Office of the Chief Investigator
Transport and Marine Safety Investigations

Marine Safety Investigation
Report No 2008/10

LC873

Collision

Police Vessel VP02-08

and Recreational Vessel LC873

Near the entrance to Patterson River Port Phillip

1 November 2008

VP02-08

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THE CHIEF INVESTIGATOR

The Chief Investigator, Transport and Marine Safety Investigations is a statutory position established on 1 August 2006 under Part V of the *Transport Act 1983*.

The objective of the position is to improve public transport and marine safety by independently investigating public transport and marine safety matters.

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. In conducting investigations, the Chief Investigator will apply the principles of 'just culture' and use a methodology based on systemic investigation models.

The Chief Investigator is required to report the results of investigations to the Minister for Public Transport and/or the Minister for Roads and 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 Act 1983*.

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

EXECUTIVE SUMMARY

On the night of 31 October 2008, the Victorian recreational vessel LC873 with five persons on board was anchored off the entrance to Patterson River in Port Phillip Bay. At the same time, the Victoria Water Police vessel VP02-08 with two persons on board was engaged in patrolling the waters on the east side of Port Phillip Bay.

At about 0253[1] on 1 November 2008, VP02-08 was travelling north from Mornington when it collided with LC873. Both vessels sustained severe damage to their bow sections above the waterline but were able to return to shore unassisted. The five occupants of LC873 claimed to suffer bruising.

In their evidence, the master and crewman of VP02-08 stated that they did not detect LC873 visually or by radar, alleging that LC873 was not illuminated. The occupants of LC873 claimed that the anchor light was illuminated.

At the time of the incident there was a south south-westerly wind of about 6 to 10 knots causing sea waves up to about half a metre in height. There was also a southerly swell of up to about one and a half metres in height. The visibility of small vessel lights at that time was reported to be between half and three-quarter nautical mile. At the time of the incident the master of VP02-08 reported that his radar display was malfunctioning.

This report analyses the reasons why VP02-08 did not detect LC873 either visually or by radar and makes the following recommendations:

- That Victoria Water Police update its vessels' standard operating procedures and that police officers undergo training in human factors awareness and fatigue management.

- That Marine Safety Victoria reviews the necessity for small vessels to install radar reflectors when operating in exposed waters and the requirement for operator licensing and education and carriage of safety equipment for recreational vessels at anchor.

[1] All times denoted are in Australian Eastern Daylight Saving Time.

1. CIRCUMSTANCES

1.1 The incident

At about 2230 on 31 October 2008, the Victorian registered recreational vessel LC873 with five persons on board was launched from Patterson River boat ramp and proceeded down river. It anchored at about 2300 about 0.65 nautical miles[2] to the north-west of the entrance to Patterson River reportedly in 29 feet (8.8 metres) depth of water. The occupants of LC873 said that soon after they anchored, the anchor light was switched on and all other lights were switched off.

At about 2245 that same evening, the VWP (Victoria Water Police) vessel VP02-08 departed its base at Williamstown to patrol the east side of Port Phillip Bay. The vessel proceeded via the Port Melbourne Shipping Channel to Fawkner Beacon then to Wooley Reef before arriving at the Mornington Pier at about 0050 on 1 November 2008. After a crew meal break, VP02-08 resumed its patrol, at about 0155. The master reported that on the return trip, VP02-08 travelled at about 16 to 18 knots[3] in a general northerly direction (see Appendix A) along the charted 10 metre depth contour line.

When VP02-08 was about half a nautical mile south of Patterson River entrance, the master and crewman observed the anchor lights of three or four vessels on their port side and confirmed the sighting by radar. Soon after this, the master stated that he saw "for only an instant a white object appear directly in front and to the bottom right of his windscreen." The sighting was immediately followed by VP02-08 colliding with the object, which they subsequently identified to be a small vessel.

The time of collision was recorded by VP02-08 as 0253 and the position recorded on its GPS was $38^0$04.18'South $145^0$06.43'East. The master and crewman of VP02-08 alleged that the other vessel was in total darkness and that after the collision they observed the vessel switch its lights on. VP02-08 turned around and returned to the other vessel. At the same time VP02-08 radioed the water police RCC (Rescue Coordination Centre) at Williamstown to inform the duty officer of the situation.

The occupants of each vessel ascertained the extent of damage to their vessels and injury to personnel. LC873 then started its engines and proceeded up river returning to the Patterson River ramps. VP02-08 was too large to enter the river and requested the RCC to despatch a land unit to the ramp to meet LC873. VP02-08 then returned to its base at Williamstown accompanied by another patrol vessel.

LC873 was met at the boat ramp by a police land unit and statements were obtained from the occupants of the vessel. A short time later, a water police unit arrived at the ramp to inspect LC873. They noted that the navigation lights and anchor light of LC873 were operating satisfactorily but found that the vessel did not carry the requisite flares and was short of one lifejacket.

[2] One nautical mile is 1852 metres.
[3] One knot = one nautical mile per hour.

1.2 Consequences

VP02-08: The starboard bow was holed over an area approximately 1050 mm x 550 mm commencing approximately 1230 mm aft of the stem bar. There was moderate water ingress. The two occupants reported that they did not receive any injury.

LC873: The bow up to about 900 mm aft of the stem bar was crushed and askew with guardrails broken. The anchor rope holding cleat was severed causing the vessel to be adrift. The keel board was split allowing some water ingress. The five occupants reported receiving minor bruising.

Figure 1: Damage to LC873

Figure 2: Damage to VP02-08

2. FACTUAL INFORMATION

2.1 Background

An occupant of LC873 had entered the Tea Tree Snapper Fishing Competition which was due to run from 2200 on 31 October 2008 until 1400 on 1 November 2008 in Port Phillip Bay and Westernport Bay. There were four other persons who accompanied him.

VP02-08 was on a patrol of the waters of Port Phillip Bay specifically between Williamstown and Mornington. The principal task for this patrol was to ensure that vessels entered in the fishing competition did not block the shipping channels and did not fish or anchor in prohibited areas. The patrol also had a function to enforce the provisions of the Marine Act and Regulations.

2.2 Personnel

2.2.1 Master, VP02-08

At the time of the incident the master was steering the vessel.

The master of VP02-08 had about 25 years experience, having commenced his career as a deckhand with the VWP in 1983. He obtained his Certificate of Competency as Coxswain in June 1984 through MBV (Marine Board of Victoria[4]) and since that time took command of water police vessels up to 12 metres in length, operating in Port Phillip Bay.

At the time of the incident the master held a Certificate of Competency as Master Class 5 with Local Knowledge endorsements for the ports of Port Phillip, Melbourne and Geelong issued in December 1990 by MBV and a Certificate of Competency as Marine Engine Driver Grade 1 issued in September 2002 by MSV (Marine Safety Victoria). Both certificates were confirmed valid for use by MSV.

During the course of his career the master had also completed all VWP mandated internal training and short courses appropriate to his rank and experience, including a radar refresher course on 28 October 2008. He was reportedly not suffering from any medical condition that would render him unfit for duty. The report of his last medical examination conducted about two years prior indicated that he was fit for duty.

The master's stated schedule of work and rest for the previous three days was as follows:

- 29 October, awoke at 0500 for a day shift from 0700 to 1900 and went to bed at about 2200;
- 30 October, rostered day off, awoke at about 0700 and went to bed at about 2200;
- 31 October, awoke at about 0700, worked in his laboratory throughout the day and reported for duty at 2100.

The master was breathalysed immediately on returning to the VWP station. The result indicated zero alcohol content.

[4] The Marine Board of Victoria was replaced by Marine Safety Victoria in February 2002 by an Act of Parliament.

2.2.2 Crewman, VP02-08

At the time of the incident the crewman was providing look-out assistance, monitoring the navigational equipment and general deckhand duties.

The crewman aboard VP02-08 joined the water police branch in April 2006 and since that time has acted as crewman on various VWP vessels operating in Port Phillip Bay. He did not hold any commercial qualifications but a few days prior to the incident he passed the oral examination conducted by MSV, to obtain a Certificate of Competency as Coxswain. Prior to joining the water police branch, the crewman had about 15 years experience in various land based units of Victoria Police.

The crewman had also completed all VWP mandated internal training and short courses appropriate to his rank and his experience, including a radar refresher course on 28 October 2008. He was reportedly not suffering from any medical condition that would render him unfit for duty. The report of his last medical examination conducted in April 2008 indicated that he was fit for duty.

The crewman was on rostered leave from 1700 on 28 October and resumed duty at 2100 on 31 October 2008.

The crewman was breathalysed immediately on returning to the VWP station. The result indicated zero alcohol content.

2.2.3 Occupants, LC873

There were five persons on board LC873. The designated operator of LC873 claimed to have about 15 years experience on various size recreational vessels in Port Phillip Bay and Westernport Bay. He also had about 12 to 18 months experience as a deckhand on a commercial fishing charter vessel operating in Port Phillip Bay. He did not hold any marine qualifications or an RBOL (Recreational Boat Operator Licence).

Three other occupants of LC873 also claimed to have about 15 years or more experience on recreational vessels generally smaller than LC873. The fifth occupant of LC873 was on his first trip on a vessel. None of them held any marine qualifications or a current RBOL although one member had previously held an RBOL which expired in January 2008.

The operator of LC873 was breathalysed on arriving at the ramp. The result indicated zero alcohol content.

2.3 The vessels

2.3.1 VP02-08

VP02-08 (see Appendix B) is a Steber 40 enclosed cabin cruiser with a flybridge, of GRP (fibreglass) construction, built by Stebercraft Pty Ltd in 2008. It is owned and operated by the VWP as a patrol/search and rescue vessel. At the time of the incident the vessel was under survey with MSV. The vessel's area of operation was principally within Port Phillip Bay and Westernport Bay but it was certified to travel up to 100 nautical miles off the coast.

VP02-08 has an overall length of 12.34 metres, measured length of 11.99 metres, an extreme breadth of 4.7 metres and depth of 1.5 metres. The vessel has a draught of about one metre when in the displacement mode.

Propulsion power is supplied by twin six cylinder Yanmar 6CXM-GTE2 inboard diesel engines each of 364 kW propulsion power at 2,900 RPM driving twin inward turning 4-bladed fixed pitch propellers, giving the vessel a service speed of about 30 knots.

The certificate of survey indicated that VP02-08 should be manned by a Coxswain holding a local knowledge endorsement for the relevant port waters and a Marine Engine Driver Grade 3. Based on MSV advice during vessel commissioning, VWP was of the understanding that one person could hold both Deck and Engineering certificates of competency when operating within the confines of designated sheltered waters.

The vessel's navigational equipment complied with the requirements of the USL (Uniform Shipping Laws) Code. The wheelhouse was constructed to facilitate dual watchkeeping. On the starboard side was the Helm Station from where the vessel was navigated and vessel internal systems controlled. On the port side was the Observer's Station from where the navigation systems – radar, chart, sounder and GPS – were controlled.

