public interest and media comment, some of which has not appreciated the scale of the operations of, and services provided by, Sydney Ferries. To put the incidence of collision accidents into perspective, it is important to recognise that during the period October 2004 to October 2005, Sydney Ferries conducted approximately 180,000 service runs and made 540,000 berthings. Statistically, the frequency of collisions of all types and gravity throughout this period, across all vessels operated by Sydney Ferries, was less than 1 per 5000 trips, or less than 0.02%. While the frequency of incidents is very low statistically and reflects a record of generally safe operations, the fact that there have been instances of collision at all, indicates the requirement to understand the causes and identify the remedies that will enable Sydney Ferries to improve its approach to safety and deliver a safer working environment for its crews and a safer public transport service.

Findings

In relation to those matters prescribed by the Terms of Reference as the principal lines of inquiry, OTSI finds as follows:

a. Causation

i. Freshwater class vessels were over-represented in incidents of collision throughout the period October 2004 to October 2005 and indeed, over a longer period of time. This was a consequence of their technical complexity relative to other classes of vessels operated by Sydney Ferries, and the reduced margin for error which comes with their size.

ii. *Collaroy*, which has a unique propulsion control system, was involved in four collisions and was thus over-represented in instances of collision within the Freshwater class throughout the period October 2004 to October 2005 because the risks associated with operating a vessel that is unique were not properly recognised and managed by Sydney Ferries. Additionally, over the period 1 January 2001 to 30 June 2005, *Collaroy* was involved in 15 collisions, which was twice as many as any other vessel in the class.

iii. The majority of the collisions involving Freshwater class vessels, including *Collaroy*, have been caused by human error. This was largely underpinned during the period October 2004 to October 2005 by both individual and organisational shortcomings; the same can be said of many of the collisions that resulted from technical problems during the same period. The extent to

which these same shortcomings caused or contributed to collisions involving Freshwater class vessels prior to October 2004 is less clear. However, examination of reports into safety-related matters within Sydney Ferries prior to October 2004 indicates that the same shortcomings were present within the organisation.

b. Issues in Common

i. The majority of the incidents occurred when switching to, or while in, Manoeuvring mode, i.e., in the process of berthing.

ii. Most of the incidents were initiated by a control failure, or the perception by Masters that they were confronted with a control failure.

iii. Three of the incidents involved the same Master and three of the incidents, the same Engineer, although the individuals concerned were not part of the same crew in any of the six instances.

iv. In most instances, Masters were left with few recovery options because they were committed to a berthing approach and therefore had little time or space in which to respond.

v. Some Masters did not initiate recovery options that were available to them because they lacked a proper understanding of their vessel's operating systems and did not properly interpret information that was available to them.

vi. In a number of instances, early indications of a mechanical or electrical fault might have been detected, had proper start-up procedures been observed.

vii. Crew actions, prior to and during the incidents, generally did not reflect good crew resource management (CRM).

viii. Crews had not had the benefit of a recently conducted, structured program of emergency training.

ix. There is a view in some areas of Sydney Ferries that some of the collisions caused by human error during berthing might have been avoided if the vessels had been operated at lower speeds on their approach to the berth. This view was also countenanced in a recent report provided by marine consultants. However, the proposition could not be substantiated because the onboard monitoring systems on Freshwater class vessels do not have the capacity to record speed, and Sydney Ferries does not employ any external tracking system to record approach speeds. OTSI also notes that while the

instrumentation available to Masters on Freshwater class vessels might allow them to estimate their speed, there is nothing to indicate their vessel's actual speed.

c. Design Issues

i. While Freshwater class vessels are more complex to operate and maintain than other classes operated by Sydney Ferries, and incorporate some design features that would not be found on more modern vessels, OTSI could not find any significant weaknesses in their design.

ii. *Collaroy*'s unique propulsion control system was less well understood than that of its sister vessels by those who operate and maintain the vessel and this presented Sydney Ferries with additional risks which were not fully appreciated.

iii. *Collaroy*'s unique propulsion control system was originally considered to be technologically superior to the systems fitted to the other three Freshwater class vessels, but is now considered to be inferior because the systems of the other three vessels have been upgraded. However, the Masters and Engineers who have operated *Collaroy* are supportive of its return to service.

d. Organisational Issues

i. Many of the factors that caused or contributed to the Freshwater class collisions were manifestations of organisational problems within Sydney Ferries.

ii. Organisational arrangements within Sydney Ferries have been the subject of considerable review in recent years, some of which has been externally directed and some of which has been commissioned by Sydney Ferries itself. Sydney Ferries has therefore been aware of its internal deficiencies and there are no new shortcomings identified in this report.

iii. The high rate of turnover of senior managers within Sydney Ferries has created considerable organisational 'churn' and has adversely impacted on the management of daily operations and its capacity to implement effective change within the Corporation.

iv. The process of 'corporatising' Sydney Ferries, which is ongoing, has required considerable effort and has added to the challenges confronting senior managers.

v. There is a strong sense of organisational identity within Sydney Ferries, with some of the current staff being third generation employees. This has helped sustain Sydney Ferries, in its varying forms, during difficult times. However, there is also strong affinity with the status quo and a firmly-held opinion among some front-line employees that the company can run itself. This opinion has been reinforced by the continual change of senior managers. It manifests itself in a lack of regard for formal procedures and has complicated the management of change.

vi. Sydney Ferries has a developing, rather than a developed, capacity to identify and manage risk.

vii. Limitations in the competencies of some individuals have been exacerbated by inadequate crew training.

viii. Crew resource management onboard Sydney Ferries' vessels is below what might be considered best practice and has been affected, over time, by inadequate training, poor communication procedures, ill-defined roles and responsibilities of the Helmsman and the Engineer's Assistant (or 'Greaser') and rostering practices.

ix. Limitations exist in Sydney Ferries' system for recording and classifying reportable incidents and capturing important information in relation to causation.

e. Adequacy of Emergency Responses

i. Onboard responses to the onset of technical difficulties were often less than assured and reflected limitations in Sydney Ferries' approach to crew resource management and emergency training.

ii. While Sydney Ferries' shore staff responded quickly and effectively to the collisions, none of the incidents resulted in large numbers of casualties and none of them was complicated by significant environmental damage, fire or smoke.

iii. Communication between Masters and Engineers and between Masters and Operational Controllers was often unstructured and imprecise.

iv. There are varying interpretations as to when the three hour 'window' within which crew may be drug and alcohol tested starts and finishes, and there are some inconsistencies between Sydney Ferries' Drug and Alcohol Policy and its Discipline Policy.

f. Adequacy of Sydney Ferries' Response and Remedial Actions

i. Sydney Ferries has devoted considerable effort to embracing the recommendations of many reports, and to embracing change more generally over time, but has not always progressed matters in a holistic manner, or pursued issues to a logical conclusion.

ii. Sydney Ferries' responses to the incidents under review reflected a focus on the symptoms rather than the causes.

iii. Sydney Ferries has issued numerous policies and instructions to improve safety, but has been less active in auditing compliance with those policies and instructions.

iv. Sydney Ferries is now addressing its organisational deficiencies in a more systematic manner. However, the number and complexity of issues being addressed concurrently will require a high level of continuing oversight if the intended outcomes are to be achieved.

Recommendations

In order to prevent, or at the very least minimise the potential for, recurrence of Freshwater collision accidents, and to improve the safety and reliability of this class of ferries, the following remedial safety actions are recommended for implementation by Sydney Ferries Corporation and the NSW Maritime Authority respectively:

a. Sydney Ferries Corporation

i. **Risk Management**

(1) Sydney Ferries' Board exercise close and continuing oversight of the progress of all safety related projects.

(2) While Sydney Ferries continues to respond to the outcomes of a significant number of reports and reviews, and manages a significant number of complex projects, it establishes a small project team, or alternatively appoints a project manager without other duties, with responsibility for coordinating the implementation and progress of all the recommended safety actions.

(3) Review its risk management framework and expedite the development

of a risk register.

(4) Ensure that all managers understand contemporary risk management concepts and principles and are able to apply them within Sydney Ferries' risk management framework.

(5) Expedite the development of an Asset Management Plan.

(6) Implement formal quality assurance and auditing programs.

(7) Ensure that changes to instructions, procedures and policies that impact on the operation of vessels are underpinned by thorough risk assessments and are formally communicated.

(8) Give careful consideration to the full range of implications arising from the external reviews it has commissioned in relation to the Freshwater class and the *Collaroy* in particular.

(9) While *Collaroy* remains unique, ensure its uniqueness is fully understood by all personnel required to either operate or maintain the vessel.

(10) Continue to progress, in concert with Unions, the development of a cogent and contemporary fitness-for-work policy and ensure that NSW Maritime is kept informed of the status of this important endeavour.

(11) Institute a standard crew fitness-for-work assessment, supervised by Masters, to be conducted at sign-on points.

(12) Address the need for Masters, across all classes, to be able to accurately determine their vessels' speed, and for it to be able to independently confirm vessel operating speeds when it is necessary to do so.

(13) Ensure that there is a uniform understanding of its vessel incident reporting requirements throughout Sydney Ferries and establish a single database to capture such occurrences and the factors that caused or contributed to them.

ii. **Emergency Management**

(1) Review the Fleet Emergency Response Plan (FERP) to ensure consistency with the State Disaster Plan (DISPLAN) and legislative requirements.

(2) Review the utility of the "Digital Announcer Passenger Warning Announcement System" onboard Sydney Ferries' vessels.

(3) Require Masters and Operational Controllers to come to a shared understanding of any recovery plan following an accident or incident.

(4) Continue to reinforce the use of proper radio communication protocols on, between and with Sydney Ferries' vessels.

(5) Ensure that persons who are required to control, or assist in the coordination of, an emergency response are readily identifiable when required to perform such a role.

(6) Review its Drug and Alcohol Policy and its Discipline Policy to ensure that they are consistent and that there is a shared understanding throughout the Corporation as to the timeframe within which Drug and Alcohol testing, following an accident or safety-related incident, may occur.

iii. **Training and CRM**

(1) In addition to requiring the recently expanded training team to assist in the design, development, delivery and assessment of initial, continuing and critical incident training, require that all drills that are considered to be part of Sydney Ferries' continuation and emergency/critical incident training be evaluated by the Fleet Standards Group. This Group should also conduct check 'rides' to validate training.

(2) Confirm, as a matter of urgency, the system for initial and continuation training ('type-rating') for the benefit of all crew members.

(3) Provide those responsible for crew rostering with read-only access to the qualifications database to ensure that those being rostered hold the required qualifications and that they are current.

(4) Provide Masters with the means to allow them to satisfy themselves that those being rostered onboard the vessel they will control hold appropriate and current qualifications.

(5) Clarify the roles and responsibilities of the Helmsmen and Greasers and provide formal training to properly equip them to fulfil their related duties.

(6) Expedite the delivery of critical incident training to all crew members.

(7) Pre-programme a regime of specified training drills, supported by relevant scenarios and training material, to be undertaken by all crew members during normal rostered hours.

(8) Ensure that any assessment that leads to the award or maintenance of a qualification is subject to formal and independent validation.

(9) Develop checklists for all classes of vessels, for both normal operations and emergency situations.

(10) Ensure that 'lessons learned' from accidents, incidents, exercises, drills and risk assessments are formally distributed to crews and relevant staff members.

iv. **CRM and Communication**

(1) Act to reinforce CRM, and in particular to require that safety critical issues during start-up and emergency procedures are the subject of specific communication between Masters and Engineers.

(2) Minimise the rotation of crew members during a shift and ensure that any rotation that must occur does not take place without reference to the Master.

(3) Align shifts so that all members of a crew start work at the same time.

(4) Require the use of formal communication procedures onboard, between and with all Sydney Ferries' vessels.

v. **Maintenance**

(1) Ensure that the development of Technical Maintenance Plans is progressed in accordance with project timelines.

(2) Monitor the progress of initiatives taken in response to KPMG's report into the shipyard function at Balmain.

(3) Review the maintenance of Freshwater class vessels, and *Collaroy* in particular, in the light of the risk assessments recently conducted by industry experts.

(4) While *Collaroy* remains unique, act to ensure its uniqueness is fully understood by all personnel required to maintain the vessel.

(5) Conduct an analysis of critical failure modes on all classes of vessels, commencing with the Freshwater class, with particular emphasis on propulsion control systems.

b. NSW Maritime

i. Continue to monitor the management of risk, training and maintenance in Sydney Ferries.

ii. Closely monitor the performance of *Collaroy* following its reintroduction to service and require that any occurrence, other than planned maintenance, which causes it to be taken out of service be reported by Sydney Ferries.

iii. Review any risk assessments associated with *Collaroy*'s reintroduction into service or the impending upgrade of its propulsion control system.

iv. Maintain continuing oversight of the progress of major safety-related programs and projects within Sydney Ferries.

PART 1 INTRODUCTION

Appointment

Date of commencement of systemic investigation: 22 September 2005.

Scope of Investigation: The investigation focused on 11 incidents of collision involving the Freshwater class of vessels operated by Sydney Ferries between October 2004 and October 2005. However, OTSI also reviewed collisions involving other classes of vessels operated by Sydney Ferries during the same period in order to determine whether the factors that caused or contributed to the Freshwater class collisions were unique to that class.

