Office of the Chief Investigator
Transport Safety

Marine Safety Investigation
Report No 2013/02

Passenger Fatality

MV Moonraker

Port Phillip Bay

13 December 2013

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THE CHIEF INVESTIGATOR

The Chief Investigator, Transport Safety is a statutory position under Part 7 of the *Transport Integration Act 2010*. The objective of the position is to seek to improve transport safety by providing for the independent no-blame investigation of transport safety matters consistent with the vision statement and the transport system objectives.

The primary focus of an investigation is to determine what factors caused the incident, rather than apportion blame for the incident, and to identify issues that may require review, monitoring or further consideration.

The Chief Investigator is required to report the results of an investigation to the Minister for Public Transport or the Minister for Ports. However, before submitting the results of an investigation to the Minister, the Chief Investigator must consult in accordance with section 85A of the *Transport (Compliance and Miscellaneous) Act 1983*.

The Chief Investigator is not subject to the direction or control of the Minister in performing or exercising his or her functions or powers, but the Minister may direct the Chief Investigator to investigate a transport safety matter.

SAFETY SUMMARY

What happened

On 13 December 2013, the charter vessel MV Moonraker was on a dolphin and seal swim cruise in the southern part of Port Phillip Bay. At the first stop at Chinaman's Hat, passengers entered the water to swim with seals. With the vessel drifting near the platform, passengers entered and exited the water via a transom deck and swim platform at the vessel's stern.

Due to the prevailing tide and wind, the vessel drifted away from the swimmers. To bring the vessel back towards the swimmers, the Master engaged astern propulsion on the starboard propeller. During this manoeuvre, a passenger who was standing on the swim platform jumped into the water, went under the stern of the vessel and was struck by the rotating propeller. The passenger suffered fatal injuries.

What was found

The Chief Investigator, Transport Safety found that the passenger entered the water following a misunderstanding with a crew member. The passenger was pre-occupied with having his photograph taken and probably did not realise that the boat was moving astern.

It was also found that the vessel's safety management system did not adequately identify the hazard and associated risk of a passenger being struck by a propeller after entering the water while the vessel was manoeuvring. The control of this risk through passenger management, vessel conning position and a number of other potential operational practices was not documented in the safety management system.

What's been done as a result

Moonraker Charters has modified its practices for swim operations and passengers are no longer permitted to remain on the swim deck while the vessel is manoeuvring. The safety management system has also been updated to identify 'propeller strike' as a hazard. A number of instructions have been created to document vessel practices including the use of the auxiliary (aft) conning position during a swim activity, passenger oversight, passenger briefing and the requirements for master-crew communication.

The Australian Maritime Safety Authority (AMSA)—the safety regulator—has provided information sessions on safety management systems to small commercial vessel operators and Transport Safety Victoria, as a delegate of AMSA in Victoria, has indicated an intention to evaluate safety management systems of dive and swim craft.

Safety message

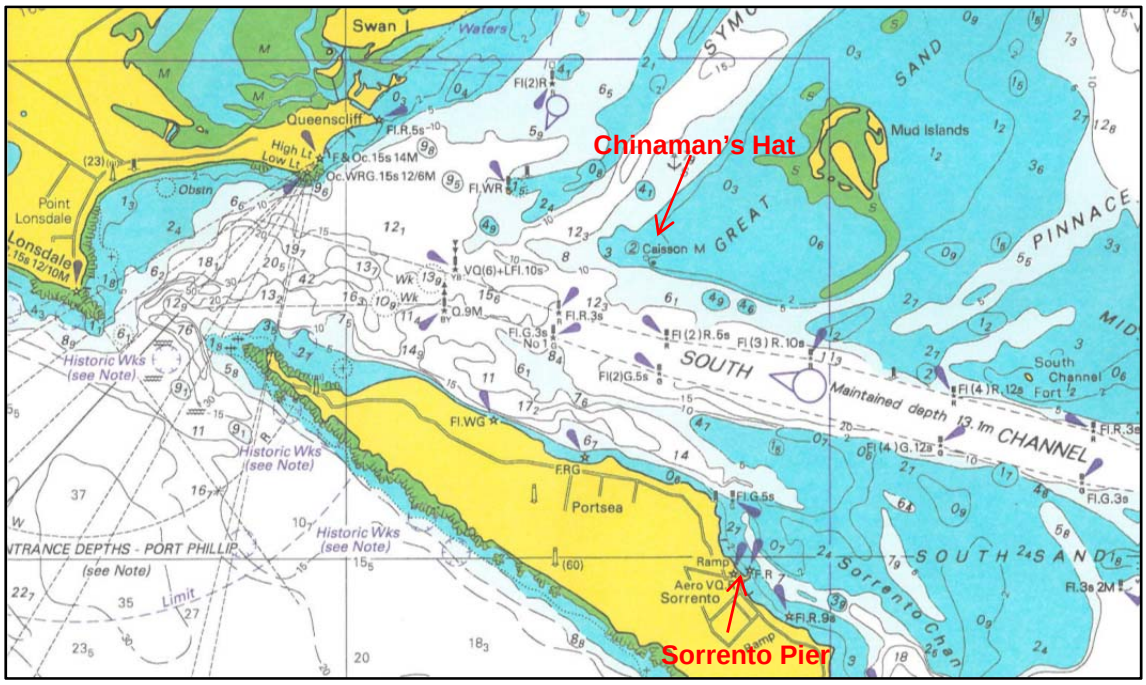
Owners and operators of passenger carrying vessels must ensure that for their specific operations, all hazards to passengers are identified and that the associated risks are appropriately controlled and documented in the vessel safety management system.

