Transportation Safety Board of Canada
Bureau de la sécurité des transports du Canada

MARINE TRANSPORTATION SAFETY INVESTIGATION REPORT M17C0179

BOTTOM CONTACT AND SUBSEQUENT FLOODING

Passenger vessel *Island Queen III*
Kingston, Ontario
08 August 2017

Canada

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Executive summary

On 08 August 2017, at approximately 1246 Eastern Daylight Time, the passenger vessel *Island Queen III*, with 279 passengers, 10 crew members, and an entertainer on board, was on a 3-hour cruise in the Thousand Islands area of the St. Lawrence River when it made bottom contact off Kingston, Ontario. Shortly after departure, the vessel had deviated from its planned route to avoid a fleet of sailing dinghies causing it to travel north of its intended track. The vessel's position was being monitored solely by visual navigation. Although other sources of information and methods of navigation were available, none of these were used to cross-check the visual navigation, allowing the inaccuracy of the navigation to go undetected.

The vessel sustained damage that resulted in the flooding of the steering compartment. The vessel was able to return to the dock without assistance. No injuries or pollution were reported. The TSB investigation into this occurrence revealed safety deficiencies that led the Board to issue 3 safety concerns.

Availability of sufficient lifejackets for all children and infants on board

Transport Canada's (TC's) *Life Saving Equipment Regulations* require every vessel of more than 5 gross tonnage (GT) and certified to carry more than 12 passengers to carry 1 lifejacket for each member of the complement. In addition, these vessels must carry lifejackets that are suitable for children for at least 10% of the maximum complement, or 1 for each child on board, whichever is greater.[1]

The *Island Queen III* carried 31 child sized lifejackets, 10% of its maximum complement. The investigation determined that there were 32 children and 4 infants on board. However, there was no procedure in place to determine and record these numbers and the master and crew did not know how many children and infants were actually on board. In addition, unlike international requirements for the carriage of lifejackets for a body mass under 15 kg, there is no Canadian requirement for a vessel to carry lifejackets that are suitable for infants.

The Board is concerned that, without TC requirements for the carriage of infant-sized lifejackets on board vessels, and for vessel operators to ensure the number of child- and infant-sized lifejackets on board equals or exceeds the number of children and infants on board, there remains a risk that vessels may not have a sufficient number of suitably sized lifejackets for children and infants.

Safe evacuation of passengers in an emergency

The *Life Saving Equipment Regulations* require all passenger vessels to have an evacuation procedure that outlines how all passengers and crew members will be evacuated from the vessel within 30 minutes of the abandon ship signal being given.[2] Although this regulatory requirement is in place, there is no process in place for operators to confirm that their procedure meets the requirement or to obtain approval from the regulator. In addition, TC has no formal procedure to assess if this requirement is being met. Presently, each inspector is left to determine how this requirement is assessed; the requirement is most frequently assessed by the inspector witnessing a drill on board the vessel. This provides little insight as to the crew's ability to evacuate passengers from the vessel, as drills are almost always conducted without passenger involvement.

The *Island Queen III* did not have a procedure to evacuate its passengers within 30 minutes of an abandon ship signal being sounded, as required by regulation.

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1 Transport Canada, C.R.C., c. 1436, *Life Saving Equipment Regulations* (last amended 17 June 2015), paragraph 17(5)(b).

2 Transport Canada, C.R.C., c. 1436, *Life Saving Equipment Regulations* (last amended 17 June 2015), section 111.

The absence of evacuation procedure development by operators and of oversight by the regulator has been identified in other TSB investigations.[3] Similarly, another 5 TSB investigations[4] identified the absence of passenger safety-related duties in evacuation procedures or muster lists, and the fact that this absence was not identified through annual vessel inspections.

The Board is concerned that, until such time as TC implements a formal validation and approval process for passenger vessel evacuation procedures, there remains a risk that crew members and passengers will not be prepared for the safe evacuation of the vessel in an emergency.

Crew training in passenger safety management

The emergency duties assigned to any crew members relating to passenger safety fall largely within the domain of crowd management. Therefore, crew members require knowledge and skill in crowd management, as well as a basic understanding of crisis management and human behaviour in emergencies.

