Transport Accident Investigation Commission

Final report

Marine inquiry MO-2019-204
Capsize of water taxi Henerata,
Paterson Inlet, Stewart Island/Rakiura
12 September 2019

November 2020

About the Transport Accident Investigation Commission

The Transport Accident Investigation Commission (Commission) is a standing commission of inquiry and an independent Crown entity responsible for inquiring into maritime, aviation and rail accidents and incidents for New Zealand, and co-ordinating and co-operating with other accident investigation organisations overseas.

The principal purpose of its inquiries is to determine the circumstances and causes of occurrences with a view to avoiding similar occurrences in the future. It is not the Commission's purpose to ascribe blame to any person or agency or to pursue (or to assist an agency to pursue) criminal, civil or regulatory action against a person or agency. However, the Commission will not refrain from fully reporting on the circumstances and factors contributing to an accident because fault or liability may be inferred from the findings.

Figure 1: Water taxi, *Henerata*
(credit: Rakiura Charters Limited)

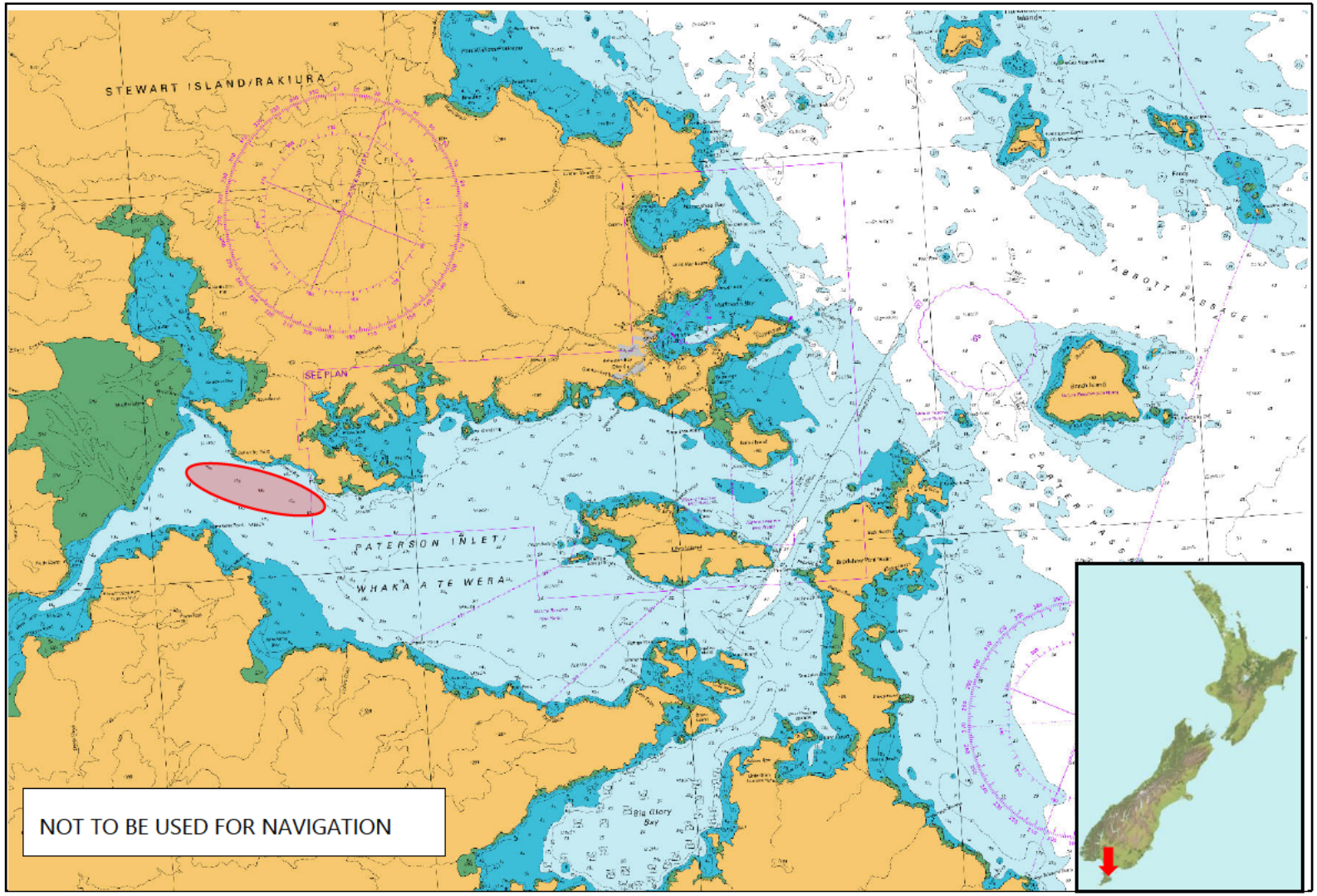

Figure 2: Location of accident on Chart NZ6825
(credit: Land Information New Zealand)

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1 Executive summary

What happened

1.1 On 12 September 2019, the *Henerata* was being operated as a water taxi service from Freshwater Hut to Golden Bay via Paterson Inlet on Stewart Island/Rakiura.

1.2 At approximately 1300, the *Henerata* departed from the Freshwater Hut landing and travelled down the Freshwater River. There were six passengers and the skipper on board. At about 1310 the vessel entered Paterson Inlet and the weather conditions deteriorated. About 10 minutes later the *Henerata* became swamped and capsized. The skipper made a Mayday radio broadcast prior to the capsize. The skipper and the passengers held on to the upturned vessel for about an hour before rescue vessels arrived.

1.3 The passengers and the skipper suffered hypothermia and water ingestion to varying degrees. Passengers who required hospital treatment were transferred to Southland Hospital by helicopter. There were no fatalities.

Why it happened

1.4 The Transport Accident Investigation Commission (Commission) found that the sea conditions were worse than the skipper expected when the *Henerata* entered steep and unpredictable seas. The Commission also found that the *Henerata* broached as a result of the steep and unpredictable seas, was overwhelmed, and capsized.

What we can learn

1.5 Due to the absence of any communication facilities in the Freshwater River area, passenger pick-up services from Freshwater Hut were rarely cancelled. It was about as likely as not that this resulted in a self-perceived pressure to operate the water taxi service. The operator has since amended its booking information provided to passengers to notify them that cancellations are possible and that they should be prepared to stay overnight should cancellations occur.

1.6 The operator's Maritime Transport Operator Plan had no defined weather criteria to assist the skipper's decision to sail, nor did it assess the risk of capsize. The Commission has made a **recommendation** to the operator to address these issues. The operator has made several changes to its operations to improve safety should a capsize occur.

1.7 A lack of stability information likely prevented the operator being able to assess fully the risk of capsize. The Commission has made a **recommendation** that Maritime New Zealand ensure that future Maritime Rules require appropriate stability and buoyancy testing for all domestic commercial passenger vessels.

Who may benefit

1.8 Maritime operators, regulators, surveyors and boating associations may all benefit from the findings in this report.

2 Factual information

Narrative

2.1 On 12 September 2019, the *Henerata*, operated by Rakiura Charters Limited (the operator) was providing water taxi services in Paterson Inlet, Stewart Island/Rakiura. The services for the day included a morning service to and from Ulva Island, and an afternoon water taxi service, picking up six passengers from the Freshwater Hut landing and dropping them off at Golden Bay (see Figure 3).

2.2 The operator was based in Oban, and at about 0730 that day the skipper checked the weather forecast for the day. It predicted strong north-westerly winds, which were forecast to increase in the late afternoon.

2.3 A passenger ferry, the *Foveaux Express*, which sailed between Oban and Bluff, had its scheduled morning service cancelled due to the prevailing weather. In addition, its afternoon service was brought forward to depart at 1100 to avoid the increasing winds.

2.4 Prior to the ferry's departure, the skipper of the *Henerata* went to the wharf at Halfmoon Bay to discuss with the ferry's skipper the weather and the reasons for the ferry reschedule.