1. THE OCCURRENCE

1.1 Sorrento to Chinaman's Hat

At about 0900 on the morning of 13 December 2013, the Victorian registered vessel MV Moonraker departed Sorrento Pier on a dolphin and seal swim tour in Port Phillip Bay. On board were the Master, three crew and 19 passengers. The first scheduled stop was at a small wooden structure colloquially known as Chinaman's Hat (see section 1.2) to swim with the seals.

Figure 1: Southern Port Phillip and the location of Chinaman's Hat



Source: Extract from Chart AUS143, Australian Hydrographic Office

After departing Sorrento, the passengers were given a safety briefing by one of the crew who was to act as their swim guide during the cruise. Some passengers recalled being advised not to embark or disembark (via the stern swim platform) while the vessel was moving and that swimmers in the water should not approach the vessel until given the 'all clear' from the crew member on board the vessel. However, a number of passengers reported that they did not pay attention to the safety briefing – some due to engine noise, others because they were concentrating on donning their gear and one passenger could not understand English.

The vessel arrived at Chinaman's Hat at about 0930. The vessel stopped close to and south-east of the structure with its stern facing towards it and preparations were made for the seal swim.

At Chinaman's Hat the sea conditions were benign. The wave height was less than half a metre and there was no swell. There was a light south westerly wind of about eight knots and an incoming tide of about two knots. The depth of water was about six metres and the water temperature about 19^0 Celsius. The sky was partly cloudy and the air temperature was about 15^0 Celsius.

1.2 Chinaman's Hat

Chinaman's Hat is an octagonal structure serving as a haul-out[1] for local Brown Fur seals in the South Channel of Port Phillip.

Figure 2: Chinaman's Hat

The structure and the surrounding waters are managed by Parks Victoria[2]. There are no fixed mooring points or platforms near the site, and visiting vessels can either drift or drop anchor. There are no anchoring restrictions in the vicinity of the structure.

1.3 Event sequence

With the Master operating the vessel from the main conning position inside the wheelhouse, the vessel approached Chinaman's Hat stern-first. When the signal was given, a small group of passengers jumped into the water and swam towards the structure followed by one crew member acting as a swim guide. The second swim guide entered the water a little later along with the main body of passengers. Three passengers remained on board, one seated at the aft end of the main deck and the other two were seated near the main cabin bulkhead.

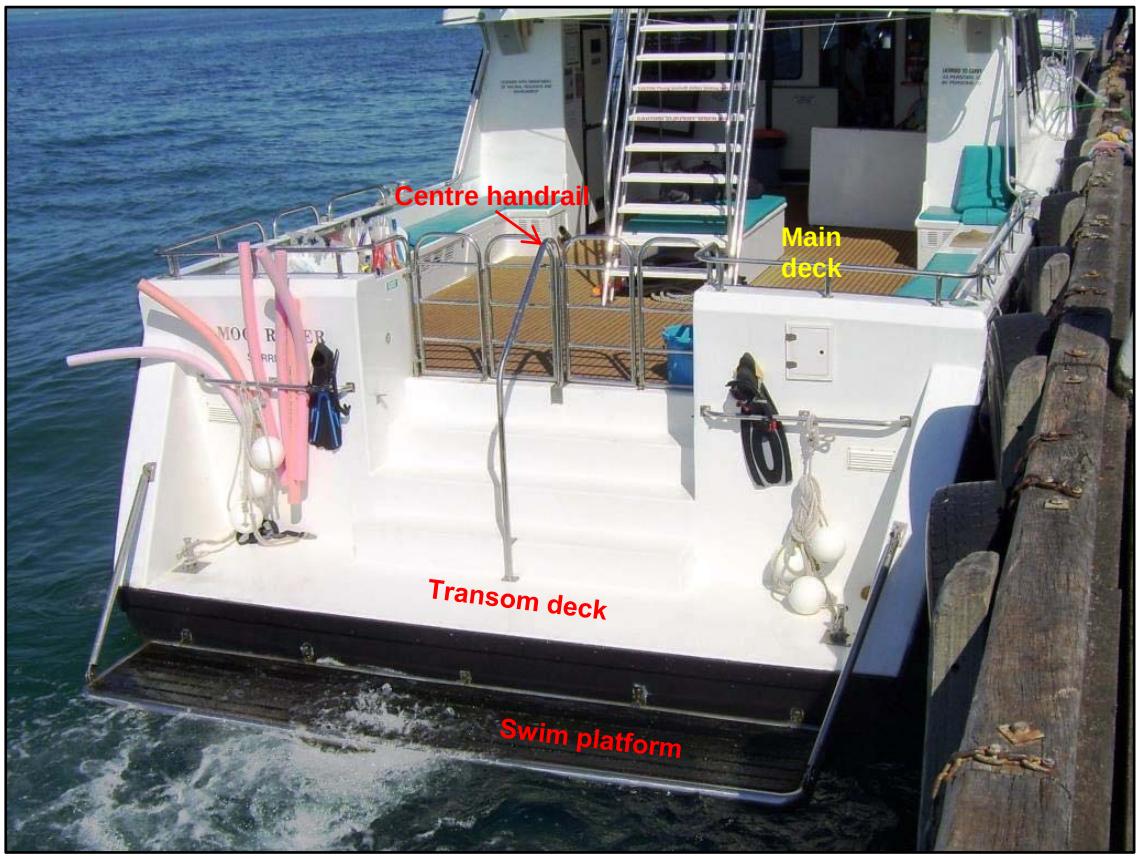
The third crew member assisted passengers into the water at the swim platform and then was stationed on the main deck adjacent to the centre handrail (Figure 3) acting as the look-out. The Master was operating the vessel from the main conning position inside the wheelhouse.