Observer Station

Helm Station

Figure 3: Helm and Observer Stations

The wheelhouse forward windows complied with the requirements of the USL Code construction, size and visibility. They were constructed in three sections each of 725 mm width, with a window frame (strut) between each. The corner struts were about 180 mm wide and the two centre struts were about 162 mm wide.

When standing at the helm position, the starboard corner strut caused a blind sector of about 15 degrees, between about 35 and 50 degrees to the right of the helmsman and the starboard inboard strut caused an obstruction of about 11 degrees, between about 24 and 35 degrees to the left of the observer. The two struts on the port side would have caused similar blind sectors to the observer.

Each station had a Raymarine E120 electronic navigation display which incorporated the electronic chart, radar, GPS and fish finder (echo sounder). At the time of the incident, both displays were vertically configured to display the electronic chart in one half of the screen and the radar display in the other half. The master radar was controlled by the Observer Station and the slave display was with the Helm Station.

VP02-08 was equipped with an SOP (Standard Operating Procedure) booklet specific to the vessel, which provided guidance to persons operating the vessel regarding their duties, OH&S matters, and checks and procedures required at various stages of vessel operations including "Speeds to be observed".

However, the SOP did not provide guidance with regard to the allocation of duties to a two person navigation team (bridge team management), fitness for duty/taking over the

watch, preferred look-out arrangements and guidance on the characteristics and limitations of the vessel's radar. The allocation of roles and responsibilities for the navigation team was decided by the master.

2.3.2 VP02-08 manoeuvring characteristics

Following the recommissioning of VP02-08 after the collision, the vessel's manoeuvring characteristics and navigational equipment were checked. The checks were carried out in daylight hours. The wind was from the south south-west at about 20 knots with seas one to one and a half metres in height. The sky was overcast and visibility was clear.

Vessel handling in following seas:

- At a speed of about 10 to 12 knots the vessel yawed considerably, sometimes up to about 20 degrees each way with slight rolling and pitching. The vessel vibration was minimal.
- At a speed of about 15 to 16 knots the vessel held steady on course, occasionally yawing up to about five degrees each way. The vessel experienced slight vibrations and occasional pitching and rolling.
- At a speed of about 18 to 20 knots the vessel held a steady course but experienced moderate to severe vibration, pitching, pounding and rolling. At this speed the vessel reached 'semi-planing' mode.

Stopping distance and turning ability:

- The vessel was driven at a speed of about 18 knots in following seas. From a pre-determined position the stopping distance (full ahead to stop engines) was measured by GPS to be about 45 metres and when turning around, the maximum distance off from that pre-determined position was about 130 metres.

Radar displays:

- The radar was operated for about two hours on various range scales. The tuning was set on 'automatic', and anti-sea clutter was adjusted manually. The investigation noted that the radar range scale was linked to both displays and could not be individually adjusted.
- Both screens displayed targets clearly, picking up small vessels (similar to LC873) and sail boats at about one and a half to about two nautical miles range. The targets were easily detected on the screen but appeared to lose strength when plotted on the heading marker (targets directly ahead) and were sometimes hidden or appeared intermittently.
- The investigation did not detect any radar malfunction or other interference. Sea clutter was set at minimum and did not affect the detection capability of targets at close range.
- The electronic chart displays could be set to different range scales.

2.3.3 LC873

LC873 (see Appendix B) is a Huntsman 23 half cabin cruiser with a flybridge, of GRP (fibreglass) construction built by Huntsman Marine in 1984. At the time of the incident the vessel was registered as a recreational vessel with VicRoads. It is owned by a private citizen.

LC873 has an overall length of seven metres, an extreme breadth of three metres and depth of 1.25 metres. The water-stained mark around the hull indicated that the vessel normally operated at a draught of about 60 centimetres.

Propulsion power is supplied by a V-8 cylinder Mercury Mercruiser 898 inboard petrol engine of 224 kW propulsion power at 4400 RPM driving a right hand single screw 3-bladed fixed pitch propeller, giving the vessel a service speed of about 20 knots.

The vessel's navigational equipment consisted of a GPS receiver, a fish finder (echo sounder) and a hydraulic steering system. An inspection of the vessel post incident found that the navigation and anchor lights were of a type usually found on small recreational vessels however the vessel had the green sidelight fitted on its port side and the red sidelight fitted on its starboard side[5]. The anchor light was installed at a height of about 2.7 metres above the water line and provided unobstructed all round visibility. The vessel was not fitted with a radar reflector (see section 2.11).

The forward part of the vessel housed two bunks, which could be accessed either through the half cabin or through a hatch cover on the forward deck. The hatch cover was made of fibreglass and was opaque. The half cabin was located in the mid section of the vessel. On the starboard side was the helm station with steering and engine controls. The light switches were located on the dashboard behind the steering wheel. On the port side of the cabin was a table with a seat on each side (forward and aft). The vessel could also be navigated from the fly bridge.

Figure 4: Interior of LC873 after collision

Figure 5: LC873 Anchor light after collision

2.4 Waterway

Patterson River is about 33 kilometres south east of Melbourne in the suburb of Carrum. It connects Patterson Lakes to the eastern side of Port Phillip Bay. The section of river open to public access extends from the mouth of the river to about 2.8 kilometres inland, with depths of up to 3.5 metres. There are four public ramps situated on the south side of the river between 650 metres and one kilometre from the entrance.

The entrance to Patterson River has a length of rock wall on either side which forms a breakwater and is marked by lateral marks. The waters around the entrance are generally safe for surface navigation for vessels of draught up to 1.5 metres.

About 170 metres upriver from the breakwater entrance, the Nepean Highway crosses the river at an air draught of 5.4 metres above chart datum. There is a considerable

[5] In accordance with international regulations, the green sidelight should be fitted on the starboard side and the red sidelight on the port side.

amount of shore lights dotting the landscape on both sides of the entrance. The investigation noted that vessel lights and navigational markers close inshore were obscured by the shore lights when viewed from a distance offshore.

The 10 metre depth contour line between Mornington and Patterson River runs approximately parallel to the shore, ranging from about 0.4 to about 1.3 nautical miles off. At the river entrance, the depth contour was between about 1.1 and about 1.2 nautical miles off the shore line.

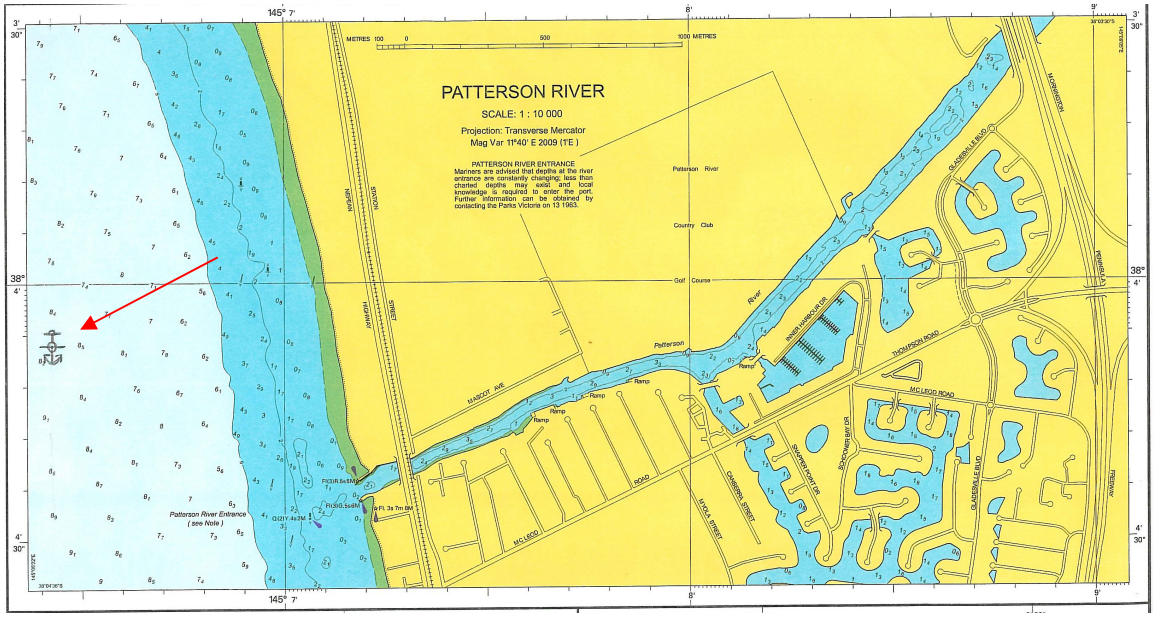


Figure 6: LC873 anchor position near the entrance to Patterson River. (see Appendix A for larger scale chart of the area)

2.5 Interview information and statements

2.5.1 The master, VP02-08

The master of VP02-08 stated that he awoke at about 0700 on the morning of Friday, 31 October 2008. He spent the day relaxing and working in his laboratory, but did not sleep. He stated that this was normal routine for him. The master reported for duty at about 2100 that day and stated that he took over the vessel VP02-08 at about 2230, along with another police officer who would act as his crewman for the remainder of the shift.

After completing a check of the vessel, the master stated that VP02-08 departed the wharf at about 2245. His general duties that night were to patrol the waters between the Patterson River and Mornington, in the general area where recreational vessels taking part in the snapper fishing competition were expected to be fishing.

The master stated that he patrolled the waters to ensure that the small vessels kept clear of the shipping channels, did not anchor or fish in prohibited areas and generally maintain the law and order and safety of the waterways. He stated that during a patrol, it was usual for the police vessel to go alongside other vessels to conduct compliance inspections however on this patrol, due to the sea conditions, VP02-08 had to maintain a safe distance from other vessels.

On this night, the master stated that he was in control of the vessel and took his place at the Helm Station, on the starboard side of the vessel. This side also had the 'slave' radar display and the engine throttles. The master was responsible for the navigation of the vessel whilst also checking the radar picture and maintaining a visual lookout generally from ahead to around the starboard side of the vessel.

The master stated that the crew member sat at the port side seat, which had the 'master' radar. He stated that the crew member was responsible for monitoring the radar and to maintain a visual lookout, observing visually from ahead and to the port whilst the master maintained forward vision and to the starboard. As a matter of routine practice they would randomly scan the horizon on the other side of the vessel. He stated that he also instructed the crewman to call out any targets observed visually or by radar.

VP02-08 headed into the Port Melbourne Channel and then headed south towards Fawkner Beacon and from there to Mornington. The master stated that the wind was blowing at about 20 knots from the south westerly direction and waves were up to two metres in height. There was no moon and the sky was overcast. The master stated that visibility was restricted with bow wave spray continually breaking over the forward wheelhouse windows necessitating the continuous use of the window wipers. He stated that he maintained a speed of about 16 knots so as to reduce the pitching of the vessel and the amount of spray breaking over the wheelhouse windows.