2.5 The skipper checked the weather forecast again at about 1100 and noted that the north-westerly winds were due to increase from 1600 onwards.

2.6 The skipper cancelled the *Henerata*'s morning service to and from Ulva Island, knowing that the weather conditions would make embarking and disembarking the passengers dangerous.

2.7 At about 1130 the skipper boarded the *Henerata* at Golden Bay, completed the start-up procedures, and departed for the Freshwater River at the western end of Paterson Inlet (see Figure 3).

2.8 During the passage to the Freshwater River the skipper kept close to the sheltered northern shoreline of Paterson Inlet. Once the *Henerata* had passed Dundas Harbour, the skipper took a direct track across the Freshwater Flats to the mouth of the river.

2.9 The *Henerata* arrived at the Freshwater Hut landing slightly ahead of schedule. The skipper embarked the passengers, gave them a safety briefing and departed from the landing. The skipper made a radio broadcast on very high frequency (VHF) channel 65[1] to report that the *Henerata* was proceeding down the Freshwater River.

2.10 At about 1310 the *Henerata* exited the river and the skipper steered a direct line across the Freshwater Flats toward Dynamite Point. The skipper noticed that the wind speed had increased and, as the vessel moved into deeper water, the sea state changed to very steep and confused[2] waves.

[1] Stewart Island Marine Radio ZLRZ.

[2] A condition in which waves originate from different directions, which can create confusion when anticipating ship handling requirements.

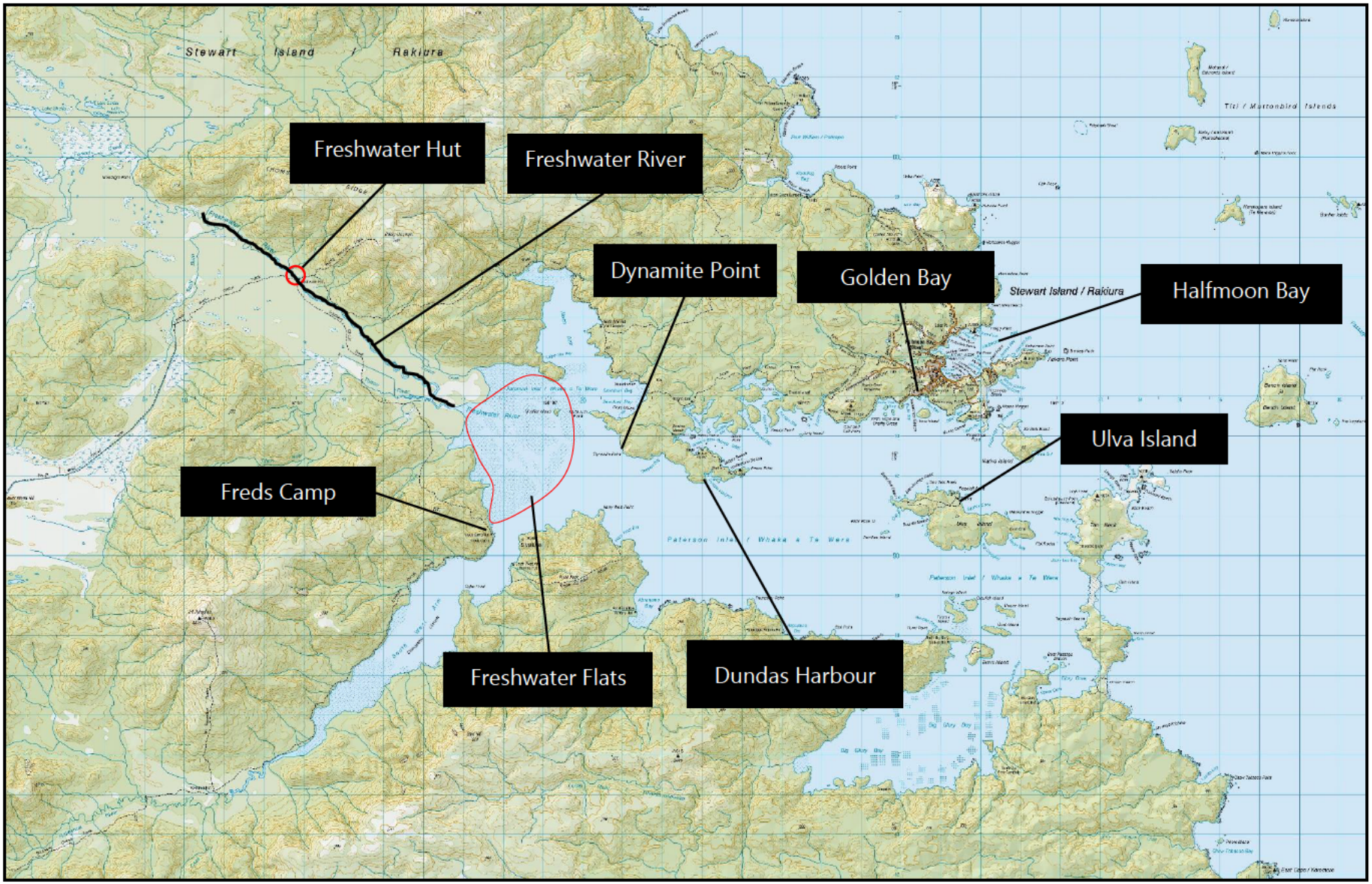

Figure 3: Paterson Inlet
(credit: Land Information New Zealand)

2.11 The skipper manoeuvred the *Henerata* through the waves. Upon seeing a larger set of waves, the skipper steered straight and used the throttle to match the vessel's speed to the wave speed and ride on the back of a wave. The wave lifted the stern[3] of the *Henerata* and drove the bow[4] down into the wave trough. The *Henerata* broached[5] to port[6] and rolled onto its starboard[7] side.

2.12 The skipper saw that there was water in the cabin and that the amount of water was increasing. At 1320 the skipper made a Mayday[8] call on the VHF radio and then went aft[9] and opened the cabin door. Water flooded into the cabin and the *Henerata* capsized. The incoming water washed the skipper through a broken window next to the driving position (see Figure 4).