A short while later two passengers returned to the vessel and sat down on the swim platform, one on either side. At this time the engines were idling with the propellers disengaged and the Master was standing on the main deck alongside the deck look-out.

[1] Haul-out is the behaviour associated with temporarily leaving the water between periods of foraging activity.
[2] Parks Victoria, created under the *Parks Victoria Act 1998,* is the local port manager for Port Phillip Bay.

The passenger on the starboard side of the swim platform then asked the deck look-out to take a photograph of him. This also entailed the crew member retrieving the passenger's mobile phone from a bag. There was reportedly some confusion between the passenger and the look-out over the crew's operation of the camera function of the mobile phone. To witnesses, the passenger appeared impatient.

Figure 3: Aft section of MV Moonraker



Around the same time, the Master asked whether any of the passengers would like to get back into the water and the passenger sitting on the port side of the swim platform indicated that he would. Due to the wind and an in-coming tide of about two knots[3], the vessel had drifted some distance away from the swimmers that were still in the water.

The Master returned to the wheelhouse and engaged the starboard engine to astern propulsion and the vessel started moving slowly astern towards the swimmers. Witnesses recalled noticing the change in the deck vibration and the wash over the swim platform.

As the boat was manoeuvring astern and after the look-out had taken a photograph of the passenger standing on the starboard side of the swim platform, the same passenger asked if the look-out could take a photo of him in the water, to which the look-out replied 'yes'. The passenger then immediately jumped into the water.

On seeing the passenger jump, the look-out shouted 'no' and two passengers shouted 'stop'. The Master heard the shouts and in response, stopped the starboard engine, then gave a short kick ahead on the port engine to reduce the vessel's astern momentum. The sequence of these events occurred in a matter of seconds.

[3] One knot is one nautical mile per hour or 1.852 km/h.

A short time later the passenger reappeared at the stern. The Master by this time had arrived at the transom deck and with the assistance of the look-out, a swim guide and other swimmers, the injured passenger was brought back on board. The passenger had suffered severe lacerations. First aid was applied and the Master called emergency services. After retrieving all other swimmers, the Moonraker returned to Sorrento Pier. Ambulance services met the vessel at the pier and first aid was continued but the passenger could not be saved.

2. CONTEXT

2.1 The crew

2.1.1 The Master

The Master had operated the MV Moonraker in the waters of Port Phillip since 2002. On this trip the Master was also acting as the Chief Engineer. At the time of the incident the Master held a Certificate of Competency as Master Class 5 issued by the Department for Planning and Infrastructure, Western Australia in December 2002 and revalidated until June 2018; and a Certificate of Competency as Marine Engine Driver Grade 3 issued by Marine Safety Victoria[4] in November 2004 and renewed until November 2014.

The Master had been issued with a Certificate of Local Knowledge for the port waters of Port Phillip and Queenscliff by Marine Safety Victoria in October 2003 that had expired in October 2013. A Certificate of Local Knowledge is issued as verification that the holder is familiar with the waters in which they will operate a vessel. Given that the Master had been operating in these waters for several years, the lapse in currency of this certificate is not considered to have been a factor in this incident.

After the incident the Master was breathalysed for alcohol consumption and registered a zero result. The Master's work schedule over the previous three days indicated that there was adequate opportunity for rest although, the night before the incident the Master's sleep was disrupted.

2.1.2 The crew

There was no regulatory requirement for the crew to hold a formal maritime qualification.

The deck look-out had about eight years experience on swim charter vessels, and had been working on Moonraker for about two years. The look-out also held a Dive Master Instructor Licence and a qualification in Dive and Resort Management. The look-out's work schedule over the previous three days indicated that there was adequate opportunity for rest.

The other two crew members acting as swim guides each had about four years experience on swim charter vessels. One swim guide was certified to master a vessel up to 12 metres in length in Tongan local waters and had worked in Tonga as a dive master's assistant. He had worked on Moonraker for about 16 weeks over two seasons. The other swim guide had just completed the training course leading to a Certificate of Competency as Coxswain and had worked on Moonraker for about two weeks. At the time of the incident they were in the water and did not witness the incident.

