Jet Boat Accidents

Historical Impact Review

June 2012

CR-2012-505

The Transport Accident Investigation Commission is an independent Crown Entity established to determine the circumstances and causes of accidents and incidents with a view to avoiding similar occurrences in the future.

This report is the third in a series of historical reviews produced by the Transport Accident Investigation Commission, the purpose of which is to assess the influence of the Commission's activity in the transport sector.

Cover photograph from the Transport Accident Investigation Commission's Report 09-203, jet boat, DRJS-11 grounding and subsequent rollover Dart River, near Glenorchy, 20 February 2009 (Digitally Altered).

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Glossary and Abbreviations

ACC - Accident Compensation Corporation

DOL – Department of Labour

Incidents, accidents and serious harm. These terms have the meanings defined in the New Zealand Maritime Transport Act, 1994.

Maritime Transport Act, 1994. The Act of Parliament under which maritime activities are regulated. The Act is responsible for the bringing into existence MNZ, and provides the legal basis for the formulation Maritime Rule Parts to permit, prohibit or require particular actions and procedures by maritime operators.

MNZ - Maritime New Zealand. The New Zealand Crown entity charged with promoting maritime safety, preventing marine pollution, providing maritime search and rescue services, and coordinating marine security.

MSA – Maritime Safety Authority. The Maritime Safety Authority was renamed Maritime New Zealand in July 2005.

MSD – Ministry of Social Development.

NZCJBA - New Zealand Commercial Jet Boat Association.

PWC. Personal water craft.

SOLAS/non-SOLAS – International Convention for the Safety of Life at Sea, 1974. The SOLAS convention is an international treaty concerning the safety of merchant ships. Non-SOLAS vessels are those not covered by the convention.

SOP – Safe Operating Plan. Maritime Rule Part 80, which came into force in 1999, defined Safe Operating Plans as a lower cost alternative to Safe Ship Management Plans for smaller commercial vessels.

SSM – Safe Ship Management Plan. The system used by larger commercial maritime vessels to ensure safety. SSMs are defined within the Maritime Transport Act, 1994

The Commission – The Transport Accident Investigation Commission of New Zealand.

Introduction

The principal purpose of the Transport Accident Investigation Commission (the Commission) as defined by statute is "to determine the circumstances and causes of accidents and incidents with a view to avoiding similar occurrences in the future, rather than to ascribe blame to any person." The Commission's mandate covers accidents and incidents in the aviation, marine and rail sectors. The statutory definition raises issues about how the Commission can evaluate whether it has been effective in achieving its principal purpose. To measure whether similar occurrences have, in fact, been avoided, information about the frequency, rate per exposure and consequences of the given type of occurrence over a specified period is required. Such information forms the basis of steps one and five of the accident prevention cycle outlined below (Figure 1).

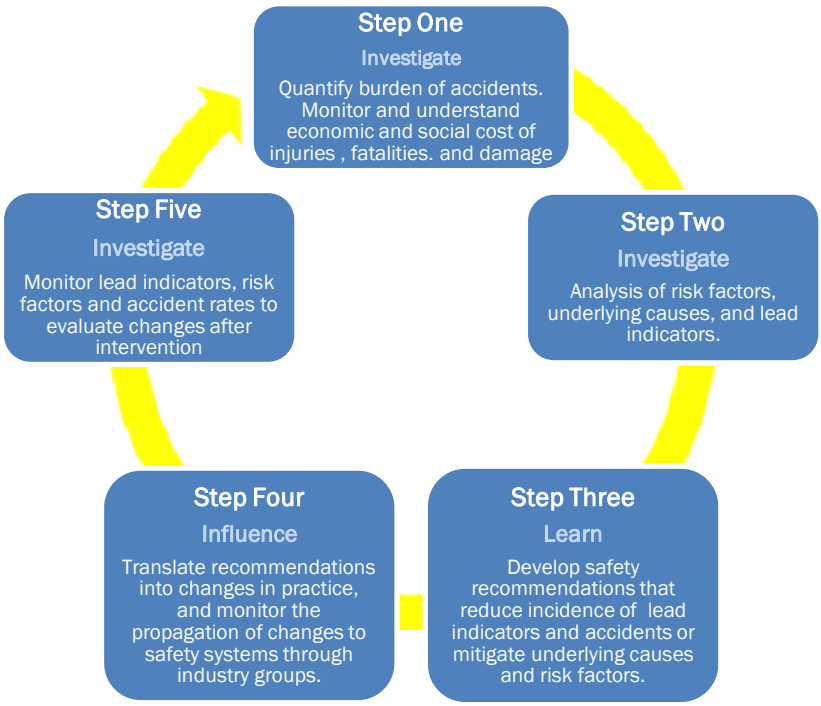

Figure 1. A cyclic accident prevention model

As part of its research strategy, the Commission has provided a commitment to review the history of the Commission's investigations and recommendations. The purpose of historical review of the Commission's reports is to assess the influence of the Commission's activity in the transport sector. Rather than review the impact of individual reports, the Commission has opted to look at "themes" in transport safety, and the Commission's impact on that theme. "Themes" refer to broad types of accident, collections of accident causes, and critical transport locations. Looking at a transport theme, identifying relevant Commission reports, regulator actions, and legislative changes, and observing changes in accident rates and sector behaviour will provide information about the effectiveness of the Commission in influencing the transport sector, and lend guidance on changing the Commission's activities to better promote transport safety.

This report, the third such review, has as its focus the marine sector, and, in particular, the Commission's investigations into jet boat accidents published from the year 1995 onward. Although the Commission has investigated incidents involving private jet boats (e.g. Inquiry 09-201) the great bulk of the Commission's investigations into jet boating have dealt with commercial jet boats, and the operators of such craft. Thus the main focus of the review will be on the Commission's investigations and influence on safety with respect to commercial jet boat operations. Reference will be made to investigation 09-201, however, because recommendations resulting from the investigation had implications for commercial operations.

The regulator of maritime activities in New Zealand, formerly called the Maritime Safety Authority, was renamed Maritime New Zealand in 2005. Throughout this report the regulator is referred to by the name it had at the time, either the MSA or MNZ, but readers should be aware that these terms refer to same organization.

Commercial Jet Boating in New Zealand

Commercial jet boating is conducted at various locations throughout New Zealand, and encompasses a range of activities. Services offered include adventure ("thrill") rides, eco-tourism, fishing, hunting and industrial transportation (Maritime Safety Authority (MSA), 2001). The first practicable jet boat engine was developed by Sir William Hamilton in 1954 , and led to the development of CWF Hamilton, a New Zealand company that specializes in producing jet boat propulsion units. According to their promotional materials, Kawarau Jet Boats launched the first commercial jet boat trip in 1960. Shotover Jet began in 1970 and, having carried 1480 passengers in its first year, has now provided trips to over 3 million passengers. Jerry Hohneck, the Chairman of the New Zealand Commercial Jet Boat Association (NZCJBA) from 1997 to 2000, and from 2004 to the present, reported that the amount of commercial jet boating activity throughout New Zealand increased rapidly through the 1990's (Personal Communication, April 2012).

Step 1 – Quantify the burden of accidents/incidents - incidence, severity and exposure

Number and Size of Operators

Under the requirements of Maritime Rule Part 80, all commercial jet boat operators are required to have a Safe Operating Plan (SOP). In January 2011, The Commission obtained information from MNZ about the number of commercial jet boat operators, and the number of vessels used by each. Forty eight operators had Safe Operating Plans (SOPs) at that time, down from 62 reported in the MSA review of commercial jet boat operations in 2001 (MSA, 2001). There were 119 vessels listed against the operators, with 31 of the operators (64%) having either one or two vessels (Figure 2).

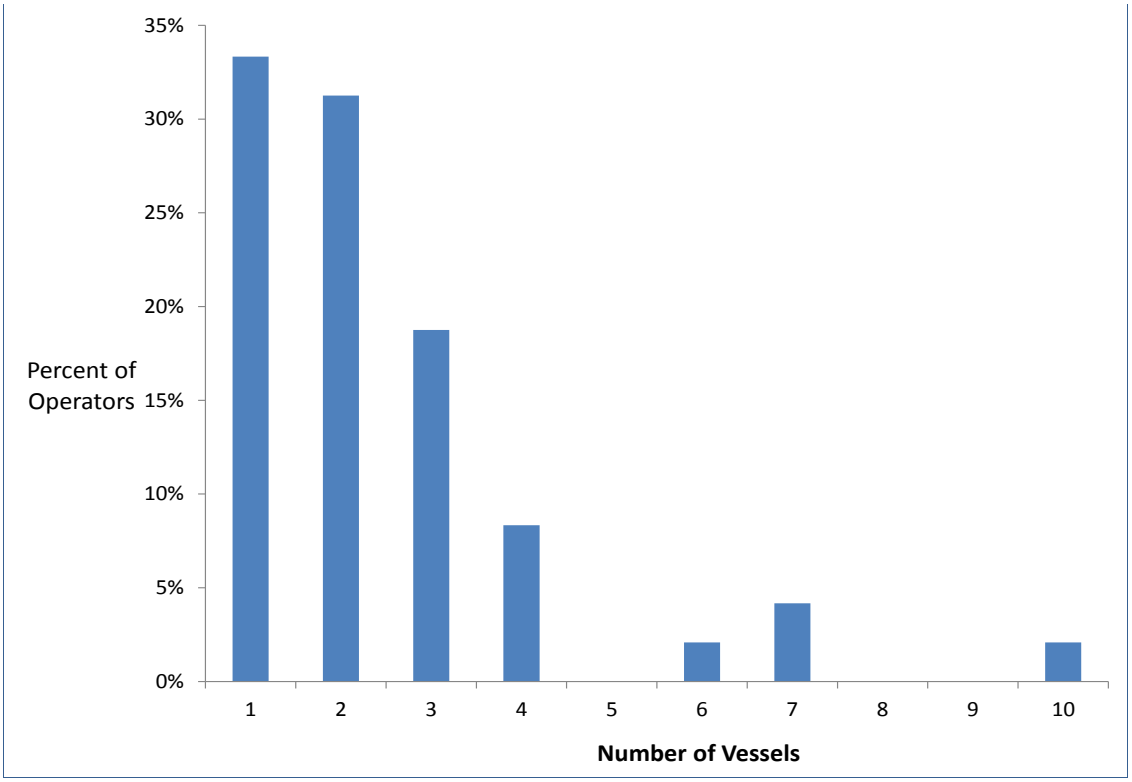

Figure 2. Size of Commercial Jet Boat Operations in New Zealand as at January 2011

Participation rates for Commercial Jet Boating in New Zealand

The New Zealand Department of Labour (DOL), in response to a Prime-Ministerial request, conducted a stock-take and review of the risk management and safety provisions in the adventure and outdoor commercial sectors in New Zealand (2010). The reports produced are available online (see Schedule 1).

The DOL stock-take provided estimated average participation rates for jet boating in New Zealand over the period 2006-2008 (2010). Although noting the high level of error inherent in the measures, the figures represent the 'best available' indicators of the number of participants. A total of 369,000 people per annum, 55% of whom were international tourists, were reported to have taken part in commercial jet boating activities. The DOL stock-take explicitly excluded operators who were engaged only in transportation services, and indicated that 31 commercial jet boat operators fell within the scope of their review. Of these, three large operators were responsible for carrying around 2/3 of the total passengers. As noted in the MSA review (2001), there are distinct seasonal variations in activity, with the summer months (November/December through to March) being the period of greatest demand for services, a fact that was reiterated by Jerry Hohneck of the NZCJBA (Personal Communication, April 2012).

Incidents and Accidents

Information regarding jet boat incidents and accidents has been provided to the Commission by Maritime New Zealand (MNZ). There are several concerns with the quality of the occurrence data, and the ability to draw inferences regarding changes in reported occurrences.

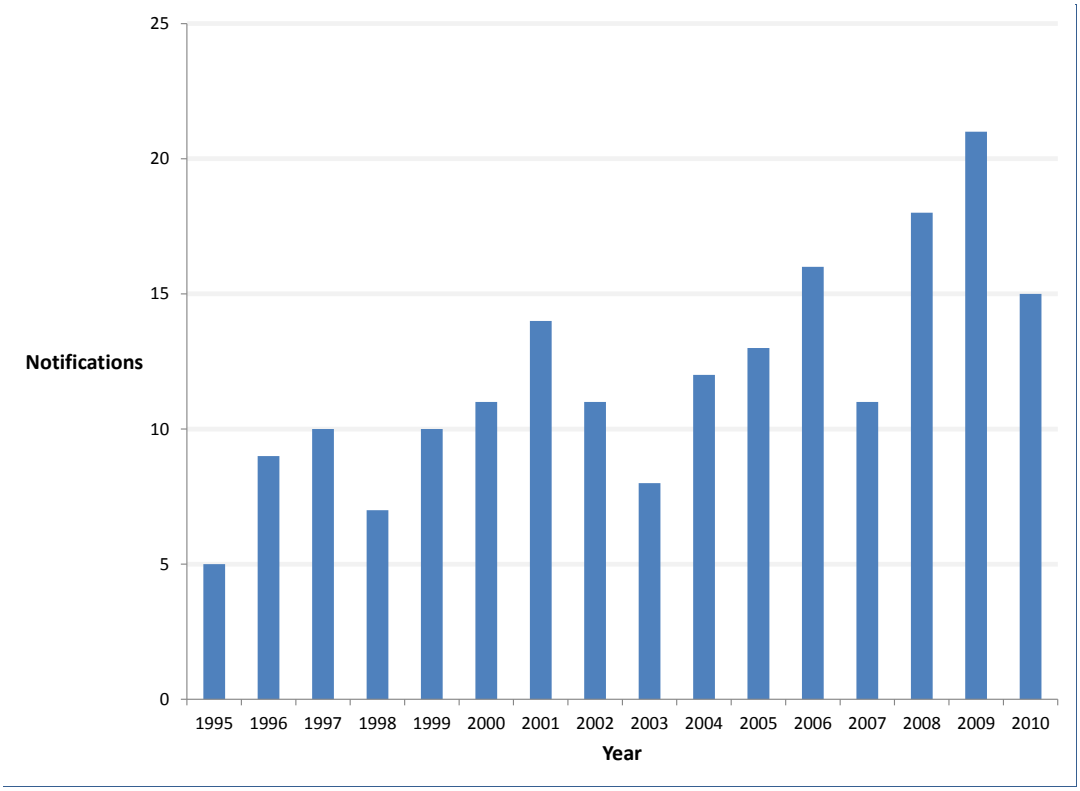

Figure 3. Jet boat accident/incident notifications to the Commission 1995-2010

According to Commission records, the Commission received 181 notifications of jet boat accidents or incidents from the regulator from 1995 to 2011 (Figure 3). The regulator investigated 45 of the accidents/incidents, and parallel investigations by the Commission and the regulator were conducted in 13 of the cases. We are unable to ascertain the extent to which changes in reported occurrences reflect changes in actual occurrence rates, or changes in reporting practices over the period examined. There is anecdotal evidence to suggest that reporting practices have changed notably among commercial jet boat operators between 1995 and the present, with operators now being much more likely to report incidents than was the case in the mid-late 1990s. To mitigate this issue, this

report looks mainly at reports of injury and death, which are less likely to be prone (although not immune) to variations in reporting rate. There are also issues with the collection, collation and analysis processes that have been used by MNZ over time, which means that MNZ cannot assure the Commission that the number of occurrences they report matches the number of occurrences reported to them.

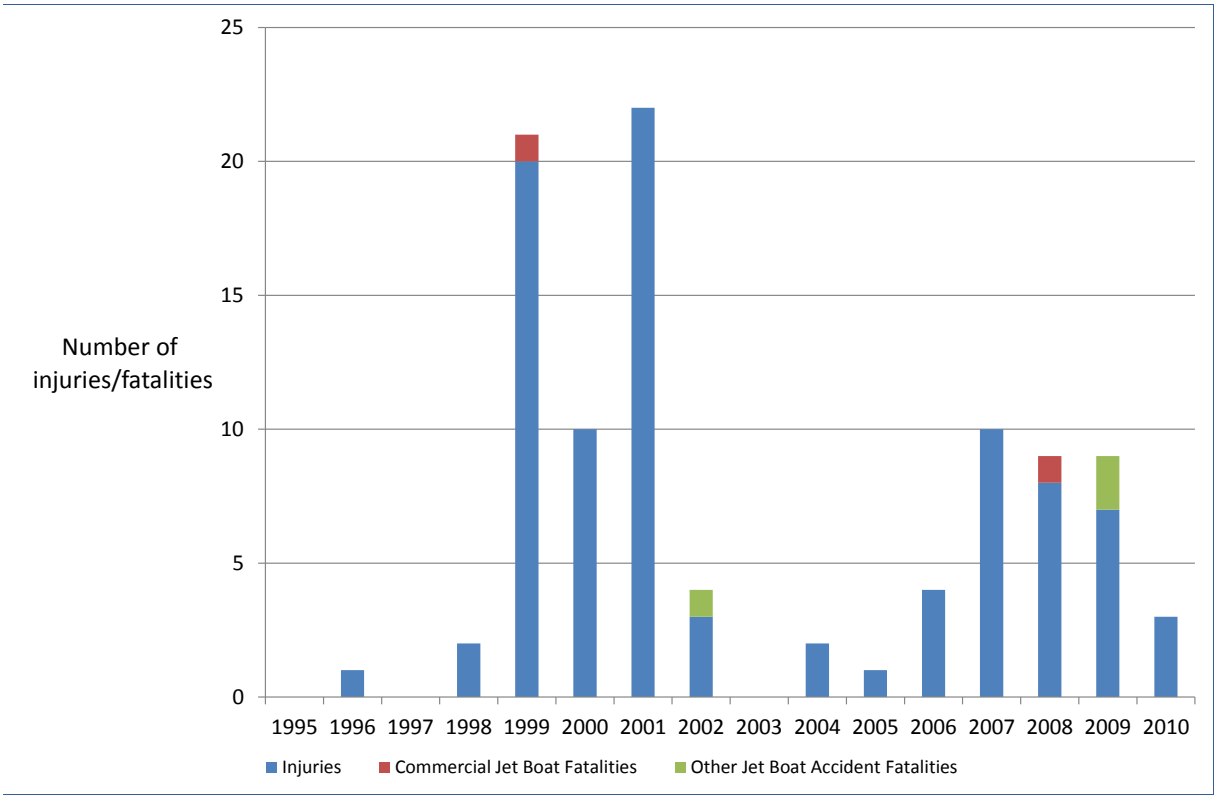

Figure 4. Jet boat injuries and fatalities reported to the Commission from 1995 to 2010

As shown in Figure 4, Maritime New Zealand provided the Commission with records of 93 injuries, and five fatalities resulting from jet boat accidents on New Zealand lakes and rivers from 1995 to the end of 2010. Of the five reported fatalities, two occurred to passengers on commercial jet boat rides, one during a 'jet-sprint' event, and the remaining two were the result of a collision between a private jet boat and a personal water craft ('jet ski'). Bentley and Page (Bentley & Page, 2008) reported four jet boat fatalities over the period 1982-1996; the Commission is aware that there was an accident resulting in five fatalities in 1981 due to a collision between two commercial jet boats on the Kawarau River. If combined with the data available to the Commission, the fatality rate has been approximately 0.2 pa from 1982-2011 (or one fatality every four and two-thirds years). It may be that there has been a decrease in injury rate from 2001 onwards, but the numbers from year to year are highly variable, and it is difficult to draw any statistical conclusions regarding changes in rate from the data. At least part of the change from 1999 onward will be the result of changes in reporting rates.