Type of investigation: Ferry Safety Investigation, pursuant to Section 46BA of the *Passenger Transport Act, 1990.*

Investigator: The Office of Transport Safety Investigations

Terms of Reference

The terms of reference established by the Chief Investigator required the investigator to:

1. determine why the Freshwater class of ferries had been involved in eleven collision accidents in the period October 2004 to October 2005;
2. ascertain whether accident causation was common in all cases, in some cases, or whether there was a different cause in each accident;
3. establish whether there were any fundamental, inherent flaws in the design, engineering, propulsion, control, handling or any other systems in the Freshwater class which compromised its safety and reliability as a public passenger ferry;
4. identify whether there were any organisational, operational, logistic, financial, administrative, human or other factors which have compromised vessel operating safety systems and contributed to the cause/s of these accidents;
5. assess the appropriateness and adequacy of the response and remedial action taken by Sydney Ferries Corporation to this sequence of accidents;

6. assess the effectiveness of emergency actions that were initiated in response to these accidents;

7. make recommendations to prevent, or at the very least minimise the potential for, recurrence of this type of accident and to improve the safety and reliability of the Freshwater class of ferries, and

8. propose any course of action that would enhance the provision of safe ferry services.[1]

Methodology

In addressing the Terms of Reference, OTSI's Investigator-In-Charge:

- reviewed investigations conducted by Sydney Ferries, NSW Maritime and OTSI, and related evidentiary material from the individual incidents of collision;
- interviewed Freshwater class Masters, Engineers, and GPHs;
- interviewed senior managers throughout Sydney Ferries;
- met with members and delegates from the Australian Maritime Officers' Union (AMOU), representing the Inner and Outer Harbour Masters and the Inner Harbour Engineers; the Australian Institute of Marine and Power Engineers (AIMPE) representing the Outer Harbour Engineers, and the Maritime Union of Australia (MUA), representing the GPHs;
- reviewed a range of Sydney Ferries' business plans, policies, instructions, manuals and records;
- reviewed a number of internal and external reviews of Sydney Ferries;
- interpreted data downloaded from data loggers;
- examined equipment and participated in trials and simulations;
- attended crew emergency and refresher training, and
- received unsolicited submissions from concerned individuals.

The investigation is not intended to attribute blame or liability. However, relevant factual information has been included to support the identification of deficiencies, the analysis and the conclusions. Some information may reflect on the performance of individuals and

[1] The *Passenger Transport Act 1990* defines a ferry as a vessel which seats more than eight adult persons and includes a vessel of any class prescribed by the regulations for the purposes of this definition.

organisations and how their actions contributed to the outcomes of the matters under investigation.

A systemic approach was adopted to identify immediate, long-term and organisational issues. The investigation identified and analysed the issues relevant to the terms of reference and makes a number of recommendations.

The underlying feature of the methodology is the Just Culture principle with its focus on safety outcomes rather than the attribution of blame or liability.

Consultation

The extent of OTSI's consultation with Directly Involved Parties (DIPs) throughout the course of this investigation is reflected in the Methodology described above. In particular, consultation with Sydney Ferries was frequent and detailed.

The Investigator in Charge and OTSI's Deputy Chief Investigator met with representatives of the AMOU, AIMPE and the MUA at the outset of the investigation. These officers also met with Sydney Ferries' and NSW Maritime's senior management teams to review the report when it was in its draft format. The Deputy Chief Investigator subsequently met with representatives of the aforementioned Unions to discuss the draft findings and recommendations. This review process resulted in some revision to the draft report.

On 16 August 2006, a copy of the Final Draft Report was forwarded to the Chief Executives of Sydney Ferries, NSW Maritime and ITSRR. The purpose was to provide those DIPs with the opportunity to contribute to the compilation of this Final Report by verifying the factual information, scrutinising the analysis, findings and recommendations, and providing any commentary that would enhance the structure, substance, integrity and resilience of the Investigation Report. DIPs were requested to submit their comments by 6 September 2006. Submissions were received from all parties.

The Chief Investigator considered all representations made by DIPs and where appropriate, reflected their advice in this Final Report. On 29 September 2006, the Chief Investigator informed DIPs which matters from their submissions had been incorporated in this Final Report and where any proposal was not included, the reasons for not doing so.

Acknowledgements

OTSI acknowledges the cooperation provided to it by Sydney Ferries Corporation, NSW Maritime, the AMOU, the AIMPE and the MUA. OTSI particularly acknowledges the contribution of those current and former Masters, Engineers and GPHs with whom it met. While their views may have differed in relation to some of the issues, their willingness to speak openly about their concerns, and in some instances, the limitations of their knowledge and/or actions, has been central to OTSI's understanding of the related issues.

Investigation Report

This report is the result of an investigation into those systemic factors which can be attributed to having a causal influence on a series of Freshwater class collisions during the period October 2004 to October 2005. The findings and recommendations that are made are designed to contribute to the safety of the operating environment for ferry operations and to assist Sydney Ferries to deliver a safe passenger service to the travelling public.

PART 2 FACTUAL INFORMATION

Sydney Ferries Corporation

2.1 The first scheduled public passenger services on Sydney Harbour commenced in 1868 when the North Shore Steam Ferry Company commenced services between Manly and Circular Quay. This Company became Sydney Ferries Limited in 1899 and this in turn became Sydney Harbour Ferries Limited when it was sold to the NSW Government in 1951. Sydney Harbour Ferries Limited was designated a statutory State-owned corporation in 1989 and as such, operated as part of the then State Transit Authority (STA). It was separated from the STA and became an independent entity, Sydney Ferries Corporation, in July 2004.

2.2 Sydney Ferries today employs over 600 staff and has an operating budget of approximately $100,000,000 p.a. It operates 31 vessels of seven different classes to transport 14,000,000 passengers annually, and in the process, provides 180,000 services, travels 1,200,000 km and makes 540,000 berthings annually.

2.3 Significantly, nearly 70% of Sydney Ferries' workforce is engaged in crewing. As of November 2005, Sydney Ferries employed 76 permanent and nine temporary Masters, 62 permanent and seven temporary Engineers and 201 permanent and 56 temporary General Purpose Hands (GPHs). The majority of these employees belong to the Australian Maritime Officers' Union (AMOU), the Australian Institute of Marine and Power Engineers (AIMPE) and the Maritime Union of Australia (MUA). In addition, Sydney Ferries' shore-based personnel may belong to one of another five unions.

Sydney Ferries' Fleet

2.4 Sydney Ferries operates 31 vessels across seven different classes. The oldest vessels belong to the Lady class (introduced in the 1970s) and thereafter, the Freshwater class (early 1980s), the First Fleet class (mid 1980s), the JetCat and RiverCat classes (early 1990s), the HarbourCat class (late 1990s) and the SuperCat class (2000/2001).

The Freshwater Class

2.5 The Freshwater class of ferries (more commonly known as Manly ferries) are the

largest vessels operated by Sydney Ferries. The four vessels in the class, *Freshwater*, *Queenscliff, Narrabeen* and *Collaroy,* were introduced into service in 1982, 1983, 1984 and 1988 respectively. Each of the four vessels is capable of carrying up to 1,100 passengers, with seating for 815.

2.6 Freshwater class vessels are 70.4m long and 12.4m wide and have a displacement of 1,140 tonnes and a draft of 3.35m. They are double-ended monohulls, with a steel hull and aluminium on steel superstructure. This configuration provides for a bridge (wheelhouse) at either end of the vessel, allowing the ferry to be operated on return trips from Circular Quay to Manly without having to turn around. The vessel is shown diagrammatically at *Figure 1*.

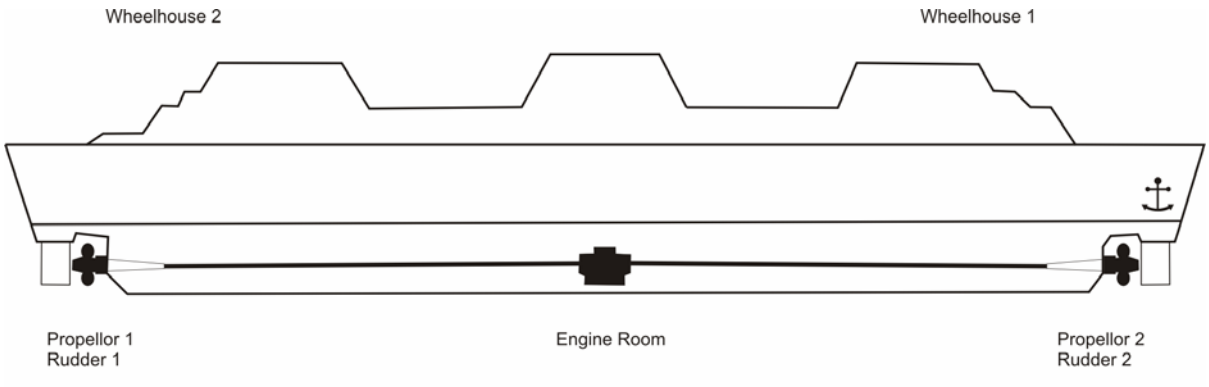

Figure 1: Diagrammatic Representation of Freshwater Class Ferry

2.7 The propulsion and control systems on the vessels *Freshwater, Queenscliff* and *Narrabeen* are almost identical, but the *Collaroy* utilises a propulsion control system which is unique within the Freshwater class. All four vessels have two main engines which can be used alone or, in conjunction, to drive one or both propellers, depending on the mode selected.

2.8 Freshwater class vessels are capable of operating in two distinct modes, Sailing mode and Manoeuvring mode. In either mode, a Backup Control function is available for use in the event of a control system failure. Should both normal and backup control functions fail, all engine and propeller control can be transferred to the Engineer in the Machinery Control Room (MCR).

2.9 Sailing mode is selected for the majority of a Freshwater class vessel's journey. In this mode, the power developed by the main engine is directed to the stern propeller to produce thrust, while the stern rudder is used to control the vessel's heading. In Sailing mode, the bow propeller is feathered and the rudder is locked at 0° (midships). In the feathered state, the blades of the bow propeller are rotated so that they lie in the direction of water flow, i.e., in line with the propeller shaft. Sailing mode provides the most streamlined vessel shape and creates the least drag through the water and is therefore the most efficient mode unless the vessel is required to manoeuvre in a confined area.

2.10 Manoeuvring mode is selected when the vessel is required to commence a berthing operation. In this mode, the inactive bow propeller is taken out of feather to a 0° pitch state. The evolution from the feathered state to the 0° pitch state takes approximately 17 seconds, during which time the bow propeller shaft commences to spin due to the force of the water passing over the now pitched propeller blades. When 0° pitch is reached, the bow propeller is engaged and the stern and bow propellers and rudders work in conjunction to enable the vessel to be highly manoeuvrable, including sideways movement which is necessary for berthing. In Manoeuvring mode, the bow propeller provides the majority of the reverse thrust and control, with the stern propeller providing the greater forward thrust.

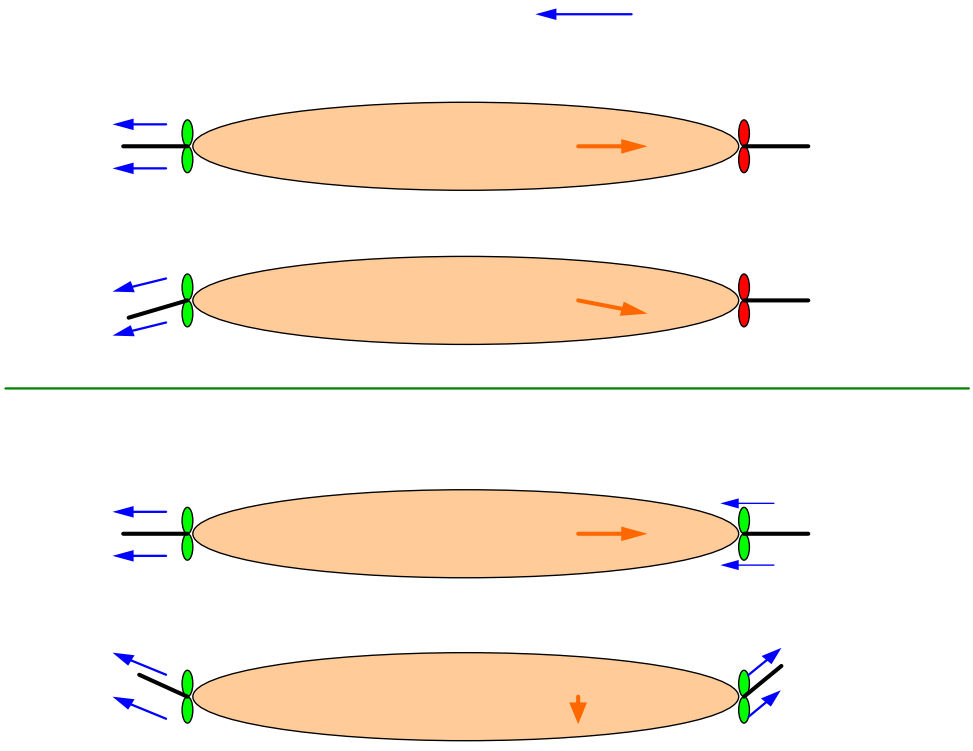

Figure 2: Representation of Freshwater Propulsion Modes

2.11 *Figure 2* illustrates the utilisation of propellers and rudders in Sailing and Manoeuvring modes.