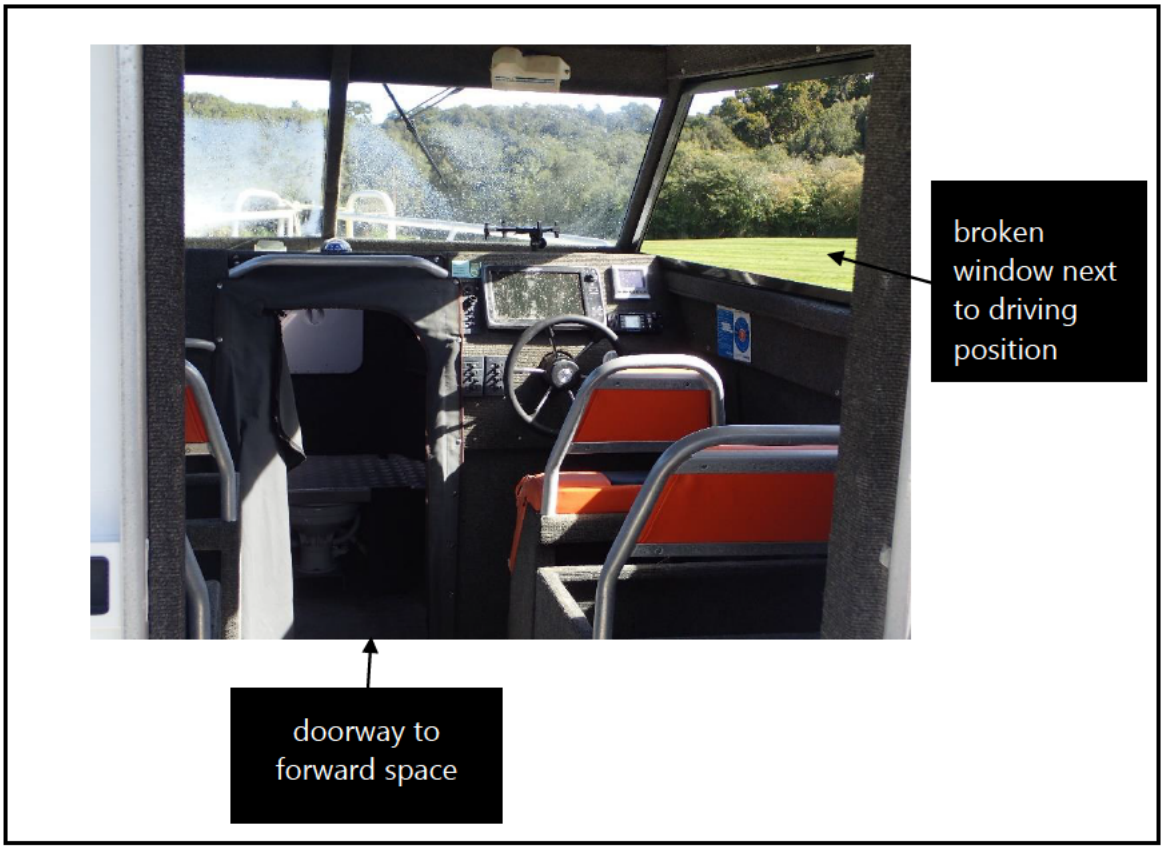

Figure 4: View of inside the cabin, looking forward from the door to the skipper's driving position

2.13 When the skipper surfaced, none of the passengers was visible. The skipper then dived underneath the upturned vessel, opened the hatch to the forward space and swam inside. Five of the passengers were trapped under the hull in an air pocket contaminated with petrol fumes (see Figure 5).

2.14 The skipper assisted the passengers through the forward hatch and out of the upturned hull. When the skipper surfaced, three of the passengers were holding on to the side of the vessel. However, one passenger had drifted away and was being

[3] The rear end of a vessel.
[4] The forward end of a vessel.
[5] When a vessel is forced side-on to the waves.
[6] The left side of a vessel when facing forward.
[7] The right side of a vessel when facing forward.
[8] An international radio distress message indicating a life-threatening emergency.
[9] Towards the stern of a vessel.

assisted back by another passenger. The sixth passenger was found clinging to the outboard motor at the stern.

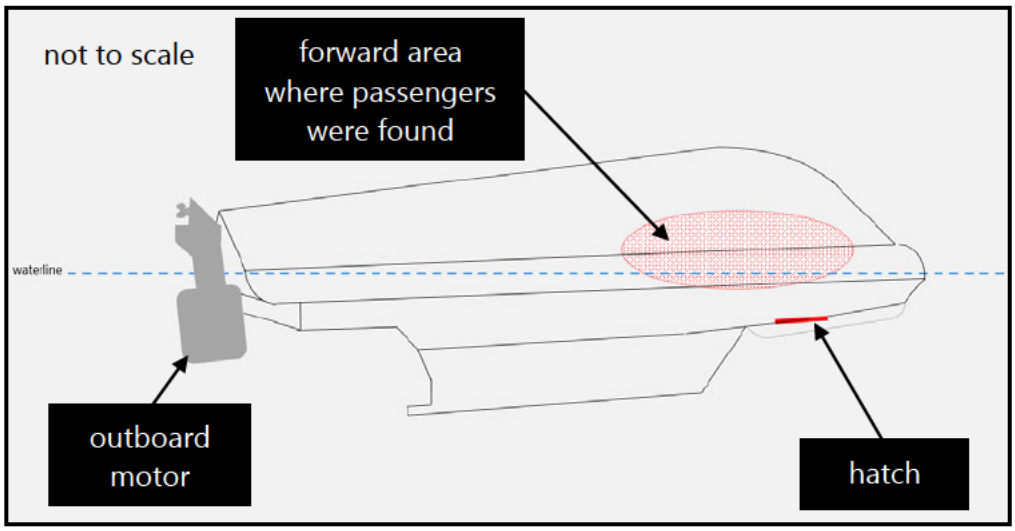

Figure 5: Location of passengers inside the upturned hull of the *Henerata*

2.15 The skipper and the passengers were on the windward[10] side of the upturned vessel where the wave action and exposure to the wind were greatest. Following the skipper's instructions, the passengers moved around to the leeward[11] side of the upturned vessel and held on to the cut-outs (see Figure 6) where the topside[12] was welded onto the pontoons.

2.16 Meanwhile, the radio operator at Stewart Island Marine Radio had heard the skipper's Mayday message on VHF channel 65. The radio operator tried to call the *Henerata* back on VHF radio but received no response. The radio operator also tried to call the skipper's mobile phone but there was no answer.

2.17 The radio operator then attempted to contact Rakiura Charters' office and the Police, but was unable to do so due to a cell network outage. At about 1328 the radio operator successfully contacted the Department of Conservation (DoC) office. The DoC operations manager informed the radio operator that DoC would prepare the vessel *Hananui* to depart immediately for Paterson Inlet to search for the *Henerata*.

2.18 Other operators had also become aware of the situation, and at about 1332 the skipper of the Ulva Island water taxi *Kaian* phoned the radio operator and advised that the *Kaian* was leaving Golden Bay to join the search for the *Henerata*. Ten minutes later the radio operator was advised that the *Aurora Australis* was also joining the search in Paterson Inlet.

2.19 From 1343 the search and rescue operation was led by the Police.

[10] The side from which the wind is blowing.
[11] The side sheltered from the wind, opposite to windward.
[12] The side part of a vessel's hull above the waterline.

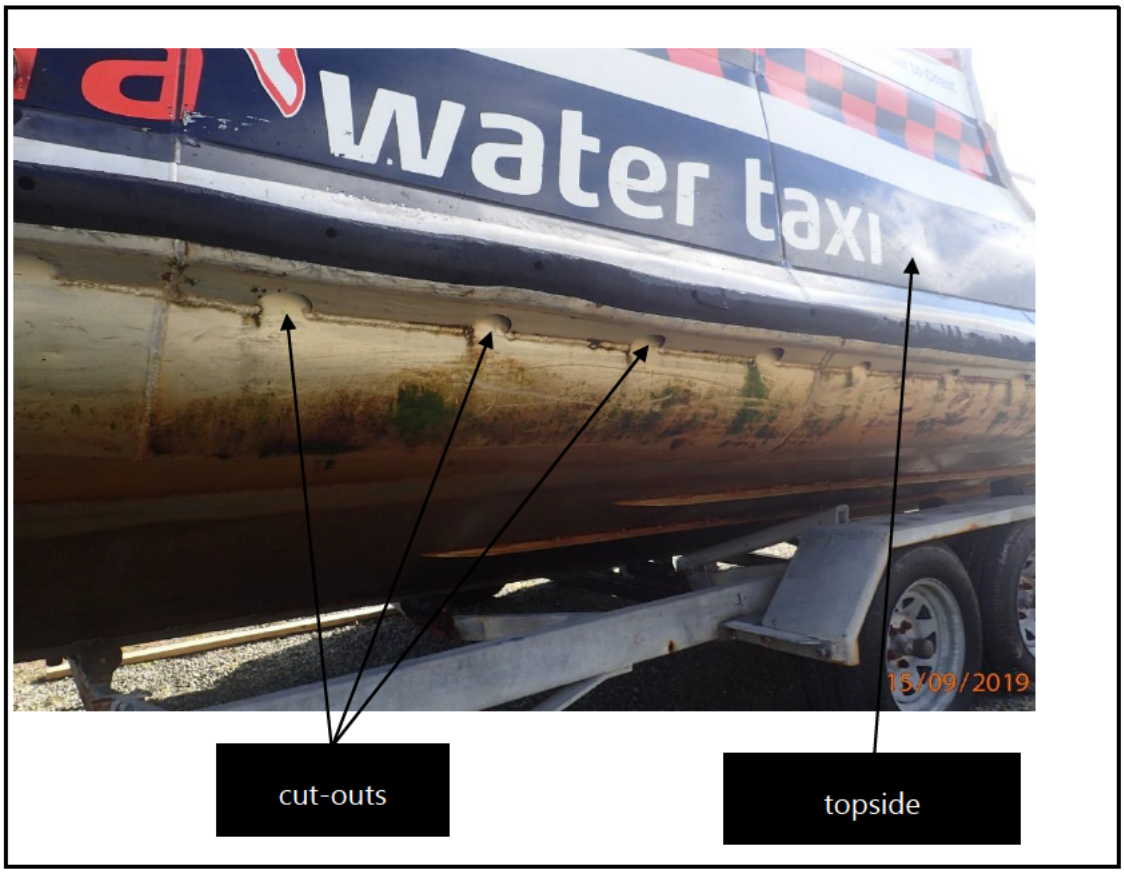

Figure 6: Locations of the cut-outs that the passengers used as handholds

2.20 As the *Henerata* drifted near to Dundas Harbour, the skipper swam into the vessel again and grabbed lifejackets and flares. They were unable to reach the emergency position indicating radio beacon (EPIRB).