Step 2 – Analysis of risk factors, underlying causes and lead indicators

Commission Investigations into Jet Boat Accidents

The Commission's investigations seek to improve safety by establishing causes of accidents in order that similar incidents may be prevented in the future. As such, they form part of Step 2 of the Cycle of Accident Prevention. Understanding risks, causes and lead indicators can help the Commission form views and frame recommendations that appropriately address the significance of the issue being examined. Since 1995 the Commission has launched 22 investigations into jet boat accidents, with 17 reports being published, and three investigations being closed on the basis that there were not sufficient implications for transport safety to warrant publication of a report. Two reports dealt with two investigations each (98-213/215, and 99-212/213).

Of the 22 accidents and incidents investigated, eight resulted from collisions with canyon walls or the river bank, four from rollovers subsequent to grounding, three from grounding without rollovers, three from collisions with another vessel, three from rock strikes and one from a collision with a bridge pier. In 59% of the accidents investigated by the Commission, a parallel investigation was undertaken by the MSA. All fatalities will also have been the subject of a Coroner's inquest.

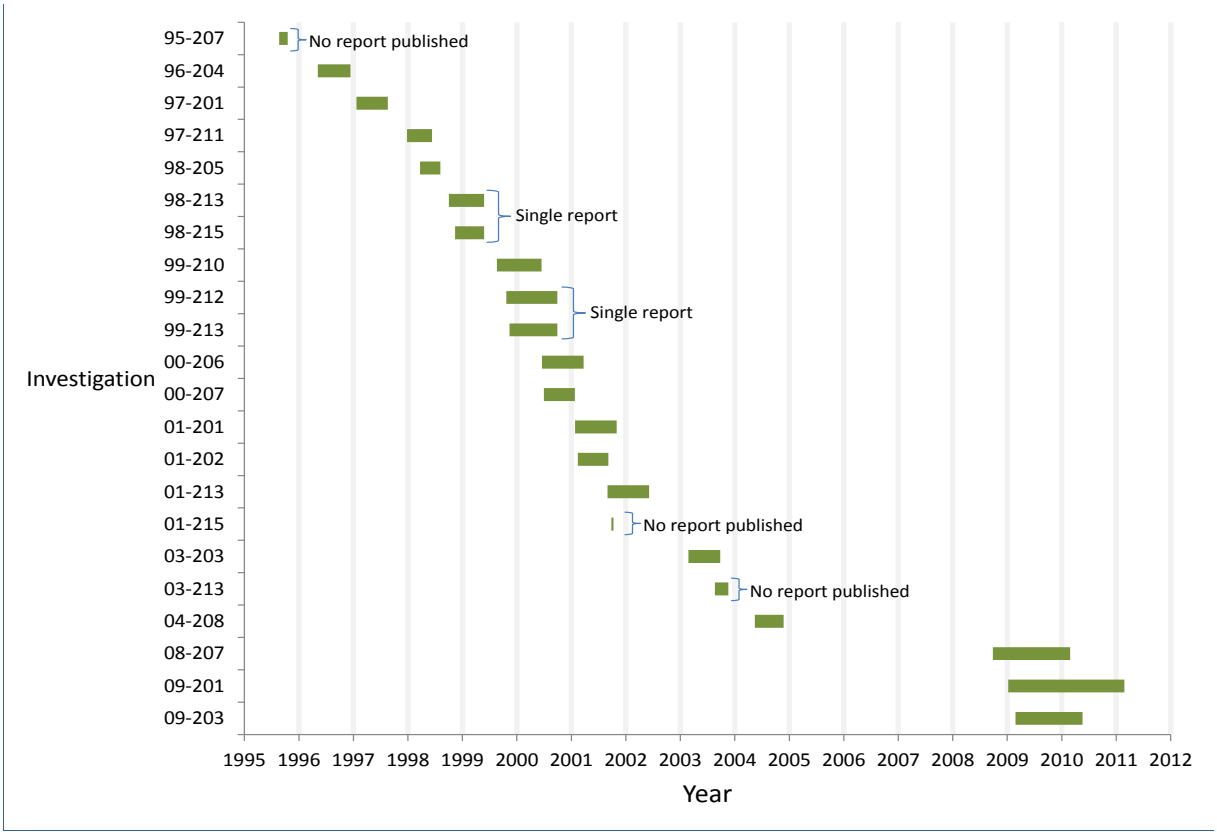

Figure 5 - Timeline of Commission Investigations into Jet Boat Accidents, 1995 to 2012

The greatest amount of activity by the Commission took place from 1997 to 2001 (Figure 5), over which period there were at least two investigations launched per annum. Investigations 99-213 and 08-207 dealt with fatal accidents that occurred during Commercial Jet Boat rides. Although required to open some investigations from 2002 through to 2004, after the major inquiries 98-213/215, 99-210 and 99-212/213 the Commission made a conscious decision not to commit the same resources to Commercial jet boating as it had in recent years. It made this decision because it judged that the significant safety issues had been identified, and now it was time to leave the MSA and the commercial jet boat industry to resolve those issues. Judging by the subsequent drop in injury accidents from 2001 through 2006, this decision appears justified.

Step 3. Learn - Develop safety recommendations that reduce incidence of lead indicators and accidents or mitigate underlying causes and risk factors

Safety Recommendations

The Commission has made 76 safety recommendations relating to jet boats from 1995 to 2011. The number of safety recommendations resulting from each investigation, and the current status of the recommendations, is shown in Table 1. A table showing all of the Commission's recommendations, and the responses to the recommendations is presented in Schedule 4. The findings and recommendations made by the MSA for the accidents in which parallel investigations by the MSA and the Commission were conducted are also presented in Schedule 4.

Table 1. Safety Recommendation status by investigation					
Investigation number	Closed acceptable	Open	Closed cancelled	Unconfirmed	Grand Total
96-204				1	1
97-201	1			5	6
97-211				7	7
98-213 /215				4	4
99-210	3			2	5
99-212 /213	18	4	3		25
00-207	2		2		4
01-201		1			1
01-202			1		1
01-213	1				1
03-203	4	1			5
04-208	2				2
08-207		4			4
09-201		6			6
09-203		4			4
Grand Total	31	20	6	19	76

The Commission developed a status system for recommendations in 2000. All recommendations since the system came into being are classed as “Open, Closed Acceptable” or “Closed Cancelled”. Safety recommendations made before the status system evolved had their status recorded as ‘Unconfirmed’ until evidence received or an investigation indicated that some other status should be assigned. Forty-one percent of the recommendations made by the Commission over the period have been acceptably closed, with 26% remaining open at the time of writing.

The number of safety recommendations made to various organisations is shown in Table 2.

Table 2. Safety Recommendation Recipients	
SR Recipient	Total
MSA/MNZ	35
Shotover Jet	11
Kawarau Jet	7
Commercial Jet Boat Assn.	3
Hamilton Jet	3
Queenstown Lakes DC	3
Dart River Safaris	2
Dart Wilderness Adventures	2
Jet Stream Tours	2
Skippers Grand Canyon	2
Taupo District Council	2
Waikato Regional Council	2
Rapids Jet	1
Alpine Jet	1
Grand Total	76

Forty-six percent of the recommendations were made to the regulator (MSA/MNZ), 37% to operators with the remaining 18% distributed among the NZCJBA, manufacturers and councils. As discussed below, safety recommendation practices have changed over time.

An attempt was made to place the Recommendations made by the Commission into general groups (Table 3).

Table 3. Recommendation Groups	
Modifications to boats/equipment	23
Drivers qualifications/training/licensing/fitness	13
Critical equipment monitoring and maintenance	13
Safe Operating Plans/Operator risk appraisals and analysis	12
Passenger briefing on risks	5
On-river communications	5
Management of user groups/operators on rivers	3
Boat speeds and risks	2
Grand Total	76

Eighty percent of the recommendations fell into the first four groups above. A breakdown of these four groups is provided in Schedule 3.

The largest report produced by the Commission over the period 1995-2011, at least in terms of the number of recommendations resulting, dealt with investigations 99-212 and 99-213. These investigations, which were combined into a single report, dealt with two similar incidents that occurred 22 days apart in October and November 1999. In both cases steering failures to boats operated by Shotover Jet in the Upper Shotover River resulted in the boats colliding with the canyon wall. In the first incident, on 21st October, eight passengers and the driver received minor injuries, and one passenger received moderate injuries. In the second incident, on 12th November, 11 passengers and the driver received minor injuries, and one passenger was killed. The same driver was operating the boats in both incidents. The Commission and the MSA both launched major inquiries into these events. The Commission's report into these accidents contained 25 safety recommendations, of which 18 have been 'closed acceptable', four remain open, and three have been cancelled. Thirteen of the recommendations were made to the MSA, of which six have been closed, three have been cancelled and four remain open. The MSA did not respond directly to any of the recommendations at the time they were released, but addressed them in a comprehensive review of commercial jet boat safety in New Zealand (MSA, 2001).

The recommendations from 99-212/213 that remain open recommended that the MSA:

1. Develop an MSA Commercial jet Boat Driver License, which every commercial jet boat driver must hold (102/99).
2. Require all commercial jet boat drivers to keep a log book of hours and training (103/99).
3. Require all new commercial jet boats intended to be operated in braided rivers, or existing boats being purchased for operation on braided rivers, to be constructed with roll protection that allows sufficient occupiable space under the boat for its full complement, should it roll (109/99).
4. Require the fitting of an inclined footplate in front of each passenger seat, having first assessed what the optimum angle for such a footplate is (110/99).

Duplicate and Repeated Recommendations

Since 2007, it has been the policy of the Commission to make recommendations to the organisations or statutory bodies that have responsibility for introducing, monitoring and enforcing rules and regulations designed to improve transport safety. Opportunities are now also made available for interested parties to address safety issues during the course of an inquiry, negating the requirement for safety recommendations in some cases.

Prior to 2007 the same (or essentially the same) recommendation was sometimes made to multiple parties. An example is recommendations 044/03 and 046/03, made to Dart Wilderness Adventures and Dart River Safaris respectively, which recommended that the River VHF channel was solely for the safe operation of jet boats on the river, and that a separate VHF radio channel should be used for routine communications. Recommendations regarding the fitting of roll bars to commercial jet boats operating in braided rivers and seat belts for passenger use in commercial jet boats generally, were also made to multiple bodies - the MJA, the NZCJBA and Kawarau Jet in the case of roll bars, and the MSA, the NZCJBA and Shotover Jet for seat belts. In these cases, however, the NZCJBA was being asked to canvass its members and provide support for the recommendations.

Roll bars. The recommendation for the fitting of roll bars was also made repeatedly to the MSA. The original recommendation, 027/98, recommended that the MSA include in Maritime Rule Part 80 "the requirement for all commercial jet boats operating in braided rivers to be fitted with a roll bar, or similar device, of sufficient height and strength to afford passengers adequate occupiable space under the boat in the event of it rolling across terrain."

The MSA responded that:

> *"We intend to consult with the industry and investigate fully the implementation of [this recommendation] in relation to:*
>
> *(a) other operational safety issues that may arise; and*
>
> *(b) the costs involved*
>
> *before we could incorporate [this provision] in the rules."*

The Commission provided another recommendation (033/99), that modified the wording to specify that all 'new' boats were required to have a roll bar or similar device fitted, and that it was recommended that "owners of existing craft to, where practicable, fit such a device to their craft".

The MSA response to the revised recommendation was:

> *The issue of retro-fitting is far from easy and may be impractical (See MSA response to previous TAIC reports 97-211 and 98-205). We shall, however, raise the issue and encourage the industry to fit roll bars, or similar devices, on all new jet boats intended to operate on braided rivers.*

The Commission repeated the recommendation again (109/99) in the report from investigations 99/212 and 99/213. The MSA responded:

> *We do not propose at this time to respond to [the safety recommendations] individually or in detail. Some of these have been proposed to and commented on by MSA in relation to previous reports.*
>
> *We would however, consider it helpful at this time to outline the course of action initiated by MSA on 28 July 2000, where a formal safety review of the Commercial jet Boat Industry was commissioned by the director of Maritime Safety....*
>
> *....The review will involve evaluation of all incident and accident data held on file, active surveying of operators in the industry and undertaking passenger expectation surveys. It will also involve data collection from international operators in an attempt to benchmark the local*

industry.

The review will be detailed, it has been given a high priority by MSA and it will involve an in depth examination of the effectiveness of Rule Part 80. The review will also involve careful evaluation, including costs and benefits, of all safety recommendations made by TAIC in this and previous reports.

In the review (MSA, 2001), the MSA highlighted that whereas the MSA was required by the Maritime Transport Act 1994 to provide a 'safe and clean maritime environment at a reasonable cost', the Commission had no requirements to make recommendations that were bound by 'reasonable cost'. The review examined the Commission's recommendations that were open at the time. With respect to roll bars, the MSA review team concluded that:

1. *Roll bars should be made compulsory for any new, or introduced, commercial jet boats operating primarily on braided river applications as from 01 July 2001….*

5. *All existing commercial jet boats operating exclusively on braided rivers are to be fitted with roll bars as per 2-4 inclusive by 01 July 2006.*

Points two to four (omitted above) dealt with details of the strength and design of roll bars, and the process by which the roll bars were to be fitted by suitably qualified people and appraised by authorized persons. Recommendation 109/99 remains open, and the status of recommendations 027/98 and 033/99 is recorded by the Commission as 'unconfirmed'.

Seat belts. Investigation 97-211 examined the rollover of a jet boat on a shingle bar in the Lower Shotover River. The Commission recommended that the Maritime Safety Rules include the following:

the requirement for all commercial jet boats to be fitted with quick-release lap belts, one for each passenger the craft is licensed to carry. (028/98)

The MSA's response to recommendation 028/98 was that recorded above with respect to recommendation 027/98 for roll bars, with the additional note:

Additionally we have some concern over the use of seat belts should the boat sink.

In investigation 98-205, the Commission found that

The extent of the occupants' injuries would probably have been reduced had they been restrained by quick-release lap belts.

The Commission did not produce a new recommendation regarding seat belts in report 98-205, referring instead to the fact that such a recommendation had been made previously. The MSA did, however respond to the finding. A cost-benefit analysis was referred to in the response by the MSA to the Commission's findings in report 98-205, as well as being provided in detail in the review of commercial jet boating prepared by the MSA (MSA, 2001). On the basis of the cost-benefit analysis, the MSA's review team did not adopt recommendation 028/98 to require operators to fit passenger seat belts to their boats (MSA, 2001). The MSA concluded that the potential increase in danger to passengers trapped in seats if a boat overturned outweighed the benefits. The MSA's review team also concluded that based on a survey conducted as part of the review, that operators were strongly opposed to the introduction of this recommendation. Partly as a result of receiving recommendation 60/01, Shotover Jet also procured a cost-benefit analysis of fitting seat belts, and decided not to recommend their introduction because of concerns of increased risk of injury when boats rolled or were swamped.

Shotover Jet Limited responded to Recommendation 60/01 as follows:

> *At this stage we are not sure we agree with your recommendation that Shotover Jet adopt a policy whereby the use of the safety lap seat belts, already fitted in the front passenger seats, is mandatory.*
>
> *The reason for this is that when MSA carried out the review of Rule Part 80 their conclusion with respect to the fitting of seat belts was that they disagreed with the recommendation made by TAIC. As the time they did note that they would continue to review this decision. MSA staff again confirmed this to me during a discussion last week. I'm sure you would agree that this puts us in a difficult situation, as we have conflicting views from two different authorities.*
>
> *For this reason we therefore believe that MSA and TAIC should collectively advise us on what we should do.*

Recommendation 028/98 to MSA is listed by the Commission as 'unconfirmed', and 60/01 to Shotover Jet remains open.