2.12 Backup Control is utilised when a control failure is experienced, or when controls fail to respond as directed, in either Sailing or Manoeuvring mode. Backup Control utilises a combination of hard wiring and micro-processor electronics which are separate from the other modes of control. In Backup Control, the normal steering device, known as the X-Y lever and resembling a joystick, is isolated and steering control is effected via a rudder control lever and pitch control levers which are located to the left of the main control console.

Collaroy

2.13 While the *Queenscliff*, *Freshwater, Narrabeen* and *Collaroy* make up the Freshwater fleet, the *Collaroy* has a number of design features which make it unique within the Freshwater class. These include:

a. structural changes within the hull which were intended to add additional strength and to give greater protection to the machinery space in the event of a grounding;

b. the fitment of fin stabilizers;

c. the fitment of a food preparation and service areas and a shop;

d. the fitment of a sewage treatment plant;

e. increased fuel capacity;

f. the fitment of a single Daihatsu gearbox in lieu of the two Lohmann and Stolterfoht gearboxes;

g. the fitment of engine-driven cooling water pumps in lieu of electrically driven pumps, and

h. the fitment of a Kamome propulsion control system in lieu of the LIPS system.[2]

2.14 The most significant of the above points of difference from an operating perspective

[2] The rationale for fitting this significantly different propulsion control system is presented on pages 8-9 in OTSI's investigation report into a collision involving *Collaroy* on 4 March 2005. This report may be accessed via www.otsi.nsw.gov.au

is that of the unique propulsion system fitted to *Collaroy*. The effect of this difference is that:

a. all clutches disengage on *Collaroy* if Normal Control is selected after Back-up Control, unlike on its sister vessels;

b. the main lever controls have single potentiometers, but micro-switches for each direction, whereas the other vessels have dual potentiometers,

c. the main engine speed feedback signals are from single dynamos rather than proximity counters;

d. there are dual, rather than single, actuators for pitch control;

e. some functions have more than one switch, an arrangement not replicated on the sister vessels, and

f. *Collaroy* has five times the number of electrical relays in the propulsion control system and only one 24volt DC system.

Crew

2.15 Freshwater class vessels are typically crewed by six personnel: a Master, an Engineer and four GPHs. One of the GPHs acts as the Helmsman and another as the 'Greaser', assisting the Master and Engineer respectively. The other two GPHs assist to secure the vessel after berthing; release the vessel prior to departure and in the embarking and disembarking of passengers. All of the crew have more specific functions to perform during emergencies.

Freshwater Class Accidents, October 2004 – October 2005

2.16 An overview of the 12 accidents initially under investigation is provided at *Appendix 1*. However, as the investigation progressed, OTSI's consideration was confined to 11 accidents when it was established that one of the incidents did not involve a collision.[3]

[3] On 21 March 2005, *Freshwater* sustained wave damage.

PART 3 ANALYSIS OF FRESHWATER CLASS INCIDENTS

Collisions Across All Classes in Sydney Ferries' Fleet

3.1 Before examining the Freshwater class collisions identified in Appendix 1, OTSI sought to establish, more generally, the frequency and nature of collisions occurring within Sydney Ferries. Comparative data provided by Sydney Ferries and NSW Maritime, at Appendix 2, indicates the number of reportable incidents[4], and identifies the number of collisions therein, by all classes of vessels operated by Sydney Ferries in the period October 2004 to October 2005. It also indicates whether those incidents were caused primarily by human error or equipment malfunctions. Appendix 3 indicates the number of collisions involving Freshwater class vessels during the period 2001-2005.

3.2 The key information to be derived from the comparative data is that:

a. Over the period October 2004 to October 2005, there were 34 collisions and the four Freshwater class vessels, which make up 13% of Sydney Ferries fleet, were involved in 11, or 32%, of the collisions.

b. Human error was identified as being more prevalent than technical failures.

c. The number of incidents involving Freshwater class vessels in 2005 was significantly higher than in the preceding three years.

3.3 OTSI then sought to establish whether the number of collisions that occurred during this period, across all classes, was greater or less than the average number of collisions per year calculated over a longer period of time. Sydney Ferries had considerable difficulty in providing such figures because it had not had a single point of collection for such data and because the definition of what constituted a reportable collision may have varied over time. Accordingly, it provided four sets of figures in which there were variations for three, almost similar, over-lapping periods:

a. 1988 to 1995, 462 collisions;
b. 1 January 2001 to 1 April 2005, 138 collisions;
c. 1 July 2001 to 1 July 2005, 193 collisions, and
d. 1 January 2001 to 30 June 2005, 225 collisions.

[4] The range of matters that must be reported goes beyond just collisions and includes, for example, persons overboard, onboard fires, control failures etc

3.4 OTSI had reservations about using these figures for the purpose of comparative analysis. At best, they indicated that the highest average number of collisions per annum, based on the figures provided for the period 1988 to 1995, was 58. The lowest average number of collisions per annum, based on the figures provided for the period of 1 January 2001 to 1 April 2005, was 33. OTSI had more confidence in the figures provided for the period October 2004 to October 2005, even though they still had to be generated manually within Sydney Ferries, because it sighted documentation in relation to each of the occurrences and because the matter of collisions during this period was the subject of considerable scrutiny. However, the only meaningful deduction it could make about the number of collisions recorded over the period October 2004 to October 2005, compared to earlier periods, was that there did not appear to be an upward trend. Nevertheless, the number of accidents involving the Freshwater class during October 04 to October 05 was higher than the actual number of collisions for each of the years from 2001 to 2004.

Freshwater Class Collisions, October 2004 to October 2005

3.5 The most notable feature of *Appendix 1* is that *Collaroy* was involved in four of the 11 instances of collision, compared with three each for *Freshwater* and *Queenscliff* and one for *Narrabeen*. In order to 'normalise' the number of collisions involving each vessel in the class, OTSI sought advice on the number of hours each of these vessels had been in service during the period October 2004 to October 2005. This information was provided by Sydney Ferries' GM Engineering. He indicated that *Queenscliff*, *Freshwater*, *Collaroy* and *Narrabeen* had been in service for a total of 5,980 hours, 4,869 hours, 4,310 and 2,631 hours respectively. He explained that the low rate of usage of *Narrabeen* was due to the extensive, but scheduled, maintenance performed on the vessel throughout much of the period. Given the relative usage rates, OTSI considers *Collaroy* to have been overrepresented in Freshwater collisions during October 2004 to October 2005.

3.6 In each of the 11 incidents of collision during October 2004 to October 2005, there were some common features which include:

a. nine of the 11 collisions occurred while berthing or preparing to berth, and 10 while the vessels were in, or being switched to, Manoeuvring mode;

b. in 10 of the 11 collisions, the Master reported that the vessel operated contrary to their expectations;

c. one Master and one Engineer had been involved in three collisions each, but

never together;

d. alcohol and fatigue were not at issue, although there were two instances where the crew list did not match those ultimately tested for drugs and alcohol. In one instance a GPH tested positive for cannabis and in another instance, a delay in the commencement of testing meant that a Master and two GPHs were not able to be tested within the specified time limits[5], and

e. human error was identified as the primary cause in six of the collisions and mechanical failure in four.

3.7 On close examination of the investigation reports into these collisions, other commonalities were also evident. They include:

a. the absence, or lack of observance, of standard operating procedures;

b. questionable levels of competency in emergency situations;

c. limitations in training and crew resource management;

d. poor communication;

e. limitations in maintenance, and

f. poor identification and management of risk.

3.8 OTSI also noted that these additional features were commonly present in collisions involving other classes of vessels operated by Sydney Ferries over the corresponding period.

Absence, or Lack of Observance, of Standard Operating Procedures and Operating Instructions

3.9 OTSI reviewed each of the 11 collisions in detail and was able to ascertain that none of them could be attributed to fatigue, impairment, distraction, inducements to take short-cuts or the tempo of operations. However, in a number of instances, accidents were either caused, or exacerbated, by a lack of standard operating procedures or a failure to observe, or comply with, a specified procedure. For example:

a. In the collision involving *Collaroy* on 8 January 2005, the absence of a standard operating procedure for vessel start-up and departing a berth was identified as a contributing factor.

[5] Collision involving *Collaroy* on 19 September 2005.

b. In the collision involving *Queenscliff* on 19 January 2005, the absence of a documented procedure for changing from Sailing mode to Manoeuvring mode was identified as a contributing factor.

c. In the collision involving *Collaroy* on 4 March 2005, the absence of formal start-up and handover procedure was identified as a contributing factor.

3.10 Sydney Ferries' primary reference for standard operating procedures is its series of Vessel Operating Manuals (VOMs[6]) and these are supplemented periodically by the issue of notices, such as the Vessel Day Files and Daily Operations Sheets. OTSI noted that VOMs varied in their quality and content. In some instances, VOMs included information of a generic nature which was irrelevant or erroneous in the context of the vessel on which the VOM was being carried. There was, for instance, no reference to *Collaroy*'s unique propulsion control system in the Freshwater class VOM. It was also apparent to OTSI that there was a lack of consistency in the way VOMs had been amended, and that generally, document control had been variable. Perhaps more importantly, there was an absence of standardisation in the way Engineers and Masters performed routine functions and this, in part, could be explained by the absence of clearly defined procedures and check lists for basic procedures, such as vessel start-ups and drills. In addition, emergency procedures had not been well defined. Significantly, there had been little attempt to link the range of options that might be employed in specific emergencies with the area in which the emergency might occur. Underpinning these deficiencies has been a fundamental limitation in Sydney Ferries' ability to identify operational risks. However. all of these matters are now the subject of considerable attention and remedial action within Sydney Ferries.

Competency in Non-Standard Operating Conditions

3.11 OTSI noted several instances where Masters were unable to interpret the 'symptoms' of the problems that confronted them and therefore exercised response options that were either inappropriate or ineffective. As a consequence, instances that were initially 'non-standard' escalated to become emergencies, placing additional demand on the Masters. For example:

a. On 4 March 2005, *Collaroy*'s Master, confronted by control problems,

[6] VOMs are available for each class of vessel and detail the requirements for the safe operation of vessels.

responded without referring to his instrumentation which would have indicated to him that a ProCon (programmable logic controller) had failed. Rather than reverting to emergency control or attempting to effect control through the Engineer, he continued to rely on controls that were being identified as inoperable.

b. On 19 September 2005, *Collaroy*'s Master deduced that there had been a total loss of the primary electrical power system while successfully communicating on a radio that was dependent on this system. Given his interpretation of the situation, the Master thought his only option to slow or stop the vessel was to drop anchor, whereas a more appropriate course of action would have been to have activated emergency control.

3.12 OTSI also noted that some Engineers had either limited understanding or very limited experience of how to exercise emergency control from the MCR. It further noted instances where GPHs had difficulty in letting go an anchor under emergency situations. OTSI expected that crew members would be reluctant to talk about matters of competency. However, individuals generally spoke freely about their limitations in understanding and experience. The three unions who engaged with OTSI throughout its investigation, the MUA, AMOU and AIMPE, attributed such limitations in competency to inadequate training within Sydney Ferries.

3.13 In addition to instances where an error initiated an emergency, there were a number of instances where actions taken, or not taken, in response to the onset of a mechanical or electrical problem, exacerbated the situation. For example:

a. On 26 May 2005, the Master of *Narrabeen* inadvertently placed the vessel into Back-up mode rather than Manoeuvring mode, and refused to countenance advice to that effect from the Engineer. His subsequent recovery actions were limited to repeating control inputs that were having no effect because he was in the wrong mode.

b. The Master of the RiverCat class ferry *Betty Cuthbert* on 23 September 2005 experienced control problems which might have been overcome had he moved to an adjacent set of controls.

c. The collision of *Betty Cuthbert* with two moored vessels on 11 January 2006 was the consequence of a recovery plan, implemented after control problems, which had inherent risks that were not appreciated or managed.

3.14 The above observations are a reflection of the limitations that existed within Sydney Ferries, at the time, in the areas of standard operating procedures, training, crew resource management (CRM), maintenance, rostering, supervision, communication and risk management.

3.15 In addition to the above limitations, there is a view in some areas of Sydney Ferries that some of the collisions caused by human error during berthing might have been avoided if the vessels had been operated at lower speeds on their approach to the berth. This view was also countenanced in a recent report provided by marine consultants. However, the proposition could not be substantiated because the onboard monitoring systems on Freshwater class vessels do not have the capacity to record speed, and Sydney Ferries does not employ any external tracking system to record approach speeds. OTSI also notes that while the instrumentation available to Masters on Freshwater class vessels might allow them to estimate their speed, there is nothing to indicate their vessel's actual speed.

Limitations in Training and Crew Resource Management

3.16 Given the limitations of both individual and crew actions, OTSI conducted a detailed examination of the system employed within Sydney Ferries to qualify crew members and to ensure they maintain the related competencies, and its approach to emergency training and CRM.

3.17 Individual competencies in Sydney Ferries are acquired during initial training which involves induction and vessel-specific training. This is followed by continuation training which is intended to refresh competencies gained during initial training and to address common 'core' skill requirements, such as first aid and emergency procedures, or 'drills'.