[4] The Victorian maritime regulatory agency responsible for crew certification at that time. Certification functions are now performed in Victoria by Transport Safety Victoria under delegation from the Australian Maritime Safety Authority.

2.2 The vessel

2.2.1 Certification

The extant vessel certification for MV Moonraker had been issued by Transport Safety Victoria (TSV) and was current and valid. A Certificate of Survey had been issued on 10 November 2011 and a Safe Construction Certificate on 13 December 2012. This certification permitted Moonraker to operate on Port Phillip Bay with a total complement of 84 persons.

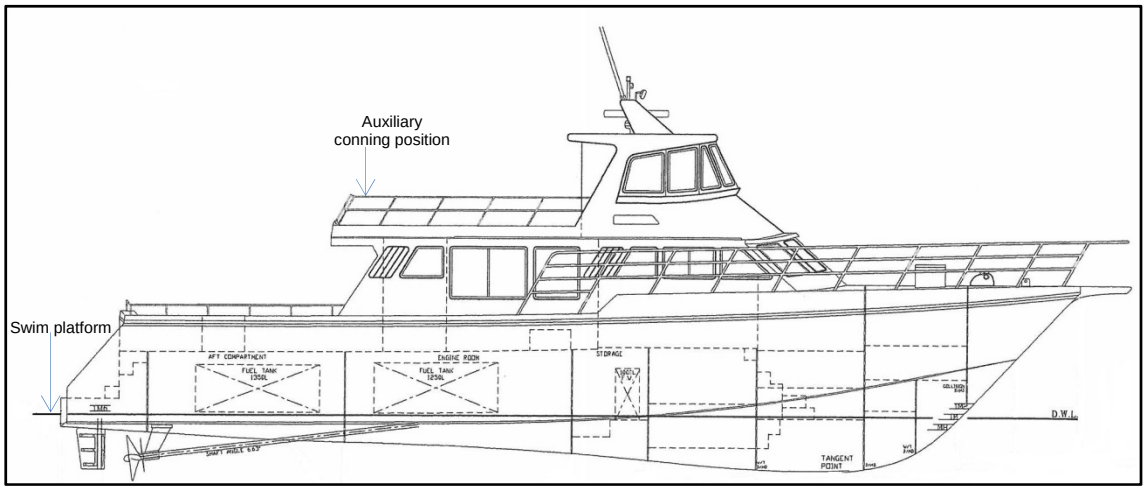
The vessel certification required crewing by a Master (holding a Certificate of Competency as Master Class 5), an Engineer (holding a Certificate of Competency as Marine Engine Driver Grade 3) and one general purpose hand (no qualification requirement). The Master was permitted to hold the Engineer qualification in which case an additional general purpose hand was to be carried in lieu. The crewing on the day of the incident met these certification requirements.

2.2.2 Configuration

MV Moonraker is a custom built dive charter boat of GRP construction, built by Sea Chrome Marine in Fremantle, Western Australia in October 1997 for Moonraker Charters in Sorrento, Victoria and since delivery had been operating in the waters of Port Phillip. The vessel's structure and equipment complied with the requirements of the Uniform Shipping Laws Code and the National Standards for Commercial Vessels.

Moonraker had a length overall of 20.6 metres, a beam of 5.5 metres and a draft of 1.6 metres. The upper deck comprised an enclosed wheelhouse and an open half-deck aft, with seating. The main deck housed an enclosed section for passenger seating and an open deck area aft. There were four steps leading down from the main deck to the transom deck. The owners had added a swim platform about 800 mm wide to the transom. The swim platform was of an aluminium frame construction with wooden boards and was installed at the level of the waterline.

Figure 4: MV Moonraker profile



Source: Moonraker Charters.

Propulsion was supplied by two 447 kW Caterpillar diesel engines, each driving an inward turning propeller, giving the vessel a maximum service speed of about 23 knots.

The propellers were Veemstar, 4-bladed fixed-pitch with a diameter of 850 mm and pitch 975 mm. The lowest point of each propeller blade was about 1300 mm below the waterline, 1300 mm forward of the transom and about 2100 mm from the edge of the swim platform.

The Master reported that when manoeuvring astern at the time of the incident, the port engine was idling and the starboard engine was operating at approximately 700 RPM, corresponding to a propeller RPM of about 280. The Master recalled observing that the vessel's speed over ground[5] at that time was about 0.8 knots.

2.2.3 Conning position

There were three conning positions on the vessel. The main conning position was located on the port side of the wheelhouse and adjacent to the vessel's navigational equipment. A secondary conning position was located on the starboard side of the wheelhouse and was used mainly when berthing the vessel starboard side to the wharf. A third (auxiliary) conning position was located outside the wheelhouse at the aft, port corner of the upper deck (Figure 4).

To switch conning positions, the controls at the active position would be set to 'neutral'. The operator could then move to an alternate conning position and by pressing a button, activate that control. All three conning controls were reported to be in working order at the time of the incident.