When the repeated and duplicate recommendations are removed, the Commission has made recommendations with respect to the following 29 areas:

Recommendation Group

1. Boat speeds and risk
2. On river communications
3. Compliance with regulations
4. Critical equipment monitoring and maintenance
5. Distraction of drivers
6. Driver safety - drug and alcohol testing
7. Driver training requirements
8. Equipment - fuel escape when boat inverted
9. Equipment - marked emergency exit
10. Equipment - means of isolating electrical power and fuel systems
11. Equipment - modify plate to prevent driver's forefoot from catching on it
12. Equipment - Passenger Protection - general
13. Equipment - Passenger Protection - helmets
14. Equipment - Passenger Protection - bilge pump
15. Equipment - Passenger Protection - footrests
16. Equipment - Passenger Protection - roll bar
17. Equipment - Passenger Protection - seat belts
18. Equipment - Passenger protection - seating
19. Equipment - radio back-up failsafe
20. Equipment - steering failsafe for single engine jet boats
21. Equipment - twin propulsion systems
22. Manage user groups on river
23. Minimise driver fatigue
24. Passenger briefing on risks
25. Procedures and guidelines for Authorised Persons for SOP appraisal
26. Record passenger numbers
27. Regulation of operator numbers
28. Risk analysis from launching close to a bridge
29. Risk analysis of each operator

Regulatory environment

Maritime Rule Part 80

Part 4 of the Maritime Transport Act, 1994, provides the legislative underpinning for the creation of Maritime Rules in New Zealand. Over most of the period covered by this review, Commercial jet boat activities have been regulated under Maritime Rule Part 80. Maritime Rule Part 80 was signed into law in 1998, pursuant to Section 36 of the Maritime Transport Act 1994 and came into force on February 11, 1999 (MNZ). Prior to 1998, regulation of commercial jet boat activities fell under various other Rule Parts, notably Maritime Rule Parts 21 (safe ship management), and 22 (collision prevention). With respect to commercial jet boats, Maritime Rule Part 80 applies "to any jet boat that is not a pleasure craft, that carries passengers at planing speeds on rivers."

According to Maritime Rule Part 80, the objective of the Rule Part was to incorporate

'in the maritime rules structure "codes of practice" relating to the design, construction, equipment and operation of marine craft used in the adventure tourism industry. The body of Part 80 contains those maritime rules requiring compliance with the "codes of practice" which appear as appendices to Part 80.'

Key elements of Maritime Rule Part 80 were the introduction of Safe Operating Plans (SOPs), and the definition and assignation of powers to "Authorised Persons" who were given responsibility for inspecting and auditing commercial jet boat operations to ensure compliance with the SOP. The SOPs had the effect of removing the requirements for craft to be under a safe ship management system as prescribed in Maritime Rule Part 21.

A review of the Safe Ship Management (SSM) system was undertaken by Thompson Clarke in 2002 at the request of the Maritime Safety Authority (Thompson Clarke, 2002). The review covered the entire Safe Ship Management system, including evaluation of the effectiveness of the implementation of Safe Operational Plans and Authorised Persons under Maritime Rule Part 80.

Concerns about Authorised Persons highlighted in the review were:

- excessive numbers of Authorised Persons for the number of operators with SOPs
- lack of rigorous selection and accreditation processes
- wide variations in approaches, competency and experience between Authorised Persons
- A sense amongst some Authorised Persons that if they were too strict then the operator could 'shop around' and procure the services of another.

The review contained several recommendations to the effect that the existing Authorised Persons scheme for Adventure Tourism activities be disestablished and redeveloped using MSA staff or Authorised Persons who were properly trained and contracted directly by MSA (Thompson Clarke, 2002). Maritime New Zealand's current AP for commercial jet boat operations, Jeff Horne, reports that there were, at the time he commenced employment with MNZ, 12 Authorised Persons distributed throughout New Zealand with responsibility for issuing certification under the SOP scheme (Personal Communication, February 2012).

The Office of the Auditor General (OAG) released a report in December 2005 that dealt with the progress in implementing the recommendations contained within the Review of Safe Ship Management Systems (OAG, 2005). The OAG reported that the Authorised Person scheme had, by 2005 "been largely abolished, and replaced by the use of the MSA's own safety auditors." The OAG noted the Queenstown Lakes District Council was an exception, and that MSA allowed the QLDC to audit adventure tourism vessels in its district. Concerns that such an exception could result in different audit and safety standards in the QDLC than in other areas were raised by the OAG, with a note that the MSA must "have appropriate monitoring procedures to ensure that this does not happen." As of the time of writing of this report, there remain two APs, one of whom has responsibility for the Queenstown District Lakes area, and the other who has responsibility for all other areas.

Maritime Rule Part 80 has been modified a number of times since its introduction. In 2008 two sets of amendments were made – the first dealt with minor 'tidying up' of the regulations dealing with specific New Zealand standards for lifejackets and petrol installation. In the second 2008 amendment, Maritime Rule Part 80 was altered along with many other Rule Parts in a clarification and amendment of the requirements for carrying on-board portable fire extinguishers. Minor changes in 2009 resulted in greater flexibility being permitted in the form of the certificates of compliance by substituting references to annexes with a statement that the certificate of compliance must be *"in the relevant form approved by the Director."* Two annexes – Annex 1 to Appendix 1, which contained a certificate of compliance for Commercial jet Boats Operating on Rivers, and Annex 3 to Appendix 2, which did the same for White Water Rafting Operators, were hence revoked.

In 2011, Maritime Rule Part 80 was further modified by revoking the sections dealing with commercial rafting. Maritime Rule Part 81 was developed to regulate commercial rafting operations henceforth.

Maritime Rule Part 82

As of the time of writing of this review, a new Maritime Rule Part (82), which will supersede Maritime Rule Part 80, was before the Minister of Transport. Maritime Rule Part 82 is intended to limit the likelihood and consequences of serious harm to people on board commercial jet boats operating on rivers. As was the case with Rule Part 80, the new Rule Part sets minimum standards that must be met, and requires each commercial jet boat operator (operator) to develop and maintain a safe operational plan (SOP) that adequately manages risks and hazards specific to their operation.

To achieve this, Maritime Rule Part 82 requires that no operator may carry passengers unless they hold a Commercial Jet Boat Operator Certificate (CJBOC). A commercial jet boat operation (operation) will be issued with a CJBOC when the Director of MNZ is satisfied the operation's jet boats and equipment meet minimum safety standards. The operation must also develop, maintain and follow an SOP that satisfactorily identifies and manages its risks and hazards. A jet boating update circular released by Maritime New Zealand outlining the changes to the existing Rule Part. ("Jet Boating Update," 2009), also noted that the new Maritime Rule Part 82 would remove the provision for authorized persons.

The DOL review considered the introduction of Maritime Rule Part 82 and concluded that 'the proposed regulatory intervention [is] appropriate to the level of risk associated with commercial jet boating…and that the new rules will adequately address the identified deficiencies in the regulatory framework applicable to the sector.' No specific recommendations were made by the DOL review team with respect to commercial jet boating.

According to a letter [MNZ REF: SPR 08440-08; Date: 18 August, 2010] sent to the Commission by MNZ, Maritime Rule Part 82 addresses a number of outstanding Transport Accident Investigation Commission recommendations, including:

- the introduction of jet boat driver licensing (102/99)
- requirements for driver competency programmes and initial and ongoing driver assessments (032/99)
- requirements for drivers to keep a log book of hours and training (103/99)
- requirements that jet boats operating on braided rivers be fitted with an exit structure to protect passengers in the event that the boat overturns (109/99)
- the fitting of an inclined footplate for each passenger seat (110/99)
- the safety issue whereby emergency back-up radios are not capable of being used for communicating with either rescue authorities or the boat's home base (001/10)
- addressing the way risks are communicated to potential commercial jet boat passengers (002/10)
- the requirement that boats with canopies need clearly marked paths for emergency exit. The path needs to be explained to passengers during the safety briefing (014/10)

MNZ noted that Maritime Rule Part 82 did not specifically address a number of Commission recommendations - Table 4 is reproduced from REF: SPR 08440-08:

Table 4 – Commission Recommendations not specifically addressed by Maritime Rule Part 82		
Recommendation Number	Recommendation	MNZ Comment
003/10	Address the commercial jet boat industry that in spite of the requirements under Maritime Rules Part 80 and other safety initiatives taken by MNZ that the issue of delivering meaningful pre-trip safety briefings, particularly where understanding of the English languages is an issue, still remains.	The issue of delivering effective pre-trip safety briefings is the subject of a focused audit campaign. MNZ has also issue Safety Bulletin 19 to the sector reminding operators of their obligations in this area. The most recent jet boating newsletter also dealt with the issue. We consider this to address the intent of the recommendation.
004/10	Address with the commercial jet boat industry that in spite of the requirements under Maritime Rules Part 80 and other safety initiatives taken by Maritime New Zealand that the issue of accounting for passengers when multiple boats are involved during emergency response still remains.	The issue of accounting for passengers when multiple boats are involved during emergency response is also the subject of a focused audit campaign. We consider this measure will address the intent of the recommendation
011/10	That distraction of jet boat drivers when driving at high speeds that require a high degree of concentration had not been identified as a risk to the operation and was the main factor contributing to this accident. This could be an issue to address across the industry.	This hazard will be identified to operators during routine liaison visits, which will also assist MNZ to determine the scale of the problem across the sector. Operators management of the hazard will be monitored and assessed during subsequent audits. MNZ will then assess whether further action, such as a Safety Bulletin, is necessary.
012/10	There was no means of preventing the uncontrolled escape of fuel from the fuel tank vents when the boat was inverted and these vents were located above the emergency exit from the passenger compartment.	MNZ is following up with this operator and their authorized person to determine that changes to the fuel breather system, made since the accident, satisfactorily address this hazard. Only one other New Zealand operator has jet boats with enclosed canopies. In that instance the fuel valves are placed well away from the emergency exits. Any new commercial jet boats with canopies will be inspected prior to commencing operation to ensure this hazard has been addressed.
013/10	That in the event of an emergency on board a commercially operated jet boat there was no easily-accessible quick-acting means to isolate electrical power and fuel systems including fuel venting arrangements. This could be an issue to address across the industry.	MNZ is undertaking work to determine the scale of this problem across the sector, including an assessment of whether this is a viable and cost effective option

It is anticipated that Maritime Rule Part 82 will be ready for ministerial sign off in July 2012. In accordance with its independent status, the Commission did not make a submission on the proposed Rule Part.

Step 4. Influence: translate recommendations into changes in practice, and monitor the propagation of changes to safety systems through industry groups.

In the course of undertaking this review, the Chairman of the NZCJBA and senior personnel from two of the larger Commercial Jet Boat operators were contacted to canvass their views on the role of the Commission over the past 15 years. The purpose of this was not to attempt to obtain a representative sample of opinions across the industry, but merely to try to get a feel for how some of the important stakeholders view the Commission and whether they believe it has been effective in its role.

The Commercial Jet Boat personnel were asked:

> *"In your view, has the Commission had a positive influence on safety with respect to Commercial Jet Boat operations in New Zealand?"*

Both operators responded that they believed the Commission has made a very positive difference to safety in Commercial jet boating, and both also said that the recommendations made to their operations had been taken on board and implemented, and subsequently substantially influenced their processes, fleet and training procedures. Following a major Commission investigation, one of the respondents noted that at the time their business had also obtained another major external review of their processes. The findings of that review, in concert with those of the Commission, led to a complete overhaul of their maintenance programme, and a redesign of their boats. Also mentioned was the fact that it was "good to have an independent body to get an outside view of issues, because sometimes things can be overlooked by people who are continually working closely in an area". (Personal Communications, April-May 2012)

It was noted by the Chairman of the NZCJBA that the Commercial Jet boat industry is competitive and dynamic, and that many factors play a part in bringing together a safe but thrilling experience for participants. He was also positive about the role the Commission had played in improving safety in the industry. (Personal Communication, April 2012)

An article in the September 2011 issue of Lookout!, the MNZ safety magazine entitled "Serious about Safety", highlighted the systems used by Shotover Jet Ltd., to maintain the safety of their fleet and passengers. http://www.maritimenz.govt.nz/Publications-and-forms/Lookout/LookOutSep11.pdf. Many of the points addressed in the article relate directly to recommendations made by the Commission, for example critical parts tracking and reliability centred maintenance.

Step 5. Monitor lead indicators, risk factors and accident rates to evaluate changes after intervention

The best available information indicates that the relative risk to participants in Commercial Jet Boating is low. Relative rankings of hospitalization, death and injury for various adventure tourism activities in New Zealand have been reported by Bentley and Page (Bentley & Page, 2008). Bentley and Page developed a three-tiered ranking system, which took into account injuries, fatalities and, where they were able to be determined, incidence and prevalence. Activities in the highest risk group were mountaineering and tramping, snow sports, horse riding and mountain biking/cycling. White water rafting, surfing and underwater diving fell into the middle group, and jet boating, water skiing and kayaking fell into the lowest risk group. The DOL review noted that the nature of the outdoor adventure tourism sector 'involves inherent risk', and that the various activities comprising the sector have widely varying risks. The DOL review team posited that all practicable steps should be taken to minimize the risk of accidents, rather than there being an expectation that accidents would be entirely eliminated

The lack of quality data and, historically, issues with the ability of MNZ to query and analyse the data they have collected, means that it is difficult to draw inferences about whether meaningful decreases in accident rates have been achieved over the period examined. Nonetheless, it is worthwhile

continuing to monitor incident, accident and fatality rates, especially in light of the upcoming introduction of Rule Part 82. Over the past several years MNZ have invested in improving their surveillance system, but there remains a lack of integration across the various transport sectors. Among the key findings of the DOL report was fact that there is no comprehensive surveillance system to capture accident and participation information across the adventure tourism sector. Bentley and Page made a similar point in their 2008 paper:

"National tourism injury databases or surveillance systems do not exist in New Zealand…This has had a number of important consequences, including the fact that the scale of the adventure tourism injury problem and areas of risk to adventure tourism clients remains unknown, while interventions cannot be effectively designed or targeted".

Such information gaps have been highlighted in previous Commission Historical Impact Reviews as presenting a barrier to the implementation of comprehensive risk management systems across specific elements of the New Zealand transport sector. At present information regarding incidence is collected and stored by various administrative bodies (e.g MNZ, CAA, DOL, ACC), and there is little consistency in collection and storage of information on exposure from one adventure tourism activity to the next.

Discussion

The Commission has been very active in investigating Commercial Jet Boat accidents over the period 1995 to 2011. It seems that many of the major changes to industry practices that the Commission has recommended have been taken on board by the regulator, operators, manufacturers and the NZCJBA. Following its major combined report 99-212/213, which included 25 recommendations covering issues the Commission had been concerned with up until that point, the Commission made a conscious decision over the period 2002 to 2004 to not commit the same resources to commercial jet boating as it had in recent years. It made this decision because it judged that the significant safety issues had been identified, and now it was time to leave the MSA and the commercial jet boat industry to resolve those issues. Judging by the drop in injury accidents from 2001 through 2006, this decision appears justified. The Commission continued to monitor the notifications and then decided to 'test' the system again from about 2008. It did this in response to what appeared to be a rise in notifications of serious occurrences.

Based on the responses to the Commission's recommendations (Schedule 4) it seems that the relationship between the MSA and the Commission with respect to findings and recommendations resulting from Commission investigations was not always harmonious. The comments made in the MSA review of Commercial Jet Boating, (MSA, 2001) and the responses by the MSA shown in Schedule 4, indicate that the MSA considered some of the Commission's recommendations to be either unjustifiable on safety grounds, or too costly to warrant adoption. The fact that the MSA had to produce a safe maritime environment 'at reasonable cost' was repeatedly referred to in the review and the responses (MSA, 2001). In addition, there was often duplication of effort and (probably) wasted resource as a result of the fact that the Commission and the MSA frequently undertook parallel 'safety' investigations. In fatal accidents, it was possible that investigations could simultaneously be launched by the Commission, the MSA, the Police, and the Coroner's Office.

The lines of responsibility between the regulator and the Commission appear to have been clarified, and the overall working relationship between MNZ, as it now is, and the Commission seems to be much improved since the late 1990s and early 2000s. Recent changes to the Memorandum of Understanding between the Commission and MNZ state that both organisations will no longer launch investigations of the same type into the same incident. If the Commission launches an enquiry, MNZ may also launch if they believe that there might be compliance issues. If the Commission does not launch an inquiry into a given event, MNZ may still opt to launch an investigation designed to establish causes and possibly lead to safety recommendations. The Commission has precedence with respect to safety investigations if they do decide to launch an inquiry.

While 37 recommendations were closed over the period, 20 remain open at present, some of which have been open for extended periods. It seems likely that another eight or so will be ready for consideration for closure when Maritime Rule Part 82 comes into force, although those are, of course, decisions to be made by the Commissioners. Others, such as those where a repeated recommendation was made regarding the same issue without closure of the earlier recommendations (e.g. 109/99 with respect to roll bars, with 027/98 and 033/99 currently 'unconfirmed'), may require review by the Commission to examine whether they remain relevant.

The practicalities and safety issues associated with fitting seat belts for all passengers have been considered in cost-benefit studies by the MSA and Shotover Jet Ltd. Given the concerns raised by the MSA, the NZCJBA and operators about the increased risk of death through drowning in cases where the boat overturns and in light of the other recommendations addressing passenger safety that have been adopted by the regulator and operators over the intervening period, the Commission may wish to consider either cancelling or re-evaluating the relevance of the outstanding recommendations regarding seat belts.