3.18 GPHs employed by Sydney Ferries need to be 18 years of age or older and must possess a "Record of Service Book", issued by NSW Maritime. They subsequently attain a certificate of competency, the Certificate 1 in Transport and Distribution (Maritime Operations), through the successful completion of classroom and on-the-job training (OJT), and a First Aid Certificate. Additional OJT is then provided by Sydney Ferries to equip GPHs to perform the roles of Helmsman and Greaser on specific vessels.

3.19 GPHs wishing to become Masters must apply for leave without pay[7], spend time at sea with an external maritime organisation and attend TAFE, typically for a period of six months, to obtain a Master Class 4 license issued by NSW Maritime. When a Master's position is advertised, GPHs holding a Master Class 4 licence may choose to apply and are required to participate in the same selection process as external applicants. If they are successful, GPHs undergo the same training as an external applicant. More recently, Sydney Ferries has required GPHs wishing to become Masters to undergo aptitude testing before releasing them to attend the external training at sea.

3.20 Masters must hold the following qualifications before they can operate a Sydney Ferries' vessel:

a. a valid Certificate of Competency (minimum Master Class IV (Trading) including a general licence;

b. a valid MED Certificate 3;

c. a valid Radio Operator's Licence;

d. a valid First Aid Certificate;

e. a valid Small Ship's Radar Certificate, and

f. a valid Local Knowledge Certificate issued for the Port of Sydney.

3.21 In addition to the above requirements, Masters undergo a week of organisational induction training followed by a further week of generic training which looks at role-related matters including engineering systems, CRM and SOPs. A third phase of the training is focused on OJT, during which time a Master may qualify to operate a specific class, typically a First Fleet vessel. Subject to satisfactory performance on this type of vessel and based on rostering opportunities, a Master might then be given the opportunity to do initial training on other classes of vessels. A Master will generally have been qualified on several classes of vessels over a number of years before undertaking training on the Freshwater class. Masters were also required to demonstrate their ongoing competence by operating on each class of vessel for which they were qualified for 30 hours on an annual basis. This process of continuation training was known as 'type rating' within Sydney Ferries and continues to be commonly referred to as such. However, ongoing competency is now tested

[7] GPHs are subsequently reimbursed when they return to Sydney Ferries

every 90 days through participation in Drill Package 4 which focuses on critical control system failures and CRM. This training is overseen by qualified trainers.

3.22 Engineers within Sydney Ferries are employed on either Inner Harbour vessels or Outer Harbour vessels and their training pathways differ. Outer Harbour Engineers, i.e., those employed on the Manly service must hold the following qualifications before they can be assigned to a Freshwater or JetCat class vessel:

a. a valid Class 1 (Motor) Certificate of Competency, or a Class 1 Certificate of Recognition as issued by the Australian Maritime Safety Authority of Australia (AMSA) and endorsed by NSW Maritime; or

b. a current Class II Certificate of Validity, or a Class II Certificate of Recognition as issued by AMSA and endorsed by NSW Maritime, and

c. a valid First Aid Certificate.

3.23 All Sydney Ferries' Inner Harbour Engineers must hold the following qualifications before they can be assigned to an Inner Harbour vessel (First Fleet, Lady Class, RiverCats and SuperCats)[8]:

a. a valid Marine Engineering Driver Certificate Grade 2 as issued by NSW Maritime, and

b. a valid First Aid Certificate.

3.24 Inner Harbour Engineers undergo a week of organisational induction training, followed by a further week of generic training looking at role-related matters including engineering systems, CRM and SOPs. A third phase of the training is focused on OJT, during which time an Inner Harbour Engineer may qualify to operate a specific class, typically a First Fleet vessel. Subject to satisfactory performance on this type of vessel, an Inner Harbour Engineer begins a period of 30 shifts on First Fleet class vessels. Further assessment occurs at the conclusion of this period. Inner Harbour Engineers will usually progress onto SuperCat and Lady Class vessels, whilst Outer Harbour Engineers operate JetCat and Freshwater Class vessels exclusively.

3.25 During the period under review, Crew Competencies were promoted through participation in three days safety refresher training (SRT) per year addressing matters such as fire fighting, operating in confined spaces, OH&S, refuelling and

8 Rivercat and HarbourCat Masters are dual-qualified i.e. they also attend to the engineering duties. This requires them to hold a valid Marine Engineering Driver Certificate, Grade 3, issued by NSW Maritime.

technical/machinery operations. Crew were also required to participate in a system of drills. There were 33 mandated drills, some of which were shore-based. The drills were intended to rehearse a crew's ability to respond to particular contingencies. OTSI noted that none of the drill packages in existence during October 2004 to October 2005 adequately addressed control failure scenarios.

3.26 Crew competencies were also intended to be reinforced through Crew Resource Management (CRM) training. This training seeks to optimise teamwork and cohesive actions, particularly in the face of emergencies. Effective CRM in the maritime environment is built around high levels of individual competency, clearly defined roles and responsibilities, good standard operating procedures, good operational communication and mutual respect, all of which must be reinforced by frequent and demanding training and good HR practices. Few of these elements were in place at Sydney Ferries throughout October 2004 to October 2005, and OTSI observed in a number of its investigation reports into incidents involving Sydney Ferries' vessels during this period that CRM was sub-optimal.

Review of Training Arrangements

3.27 In light of the many instances of error or omission which became evident during its investigations, OTSI spent significant time reviewing training arrangements within Sydney Ferries. It met with Sydney Ferries' training staff and the AMOU, AIMPE and MUA, observed classroom and sea-based training and reviewed training packages. Moreover, it was contacted by, and met with, a number of individual Masters and Engineers who were concerned about the limitations of their own knowledge, and expressed strong reservations about what they considered to be a failing training system. While opinions varied widely, there was agreement on some key issues, particularly that training packages in use throughout the period October 2004 to October 2005 were not sufficiently developed, and the delivery of drill packages and CRM training was sub-optimal.

3.28 OTSI's review of Sydney Ferries' training packages revealed them to be in varying stages of evolution. Senior management within Sydney Ferries acknowledged this reality and advised that the training system, and related documentation, had been undergoing significant review since corporatisation because it lacked consistency and robustness and did not meet the Corporation's quality or legislated imperatives. OTSI was also briefed on the difficulties associated with finalising revised training

arrangements in the absence of a finalised revised workforce plan and while negotiating a new Enterprise Agreement (EA05), both of which were being progressed in parallel.

3.29 In the absence of a confirmed workforce plan, Sydney Ferries' training plan was underpinned by a number of assumptions, particularly in the areas of rostering and 'core' working hours which, in turn, were dependent on the outcomes of revised Enterprise Agreements which were under negotiation. OTSI had already formed the view, as a result of its discussions with the AMOU, AIMPE and the MUA, that rostering and 'core' hours, or the number of hours that must be worked by full-time employees per fortnight, were having a significant impact on training within Sydney Ferries. Under the then existing Enterprise Agreements[9] , Sydney Ferries' employees could not be required to work overtime. The unions contended that Sydney Ferries was not allowing sufficient time for training within the core working hours and as a result, crew were being required, in some instances, to attend training during overtime. They also noted that compliance with such a requirement might have placed individuals in situations where they were working in excess of the hours allowed under fatigue guidelines. As such, the unions' position was that their members could not be compelled to attend training.

3.30 The unions were critical of situations where they perceived trainers to be inadequately equipped to deliver training and cited the example of engineers, who had formal fire-fighting competencies, being required to attend fire-fighting training that was being delivered by a GPH, who did not. They also expressed concerns about the possibility of the evaluation of competency testing being conducted by persons who did not hold relevant professional qualifications, and about how the results of such testing might be utilised by Sydney Ferries. OTSI understands that the example cited related to crowd management in the event of a fire, not fire-fighting per se, and believes that the related concerns, and some of the others which were indicated, were largely unfounded. However, the Unions cited further instances, one of which was subsequently confirmed by OTSI, of individuals being rostered for duty onboard classes of vessels on which they had not served for many years. Quite apart from this programming issue, OTSI noted that drills were conducted by Masters and were not subject to independent evaluation[10]. This, in concert with Union

[9] New Enterprise Agreements were concluded in 2006.

[10] This is consistent with the normal practice under the ISM Code.

resistance to scheduled training, meant that Sydney Ferries was only able to exercise limited control over continuation, and therefore emergency, training.

3.31 In the absence of crew-based rostering[11] and programming issues over time, the standard of delivery of drills has varied significantly, with some drills being practised frequently and some crew members frequently participating, while other drills and crew members have received little attention. By way of example:

a. There was no record of the Engineer onboard *Collaroy* when it collided on 4 March 2005 having participated in emergency training throughout 2004, or during the period 1 January to 4 March 2005. The Master had last participated in emergency training in October 2004.

b. A GPH aboard *Freshwater* during the incident on 17 October 2005 indicated that he had not been involved with drills on that class of vessel for nearly 15 years.

c. The Engineer involved in three of the incidents of collision involving the Freshwater class throughout the period October 2004 to October 2005 completed his training on the class in May 1999, but there was no record of him having participated in any sort of safety refresher training or type rating again until February 2004. He subsequently participated in a day of safety refresher training in 2005 but was absent for a second day of programmed training. Notwithstanding, he was deemed "competent" by an assessor.

d. The Master involved in three of the incidents of collision involving the Freshwater class throughout October 2004 to October 2005 completed his training on the class in September 1991, but there was no evidence of his having participated in any sort of safety refresher training or type rating again until May 2003. The Master participated in one day's safety refresher training and one round of type rating in 2005, but training records show the Master as having "Attended", rather than as being competent.

e. In November 2005, a Master was rostered for duty onboard a Freshwater class vessel even though he had not trained on the class for 18 months.[12]

3.32 In citing the above instances, OTSI acknowledges that many of the related training

[11] Crew-based rostering involves the same individuals being rostered on and off as a group. Sydney Ferries currently fills crew positions by rostering individuals on an individual basis

[12] This Master was subsequently provided with refresher training and was requalified before being required to operate on the Freshwater class vessel.

issues had their origins in arrangements inherited from the STA at the time Sydney Ferries was corporatised. The impact of corporatisation is addressed later in this report.

3.33 Several Masters interviewed by OTSI expressed frustration about GPHs being on a different roster and the practice of GPHs being relieved by another person during a roster without reference to the Master. OTSI understands that the issue of unplanned and frequent rotation of GPHs during a given rostered period is not confined to this group and that Masters and Engineers are also being rotated frequently. The Masters also cited instances where Engineer and GPH training occurs onboard without prior advice to them. In its investigation into a collision involving *Collaroy* on 19 September 2005, OTSI noted that when the Master sought to communicate with the rostered Engineer, he ended up communicating with an Engineer trainer. Unbeknown to the Master, the rostered Engineer was otherwise engaged in onboard training. Sydney Ferries acknowledges that the frequent rotation of individuals does little for teamwork onboard vessels and is inconsistent with good CRM.

3.34 The net effect of the various limitations described above is that Sydney Ferries exerted less influence over the conduct of training than might have been the case previously, and that crew competencies and/or confidence declined. This had a knock-on effect on efforts, albeit ones that were somewhat piecemeal, to promote CRM. OTSI has noted in virtually all of the matters that it has investigated, across all classes, that CRM was sub-optimal throughout Sydney Ferries. The same observation was made in the Taylor Report in 2001[13]. Sydney Ferries recognises this reality and acknowledged that their early attempts to promote CRM were limited in their scope and were not pursued through to a conclusion. However, it did provide OTSI with evidence that these issues are now under active consideration and advised that one of the aims of the new EA05 is to align the rosters of the GPHs with those of other crew members and to move towards crew-based rostering.

3.35 The unions were very critical of the situation as they perceived it, where training was being fundamentally re-shaped by a number of senior managers within Sydney Ferries, whose individual exposure to the maritime industry was very recent. OTSI notes that this perception might have been associated with contentious issues under negotiation in revised EBA arrangements; the cessation, around August 2005, of

[13] A report commissioned by the Minister for Transport in 2001 and prepared by the then Waterways Authority, entitled "Independent Review of the Operations of Sydney Ferries".

what had been a monthly consultative forum[14], and a decision to relocate a full-time trainer with considerable maritime experience from Balmain to Circular Quay and to return two Masters (who were kept off-line to relieve other Masters undergoing training) to full-time operational roles. Sydney Ferries has since reinforced its training team substantially and as part of this reinforcement has added two additional full-time training Masters. OTSI believes that Sydney Ferries' training challenges warrant full-time attention and that, whilst it is appropriate for some trainers to be drawn from the operating roster as required, it is essential that there be a 'core' of suitably qualified and experienced fulltime trainers in the training team. The resulting interaction between those with contemporary training management skills and technical training skills should assist the process of breaking down some of the negative perceptions that exist within Sydney Ferries and the Unions in relation to training. In sum, given the range of vessels operated, the numbers requiring training and the frequency of training within Sydney Ferries, OTSI sees the reinforcement of the training team as a very positive development.

3.36 In addition to the requirement to improve the design and delivery of training, Sydney Ferries has recognised the need to improve its management of training records and is in the process of developing and populating a competency database. This database will form a key part of a revised Student Course Administration System (SCAS). It will be important, however, that those responsible for rostering have direct access, albeit on a read-only basis, to this database to ensure that those being rostered have the requisite competencies and currencies. OTSI also believes that Masters should be able to access the same database to satisfy themselves in relation to the same matters. This is an especially important 'cross-check' in situations where crew members have to be replaced at short notice. Finally, OTSI believes that all employees should have electronic access to their own training records in order for them to identify when they are required to re-qualify, undertake refresher training or participate in drills.