TC's *Marine Personnel Regulations* require crew members to hold a Passenger Safety Management Certificate[5] when assigned to assist passengers in an emergency on Canadian passenger vessels of more than 500 GT that carry more than 12 passengers and are on a voyage other than a sheltered waters voyage. The 12.5 hours of training required to obtain this certificate are specific to the management of passengers in an emergency.

Crew members on smaller passenger vessels or passenger vessels making a sheltered waters voyage, where the above passenger safety management training is not required, do receive training in passenger management as a small part of the required Marine Emergency Duties (MED) training. However, in the case of the Small Seasonal Passenger-Carrying Vessel Safety (Non-Certificated Personnel) MED Training, which was completed by many of the staff on board the *Island Queen III*, the entire training is completed in 6 hours, with just 15 minutes allotted to crowd control.

The current requirement to complete the passenger safety management training is based on vessel tonnage and the voyage type. The number of passengers is not the primary consideration in the requirement for this specialized training. Currently in Canada, there

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3 TSB marine transportation safety investigation reports M06W0052 and M12C0058. Appendix C of the report into this occurrence, M17C0179, contains a list of similar investigations.

4 TSB marine transportation safety investigation reports M07L0158, M12C0058, M13L0067, M13M0287, and M15A0009.

5 Transport Canada, SOR/2007-115, *Marine Personnel Regulations* (as amended 03 February 2017), subsection 230(1).

are only 115 passenger vessels greater than 500 GT, while there are 1145 passenger vessels of 500 GT or less which may carry large numbers of passengers, such as the *Island Queen III*.[6]

The Board is concerned that, until such time as the crew members of all vessels carrying more than 12 passengers are required to complete appropriate training in passenger safety management, there remains a risk that crew members will not be prepared to manage passengers effectively in emergency situations.

6 Search of Transport Canada Vessel Registration Query System at 26 November 2019 (available at https://wwwapps.tc.gc.ca/Saf-Sec-Sur/4/vrqs-srib/eng/vessel-registrations/search, last accessed on 13 January 2020). Includes all passenger vessels and ferries greater than 5 GT up to and including 500 GT.

MARINE TRANSPORTATION SAFETY INVESTIGATION REPORT M17C0179

BOTTOM CONTACT AND SUBSEQUENT FLOODING

Passenger vessel *Island Queen III*
Kingston, Ontario
08 August 2017

1.0 FACTUAL INFORMATION

1.1 Particulars of the vessel

Name	*Island Queen III*
Official number	348017
Port of registry	Kingston
Flag	Canada
Type	Passenger
Materials	Aluminum
Gross tonnage	303.56
Length overall	27.4 m
Registered length	20.06 m
Draft (estimated at the time of the occurrence)	1.7 m
Built	1975
Propulsion	2 geared diesel engines, providing 483 kW (648 BHP) in total
Maximum complement	308 (maximum 301 passengers, minimum 7 crew)
Complement on board at the time of the occurrence	290 (279 passengers, 10 crew, 1 entertainer)
Registered owner/manager	Kingston & The Islands Boat Lines Ltd.

1.2 Description of the vessel

The *Island Queen III* (Figure 1) is a triple-decked passenger vessel with a decorative paddle wheel located at the stern and a functional gangway at the bow. The general arrangement of the vessel is shown in Appendix A.

Figure 1. The *Island Queen III* (Source: TSB)

The main deck is enclosed with horizontally sliding windows all around. Passengers and crew embark and disembark using this deck through exits located on the starboard side at the bow and stern. Two additional exits to the exterior deck are located on the port side at the bow and stern, and are intended for emergency use. A stage for on-board entertainment is located at the bow, and a canteen area is located at the stern. The rest of the deck is open and certified to accommodate 140 passengers; stackable chairs are provided for optional seating. Stairways on both the port and starboard sides at the stern provide access to the promenade deck.

The promenade deck is enclosed with horizontally sliding windows all around; there are no exits to the exterior from this deck. The deck is fitted with tables and chairs that can accommodate 108 dining passengers, and a bar is located at the stern. A stairway on the port side at the stern provides access to the upper deck.