The master stated that during the voyage he set the navigational displays such that half the screen showed a radar picture and the other half showed the electronic chart plotter. The radar was set at three-quarter nautical mile range scale and the anti-sea clutter was adjusted to reduce the echoes from sea waves. The chart plotter was set to three nautical miles range. The master remained standing throughout while steering the vessel and the crewman was seated at the Observer Station on the port side.

The master stated that his radar display was malfunctioning. Every seven to 20 seconds his display would blank out and after about one to two seconds would illuminate to full brilliance, the brilliance then slowly reducing to its control setting. He stated that "although distracting, the chart link/radar unit was still useable". The master stated that the crewman's monitor also suffered similar malfunction but only on a few occasions.

VP02-08 encountered two small vessels near Wooley Reef. The master stated that the weather was not conducive to going alongside those vessels so they communicated with those vessels by marine radio, noting the registration details of the vessels and the licensing details of its occupants. VP02-08 then proceeded to Mornington, where it berthed at the pier at about 0050 on 1 November 2008. The master and crewman had a meal break there.

At about 0155 the master reported that VP02-08 resumed its patrol, heading in the general northerly direction along the charted 10 metre depth contour line. He stated that the navigational duties and the equipment were set the same as for the south bound trip. As the master's display was malfunctioning, the master stated that they monitored the crewman's display. The crewman was instructed to alert the master to any targets he observed on the radar or visually.

During the northbound trip the master reported that the wind had changed direction to blow from the north. The waves had reduced to about one to 1.5 metres. There was still a following sea. Bow spray was much less than on the southbound trip but the master still required to use the window wipers occasionally. He stated that he

maintained a speed of about 16 to 18 knots which by his judgement was comfortable for the vessel and crew and allowed steady headway with minimal bow spray. He also stated that what little ambient (internal vessel) light there was, did not affect his vision and the sky was still very dark.

The master stated that as VP02-08 approached Patterson River, he pointed out the river channel entrance lights to the crewman. A little later, he stated that his crewman alerted him to a cluster of about three or four vessels to the north-west, which he identified visually and by radar.

At this time VP02-08 was about one nautical mile to seaward and about half a nautical mile south of Patterson River entrance. He stated that the vessels were "well away to the west". During this time, the master stated that he continued to maintained visual and radar watch, scanning ahead and to the starboard side of the vessel.

The master stated that the vessels were on the port beam well away to the west when he suddenly observed a flash of white directly in front and to the bottom right of his windscreen. He stated that the "flash of white" was an object illuminated by the masthead light and starboard sidelight of VP02-08. At about the same time, the master stated that VP02-08 came in heavy contact with the object.

The master stated that he immediately stopped the engines and called out to the crewman that they had hit something. He then turned around in his seat and saw that VP02-08 had collided with a white coloured vessel. He stated that the vessel was in total darkness, he could not see any lights on that vessel.

The crewman proceeded aft and soon thereafter alerted the master that the vessel had turned its lights on. The master turned around to see a vessel now several metres astern of VP02-08. He stated that he now could see the vessel's starboard sidelight, anchor light and cabin lights.

The master reported the incident to RCC (police Rescue Coordination Centre) at Williamstown and simultaneously manoeuvred VP02-08 around to starboard to approach the other vessel. At about this time the master stated that the other vessel extinguished all its lights. The crewman came back into the wheelhouse to assess the damage done to VP02-08 and informed the master that the starboard bow had been holed above the waterline with minor flooding.

As VP02-08 approached the other vessel, the crewman went onto the forward deck to assess the other vessel and shouted to the occupants to turn their vessel's lights on. The crewman then started a conversation with the occupants of the other vessel but the master stated that he could not hear what was being said.

Soon after, the master observed the persons on the other vessel conducting checks of the vessel, when he saw a male person go to the stern and ignite a cigarette lighter and light up a cigarette. He stated that he heard his crewman shout to the person to extinguish the cigarette, which was complied with.

The master stated that shortly thereafter the vessel started its engine and proceeded under its own power towards the Patterson River. VP02-08 followed and the crewman came back to the wheelhouse. He stated that on enquiring with the crewman, he was informed that it was too dark to see the registration number of the other vessel and the occupants of that vessel did not know the number. The crewman also reported to the master that no one on board the other vessel needed medical attention.

The master transmitted this information to RCC and then handed the microphone to the crewman who requested land units to attend the Patterson River boat ramp. The master stated that VP02-08, due to its size, could not proceed through the mouth of the river.

The master and crewman then made another inspection of VP02-08 and made some emergency repairs to stem the flow of water into the vessel. They also rigged the bilge pumps to pump out the water inside the vessel. At that point another police vessel VP16 met up with them and escorted VP02-08 back to Williamstown.

2.5.2 The crewman, VP02-08

The crewman of VP02-08 stated that he awoke at about 0900 on Friday 31 October 2008. His day involved light home duties. He slept from about 1500 to about 1700 before travelling to the water police base to commence his duty at 2100. He stated that he was assigned as crewman of VP02-08 for that shift and that they were rostered to patrol Port Philip Bay in relation to the Tea Tree fishing competition.

The crewman stated that at about 2230 he and the master boarded VP02-08. He stated that he was assigned deckhand duties, assisting the master with lookout, radar observer and general deckhand duties. He stated that he was seated in the port side chair. He described his lookout role as observing the radar for targets and also to visually focus primarily from ahead to down the port side and to occasionally scan the whole horizon. In his evidence the crewman stated that he frequently shifted in his seat so as to see around the blind spots caused by the window frames.

With regard to the radar, the crewman stated that his display did not malfunction as severely as did the master's display. The crewman recalled that he experienced blanking of the screen about six times during the entire watch. He stated that there was a lot of sea clutter on the radar screen during the south bound trip but was considerably reduced on the northbound trip.

The crewman stated that during the shift he detected a number of vessels on his radar and was also able to visually identify them. He could not recall with certainty whether his first sighting of the vessels was visually or by radar. The crewman stated that he alerted the master to every vessel that he detected. He stated that he estimated the visibility to be about three-quarter nautical mile.

During the southbound trip the crewman estimated the wind to be blowing from a southerly direction at about 15 to 20 knots and the wave height was about one to 1.5 metres peaking to two metres. He estimated that the wind remained about the same on the northbound trip but the waves had reduced slightly, peaking at about 1.5 metres.

He stated that the south bound trip was uncomfortable due to frequent severe pounding. On the northbound trip, the crewman stated that the master adjusted the speed so that there was only moderate pounding with occasional yawing "but you had to hold on". He further added that after the incident, VP02-08 travelled back to Williamstown at very slow speed and that it was a smooth journey.

The crewman stated that VP02-08 was navigated approximately one nautical mile off and approximately parallel to the coast line. He stated that the sky was overcast but other vessels' lights appeared bright and clear against the dark background. Just prior to the incident, the crewman confirmed that he detected three or four vessels on the

radar some distance off on the port side and that he was able to identify them visually as well.

The crewman stated that he was monitoring the vessels on his port side when he felt VP02-08 jolt and heard a loud crunching sound on the starboard side. He stated that he went to the stern of the vessel and observed "a shape" off the starboard quarter and, when it was illuminated, he identified that shape to be a small vessel. The crewman stated that he reported to the master that the struck vessel had just turned its navigation lights on. At the same time the crewman observed the master calling RCC on the marine radio.

The crewman stated that he then went into the forward compartment of VP02-08 to assess the damage and observed water coming through a hole approximately 40 centimetres long above the bunk on the starboard side. He reckoned that the ingress of water was not severe enough to cause stability issues. The crewman reported the extent of damage to the master, then he went onto the starboard bow while the vessel was turned around to head back to the struck vessel.

On approaching the other vessel, the crewman stated that he observed it to be floating freely but had extinguished all its lights. He had to shout out to the occupants to switch the lights back on. About 20 to 30 seconds later he observed the sidelights and anchor light come on as well as a deck light illuminating the rear deck of the vessel. The crewman noted that the other vessel was approximately 26 feet in length with an inboard engine. He observed a male standing on the rear deck donning a yellow PFD (personal flotation device) who was joined by two other males.

The crewman stated that he called out to the occupants of the other vessel to verify whether there were any injuries and then told them to check their vessel for damage and whether it could be driven. He stated that he observed the vessel start to move under its own power and at about the same time he also observed a person at the rear flicking a cigarette lighter and lighting a cigarette. The crewman stated that he immediately shouted at that person to extinguish the cigarette. He stated that the person on the other vessel complied.

VP02-08 then followed the other vessel up to the mouth of the Patterson River. The crewman stated that he went back into the cabin and sent a message to RCC to request a land unit to intercept the boat at the ramp and establish the identification of the vessel and its occupants. VP02-08 could not follow the other vessel up the river and turned around to head back to Williamstown.

On the way back, the crewman stated that they made some emergency repairs to stem the ingress of water and re-rigged the bilge pumps to pump out the water in the forward locker. On the way back, VP02-08 was met by VP16 who escorted them to Williamstown.

2.5.3 Statements, other police officers

The two water police officers called by RCC to attend LC873 at Patterson River boat ramps, stated that they arrived at the boat ramp at about 0500. In their statements, the officers stated that when they arrived at the boat ramp, they saw a 23 foot 'Huntsman' recreational vessel with a damaged bow section and that police officers from a land unit were engaged in taking statements from the occupants of the vessel.

The officers stated that when they arrived, they observed the navigation lights and anchor light on the vessel flicking on and off several times as if, in their opinion,

someone was operating the switch or playing with the vessel's power supply. The officers stated that initially there were no identifying numbers on the vessel but whilst inspecting the vessel, they noted the registration label on the port side window which showed the registration number as LC873.

The officers recorded the damage to the bow of LC873 and then proceeded to inspect the equipment on the vessel including its lights. The officers requisitioned LC873's GPS equipment in order to confirm whether LC873 was at anchor and if so, it's anchor position.

Their statements indicate that the operator of LC873 assisted them with their inspection. In summary, the relevant findings in the officers' statements indicate that:

- the navigation lights and anchor lights were operating satisfactorily;
- the occupants of LC873 advised the officers that the vessel was at anchor and that the impact of the collision snapped the cleat holding the anchor rope;
- none of the occupants of LC873 had a current recreational boat operator's licence;
- LC873 did not have the requisite flares;
- LC873 had one less PFD than the number of persons it carried;
- LC873 registration number was not marked on its sides.

2.5.4 Occupant 1, LC873

In his evidence, Occupant 1 stated that he was the designated operator of the vessel LC873. He stated that he has been driving various size vessels less than 12 metres in length predominantly in Westernport Bay since childhood and had recently acquired about 12 to 18 months experience as a deckhand on a commercial charter fishing vessel operating in Port Phillip Bay. He did not hold any marine qualifications or an RBOL.