3.37 Quite apart from the merits of the arguments put to OTSI by Sydney Ferries, unions and individual crew members, OTSI was struck by the enthusiasm with which Masters and Engineers embraced recent rounds of critical control failure management training. This training, initially limited to Freshwater class Masters and Engineers, demonstrated that at the individual level, Masters and Engineers want, and will actively participate in, training that is properly designed and delivered. Prior

[14] Sydney Ferries advised that this forum ceased because one of the major unions ceased attending the related meetings.

to delivering this training, considerable effort was devoted to the identification and development of relevant scenarios and to ensuring that the related learning objectives were clearly defined. This training was delivered in three phases: Phase 1 involved classroom discussions; Phase 2 saw Masters and Engineers being required to respond to a number of scenarios and being mentored as they responded, and Phase 3 required Masters and Engineers to interpret and react to emergency scenarios without assistance from the training staff. OTSI participated in a number of iterations of each phase and witnessed Masters and Engineers willingly acknowledging their limitations, and readily responding to the opportunity to be exposed to demanding training. While this training had very specific aims and was limited to Freshwater class Masters and Engineers only, it was based on sound planning and realistic contingencies and as such, provided a good model for the redesign and delivery of training that is to follow.

3.38 Notwithstanding the significant work that remains to be done to improve training within Sydney Ferries, and which is underway, it will also be important for the Corporation to monitor crew performance. The practice of check flights is well established in the aviation industry and check 'rides' are becoming more prevalent in the rail industry. These practices need to be replicated within Sydney Ferries. It will be important, however, that the check ride be seen as a normal part of the training continuum, rather than as a tool that is applied randomly, and Masters, Engineers and GPHs should be encouraged to regard those conducting the check-ride as mentors.

3.39 OTSI understands that taking vessels off-line for the conduct of training can impact on the delivery of passenger services and therefore revenue, as well as maintenance schedules. Certain types of training, including emergency training, were routinely conducted on vessels while they were delivering passenger services until early 2005, and the final stages of initial training continue to be conducted, under supervision, during the delivery of normal services. Some Masters and Engineers expressed the view to OTSI that the prohibition of emergency training while passengers were onboard has meant that there is less opportunity to practice the related skills and procedures and that, as a consequence, their knowledge and skills have eroded. They contend that even with the benefit of improved and more frequent training, such skills need to be refreshed continuously. OTSI notes that under current arrangements, there is much greater opportunity for training, but acknowledges the potential cost benefits of conducting certain types of training whilst passengers are

on board. If such a need exists, and before there is any relaxation of the extant policy which prohibits such activity, it would be necessary for Sydney Ferries to undertake a detailed risk assessment and to establish clear parameters for those drills that were to be allowed while passengers were on board. If Sydney Ferries wanted to pursue this option, OTSI believes that it would also be necessary for Sydney Ferries to subject its related risk assessments and policies to scrutiny by the NSW Maritime Authority.

Poor Operational Communication

3.40 Another of the common themes to emerge during OTSI's review of Freshwater class incidents has been that of poor operational communication. By way of example, there were:

a. seven instances during which the Master failed to communicate the fact that he/she was experiencing a problem to anyone in the crew;

b. three instances during which the Master could not communicate directly with the crew, and

c. 10 instances during which the Master failed to activate a voice message intended to warn passengers of an emergency.

3.41 Poor operational communication was not confined to the management of incidents onboard Freshwater class vessels; it was also apparent in the collisions involving other classes. This deficiency was also readily apparent during the recently conducted critical incident training that OTSI witnessed. The key weaknesses are that proper communication protocols are not observed and that communication is very conversational. In the absence of proper communication protocols, there is a tendency for the 'sender' to assume that his/her message has been correctly interpreted and is understood. These observations are reflected in voice recordings of operational communications.[15]

3.42 OTSI investigators, onboard a Freshwater class vessel to observe training, noted that Masters preferred to use the telephone rather than the radio when communicating with the Engineer. It was suggested this was because the phone has a louder alarm and is therefore more likely to be heard by the Engineer in the MCR. OTSI noted that communication became faster and even more conversational when

[15] Refer to OTSI's investigation report into an incident involving *Betty Cuthbert* on 11 January 2006 at www.otsi.nsw.gov.au

the phone was utilised. Several Masters suggested to OTSI that one of the reasons that proper voice procedure is not employed is because English is a second language for many crew members. OTSI believes that this should provide an even greater incentive to use proper radio communication procedures. Such procedures require information to be communicated in short transmissions and in plain language. It also requires that unusual words be spelt; numbers be presented in a specific way; the sender pause between sections to allow the receiver to 'digest' information; information that has been received be acknowledged, and that the receiver repeat, or 'read back', critical information. The effect of such a procedure is to require the sender to think carefully about what has to be said; to communicate succinctly and to eliminate slang, and the receiver to listen actively. This process provides for structured and deliberate communication and reduces the margin for misunderstanding, particularly when one of the parties is communicating in other than their first language. Proper communication procedures also serve to reinforce adherence to standard operating procedures and CRM more generally, particularly in emergency situations. The absence of proper communication procedures onboard Sydney Ferries was a reflection in limitations in training, standard operating procedures and CRM, and a lack of supervision. Sydney Ferries is addressing these issues, as is described in Part 4 of this investigation report, and recently issued FOTM 2006-2007 (Ferry Operations Temporary Memoranda) "Radio Communications" to reinforce its requirements for proper communication onboard, and with, its vessels. However, it will need to continually emphasise these requirements if there is to be significant and sustained improvement in this area.

Limitations in Maintenance

3.43 OTSI could find no evidence to suggest that Freshwater class vessels had been maintained to any greater, or lesser, extent than any other class of vessel operated by Sydney Ferries, but it had little difficulty in establishing that maintenance was sub-optimal within Sydney Ferries. KPMG observed in its July 2005 report that:

a. the structure at Balmain Shipyard provided limited accountability for coordination and shipyard performance, except at the Fleet Manager level;

b. Engineering Superintendents had broad roles, but limited specific accountability;

c. Production Superintendents had defined accountability, but no authority;

d. Planners were predominantly performing an administrative function, rather

than actively driving planned maintenance programmes, and

e. Trade Supervisors covered leave for other Trade Supervisors in areas in which they had no expertise, and that they had accountability and authority, but their lack of expertise limited their application of either.

3.44 More recently, NSW Maritime observed that:

a. processes at the shipyard were immature and inadequate, and documentation was often incomplete;

b. issues remained open for unacceptable periods of time;

c. monitoring of work and performance was poor, and

d. contractor/supplier arrangements were sub-optimal.

3.45 OTSI's examination of maintenance was assisted greatly by Sydney Ferries' newly appointed GM Engineering (an appointment previously referred to as the Marine Engineering Superintendent), the sixth person to fill the role since 1998. He welcomed the recent reviews of maintenance that had been conducted because he believed they added weight to the need to modernise the systems and processes employed at the Balmain Shipyard. He also highlighted the difficulties associated with maintaining seven different classes of vessels, within which there are often a number of vessel variants, in the absence of a corporate Asset Management Plan. Such plans define the service life of major capital assets and provide a framework for the management of those assets and, in conjunction with manufacturers' specifications, provide the basis for the development of technical management plans and subsequently the detailed description of inspection and major and minor servicing regimes. Sydney Ferries has had inspection and minor and major maintenance regimes in place for many years, although those regimes have benefited as a result of recent review. OTSI noted that work has only recently commenced on the development of technical management plans, albeit in the absence of an asset management plan. Sydney Ferries advised that the development of this latter plan is about to be outsourced.

3.46 Perhaps the most telling point made by the GM Engineering was that only approximately 45% of the maintenance effort at Balmain, under present arrangements, is being directed towards preventative maintenance.

3.47 Quite apart from the above limitations, it was apparent to OTSI that crews have

lacked confidence in the defect reporting system. They advised that many of the issues they raised went unactioned and that because there was insufficient feedback to them, the onus was on them to check whether a matter had been rectified.

3.48 KPMG made the following related observations about Sydney Ferries' maintenance in a report commissioned by Sydney Ferries in July 2005:

a. Balmain Shipyard's information system provided adequate capabilities, however, reports were compromised by data quality, which was a result of lack of training, access and enforcing maintenance processes (such as closing-off work requests).

b. The lack of coding of work requests made it difficult to analyse equipment history and performance.

c. Time constraints (itself a result of inefficiencies) resulted in limited documentation for equipment modifications.

d. Few performance measures, or review mechanisms existed.

3.49 A Global Maritime report, commissioned by Sydney Ferries in August 2005, also expressed reservations about competing priorities, ineffective processes and inadequate supervision at Balmain. After reviewing maintenance documentation, OTSI's impressions were not dissimilar. It found that over 300 reported defects on the Freshwater class vessels remained outstanding. While many of the defects related to matters that would not affect the safe operation of a vessel, there was little to indicate that the defects had been properly prioritised. As a consequence, when vessels were docked, decisions as to what work would be conducted were often being made by other than those who were responsible for maintenance outcomes. This lack of prioritisation also complicated the management of spare parts at Balmain.

3.50 During its examination of maintenance matters, OTSI learned that there were very few staff at Balmain with specific expertise in hydraulics, marine electronics and the operation of the LIPS, Rexroth, or Kamome propulsion control systems, as Sydney Ferries out-sources a significant amount of maintenance work in relation to these functions. Whilst OTSI appreciates why Sydney Ferries has pursued such a strategy, out-sourcing requires considerable attention be paid to quality assurance and OTSI has previously noted, in its investigation reports into collisions involving *Collaroy* on 4 March 2005 and 19 September 2005, that quality assurance

procedures at Balmain require reinforcement.

3.51 OTSI is aware of the significant efforts that are being made to upgrade skills and to improve systems and processes at the Shipyard. KPMG's report contains a strategy to achieve such outcomes and is being used as a 'blueprint' in the related areas by Sydney Ferries. Major initiatives in being, or in prospect, include:

a. a revised training strategy for maintenance staff;

b. revised roles and duty statements for all staff, with emphasis on the allocation of responsibilities for specific parts of the technical maintenance plans to specific individuals;

c. finalisation of technical maintenance plans for all vessels, and

d. upgrading of the information management system to support improved data capture, analysis, maintenance planning and the electronic production of maintenance schedules and check lists.

3.52 The recent appointment of a Fleet Manager Engineering, assisted by two specialists, within the Operations Division is a significant development. There is now a clear conduit for maintenance matters between the Operations Division and the Balmain Shipyard. One of the Fleet Manager's early initiatives has been to implement a revised system for the reporting and management of defects. Under the revised arrangements, defects are reported to the Operations Division where they are assigned a priority before being despatched to the Balmain Shipyard. The Fleet Manager is also responsible for ensuring that work has been performed to the required standard before a vessel is returned to service. The benefits of this revised approach are already apparent. Nevertheless, OTSI appreciates that many of the other initiatives underway in the areas of maintenance are more industrially complex and will take time to put in place. It would also be unrealistic to anticipate immediate benefits when the required arrangements have been successfully negotiated.

Poor Identification and Management of Risk

3.53 Like the eight other commercial ferry operators issued with a NSW Government service contract[16], Sydney Ferries has been required to identify and manage risk within the framework of a Safety Management System (SMS) since 1 July 2005. Implicit in such a requirement is the obligation to systematically identify, analyse and

[16] Service contracts are issued by the MoT and generally define minimum service levels, fare structures, specific routes and wharves.

treat risk. NSW Maritime has also required that policy, material and procedural changes, or issues with safety implications, be brought to its attention by operators. This is an evolving, rather than a mature arrangement, and Sydney Ferries' SMS system was subjected to its first audit by NSW Maritime in October 2005.

3.54 The audit results confirmed OTSI's view that Sydney Ferries has a developing, rather than a developed, capacity to identify and manage risk. The following instances are illustrative:

a. Sydney Ferries was aware of *Collaroy*'s unique propulsion control system but did not reflect this in the Freshwater class, or a dedicated, VOM, or in drills.

b. The decision to use *Collaroy* as a relief vessel compounded its uniqueness and complicated the scheduling of maintenance of the other Freshwater class vessels.

c. Sydney Ferries did not begin to consolidate hazard reporting data until August 2005 and has yet to complete the compilation of a risk register.

d. Changes to operating procedures have not always been underpinned by formal risk assessments and the changes themselves have not always been properly documented and/or promulgated.

e. Vessel recovery plans, following an emergency situation, have not always been subjected to a risk assessment.

Broader Organisational Issues

3.55 Many of the issues highlighted thus far in this report are, in OTSI's view, manifestations of limitations in Sydney Ferries' corporate circumstance or organisational arrangements. Sydney Ferries, with 600 employees and an annual budget of approximately $100M, is a big business, yet many of its systems and processes do not reflect this. By its own admission, Sydney Ferries' information management, accounting, maintenance, training, and risk management frameworks are sub-optimal. In seeking to understand these weaknesses, OTSI identified three persistent issues, in that Sydney Ferries:

a. has suffered from a lack of continuity at the senior management level;

b. continues to be challenged by issues associated with its corporatisation, and

c. has difficulty in bringing about change because of its highly unionised workforce.