The upper deck is an open observation deck with bench seating that can accommodate 53 passengers. The upper deck also provides access to the vessel's elevated wheelhouse.

The enclosed main and promenade decks create high sides on the vessel, while the vessel's draft is shallow relative to its height. This design causes the vessel to drift from its intended course when the wind is on the vessel's side.

The hull below the main deck is divided into 6 watertight compartments (from stern): stern storage, steering compartment (identified in Appendix A as the steering room), supplies room, engine room, fuel compartment (identified in Appendix A as the cargo room), and forepeak. Each compartment is accessible through its own hatch on the main deck.

The engine room is equipped with 2 geared diesel engines, each connected to a propeller. The engine room is also fitted with an engine-driven bilge pump and an electrical bilge pump. Both pumps are connected to the bilge manifold, which connects suction lines to each of the 6 underdeck compartments.

The steering compartment contains the steering gear controlling the 2 rudders. In addition to the bilge system suction, an electric submersible pump is fitted in this space.

The wheelhouse is equipped with a global positioning system (GPS) receiver, a multifunction display with integrated radar and chart plotter, and an electronic charting system (ECS). The wheelhouse is also fitted with 2 very high frequency (VHF) radiotelephones, a public address (PA) system, an internal communications system, and a GPS-triggered tour commentary system.[7]

The vessel is equipped with 4 inflatable rescue platforms: 1 located on the port side and 3 on the starboard side, each with a capacity of 75 persons. The vessel carries 310 adult-sized lifejackets and 31 lifejackets suitable for children[8] on board.

1.3 History of the voyage

At 1210[9] on 08 August 2017, the *Island Queen III* began boarding passengers for its Heart of the Islands cruise.[10] With 279 passengers on board, the vessel departed Kingston, Ontario, at 1237, with the master at the helm. In addition to passengers, the complement included 10 crew members and 1 entertainer, for a total of 290 people on board.

During departure, the mate was on the bow to let go the forward mooring lines. Once the lines were clear, the mate proceeded to the wheelhouse. Shortly after the vessel departed the dock, a pre-recorded audio safety briefing played in English over the vessel's GPS-triggered tour commentary system.

At approximately 1240, as the vessel approached Point Frederick Shoal (Figure 2), the mate entered the wheelhouse. Both the mate and the master observed a fleet of sailing school dinghies (shown as red boats in Figure 2) to the vessel's port side and clear of the planned route.

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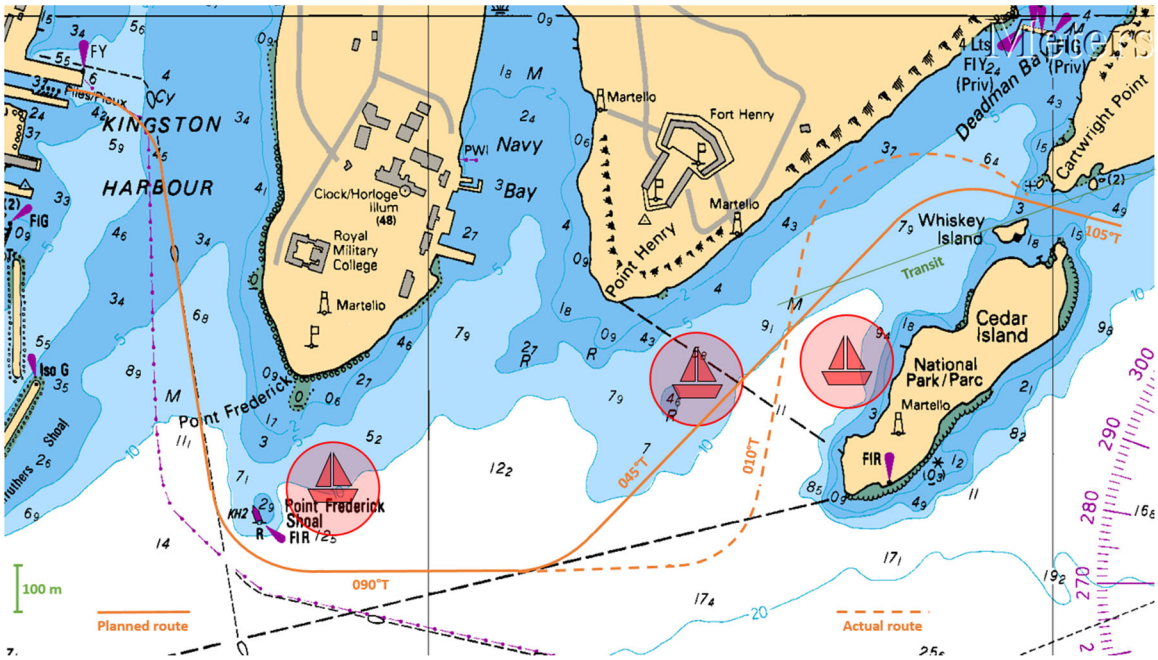
7 A GPS-triggered tour commentary system automatically plays recorded commentary when the vessel is in close proximity to a predetermined GPS position along the cruise route.