From the auxiliary conning console located aft on the upper deck there was a clear view of the swim platform and the swimmers and there was easy two-way communication (verbal and visual) between the Master and a deck look-out located on the main deck. In contrast, the conning positions in the wheelhouse afforded limited visibility aft and the potential for effective communication between Master and deck look-out was limited.

2.3 Charter operations

2.3.1 Licensing of operations

The vessel operator had been issued with a Tour Operator Licence by Parks Victoria (the waterway manager) that permitted the conduct of tourism and recreation business activities on Public Land Areas in Victoria. A provision of this Licence was that Moonraker Charters comply with (the guidelines contained in) Adventure Activity Standards[6]. These guidelines addressed issues regarding: duty to warn participants of risks; pre-activity documentation; competency of guides and look-outs; and responsibilities of those operating the activity.

In addition, a Marine Mammal Permit had been issued by the Department of Environment and Primary Industries (DEPI), Victoria, for the conduct of Whale (Dolphin) Swim Tours. There was no permit required for swimming with the seals.

[5] A speed over ground of 0.8 knots equates to a speed through water of about three knots, based on an opposing current of about two knots (estimated from the tide tables for Port Phillip).

[6] Adventure Activity Standards : Snorkelling, SCUBA Diving & Wildlife Swims, Edition 2 - April 2005, written by the Outdoor Recreation Centre Inc.

2.3.2 Overview of operations

Moonraker Charters operated dolphin and seal swim tours of about three-hours duration from November to April each year. Each tour typically stopped for between 20 and 30 minutes each at South Channel Fort, Chinaman's Hat (seal swim) and Pope's Eye. Dolphin swims were not at pre-arranged locations and were dependent on the sighting of dolphins. The vessel would drift and passengers were allowed a short swim in the vicinity of the dolphins.

The vessel did not anchor at the swim sites. The Master reported that the time taken to drop the anchor then retrieve it would make it impractical. Additionally the Master was of the view that with the vessel swinging at anchor, maintaining a look-out to swimmers would be more difficult and passengers could be required to swim around the vessel to get to and from the swim location.

2.4 Safety management system

2.4.1 Moonraker safety manuals

Moonraker Charters had developed a *Safety Management System Manual* for the MV Moonraker prior to the regulatory requirement of 1 July 2010 and submitted it to the safety regulator (TSV) but did not receive any feedback from the regulator regards its content or appropriateness. Two additional manuals supported the vessel's tour operations: the *Employee Manual for Operations, Passenger Emergencies, and Health and Safety*, and *The Guides Guide.*

As a suite of manuals, there were gaps in the identification and management of some risks associated with a swim activity. Specifically, the safety management system did not identify the potential hazard of 'propeller strike'. As a consequence the control measures to manage the associated risk were not clearly documented. The manuals did not adequately address the safety management of passengers during a swim activity, embarkation and disembarkation from the swim platform, look-out responsibilities during safety critical operations, the use of the auxiliary vessel conning positions for swim activities and the specific risks associated with operating propulsion during a swim activity.

2.4.2 Preliminary passenger information

In accordance with the Adventure Activity Standards and the company's safety manuals, the vessel was required to obtain information from passengers regarding their previous snorkel experience, swimming ability, medical issues or understanding of English. Passengers on the vessel at the time of the incident indicated that they were not asked for this information.

2.4.3 Safety briefings

The safety manuals specified that the Master would provide the initial safety briefing over the PA system and the crew would demonstrate the location and use of the lifesaving equipment. In practice, the initial safety briefing was carried out by the swim guide when the passengers were mustered on the main deck, after departing the wharf. The crew did not have a pro-forma of the safety briefing to refer to.

The safety manuals specified that a second passenger briefing was to be delivered by the swim guide prior to the vessel arriving at the swim site. This briefing informed swimmers about the site and provided information about interacting with the animals.

On this trip both briefings were conducted concurrently by the swim guide when departing the wharf.

2.4.4 Swim activities

For the swim activity, vessel procedures stated that passengers had to assemble on the main deck in their swim gear and when given the signal, move to the transom deck and be seated. When the Master advised that it was safe to do so, the guides were to enter the water first and would then signal to the passengers to follow.

The safe procedure for entry into the water was by sitting on the swim platform and 'sliding' into the water. Vessel procedures required one swim guide for every 10 swimmers, their function being to corral the swimmers and to oversee their safety in the water, including their return to the vessel.

The deck look-out's duty was to assist passengers to get into and out of the water and at other times to stand at the centre handrail on the main deck and maintain a look-out. The role of the look-out included communicating with the Master on passenger movements into and out of the water and clearances around the vessel.

The procedures did not specify any signals to alert swimmers that the vessel was operating astern propulsion.

2.4.5 Crew training

Moonraker Charters operated two vessels on dolphin and seal swim tours, and the deckhands and swim guides were interchanged according to operational requirements. New crew were provided with on-the-job training and paired with an experienced crew member until they were deemed proficient.