Organisations that influence the activities and safety of Commercial Jet Boat operations include MNZ, the Commission, the Office of the Auditor General, the Department of Labour, the Police, the Coroner's Office, the NZCJBA and of course, the operators themselves. Given the complexity of the system and the interactions of the parties, appraising the effect of one organization on safety relative to others is difficult. Nevertheless, there are reasons to believe that the Commission has had a positive influence on safety in Commercial Jet Boating activities over the period of the review. For example, important recommendations made by the Commission have included improved:

- processes for monitoring and maintaining critical equipment,
- driver training and licensing requirements,
- modifications to the boats (e.g. fail-safe mechanisms for steering
- the introduction of dual engine systems, roll bars), systems for recording of passenger numbers,
- requirements for safety briefings for passengers of the risks involved
- actions to take in the event that a mishap occurs.

In addition, some of the major operators and the NZCJBA were very positive about the work the Commission has done, and the influence of the Commission on enhancing safety in the industry.

Author

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Tim Burfoot, Chief Investigator, Transport Accident Investigation Commission

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Hamilton Jet Ltd. from http://www.hamjet.co.nz/about_hamiltonjet/sir_william_chronology

Kawarau Jet Ltd., from: http://www.nzjetboat.co.nz/PicsHotel/kjet/Brochure/KawarauJetBrochure07.pdf

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Shotover Jet Ltd., from http://www.shotoverjet.com/

Thompson Clarke. (2002). Review of Safe Ship Management Systems. Report to MSA.

Attachments

Schedule 1. Links to the Department of Labour Review of risk management and safety in the adventure and outdoor commercial sectors in New Zealand 2009/10

http://www.dol.govt.nz/consultation/adventure-tourism/nz-stocktake/nz-stocktake.pdf
http://www.dol.govt.nz/consultation/adventure-tourism/final-report/01.asp

Schedule 2. Safety Recommendation status						
Investigation number	SR No.	Closed acceptable	Open	Closed cancelled	Unconfirmed	Grand Total
96-204	060/96				1	1
96-204 Total					1	1
97-201	046/97				1	1
	047/97				1	1
	051/97				1	1
	057/97	1				1
	060/97				1	1
	061/97				1	1
97-201 Total		1			5	6
97-211	027/98				1	1
	028/98				1	1
	029/98				1	1
	030/98				1	1
	031/98				1	1
	033/98				1	1
	032/98				1	1
97-211 Total					7	7
98-213 /215	032/99				1	1
	033/99				1	1
	034/99				1	1
	035/99				1	1
98-213 /215 Total					4	4
99-210	030/00	1				1
	031/00	1				1
	034/00	1				1
	032/00				1	1
	033/00				1	1
99-210 Total		3			2	5
99-212 /213	098/99	1				1
	099/99	1				1
	100/99	1				1
	101/99	1				1
	105/99	1				1
	111/99	1				1
	068/00	1				1
	069/00	1				1
	070/00	1				1
	071/00	1				1
	072/00	1				1
	073/00	1				1
	078/00	1				1
	079/00	1				1
	080/00	1				1
	081/00	1				1

Schedule 2. Safety Recommendation status						
Investigation number	SR No.	Closed acceptable	Open	Closed cancelled	Unconfirmed	Grand Total
	082/00	1				1
	083/00	1				1
	102/99		1			1
	103/99		1			1
	109/99		1			1
	110/99		1			1
	104/99			1		1
	106/99			1		1
	107/99			1		1
99-212 /213 Total		18	4	3		25
00-207	131/00	1				1
	132/00	1				1
	129/00			1		1
	130/00			1		1
00-207 Total		2		2		4
01-201	060/01		1			1
01-201 Total			1			1
01-202	033/01			1		1
01-202 Total				1		1
01-213	020/02	1				1
01-213 Total		1				1
03-203	043/03	1				1
	044/03	1				1
	045/03	1				1
	046/03	1				1
	042/03		1			1
03-203 Total		4	1			5
04-208	077/04	1				1
	078/04	1				1
04-208 Total		2				2
08-207	001/10		1			1
	002/10		1			1
	003/10		1			1
	004/10		1			1
08-207 Total			4			4
09-201	002/11		1			1
	003/11		1			1
	004/11		1			1
	005/11		1			1
	006/11		1			1
	007/11		1			1
09-201 Total			6			6
09-203	011/10		1			1
	012/10		1			1

Schedule 2. Safety Recommendation status						
Investigation number	SR No.	Closed acceptable	Open	Closed cancelled	Unconfirmed	Grand Total
	013/10		1			1
	014/10		1			1
09-203 Total			4			4
Grand Total		31	20	6	19	76

Schedule 3. Safety Recommendations by safety issue addressed		
Recommendation	General Area	Total
Modifications to boats/equipment	Equipment - passenger protection - roll bar	5
	Equipment - passenger protection - seat belts	3
	Equipment - passenger protection -general	3
	Equipment - passenger protection - footrests	2
	Equipment - passenger protection - seating	1
	Equipment - passenger protection - bilge pump	1
	Equipment - passenger protection - helmets	1
	Equipment - fuel escape when boat inverted	1
	Equipment - marked emergency exit	1
	Equipment - means of isolating electrical power and fuel systems	1
	Equipment - modify plate to prevent driver's forefoot from catching on it	1
	Equipment - radio back-up failsafe	1
	Equipment - steering failsafe for single engine jet boats	1
	Equipment - twin propulsion systems	1
Drivers	Distraction of drivers	1
	Driver safety - drug and alcohol testing	1
	Driver training requirements	7
	Minimise driver fatigue	1
	Boats travelling at unsafe speeds	1
	Record passenger numbers	2
Critical equipment monitoring and maintenance	Critical equipment monitoring and maintenance	13
Safe Operating Plans/Operator risk appraisals and analysis	Compliance with regulations	6
	Procedures and guidelines for APs for SOP appraisal	2
	Risk analysis from launching close to a bridge	1
	Risk analysis of each operator	3
Grand Total		61

Schedule 4 - Safety Recommendations by the Commission and MNZ/MSA and Responses to Commission Recommendations					
TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
95-207	95 724	**A preliminary investigation showed that the circumstances were not likely to have significant implications for transport safety.** Consistent with section 13 of the TAIC Act the Commission discontinued the investigation and no report was published.	NA	NA	No report available from MNZ
96-204	96 992	**Jet boat "Mackcraft", collided with cliff face, Kawarau River Queenstown, 4 May 1996** On Saturday, 4 May 1996, at approximately 1530 hours, the driver of a passenger jet boat, whilst attempting a high-speed close encounter with a rock face at Highcliffs on the Kawarau River, glanced the boat off a rock outcrop and the boat collided, head on, with the cliff face. The driver and four passengers received minor to serious injuries in the collision. Causal factors included an error of judgement by the jet boat driver. The driver's last-minute attempt to abort the manoeuvre was a contributing factor to the collision. Safety issues discussed relate to improved protection for passengers.	Take steps to improve the passenger protection in each of the jet boats operated by Alpine jet. 060/96	The owner of Alpine jet Ltd declined to reply.	No report available from MNZ

Schedule 4 - Safety Recommendations by the Commission and MNZ/MSA and Responses to Commission Recommendations					
TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
97-201	97 1267	**Jet boat "Rapids Jet", foundered, Fulljames Rapid Waikato River Taupo, 20 January 1997** On Monday, 20 January 1997, at about 1255 a jet boat carrying ten passengers plus the driver, and a substantial amount of water in the cockpit, was proceeding up the Ngaawapurua (Fulljames) "Rapid", when it lost engine power, took on more water and foundered in the rapid. The 11 occupants escaped to the river bank uninjured. Causes included the driver's failure to notice the substantial amount of water in the cockpit which affected the performance of the boat, reduced the freeboard and caused the engine to stop. A safety issue identified was the carriage of more than the approved number of passengers. Safety recommendations were made to the operator, the Waikato Regional Council and the Taupo District Council regarding the regulation of operators on the Waikato River	It was recommended to the owner of Rapids Jet that as a matter or urgency, he register Rapids Jet with an approved organisation to comply with the Code of Practice for the safety of Commercial Jet Boats Operating on Rivers under the New Zealand Safety Management Code. Such action will become mandatory in January 1998. 046/97 It was recommended to the Taupo District Council liaise with the Waikato Regional Council to ensure all operators of commercial vessels in areas under their jurisdiction who are not currently monitored for safety by another organisation, be made to comply with the New Zealand Ship Safety Management Code as a matter of urgency. 047/97 It was recommended to the Taupo District Council liaise with the Waikato Regional Council to monitor and regulate the number and type of commercial operators on the stretch of the Waikato River between the Huka Falls and the Paetataramoa Stream to ensure that such operations do not pose a safety hazard to each other and their clients. 051/97	No reply to SR. On the matter of commercial vessels code compliance this is accepted and we will take this up immediately. The matter has been an ongoing concern with the practical issues of monitoring and regulating requiring resolution. On the matter of commercial vessels code compliance this is accepted and we will take this up immediately. The matter has been an ongoing concern with the practical issues of monitoring and regulating requiring resolution.	No report available from MNZ

Schedule 4 - Safety Recommendations by the Commission and MNZ/MSA and Responses to Commission Recommendations					
TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
97-201 *continued*	97 1267 continued		It was recommended to the Director of Maritime Safety that he in consultation with the commercial jet boat industry, expand the section on Bilge Pumping in the Code of Practice for the safety of Commercial Jet Boats Operating on Rivers to reflect the following: Where practicable, bilge pumps should be activated automatically and the driver should be provided with an indicator which shows when each pump is operating; and where practicable, the overboard discharge(s) should be located in a position where the driver can observe the discharge. 057/97	Maritime Safety Authority will be including the Code of Practice for jet Boats in Part 80 of the Maritime Rules ... The requirements relating to the provision of bilge pumps stipulates that "it is recommended that one bilge pump be self activating with automatic visual means of indicating to the driver that it has been activated." No reference has been made to the position of the discharge as the visual indicator is considered sufficient and there are practical problems in locating the discharge where it can be seen by the driver. The rule is to be released for industry and public comment shortly.	
			It was recommended to the Waikato Regional Council seek the necessary powers under the Harbours Act and in liaison with the Taupo District Council or other relevant authorities to: ensure all operations of commercial vessels in areas under their jurisdiction who are not currently monitored for safety by another organisation, be made to comply with the New Zealand Ship Safety Management Code as a matter of urgency. 060/97	The Council would be reluctant to adopt this recommendation. The Council's preference is to await the results of the Harbours Act legislation review, and to commence any responsibilities for navigation safety in line with the forthcoming legislation. Secondly the Council does not consider compliance with the Ship Safety System to be their responsibility, but for it to rest with the Maritime Safety Authority.	

Schedule 4 - Safety Recommendations by the Commission and MNZ/MSA and Responses to Commission Recommendations					
TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
97-201 *continued*	**97 1267** *continued*		It was recommended to the Waikato Regional Council seek the necessary powers under the Harbours Act and in liaison with the Taupo District Council or other relevant authorities to: monitor and regulate the number and type of commercial operators on the stretch of the Waikato River between the Huka Falls and the Paetataramoa Stream to ensure that such operations do not pose a safety hazard to each other and their clients. 061/97	The Council is likely to adopt this recommendation; however it would not be implemented prior to the results of the Harbours Act review being known to the Council. A further delay would result due to the need to develop an appropriate bylaw under which the matters of the recommendation could be controlled. These delays also reflect the necessity for the Council to plan appropriately for adopting a new function, and making staff and budgeting resources available to undertake this function in a comprehensive manner for the whole region.	
97-211	**97 1695**	**Jet boat "K-Jet 3", rolled on a shingle bar, Lower Shotover River Queenstown, 26 December 1997** At about 1545 on Friday, 26 December 1997, a jet boat carrying 10 passengers plus the driver, ventured into a shallow tributary of the Lower Shotover River. The driver turned hard left in an attempt to regain the main channel but the boat skidded sideways along a shingle bar for some	It was recommended to the Director of the Maritime Safety Authority that he: Include in the Maritime Rules, Part 80 [Marine Craft Involved In Adventure Tourism] the requirement for all commercial jet boats operating in braided rivers to be fitted with a roll bar, or similar device, of sufficient height and strength to afford passengers adequate occupiable space under the boat in the event of it rolling across terrain. 027/98	We intend to consult with the industry and investigate fully the implementation of [this recommendation] in relation to: (a) other operational safety issues that may arise; and (b) the costs involved before we could incorporate [this provision] in the rules.	No report available from MNZ

Schedule 4 - Safety Recommendations by the Commission and MNZ/MSA and Responses to Commission Recommendations					
TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
97-211 *continued*	**97 1695** *continued*	10 m before it rolled and came to rest upside down. Several of the passengers and the driver received minor to serious injuries in the accident. Safety issues identified included the fitting of roll bars and passenger lap belts on commercial jet boats operating in braided rivers, and the recording of the number of passengers carried on each trip. Safety recommendations were made to the Director of Maritime Safety, the chairman of the Commercial Jet Boat Association and the management of Kawarau Jet Limited to address the above safety issues.	include in the Maritime Rules, Part 80 [Marine Craft Involved In Adventure Tourism] the requirement for all commercial jet boats to be fitted with quick-release lap belts, one for each passenger the craft is licensed to carry. 028/98 Include in the Maritime Rules, Part 80 [Marine Craft Involved In Adventure Tourism] the requirement for operators to include in their safe operational plan, a system of recording the number of passengers carried on each trip, at the base, and on the boat, before the boats depart, to assist rescue services in accounting for all boat occupants in the event of a mishap. 029/98	We intend to consult with the industry and investigate fully the implementation of [this recommendation] in relation to: (a) Other operational safety issues that may arise; and (b) the cost involved before we could incorporate [this provision] in the rules. ... concerning the recording of passenger numbers, we are arranging for this to be included as a requirement of the safe operational plan in Part 80 of the maritime rules. [See also recipient's other comment] As you know, the Maritime Transport Act 1994 requires that the Minister promote maritime safety at reasonable cost. Any rules submitted for the Minister's signature must indicate the probable costs and benefits of its implementation and, additionally, be subject to industry consultation.	

Schedule 4 - Safety Recommendations by the Commission and MNZ/MSA and Responses to Commission Recommendations					
TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
97-211 *continued*	**97 1695** *continued*		It was recommended to the chairman of the Commercial Jet Boat Association that he: Liaise with members of the association and support the requirement for: all commercial jet boats operating in braided rivers to be fitted with a roll bar, or similar device, of sufficient height and strength to afford passengers adequate occupiable space under the boat in the event of it rolling across terrain. 30/98 Liaise with members of the association and support the requirement for: all commercial jet boats to be fitted with quick-release lap belts, one for each passenger the craft is licensed to carry. 031/98	[An earlier communication indicated that this recommendation will be considered at the annual general meeting of the Commercial Jet Boat Association on 11 July 1998. On 30 July 1998 a reply was received, dealing with recommendation 031/98, but not recommendation 030/98.] [following the 11 July 1998 meeting of the Commercial Jet Boat Association] The recommendations had been discussed at the annual general meeting. The meeting agreed unanimously that the implementation of this recommendation may place passengers at risk in a jet boat sinking/high side/fire situation, and is not practicable. A major factor in all these situations would be disorientation of passengers, only thinking of trying to escape from the hull and forgetting to undo their seatbelt. The meeting also agreed unanimously that the Association/TAIC/MSA should look at the following to improve passenger safety in commercial jet boats: 1. Passenger compartment should be user friendly, i.e. padding in all areas, no sharp seat front edges, no sharp hand rail supports, legs	

Schedule 4 - Safety Recommendations by the Commission and MNZ/MSA and Responses to Commission Recommendations					
TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
97-211 *continued*	**97 1695** *continued*			of passengers at the proper angle so passengers can brace themselves, feet/legs cannot go under seat frames/drivers seat, dash area in front seating area properly designed etc. 2. Driver training, jet boat companies should have a more stringent assessment system (i.e. Police check, etc) in place, and develop a more intensive training programme ensuring drivers are fully aware of their responsibilities, etc. To ensure that [1 and 2 above] are implemented as soon as practicable, the Association has contracted the Queenstown Harbourmaster to audit all its members by 30 November 1998.	
			It was recommended to the Management of Kawarau Jet Ltd that it: Modifies the engine cover securing arrangement on all their boats so that the cover remains closed in the event of the craft rolling, to improve the effectiveness of the antenna arch as a roll bar. 032/98 Devises a system whereby the number of passengers carried on each trip is recorded at the base, and on the boat before the boats depart on each trip. 033/98	This recommendation will be considered at the annual general meeting of the Commercial Jet Boat Association on 11 July 1998. This recommendation will be considered at the annual general meeting of the Commercial Jet Boat Association on 11 July 1998.	