2.21 The skipper climbed onto the upturned hull and observed the *Kaian* approaching.

2.22 At about 1419 the skipper of the *Kaian* confirmed to the radio operator at Stewart Island Marine Radio that the *Henerata* had been located and that there were seven people in the water. The *Aurora Australis* and the *Hananui* followed shortly after the *Kaian*. Between the three vessels, the *Henerata*'s passengers and the skipper were recovered from the water and taken to Golden Bay.

2.23 The local ambulance and fire services were awaiting their arrival. The skipper and passengers on board the *Henerata* were assessed by the island's nurse; two had lost consciousness and the rest had hypothermia. Two helicopters were deployed from Dunedin and arrived at Stewart Island/Rakiura around 1615 and 1625 respectively. They subsequently transferred four of the patients to Southland Hospital.

2.24 The vessel *Aurora* arrived on site shortly after everybody from the *Henerata* had been rescued. The crew of the *Aurora* righted the *Henerata* and towed it back to Golden Bay.

Personnel information

2.25 The skipper of the *Henerata* had earned a commercial launch master qualification in 1998. The skipper had been operating similar vessels since 2002, including seven seasons operating from beaches where the effects of wave action on a vessel were an important aspect of the vessel's handling.

2.26 After working as a skipper overseas and as a supervisor and manager for a large tour operator elsewhere in New Zealand, the skipper had bought the water taxi company in 2012. The building of the *Henerata* had been commissioned in 2014.

Vessel information

2.27 The *Henerata* was an aluminium alloy, hard-top, collared vessel[13] based on an Osprey Boats design. The design had been approved in 2005 and the vessel had been built by Alloyd Engineering in Nelson. The vessel was similar to a rigid-hulled inflatable boat and was commonly referred to as a pontoon boat in New Zealand.

2.28 The build had been carried out under survey[14] and the *Henerata* had been deemed to meet all the relevant requirements of Maritime Rules Part 40A: Design, Construction and Equipment – Passenger Ships which are not SOLAS Ships[15]. On the completion of the build, the *Henerata* had been issued with a Certificate of Survey dated 16 December 2014.

2.29 On 28 September 2018, a renewal survey had been conducted and a new Certificate of Survey issued, valid for five years.

2.30 The *Henerata* was certified to carry a maximum of 20 people on board, operating within restricted inshore limits. The skipper was the only crew member required to be on board.

2.31 The *Henerata* was propelled by a Honda 250-horsepower outboard motor.

Vessel stability

2.32 Collared vessels such as New Zealand pontoon boats and rigid-hulled inflatable boats are inherently buoyant. The hull consists of a number of air-filled chambers around its periphery, in addition to underdeck airtight voids.

2.33 The building and stability requirements for the *Henerata* were contained in Maritime Rules Part 40A. When the *Henerata* was built in 2014, Part 40A was silent on stability and swamp test requirements for vessels between six and 15 metres in length.

2.34 In 2018 Maritime New Zealand had issued a position statement[16] that contained guidance for surveyors on assessing the stability and buoyancy of applicable vessels. The position statement recommended swamp testing and/or swamp calculations for vessels on which Part 40A was silent.

2.35 The swamp test and swamp calculations were intended to ensure that there was enough buoyancy, in the form of airtight chambers or additional floatation material, to support the weight of a vessel, its engine and associated equipment, and the maximum number of persons on board when the vessel was inundated with water.

[13] In New Zealand terminology, a rigid-hulled collared vessel that has alloy buoyancy chambers around the periphery of the hull.

[14] Constructed subject to an initial survey, conducted by a certified surveyor, from the time of the commencement of building the vessel until the completion of the building of that vessel.

[15] Maritime New Zealand Consolidation, 1 November 2016. SOLAS is the International Convention for the Safety of Life at Sea.

[16] PS [Position Statement]-07-18 Swamp calculations or swamp tests for open or partially-decked boats. Maritime New Zealand, July 2018.

Meteorological and ephemeral information

2.36 The forecast weather conditions for Stewart Island between 1300 and 1630 on 12 September 2019 are summarised below:

- a severe weather watch[17] was in force that stated:

  West to north-westerly winds may approach severe gale in exposed places at times

- the Foveaux coastal forecast indicated:

  northwest winds of 50 knots for the coastal waters east of Stewart Island

  The forecast was updated at 1248 and the forecast wind speed was reduced to 45 knots

- the Southland regional forecast, which included Stewart Island, forecast:

  north-westerlies with gusts to 59 knots and showers.

2.37 The Foveaux coastal marine forecast[18] initially contained a strong wind warning. It was later revised with a decreased wind speed (see Figure 7).

Issued 0440 NZST 12 September 2019
FOVEAUX
STORM WARNING IN FORCE
Northwest 35 knots, rising to 50 knots south of Slope Point this morning. Sea becoming high in the south. Southwest swell 5 metres. Poor visibility in rain from this evening.
OUTLOOK FOLLOWING 3 DAYS: Westerly 20 knots. Changing Friday and southeast 15 knots and turning overnight Friday northeast 15 knots. Changing late Saturday westerly 15 knots and rising late Sunday northwest 25 knots with rough sea. Heavy southwest swell, easing Friday.

Issued 1248 NZST 12 September 2019
FOVEAUX
Northwest 35 knots, but 45 knots south of Slope Point. Easing to westerly 25 knots everywhere overnight tonight, to southerly 15 knots late Friday morning, and turning northeast 10 knots Friday evening. Sea high in the south, easing. Southwest swell 5 metres offshore, easing. Poor visibility in rain developing early this evening, easing to showers Friday morning, and clearing Friday afternoon.
OUTLOOK FOLLOWING 3 DAYS: Northeast 15 knots. Turning Saturday evening westerly 15 knots and rising late Sunday northwest 25 knots with rough sea. Heavy southwest swell at times.

Figure 7: The Foveaux coastal marine forecast for 12 September 2019 (credit: MetService)

2.38 Weather forecasts for 12 September 2019 consistently predicted gale north-westerlies with gusts to 110 kilometres per hour (59 knots).

Survival aspects

2.39 The passengers and the skipper were not wearing lifejackets at the time of the capsize. The passengers were able to hold on to the hull of the upturned vessel because the

[17] When referred to in a severe weather watch or warning, a 'severe gale' is a mean wind speed greater than or equal to 90 kilometres per hour (48 knots), or frequent gusts exceeding 110 kilometres per hour (60 knots). A knot is a measurement of speed in nautical miles per hour, equivalent to 1.852 kilometres per hour.

[18] This forecast covers the sea area from Nugget Point (South Island) to South West Cape (Stewart Island).

cut-outs where the topside was welded onto the pontoons happened to provide, by chance, makeshift handholds.

Tests and research

2.40 Data stored in the memory card of the outboard motor was retrieved and assessed. The data included the total engine run time, but there was no other information.

Similar occurrence

2.41 In 2004 a 7.4-metre pontoon boat capsized while operating as a water taxi in Abel Tasman National Park. It was picking up passengers from a beach in poor sea conditions when it was overwhelmed and capsized with 13 passengers on board. The vessel had an anchor set but was unable to maintain its bow-to-sea orientation. As it rolled the hull struck the seabed, contributing to its capsize.