2.5 Regulatory oversight

2.5.1 The regulator

Transport Safety Victoria (TSV) is the State regulatory authority responsible for the efficient and safe operation of vessels on State waters, including the regulation of waterways and the management of ports. Until 30 June 2013, TSV was also responsible for the certification of Victorian commercial vessels and crew.

From 1 July 2013, commercial vessels and crew were governed by the provisions of the *Marine Safety (Domestic Commercial Vessels) National Law Act 2012* and the associated certification functions performed by TSV under delegation from the Australian Maritime Safety Authority (AMSA). In accordance with the *National Law Act*, all existing certificates and conditions issued by the State Regulator continued to apply until such time that the owner of a vessel applied for a new Certificate of Operation or 1 July 2016, whichever was the earlier.

2.5.2 Regulatory requirements for safety management systems

In recent years, the requirement for a safety management system (SMS) for domestic commercial vessels has been introduced into legislation. While the SMS framework was well established in shipping[7], this regulatory requirement and its adoption by the small commercial vessel sector was relatively new.

The SMS requirement for domestic commercial vessels was formally mandated in the *Marine Safety Regulations 2009*. These regulations stipulated that by 1 July 2010 every Victorian commercial vessel was to have an SMS in accordance with Part E Operational Practices of the *National Standard for Commercial Vessels (NSCV)*.

The requirement for an SMS was affirmed by the *Marine Safety (Domestic Commercial Vessels) National Law Act 2012* that took effect in Victoria on 1 July 2013, and *Marine Order 504 (Certificates of Operation-National Law) 2013* that in turn referenced Part E of the NSCV.

Part E specifies minimum requirements for the safe operation of domestic commercial vessels. It promotes the development of an on-board safety culture and provides a framework to assist the identification of hazards, analysis of risks, and the implementation of measures that eliminate, minimise or control those risks. Compliance with the requirements of Part E are in the form of a documented Safety Management System (SMS) that, amongst other things:

- provides for safe practices in vessel operation and a safe working environment; and
- establishes means of identifying hazards and then eliminating or reducing risk to an acceptable level.

SMS should be tailored to the specific vessel and its operations. Information received from the respective States and the Northern Territory maritime agencies indicated that they do not regularly audit vessels' safety management systems.

2.6 Previous incidents (commercial vessels)

2.6.1 Victoria

In Victoria, there have been two reported incidents of propeller strike involving a commercial vessel in the previous 10 years. In 2008, a snorkeller was severely injured when the vessel was manoeuvred astern as the swimmer attempted to board the vessel at its transom[8]. In the second incident, a diver had an uncontrolled ascent and came in contact with the vessel's propeller.

2.6.2 Queensland

There have been two recorded incidents of propeller strike in Queensland in the previous five years. In the first case, a crew member was struck by the propeller when he tried to push the vessel off a sand bank. In the second instance, a snorkeller came in contact with the idling outboard motor of a tender.

[7] The International Convention for the Safety of Life at Sea (SOLAS) is an international treaty that specifies minimum maritime safety standards including the requirement for vessels to have a safety management system.
[8] Office of the Chief Investigator, Marine Safety Investigation Report No 2008/13.

2.6.3 New South Wales

There have been no recorded propeller strike incidents involving a commercial vessel in New South Wales in the previous ten years. The only recorded propeller strike event was in 2010 involving a cadet of the Australian Defence Force Academy who was severely injured when he was struck by the propeller of a small vessel after falling overboard.

2.6.4 Other Australian jurisdictions

The other States and the Northern Territory have not had any propeller strike incidents involving a commercial vessel reported in the previous five years.

2.6.5 New Zealand

There have been two incidents of propeller strikes reported in the previous four years. The most recent incident occurred earlier this year (2014) when a passenger seated at the stern transom of a catamaran (with unguarded propellers) believed that they had been given the go-ahead to get into the water and did so, not realising that the vessel was still operating astern propulsion and was struck by the propeller. Prior to this incident, Maritime New Zealand ran a series of industry workshops on commercial swimming operations and the hazards associated with unguarded propellers and have announced that they will be issuing new guidelines for commercial swimming operations later this year.

2.7 Protecting swimmers from propeller strike

2.7.1 Propeller guards

Propellers can be guarded to reduce the risk of propeller strike on swimmers. Guards are most commonly used on small craft where there is an identified risk to swimmers that requires this mitigation. Guards of various types are available and can enclose the propeller to varying degrees. Propeller guards add drag to the vessel and normally have some impact on propeller performance and vessel manoeuvrability.

For vessels the size of Moonraker, guards that permanently guard the propeller are not a common fixture due to the implications on vessel performance. Any guarding arrangement on vessels of such size would more likely be deployed only when the vessel was stationary or manoeuvring at low speeds.

2.7.2 Mooring and anchoring

The risk of propeller strike can be effectively eliminated by mooring or anchoring the vessel prior to disembarking the passengers. This is a common, although not mandated, practice in many parts of Australia where fixed mooring points or platforms are installed at popular visit locations.

2.8 Master's response

The Master reacted appropriately to the passenger jumping in the water by stopping the starboard propulsion. The Master then operated the port engine ahead for reportedly a fraction of a second in an attempt to slow the vessel. While this action was well intentioned and a decision made instinctively, it was not an appropriate response given the proximity of the swimmer to the vessel.