On the night of the incident, the occupant stated that he met up with his friends at a service station in Baxter, where they had stopped to refuel the vessel. He noted that the vessel was a 24 foot Bertram cruiser. The group then proceeded to Carrum and at about 2230, they launched the vessel. Before launching LC873, the occupant stated that he checked the engine and batteries, the bilge pumps and the navigation lights with other members of the group, and that they were satisfied that all systems were operating satisfactorily. He stated that the engine needed the power of both battery banks when starting up, so he set the battery isolator switch to both batteries. He did not recall the vessel's radio being switched on.

The occupant stated that the reason for the trip was to take part in the Tea Tree Snapper Fishing Competition. He stated that the original intention of the group was to wait until another friend, travelling from Altona, arrived. Since there were no moorings available in the river and not wanting to sleep in the car for the night, the occupant stated that the group decided to anchor just outside the river entrance and do some fishing there, whilst waiting for the sixth member of the group to arrive.

Occupant 1 stated that he drove LC873 from the flybridge position and at the river entrance turned to starboard, and anchored about one kilometre from the entrance beacons. During the trip he set the battery isolator switch connected to both batteries so that the batteries could get charged. He stated that the anchor position could be verified on the vessel's GPS, which was taken away by the police. Once anchored, the occupant stated that he switched off the sidelights and switched on the anchor light, internal cabin light and rear deck light. At that time he also changed over the isolator switch to battery bank no 1. He reckoned the time would have been about 2300.

The occupant stated that the group then proceeded to lay out their fishing rods and tackles. After about five minutes, the deck light and cabin light were switched off. He stated that he continuously monitored the vessel's position and noted that it lay with the bow facing Frankston with the river entrance on its port bow. He stated that the sea was a bit choppy with about a two metre swell. The sky was cloudy but the moon could be seen faintly through the clouds. The visibility was clear.

When switching off the lights, Occupant 1 recalled that the owner of the vessel questioned him as to why the all round light remained illuminated. He stated that he explained to the owner that it was the anchor light and since they were at anchor, that light should be switched on and the navigation lights (sidelights) must be switched off. From this position, the occupant stated that he could make out the anchor lights of three to four boats about one kilometre further out in the bay, which he pointed out to owner, as part of his explanation.

At about 2400, the occupant stated that the group started drifting off to sleep. Three occupants went into the forward cabin and lay down. The occupant and the owner seated themselves at the table on the port side of the vessel with the owner facing forward and Occupant 1 facing aft. At this time, he stated that he explained to the owner how to check that the vessel was holding its anchor position, by checking the aspect of other lights in the vicinity. It started getting cold so the occupant rigged the canvas sheeting over the stern of the cabin, to block off the wind.

There was a cooler box (esky) with beer, placed on the aft deck. Occupant 1 stated that he did not consume any alcohol. He stated that he blew '00' when the police breathalysed him following the incident. The owner was sitting with Occupant 1 and at intervals would exit the canvas shelter to the aft deck to get a beer. Each time the owner went aft, Occupant 1 asked him if everything was "OK" to which the owner would look around and then report back that "all was OK". He stated that he put his head down on the table and was trying to cat-nap.

When questioned as to how he could be certain that the anchor light was illuminated at the time of the collision, Occupant 1 stated that the group used the bow overside, as a toilet stop and that every time he went on to the bow, the anchor light helped him see his way around the bow.

Occupant 1 also stated that during the time at anchor, he observed three vessels at different times exiting Patterson River headed towards his vessel. As they approached, they altered course to sail around LC873 and then resumed their passage. He stated that it could be construed that the vessels saw their anchor light and veered around LC873.

The occupant stated that he had his head down when the owner awakened him stating that he could see a green light coming towards the vessel. Occupant 1 stated that he immediately jumped up and noticed that it was the green sidelight of a vessel headed directly for LH873. He immediately woke the sleeping members and shouted to them that they were going to get hit, then he ran to the aft deck to observe the approaching vessel. A few seconds later there was a huge impact and LH873 swung about 180 degrees.

Occupant 1 recalled that he clung to the ladder at the rear but the other occupants were thrown around violently inside the cabin. He stated that he hurt his left elbow in the impact. After the impact, he stated that he immediately went to the lighting panels and pulled on the switches to switch on all the lights. He stated that he later realised, that in his panic he even pulled a couple of knobs off the switch stems. At this time he noted that the other vessel was about 100 metres off and was turning around. At the same time he became aware of another occupant handing out lifejackets to everyone.

When the other vessel came near, the occupant noticed that it was a police vessel and tried to calm the other occupants of the vessel. He stated that the first words shouted from the other vessel was "your anchor light was not on" to which he shouted back that it was on and pointed to it. As per the police officer's request, Occupant 1 checked his vessel and reported that there were no serious injuries to the occupants but the bow of the vessel was badly damaged and the cleat holding the anchor rope had snapped and the vessel was adrift.

After communicating with the other vessel, Occupant 1 attempted to start the engines. He stated that the engine would crank up but would not start and he realised that it was because it was connected to only one battery bank. He went aft to change over the isolation switch. In order to see better, he stated that he flicked on his cigarette lighter and that another occupant of the vessel also lighted a cigarette at the stern, to burn the fishing lines and they were immediately cautioned by the police vessel that there could be a fire hazard.

The occupant returned to the flybridge and started the engines. He stated that he lit a cigarette later, when he was standing on the flybridge and recalls being cautioned by the police vessel once again.

LC873 returned up the Patterson River. Occupant 1 stated that they did not have any further conversation with the police vessel. When they arrived at the ramp they were met by other police officers where they reported the incident and made their statements. The occupant stated that around this time two water police officers arrived and proceeded to check the equipment of LC873. He stated that the officers were satisfied that the anchor light and navigation lights were working.

With regard to LC873 switching off all its lights for about 20-30 seconds when the police vessel turned around to return to LC873, Occupant 1 could not recall that happening. He stated that after starting the engines he went onto the flybridge to drive LC873 back to the ramp. At that time he asked the persons below to switch off the anchor light and cabin lights. He stated that the persons below did not know the switches so a few times all lights were switched off and switched on, before they found the right switch.

2.5.5 Occupant 2, LC873

Occupant 2 was a friend of the owner of the vessel. He towed the boat and trailer with his car, to the ramp. In his evidence, Occupant 2 stated that he had about 12 to 15 years boating experience on similar size vessels to LC873 and smaller vessels, mainly in Port Phillip Bay and Westernport Bay. He did not hold any marine qualifications or an RBOL. He stated that he departed his home along with the owner at about 2000 on 31 October 2008 and picked up the other members of the group at about 2100 at Baxter.

Occupant 2 stated that once they arrived at Patterson River boat ramps, he assisted Occupant 1 in conducting operational checks on the engines and the lights. With

regard to the engines, he stated that he cranked the engine first with Battery Bank 1, then with Battery Bank 2 in order to prime the engine. He stated that the engine was not capable of starting with only one battery bank. He stated that by following this procedure he could also verify that the each battery was 'charged'. The occupant also reported that the navigation lights and the anchor light were operating satisfactorily.

Occupant 2 stated that he and Occupant 1 then proceeded to start and run the engine for a short time, using both battery banks. The engine was then stopped and at about 2230 the vessel was lowered into the water and disconnected from its trailer. He stated that Occupant 1 took charge of driving the vessel whilst he started up the fish finder equipment in the cabin. He recalled that Occupant 1 had switched on the navigation lights when LC873 was underway.

The occupant stated that LC873 exited the river into Port Philip Bay at about 2250, and stopped about one kilometre from the entrance. He stated that the sea was a bit choppy and they were all a bit nervous. He saw some fish on the fish finder, so they decided to anchor there and do some fishing. He stated that Occupant 1 anchored the vessel whilst he started rigging the fishing rods and tackles. He reckoned that this must have taken about five to ten minutes, after which he observed Occupant 1 to switch off all lights on the boat and only keep the anchor light on.

Whilst fishing, Occupant 2 stated that he could see the lights of lots of boats about one kilometre further out in the bay. He also noted a few vessels entering and departing Patterson River. He stated that there was about a two metre swell and there was probably a south westerly wind. The stern of the vessel was pointing towards land. He also observed a few shore lights in the distance.

Occupant 2 stated that he felt a bit sea sick and at about 2330 he went into the forward cabin to lie down. Whilst lying down, he recalled he informed the other members that he could hear a boat with a powerful engine running some distance off. The vessel could not be visually identified and he remarked to the group that perhaps someone was 'hooning' about in a very powerful boat. He stated that he lay down with his head facing aft. He did not fall off to sleep but intermittently joined in the conversation with Occupant 1 and the owner.

When questioned about the anchor light, Occupant 2 stated that when he was lying down, he could see the glow of the anchor light through the forward space hatch cover.

The occupant stated that all was quiet for a while when suddenly Occupant 1 shouted to him that there was a boat approaching and that they were going to get hit. By the time he tried to get up, he stated that LC873 was hit in the bow by a large vessel. He was thrown about the cabin hurting his back and head. When he could get out, he noted Occupant 1 switching on all the lights. At about that time the other two occupants also got out of the forward cabin.

Occupant 2 stated that he immediately started the bilge pumps and then started distributing PFDs to the group. He recalled that the first PFD he got, he pulled over the owner as he knew that the owner could not swim. He stated that he did not don a PFD but made sure that all the others onboard did. He then looked up to see a vessel approaching and then realised that it was the police vessel that had collided with LC873.

The occupant also corroborated the evidence given by Occupant 1 regarding the events that took place once the police vessel came alongside, until the time LC873 returned to the ramp and was met by the land units. He stated that when the vessel

came alongside, the occupants jumped onto the pier and the owner removed his PFD. When the police inspected the equipment, he found that PFD missing and he suspected that it was pilfered.

Occupant 2 also stated that he did not consume any alcohol during the trip and when the police breathalysed him they found no trace of alcohol.

2.5.6 Occupant 3, LC873

Occupant 3 is the registered owner of LC873. Although he has owned this vessel for almost one year, he stated that this was the first time ever that he had ventured out on the boat. After obtaining the boat, the owner stated that it underwent major refurbishment of its engines and batteries, which was finally completed some time after Easter 2008. Since then, the boat was taken out on occasions by his friends but he did not accompany them. The owner stated that he did not hold an RBOL.

The owner stated that on this trip, he travelled with Occupant 2 to Patterson River, picking up the other members of the group along the way. Since this was his first trip on the vessel, he stated that he was very excited. He was eager to assist in all activities of getting the boat into the water and recalled asking a lot of questions as to why they needed to undertake those activities. He stated that he sat up in the flybridge with Occupant 1 as the vessel transited the river outbound.

When LC873 was anchored, the owner stated that Occupant 1 switched off the navigation lights and switched on an all-round light above the flybridge. He stated that he asked why the change of lights, to which Occupant 1 replied that the all-round light was the anchor light and since the vessel was at anchor, the 'running' lights had to be switched off and the anchor light switched on. The owner stated that Occupant 1 then pointed out some dim white lights in the distance and explained to him that they were the anchor lights of other vessels about a kilometre off.