Organisational information

2.42 The skipper of the *Henerata* was the owner and operator of Rakiura Charters Limited. The business operated under the Maritime Operator Safety System (MOSS) as specified by Maritime Rules Part 19: Maritime Transport Operator – Certification and Responsibilities[19]. Under the MOSS framework, an operator is required to develop an appropriate safety system and prepare a Maritime Transport Operator Plan (MTOP). With an approved MTOP and vessels meeting all survey requirements, the operator is issued with a Maritime Transport Operator Certificate. Rakiura Charters held a Maritime Transport Operator Certificate, which had been issued by Maritime New Zealand in June 2015.

[19] Maritime Rules Part 19: Maritime Transport Operator – Certification and Responsibilities. MNZ Consolidation, 1 January 2015.

3 Analysis

Introduction

3.1 Operating a boat in adverse weather conditions, particularly when carrying passengers, can be hazardous. The *Henerata* was operating a water taxi service in the Paterson Inlet area of Stewart Island when it capsized. The skipper and six passengers remained in the water for over an hour, holding on to the hull of the upturned vessel. Three local vessels assisted in recovering everyone from the water, and a fourth vessel righted the *Henerata* and towed it back to Golden Bay.

3.2 The following section analyses the circumstances surrounding the event to identify those factors that increased the likelihood of the event occurring or increased the severity of its outcome. It also examines any safety issues that have the potential to adversely affect future operations.

Planning and decision to operate the service

3.3 A large proportion of accidents involving small vessels are weather related. Bad weather can make the environment on board a vessel extremely hazardous. It can also place a lot of strain on the vessel's structure and equipment and the people on board[20].

3.4 Therefore, prior to sailing, a skipper should develop a plan for the voyage and determine whether it is safe to sail. It is essential that as part of this planning the skipper obtain an up-to-date marine weather forecast and tidal information for their boating area. This information should be considered in conjunction with:

- the vessel and its capabilities
- the intended operations
- the operating area.

3.5 The operator's MTOP required skippers to take weather and sea conditions into consideration for ensuring passenger safety. The MTOP specified, as a minimum, the following decision criteria for skippers:

- the current and forecast weather conditions and sea state
- visibility
- tidal flows (including any changes that could result in wind against tide)
- traffic density
- the health, mobility and comfort of all persons on board
- any other information relevant to the safety of the operation.

3.6 On the day of the accident the skipper obtained and considered the information identified in the MTOP to assist them in making a decision on whether to proceed. Having operated the *Henerata* in similar weather conditions many times, the skipper recalled determining that it was safe to proceed based on their knowledge and experience. The operator's MTOP had no defined weather criteria against which

[20] Maritime New Zealand – https://www.maritimenz.govt.nz/recreational/safety/weather.

skippers could assess the forecast weather. This is discussed further in 'Operator's Maritime Transport Operator Plan considerations'.

3.7 The *Henerata's* design approval and Certificate of Survey included operating limits expressed as a wave height versus speed table. The maximum wave height on the table was two metres. While the nearest swell forecast for the Foveaux Strait area was above the specified wave height, the Paterson Inlet area's location and topography meant its conditions would have likely differed from those forecast. Some parts of the voyage would very likely have been milder than the nearest swell forecast due to the protection afforded by the local area. Conditions in other parts, such as those in the position of the accident, may have been closer to those forecast.

3.8 The accident area was known locally to be subject to steep, confused seas, particularly when the tidal flow acted in the opposite direction to the wind. The boundary between the channelled sand bars of the Freshwater Flats and the deeper water in Paterson Inlet created variable interactions between the seabed and water flow.

3.9 MetService carried out a forensic weather assessment for the Transport Accident Investigation Commission (Commission) to try to determine the expected sea conditions for the forecast wind speed on the day of the accident. Its report stated that wave heights should have been an estimated three-quarters of a metre. While the forensic weather assessment did not appear to match the actual conditions on the day, it did show that conditions in the inlet were difficult to predict.

3.10 To mitigate some of the risks associated with the weather conditions, the skipper planned the *Henerata*'s schedule to ensure that the pick-up time for the passengers from Freshwater Hut coincided with the high-water time at Bluff, which was predicted to occur at 1252. This was to ensure, so far as possible, that the outgoing tide and the prevailing wind would act in the same direction for the eastbound return trip through Paterson Inlet. Sea conditions should have been calmer during this period, helping to reduce the risk to passengers of vessel movements in rough conditions associated with wind against tide. This shows that the skipper had considered the intended operations and the operation area and attempted to mitigate the risks associated with the weather conditions.

Self-perceived pressure

3.11 As there were no communication facilities available at Freshwater Hut, there was no way for the skipper to contact the passengers awaiting the water taxi service. The skipper reported that although drop-off trips to Freshwater Hut were often cancelled, passenger pick-ups were rarely cancelled due to the lack of communication facilities.

3.12 This lack of communication was about as likely as not to have resulted in a self-perceived pressure on the skipper to pick up the passengers. The operator has since amended its booking information provided to passengers to notify them that cancellations are possible and that they should be prepared to stay overnight should cancellations occur.

Conduct of the service and capsize

3.13 While exiting the Freshwater River and crossing the Freshwater Flats on the return journey, the skipper observed that the wind speed had increased and sea conditions had worsened since the outward trip. Although the predicted time of high water had

already passed, it is about as likely as not that there was still some residual flood tide. The skipper considered, but decided against, diverting to Freds Camp and waiting to ensure that the tide had turned to reduce the risk from adverse sea conditions.

The skipper's decision to carry on should have prompted a re-examination of the risks to which the passengers were potentially exposed. Ideally the passengers would have been provided with and donned lifejackets and mustered in the most appropriate position; any safety instructions would have been repeated; and a safety call would have been made using VHF radio.

3.14 The skipper and the passengers recalled the sea conditions just before the *Henerata* capsized as confused, with breaking waves about two to three metres in height. With the offshore wind at the western end of Paterson Inlet, the waves would have been in a developing phase and therefore choppy and asymmetric. The combination of wind speed, the nature of the seabed and the tidal flow created steeper-than-normal and unpredictable seas. In summary, it is about as likely as not that the sea conditions at the time of the accident were considerably more severe than predicted in the weather forecast.

3.15 An inspection of the vessel by the Commission's investigators found no anomalies that would have prevented it operating correctly. An inspection of the engine found no defects that would have prevented it producing power. Similarly, the skipper did not recall any mechanical issues and recalled the vessel becoming overwhelmed by the steep and unpredictable seas. Therefore, the Commission found that the vessel capsize was almost certainly a result of the vessel broaching in the steep and unpredictable seas.

Events after the capsize

3.16 At the time of the capsize the passengers were not wearing their lifejackets. It is to the skipper's credit that they re-entered the upturned hull and guided the passengers out through the forward hatch. Had the skipper not done so, the consequences of this accident could have been more severe.

3.17 While the vessel had an EPIRB on board, the skipper was unable to reach and activate it when the vessel capsized. Had the vessel been fitted with a float-free EPIRB it would have automatically notified authorities once the capsize occurred. The operator has since relocated the EPIRBs on its vessels closer to the helm position and fitted the vessels with float-free EPIRBs.

3.18 While the passengers were not wearing lifejackets at the time, had they been they may have had problems in their egress from the upturned hull. The permanent buoyancy of the lifejackets would have made it difficult for the passengers to swim down and out of the forward hatch. The operator has since changed the lifejackets on board to manually inflatable ones that are less bulky (see Figure 8) and in the event of a capsize can be inflated after escaping the vessel.

Figure 8: Inflatable lifejacket (left) and foam-filled inshore lifejacket similar to those on board the *Henerata* at the time of the accident (credit: Maritime New Zealand)

3.19 Once outside the vessel, the design of the cut-outs on the *Henerata*'s hull allowed for makeshift handholds and helped to keep the skipper and the passengers, who were not wearing lifejackets, afloat and increased their chance of rescue.