3. SAFETY ANALYSIS

3.1 Passengers on swim platform during vessel manoeuvres

The vessel's safety procedures during swim activities were based on the experience of the Master and Moonraker Charters. Perhaps due to the absence of any propeller strike or near-miss event in many years of operation, the operator considered the practice of allowing the passengers onto the transom deck and swim platform while the vessel was manoeuvring to be safe.

With passengers located on the swim deck or transom deck, there existed the realistic potential for a passenger to fall or intentionally enter the water at an inopportune moment. Furthermore, although the procedures stated that the swim guides get into the water first and then signal the passengers to follow, in practice this was not enforced, increasing the potential of passengers getting into the water without permission. The operator did not document this hazard and had not implemented appropriate controls to guard against the associated risks. One possible control measure was to have passengers return to the main deck and close the access handrail between the main and transom decks prior to engaging propulsion and manoeuvring the vessel.

3.2 Misunderstanding between crew member and passenger

The passenger entered the water following a misunderstanding with a crew member. In attempting to be helpful, the crew member agreed to take a photograph of the passenger in the water, never intending that to be construed as permission for the passenger to enter the water immediately. Whereas, from the passenger's perspective, the crew's response must have been understood as giving tacit permission to enter the water.

3.3 Passenger behaviour

Witnesses indicated that in the lead up to the incident the passenger had become impatient with the crew member's attempts to take a photograph of him standing on the swim platform. The pre-occupation with this activity acted as a distraction and probably contributed to him not recognising or forgetting that the vessel was manoeuvring astern.

3.4 Conning position

The conning position for the Master during swim activities is an important risk control measure that was not documented within the operator's safety manuals. Whether conning from the auxiliary position would have changed the outcome of this incident is not known. However, conning from the wheelhouse heightened the risk of the swim activity due to the reduced visibility of the Master to the stern of the vessel and by limiting communication between the Master and deck look-out.

3.5 Safety management system

Propeller strike injuries are not common in Victoria or other parts of Australia. However, when they occur the repercussions are often serious. Due to the low likelihood of this type of event, the risk—a combination of likelihood and consequence—can often be masked. This is where a structured risk assessment process should reveal the extent of the risk. Risk controls can then be introduced and evaluated in a structured manner. The outcome of this process is a rational and well considered safety management system (SMS).

The SMS manual developed by Moonraker Charters did not document the hazards and risks associated with swim activities and propeller strike. As a result there was no transparent consideration of the risks and the potential controls to manage those risks. In addition to those absent controls identified as individual safety factors—physical passenger management (see 3.1) and conning arrangements (see 3.4)—there existed a suite of other potential controls that should have been more carefully and transparently considered. Other options in the potential suite of risk controls for swim activities included fixed mooring arrangements at regularly visited swim sites, options for anchoring, systems that might guard the propellers, creating embarkation points away from the propellers, the improved definition of crew duties during safety critical operations and enhanced passenger safety briefings.

3.6 Regulatory guidance and oversight

The development of a safety management system (SMS) based on risk assessment requires specialist skills often not found in the small commercial vessel industry. The opportunity to ‘buy in’ those skills is often limited and an SMS will be ineffective if the operator does not have full understanding and ownership of their system.

In Victoria, as in most other Australian States and Territories, there has been limited regulatory oversight of the implementation of SMS complying with Part E of the National Standards for Commercial Vessels. An effective audit regime coupled with an education program has the potential to enhance compliance and support the industry to maximise the potential safety benefits from the SMS framework.

4. FINDINGS

The following findings are made with respect to the fatal injury of a passenger struck by a rotating propeller of MV Moonraker at Chinaman's Hat on 13 December 2013. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

Safety issues or system problems are highlighted in bold to emphasise their importance. A safety issue is an event or condition that increases safety risk and: (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations; and (b) is a characteristic of an organisation or a system, rather than a characteristic of a specific individual, or characteristic of an operating environment at a specific point in time.

4.1 Contributing factors

1. Passengers were permitted to congregate on the swim platform while the vessel was manoeuvring. This was standard operational practice for swim activities and increased the potential for passengers to jump or fall into danger. **[Safety Issue]**

2. There was a misunderstanding between the passenger and a member of the crew. When the look-out agreed to take a photograph of the passenger in the water, the passenger must have understood that to mean that he could enter the water immediately, whereas that was not the intended message of the crew member.

3. The passenger jumped into the water while the vessel was manoeuvring astern.

4.2 Other factors that increased risk

4. The operator's safety manuals did not specify the use of the auxiliary conning position for particular vessel manoeuvres or activities. Conning from the wheelhouse increased risk for the swim activity. **[Safety Issue]**

5. The operator's safety management system did not adequately document the hazards and risks associated with swim activities. There was a suite of operational considerations associated with swim activities that should have been transparently considered and the risk controls clearly documented. **[Safety Issue]**

6. There has been limited regulatory guidance to and oversight of the domestic commercial vessel industry's adoption of safety management systems. The industry is fragmented, has limited resources and has struggled to take full advantage of the SMS framework. **[Safety Issue]**

5. SAFETY ISSUES AND ACTIONS

The safety issues identified during this investigation are listed in the Findings and Safety issues and actions sections of this report. The Chief Investigator, Transport Safety expects that all safety issues identified by the investigation should be addressed by the relevant organisation(s). In addressing those issues, the Chief Investigator, Transport Safety prefers to encourage relevant organisation(s) to proactively initiate safety action.