Schedule 4 - Safety Recommendations by the Commission and MNZ/MSA and Responses to Commission Recommendations					
TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
98-205	98 1802	**Jet boat, "Predator", rock strike, Dart River, Glenorchy, 23 March 1998** At about 1050 on Monday, 23 March 1998, a commercial jet boat carrying 14 passengers was transiting down the upper Dart River. While negotiating a right hand bend in the river, the driver reduced power as he turned the boat hard left around a rock in midstream. When he re-applied power the engine stalled. Without directional control the driver was unable to prevent the boat striking a large rock on the river bank. The passengers and the driver received minor to serious injuries in the accident. Seven passengers were evacuated by helicopter. Safety issues identified included the fitting of passenger seat belts and the recording in the boat of the number of passengers carried on each trip.	None		Jet Boat Operators to be reminded of reporting requirements under Section 31 of Maritime Transport Act 1994

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
98-213/ 98-215	98 1933	**Investigation 98-213 /215 Jet boat "Terminator", rollover on to shingle bar, Dart River, Glenorchy, 2 October 1998 and, jet boat "Helijet 7", collision with rock face, Kawarau River, Queenstown, 12 November 1998** At about 1610 on Friday, 2 October 1998, the jet boat "Terminator" was proceeding at a speed of about 65 km/h down one of many secondary channels on a braided section of the Dart River, when the driver was confronted with an obstacle partially blocking a left hand turn in the channel. As the driver attempted to make the turn around the obstruction, his boat struck it, the driver lost control and the boat skidded sideways into a shingle bank and flipped, trapping some of the passengers beneath the boat. The 11 passengers plus the driver suffered minor to serious injuries.	It was recommended to The Director of the Maritime Safety Authority that he: amends Maritime Rule Part 80 [Marine Craft Involved In Adventure Tourism] to: • raise the minimum hours of training for jet boat drivers to 100 hours, • set a standard for drivers to reach before they can be certified as senior drivers, • require operators of commercial jet boats to have a system of on-going guidance and training for new drivers, and a system of peer review among senior drivers, and • require drivers to undergo a further 50 hour training on any new river they intend to operate on. 032/98	This is not accepted. Rule Part 80, developed after extensive industry consultation and full cost-benefit evaluation, was not in force at the time of these accidents and will not be fully implemented until July of this year. It would appear premature to amend the Rule at this stage, not least since it addresses each of the issues raised by your recommendations. In that particular context, we should stress that the Rule requires a minimum number of hours of training for jet boat drivers, while overall standards and ongoing guidance and monitoring are matters we would expect to see covered in any company's Safe Operational Plan, approved by an expert Authorised Person.	The Maritime Safety Inspector (MSI) who investigated this accident has made the following recommendations: That a longer probation period for first season drivers on the river be implemented That when, during such a period, the probationer drive in the company of another more experienced driver and be obliged to 'follow the lead' of the other boat That consideration be given to increasing the height of the windscreen top bar and the provision of a roll bar across the stern so as to ensure as far as possible a clearance between the gunwales and the ground of around 300 millimetres (depth of a man's chest or head)

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
98-213/ 98-215 *continued*	**98 1933** *continued*	At about 0945 hours on Thursday, 12 November 1998, the jet boat "Helijet 7" was travelling down the main channel of the Kawarau River at a speed of about 65 km/h when the driver lost control of his boat in a back eddy near the true river left bank. The boat veered left and struck a rock face. The 5 passengers and driver suffered minor to serious injuries. Safety issues identified were the adequacy of training for jet boat drivers required under current legislation, and the fitting of a roll bar or similar device to jet boats operating on braided rivers. Recommendations were made to the director of maritime safety, the chairman of the Commercial Jet Boat Association and the general manager of Shotover Jet Limited to address the safety issues.	It was recommended to The Director of the Maritime Safety Authority that he: amends Maritime Rule Part 80 [Marine Craft Involved In Adventure Tourism] to require a roll bar, or similar device, to be fitted on all new commercial jet boats intended to be operated in braided rivers, and recommend to owners of existing craft to, where practicable, fit such a device to their craft. The roll bar or similar device should allow sufficient occupiable space under the boat for its full complement, should it roll. 033/99 It was recommended to the chairman of the Commercial Jet Boat Association that the Association: support the recommended changes to Maritime Rule Part 80 [Marine Craft Involved In Adventure Tourism], and begin a programme of compliance with the changes as a matter of urgency. 034/99	We shall, however, draw your report and its recommendations to all such persons. The issue of retro-fitting is far from easy and may be impractical (See MSA response to previous TAIC reports 97-211 and 98-205). We shall, however, raise the issue and encourage the industry to fit roll bars, or similar devices, on all new jet boats intended to operate on braided rivers. The Association supports the proposal of drivers having 100 hours of training however we believe this is not achievable across the whole industry given that the majority of operators are only small and the fact that training is the responsibility of the operator. During the 1980's the Code of Practice driver training hours was 100 hours, this was subsequently reduced to 50 hours in consultation with the Industry by the Queenstown Lakes District Council when the Bylaws were adopted. The reason for this was it was not accepted by the industry hence the Council adopted 50 hours in the Bylaws when they were adopted, before a full license was issued.	

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
98-213/ 98-215 *continued*	**98 1933** *continued*			The recommendation that drivers obtain a standard before they can be certified as Senior drivers and that drivers have on going guidance/training is supported, however as Rule 80 stands there is not requirement for any operator to ensure his staff is given the above. As you are no doubt aware in Queenstown jet boat drivers are issued with a full license, it seems somewhat ridiculous that once Rule 80 becomes law on July 14 the Council will not be able to issue licenses. The [Association] totally supports drivers under going 50 hours of training on each river they intend to operate on. The [Association] does not support the recommendation of fitting Roll Bars in commercial jet boats, as they could cause a jet boat to roll a second time thus exposing passengers to even greater risk. A foil/ducktail would be more practical but this also would need to be designed around the jet boat and is not something that could just be fitted to every jet boat. To summarise:	

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
98-213/ 98-215 *continued*	**98 1933** *continued*		It was recommended to the General Manager of Shotover Jet Limited that he: Implement the recommended changes to Maritime Rule Part 80 [Marine Craft Involved In Adventure Tourism] within Shotover jet Limited and all of its subsidiaries, as a matter of urgency. 035/99	the [Association] supports in part the recommendations, as detailed, i.e. the 50 hour training requirement. Further analysis is required on the other items. At the forthcoming AGM (17 July 1999, at the Waikato River Lodge) the [Association] will be discussing these items in detail and will report back to you after this meeting. 1. The first four points relating to boat driver training have been adopted at all our jet boat subsidiaries with the relevant changes made to Operations and Safety Plans. 2. Dart River Safaris is our only subsidiary that operates on a shallow braided river. We are looking at a boat replacement programme over a period of one to five years. When designing the new boats your recommendation regarding roll bars or similar device will be considered.	

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
98-215	98 1924		As above		With the "Marine Craft used in Adventure Tourism Rule 80" before the Ministry awaiting a signature at the time of writing this report, it should be noted there is a requirement within the new Rule that *"Any person commencing employment as a driver of a jet boat must have not less than 50 hours experience as a jet boat driver, under the supervision of a recognised experienced driver, before operating solo with passengers"*.Mr Tunley had accumulated 66 hours driving jet boats with 27 hours under supervision. He did not therefore meet the standards imposed by Rule 80 and although he was not required to meet than standard, it is my opinion that the driver's loss of control was, in part, due to his inexperience. The passenger's evidence indicated that the jet unit ran continually and nothing interrupted it. There was no evidence to show that the mechanical steering linkages jammed.

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
98-215 *continued*	**98 1924** *continued*				Without a definitive cause having been established, any conclusions must be speculative. However, with this proviso it may be prudent for MSA to suggest to the owner that more training time be given to prospective drivers and the 50 hours minimum be treated as the lowest standard of training rather than the norm.
99-210	**99 2178**	On Friday, 20 August 1999 at about 1410, the jet boat "Helijet 2", with a driver and 8 passengers on board, was proceeding at about 60 km/h past a series of rocky outcrops on the Kawarau River when the driver experienced what he considered to be a lock-up of his steering system as he rounded the last of the outcrops. The driver freed the steering by reducing throttle and moving the steering wheel from side to side. Meanwhile, the boat had entered a cove and the driver turned the boat to avoid a head-on collision with a rock face. The right rear of the boat struck the rock face, the boat slewed to the right and struck the rock face again at the right front of the boat. One of the passengers was severely injured while most of the others received minor injuries.	Review the company promotional advertising literature for both Kawarau jet and Helijet to ensure that prospective customers are made fully aware of the nature of the trip they may be undertaking and the inherent risks involved. 030/00 Ensure that drivers include in the pre-trip safety briefing that passengers should use the footrests to brace themselves against the motion of the boat. 031/00 Consider fitting inclined solid plate footrests, similar to those fitted for the front seat passengers, throughout the Helijet boats. 032/00	Please refer to our brochure reading ..."jetboating is an adventure activity with a degree of risk. Even though commercial operations are run within strict safety guidelines, the operator cannot guarantee the absolute safety of the participants or their belongings." We enclose a copy of the newly issued Safety Briefing sheet that our drivers run through with our passengers prior to a trip commencing. This sheet was developed with symbols to assist with foreign visitors under the guidance of our local Harbour Master. We shall address the modification points with the owners and advise you accordingly. Kawarau jet is supplied with these boats to carry Helijet passengers under contract.	It is recommended that the operator of Helijet 2 formulate a contingency plan to safeguard passengers against injury and the craft against damage, should a similar incident happen again. This contingency shall be discussed with the Authorised Person and included in the Safe Operational Plan

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
99-210 *continued*	**99 2178** *continued*	Safety issues identified in this and other jet boat accident investigations were: • operational supervision of jet boat operations and standards • driver training and licensing • maintenance control • passenger briefings • occupant protection in the event of collision. Safety recommendations were made to the Directors of Kawarau jet Limited to address the safety issues.	Consider enhancing internal features of the Helijet boats to increase the protection afforded to passengers in the event of an accident. 033/00 Introduce a system of driver review where junior drivers are periodically assessed by a senior driver and senior drivers by their peers. From time to time, such reviews should be undertaken when river conditions are near safe operating limits. 034/00	Consider enhancing internal features of the Helijet boats to increase the protection afforded to passengers in the event of an accident. 033/00 We are currently in the process of revising our complete operating manual. We acknowledge the recommendation of periodic assessment and shall include such a programme into our practised procedures. We aim to have this manual completed by the end of July this year	
99-212/ 99-213	**99 2220 99 2236**	**Jet boats "Shotover 14" and "Shotover 15", separate collisions with canyon wall, Shotover River, near Queenstown, 21 October and 12 November 1999** On Thursday 21 October 1999 at about 1810, jet boat "Shotover 14" entered the first canyon on the Upper Shotover River with the driver and 9 passengers on board, travelling at about 65 km/h. While travelling close to the left side of the canyon a component in the steering system caught on a bracket, preventing the driver from steering to the right.	Produce a manual of procedures and guidelines for those MSA-approved authorised persons to follow when assessing, approving or auditing commercial jet boat operators' activities and safe operational plans. 100/99 Require MSA-approved authorised persons to have undergone safety audit training. 101/99 Develop an MSA Commercial jet Boat Driver Licence, which every commercial jet boat driver must hold. The licensing system should be structured with: • a detailed training syllabus and a driving test, for the basic licence	[Awaiting result of formal safety review of the Commercial jet Boat Industry commissioned by the Director of Maritime Safety on 28 July 2000. See respondent's other comment for more detail.] We do not propose at this time to respond to [the safety recommendations] individually or in detail. Some of these have been proposed to and commented on by MSA in relation to previous reports. We would however, consider it helpful at this time to outline the course of action initiated by MSA on 28 July 2000, where a formal	From 99 2220: This accident, as with the engine failure of Shotover Jet No. 19 on 22 August, had the potential for serious injury or even death. The drivers of commercial jet boats and the associated companies must be familiar and conduct their operations in accordance with the requirements of section 65(1)(b) and (2)(b) of the Maritime Transport Act 1994. Shotover Jet Limited should regularly review their operations for compliance with the Act, with particular emphasis on the safety of their passengers and drivers whilst operating jet boats at speed in the Shotover River.

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
99-212/ 99-213 *continued*	**99 2220 99 2236** *continued*	The driver overcame the jammed steering by applying considerable force through the steering wheel, but too late to prevent the jet boat glancing off the canyon wall into a rock face. Eight passengers and the driver received minor injuries and one passenger received moderate injuries in the impact. The boat was extensively damaged. On Friday 12 November 1999 at about 1415, jet boat "Shotover 15: entered the second canyon on the Upper Shotover River with the driver and 12 passengers on board, travelling at about 65 km/h. While the boat was travelling close to the right canyon wall the steering locked and the boat struck the canyon wall. The passenger in the right rear seat struck his head on a rock overhang and was fatally injured. The other passengers and driver received minor injuries. Safety issues identified included: • standards of maintenance • standards for design of jet boat components • small safety margins designed into the trip • driver training	• several levels of endorsement, each dependent on specified numbers of driver hours and a further driving test • restrictions on all-up weight (boat and passengers) for each endorsement • endorsements for each river on which the holder intends to operate, following a specified number of hours on each river • experience requirements, and a training syllabus and test for jet boat driver instructors • a requirement for subsequent periodic check trips • a requirement for drivers who do not accumulate a specified number of driving hours within a specified period, to undergo revalidation training. 102/99 Require all commercial jet boat drivers to keep a log book of hours and training. 103/99 Require all commercial jet boat operators to identify on each jet boat all components that are critical to the safe operation of the boat, and to have a documented inspection and maintenance system in place that covers those critical components. The inspection and maintenance system should complement rather than replace any existing system of daily checks. 104/99	safety review of the Commercial jet Boat Industry was commissioned by the director of Maritime Safety. This review is an MSA initiative response to the recent accidents experienced by the industry and a desire to evaluate the performance of Rule Part 80. Terms of reference for the review are listed hereunder: Purpose: Review the commercial jet boat industry to identify actual and potential current safety issues, assess any adverse safety trends and propose recommendations and any new initiatives to ameliorate adverse safety trends. 1 Document the safety performance of the commercial jet boat industry and identify its relative performance in the maritime industry (other adventure tourism activities, other passenger vessels, and commercial maritime operations), taking into account relevant technical, environmental and social considerations. 2 Develop benchmarks for the commercial jet boat industry by reviewing the performance of the industry overseas.	Shotover Limited should readdress their safety briefing given to their passengers. The photograph taken by Shotover Jet as the vessel passed the jetty (Appendix 3) clearly shows Mr Yap rising out of his seat having been briefed not to. It should be noted that Mr Yap, from Hong Kong, understood English extremely well. The damage outlined in 1.10 of this report suggests that the present systems in place are not ensuring safe standards are being met. The Company did not foresee, at the design stage, that the proximity of the shackle to the underside of the foredeck would pose a danger to steering when the "taut" wire bounced as the boat reacted to the impact of the forces it encountered in operation. The engine was held down by 4 x 3/8 inch UNC bolts (with an approximate Ultimate Tensile Strength of 800Pa) to the bottom bearers in the boat. The possibility of the engine breaking completely free and sliding forward into the backs of the passengers in the event of a collision was not taken into account.

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99-212/ 99-213 *continued*	99 2220 99 2236 *continued*	• the effectiveness of Rule Part 80 in ensuring safety in the jet boat industry • management style and its effect on safety. Drawing on lessons learned from these 2 accidents and others investigated in the past, several safety recommendations were made to the director of Maritime Safety, the operator and a manufacturer of water jet units, to address the safety issues.	Require all commercial jet boat operators to incorporate any manufacturer's recommended maintenance schedule in their own inspection and maintenance system.105/99 Require all commercial jet boat operators to use only authentic or approved parts when replacing worn or damaged critical components, or to use parts reconditioned, either to the manufacturer's specifications, or to the approval of an appropriate surveyor. 106/99 Require all commercial jet boat operators to have a system for recording and tracking in-use and spare critical components that enables the history of any critical component to be monitored and traced. 107/99 Require all new commercial jet boats intended to be operated in braided rivers, or existing boats being purchased for operation on braided rivers, to be constructed with roll protection that allows sufficient occupiable space under the boat for its full complement, should it roll 109/99 Require the fitting of an inclined footplate in front of each passenger seat, having first assessed what the optimum angle for such a footplate is. 110/99	• Identify and assess possible areas of concern within the commercial jet boat industry, in terms of safety performance and perceived future trends. • Contextualise the safety performance of the commercial jet boat industry by identifying past, present and future trends within the industry. • Review the current operation and effectiveness of legislation (Rule Part 80 and Maritime Transport Act/local bylaws) where appropriate. 6 Provide recommendations on any new safety initiatives based on lessons learned from the review. The review will involve evaluation of all incident and accident data held on file, active surveying of operators in the industry and undertaking passenger expectation surveys. It will also involve data collection from international operators in an attempt to benchmark the local industry. The review will be detailed, it has been given a high priority by MSA and it will involve an in depth examination of the effectiveness of Rule Part 80. The review will also involve careful evaluation, including costs and benefits, of all safety recommendations made by TAIC in this and previous reports.	The Investigator recommends that the following being considered by the Maritime Safety Authority (MSA): A full independent audit purusant [sic] to section 54 of the Maritime Transport Act, be carried out on Shotover Jet Ltd at its site on the Shotover River of the Company and its operation in its entirety. From 99 2236: This is the third accident with a Shotover Jet in a period of less than three months. The first two also had the potential to cause serious injury. The Director of Maritime Safety consider charging Shotover Jet Ltd under section 65 of the Maritime Transport Act 1994 for operating a ship in a manner which resulted in the death of Mr Yuichiro Shibata. The drivers of all commercial jet boats should be made aware of the responsibilities and consequences that are set out in by [sic] section 65 (1) (b) of the Maritime Transport Act 1994.