8 Paragraph 17(5)(b) of the *Life Saving Equipment Regulations* requires lifejackets suitable for children for at least 10% of the complement, or 1 for each child on board, whichever is greater.

9 All times are Eastern Daylight Time (Coordinated Universal Time minus 4 hours).

10 The Heart of the Islands cruise is approximately 33 nautical miles round trip and lasts about 3 hours, departing from Kingston and passing through the Thousand Islands.

Figure 2. The *Island Queen III*'s track from Kingston Harbour to Cartwright Point (shown in orange) and the sailing school dinghies (indicated by red boats) (Source: Canadian Hydrographic Service Chart 2017, *Kingston Harbour and Approaches*, with TSB annotations)



The mate then began to count the tickets collected from the passengers upon boarding to get an accurate count of the number of passengers on board.

After passing the Point Frederick Shoal buoy and the fleet of dinghies, the master turned the vessel to port to a heading of approximately 090° true (T). A second fleet of sailing school dinghies was training off Point Henry, near the master's planned route. To avoid the dinghies, the master continued past the planned alteration point and toward Cedar Island. A third fleet of sailing school dinghies was training off Cedar Island. Once the vessel was clear of the dinghies off Point Henry, at approximately 1243, the master turned to port to a new course of approximately 010°T, which gave a wide berth to the second and third fleets of dinghies as the vessel proceeded up Deadman Bay.

Navigating visually, the master continued up Deadman Bay until the north side of Whiskey Island and the south side of Cartwright Point were in transit.[11] At approximately 1244, the master applied 5° starboard helm to turn the vessel onto the planned course of 105°T, into the channel between Whiskey Island and Cartwright Point, known as Whiskey Cut.[12] The master visually determined that the vessel was northwest of the planned route and checked the ECS to confirm sufficient water depths in the area. The master also confirmed that the vessel's position displayed on the ECS was northwest of the planned route.

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11 "Two objects…seen in line with one another are said to be in transit." (Source: The International Maritime Dictionary, 2nd edition [Van Nostrand Reinhold Company Inc., 1961, reprinted 1983]).

12 Whiskey Cut measures approximately 70 m from Whiskey Island to Cartwright Point. The navigable channel measures approximately 50 m from Whiskey Island with a shallow area and submerged rock near the shoreline of Cartwright Point.

The master continued the turn until the vessel's bow was aligned with the centre of Whiskey Cut and then returned the helm to amidships on a heading of approximately 140°T. At approximately 1245, the master visually determined that the vessel's heading would cause the vessel to pass too close to Cartwright Point. To correct the heading, the master applied 3 degrees starboard helm until the vessel's bow was once again aligned with the centre of Whiskey Cut, and then returned the helm amidships.

With the vessel now approximately 150 m from Whiskey Cut, the master again visually determined that the vessel would pass too close to Cartwright Point and once more applied 3° of starboard helm to align the vessel with the centre of Whiskey Cut. At 50 m from Whiskey Cut, the master applied a third correction of 3° starboard helm to once again move the vessel into the centre of Whiskey Cut. The master's correction swung the bow to starboard, while the stern swung to port and toward the shoreline of Cartwright Point. To correct the stern's swing to port, the master applied port helm. These helm manoeuvres attracted the attention of the mate, who was still counting tickets in the wheelhouse.