Lack of Continuity at the Senior Management Level

3.56 Sydney Ferries has had, for a variety of reasons, a high turnover of senior managers, including:

a. 12 Chief Executive Officers or equivalents in 15 years;

b. four General Managers Operations or equivalents in two years;

c. six General Manager Engineering or Marine Engineering Superintendents in six years, and

d. three Chief Finance Officers in the last 18 months.

3.57 In any organisation, there is an impact when senior managers are replaced. It takes time for new incumbents to understand their new circumstance, to form their own views on the strengths and weaknesses of existing arrangements and to impress their requirements upon the organisation. These impacts are exacerbated when the movement of senior managers is unplanned. There is additional impact when vacated positions are filled on a temporary basis from within, as has often been the case within Sydney Ferries, because the incumbents are often required to divide their attention across the new and old appointments. Acting managers are also generally less well placed to bring about or manage change. As OTSI examined Sydney Ferries' efforts to bring about changes recommended in numerous reviews and investigation reports, it appreciated the extent to which such endeavours have been complicated and frustrated by a lack of continuity in senior management.

3.58 The lack of continuity in senior management within Sydney Ferries has created a degree of cynicism at lower levels within the organisation, and there is a perception in some quarters that provided business is done in the usual way, the organisation can run in the absence of senior management. Such an attitude, left unchecked, creates a resistance to change. Therefore, Sydney Ferries has a significant challenge in modernising its systems, practices and processes. It not only has to convince employees and the unions of the need for change, it must also be able to demonstrate to them that senior management will remain in place to bring about the change in a planned, orderly fashion.

Corporatisation

3.59 Prior to being corporatised in July 2004, Sydney Ferries was an operating entity

within the State Transit Authority; a body that was, and continues to be, fundamentally concerned with bus operations. Upon corporatisation, Sydney Ferries inherited a $49M debt, associated with the previous purchase and upgrade of capital (ferry) assets. It also inherited many of State Transit Authority's (STA's) business systems. Sydney Ferries is required to retire its debt and thus far, has managed to reduce the debt to approximately $42m. It would also like to retire many of the business systems that it inherited because they are either dated, or unsuited to its business purposes. However, while the replacement of business systems is expensive, the retention of dated and unsuitable systems is often more expensive over time. Both of these realities impact on Sydney Ferries' ability to retire its debt.

3.60 OTSI sought to establish the extent to which Sydney Ferries' operations were being adversely impacted by the requirement to retire debt. Sydney Ferries advised that while all of their financial planning had to take into account the requirement to service its debt, those plans did not include any reduction in passenger services, staffing, or maintenance, but that there was growing appreciation for its need to replace dated operating systems. Sydney Ferries pointed out that the requirements to determine its true operating cost base; establish corporate policies and asset management, training and technical maintenance plans; develop a safety management system; embrace new fatigue and drug and alcohol imperatives, and negotiate a new enterprise agreement (EA05) in the space of less than two years has weighed heavily upon it at the corporate level. At the same time, Sydney Ferries has also been required to accommodate the recommendations of numerous reviews. The pressure of these responsibilities has been considerable and Sydney Ferries has had difficulty in exercising oversight over multiple programs and projects. This has been exacerbated by a tendency within Sydney Ferries, pre-dating corporatisation, to devote insufficient staff resources to major projects and to plan in sufficient detail. Recognising that it was effectively being overwhelmed by recommendations contained in reviews and reports dating back to 2001, Sydney Ferries has recently conducted an audit to identify matters which could be considered to be properly closed-out and to rationalise those which had not. Rather than attempting to address in excess of 25 recommendations made in relation to training over the last five years, for example, Sydney Ferries is viewing the related recommendations in totality to identify the major themes or issues that need to be addressed.

A Highly Unionised Workforce

3.61 With in excess of 600 employees and eight unions, Sydney Ferries has perhaps a more complex industrial environment than RailCorp and STA, both of which are considerably larger. As noted earlier in this report, the 'consultative forum', which had served to promote dialogue on a broad range of issues between Sydney Ferries and the unions on a monthly basis, has lapsed in recent times. OTSI understands that Sydney Ferries is now consulting with Unions on an individual basis in relation to some matters that might have previously been discussed in this forum. However, Sydney Ferries has also constituted a number of new safety committees at which Unions are represented. The AMOU expressed the view that one of these committees, the Chief Executive's Safety Committee at which it, AIMPE and the MUA are represented, has been very useful to date.

Emergency Response

3.62 In examining the effectiveness of response actions taken by Sydney Ferries in the face of emergencies throughout the period October 2004 to February 2006, OTSI differentiated between the specific actions taken by crew members, addressed earlier in this report, and Sydney Ferries' wider management of emergencies.

3.63 At the corporate level, Sydney Ferries has a documented 'Fleet Emergency Response Plan' (FERP) which details contingency actions in response to an onboard emergency. It also has a "Shore Based Emergency Response Plan" (SERP). Both of these are informed by a Maritime Disaster Plan (MARDAP). Sydney Ferries has generally managed events following an accident, or incident, in an effective manner and its interaction with other agencies at incident sites has also been effective. However, none of these emergencies has required Sydney Ferries to manage multiple casualties, major injuries, fires, flooding or major environmental 'spills' and as such, the plans have not been fully tested. In addition, OTSI could find little to suggest that the plans were exercised throughout the period October 2004 to October 2005. OTSI did note that Sydney Ferries participated in a major exercise in May 2006. This exercise required it to activate its Emergency Control Centre and Emergency Management Team as well as deploying Liaison Officers to a number of agencies. It also tested communication links throughout the organisation.

3.64 OTSI noted that there is a degree of inconsistency in the FERP in relation to control of emergencies. The FERP states that "The vessel's Master shall assume initial

control of all incidents. Sydney Ferries is however responsible for the initial control of the incident until the arrival of Police/Emergency Services". The FERP describes the role of an "Emergency Controller" whereas the same role is referred to as the "Emergency Manager" in the Emergency Management Team Roster. OTSI was advised by the MUA and AMOU that the control of emergencies is of concern to them. They cited incidents where, allegedly, senior managers in Sydney Ferries, who did not have maritime backgrounds, directed Masters to undertake actions at Circular Quay, following an accident, that were inappropriate, such as directing the evacuation of passengers before a vessel had been secured. OTSI has not witnessed such an instance but has first-hand experience of attending accident sites and not being able to locate the Emergency Controller for a considerable period of time because that officer was not readily identifiable.

3.65 OTSI has reviewed many voice recordings taken from Sydney Ferries' vessels following emergencies and has noted that communication between Masters and Controllers in emergency situations is often less than precise. The absence of proper communications protocols has also contributed to poor decision-making following an emergency. OTSI has concerns about the relatively passive role played by Operations Controllers after incidents and cites the example of an incident involving *Betty Cuthbert* on 11 January 2006. In this incident, the Master was confronted with a less than responsive starboard propulsion unit. The Master handled the immediate situation well and having done so, decided to recover his vessel back to Balmain by setting the defective starboard steering propulsion unit to the 'centred' position so that he was not dependent on it for steering. *Betty Cuthbert* then re-commenced its journey to Balmain, with the Master obtaining forward thrust from the starboard propulsion unit and both thrust and steering from the port unit. He reported that the vessel handled normally until it reached a point adjacent to Spectacle Island where, at an approximate speed of 18 knots, it made an uncommanded turn to port and headed toward Fern Bay. The Master attempted to regain control of the vessel by steering to starboard, but the vessel did not respond to these steering inputs and subsequently struck two moored vessels. There were readily identifiable risks associated with this plan; at a minimum, *Betty Cuthbert* should have been operated at a reduced speed and consideration should have been given to the need for an escort vessel, and/or the need for other harbour users to have been provided with some indication that *Betty Cuthbert* was partially disabled. These were matters that should have been dealt with by the Operations Controller. While OTSI accepts that the Master must control events onboard a vessel, it believes

that the recovery of a vessel that has been damaged or disabled must be the subject of dialogue between a Master and the Operations Controller and the outcome of that dialogue should be an agreed recovery plan. This requires Operations Controllers to have the necessary knowledge to assess the risks associated with a course of action proposed by a Master, or at a minimum, to have some very clear policy guidance about what actions should or should not be considered as the appropriate options.

3.66 Sydney Ferries attracted public criticism in September 2005 for its failure to drug and alcohol test all crew members following an incident involving *Collaroy* on 19 September 2005. OTSI notes that Sydney Ferries' Drug and Alcohol Policy is consistent with both the provisions of the *Passenger Transport Act 1990* and the *Passenger Transport (Drug and Alcohol Testing) Regulation 2004,* and that neither obliges Sydney Ferries to arrange testing of all employees involved in an incident or accident. However, OTSI is aware that there have been occasions where some crew have refused to be tested because the testing had not been conducted within a specified time frame. OTSI considers that there is a degree of ambiguity in Sydney Ferries' Drug and Alcohol Policy. The Policy does not specify when testing is to occur, but refers instead to the *Passenger Transport (Drug and Alcohol Testing) Regulation 2004* which states that employees may be tested following an accident or an incident, but that testing must not be required "at any time after the expiration of 3 hours from the time the employee carried out the transport safety work". Sydney Ferries' procedures require that tests are conducted "no more than 3 hours after the employee has been required to be tested". One of the unions has advised its members that they should not subject themselves to testing following an accident or incident until such time as the vessel has been secured and passengers disembarked, or agree to testing that has not been required within three hours of the vessel being secured and passengers disembarked. This should not be mistaken as an unwillingness to support such testing; indeed the Unions that provided input throughout this investigation indicated that they felt that such testing should be compulsory after any significant incident. OTSI is of the view that there is a need for an agreed understanding between Sydney Ferries, its employees and the unions in relation to the intention of the 3 hour provision in the Regulation.

3.67 In the same way that some of the actions taken immediately following an emergency have been inappropriate or incomplete, so too some of the follow-up actions taken after incidents have also been deficient. Following an accident involving *Narrabeen* on 26 May 2005, Sydney Ferries conducted a de-brief of the incident but the crew

were not involved in this activity. Sydney Ferries also gave consideration to the installation of an emergency alarm button as a result of this accident. The button was subsequently installed on the bridge of the four Freshwater class vessels but there was little knowledge of this initiative amongst crews until some time later when the Training Division issued a circular covering the purpose and use of the button. During an emergency on *Collaroy* on 19 September 2005, a Master who had not been properly familiarised with the operation of the alarm, pressed the button repeatedly, not realising that the alarm required a period of seven seconds before it became fully audible. The effect of the Master's repeated actions was to repeatedly disable the alarm before it could become audible.

3.68 In its early meetings with the AMOU, AIMPE and the MUA, concern was expressed to OTSI about the number of agencies that sometimes arrive at the scene of an incident and the requirement for crew to be subjected to multiple interviews, and in some instances duplicated drug and alcohol testing. OTSI regarded such concern as reasonable and understandable, and the Chief Investigator subsequently met with the Acting Chief of Sydney Ferries (who had been seconded from his appointment as the Chief Executive of NSW Maritime) and the Acting Chief Executive of NSW Maritime to explore the related issues. Agreement was reached on a number of matters relating to protocols and procedures and, as a result, there is now less duplication of effort. However, there is room for further cooperation and for other entities to be encouraged to participate in a further round of discussions which OTSI will seek to facilitate.

Summary

3.69 All of the foregoing reflects the shortcomings in the operations of Sydney Ferries over a considerable period of time, culminating in a series of incidents during 2004 and 2005 which compromised the integrity of the Corporation as a provider of safe passenger transport services. Despite a number of reviews and reports, Sydney Ferries has experienced difficulty in implementing a comprehensive programme of safety remediation. Nevertheless, it is aware of the problems which constitute the potential compromise to its recovery, and has embarked on a course of concurrent projects to restore safety and reliability to its fleets' operations. These Safety Actions are described in Part 4 following.

PART 4 REMEDIAL ACTION UNDERTAKEN BY SYDNEY FERRIES POST OCTOBER 2005

4.1 Sydney Ferries has progressed a significant number of initiatives to improve its vessel operations, and organisational efficiency more generally, throughout 2005 and 2006. Some of these initiatives are recent and in direct response to the collisions involving the Freshwater class vessels. The initiatives are at varying stages of implementation and all will require ongoing commitment within Sydney Ferries if they are to achieve their stated objectives. These initiatives, and their status as advised by Sydney Ferries, are summarised below.

Operations

4.2 Sydney Ferries is reorganising its largest division, the Operations Division. The structural changes are specifically aimed at improving safety and reliability. The key aspects of the reorganisation include:

a. the absorption of the Training and Development function into the Operations Division;

b. the creation of a Fleet Standards Group consisting of five permanent staff with responsibility to:

   i. coach crews in the conduct of emergency and standard operating procedures;

   ii. visit/monitor crews during normal operations;

   iii. set and enforce crew standards in safety, customer service, security, vessel and personal cleanliness, and seamanship, and

   iv. progress CRM training;

c. the addition of a Fleet Manager Engineering, to be assisted by two engineering specialists within the Operations Division, with responsibility for the assignment of priorities to work requests (defect notices) and monitoring the quality of maintenance work performed before vessels re-enter service, and

d. a proposal to appoint a Business Manager within the Operations Division to develop and monitor implementation of an Operations Division Business Plan.