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
99-212/ 99-213 *continued*	**99 2220 99 2236** *continued*		Conduct an independent inspection of all commercial jet boats by suitably qualified persons, to assess the compliance with Rule Part 80 [Marine Craft Involved In Adventure Tourism] with regards to occupant protection in event of collision, and withdraw any operator's certificate of compliance where their boats do not comply. 111/99 Critically review the design of the jet boat trips offered by all its subsidiaries and ensure that passengers are exposed to a lower level of risk than they were on the Shotover Queenstown operation at the time of the accidents involving Shotover 14 and Shotover 15. 068/00 Upgrade the Shotover jet Limited fleet to a level that both complies with Rule Part 80 [Marine Craft Involved In Adventure Tourism] and is commensurate with the type of trip being offered. 069/00 Review the company policy on driver working hours to reduce the possibility of drivers operating fatigued. 070/00 Ensure that sufficient resources are put into maintaining the Shotover jet Limited fleet in a state of repair appropriate for its intended use. 071/00		Whilst operating in a river where the width is limited by rock walls and there are no shingle banks to act as gravel traps, drivers should have some form of emergency action plan in place. At no time should the speed be such that a steering failure or engine failure leaves them and their passengers at risk of serious harm. In this regard, driver training and testing should include the ability to carry out an emergency stop. Safety procedures dealing with emergencies should be written in the Company's Safe Operation Plan (SOP). Shotover Jet Ltd should readdress the safety briefing given to their passengers. Those passengers who do not understand any English should be given the opportunity to make that fact known to the staff who should arrange a specific briefing for them. The tendency that the drivers steer their way out of trouble is of concern. It could increase the risk of serious harm should a collision occur. The driver has to drive the engine hard to gain maximum thrust to get the maximum steering effect and in doing so keeps the boat's momentum high when he should, in circumstances where collision is imminent, be

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99-212/ 99-213 *continued*	99 2220 99 2236 *continued*		Critically review the design of the new steering nozzle and associated components on HJ-212 jet units and ensure that it is strong enough for its intended purpose. 072/00 Consider either recalling all old HJ-212 steering nozzles or producing a service bulletin warning users of possible failure and the consequences.073/00 Fit steering limit stops to all boats in the Shotover fleet fitted with HJ-212 jet units. 078/00 Identify on each jet boat all components that are critical to the safe operation of the boat, and have a documented inspection and maintenance system in place that covers those critical components. The inspection and maintenance system should complement rather than replace any existing system of daily checks. 079/00 Incorporate any manufacturer's recommended maintenance schedule in the Shotover jet inspection and maintenance system. 080/00		reducing the momentum to lessen the possible impact. There was no time for the driver to have reacted in any other way in this case, but an emergency stop should have been an option. The drivers have no procedure in their training that allows them to practice a full emergency stop and this should be remedied. The hull design of the various boats may have to be looked at closely if, during an emergency stop, the boat dives down uncontrollably and has a tendency to become swamped. Steering nozzles should be inspected more thoroughly and a programme put in place for independent crack detecting tests to be carried out periodically as a matter of course. All nozzles should be stamped so that they can be readily identified and records kept of these tests. The fire extinguishers on the jet boats will require additional care being in a harsh environment where there are high levels of vibration. They should be checked on a more regular basis.

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
99-212/ 99-213 *continued*	99 2220 99 2236 *continued*		Use only authentic or approved parts when replacing worn or damaged critical components, or use parts reconditioned, either to the manufacturer's specifications or to the approval of an appropriate surveyor.081/00 Implement a system for recording and tracking in-use and spare critical components that enables the history of any critical component to be monitored and traced. 082/00 Recommend the fitting of steering limit stops in the installation manual for all HJ-212 jet units, and other model jet units as appropriate. 083/00		All repair work carried out by Shotover Jet Ltd should be reassessed and recognized welding or machining procedures put in place. It is of paramount importance that the Company consults with C.W.F. Hamilton & Co Ltd to ensure all components affecting the safety of passengers are inspected regularly and all are [sic] tolerances kept within the manufacturers specifications. *Ref WBM Report Section 27 page 43* The manager of Ship Safety Management in consultation with the rules division of the Maritime Safety Authority should initiate the development where it is mandatory for all commercial jet boats to be fitted with steering stops. *Ref. WBM report section 18 page 41.* Opinion Consideration should be given by the Director of Maritime Safety Authority (MSA) to conducting a full independent audit of the Shotover Jet Ltd under section 54 of the Maritime Transport Act.

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99-212/ 99-213 *Continued*	99 2220 99 2236 *continued*				Shotover Jet Ltd jet boat ride ticket has a disclaimer that attempts to absolve itself of all liability for passenger's safety. In the absence of a Company undertaking to the contrary, it is the responsibility of the MSA to ensure that passengers are safely carried. The Maritime Safety Authority should consult with the New Zealand Jet Boating Association and ask their views on what can be done to reduce the serious problem we have in New Zealand where passengers lives are constantly being put at risk by operators relying on single engine jet boats whilst at speed passing close to the river banks and also navigating through gorges where there is very little margin for error.

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99-212/ 99-213 *continued*	99 2220 99 2236 *continued*				Commercial jet boat companies should be given a time frame in which to have all their jet boats powered by a minimum of two engines, both engines being totally independent of each other and driving their own water jet unit. This opinion should be put to the NZJBA. Shotover Jet and other jet boat operators operating in gorges should be ensuring their drivers keep a safe operating margin from rock faces. This minimum distance should be determined by the MSA in conjunction with the SOP Authorised Person. A review of the distance should be undertaken periodically. It should still be noted that the MSA cannot overlook that jet boat companies "buzzing" the river bank, i.e. rock faces etc. are increasing the risk of severe injury to its passengers. The commercial jet boat companies should be asked to review critically their drivers operating 'lines' and ensure that in their SOP there is [sic] full emergency procedures documented.

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
00-206	00 2424	**On Friday 16 June 2000 at about 1515, the commercial jet boat "Huka jet 1" with a driver and 7 passengers on board was proceeding at about 80 km/h through a section of the Waikato River known as "First Shallows" when the engine failed.** As a consequence the driver lost all directional control and was unable to slow the boat. The boat collided with overhanging trees on the riverbank, slewed to the right, continued through the trees and grounded on the riverbank. Two of the passengers received minor injuries. Safety issues identified included: • standard fleet-wide modification made without fully considering the differing construction of each boat • modification of the engine cooling system leading to the potential for air locks in the LPG regulator • fitting of a critical component that was cracked.	Nil		The gas converter should be refitted below the coolant expansion tank and the coolant tank fitted with an alarm to warn the driver of a falling coolant level. The lowering of the converter should be carried out immediately and the alarm fitted as soon as practicable. The Authorised Person to check this by 18 January 2001. Management should address driver training procedures. All trainees and existing drivers to be made fully conversant with emergency measures to adopt in the event of engine failure. Procedures should be introduced by management relating to all perceived emergencies and documented in the Company's Safe Operational Plan (SOP). If management conclude that there is little or no corrective action that a driver can take when placed in similar circumstances as this accident, then this should be stated in the SOP. The Authorized Person to check this by 18 January 2001. The safe driving lines that the drivers follow should be critically re-evaluated by management with safety and reaction times considered in the event of emergencies.

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
00-206 ***continued***	00 2424 *continued*			The Authorised Person in this case, Mr Martin Black, should endeavour to carry out more frequent inspections [sic] of these craft to ensure that they fully comply with the MSA Rule Part 80 Marine Craft Used For Adventure Tourism. The last inspection by the Authorised Person, recorded with the MSA, was over 650 days ago. The Authorised Person should ensure that all inspections for which he is responsible are recorded even when the work has been delegated.	When the boat was inspected the First Aid kit was located under the second row of seats and held place by bungy cords. The driver should know where this is stowed and management to ensure this is the case. A letter confirming that the above recommendations have been addressed should be sent by the Authorised Person to the Chief Investigator of Accidents of the MSA by 18 January 2001 The Authorised Person in the case, Mr Martin Black, should endeavor to carry out more frequent inspections [sic] of these craft to ensure that they fully comply with the MSA Rule Part 80 Marine Craft Used for Adventure Tourism. The last inspection by the Authorised Person, recorded with the MSA was over 650 days ago. The Authorised Person should ensure that all inspections for which he is responsible are recorded even when the work has been delegated.

Schedule 4 - Safety Recommendations by the Commission and MNZ/MSA and Responses to Commission Recommendations					
TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
00-207	00 2420	**On Thursday 29 June 2000 at about 1505, the jet boat "Discovery" was approaching Tyrees Cut on the Shotover River with the driver and 15 passengers on board. The driver had reduced speed approaching the cut, and as he attempted to accelerate to maintain control of the boat the left side of his boot momentarily caught on the accelerator surround, preventing him from applying optimum power for the manoeuvre, causing the boat to drift to the right of the intended track.** The stern of the boat clipped the canyon wall, causing it to spin towards a recess in the wall. The driver managed to apply power and avoid the recess but the starboard bow of the boat collided with the rock face immediately downstream. The driver and 13 passengers suffered minor injuries and 2 passengers suffered moderate injuries. The boat was extensively damaged.	On 15 January 2001 the Commission recommended to the Queenstown Lakes District Council harbourmaster that he: liaise with rescue helicopter and jet boat operators to develop a plan to introduce the use of a common radio frequency by all parties during rescue operations 129/00 introduce appropriate and practicable speed restrictions through Tyrees Cut and other similar areas of concern on the river. 130/00	On 10 February 2001 the Queenstown Lakes District Council harbourmaster replied, in part: We are working with all parties concerned to improve radio communications and procedures, it is an on going process. With regard [to] the recommendation that practical speed restriction be implemented in Tyrees cut and other similar areas. I do not agree that there should be any speed restrictions as in areas like Tyrees cut, it should be up to the skipper on the day as he is the one who is best qualified to assess what is the best speed for his vessel ie it could depend on river flow, type of boat, loading of boat etc. Both points are addressed in the Companies SOP, ie cutoff levels are in the SOP for Tyrees cut. Neither recommendation is going to be implemented at this time.	The fitting of the Safety Monitoring System, as utilized by the operator, is a useful tool to oversee the operation of the drivers and their driving techniques. It can therefore be used for further training of the drivers where the graphs can be analysed with the driver. It also leaves little doubt as to the circumstances prevailing as the parameters leading up to an incident are recorded giving a factual database. The driver must choose suitable footwear and the management should ensure all drivers refrain from wearing clumsy or loose footwear. The river levels were rising and approaching a flow rate where management should have been considering the safety of the passengers and the driver. With the restriction caused by the cutting, there is a build up of pressure waves and a great deal of extremely turbulent water that increases the risks the passengers are subjected to. The management of Skipper's Grand Canyon Jet, in conjunction with their drivers, are to be asked to revisit their Safe Operational Plan (SOP) and consider ways of lessening this apparent risk.

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
00-207 *continued*	00 2420 *continued*	Safety issues identified included: • the suitability of footwear worn while driving jet boats • the lack of co-ordinated radio communication procedures for emergency services in the Queenstown area • the non-reporting of hazards and incidents • a speed restriction placed on the area of the accident potentially compromising safety.	On 15 January 2001 the Commission recommended to the general manager of Skippers Grand Canyon Limited that he: remove or alter the extended plate to the left of the accelerator to prevent the driver's forefoot from catching on it 131/00 modify either the gunwale or the passenger seats to prevent passengers sliding into the gap under the gunwale. 132/00	No reply to SR	They should reply in writing by 18 January 2001, as to how they intend to address this perceived danger and also acknowledging recommendation 5.2.1 The coaming of the hull where the passenger's hip was fractured, should be critically inspected and consideration given to modifying the design of all seating to eliminate this type of injury. The Authorised Person for the company's SOP should ensure that the above recommendation is carried out by 18 January 2001 and forward a report to the MSA. The frequency of jet boat accidents around the country is a concern. There appears to be the distinct possibility of serious harm. It is recommended that a copy of this report and any future MSA jet boat accident reports be forwarded to all commercial jet boat operators, so that they can be made aware of these accidents occurring.

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
01-201	01 2564	**Commercial jet boat "Huka Jet 3", rock strike and uncontrolled departure from river, Lake Aratiatia, Waikato River, Taupo,, 25 January 2001** On Thursday 25 January 2001 at about 0945, the commercial jet boat "Huka Jet 3", with a driver and 10 passengers on board, was proceeding at about 60 km/h into the area known as the "Second Tunnel" on Lake Aratiatia on the Waikato River near Taupo, when the extreme right rear of the boat struck a rock on the riverbank. The impact slewed the boat to the right and despite the driver?s efforts to regain control, the boat climbed the riverbank and came to rest among the trees within the tunnel area. Four of the passengers were severely injured and 4 others received minor injuries. Safety issues identified included the suitability of the Second Tunnel as an area of operation for commercial jet boats.	On 31 October 2001 the Commission recommended to the General Manager Jetboating of Shotover Jet Limited that he: adopt a policy whereby the use of the safety lap seat belts, already fitted in the front passenger seats, is mandatory. 060/01	On 12 November 2001 the General Manager Jetboating of Shotover Jet Limited replied: 5.2.1 At this stage we are not sure we agree with your recommendation that Shotover Jet adopt a policy whereby the use of the safety lap seat belts, already fitted in the front passenger seats, is mandatory. The reason for this is that when MSA carried out the review of Rule Part 80 their conclusion with respect to the fitting of seat belts was that they disagreed with the recommendation made by TAIC. As the time they did note that they would continue to review this decision. MSA staff again confirmed this to me during a discussion last week. I'm sure you would agree that this puts us in a difficult situation, as we have conflicting views from two different authorities. For this reason we therefore believe that MSA and TAIC should collectively advise us on what we should do.	The safe driving lines that the drivers follow should be critically re-evaluated by management with the 2nd tunnel and areas similar being accessed with the question, *do we really need to enter these areas and if we do can we guarantee the safety of the passengers?* The boats pass by sloping banks, rock faces and between small islands at speeds greater and distances less than one would safely navigate a river. This is the second accident involving Huka Jet Ltd in a period of a little over seven months, that resulted from operating at speed in a restricted waterway. It is recommended that the MSA bring to the attention of Huka Jet section 65 of the Maritime Transport Act 1994, so that there is no doubt as to the serious nature in which the MSA views these accidents. The Huka Jet drivers are aware of the last jet boat accident involving this Company, but have not seen accident reports from the MSA or the Transport Accident Investigation Commission (TAIC) investigations involving their parent company and other operators.

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
01-201 *continued*	01 2564 ***continued***				It is recommended that the parent company, Shotover Jet Ltd, obtain copies of these reports and ensure that all their employees read them so that it may engender a proactive safety culture.
01-202	01 2591	**Commercial jet boat "Shotover 6", engine failure and collision with river bank, Shotover River, Queenstown, 12 February 2001** On Monday 12 February 2001, at about 1115, jet boat "Shotover 6" was proceeding down Shotover River at about 75 km/h with the driver and 10 passengers on board, when the engine suddenly stopped. As a result the driver lost steerage of the boat and it continued for about another 50m before colliding with rocks and overhanging trees on the riverbank. One passenger suffered moderate injuries and the driver and other passengers suffered minor bruising. The boat was slightly damaged The exact cause of the engine failure was not established. Safety issues identified included: • the need to isolate the ignition system before undertaking electric welding on boats	On 31 August 2001 the Commission recommended to the director of maritime safety that: Maritime Rule Part 80 is changed to require mandatory installation of twin propulsionsystems in all newly constructed commercial jet boats engaged in high risk adventure operations. 033/01	On 5 September 2001 the director of the Maritime Safety Authority replied: 5.2.1 MSA notes that it has recently completed a formal review of the Safety Performance of Commercial Jet Boating in New Zealand, and that the submissions received were being assessed. This process is now completed and the review team have passed its recommendations, after considering the comments received, to the Manager Safety and Environment Standards, to commence formal industry consultation for amendment of Maritime Rule Part 80. The issue of twin propulsion (engine) systems was seriously considered by the review team for high adventure operations. Indeed the review team made note in section 13.4 that:	Jet boat operators should be made aware of the possible damage to electronic components from voltage spikes associated with electric welding processes. Components that can affect the safe operation of the jet boat i.e. electronic ignition parts, should be electrically isolated and removed from the boat before any welding process takes place. Radio sets should also be treated in the same way as these can be crucial to the safe operation. Autotronic Controls Corporation should be advised of, including an advice note, warning purchases of the possibility of damage to the ignition components from induced high voltage or frequencies during electric welding processes. The hazards in the river should be periodically addressed and management's attention should be drawn to the dangerous limbs protruding horizontally in towards the possible path of a jet boat.

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
01-202 *continued*	01 2591 ***continued***	• the inherent risk of loss of directional control due to engine stoppages in jet boats with single propulsion systems		"The compulsory use of lap belts and twin engine boats for high adventure activities should be regularly reviewed by MSA in light of operational experience." The review team did not include twin engine boats for high adventure activities in its recommendations, as it was not satisfied that such a recommendation would meet the MSA's charter of "A Safe and Clean Maritime Environment at reasonable cost", where "Reasonable Cost" is defined in Section 430(b) of the Maritime Transportation Act 1994 as a [sic] meaning, "when the value of the Cost to the nation is exceeded by the value of the resulting benefit to the nation." As part of the review process, reported accidents were considering along with possible initiatives which could have prevented the accident from occurring. On the basis of that study, and bearing in mind MSA's charter, the review team determined the compulsory use of twin engine boats for high adventure activities did not achieve the "Reasonable Cost" criteria.	The company should be asked as to what procedure they have in place to lessen these perceived risks of injury. Shotover Jet Limited should investigate the possibility of fitting an electronic engine management device where it can be analysed after an engine failure, so the exact cause of the failure can be found. The method presently used where synthetic rubber sleeves are fitted between the hull and the exhaust manifolds should be examined with a view to reducing the possibility of the sleeves being pulled off in an accident. This occurred during impact and it has happened in previous accidents with the resulting ingress of water into the engine compartment causing concern with regard to the boat sinking. The Company should examine their method of controlling the temperature of the engine coolant flowing through the hand rails fitted on the backs of the seat such that passengers can maintain a firm grasp at all times.