At 1246, the *Island Queen III* made bottom contact with a submerged rock southwest of Cartwright Point. A distinct bump was felt and a loud noise was heard as the vessel's keel made contact. The port propeller also made contact with the bottom, causing the port engine to stall. The port rudder was jammed at approximately 5° to port.

The vessel sheered to port as it continued forward. The master put the starboard propeller astern, correcting the sheer and swinging the bow back toward the centre of Whiskey Cut. He restarted the port engine and manoeuvred the vessel through Whiskey Cut, turning back toward Kingston along the southeast side of Cedar Island. The mate proceeded to the bow to inspect the vessel for damage.

The crew member designated in charge of machinery (henceforth referred to as "the engineer"[13]), who was in the engine room when the vessel made bottom contact, inspected the engine room's hull and machinery for damage and found none. He then proceeded up to the main deck and joined the mate on the bow.

The mate and the engineer looked over the port side and along the length of the vessel and did not see any damage. They then moved inside and cleared passengers and chairs from the access hatch to the fuel compartment. The mate entered the fuel compartment and did not see any damage.

At 1250, the mate opened the hatch to the steering compartment. Water had flooded the compartment to a depth of approximately 15 cm. The water was entering the compartment through a gash measuring approximately 30 cm long in the bottom shell plating on the aft port side of the vessel.

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13 In this occurrence, "engineer" refers to a person designated in charge of machinery, per Marine Technical Review Board Decision M10720 (available at https://wwwapps.tc.gc.ca/Saf-Sec-Sur/4/mtrbq-sridb/eng/decisions/details/10720, last accessed on 21 February 2020).

The mate instructed the engineer to return to the engine room and start the bilge pump for the steering compartment. The mate also instructed a canteen server to inform the master that the vessel was taking on water in the steering compartment. The mate entered the steering compartment, started the local electric submersible pump, and exited the compartment to stand by at the access hatch.

While the mate and engineer were assessing the vessel for damage, the purser was working at the bar on the promenade deck. Because no information about the occurrence had been conveyed to passengers and staff, several members of the hospitality staff came to the purser seeking information and direction. The purser told the staff to reassure passengers and carry on serving them as usual. Several passengers also asked the purser what was happening; the purser reassured the passengers and informed them that the crew was assessing the situation.

At approximately 1251, the canteen server called the wheelhouse on the internal communications system and informed the master that water was coming into the steering compartment and that the engineer was starting the bilge pump. The master informed the server that the vessel would return to Kingston. The server then proceeded to the promenade deck and informed the purser that the vessel was taking on water and would be returning to Kingston.

The master contacted the company's senior master ashore to inform him of the incident and of the vessel's return to its berth in Kingston.

The entertainer entered the wheelhouse and asked the master if he should make an announcement to passengers. The master agreed, and the entertainer went back toward the stage area.

At approximately 1253, the engineer returned to the steering compartment access hatch and confirmed to the mate that the engine-driven bilge pump had been started and was pumping from the steering room. The mate instructed the engineer to retrieve the 3 fire buckets located on the promenade deck.

The entertainer announced over the vessel's public address system that the vessel would be returning to Kingston due to mechanical issues. The passengers were not informed of the specific reasons for the return.

The engineer returned to the steering compartment access hatch with the fire buckets. The lights had gone out in the compartment, so he proceeded to the electrical panel located in the men's washroom on the main deck. The breaker for the steering compartment lights had tripped. To prevent the risk of electrocution, he isolated all power to the compartment. The engineer returned to the steering compartment access hatch at approximately 1257.

At 1300, the mate proceeded to the wheelhouse and informed the master that water had flooded the steering compartment up to the second rung on the ladder (a depth of approximately 60 cm), and that the bilge pump and electric submersible pump were pumping water from the compartment.

At 1302, the mate proceeded to the steering compartment access hatch. On his way there, the mate suggested to the purser that he designate a crew member to distribute lifejackets, if lifejackets were needed.