Training

4.3 **Recognition as a Registered Training Organisation (RTO)**. Sydney Ferries has restructured its approach to training and assessment to comply with the national standards required to become an RTO and to ensure that training courses accommodate enterprise risks, vessel requirements and other outcomes defined within its Safety Management System. The following phases were established for this project:

a. Stage 1 involved the development of appropriate policies and procedures to meet Vocational Education and Training Accreditation Board (VETAB)[17] and Sydney Ferries' requirements. This stage has been completed.

b. Stage 2 involved an extensive internal audit to VETAB standards and has been completed.

c. Stage 3 involved the finalisation of the documentation required to support the inclusion of Certificate IV Transport and Distribution (Maritime Operations) and Certificate III Transport and Distribution (Marine Engineering) in Sydney Ferries' application for recognition as an RTO. This stage has been completed.

d. Stage 4 involved lodging the application for recognition and VETAB has commenced its consideration of the application.

4.4 **Review of Initial Training of Masters**. Sydney Ferries has reviewed the initial training of Masters, i.e., the training required for Masters to qualify on specific vessel types to ensure that they meet national standards, and that it reflects appropriate risk assessments and is fully underpinned by standard and emergency operating procedures. The milestones for this project are as follows:

a. Stage 1, which has been completed, involved the development of a new training program and associated materials for First Fleet class vessels.

b. Stage 2 involved the piloting of the First Fleet class training program and has been completed.

c. Stage 3, which is due for completion by 30 December 2006, involves the development of new training programs and associated material for the

[17] VETAB – The Board seeks to achieve its objectives through the registration of training organisations, accreditation of vocational courses and the approval of persons to provide courses and issue guidelines in relation to these matters.

remaining classes of vessels.

4.5 **Review of General Purpose Hand (GPH) Training**. The purpose of this project is to ensure that Sydney Ferries' training provides GPHs with the required skills, knowledge and qualification and to ensure that the related competencies are consistent with VETAB's Certificate III level. Key milestones in review include:

a. Stage 1, which has been completed, involved the finalisation of a new Enterprise Agreement (EA05) providing for greater flexibility in work design, rostering and qualifications for GPHs, including the attainment of a Marine Engine Driver III Certificate (MED III) for GPHs employed as Greasers on Freshwater class vessels and/or those rostered for general purpose duties on RiverCats.

b. Stage 2, which has been completed, involved the publication of a notice calling for Expressions of Interest from GPHs interested in undertaking MED III training. To date, 42 expressions of interest have been received and Sydney Ferries is in discussion with TAFE to develop a partnering arrangement to support this training.

c. Stage 3 involves a review of any MED III training material to ensure that it meets the standards required of an RTO. The commencement of this stage is dependent on the outcomes of stage 2.

4.6 **CRM Project**. Sydney Ferries has progressively upgraded its delivery of CRM training, with a focus on the management of critical control failures, as follows:

a. Stage 1 involved the development and delivery of critical control failures and CRM training on Freshwater class vessels (excluding *Collaroy*) and has been completed.

b. Stages 2 & 3 involved the development and delivery of critical control failures and CRM training for the vessel *Collaroy* and the Jetcats, Supercats, Rivercats and Harbourcats and has been completed.

4.7 **Drills Review Project**. The purpose of this Project is to ensure that the Sydney Ferries' program of 'drills' is risk-based, timely and meets the legislative requirements of NSW Maritime and Sydney Ferries' own Safety Management System. The Project is being progressed as follows:

a. Stage 1, which has been completed, involved a review of legislation, current

practices and consideration of the related resource requirements.

b. Stage 2, which was due to be completed by 30 July 2006, involves:

   i. a review of Sydney Ferries' Quality Management System (QMS);

   ii. the re-development of the Drills Report Books for all vessels and wharves, and

   iii. an alignment of the revised drills with the Standard Operating Procedures Review Project.

c. Stage 3 involved the development of a suite of four new vessel-based, and two new shore-based, drills and has been completed. Each vessel-based drill now incorporates four emergency scenarios. These drills also form part of the revised Critical Control System Failures/CRM training program.

d. Stage 4 involves the development and implementation of training packages to prepare Masters to conduct vessel-based drills. The new packages have been trialled and are in the final stages of revision.

4.8 **Standard Operating Procedures/Safe Work Method Statements Program**. This program is developing training and reference material to support revised emergency, SOPs and safe work method statements across the fleet and at Balmain Shipyard. The Program is being delivered in two phases as follows:

a. Stage 1 which involves the development and validation of the related training.

b. Stage 2 involving a risk assessment of the related training and assessment material, and the integration of the procedures into initial and continuation training programs where appropriate.

4.9 **Log Book Revision**. This project involved the re-design of Sydney Ferries' crew log books to ensure they meet legislative requirements and that training outcomes can be appropriately recorded. Key milestones in the project were:

a. Stages 1 – 3 included a review, consultation, related Toolbox training for some Masters and a trial of the new log books. This phase has been completed.

b. Stage 4, which has been completed, involved the incorporation of amendments and the printing of the log books.

c. Stage 5 involved the conduct of Toolbox training for all Masters and has been

completed.

d. Stage 6 saw the distribution of the new log books and the withdrawal of the 'trial' log books.

4.10 **Controlling Officer's Training Program**. The purpose of this program, which is being delivered to Certificate IV standard, is to ensure that Controlling Officers are able to direct ferry movements in a manner which supports safe and timely ferry services. This Program is being delivered in four phases as follows:

a. Stages 1 and 2, which have been completed, involved the development of an Interim Operations Manual and an analysis of training needs.

b. Stage 3, which has been completed, involved the development of training and assessment materials.

c. Stage 4, which is in progress, involves the piloting and review of course materials during the orientation of a number of new Controlling Officers and Duty Managers.

4.11 **Development of a Student Course Administration System (SCAS)**. Sydney Ferries trains a large number of staff and has recognised that its current administrative arrangements do not support the effective delivery of training and its associated outcomes. SCAS is designed to allow Sydney Ferries to readily verify individual qualifications and establish when refresher training is required. SCAS now contains the detail associated with all courses, e.g., the training plan and learning outcomes, and as such, should greatly assist in the management of training. The associated timelines are:

a. Stages 1 and 2, which have been completed, involved the populating of a new database capturing initial qualification and drills data dating back to 1 January 2004.

b. Stage 3 involved the ongoing development of qualification matrices to support the management of rostering and daily crew assignment, and to assist in the timely provision of training to support roster changes or special projects. This stage has also been completed.

Human Resources' Issues

4.12 **Introduction of Revised Rosters**. Sydney Ferries has adopted a new IT-based rostering system based on HASTUS[18] software. HASTUS is intended to support the timely provision of team-based rosters that fully integrate all aspects of competency management, including drills, individual leave requirements, CRM training and class-specific revalidation processes into rostering calculations. The project is being implemented as follows:

a. Stage 1 commenced in June 2006 and involved the population and validation of data. This stage has been completed.

b. Stage 2 involved consultation with interested parties and has been completed.

c. Stage 3, which has yet to commence, involves the commencement of the utilisation of HASTUS for rostering purposes.

d. Stage 4, which is due to be completed by 30 December 2006, will see all of Sydney Ferries' designated transport safety workers, i.e., crews, operational controllers, etc, provided with a competency management/training roster for 2007.

4.13 **New Enterprise Agreements (EAs)**. Sydney Ferries has been involved in the negotiation of five new Enterprise Agreements with its employees and the related unions throughout 2005 and 2006. This process has been prolonged and complex but the five Agreements have recently been signed by the respective parties. Significantly, the new EAs will provide for additional training time, within rostered hours, and should facilitate a move towards crew-based rostering, both of which OTSI considers to be important in the context of improved CRM and improved vessel management. OTSI notes, however, that the implementation of crew-based rostering is dependent on continuing discussions about matters of detail that are not specified in the EAs.

Engineering and Reliability

4.14 In October 2005, Sydney Ferries developed Key Performance Indicators for vessel

[18] HASTUS is an internationally recognised software system specifically tailored for use in the industry. It provides specific 'tools' to assist in planning, vehicle/vessel assignment, scheduling, time-tabling, rostering, and performance analysis.

maintenance which, in concert with a more rigorous approach to the analysis of data from onboard monitoring systems, provide an improved basis to understand and respond to issues affecting reliability. In addition:

a. a new Technical Maintenance Plan (TMP) for the Freshwater class, with a separate 'volume' for *Collaroy*, has been developed and the existing TMPs for other classes will be reviewed before the end of 2006;

b. the installation of GPS on board all Sydney Ferries' vessels was completed in December 2005;

c. a contract for the supply and installation of event recorders or data loggers on all Sydney Ferries' vessels was awarded in February 2006 and is due for completion in May 2008, and

d. the implementation of recommendations from KPMG's Balmain Shipyard Review was completed in July 2006.

Other Safety Initiatives/Responses

4.15 Other safety initiatives underway within Sydney Ferries include:

a. **Review of the Quality Management System**. This review was completed in July 2006 and an implementation plan and related training for key staff is due to be completed by July 2007.

b. **Safety & Risk Management Framework**. This review was completed in September 2006. The development of an implementation plan and related training for key personnel is due for completion by March 2007.

c. **Development, Implementation and Administration of a Recommendations Management Database.** This database, due to be completed by May 2007, is intended to capture all safety-related recommendations made to/by Sydney Ferries so that safety outcomes can be tracked.

d. **Review of Fitness-for-Work Policy and Health Standards**. One of the outcomes of the new EAs has been agreement on the need to establish a more cogent and contemporary fitness-for-work policy. However, the 'detail' remains the subject of ongoing discussions between Sydney Ferries and Unions. OTSI notes that in a separate, but related development, the National Marine Safety Committee is currently reviewing extant medical standards,

established under the USL Code, in response to a request from NSW Maritime following medical-related recommendations made in the Special Commission of Inquiry's Report into the Waterfall Rail Accident. OTSI noted that these standards presently differ from the medical standards established by the Australian Maritime Safety Authority, a situation that attracted criticism from the AMOU delegates who met with OTSI. Their view was that such a fundamentally important matter as a health standard needed to be the subject of a single industry-wide policy.

e. **Development of a Fatigue Management Plan**. This project commenced in March 2006 as part of the EA negotiations and, subject to finalisation of the EA, the revised standards are due to be implemented by July 2007.

f. **Develop Risk-based Standard Operating Procedures**. The development of new procedures commenced in February 2006 and is due for completion in December 2006.

4.16 OTSI is not in a position to comment on the quality of the work being done in relation to the majority of these projects. This would have required OTSI to have audited the projects which would have been a major undertaking in its own right. It is also too early to comment on the efficacy of a number of the initiatives because the related projects are in their infancy. However, OTSI notes that the workload associated with each of these endeavours has been significant and in most cases, will continue to be so until the projects or programs have been finalised. It also notes that in the past, a number of projects within Sydney Ferries have not been progressed to any meaningful conclusion, or they have been overtaken by other events. If this is to be avoided, and given the overheads associated with the management of so many concurrent, and in many instances interdependent, projects, Sydney Ferries will have to exercise close, continuing and high-level oversight of these projects.

4.17 **NSW Maritime Audits**. NSW Maritime audited Sydney Ferries' Safety Management System in October 2005 and March 2006. The latter audit focused on the Freshwater class vessels. The Authority continues to monitor the extent to which Sydney Ferries has progressed issues identified during these audits.

PART 5 FINDINGS

5.1 In the early stages of this systemic investigation, it was established that Freshwater class Manly ferries had been involved in 11 accidents involving collision in the period October 2004 to October 2005. These 11 incidents and the 23 collisions involving other classes of vessels operated by Sydney Ferries in the same period attracted significant public interest and media comment, some of which has not appreciated the scale of the operations of, and services provided by, Sydney Ferries. To put the incidence of collision accidents into perspective, it is important to recognise that during the period October 2004 to October 2005, Sydney Ferries conducted approximately 180,000 service runs and made 540,000 berthings. Statistically, the frequency of collisions of all types and gravity throughout this period, across all vessels operated by Sydney Ferries, was less than 1 per 5000 trips, or less than 0.02%. While the frequency of incidents is very low statistically and reflects a record of generally safe operations, the fact that there have been instances of collision at all indicates the requirement to understand the causes and identify the remedies that will enable Sydney Ferries to improve its approach to safety and deliver a safer working environment for its crews and a safer public transport service.