3.20 There is no requirement for domestic commercial passenger vessels to have handholds or becket lines[21] to help survivors stay in the vicinity of a capsized vessel. The provision of handholds or similar is an important survivability item that is worthy of consideration and inclusion in the revised Maritime Rules Part 40.

3.21 There were no emergency procedures for the skipper to follow in the event of a capsize. This is further discussed in the section below.

Operator's Maritime Transport Operator Plan considerations

Safety issue: The operator's MTOP did not assess the risks associated with capsize, nor did it provide skippers with weather criteria to assist in deciding when it was safe to operate the vessel.

3.22 Maritime Rules Part 19 requires operators to develop, and operate in accordance with, safety systems that are specific and appropriate to the maritime transport operation. The appendix to Maritime Rules Part 19 also requires operators to develop emergency procedures, including for vessels stricken due to grounding, collision, capsize and sinking.

3.23 MOSS requires maritime operators to establish risk-based safety management systems relevant to their operations.

3.24 In this section the Commission identifies two aspects of the operator's MTOP that could be improved. It has issued a **recommendation** to the operator to address these issues.

[21] A line of looped rope that runs around the outside of a ship's lifeboat to provide handholds for survivors in the water.

Weather criteria

3.25 Established weather criteria take into consideration a vessel and its capabilities, along with information on the intended operations, and provide crew with the worst weather (limits) in which an operation can be safely performed (The Norwegian Commission of Inquiry into the loss of the "Bourbon Dolphin", 2008). If the operator had developed and set predefined weather criteria, all the appropriate considerations in this incident would have been taken into account, resulting in a more consistent approach to deciding when to sail. Weather criteria should be set cautiously to ensure they take into account any limitations in the information available to skippers. Weather criteria do not preclude skippers cancelling operations in less severe weather conditions based on their own judgement.

3.26 The operator had not included predefined weather criteria in its MTOP. This resulted in the skipper having to make a critical safety decision on the weather without any criteria against which to assess it. While the operator had cancellation criteria, they were solely based on getting passengers on and off vessels safely and not on the limitations of the vessels or the weather.

3.27 As there were no set weather criteria, the Commission was unable to determine whether weather criteria would have prevented the water taxi service operating. However, having weather criteria in place is an important risk control.

Risk of capsize

3.28 The operator of the *Henerata* had not assessed the risk of a capsize occurring. As a result there were no documented controls for preventing one occurring or for minimising the consequences should one occur. A fulsome assessment would have likely resulted in a review of its operations to assess how best to prevent one from occurring. Similarly, it would have aimed to minimise the consequences if one were to occur, such as through the provision of a float-free EPIRB, handholds and emergency procedures to assist skippers in their actions and directions to passengers.

3.29 There were limitations in the information available to the operator to assess the vessel's capabilities and risk of capsizing. These are further discussed in 'Regulatory requirements for stability and buoyancy'.

Regulatory requirements for stability and buoyancy

Safety issue: Operators have insufficient stability information to make informed decisions, because there is no requirement for small commercial craft to be provided with stability data.

3.30 The *Henerata* was designed and built by Osprey Boats/Alloyd Engineering (Osprey). Osprey had been producing collared vessels, known in New Zealand as pontoon boats, for more than 20 years. The design is a deep vee hull surrounded by partitioned alloy air chambers that provide additional buoyancy. The *Henerata*'s design was based on a model first approved in 2005.

3.31 Maritime Rules Part 40A prescribes the requirements for design, construction and equipment on New Zealand passenger ships that are not subject to the requirements of the International Convention for the Safety of Life at Sea. The 2005 design approval was made to cover a range of Osprey vessels from 6 to 8.5 metres in length. The design approval described an 'aluminium monohull sportsfisher/cabin cruiser vessel with enclosed accommodation forward and open deck aft'. The intended service and

operating limits were to be finalised between the owner and the surveyor based on the following:

- restricted coastal – limit to be determined by fuel capacity and location. Anticipate six passengers
- inshore limits – depending upon stability for the length of the vessel
- enclosed waters – as above
- limits are subject to the carriage of sufficient [life-saving apparatus] and sufficient stability.

3.32 The *Henerata* was constructed under survey and assigned inshore and enclosed waters operating limits. Maritime Rules Part 40 had been updated since the 2005 design approval. The classification of the Osprey vessels had changed, so that under the revised rule the Osprey was considered to be a well-decked[22] vessel and treated as an open boat[23]. This change in classification brought the Osprey vessels that were longer than six metres into a category for which the swamp test requirements were unclear. However, the *Henerata* did undergo swamp testing under Maritime Rules Part 40A.13 (Stability), 4. This section of the rule allowed for the use of an approved swamp test or calculation that demonstrated that a boat, when fully swamped, had sufficient buoyancy to stay afloat and in good trim.

3.33 The *Henerata*'s stability assessment, as attached to its original survey documents, was a combination of a July 2009 swamp test report for a 7.5-metre Osprey and buoyancy calculations for the 6.5-metre and eight-metre Osprey hulls. Both calculations showed that the airtight volume of the hull significantly exceeded the weight of the hull and therefore the vessels were considered to be very buoyant.

3.34 Although Maritime Rules Part 40A does not state the reasoning behind the flotation and stability requirements, the Australian National Standard for Commercial Vessels describes the risk, the risk controls and the performance requirements behind the flotation tests. All vessels have a risk of capsizing that needs to be controlled. Depending on a vessel's operation, size and flooding-risk category, scaled requirements are prescribed to prevent and control the likelihood of flooding and capsize. Two basic requirements are prescribed for a vessel such as the *Henerata*:

- **basic flotation**, which has a primary function of keeping the vessel afloat in the event of swamping or capsize
- **level flotation**, which has primary functions of keeping the vessel afloat and upright in the event of swamping and, in the event of capsize, afloat.

3.35 New Zealand legislation does not require passenger vessels under 15 metres in length to have stability data booklets. The data contained in a stability booklet can help a vessel's crew to estimate the vessel's stability and how it could be affected by changes in operating conditions or damage.

3.36 By meeting the requirements of the swamp test and/or the swamp test calculation, the vessel is deemed to satisfy all stability requirements and no further stability information is required. However, swamp tests are carried out in calm waters and static

[22] The vessel's deck is exposed to weather and sea, watertight against a head of 1.2 metres of sea water, and fitted with solid sides that would impede the drainage of water over the side.

[23] A boat not protected from the entry of water by means of a complete deck or by a combination of deck, weathertight superstructure and deckhouse.

conditions. In reality, the conditions that are likely to overwhelm a vessel tend to include strong dynamic forces from wind and seas.

3.37 The *Henerata*'s buoyancy was proven by the fact that it remained afloat after capsizing. The original design approval required the vessel's stability to be taken into account for determining its operating limits. Without conducting an inclining experiment[24] required for larger vessels, which is impractical for many small commercial vessels, there was no way to assess the actual stability of the *Henerata*.

3.38 It is therefore difficult for operators of small domestic commercial vessels to define safe operating limits when they have no way of measuring the margin by which a vessel may be approaching or exceeding the designed buoyancy and stability criteria.

3.39 On the one hand, operators are expected to assess vessels' suitability and limitations for intended operations. On the other hand, boat manufacturers are not currently required to provide stability information that would better assist operators in determining vessels' operating parameters.

3.40 The Maritime Rules Part 40 series is currently under revision. Therefore the Commission has issued a **recommendation** to Maritime New Zealand that it ensure future Maritime Rules require appropriate stability and buoyancy testing, with respect to a vessels area of operation, for domestic commercial passenger vessels of all sizes and risk profiles, and consider introducing survivability measures to assist survivors in the water after a capsize event.

[24] A procedure used to determine a vessel's stability characteristics. Known weights are shifted from the centreline to measured distances to port and starboard and the resulting angles of incline used to produce the vessel's own stability data.