The owner then sat at the table on the port side of the cabin, facing forward. He stated that he opened a can of beer and sat there enjoying the atmosphere. Some time later, he stated that Occupant 1 sat with him on the opposite side of the table. Occupant 1 then pointed out to him a few shore lights and explained to him that as long as the position of those lights did not change, the vessel was holding anchor. But if he noticed that the lights had changed position or seemed to look different, he should inform him immediately.

The owner stated that he continued drinking beer during the evening. He stated that the esky was placed on the aft deck and the anchor light allowed him to see into the esky and pull out his beers. He stated that another reason he was certain that the anchor light was illuminated, was because he too used the bow as a toilet stop and the anchor light illuminated the bow section.

Sometime later, the owner recalled that he saw a fixed green light out the port side window. It appeared to be getting larger. He stated that he awoke Occupant 1 to ask him what that light meant. He stated that Occupant 1 looked out the window and then immediately shouted that it was a boat headed straight for them and that they were going to get hit. Almost immediately after, the owner stated that the other vessel collided with LC873. The impact caused him to be thrown against the table, uprooting it. He stated that he and the table were flung across the cabin, injuring his head, ankles and side.

The owner stated that he was in a state of shock after that and that his recollection of events following the collision was a bit hazy. He remembers Occupant 2 putting a PFD over him and that Occupant 1 and Occupant 2 were running around checking the boat and trying to start the engine. His next recollection is of the vessel tying up at the ramps where there were police officers waiting for them. He stated that he jumped on to the pier, removed his PFD and stood around whilst the other occupants spoke to the officers.

The owner stated that this went on for some time and when he next went to retrieve his PFD, it was missing and could not be found. He stated that one of the bystanders at the ramp mentioned to the police that they had seen him jump off the vessel wearing a PFD however he was not able to identify this witness later.

2.5.7 Occupant 4, LC873

Occupant 4 stated that he had about 20 years experience operating small recreational vessels. He had entered the Tea Tree Snapper Fishing Competition. Occupant 4 stated that on the evening of 31 October 2008, he engaged in recreational fishing in his own boat, with Occupant 1 and Occupant 5. However, when the water police inspected his vessel, they found that his RBOL had expired so he immediately removed his vessel from the water.

Occupant 1 then suggested to Occupant 4 that they could go out fishing on another friend's vessel. The three of them met Occupant 2 and the owner of the vessel LC873 at Baxter, and then drove to Patterson River to launch the boat from ramp no 3. Occupant 4 stated that since he had just been fined for not holding a current licence, he did not attempt to drive LC873. He stated that Occupant 1 drove the vessel whilst he assisted him with look-out and general deckhand duties. He also assisted Occupant 2 in setting up the fish finder.

Occupant 4 stated that they checked the vessel's lights at the ramp. On the outward journey he recalled that the sidelights and internal cabin light were switched on. On reaching the entrance to the river, he stated that they turned right about 22 degrees and went out about one to one and a half kilometre before dropping the anchor. He recalled that the anchor light was switched on but could not recall whether the other lights were switched off. He stated that he did not pay much attention to the lights after that.

Occupant 4 fished for a while. He stated that he had a couple of beers while fishing. Shortly after midnight he stated that he and Occupant 5 went into the bunkhouse in the forward part of the vessel to sleep. He stated that Occupant 2 was already in the bunk whilst the owner and Occupant 1 sat at the table. At that time, the occupant stated that LC873 was lying at anchor facing south and parallel to the shoreline. At that time, he stated that there was about a one and a half metre swell.

Some time later, the occupant stated that he was awakened by Occupant 1 shouting "there's a green light coming", which he ignored at first. He saw Occupant 1 run to the open deck and at the same time he felt the impact of something hitting LC873. He stated that he was flung across the bunkhouse, bruising his left side ribs. When he managed to get out of the bunkhouse and onto the open deck, he stated that everyone was yelling, the vessel seemed to be floating free and then the police vessel came close.

Occupant 4 stated that the police officer shouted that the anchor light was not on and he pointed at the anchor light which was illuminated and replied "then what's that?"

The occupant also stated that at that time all the lights on the vessel were illuminated. He then checked the damage forward and noted that LC873 was not taking on water. He recalled that Occupant 2 handed him a PFD and that Occupant 1 was attempting to start the engine.

The occupant recalled that the police called out if everyone was okay. He stated that he checked the occupants and saw that the owner was bleeding on one leg and all others had minor injuries, which he reported back to the officer. He then went aft to cut the fishing lines, at which point Occupant 5 lighted a cigarette and was attempting to burn the lines. He stated that it was probably at this time that he heard the police officer shout to extinguish the cigarette.

Occupant 4 stated that he had no recollection of the lights being switched off as the police vessel approached. He stated that on the return trip they were trying to switch off unwanted lights as the helmsman could not see, and on a couple of occasions they inadvertently switched off all the lights on the vessel. On the trip back to the ramp Occupant 4 stated that he once again assisted Occupant 1 with look-out and general deckhand duties.

2.5.8 Occupant 5, LC873

In his evidence, Occupant 5 stated that he went along on this fishing trip at the request of his friends. He stated that he had about 30 years boating experience including driving his father's boat but all the boats he previously sailed on were much smaller than LC873.

Occupant 5 corroborated the evidence of the other occupants in that he met the boat at Baxter and then helped launch it at Patterson River ramp at about 2230. He stated that he generally assisted Occupant 1 and Occupant 2 with the pre-departure checks of the fuel, bungs (bottom plugs) and batteries. He also noted that all the lights were illuminated on the trip outbound but the helmsman called out to switch off the white light "at the top" as it was shining directly into his eyes.

During the outbound trip the occupant stated that he sat in the cabin or on the aft deck and did not pay much attention to the navigation. When LC873 reached the entrance to the river, he stated that they sailed on for about 10 minutes before dropping the anchor.

Occupant 5 then got busy with putting out the fishing lines. Once the lines were set, he stated that all the lights were switched off but the "bright one at the top" (referring to the anchor light) and the cabin light remained on. He stated that he noticed the anchor light was on because initially he saw the owner sitting on the flybridge and this light illuminated him.

While fishing, Occupant 5 stated that he saw the lights of two boats in the distance but could not estimate their distance off. A short time later, he stated that Occupant 2 started feeling uneasy and went to the forward cabin to lie down. The occupant stated that at about midnight, he and Occupant 4 also decided to go to sleep and entered the forward cabin.

The occupant stated that he was awakened when he got jolted and bumped his head. At first he thought Occupant 2 was kicking him playfully. He then realised that the others were shouting that the boat had been hit. He stated that he was passed a lifejacket by Occupant 2 which he donned and then he went out on the back deck. He

could not recall whether all vessel lights were illuminated at that point and whether they were all switched off for a short period as the police vessel turned around.

Occupant 5 corroborated the others' recall of conversation between VP02-08 and LC873 following the collision. When LC873 was told to start up its engines, he went to the back deck to haul in the fishing lines. He stated that he thought it would be quicker to just cut the lines, so he lit a cigarette with which to burn the lines. At that point he recalled the police shout to put out the cigarette, which he did.

After that, Occupant 5 stated that the sequence of events was a bit of a blur. He recalled sailing back to the ramp, getting out of the vessel, the owner removing his lifejacket and placing it on the jetty. He stated that when the police started questioning them about one missing lifejacket, two bystanders mentioned that they saw the owner put his lifejacket down on the jetty. Occupant 5 stated that he did not know those bystanders and he had no way of finding out who they were.

2.5.9 Incidental information

Incidental information collected by the investigation from police officers, local coast guard officers, recreational boaters and by first-hand observation, indicated that historically there usually are small vessels either drifting or at anchor within two nautical miles of the shoreline, engaged in fishing. Anecdotally, some of these small vessels prefer to fish in isolated spots with all their lights switched off, so that they do not attract the attention of other fishermen while other vessels switch off their lights to conserve battery power.

In observations carried out in Port Phillip Bay, the investigation noted that small vessels were not easily detected by radar. On small vessels, target detection ranged from about half to about one and a half nautical miles and up to two nautical miles under optimum conditions. On larger vessels, small recreational vessels were often invisible to radar at two nautical miles and some were not detected at all. None of those small vessels had installed a radar reflector.

The investigation also noted that a number of small recreational vessels had their anchor lights installed in obscured locations on the vessel for example, on the aft gunwale that prevented visual detection by other vessels.

2.6 Recorded information

VWP had recently installed a real time GPS tracker at the RCC whereby all police vessels were automatically tracked. The tracker was installed for the primary purpose of aiding the accuracy of searches undertaken.

The tracking system was under trial at the time, with instructions from the officer in charge for it to be switched on to track VP02-08 during the patrol. However, it was inadvertently switched off by the RCC officer about three hours prior to the collision. Therefore the investigation could not obtain exact speed and position information for VP02-08.

Prior to installing the real time tracker, VWP policy required each vessel to switch on the tracker on its onboard GPS set, especially when conducting search and rescue and at other times as deemed necessary by the master or the RCC. However, during normal patrols the onboard tracking was not usually utilised as the vessel's 'back-tracking' during patrols cluttered up the screen, making it unreadable.

VWP provided the investigation with a copy of radio communications recorded by RCC, which confirmed the post collision actions of VP02-08.

2.7 Environment

At the time of the incident there was a south south-westerly wind of about six to 10 knots, causing sea waves up to half a metre in height. There was also a southerly swell of about one and a half metre height. The tide was flooding. The height of tide was calculated to be about half a metre above chart datum and the current was negligible.

The incident took place in the hours of darkness. The sky was overcast and visibility was clear. No precipitation was recorded at that time. The ambient temperature was about 12 degrees Celsius and the pressure was about 1022 hectapascals.

2.8 Legislation, Rules, Guidelines

Section 115 of the *Marine Act 1988* states to the effect that: a person must not operate a general recreational vessel unless the person is the holder of a licence issued under Part 10A of the *Marine Act 1988* that authorises the person to operate such a vessel.

Section 230 of the *Marine Regulations 1999* states to the effect that: a person must not operate a recreational vessel in State waters unless it is equipped with the items specified in Schedule 4 of the Regulations.

The *Marine Act 1988* defines "operate" as "to be in charge of a vessel that is not at anchor or made fast to the shore or aground or ashore".

The investigation has not found any section in the *Marine Act 1988* or *Marine Regulations 1999* that requires a recreational vessel owner to ensure that persons operating his or her vessel are appropriately licensed.

In accordance with section 3 of the *Marine Act 1988* and sections 212, 300 and 301 of the *Marine Regulations 1999*, government vessels are excluded from the requirements of vessel survey and crew competency.

Rule 5 of the International Collision Regulations states that "every vessel shall at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision."

Rule 6 of the International Collision Regulations states that "every vessel shall at all times proceed at a safe speed so that she can take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions." The Rule also provides guidance on the factors that should be taken into account when determining the safe speed of a vessel including but not limited to the state of visibility; the sea and weather conditions; the proximity to other vessels and navigational dangers; and the efficiency, limitations and characteristics of the radar equipment.