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01-202 *continued*	**01 2591** *continued*			Comments received from industry as a result of the consultation document would also support this view. The review team nor MSA have not dismissed the concept of twin engine boats, rather it is our view that this technology should be embraced as it is developed, and operators be encouraged to adopt it as the technical challenges are overcome. MSA is working with Shotover Jet, industry in general and the New Zealand Commercial Jet Boat Association to achieve this goal. Considering the above we regret to advise that MSA is not able to accept the final recommendation 033/01	The Driver and those at Shotover Jet Ltd handled this accident well but the Investigator wishes to draw their attention to the effects of shock on people after an accident. These can be traumatic and life threatening. Drivers and those at Shotover Jet Ltd involved in the crisis management team must be trained and continually aware of the initial signs shown by those suffering from shock.
01-213	**01 2739**	**Commercial jetboat "Shotover 21", collison with rock, Queenstown, 31 August 2001** On Friday 31 August 2001 at about 1440, the commercial jet boat "Shotover 21" was proceeding down Shotover River at about 60 km/h with the driver and 11 passengers on board, when the engine stopped suddenly. With no propulsion the driver lost directional control	On 5 June 2002 the Commission recommended to the Director of Maritime Safety that he: liaise with the National Transportation Safety Board of USA and manufacturers of jet boat propulsion systems to explore the possibility of developing an alternative means of providing directional control for single-engine jet boats in the event of an engine failure. 020/02	On 5 July 2002 the Director of Maritime Safety replied in part: I confirm that MSA has accepted the recommendation and we are currently corresponding with National Transportation Safety Board of USA and also industry within New Zealand regarding the feasibility of developing alternative means of steering in single engine jet boats.	It is recommended that Shotover Jet Ltd management, in consultation with the engine manufacturers and/or engine technicians, develop a program where there is an engine diagnostic management system permanently fitted to all their operational jet boats within six months of this report being finalised.

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
01-213 *continued*	01 2739 *continued*	of the boat and it continued in a straight line for some 60 m before colliding with a rock face at about 30 km/h. Five of the passengers suffered serious injuries, the other passengers suffered minor injuries and the driver was unhurt. The boat was extensively damaged. The cause of the engine stoppage was not conclusively established. A safety issue identified was the inherent loss of directional control for single-engine jet boats in the event of a propulsion failure. A safety recommendation was made to the Director of Maritime Safety to address the safety issue.		The Commission has correctly identified that the alternative steering arrangement discussed in Point 22 of Analysis 2, are for personal water craft, that is jet-skis, rather than jet boats. We therefore consider that careful analysis must be made to assess whether this type of technology can be incorporated into jet boats, bearing in mind the greater weight, speed and size of these vessels.	The failure of single engine jet boats operating in the Shotover Gorge cannot be allowed to go unexplained and the management should acknowledge this recommendation with a letter to the Chief Investigator of Accidents (CIA) of MSA outlining what parameters will be monitored and the degree of accessibility to the operation. It is recommended that Shotover Jet Ltd, conduct a review on crucial components that may be subjected to failures due to fatigue stresss and notify the CIA, within one month of this report being finalised, that this has been carried out with any modifications noted. The injuries suffered by the passengers may have been lessened if the hand rail mounted at the backs of the seats was less rigid. The company should investigate an alternative method of securing the handrail to allow for a restricted degree of flexibility and there endeavour to limit the instantaneous force to the passengers arms, wrists etc., from any sudden impact.

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01-213 *continued*	01 2739 *continued*				The front passengers need to be better restrained, either by themselves having easier facilities to brace themselves or by some other device. It is recommended that Shotover Jet study and notify the CIA, within two months of the report being finalised, as to how they can lessen the risk of injury to passengers in this and those mentioned in 5.3 above. It is recommended that the Operations Manager of Shotover Jet Ltd instigate a training exercise program, including medical training, where the associated emergency services are involved to familiarise all personnel in dealing with an emergency relating to the jet boating operation on the river. This should be done within two months of this report being finalised. It should be fully discussed with all personnel involved prior to, and after, the exercise, forwarded to the Manager of Ship Safety Management at MSA.

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01-213 *continued*	01 2739 *continued*				The SOP must be re-addressed by the company and be approved by the Authorised Person to guide drivers as to action to be taken in the event of a sudden engine failure. The company should periodically ensure the drivers are audited in the aspect of checking the passengers fastening and fitting of lifejackets. A recent review of the Safe Performance of Commercial Jet Boating, dated 30 November 2001, recommends that Maritime Rule Part 80 be amended to require operators to advise passengers of the risks that they may experience during the ride. The company should consider inserting appropriate information in their advertising brochures to this effect. The free edge of polycarbonate shield faces away from the passengers, so it would be imagined as highly unlikely a passenger would injure themselves on this edge, but the safety of the front passengers should be investigated by the company to prevent them rising out of their seats during a collision or sudden stop.

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01-213 *continued*	**01 2739** *continued*				Finally, it is recommended that Shotover Jet Ltd introduce into their written procedures manual, a requirement that all drivers, maintenance staff and other relevant employees must read and sign an acknowledgement stating that they have read and understood the contents of the Safe Operational Plan, within two months of commencing employment with the company. The Investigator acknowledges that Shotover Jet Ltd have, since the accident, put in place procedures and are developing many of the above recommendations on their own accord which will undoubtedly enhance the safety of their operation.
03-203	**03 3125**	**Jet boats "Wilderness Jet 3" and un-named private jet boat, collision, Dart River, Glenorchy, Queenstown, New Zealand, 22 February 2003**	On 10 September 2003, the Commission recommended to the Chief Executive Officer, Queenstown Lakes District Council that he: evaluate and quantify the traffic on the Dart River and put in place a policy that will prevent conflict between and within the various user groups 042/03	On 24 February 2003, the Director of Maritime Safety replied that he accepted the recommendation in line with the recommendations made by the Pleasure Boat Safety Advisory Group in 1999, continue to monitor for the five-year period to December 2004, the impact of education initiatives introduced	

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
03-203 *continued*	03 3125 *continued*	On Saturday 22 February 2003 at about 1130, the commercial jet boat "Wilderness Jet 3" was travelling downstream on the Dart River, with a driver and 4 passengers on board, when it collided with Private Jet Boat proceeding upstream with a driver and one passenger on board. The boats came to rest on a shingle bank with the commercial boat on top of the private boat. The Private Jet Boat was extensively damaged. Both drivers and 4 of the passengers sustained minor injuries. Safety issues identified included: • the concentration of traffic on the Dart River • the radio traffic on the Dart River • the promulgation of information concerning private jet boaters on the river • the training of persons in charge of a pleasure craft Safety recommendations were made to the Chief Executive of Queenstown Lakes District Council, the Managing Director of Dart Wilderness Adventures and the General Manager of Dart River Safaris.	On 10 September 2003, the Commission recommended to the Managing Director of Dart Wilderness Adventures that he in conjunction with the other commercial operators on the Dart River system formulate a procedure to ensure that: information concerning the presence and intentions of private jet boaters on the river system is promulgated to all commercial operators at the earliest possible time. the river VHF radio channel is available solely for radio traffic necessary for the safe operation of jet boats on the river. This channel should be monitored by all operators and their boats and used for the passing of safety information, including the disposition of private jet boats on the river. A separate VHF radio channel should be utilised for routine radio traffic of the commercial operators 044/03.	in New Zealand against set safety targets. Further, that the systems of compulsory boating safety education in the Canadian and other jurisdictions, continue to be monitored for success through the same period, with a view to implementation of such a system in New Zealand. On 15 October 2003, the Chief Executive Officer of Queenstown Lakes District Council replied, in part, as follows: it was agreed that the council will prepare a brief, including costs for the purposes of implementing a safety study of the Dart River to evaluate and make any necessary recommendations to improve safety between various user groups. This will include any recommendations concerning changes to the Memorandum Dart River Operating Procedures, under which commercial users presently operate. It is envisaged that the study will commence and be completed by the end of the 2003/04 summer period.	

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
03-203 *continued*	03 3125 *continued*		On 10 September 2003, the Commission recommended to the General Manager of Dart River Safaris that he: in conjunction with the other commercial operators on the Dart River systemformulate a procedure to ensure that: • information concerning the presence and intentions of private jet • boaters on the river system is promulgated to all commercial operators • at the earliest possible time (045/03). • the river VHF radio channel is available solely for radio traffic necessary for the safe • operation of jet boats on the river. This channel should be monitored by all operators and their boats and used for the passing of safety information, including the • disposition of private jet boats on the river. A separate VHF radio channel should be • utilised for routine radio traffic of the commercial operators 044/03 & 046/03.	On 13 October 2003, the Managing Director of Dart Wilderness Adventures replied, in part, as follows: I can confirm after a positive meeting between all parties it was resolved to implement a logging system for making sure all commercial operators on the Dart River were aware of private boat movements. I will send more details when the system is finalised in the next few weeks On 25 September 2003, the General Manager of Dart River Safaris and Funyaks replied, in part, as follows: Dart River Safaris (DRS) would like to advise the TAIC that we are carrying out the following procedures to comply with the recommendations that TAIC has recommended after the report: 1. DRS is drawing up new procedures to ensure that both the communication and recording of daily hazards such as private jet boats complies with the suggestions of the report and is agreed by all operators. This will be completed no later than the end of October 2003. A copy of the procedures will be included into the SOP and authorities will also be sent a copy.	

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03-203 *continued*	03 3125 *continued*			2. DRS are meeting with Queenstown Lakes District Council, local Harbourmaster and DWA on the 3rd of October to discuss and resolve any identified issues / recommendations that were raised in the report. 3. DRS is going to propose a change in daily operating procedures to mitigate any potential dangers with both .other. commercial users and private users when entering and exiting the Rockburn stream. We have identified this area as a medium risk level for traffic using the Dart River/Rockburn confluence with motorized or non-motorised craft.	

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
04-208	04 3476	**Jet boat CYS, propulsion failure and capsize, Waimakariri River, 13 May 2004** On 13 May 2004, a party of 18 passengers hired 2 jet boats to take them for a trip on Waimakariri River, north of Christchurch. At the conclusion of the trip, at about 1700, while the driver of CYS was manoeuvring back onto the boat's trailer, the reverse duct jammed in the down, or astern, position. The driver tried to rectify the problem, but the boat was caught in the swift flowing current and was swept towards a motorway bridge, less than 100 m downstream. The driver tried to manoeuvre the boat, but he was unsuccessful and it collided with one of the bridge supporting piers. On impact, the downstream side of the boat rode up against the pier causing the back of the upstream side to become submerged, allowing water to enter the hull. The boat quickly filled with water, tipping the occupants out and capsizing.	On 16 November 2004 the Commission recommended to the owner of Jet Stream Tours Limited that he: Undertake a hazard identification audit of his operation, with special regard to the particular risks associated with operating from a launching ramp close to a bridge, where strong river currents may be experienced. 077/04 Instigate regular training of his drivers, paying particular attention to unexpected events so that they can react automatically. 078/04	On 3 December 2004 the owner of Jet Stream Tours Limited replied: I have recently completed a risk identification and evaluation of our operation (23 Nov 04). This audit covered aspects such as severity, frequency and a final risk rating. This is still in draft form until discussed with the companies drivers for their feedback. With regard to the Bridge Piles, (Hazard ID #006) we are in contact with Ecan to see if we can remove 1 steel fence post and replace the guard cable with a removable chain so we can put our passenger jetty in closer to the ramp area.	It is the opinion of the Maritime Safety Authority that the drivers physically check the fit of all lifejackets prior to passengers getting onboard the jet boat. It is recommended that the Maritime Safety Authority include hours of operation into Maritime Rule Part 80. The hours of operation to read, “Jet Boats are only to operate between sunrise and half an hour before sunset except where "night operating" is the specific purpose of the trip and is provided for in the approved safe operational plan.”

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04-208 *continued*	04 3476 *continued*	The driver and most of the passengers were thrown clear of the boat and managed to make it to shore a short distance below the bridge. However, one passenger was missing. The second boat was sent to check the upturned hull, which was being swept down the river. As the other boat neared the upturned hull, the missing passenger swam free and was picked up. There were no injuries, but the jet boat CYS suffered significant damage to its engine and electronics. Safety issues identified included: • modification and design of the reverse latch assembly and the detent in the brake rod • adequacy of driver training and the risk management of the jet boat operation Safety recommendations were made to the owner of Jet Stream Tours Limited.		Also we have been in contact with Ready Mix Concrete who will (once the guard chain is removable) begin putting in a shingle wall on the downstream side of the ramp area out into the main flow. This will create a deep eddy on the upstream side and make a good holding pool and boat parking area in the ramp entrance for the general public. Currently the area can get silted up on the downstream side. 078/04 We will be having a training day on 5th December (subject to river and weather conditions). Special attention will be given to the Hazard Identification implementation of controls considered in the Hazard Audit. From this training day we will be able to assess what is possible and practical.	

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08-207	08 4894	**Report 08-207, Commercial jet boat Kawarau Jet No. 6, roll-over, Confluence of the Kawarau and Shotover Rivers, 25 September 2008** At about 1400 on 25 September 2008, a tour group of 22 non-English speaking overseas tourists, with a driver, departed the Queenstown Main Town Pier on what was intended to be a typical one hour jet boat excursion on the Shotover River. During the return journey the jet boat touched a sand bar at the meeting of the Shotover and Kawarau Rivers and rolled over coming to rest upside down. One passenger was trapped and drowned under the upturned boat, one other passenger suffered moderate injuries, while five other passengers suffered minor injuries. The boat received superficial damage. Boats often travelled across the bar when enough water was available to do so. The experienced driver of the accident craft had done so on 2 trips earlier the same day, and the practice was taught during driver training.	On 25 February 2010 it was recommended to the Director of Maritime New Zealand that she: Address the safety issue whereby in the event of an accident or incident, the emergency back-up radios are not capable of being used for communicating with either the rescue authorities or the boat's home base. 001/10	On 15 March 2010 the Director of Maritime New Zealand replied to the safety recommendations: 001/10 Draft rule „Part 82 — Commercial Jet Boat Operations" introduces a requirement whereby back up arrangements must be in place in case the primary means of communication fails. We consider the proposed rule change will address the intent of the recommendation. 002/10 Draft rule "Part 82— Commercial Jet Boat Operations" introduces a requirement that passengers be advised, before departing on any trip, of the specific risks they may experience during the trip. MNZ has also recommended to the "Review of Risk Management and Safety in the Adventure and Outdoor Commercial Sectors in New Zealand" that a pre trip risk warning is adopted as a general safety management principle across the adventure sector. We consider these two proposals will address the intent of the recommendation	No report – Prosecution taken

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08-207 *continued*	08 4894 *continued*	As the driver approached the bar he saw what he thought was clear water ahead of the boat but as he adjusted his helm to turn the boat upstream the bar appeared in front of the boat. The boat touched the bar as it was in a sliding turn to the right with the momentum causing it to flip and came to rest upside down.	Bring this report to the attention of the reviewers of adventure tourism in New Zealand, and ask them to consider how to deal with informing potential commercial jet boat passengers of the risks inherent with the activity. 002/10	.	
		Another jet boat travelling up stream parallel and close to the sand bar at the confluence had crossed ahead of the accident boat. It is highly likely that interaction between the hull of the passing jet boat and the river bank caused the water over the sand bar to recede into the main channel. This effect had not been considered in safety planning or driver training.	Address with the commercial jet boat industry that in spite of the requirements under Maritime Rules Part 80 and other safety initiatives taken by Maritime New Zealand: the issue of delivering meaningful pre-trip safety briefings to passengers, particularly where understanding of the English language is an issue, still remains. 003/10	003/10 The issue of delivering effective pre-trip safety briefings is the subject of a focused audit campaign. MNZ has also issued Safety Bulletin 18 to the sector reminding operators of their obligations in this area. The most recent jet boating newsletter also dealt with the issue. We consider this to address the intent of the recommendation.	
		The passenger who remained trapped and undetected under the upturned hull highly likely drowned before rescuers could reasonably determine that one was missing. There was sufficient space beneath the	the issue of accounting for passengers when multiple boats are involved during emergency response still remains. 004/10	004/10 The issue of accounting for passengers when multiple boats are involved during emergency response is also the subject of a focused audit campaign. We consider this measure will address the intent of the recommendation.	

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08-207 *continued*	08 4894 *continued*	upturned boat created by the roll bar for the driver and passengers to escape. Reasons for the deceased not escaping could have been entrapment, disorientation, inhalation of water owing to gasping reflex, flotation from lifejacket forcing the passenger up under the hull, or a combination of these. The operator has made a number of operating changes to reduce the risk of a recurrence including no longer crossing the bar involved, and requiring drivers to steer straight on to any bars or banks that cannot be avoided to minimise the risk of flipping or rolling over. Safety recommendations have been made to the Director of Maritime New Zealand to address a number of safety factors identified during the investigation that did not contribute to this accident or its outcome.			

Schedule 4 - Safety Recommendations by the Commission and MNZ/MSA and Responses to Commission Recommendations					
TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
08-207 *continued*	08 4894 *continued*	These recommendations were to: address the coverage limitations of emergency back-up radios bring to the attention of the reviewers of adventure tourism in New Zealand the lessons learned from this accident, and in particular, how to deal with informing potential commercial jet boat passengers of the risks inherent in the activity address with the commercial jet boat industry: the issue of delivering meaningful pre-trip safety briefings to passengers, particularly where understanding of the English language is an issue. the issue of accounting for passengers when multiple boats are involved during emergency response.			