Any person or body who has assisted the Chief Investigator, Transport Safety with this investigation or to whom the report may be relevant were provided with a draft report and invited to provide comment.

5.1 Passengers on swim platform during vessel manoeuvres

Number:	2013-02-001
Issue owner:	Moonraker Charters

Safety issue description

Passengers were permitted to congregate on the swim platform while the vessel was manoeuvring. This was standard operational practice for swim activities and increased the potential for passengers to jump or fall into danger.

Proactive action taken by Moonraker Charters

Moonraker Charters has updated its safety management system to include procedures that enhance passenger control during entry to and exit from the water. An instruction has been added specifying that passengers must never remain on the swim platform, and that the platform was only to be used to enter or exit the water.

Chief Investigator, Transport Safety comment in response

Effective implementation of these control measures will reduce risk associated with the swim activity.

5.2 Conning position during swim activities

Number:	2013-02-002
Issue owner:	Moonraker Charters

Safety issue description

The operator's safety manuals did not specify the use of the auxiliary conning position for particular vessel manoeuvres or activities. Conning from the wheelhouse increased risk for the swim activity.

Proactive action taken by Moonraker Charters

Moonraker Charters has updated its safety management system to include instruction that during a swim activity, the Master will only operate the vessel from the auxiliary (rear) conning controls on the upper deck.

Chief Investigator, Transport Safety comment in response

Effective implementation of this control measure will reduce risk associated with the swim activity.

5.3 Safety management system

Number:	2013-02-003
Issue owner:	Moonraker Charters

Safety issue description

The operator's safety management system did not adequately document the hazards and risks associated with swim activities. There was a suite of operational considerations associated with swim activities that should have been transparently considered and the risk controls clearly documented.

Proactive action taken by Moonraker Charters

Moonraker Charters has updated its safety management system for MV Moonraker to include the hazard of 'propeller strike'. The control measures identified for this hazard and the associated risk pertain to passenger briefings, oversight of passengers by crew, master-crew communication and ensuring the propulsion machinery is out of gear when swimmers are returning to the boat. These measures are supported with more detailed instructions. There are additional measures embedded in the updated instructions that also contribute to managing this risk, although the linkage to the risk is not clearly documented.

Chief Investigator, Transport Safety comment in response

Effective implementation of the control measures documented in the updated safety management system will reduce risk associated with the swim activity. The measures are largely procedural and will require rigor in their implementation.

While it is beyond the scope of this investigation to undertake a comprehensive review of the updated safety management system, preliminary review of safety management system indicates there is scope for further improvement.

Chief Investigator, Transport Safety recommendation

It is recommended that Moonraker Charters undertakes a further review of the safety management system to provide more transparent linkages between the risk of 'propeller strike' and the complete suite of control measures, and to enhance the clarity of the instructions in support of these measures. Passenger access to the transom deck (platform) should also be more clearly addressed.

5.4 Regulatory oversight of safety management system

Number:	2013-02-004
Issue owner:	Australian Maritime Safety Authority

Safety issue description

There has been limited regulatory guidance to and oversight of the domestic commercial vessel industry's adoption of safety management systems. The industry is fragmented, has limited resources and has struggled to take full advantage of the SMS framework.

Proactive action taken by Australian Maritime Safety Authority and Transport Safety Victoria

In direct response to the event, Transport Safety Victoria acting as a delegate of the Australian Maritime Safety Authority issued a prohibition notice requiring modification of the safety management system of MV Moonraker to address risks associated with swim activities. Transport Safety Victoria has also indicated an intention to evaluate safety management systems of other dive and swim craft and look more closely at the risks and control measures associated with swim activities.

The Australian Maritime Safety Authority has provided information sessions on safety management systems to small commercial vessel operators around Australia, including Victoria, and has indicated an intention to partner with sector associations to assist the owners and operators of domestic commercial vessels to prepare operation-specific safety management systems in accordance with Part E of the National Standard for Commercial Vessels.

Chief Investigator, Transport Safety comment in response

Effective implementation of an education program including partnering with sector associations will assist in addressing this safety issue.

The advised regulatory response, to evaluate safety management systems (SMS) on other dive and swim craft, will assist in addressing this safety issue in this sector. However, there are opportunities to consider more broadly the regulatory oversight of SMS for small commercial operations. Specifically, there is considered significant scope for developing a more robust and strategically focussed SMS audit regime.

Chief Investigator, Transport Safety recommendation

It is recommended that AMSA and its delegate Transport Safety Victoria implement an effective audit regime to support the small commercial vessel industry to maximise the potential safety benefits of the SMS framework.