4 Findings

4.1 Sea conditions were worse than the skipper expected when the *Henerata* entered steep and unpredictable seas.

4.2 The *Henerata* broached as a result of steep and unpredictable seas, was overwhelmed, and capsized.

4.3 The operator's Maritime Transport Operator Plan had no defined weather criteria to assist the skipper's decision to sail, nor did it assess the risk of capsize.

4.4 A lack of stability information likely prevented the operator being able to fully assess the risk of capsize.

4.5 Due to the absence of any communication facilities at Freshwater Hut, passenger pick-up services from Freshwater Hut were rarely cancelled. It was about as likely as not that this resulted in a self-perceived pressure to operate the water taxi service.

4.6 The pontoon hull design allowed the vessel to stay afloat once it was inverted.

4.7 The passengers were not wearing lifejackets at the time the *Henerata* capsized.

4.8 Cut-outs on the underside of the hull gave the passengers handholds that enabled them to stay together with the upturned vessel.

5 Safety issues and remedial action

General

5.1 Safety issues are an output from the Commission's analysis. They typically describe a system problem that has the potential to adversely affect future operations on a wide scale.

5.2 Safety issues may be addressed by safety actions taken by a participant, otherwise the Commission may issue a recommendation to address the issue.

Operator's safety management system

5.3 A safety management system enables company personnel to implement the company safety policy and ensure that operations on board a vessel are undertaken safely without risk to crew. The underpinnings of an effective safety management system are safety assessments, which examine the tasks being undertaken on a vessel to identify the hazards present. This ensures that appropriate safeguards are put in place.

5.4 On this occasion the operator's safety management system was not supported by an effective assessment of the risk of vessel capsize, or criteria for the weather in which the vessel could be operated safely.

5.5 The operator has taken the following safety actions to address this issue:

- fitting at the helm of each vessel a window-breaking hammer with attached lifejacket strap cutter
- relocating the EPIRB from beside the cabin door to the helm position
- mounting a float-free EPIRB on each vessel's rooftop
- adding manually inflatable lifejackets for the skipper and passengers seated in the cabin
- requiring passengers to wear lifejackets on any trips with a duration of 20 minutes or longer
- adding restraint straps to secure luggage stowed on passenger seats
- revising the MTOP for trip cancellation procedures and the use of other, larger vessels in rough weather.

5.6 The Commission welcomes the safety actions to date. However, it believes more action needs to be taken to ensure the safety of future operations. Therefore, the Commission has made a recommendation in Section 6 to address this issue.

Stability and buoyancy requirements

5.7 New Zealand legislation does not require commercial passenger vessels under 15 metres in length to have stability data booklets. The data contained in a stability booklet can help a vessel's operator and crew to estimate the vessel's stability and how it could be affected by changes in operating conditions or damage.

5.8 Presently, the lack of this information makes it difficult for operators to assess their vessels' capabilities accurately and develop procedures for skippers to follow that define safe operating limits.

5.9 No action has been taken to address this safety issue. Therefore, the Commission has made a **recommendation** in Section 6 to address this issue.

Other safety action

5.10 Participants may take safety actions to address issues that would not normally result in the Commission issuing a recommendation.

5.11 The following additional safety actions have been taken by the operator:

- more frequent reporting on rough-weather trips via VHF radio
- advising customers at the time of booking that all bookings are weather dependent, and postponement or cancellation may occur. Below is an example of the Freshwater River confirmation that is generated from the operator's booking system and emailed to customers when bookings are confirmed:

> Please note that in extreme weather circumstances, there is a possibility that our service may be cancelled. Customers must be prepared to stay at Freshwater Hut for an extra night, or until the weather allows a safe pick up. Cell phone reception is available up Rocky Ridge if you take the marked track from Freshwater Hut (1.5hr round trip). If you decide to walk out instead, please inform us as soon as possible when you arrive back into the village.

6 Recommendations

General

6.1 The Commission issues recommendations to address safety issues found in its investigations. Recommendations may be addressed to organisations or people, and can relate to safety issues found within an organisation or within the wider transport system that have the potential to contribute to future transport accidents and incidents.

6.2 In the interests of transport safety, it is important that recommendations are implemented without delay to help prevent similar accidents or incidents occurring in the future.

New recommendations

6.3 **On 18 November 2020 the Commission recommended that Maritime New Zealand ensure that future Maritime Rules require appropriate stability, buoyancy, and survivability assessments with respect to a vessel's area of operation, and that information is made available for all domestic commercial passenger vessels. (013/20)**

On 3 December 2020, Maritime New Zealand replied:

> We agree with this recommendation.
>
> The issue will be incorporated into a wider reform of Maritime Rules Part 40. This reform project began in 2018 and is the most significant reform of domestic commercial vessel standards in almost 20 years.
>
> The project will explore what information should be made available on vessels, including passenger vessels. More broadly, the recommendation speaks to things such as passenger safety briefings and safety systems, which fall under Maritime Rules Part 19: Maritime Transport Operator – Certifications and Responsibilities. As part of the reform project, possible links and consequential amendments to Part 19 will be explored.
>
> The purpose of Rules Part 19 is to require maritime transport operators to develop, and operate in accordance with, safety systems that are specific and appropriate to their maritime transport operation. Specifically, Part 19 prescribes certification requirements for persons who conduct maritime transport operations and the requirements for continuing such operations.
>
> The 40 Series Reform is a long-term, collaborative project that intends to ensure that the rules for design, construction and equipment for domestic (non-SOLAS) ships are fit for purpose. Because of the scale of the reform being undertaken in this project, Maritime NZ believes the new rules, if accepted by the Minister of Transport, would likely come into effect in 2023.

6.4 **On 18 November 2020 the Commission recommended that Rakiura Charters Limited ensure that its Maritime Transport Operator Plan assesses all risks associated with its operations and ensure that adequate guidance is available for skippers to make decisions on when it is safe to sail. (014/20)**

On 3 December 2020, Rakiura Charters replied:

We (Rakiura Charters Limited) confirm that we have fully implemented the final recommendation 014/20.

1. Ensure that Rakiura Charters Limited's MTOP assesses all risks associated with its operations:

We conducted an internal review of our MTOP in Oct-Apr 2020 which was followed by a Maritime New Zealand audit in May 2020

2. Ensure that adequate guidance is available for skippers to make decisions on when it is safe to sail:

We have

a) changed our weather forecasting provider to a more local provider providing more accurate data

b) included consideration of a live local weather station in our weather assessment process

c) introduced the option to skippers to utilise another operator's larger vessel when needed

d) formalised a Plan B procedure to divert to a sheltered area, once the decision to sail has already been made, if there is a sudden extreme weather change, including the option to leave passengers behind if unsafe to continue trip

7 Key lessons

7.1 The Maritime Rules set minimum standards for vessels to operate safely. Operators should strive to exceed the minimum standard and in doing so provide their crews and passengers with a better chance of survival in emergency situations.

7.2 Safety equipment should be fit for purpose and readily accessible by occupants when required.

7.3 When a skipper identifies an increased risk due to unexpected conditions, they should take appropriate actions to ensure the vessel and passengers are prepared for an emergency event.

8 Data summary

Vehicle particulars

Name:	*Henerata*
Type:	collared vessel, water taxi
Class:	New Zealand MOSS
Limits:	restricted, inshore
Length:	7.5 metres
Breadth:	2.5 metres
Built:	2018
Propulsion:	Honda outboard 250hp
Owner/Operator:	Rakiura Charters Limited
Minimum crew:	one

Date and time	12 September 2019, 1320
Location	Paterson Inlet, Stewart Island/Rakiura
Persons involved	seven: six passengers, one crew
Injuries	hypothermia
Damage	salt water contamination of outboard motor, water damage to inside of cabin and electronics, broken window and minor hull damage

9 Conduct of the inquiry

9.1 On 13 September 2019, a news bulletin in relation to the occurrence was brought to the attention of the Commission. The Commission subsequently opened an inquiry under section 13(1) of the *Transport Accident Investigation Commission Act 1990* and appointed an investigator in charge.