VP02-08 SOP states that "during the hours of darkness or in conditions of poor visibility, the vessel's speed will be reduced to enable safe navigation. During adverse weather conditions the vessel will be operated at such a speed that minimises shock

loads and stress placed on the vessel, and remains safe for every person onboard. A safe speed is to be adhered to at all times, taking into consideration all the prevailing circumstances as outlined in Rule 6 Collision Regulations."

Rule 30 of the International Collision Regulations states that a vessel of less than 50 metres in length shall exhibit an all-round white light where it can best be seen and may also use the available working or equivalent lights to illuminate her decks.

The STCW[6] Code requires an appropriate and effective watch or watches to be maintained for the purpose of safety at all times, while the ship is at anchor or moored and for the Administration to make companies, masters and all watchkeepers aware of such requirement.

2.9 Victoria Water Police

2.9.1 Organisational background

The VWP (Victoria Water Police) has the primary role of coordinating all marine incidents including search and rescue involving recreational vessels, yachts and fishing vessels and commercial vessels throughout Victoria. The other role of the VWP is to ensure that all vessels are equipped with appropriate safety equipment, comply with registration requirements and that marine laws and regulations are enforced. The squad is also used to transport other (emergency, safety and rescue) units to locations that are inaccessible by land.

The VWP squad is based at Williamstown, at the mouth of the River Yarra, which also houses the RCC (Rescue Coordination Centre). VWP operates a fleet of vessels engaged in regular patrols of the waterways, the extent of which is commensurate with actual and predicted boating activity in any waterway. Although the *Marine Act 1988* does not apply to police vessels, VWP has elected to maintain their vessels in survey with MSV and to be manned in accordance with MSV manning requirements.

VWP works closely with Parks Victoria for signage regulations and with MSV for incidents regarding boating complaints. They also have a liaison with AMSA (Australian Marine Safety Authority) based in Canberra. The squad examines vessels involved in boating accidents and advises whether prosecution is necessary and is involved in the preparation of inquest briefs.

2.9.2 Recruitment, training and rostering

The investigation noted that every person joining Victoria Police undergoes fresh recruit induction and training in police work. The initial induction also discusses the general principles regarding human factors issues and fatigue awareness.

Officers join the water police squad by transfer from other police units. All newly joined members are subjected to a regime of classroom and onboard training as part of their induction to operating water police vessels. They are then assigned as trainee deckhands on various police vessels and are encouraged to obtain a commercial qualification as master and engineer.

All masters and engineers operating VWP vessels are certified by MSV. During the winter months when there is a slight decrease in the number of call-outs, the squad

[6] International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended in 1995 and 1997.

conducts its own internal training of short courses and refresher courses for its members and carries out maintenance on its vessels.

The courses conducted by VWP concentrate on navigation and seamanship, search and rescue and other police enforcement duties. However, the investigation noted that other than the initial induction training, subsequent training did not include human factors awareness and fatigue management, specific to water police activities.

VWP complies with Victoria Police's Enterprise Bargaining agreement which mandates minimum breaks, fatigue management and consideration of members' fitness for duty. The squad has a rostering policy in place, compatible with OH&S requirements to ensure that all operators are not over-worked and are provided with adequate rest between shifts.

VWP also has systems in place to ensure that operating vessels are not under-manned. The organisation has developed and implemented individual SOPs for each vessel in its fleet.

2.9.3 Operation Tea Tree

On receiving information that the Schnapper Point Angling Club intended to hold a fishing competition, VWP prepared an Operation Order to patrol the waters of Port Phillip Bay and Westernport Bay for the duration of the competition.

Operation Tea Tree was conducted from 1300 on 31 October 2008 until 1700 on 1 November 2008. The operation was initiated to increase awareness regarding marine safety, crime prevention and to deter minor offences. VWP also intended to liaise with other relevant authorities during the competition, to provide information targeting all facets of marine safety, recreational boating and fishing. There were 25 officers rostered for the operation.

In accordance with the Operation Order, there were five patrol vessels including VP02-08 deployed during the day shift of 31 October and 1 November. During the night of 31 October, only VP02-08 was rostered to patrol the waters.

Two police officers were assigned to VP02-08 for the night shift commencing at 2100. Their duties as per the Order were to conduct safety audits of recreational and commercial vessels inclusive of checking vessel activity along the shipping channel, marine parks and other restricted areas in the eastern side of Port Phillip Bay.

No other incidents involving police vessels were reported during Operation Tea Tree.

2.10 Marine Safety Victoria

Marine Safety Victoria is the State regulatory authority responsible for the efficient and safe operation of vessels on State waters by coordinating waterway management, developing and implementing vessel standards and operator competencies, protecting the marine environment and by funding the improvement and development of associated infrastructure to provide for the efficient and safe operation of vessels on State waters.

With regard to recreational vessels, MSV has a responsibility to ensure that these vessels operating in Victoria are registered and equipped in accordance with the requirements of the *Marine Act 1988* and *Marine Regulations 1999*; and to test, approve the testing of and licence operators of such vessels.

The function to register vessels, test operators and issue licences has been delegated to VicRoads. Operators can also complete an MSV approved training course then apply to VicRoads for an RBOL.

2.11 Radar Reflectors

Radar detects targets by transmitting a pulse of radio energy and then 'listening' for a returning echo. This process is repeated at a very rapid rate, up to about 2,000 times each second. The strength of the returning echo depends on the size, characteristics and aspect of the target. The best echoes will be received from hard, flat surfaces placed at 90 degrees to the radar signal.

Small vessels, particularly of wooden, fibreglass or other non-metallic construction, are poor reflectors of radar signals. Such vessels can have a large number of separate reflectors (metal masts, booms, engine, etc) however, usually none of these is large enough to provide a constant echo. Therefore these vessels return very poor echoes to an observer on another vessel and, at times, echoes could be lost.

A radar reflector is a passive device that is designed to be an efficient reflector of radar signals giving a strong return to the radar. There are a number of different types of radar reflectors, from the very sophisticated to the very basic. The most common type of radar reflector found on small vessels is the "octahedral" reflector which can enhance the detection capability by radar up to three-fold.

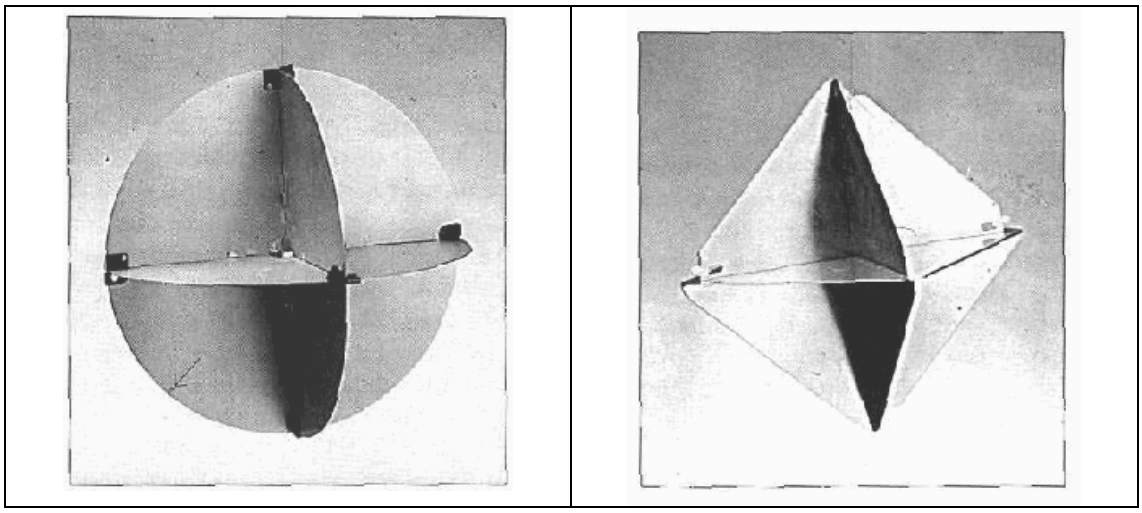


Figure 7: The octahedral radar reflector in spherical shape and diamond shape found on small vessels.

The classic octahedral reflector is made of three planar circles or squares of metal intersecting at right angles, forming eight trihedral reflectors. In the usual position, one trihedral will face up and one down and the remaining six are arrayed around a circle. This optimizes the return of radar signals from the "pockets".

The reflector works on the principle that the angle of incidence is equal to the angle of reflection. When radar signals hit the reflector at an angle, instead of the signals getting deflected or travelling right through, the trihedral formation catches the signals and by multiple reflections within its surfaces, send the signal back to the transmitting antenna, thereby enabling the maximum number of radar signals to be reflected.

The larger the surface area of the reflector, the greater the number of radar signals reflected back to the observing station.

2.12 Managing fatigue in transport

2.12.1 Circadian rhythms

An excerpt from a paper "Beyond the Midnight Oil", an inquiry into managing fatigue in transport by the House of Representatives Standing Committee on Communication, Transport and the Arts, The Parliament of the Commonwealth of Australia, October 2000 states:

"The body's circadian rhythms increase and decrease body temperature over a roughly 24 hour period, reaching a low point at approximately 0300 to 0500 with a less severe low point at around 1500 and 1700. These low points induce a strong physiological need for sleep at around these times. Working through these periods produces a higher relative risk of accident."

Furthermore, according to the International Maritime Organisation's MSC Circular 1014, "irregular schedules caused by shifting rotations cause the circadian rhythms to be out of synchronization. The internal clock can only adjust by an hour or two each day. Sometimes, depending on the new schedule, it takes several days to adjust. In the meantime, the internal clock wakes a person up when they need to sleep and puts them to sleep when they need to be awake."

The body's internal clock can be reset over time if external events change for an extended period. However, research shows that it cannot be permanently adjusted to a reversed cycle of work and sleep if external events remain the same, such as occurs in shiftwork. Night work of any sort is well known to be at higher risk of error and result in poor performance in general. In addition, night work always requires more effort to perform than day work (Beyond the Midnight Oil).

A 1997 Air Safety Report by the Bureau of Air Safety Investigation found a correlation between time of day and the frequency of accidents. Human factors were involved in most of the reported incidents, with workers on duty between the hours of 0200 and 0400 having a greater chance of having an incident than workers on duty at other times of the 24-hour clock. The report also found that the majority of mistakes were 'rule based mistakes'[7] and that 'absent minded slips' were involved in about one-third of incidents.

2.12.2 Comparison of fatigue to alcohol

A study conducted by the Adelaide Centre for Sleep Research has compared the effects of fatigue against levels of alcohol known to cause impairment. The study indicated that 17 hours of sustained wakefulness leads to a decrease in performance equivalent to a BAC (blood alcohol content) of 0.05 per cent and after 24 hours is equivalent to a BAC of 0.1 per cent.