Schedule 4 - Safety Recommendations by the Commission and MNZ/MSA and Responses to Commission Recommendations					
TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
09-201		**Report 09-201: collision: private jet-boat/private watercraft, Kawarau River, Queenstown, 5 January 2009** At about 1924 hours on 5 January 2009, a recreational jet-boat and personal watercraft collided almost head-on at high speed close to willow trees near the bank of the Kawarau River, Queenstown. None of the 3 persons on the jet-boat was wearing a lifejacket, so when the driver and front-seat passenger were ejected from the boat in the collision and probably rendered unconscious, they drowned. The third person received minor injuries. The driver of the personal watercraft and his passenger were both wearing lifejackets and despite the passenger being knocked unconscious and being critically injured, she survived. The driver was also seriously injured. Both craft were extensively damaged and declared total constructive losses.	When a speed uplifting is granted by local government organisations or by Maritime New Zealand, this is effectively a reversal of measures taken to mitigate a previously identified risk of accidents occurring between craft travelling at high speed and other recreational water activities. In the case of the Kawarau River, it is a safety issue that few additional measures have been taken to mitigate the additional risks that the speed uplifting has created. This situation probably exists on the Kaituna River and therefore could also exist in other waterways where the speed restrictions have been uplifted. A second safety issue is that there is an inconsistency between Maritime Rules Part 91 where speed upliftings applied for under Rule 91.21 require a risk assessment, and then if successful, public notification and notification in the Gazette, and speed upliftings enacted by navigation bylaws that are not subject to risk assessment, approval by the Director, and publication in the Gazette.	On 22 October 2010, the Director of Maritime NZ replied, in respect to the draft recommendation: The use of high speed craft in rivers has been a part of both recreational and commercial activity in New Zealand for several decades. This is possible only by the use of "speed upliftings" which exempt the area from the 5 knot speed restrictions near land. Almost every navigable river in the country has been uplifted or has large sections which are uplifted seasonally. From time to time a temporary uplifiting is issued, often for a specific event such as a jet-boat marathon. Speed uplifting are also used in rivers, lakes and coastal areas for activities such as water-skiing and PWC use. A range of safety issues are considered before a speed uplifting is issued. The safety of other users is given high priority. It is therefore rare to have areas where numbers of other users, whatever the water activity, are likely to present. The nature of the environment, particularly in relation to visibility and sufficient room to operate are also given careful consideration.	

Schedule 4 - Safety Recommendations by the Commission and MNZ/MSA and Responses to Commission Recommendations					
TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
09-201 *continued*		Speed was one of 2 main proximate causes of the collision. Both craft were travelling on the Kawarau River in an area where the speed limit of 5 knots within 200 m of the shore had been uplifted through a Council resolution, but neither vessel was travelling at a safe speed as required by Maritime Rules Part 22, Collision Prevention, because both craft were nearing a clump of willow trees that obstructed their view of any other craft or persons permitted to be in that area at the time. The second main proximate cause was the jet-boat's travelling at speed on the wrong side of the river at the time of the collision. The report discusses the general issue of recreational boat users not being required to demonstrate an in-depth knowledge of the collision-prevention rules; knowledge that could have made both drivers more aware of their responsibilities to travel at a safe speed at all times, regardless of any uplifting of speed restrictions.	The Commission recommends that the Director of Maritime New Zealand and the Chief Executive of Local Government New Zealand address these 2 safety issues through the appropriate forum with local government organisations with a view to achieving an appropriate level of safety and consistency in safety standards on affected inland waterways. 002/11	When speed restrictions (namely the requirement for craft not to exceed 5 knots within 200 metres of shore or 50 metres of another vessel) have been uplifted, the onus is placed on the applicant to ensure the safety of other river users. When MNZ issues a temporary speed uplifting in the areas under its jurisdiction, the responsibility for safety of all users is placed on the applicant who requested the uplifting. This is made clear and an example of a temporary uplifting is included below: MARITIME RULES PART 91, NAVIGATION SAFETY: SPEED UPLIFTING FOR EVENTS *In response to your letter dated xxxxx, I am please to advise that the Navigation Safety Rule will be suspended at XXXX, as set out below to hold power boat events.* *This uplifting applies only to the five knot restriction within 200 metres of the shore and within 50 metres of other vessels. All other requirements of the Navigation Safety Rule still apply.*	

<table>
<tr><th colspan="6">Schedule 4 - Safety Recommendations by the Commission and MNZ/MSA and Responses to Commission Recommendations</th></tr>
<tr><th>TAIC Investigation No.</th><th>MNZ Investigation No.</th><th>TAIC Accident Summary</th><th>TAIC Recommendations</th><th>Responses to TAIC Safety Recommendations</th><th>MNZ Recommendations and Opinions</th></tr>
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<td>09-201
continued</td>
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<td>Lifejackets save lives and would likely have prevented the deaths of the 2 jet-boat occupants in this case. The report discusses the requirement or otherwise to wear lifejackets in craft under 6 m in length. The Transport Accident Investigation Commission (Commission) does not make a recommendation to address this issue because recent educational programmes have had some success in this area, and some local government authorities have mandated wearing lifejackets in small craft. In other areas the wearing of lifejackets is left to the discretion of the person in charge of the boat.

One of the drivers had consumed a small quantity of alcohol prior to the collision, but probably not enough to impair his performance. Nevertheless, the Commission has looked at the available statistics on alcohol and fatal boating accidents and discusses recreational boating and alcohol, and the relationship between this and the licensing of recreational boat users.</td>
<td></td>
<td>While we can grant suspension of the Navigation Safety Rule we cannot close the lake to other users or craft, and you will have to clear this with the other users.

The dates to which this suspension applies are as follows:

<table>
<tr><th>Date</th><th>Event</th><th>Place</th></tr>
<tr><td>23 Oct 2010, 1600 to 1830</td><td>Power boat marathon.</td><td>XXXX</td></tr>
</table>

The granting of this approval is subject to the following conditions:

1. The safety of the public is of paramount importance and is your responsibility

2. Any oil or fuel spillage must be promptly and effectively dealt with. Any spillage shall be promptly reported to the appropriate Regional Council and Territorial Local Authority.

3. Any litter remaining after the event must be removed from the water or adjoining land so that the area is left in a tidy condition.</td>
<td></td>
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Schedule 4 - Safety Recommendations by the Commission and MNZ/MSA and Responses to Commission Recommendations					
TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
09-201 *continued*		The personal watercraft was travelling at an unsafe speed at the time of the collision because of its close proximity to the willow trees. The Commission has determined that commercial jet-boats routinely followed similar lines at unsafe speeds. The report discusses how the routine commercial jet-boat operations on the Kawarau River conflict with the requirement for all craft to travel at safe speeds, and how commercial jet-boat drivers, like recreational boat drivers, are not required by Maritime Rules to hold Maritime Documents that require them to have demonstrated an in-depth understanding of the collision-prevention rules. The discussion of commercial jet-boat operations and the uplifting of speed restrictions leads to an issue of whether adequate protections had been put in place to mitigate the risk to river users where a speed restriction had been uplifted, a restriction that had been put in place to protect other people engaging in leisure activities		*4. The even must be advertised in a local newspaper not less than seven or more than 14 days before each event.* *5. The advertisement must clearly identify the area to which it applies, give dates and times, the nature of the event and the responsible organising body.* *6. The club must obtain the approvals required by the territorial local authority.* *7. Emergency services shall be notified and arrangements made to respond as may be required.* When a speed uplifting is permanently in force, the advice to all water users is contained in bylaws and signage at boat launching places. While this situation has been in place for many years, there have been areas where safety concerns still exist. Parts of the Shotover River are effectively closed to other users when tourist jet-boat operations are taking place. It is possible for the authority which controls the	

Schedule 4 - Safety Recommendations by the Commission and MNZ/MSA and Responses to Commission Recommendations					
TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
09-201 *continued*		around shorelines from craft travelling at high speed. Six safety recommendations have been made to the Director of Maritime New Zealand (Maritime NZ), the Secretary for Transport, the Chief Executive of Local Government New Zealand and the Chief Executive of Queenstown Lakes District Council to address the safety issues where: • the process for uplifting speed restrictions is inconsistent and there is a lack of a formal assessment of the risks created in doing so • neither recreational boat users nor commercial jet-boat drivers are required to demonstrate knowledge of the collision-prevention rules • there are no limits for alcohol and other performance-impairing substances for recreational and commercial boat drivers, and no legal mechanism to test them for alcohol and other performance-impairing substances • there is a lack of mandatory requirements for head protection on personal watercraft and other craft involved in high-risk activities.		river to reserve areas for specific purposes, thereby effectively closing a river or an area when this is considered necessary on safety grounds. While boating speed restrictions have been put in place through Maritime Rules Part 91 and Navigation Safety Bylaws, these requirements can be considered as an addition/explanation to Maritime Rules Part 22 – Collision Prevention (in effect the International Regulations for Preventing Collisions). These regulations require all vessels to travel at a safe speed. While the "5 knot rule" is appropriate for operations on larger bodies of water such as lakes for in coastal areas, it has not been considered practical much of the time on rivers, hence the uplifting of the speed restriction in many rivers. An analogous situation exists on the country's roads, with the designated safe speed on many roads increasing from 50k/h to 100k/h on the open road. Rather than address the issue by putting in place additional safety measures, roads where it is sufficiently safe to operate at 100k/h (or some other limit) have	

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
09-201 *continued*				been identified. The same consideration is given to safety before speed in an area is uplifted for boating activities. In summary, therefore, MNZ considers that there are sufficient legal remedies in place under existing legislation for both regional councils and MNZ to address any additional safety risks that may arise from the uplifting of speed restrictions on rivers.	
			On 16 March 2011, the Director of Maritime NZ, replied to the final recommendation: In respect of the second safety issue raised under this recommendation, MNZ expects to meet with Local Government NZ prior to the end of June. No reply was available from Local Government New Zealand at the time of print.	On 16 March 2011, the Director of Maritime NZ, replied to the final recommendation: In respect of the second safety issue raised under this recommendation, MNZ expects to meet with Local Government NZ prior to the end of June. No reply was available from Local Government New Zealand at the time of print.	
			On 16 March 2011, the Director of Maritime NZ replied to the final recommendation: Maritime Rule Part 82, which incorporates a new licensing system for jet boat drivers, is scheduled for introduction in October 2011.	On 16 March 2011, the Director of Maritime NZ replied to the final recommendation: Maritime Rule Part 82, which incorporates a new licensing system for jet boat drivers, is scheduled for introduction in October 2011.	
			On 16 March 2011, the Manager Maritime and Freight of Ministry of Transport replied to the final recommendation:	On 16 March 2011, the Manager Maritime and Freight of Ministry of Transport replied to the final recommendation:	

Schedule 4 - Safety Recommendations by the Commission and MNZ/MSA and Responses to Commission Recommendations					
TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
09-201 *continued*			Maritime Rules Part 80 required commercial jet-boat drivers to undergo a minimum of 50 hours training before being licensed to drive commercial jet-boats, but the Rule did not require the drivers to hold formal Maritime Documents requiring them to demonstrate an in-depth knowledge of the collision-prevention rules (Maritime Rules Part 22) and other maritime skills required of drivers of other types of commercial craft. While acknowledging that some jet-boat operations do not require interactions with other craft (the Shotover Jet is one example), most commercial jet-boats operate on rivers and lakes where they must coexist with recreational and other commercial craft. The Commission recommends to the Secretary of Transport that he liaise with the Director of Maritime New Zealand to address this safety issue, either by a change to the Maritime Rules or through some other appropriate forum. 003/11	The recommendation proposes that the Secretary for Transport liaise with the Director of Maritime New Zealand to address the safety issue of commercial jet-boats‟ interactions with recreational and other commercial craft, either through a change to maritime rules or through another appropriate forum. Maritime New Zealand has developed a revised maritime rule for jet-boat operations, Maritime Rule Part 82, Commercial Jet Boat Operations (River). The rule is due to be submitted for the Minister of Transport‟s approval later this year, and if approved will come in to force on 1 October 2011. A key change under Part 82 is a requirement for operators to establish programmes of competency assessments to ensure the initial and ongoing competence of jet-boat drivers. One of the aims of the assessment requirements is to ensure that drivers are competent when transferring between different types of jet-boat and areas of operation, as well as to manage the risk of experienced drivers becoming over-confident.	

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
09-201 *continued*			While persons in charge of recreational craft are not required to demonstrate an in-depth knowledge of Maritime Rules around collision avoidance, the risk of collisions and other mishaps will be elevated, increasingly so with increases in recreational boating activity. It is recommended that the Secretary for Transport address this safety issue by recommending rules or some other mechanism that require the person in charge of a designated recreational craft to hold a licence or certificate that requires them to be appropriately educated to identified standards. 004/11 Some commercial jet-boats on the Kawarau River have been travelling at unsafe speeds in contravention of Maritime Rules. A similar situation probably exists on the Kaituna River, and possibly on rivers in other areas as well. It is recommended that the Director of Maritime New Zealand and the Chief Executive of Local Government New Zealand work with local authorities to address this safety issue. 006/11	Maritime New Zealand has advised that the structured training programme for competency assessments is likely to include testing for knowledge of relevant maritime rules, including Part 22, Collision Prevention These arrangements, once implemented, are expected to give effect to recommendation 003/11.	

Schedule 4 - Safety Recommendations by the Commission and MNZ/MSA and Responses to Commission Recommendations					
TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
09-201 *continued*			Three of the 5 persons involved in this accident received serious head injuries and 2 of these died as an indirect result. There are a number of other activities where the benefit of wearing a helmet has been recognised: cycling, snow skiing, motorcycling, white-water kayaking and white-water rafting to name a few. Given the protection they can provide, it would seem that wearing them on a personal watercraft would be wise and there may be a case for it to be mandatory. Whether wearing a helmet in a jet-boat or any other craft capable of high-speed is practicable will require some research. It is recommended that the Director of Maritime New Zealand work with the National Pleasure Boat Safety Forum and the New Zealand Jet Sports Boating Association on an educational campaign for the voluntary wearing of safety helmets on personal watercraft engaged in high risk water activities, with a goal of mandating their use. 007/11		

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TAIC Investigation No.	MNZ Investigation No.	TAIC Accident Summary	TAIC Recommendations	Responses to TAIC Safety Recommendations	MNZ Recommendations and Opinions
09-203	09 5020	**Report 09-203, jet boat, DRJS-11 grounding and subsequent rollover Dart River, near Glenorchy, 20 February 2009** Momentary driver distraction led to a tourist jet boat striking and overturning on a midstream gravel bank in the Dart River, near Glenorchy, at about 1545 on 20 February 2009. The driver and 3 of the 18 passengers suffered injuries, while the boat received minor damage to its hull and moderate damage to its canopy. The jet boat was on the plane down-river towards Lake Wakatipu when the experienced driver pointed out a flock of geese taking flight to passengers. The driver then realised the boat was heading too close to a gravel bank, but his attempted course correction came too late to avoid the grounding, which he tried to manage with adjustments to helm and throttle. However, the boat rolled slowly onto its port side and slid along the bank on its side for a short time before coming to rest on its canopy.	On 19 May 2010 it was recommended to the Director of Maritime New Zealand that she address the following safety issues: That distraction of jet boat drivers when driving at high speeds that require a high degree of concentration had not been identified as a risk to the operation and was the main factor contributing to this accident. This could be an issue to address across the industry. 011/10 There was no means of preventing the uncontrolled escape of fuel from the fuel tank vents when the boat was inverted and these vents were located above the emergency exit from the passenger compartment. 012/10 That this jet boat fitted with a canopy did not have the path of emergency exit from the passenger compartment clearly marked and explained to the passengers during the safety briefing. 014/10	On 29 April 2010 the Director of Maritime New Zealand replied to the safety recommendations Please note we agree with and accept three of your safety recommendations as follows: 6.1.1 The distraction of jet boat drivers when driving at high speeds that require a high degree of concentration had not been identified as a risk to the operation and was the main factor contributing to this accident. This could be an issue to address across the industry. (011/10) This hazard will be identified to operators during routine liaison visits, which will also assist MNZ to determine the scale of the problem across the sector. Operators' management of the hazard will be monitored and assessed during subsequent audits. MNZ will then assess whether further action, such as a Safety Bulletin, is necessary. Report 09-203 | Page 17 6.1.2 There was no means of preventing the uncontrolled escape of fuel from the fuel tank vents when the boat was inverted and these vents were located above the emergency exit from the passenger compartment. (012/10)	

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09-203 *continued*	09 5020 *continued*	The occupants escaped by kicking out windows as directed by the driver, with most exiting onto the bank. Two passengers exited into the river, where one became soaked in petrol running out of a tank vent. The post accident handling of the situation by the driver and company was well coordinated Safety issues identified in the investigation included: the potential difficulty of removing the canopy in a deep-water situation or if the boat were inverted; the passengers? inability to hear the entire pre-trip safety brief; the poorly marked emergency exit windows; and the fuel vent's design, allowing fuel to leak out from the upturned boat and above the exit windows. The Transport Accident Investigation Commission has made recommendations to the Director of Maritime New Zealand: to encourage proper recognition of driver distraction in jet boat operations; regarding the marking of emergency exits from enclosed boats; and regarding the design and placement of fuel vents.		MNZ is following up with Dart River Safaris Ltd. and their authorised person to determine that changes to the fuel breather system, made since the accident, satisfactorily address this hazard. Only one other New Zealand operator has jet boats with enclosed canopies. In that instance the fuel valves are placed well away from the emergency exits. Any new commercial jet boats with canopies will be inspected prior to commencing operation to ensure this hazard has been addressed. 6.1.4 That this jet boat fitted with a canopy did not have the path of emergency exit from the passenger compartment clearly marked and explained to passengers during the safety briefing. (014/10) *New draft rule Part 82, which is intended to replace the present Part 80, will propose that emergency exits on boats fitted with canopies should be clearly marked as such. The need to identify the exit during safety briefings will be followed up during liaison visits with the two operators who have canopy type boats.*	

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09-203 *continued*	09 5020 *continued*		6.1.3 That in the event of an emergency on board a commercially operated jet boat there was no easily-accessible quick-acting means to isolate electrical power and fuel systems including fuel venting arrangements. This could be an issue to address across the industry. 013/10	Please note we are unable to accept the following recommendation until further work is undertaken: 6.1.3 That in the event of an emergency on board a commercially operated jet boat there was no easily-accessible quick-acting means to isolate electrical power and fuel systems including fuel venting arrangements. This could be an issue to address across the industry. *We will undertake work to determine the scale of the problem across the sector, including an assessment of whether this is a viable and cost effective option.*	

Transport Accident Investigation Commission

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