9.2 On 14 September 2019, two investigators travelled to Stewart Island to interview the skipper and other local operators, inspect the *Henerata*, and gather documentary evidence. The vessel's chart plotter was seized and a protection order was placed on the memory device contained within the outboard motor.

9.3 On 9 October 2019, two investigators travelled to Tākaka to interview two passengers who had been on the *Henerata* at the time of the accident. On 10 October 2019, two investigators interviewed a third passenger at the same location. A fourth passenger and a skipper involved in the search and rescue were interviewed by telephone.

9.4 On 17 December 2019, two investigators visited the factory where the *Henerata* had been built. On the same day, the investigators interviewed the surveyor who had overseen the building of the *Henerata*.

9.5 On 19 August 2020, the Commission approved a draft report for circulation to five interested persons for their comment.

9.6 The Commission received four submissions, and changes as a result of these have been included in the final report.

9.7 On 18 November 2020, the Commission approved the final report for publication.

10 Report information

Abbreviations

EPIRB	emergency position indicating radio beacon
MOSS	Maritime Operator Safety System
MTOP	Maritime Transport Operator Plan
VHF	very high frequency

Glossary

aft	towards the rear of a vessel
bow	the forward end of a vessel
broach	when a vessel is forced side-on to the waves
channel 65	Stewart Island Marine Radio ZLRZ
collared vessel	a rigid-hulled vessel that has rigid alloy or inflatable buoyancy chambers around the periphery of the hull
confused	a condition in which waves originate from different directions, which can create confusion when anticipating ship handling requirements
knot	a measurement of speed in nautical miles per hour, equivalent to 1.852 kilometres per hour
Mayday	an international radio distress message indicating a life-threatening emergency
pontoon vessel	in New Zealand terminology, a rigid-hulled collared vessel that has alloy buoyancy chambers around the periphery of the hull
stern	the rear end of a vessel

11 Notes about Commission reports

Commissioners

Chief Commissioner	Jane Meares
Deputy Chief Commissioner	Stephen Davies Howard
Commissioner	Richard Marchant
Commissioner	Paula Rose, QSO

Key Commission personnel

Chief Executive	Lois Hutchinson
Acting Chief Investigator of Accidents	Naveen Mathew Kozhuppakalam
Investigator in charge	Captain Jennifer Cuttriss
General Counsel	Cathryn Bridge

Citations and referencing

This final report does not cite information derived from interviews during the Commission's inquiry into the occurrence. Documents normally accessible to industry participants only and not discoverable under the Official Information Act 1982 are referenced as footnotes only. Publicly available documents referred to during the Commission's inquiry are cited.

Photographs, diagrams, pictures

The Commission has provided, and owns, the photographs, diagrams and pictures in this report unless otherwise specified.

Verbal probability expressions

This report uses standard terminology to describe the degree of probability (or likelihood) that an event happened, or a condition existed in support of a hypothesis. The expressions are defined in the table below.

Terminology*	Likelihood	Equivalent terms
Virtually certain	> 99% probability of occurrence	Almost certain
Very likely	> 90% probability	Highly likely, very probable
Likely	> 66% probability	Probable
About as likely as not	33% to 66% probability	More or less likely
Unlikely	< 33% probability	Improbable
Very unlikely	< 10% probability	Highly unlikely
Exceptionally unlikely	< 1% probability	

*Adopted from the Intergovernmental Panel on Climate Change

TAIC Kōwhaiwhai - Māori scroll designs

TAIC commissioned its kōwhaiwhai, Māori scroll designs, from artist Sandy Rodgers (Ngati Raukawa, Tuwharetoa, MacDougal). Sandy began from thinking of the Commission as a vehicle or vessel for seeking knowledge to understand transport accident tragedies and how to prevent them. A 'waka whai mārama (i te ara haumaru) is 'a vessel/vehicle in pursuit of understanding'. Waka is metaphor for the Commission. Mārama (from 'te ao mārama' – the world of light) is for the separation of Rangitāne (Sky Father) and Papatūānuku (Earth Mother) by their son Tāne Māhuta (god of man, forests and everything dwelling within), which brought light and thus awareness to the world. 'Te ara' is 'the path' and 'haumaru' is 'safe or risk free'.

Corporate: Te Ara Haumaru - The safe and risk free path

The eye motif looks to the future, watching the path for obstructions. The encased double koru is the mother and child, symbolising protection, safety and guidance. The triple koru represents the three kete of knowledge that Tāne Māhuta collected from the highest of the heavens to pass their wisdom to humanity. The continual wave is the perpetual line of influence. The succession of humps represent the individual inquiries.

Sandy acknowledges Tāne Māhuta in the creation of this Kōwhaiwhai.

Aviation: ngā hau e whā - the four winds

To Sandy, 'Ngā hau e whā' (the four winds), commonly used in Te Reo Māori to refer to people coming together from across Aotearoa, was also redolent of the aviation environment. The design represents the sky, cloud, and wind. There is a manu (bird) form representing the aircraft that move through Aotearoa's 'long white cloud'. The letter 'A' is present, standing for aviation.

Sandy acknowledges Ranginui (Sky father) and Tāwhirimātea (God of wind) in the creation of this Kōwhaiwhai.

Marine: ara wai - waterways

The sections of waves flowing across the design represent the many different 'ara wai' (waterways) that ships sail across. The 'V' shape is a ship's prow and its wake. The letter 'M' is present, standing for 'Marine'.

Sandy acknowledges Tangaroa (God of the sea) in the creation of this Kōwhaiwhai.

Rail: rerewhenua - flowing across the land

The design represents the fluid movement of trains across Aotearoa. 'Rere' is to flow or fly. 'Whenua' is the land. The koru forms represent the earth, land and flora that trains pass over and through. The letter 'R' is present, standing for 'Rail'.

Sandy acknowledges Papatūānuku (Earth Mother) and Tāne Mahuta (God of man and forests and everything that dwells within) in the creation of this Kōwhaiwhai.

Transport Accident Investigation Commission

Recent Marine Occurrence Reports published by the Transport Accident Investigation Commission

MO-2019-203	Bulk log carrier *Coresky OL*, Crew fatality during cargo-securing operation, Eastland Port, Gisborne, 3 April 2019
MO-2018-205	Fatality on board the factory trawler *San Granit*, 14 November 2018
MO-2019-202	Fatal jet boat accident, Hollyford River, Southland, 18 March 2019
MO-2019-201	Jet boat Discovery 2, contact with Skippers Canyon wall, 23 February 2019
MO-2018-202	Accommodation fire on board, fishing trawler *Dong Won 701*, 9 April 2018
MO-2018-203	Grounding of container ship *Leda Maersk*, Otago Lower Harbour, 10 June 2018
MO-2018-204	*Dolphin Seeker*, grounding, 27 October 2018
MO-2017-204	Passenger vessel *Seabourn Encore*, breakaway from wharf and collision with bulk cement carrier at Timaru, 12 February 2017
MO-2017-203	Burst nitrogen cylinder causing fatality, passenger cruise ship *Emerald Princess*, 9 February 2017
MO-2017-205	Multipurpose container vessel *Kokopo Chief*, cargo hold fire, 23 September 2017
MO-2017-202	Passenger vessel *L'Austral*, grounding, Milford Sound, Fiordland, 9 February 2017
MO-2016-206	Capsize and foundering of the charter fishing vessel *Francie*, with the loss of eight lives, Kaipara Harbour bar, 26 November 2016
MO-2016-202	Passenger ship, *Azamara Quest*, contact with Wheki Rock, Tory Channel, 27 January 2016
MO-2017-201	Passenger vessel *L'Austral* contact with rock Snares Islands, 9 January 2017
MO-2016-201	Restricted-limits passenger vessel the *PeeJay* V, Fire and sinking, 18 January 2016
MO-2016-204	Bulk carrier, *Molly Manx*, grounding, Otago Harbour, 19 August 2016
MO-2016-205	Fatal fall from height on bulk carrier, *New Legend Pearl*, 3 November 2016
MO-2015-201	Passenger ferry *Kea*, collision with Victoria Wharf, Devonport, 17 February 2015

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