The study concluded that a person with a BAC of 0.05 percent is twice as likely to have an accident as a person with zero BAC and that a person who has been awake for over 17 hours faces the equivalent risk of having an accident as a person who has been consuming alcohol.

[7] Mistakes caused by rules not being followed.

2.12.3 Attention and vigilance

In his book “Managing Maintenance Error – A Practical Guide”, Alan Hobbs states that ”there is a finite limit to the amount of information that can be processed at any time. When we are consciously attending to several things at a time, it is possible that we may in fact be rapidly switching our attention from one activity to the other.”

Exposure to excess levels of environmental factors for example temperature, excessive noise levels, harsh sea conditions, ship motion, can produce physical discomfort and contribute to a loss in attentiveness. Ship motion is an environmental factor which affects a person’s ability to maintain physical balance. Due to the extra energy expended to maintain balance while moving, the watchkeeper’s attention to navigational duties may intermittently get disrupted (MSC/Circ 1014).

With regard to vigilance, Hobbs provides an example that in WWII it was found that after about 20 minutes at their posts, radar operators became much less likely to detect obvious targets even though he or she was intently concentrating on the screen. He states that “one solution for improved vigilance is by increasing the conspicuousness of the signal”.

2.12.4 Complacency in routine

Complacency and “routinisation” (sic) are widespread in the maritime industry, and this is, by and large, inevitable when mariners repeat their voyages time after time. When these conditions exist accidents can occur as an unfortunate by-product of routine and efficient operation (Wayne Perkins, Human Factors Analyst, Maritime New Zealand).

The word “complacency” has negative connotations, but it is not intended to be derogatory when referring to the natural human response to a very familiar situation. When we do something for the first time, we are intent on what we are doing and we are aware of the hazards; but by the time we have done it without incident a thousand times, we have lost that stimulation and may become confident that nothing will go wrong (Stephen Meyer, Chief Inspector of Marine Accidents, UK).

2.12.5 Reliance on automation

A recent study has drawn attention to over-confidence and complacency that can easily be instilled in the officer of the watch by new technology which provides apparently enhanced information (Graham Mapplebeck, Navigational safety and the challenges of electronic navigation). Too many recent casualty reports indicate that some navigating officers have their head stuck in the radar all the time and never seem to look out of the window – or if they do look they don’t seem to correctly visually interpret the situation that is developing.

Automation does not reduce total workload as there is more to monitor now. An individual’s limited capabilities of information processing can be easily overloaded and can result in load shedding, channelled attention or regression to ingrained but inappropriate skills (Hobbs).

3. ANALYSIS

3.1 The incident

The evidence indicates that at the time of the collision, LC873 was lying at anchor and facing in the general southerly direction and that VP02-08 was travelling on an approximately northerly heading which resulted in a near head-on collision.

It has also been established that immediately following the collision, LC873 illuminated all its lights while still operating from the same single battery bank. Each occupant of LC873, for separate reasons, recalled that the anchor light was illuminated and that they had switched off all other lights soon after anchoring.

Had the battery bank supplying power to the light failed sometime prior to the collision (thereby extinguishing the light), the main engine would not have started post collision, as it required the charge from both battery banks to start. Furthermore, LC873 was anchored too far offshore to be lit by the shore lights and it was a dark night. Therefore, some light would have been required on the vessel for the occupants to see around them.

In the absence of an independent witness, the investigation has not been able to confirm whether LC873's anchor light was illuminated at the time of collision. The anchor light of LC873 may have been illuminated but the vessel was not detected by the crew of VP02-08 either visually or by radar, this aspect is discussed below.

The visibility by radar and by visual observation was reported to be between half to three-quarters of a nautical mile and VP02-08 was travelling at a speed of about 16 to 18 knots. Therefore, the interval between first sighting a vessel or target until the time of collision would have been between one minute and 50 seconds and two minutes and 50 seconds.

About two to three minutes before the collision, the master's and crewman's attention was drawn to the vessels on their port side, which they stated they monitored until those vessels were somewhere on their port beam. This action may have distracted them from scanning other parts of the horizon, visually and by radar.

Two occupants of LC873 only saw VP02-08 approaching them just before the collision and almost immediately after collision, one of the occupants switched on all remaining lights. This would have been at about the same time when the master and crewman of VP02-08 turned around and saw LC873 being illuminated.

It is possible that LC873 may have switched off all its lights for about 20 to 30 seconds at about the time that VP02-08 was turning around, without the occupants recalling this event. Occupant 1 of LC873 recalled that he was in a panic when he pulled the switch knobs to illuminate the vessel's lights and in his panic pulled the knobs off the switch stems. In his panic it is possible he may have tried to push the knobs back onto the stems which pushed the switch stems to an 'off' position, before he pulled the switches 'on' again.

The evidence indicates that the post collision actions (including reporting) of the master and crewman were appropriate in the prevailing sea and weather conditions, with due regard to the safety of vessels and personnel.

3.2 VP02-08 circumstances

3.2.1 Visual detection of the anchor light

The anchor light complied with the standard specifications for a small vessel, so it had a minimum visibility range of about two nautical miles in normal conditions of visibility. Post collision testing indicated that it was operating satisfactorily.

Detection of a single white light from a distance would have been difficult against a background of bright shore lights. Additionally, intermittent spray deposits on the windscreen would have reduced the visibility of the light to observers inside the wheelhouse. Therefore, the light would have become visible to VP02-08 only when it was probably half a nautical mile off at which time the crew attention was focussed on the vessels on their port side.

An inspection of the damage to VP02-08 indicated that the point of collision on the bow of VP02-08 was directly behind the windscreen starboard corner strut when viewed from the helm position. It is possible that in the two or three minutes prior to the collision, LC873 may have intermittently been hidden from the master behind the starboard corner strut and from the crewman, behind the port inboard strut. However, the lookout arrangement on VP02-08 meant that the crewman did not actively scan the horizon on the starboard side.

3.2.2 Detection by radar

It is also possible that there was more reliance placed on the radar to detect targets, over a visual look-out, by the crew of VP02-08.

At the time of the incident VP02-08 radar displays were set on three quarter nautical mile range. It was reported that during the voyage, all other small vessels seen visually were also confirmed on the radar. When the vessel was put back into service, the investigation checked the radar and displays and found them to be operating satisfactorily. The fault reported by the master could not be replicated and there had been no specific work undertaken on the radar during repair.

It is possible that due to the prevailing sea conditions and vessel motion at the time of the incident, that VP02-08 radar detected targets intermittently and not continuously. As LC873 lay almost directly ahead of the approaching VP02-08, its echo would have appeared intermittently on or almost on the ship's heading marker, but at significantly reduced strength each time that it was detected.

The investigation noted that the recommended practice for watchkeepers to frequently switch off the heading marker to check for vessels hidden by the marker was, in this incident, not followed.

In addition, being in a 'head-on' situation, LC873 presented a very narrow and angular aspect to VP02-08 which would have caused the majority of radar signal to deflect away and not back to VP02-08, further reducing the size of the echo appearing on the display.

The intermittently unreadable radar display was distracting and would have made it difficult for the master to detect targets on his display. In his evidence, the master stated that they concentrated their radar lookout on the crewman's display. From the helm position it would have been very difficult for the master to observe targets on the crewman's display. At the time that LC873 would have become visible on his radar display, the crewman was monitoring the vessels on his port side.

The investigation also noted that at no time during the voyage was long range radar scanning employed. Had the radar range scale been switched to three nautical mile range scale, it was possible that LC873 could have been detected by the radar when it was up to two nautical miles off, providing additional time for the observers to see the target on the display and to react accordingly. Additionally, just the action of switching the range scale would have triggered the observer's reaction to actively scan the display for targets.

One solution for improved vigilance is by increasing the conspicuousness of the signal (see paragraph 2.12.3). LC873 was constructed of fibreglass, which is a poor reflector of radar signals. Had the vessel been fitted with a radar reflector, it is likely that it would have increased the size of its painted target and its detectable range by up to about three-fold.

3.2.3 Master's actions

On the northbound trip, the master set a speed of about 16 to 18 knots. Post collision checks on the vessel's manoeuvring characteristics indicated that this was the most appropriate speed in the prevailing sea and weather conditions to provide personnel comfort and at the same time keep the vessel relatively steady.

The investigation found that it is common knowledge among vessel operators in Port Phillip Bay, that on occasion some small vessels are unlit while fishing. It is reasonable to assume that the master, with 25 years experience patrolling these waters, would also have been aware of that fact.

Given the fact that VP02-08 was being navigated relatively close to the shore in reduced visibility and unlit vessels were known to sometimes be in the area, it may be argued that the speed selected was not appropriate to the prevailing conditions and circumstances. A slower speed would have provided the crew of VP02-08 with greater time to react once a target was detected.

The capacity to process information can be further reduced by fatigue. The investigation has not been able to determine the fatigue level of the master at the time of collision. At the time of the incident he had been awake for about 20 hours. As a result it is possible that the master was suffering to some extent from the effects of sleep deprivation, which could have resulted in a decrease in performance.

3.2.4 Watchkeeping

The navigational conduct of a vessel (courses, speeds, areas of operation, etc) is usually determined by the type of operational navigation equipment and the number of watchkeepers available, so as to ensure that the vessel has early warning to avoid collision or grounding and to be stopped within an appropriate distance.

The investigation noted that the VP02-08 SOP booklet contained comprehensive guidelines on the duties and procedures to be carried out by the master and crew for a range of activities. However, the SOP did not contain guidelines regarding bridge team management, leaving it to the master to decide. This has resulted in each master arranging the watch slightly different to the other, which in a crew rotating environment, reduced the consistency and standardisation of helmsman and observer duties.

Ideally, there should be a method of organising the best use of personnel and equipment in the wheelhouse to reduce the level of operational risk and to place defences against 'single person errors'.

Given the circumstances of reduced visibility and the radar display malfunction, it would have been prudent for the master to have instructed the crewman to actively scan the entire horizon visually and by radar, with due regard to the blind sectors caused by the window struts.

3.2.5 Human factors

The investigation has identified a number of human factors elements that individually may not have led to the accident however, when acting collectively, would have created sufficient distraction for VP02-08 to momentarily lose situational awareness.

The incident occurred at a time when the body's circadian rhythm was at its lowest, when the body wants to sleep and statistically at the time of day when the many accidents occur, most of which were found to involve human factors. The incident occurred in the first shift for both officers of VP02-08 returning after rostered leave.

The patrol was a routine task for both officers of VP02-08, having conducted similar operations many times over the years, which may have given rise to complacency, evidenced by the unchanged look-out arrangement in the prevailing visibility despite the master's radar display malfunctioning. When these conditions exist accidents can occur, as an unfortunate by-product of routine operation.

Exposure to the extremes of environmental factors for example temperature, excessive noise levels, harsh sea conditions or ship motion can produce physical discomfort and contribute to a loss in attentiveness to navigational duties.