5.2 In relation to those matters prescribed by the Terms of Reference as the principal lines of inquiry, OTSI finds as follows:

a. Causation

i. Freshwater class vessels were over-represented in incidents of collision throughout the period October 2004 to October 2005 and indeed, over a longer period of time. This was a consequence of their technical complexity relative to other classes of vessels operated by Sydney Ferries, and the reduced margin for error which comes with their size.

ii. *Collaroy*, which has a unique propulsion control system, was involved in four collisions and was thus over-represented in instances of collision within the Freshwater class throughout the period October 2004 to October 2005 because the risks associated with operating a vessel that is unique were not properly recognised and managed by Sydney Ferries. Additionally, over the period 1 January 2001 to 30 June 2005, *Collaroy* was involved in 15 collisions, which was twice as many as any other vessel in the class.

iii. The majority of the collisions involving Freshwater class vessels, including *Collaroy*, have been caused by human error. This was largely underpinned during the period October 2004 to October 2005 by both individual and organisational shortcomings; the same can be said of many of the collisions that resulted from technical problems during the same period. The extent to which these same shortcomings caused or contributed to collisions involving Freshwater class vessels prior to October 2004 is less clear. However, examination of reports into safety-related matters within Sydney Ferries prior to October 2004 indicates that the same shortcomings were present within the organisation.

b. Issues in Common

i. The majority of the incidents occurred when switching to, or while in, Manoeuvring mode, i.e., in the process of berthing.

ii. Most of the incidents were initiated by a control failure, or the perception by Masters that they were confronted with a control failure.

iii. Three of the incidents involved the same Master and three of the incidents, the same Engineer, although the individuals concerned were not part of the same crew in any of the six instances.

iv. In most instances, Masters were left with few recovery options because they were committed to a berthing approach and therefore had little time or space in which to respond.

v. Some Masters did not initiate recovery options that were available to them because they lacked a proper understanding of their vessel's operating systems and did not properly interpret information that was available to them.

vi. In a number of instances, early indications of a mechanical or electrical fault might have been detected, had proper start-up procedures been observed.

vii. Crew actions, prior to and during the incidents, generally did not reflect good crew resource management (CRM).

viii. Crews had not had the benefit of a recently conducted, structured program of emergency training.

ix. There is a view in some areas of Sydney Ferries that some of the collisions caused by human error during berthing might have been avoided if the

vessels had been operated at lower speeds on their approach to the berth. This view was also countenanced in a recent report provided by marine consultants. However, the proposition could not be substantiated because the onboard monitoring systems on Freshwater class vessels do not have the capacity to record speed, and Sydney Ferries does not employ any external tracking system to record approach speeds. OTSI also notes that while the instrumentation available to Masters on Freshwater class vessels might allow them to estimate their speed, there is nothing to indicate their vessel's actual speed.

c. Design Issues

i. While Freshwater class vessels are more complex to operate and maintain than other classes operated by Sydney Ferries, and incorporate some design features that would not be found on more modern vessels, OTSI could not find any significant weaknesses in their design.

ii. *Collaroy*'s unique propulsion control system was less well understood than that of its sister vessels by those who operate and maintain the vessel and this presented Sydney Ferries with additional risks which were not fully appreciated.

iii. *Collaroy*'s unique propulsion control system was originally considered to be technologically superior to the systems fitted to the other three Freshwater class vessels, but is now considered to be inferior because the systems of the other three vessels have been upgraded. However, the Masters and Engineers who have operated *Collaroy* are supportive of its return to service.

d. Organisational Issues

i. Many of the factors that have caused or contributed to the Freshwater class collisions were manifestations of organisational problems within Sydney Ferries.

ii. Organisational arrangements within Sydney Ferries have been the subject of considerable review in recent years, some of which has been externally directed and some of which has been commissioned by Sydney Ferries itself. Sydney Ferries has therefore been aware of its internal deficiencies and there are no new shortcomings identified in this report.

iii. The high rate of turnover of senior managers within Sydney Ferries has created considerable organisational 'churn' and has adversely impacted on the management of daily operations and its capacity to implement effective change within the Corporation.

iv. The process of 'corporatising' Sydney Ferries, which is ongoing, has required considerable effort and has added to the challenges confronting senior managers.

v. There is a strong sense of organisational identity within Sydney Ferries, with some of the current staff being third generation employees. This has helped sustain Sydney Ferries, in its varying forms, during difficult times. However, there is also strong affinity with the status quo and a firmly-held opinion among some front-line employees that the company can run itself. This opinion has been reinforced by the continual change of senior managers. It manifests itself in a lack of regard for formal procedures and has complicated the management of change.

vi. Sydney Ferries has a developing, rather than a developed, capacity to identify and manage risk.

vii. Limitations in the competencies of some individuals have been exacerbated by inadequate crew training.

viii. Crew resource management onboard Sydney Ferries' vessels is below what might be considered best practice and has been affected, over time, by inadequate training, poor communication procedures, ill-defined roles and responsibilities of the Helmsman and the Engineer's Assistant (or 'Greaser') and rostering practices.

ix. Limitations exist in Sydney Ferries' system for recording and classifying reportable incidents and capturing important information in relation to causation.

e. Adequacy of Emergency Responses

i. Onboard responses to the onset of technical difficulties were often less than assured and reflected limitations in Sydney Ferries' approach to crew resource management and emergency training.

ii. While Sydney Ferries' shore staff responded quickly and effectively to the collisions, none of the incidents resulted in large numbers of casualties and

none of them was complicated by significant environmental damage, fire or smoke.

iii. Communication between Masters and Engineers and between Masters and Operational Controllers was often unstructured and imprecise.

iv. There are varying interpretations as to when the three hour 'window' within which crew may be drug and alcohol tested starts and finishes, and there are some inconsistencies between Sydney Ferries' Drug and Alcohol Policy and its Discipline Policy.

f. Adequacy of Sydney Ferries' Response and Remedial Actions

i. Sydney Ferries has devoted considerable effort to embracing the recommendations of many reports, and to embracing change more generally over time, but has not always progressed matters in a holistic manner, or pursued issues to a logical conclusion.

ii. Sydney Ferries' responses to the incidents under review reflected a focus on the symptoms rather than the causes.

iii. Sydney Ferries has issued numerous policies and instructions to improve safety, but has been less active in auditing compliance with those policies and instructions.

iv. Sydney Ferries is now addressing its organisational deficiencies in a more systematic manner. However, the number and complexity of issues being addressed concurrently will require a high level of continuing oversight if the intended outcomes are to be achieved.

PART 6 RECOMMENDATIONS

6.1 In order to prevent, or at the very least minimise the potential for, recurrence of Freshwater collision accidents, and to improve the safety and reliability of this class of ferries, the following remedial safety actions are recommended for implementation by Sydney Ferries Corporation and the NSW Maritime respectively:

a. Sydney Ferries Corporation

i. Risk Management

(1) Sydney Ferries' Board exercise close and continuing oversight of the progress of all safety related projects.

(2) While Sydney Ferries continues to respond to the outcomes of a significant number of reports and reviews, and manages a significant number of complex projects, it establishes a small project team, or alternatively appoints a project manager without other duties, with responsibility for coordinating the implementation and progress of all the recommended safety actions.

(3) Review its risk management framework and expedite the development of a risk register.

(4) Ensure that all managers understand contemporary risk management concepts and principles and are able to apply them within Sydney Ferries' risk management framework.

(5) Expedite the development of an Asset Management Plan.

(6) Implement formal quality assurance and auditing programs.

(7) Ensure that changes to operating instructions, procedures and policies that impact upon the operation of vessels are underpinned by thorough risk assessments and are formally communicated.

(8) Give careful consideration to the full range of implications arising from the external reviews it has commissioned in relation to the Freshwater class and *Collaroy* in particular.

(9) While *Collaroy* remains unique, ensure its uniqueness is fully understood by all personnel required to either operate or maintain the vessel.

(10) Continue to progress, in concert with Unions, the development of a cogent and contemporary fitness-for-work policy and ensure that NSW Maritime is kept informed of the status of this important endeavour.

(11) Institute a standard fitness-for-work assessment, supervised by Masters, to be conducted at sign-on points.

(12) Address the need for Masters, across all classes, to be able to accurately determine their vessels' speed, and for it to be able to independently confirm vessel operating speeds when it is necessary to do so.

(13) Ensure that there is a uniform understanding of its vessel incident reporting requirements throughout Sydney Ferries and establish a single database to capture such occurrences and the factors that caused or contributed to them.

ii. Emergency Management

(1) Review the Fleet Emergency Response Plan (FERP) to ensure consistency with the State Disaster Plan (DISPLAN) and legislative requirements.

(2) Review the utility of the "Digital Announcer Passenger Warning Announcement System" onboard Sydney Ferries' vessels.

(3) Require Masters and Operational Controllers to come to a shared understanding of any recovery plan following an accident or incident.

(4) Continue to reinforce the use of proper radio communication protocols on, between and with Sydney Ferries' vessels.

(5) Ensure that persons who are required to control, or assist in the coordination of, an emergency response are readily identifiable when required to perform such a role.

(6) Review its Drug and Alcohol Policy and its Discipline Policy to ensure that they are consistent and that there is a shared understanding throughout the Corporation as to the time frame within which Drug and Alcohol testing, following an accident or safety-related incident, may occur.

iii. Training and CRM

(1) In addition to requiring the recently expanded training team to assist in the design, development, delivery and assessment of initial, continuing and critical incident training, require that all drills that are considered to be part of Sydney Ferries' continuation and emergency/critical incident training be evaluated by the Fleet Standards Group. This Group should also conduct check 'rides' to validate training.

(2) Confirm, as a matter of urgency, the system for initial and continuation training ('type-rating') for the benefit of all crew members.

(3) Provide those responsible for crew rostering with read-only access to the qualifications database to ensure that those being rostered hold the required qualifications and that they are current.

(4) Provide Masters with the means to allow them to satisfy themselves that those being rostered onboard the vessel they will control hold appropriate and current qualifications.

(5) Clarify the roles and responsibilities of the Helmsmen and Greasers and provide formal training to properly equip them to fulfil their related duties.

(6) Expedite the delivery of critical incident training to all crew members.

(7) Pre-programme a regime of specified training drills, supported by relevant scenarios and training material, to be undertaken by all crew members during normal rostered hours.

(8) Ensure that any assessment that leads to the award or maintenance of a qualification is subject to formal and independent validation.

(9) Develop checklists for all classes of vessels, for both normal operations and emergency situations.

(10) Ensure that 'lessons learned' from accidents, incidents, exercises, drills and risk assessments are formally distributed to crews and relevant staff members.

iv. CRM and Communication

(1) Act to reinforce CRM, and in particular to require that safety critical issues during start-up and emergency procedures are the subject of specific communication between Masters and Engineers.

(2) Minimise the rotation of crew members during a shift and ensure that any rotation that must occur does not take place without reference to the Master.

(3) Align shifts so that all members of a crew start work at the same time.

(4) Require the use of formal communication procedures onboard, between and with all Sydney Ferries' vessels.

v. Maintenance

(1) Ensure that the development of Technical Maintenance Plans is progressed in accordance with project timelines.

(2) Monitor the progress of initiatives taken in response to KPMG's report into the shipyard function at Balmain.

(3) Review the maintenance of Freshwater class vessels, and *Collaroy* in particular, in the light of the risk assessments recently conducted by industry experts.

(4) While *Collaroy* remains unique, act to ensure its uniqueness is fully understood by all personnel required to maintain the vessel.

(5) Conduct an analysis of critical failure modes on all classes of vessels, commencing with the Freshwater class, with particular emphasis on propulsion control systems.

b. NSW Maritime

i. Continue to monitor the management of risk, training and maintenance in Sydney Ferries.

ii. Closely monitor the performance of *Collaroy* following its reintroduction to service and require that any occurrence, other than planned maintenance, which causes it to be taken out of service be reported by Sydney Ferries.

iii. Review any risk assessments associated with *Collaroy*'s reintroduction into service or the impending upgrade of its propulsion control system.

iv. Maintain continuing oversight of the progress of major safety-related programs and projects within Sydney Ferries.

Appendix 1

Reported Incidents Involving Freshwater Class Vessels, October 2004 – October 2005

Date	Vessel	Incident Description	Nominated Primary Cause Human Factor (HF) or Technical (T)
04 October 2004	*Freshwater*	Collision with No 4 Wharf at Circular Quay	HF
08 January 2005	*Collaroy*	Collision at Balmain Shipyard	Report could not determine if HF, or T
17 January 2005	*Queenscliff*	Collision with private yacht in harbour	HF
19 January 2005	*Queenscliff*	Collision with No 3 Wharf at Circular Quay	HF
24 February 2005	*Collaroy*	Collision with Manly Wharf	T
04 March 2005	*Collaroy*	Collision with a backboard at No 3 Wharf at Circular Quay	T
17 March 2005	*Freshwater*	Collision with a backboard at Manly Wharf	HF
21 March 2005	*Freshwater*	Vessel damaged by two large waves. Note MA report that incident actually occurred on 22/3/05	Neither HF, or T
26 May 2005	*Narrabeen*	Collision with No 5 Wharf at Circular Quay	HF
10 August 2005	*Queenscliff*	Collision with pile at No 3 Wharf at Circular Quay. Note MA report that incident actually occurred on 9/8/05.	T
19 September 2005	*Collaroy*	Collision with No 2 Wharf at Circular Quay	T
17 October 2005	*Freshwater*	Collision with Manly Wharf	HF

Appendix 2

Reportable Incidents Involving All Vessels Operated by Sydney Ferries, October 2004 – October 2005 (but excluding incidents caused by another vessel not operated by Sydney Ferries)

Vessel Class	Number of Vessels in Class	Vessel Length	Number of Reportable Incidents	Number of Collisions	Primary Cause – Mechanical/Electrical Factors	Primary Cause – Human Factors
First Fleet	9	25.4m	10	5	4	6
HarbourCat	2	29.6m	3	4	2	1
JetCat	3	34.8m	6	1	3	3
RiverCat	7	36.8m	24	5	8	16
SuperCat	4	37.8m	16	7	5	11
Lady Class	2	38.7m & 43.8m	7	1	2	5
Freshwater	4	70.4m	26	11	11	15

Appendix 3

Reported Collisions Involving the Freshwater Class, 2001 to 2005

Year	No of Collisions of Freshwater Class
2001	8
2002	6
2003	2
2004	4
2005	10
Total	**30**