Any conscious task can occupy attention and block out other information, as may have occurred when the officers were pre-occupied with monitoring the vessels on the port side, or the master's task of trying to maintain the vessel on track. It is possible that pre-occupation with these tasks blocked out information which may have appeared on the radar screen regarding LC873.

Finally, over-reliance on, or incorrect use of the radar may have resulted in a less than adequate visual look-out, due to the supposed efficiency of the equipment to provide apparently enhanced information. Added to which, research has shown that a radar observer may sometimes not see what he or she is not expecting to see.

The investigation has not been able to find evidence that the above factors are discussed as part of the water police training or refresher courses. In a shift rostering system with long and sometimes dangerous work in a dynamic workplace, it would be prudent for VWP officers to be made aware of the factors that cause fatigue or which affect situational awareness.

3.3 Recreational vessels

LC873 was anchored without a qualified operator on board. The investigation found that there is no legislative requirement for recreational vessels when at anchor to have a licensed operator on board and carry the requisite safety equipment, even if there are persons on board.

If the vessel were lying at anchor at a designated mooring, persons on board could be deemed to be relatively safe. However, for a vessel anchored in other waters, the safety of these persons can be seriously compromised in unforseen circumstances such as dragging anchor, weather turning foul or in this case, collision.

If such a situation did arise, it would be judicious to have a licensed operator available to take charge of the vessel and that there was sufficient safety equipment for the persons on board. Having a licensed operator on board would also help to ensure the correct lights are displayed and that a responsible level of look-out is maintained.

Incidental to this investigation, it was noted that there is no system or regime of inspection of recreational vessels. Therefore, deficiencies such as poorly located anchor lights or wrongly installed sidelights can go undetected until an accident occurs. VWP carry out random inspections of vessels, where primarily the vessel's registration and equipment and operator's licence are checked.

Poorly located anchor lights reduce visual detection by other vessels. Wrongly installed sidelights will present a wrong aspect to an observing vessel and where two vessels are approaching, the "give-way" vessel may assume itself to be the "stand-on" vessel. In both cases the risk of collision is significantly increased.

3.4 Look-out at anchor

Whilst the provisions of the STCW Code do not apply to recreational vessels, the investigation has found that there is no requirement for small vessels at anchor, to maintain an effective watch for the purpose of safety. An effective watch is required to ensure that the vessel is safely anchored or moored in the prevailing and sometimes changing conditions as also to detect and provide early warning of the risk of collision.

In this incident, the investigation noted that whilst two occupants of LC873 remained awake, they did not maintain an effective look-out for approaching vessels. It is possible that an effective look-out by LC873 would have provided early detection of VP02-08 approaching. The occupants could then have warned VP02-08 by sound and light signals, of approaching danger.

The investigation has not found any evidence that recreational boaters are being educated on this observance of good seamanship.

4. CONCLUSIONS

4.1 Findings

1. The master was appropriately qualified to operate VP02-08.

2. The designated operator of LC873 did not hold a recreational boat operator licence.

3. The *Marine Act 1988* and *Marine Regulations 1999* do not apply to vessels at anchor with regard to operator licensing and vessel equipment.

4. There is no requirement for a recreational vessel to maintain an anchor watch.

5. Post collision, LC873 anchor light was confirmed to be operating satisfactorily.

6. The master of VP02-08 was awake for about 20 hours leading up to the incident.

7. The actions of the master and crewman of VP02-08 post collision were appropriate in the prevailing sea and weather conditions.

8. The standard operating procedure for VP02-08 does not provide guidance in the allocation of duties for a two-man watchkeeping team, fitness for duty, taking over the watch and guidelines on the use of radar.

4.2 Contributing Factors

1. LC873 anchor light may have been obscured by the shore lights.

2. LC873 may have appeared at reduced strength and intermittently on VP02-08's radar.

3. VP02-08 look-out arrangements were less than adequate in the prevailing conditions.

4. The selection of speed by VP02-08 reduced the time available to detect targets and to take avoiding action.

5. Inadequate look-out by LC873 prevented early detection of and warning to the approaching VP02-08.

6. It is possible that a combination of fatigue, complacency and reliance on automation created a situation that reduced the vigilance of VP02-08 watchkeeping team.

5. SAFETY ACTIONS

5.1 Recommended Safety Actions

Issue 1

This incident highlights a number of human factors, collectively causal to the incident – for example, the master's lack of sleep, the connection between circadian rhythm and time of accidents, and physical and mental distractions.

RSA 2008051

That Victoria Water Police includes human factors awareness and fatigue management as part of its training for water police officers.

Issue 2

VP02-08 standard operating procedure was comprehensive in nature but did not provide guidance regarding fitness for duty/taking over the watch, the division and distribution of watchkeeping duties in a two-man team and protocol for information exchange and guidelines on the use of radar.

RSA 2008052

That Victoria Water Police review the Standard Operating Procedure for VP02-08 and other police vessels with a view to including these topics in the vessel procedures.

Issue 3

Small vessels are not generally detectable by radar at a suitable range, increasing the risk of collision for these vessels. There is currently no requirement for such vessels to be fitted with radar reflectors.

RSA 2008053

That Marine Safety Victoria should consider the necessity for certain vessels operating in exposed waterways, to be fitted with a radar reflector.

Issue 4

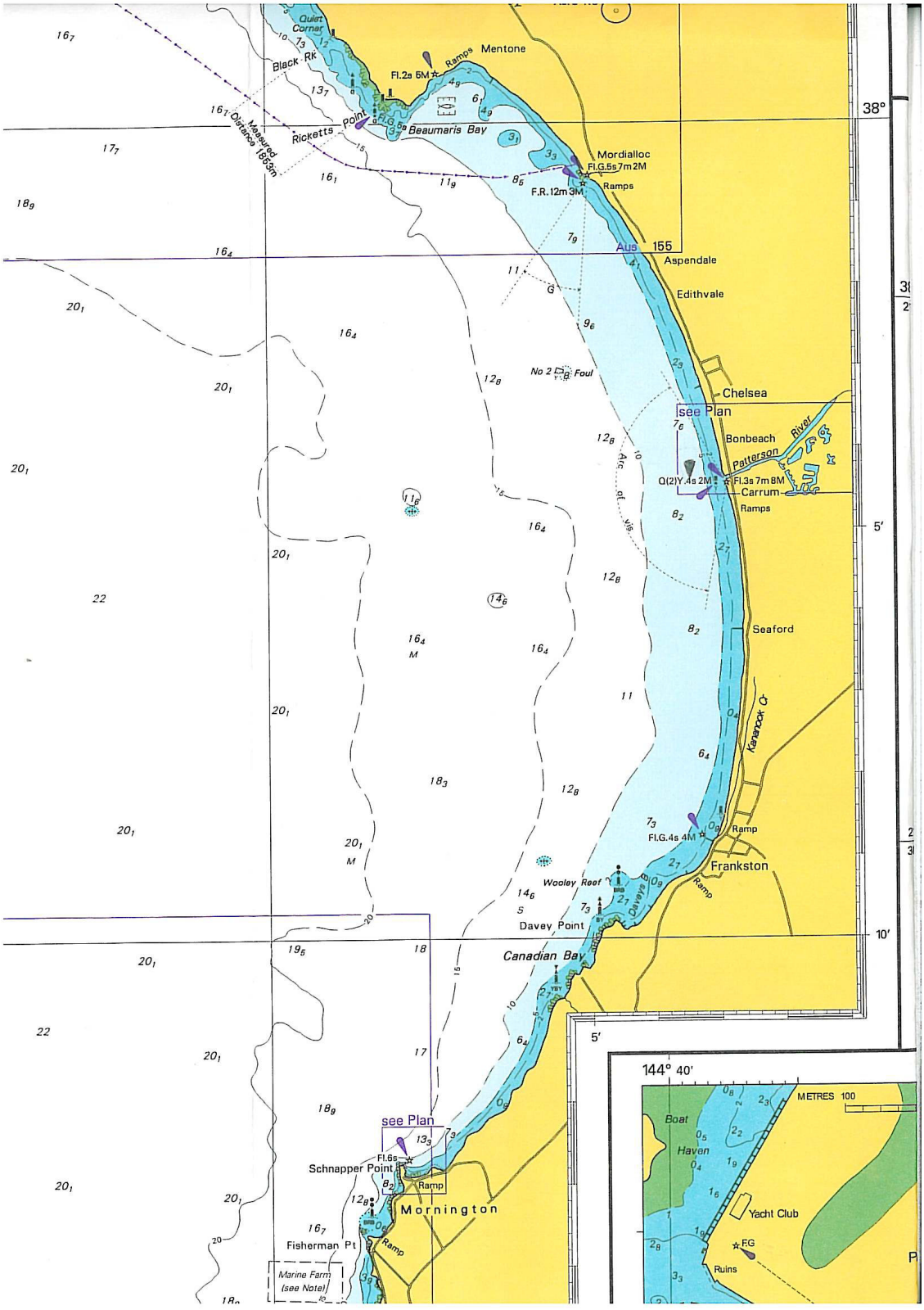
A recreational vessel may lie at anchor in any waterway, with persons on board, however there is no requirement for any person on board to hold a recreational boat operator's licence or for the vessel to carry any safety equipment or to maintain an effective look-out.

RSA 2008054

That Marine Safety Victoria should review the requirements for operator licensing and education and the carriage safety equipment for recreational vessels at anchor.

6. APPENDIXES

Appendix A Chart AUS 143 Mornington to Patterson River



Appendix B Vessel particulars

Police vessel

Name:	VP02-08
ID Number:	MSV 11558
Built:	July 2008
Builder:	Stebercraft Pty Ltd, Taree, NSW
Port of Registry:	Melbourne
Registered owner:	Victoria Water Police
Registered operator:	Victoria Water Police
Survey Authority:	Marine Safety Victoria
Length overall:	12.342 metres
Extreme breadth:	4.70 metres
Depth:	1.50 metres
Height above waterline:	5.60 metres
Main engine:	2 x YANMAR 6CXM-GTE2 inboard diesel, 6 cylinder
Propulsion power:	2 x 364 kW
Service speed:	30 knots
Propeller:	Twin screw, four bladed inward turning, fixed pitch
Steering system:	HYDRIVE Admiral Series, hydraulic RAYMARINE Autohelm ST6002
Wheelhouse equipment:	RAYMARINE E120 navigational display incorporating: Electronic charting system 3cm marine radar Fishfinder (echo sounder) GPS

Recreational vessel

Name:	LC873
ID Number:	LC873
Built:	1984
Registered:	VicRoads
Registered owner:	Private citizen
Length overall:	7.01 metres
Extreme breadth:	3.0 metres
Depth:	1.25 metres
Height above waterline:	2.70 metres
Main engine:	1 x MERCURY Mercruiser 898 inboard petrol, 8 cylinder
Propulsion power:	1 x 224 kW
Service speed:	20 knots
Propellers:	Single screw, three bladed right hand, fixed