When the mate returned to the steering compartment access hatch, he observed that the water level inside the compartment had risen further. The mate instructed 2 members of the hospitality staff to direct the passengers away from the steering compartment access hatch and the starboard side door.

At 1305, the mate began bailing water from the steering compartment with the fire buckets, passing buckets of water to the engineer and members of the hospitality staff who threw the water overboard through the starboard side door located in the passenger seating area. Despite the pumping and bailing, the water continued to rise as the vessel made its way back to the dock in Kingston.

The vessel arrived at the dock at approximately 1315, where it was secured. Two gangways were rigged on the starboard side (1 at the bow and 1 near the stern) to disembark the passengers. By this time, the water level in the steering compartment had reached the 6th rung on the ladder, approximately 1.4 m. The master became fully aware of the amount of flooding, and subsequent bailing activity, after the vessel was secured at the dock.

The vessel's hull was temporarily plugged from the outside, and additional pumps were used to manage the flooding in the steering compartment until the vessel was dry docked the following morning.

1.4 Environmental conditions

The wind was from the south at 10 to 15 knots, and visibility was good. Surface current predictions[14] for the occurrence area indicated currents of less than 0.1 knots.

The water level of Lake Ontario was 1.35 m above chart datum, which was 0.65 m higher than the average for August.

[14] Data obtained from Great Lakes Observing System Data Portal Catalog, at https://portal.glos.us/ (last accessed 24 February 2020).

1.5 Damage to the vessel

Figure 3. Damage to port propeller and rudder (Source: TSB)

The grounding deformed the vessel's keel from amidships to the stern, with tearing near amidships. The port propeller was damaged (Figure 3), as well as its tail shaft and shaft strut. The port rudder was pushed aft, bending the port rudder stock and deforming the hull surrounding the rudder stock. The top of the port rudder also punctured the hull at the steering compartment, creating an L-shaped opening measuring approximately 20 cm by 40 cm and pushing the shell plating upward approximately 15 cm (Figure 4). Nearby hull stiffeners and the bulkhead separating the steering compartment and stern storage were also damaged.

When the vessel made bottom contact, the port engine stalled. Once the engine was restarted, it was operated at a maximum of 900 rpm, as above 900 rpm significant vibration was felt throughout the ship. The engine's usual maximum is 1900 rpm.

According to the damage stability calculations in the vessel's stability information booklet,[15] the vessel would remain afloat with the steering compartment flooded.

Figure 4. Section of bottom shell plate punctured by rudder (Source: TSB)

1.6 Company operations

Kingston & The Islands Boat Lines Ltd., has been conducting tours out of Kingston, Ontario, since 1976. At the time of the occurrence, its fleet included 3 passenger vessels. It offers several sightseeing excursions seasonally from late March or early April to late October.

15 Transport Canada (TC), TP 10943, *Passenger Vessel Operations and Damaged Stability Standards (Non-convention vessels)* (2007) requires that a vessel's stability information booklet be submitted to TC for approval. The *Island Queen III*'s draft booklet was submitted to TC in February 2011. Since then, the booklet has been returned to the owner several times for clarifications and the owner has also requested further changes, adding to the delay in approval.

The Heart of the Islands Cruise is 3 hours and approximately 33 nautical miles in length, and includes Kingston's historical sites and the Thousand Islands area of the St. Lawrence River. It is not unusual for vessels to pass close to land as they navigate the narrow channels along the predetermined route.

On the *Island Queen III*, a GPS-triggered commentary system automatically plays recorded tour commentary over the vessel's public address (PA) system when the vessel is in close proximity to a predetermined GPS position along the cruise route. This allows the master to focus on the operation of the vessel.

1.7 Vessel certification and inspection

At the time of the occurrence, the *Island Queen III* was certified and equipped in accordance with existing regulations. The vessel held a valid Transport Canada (TC) inspection certificate for a non-convention[16] passenger vessel operating in sheltered waters within 1 NM from shore between Trenton, Ontario, and Prescott, Ontario. The certificate, which was valid for 1 year, permitted a maximum complement of 308 persons, of which 301 were passengers. TC last inspected the vessel on 04 April 2017.[17] The vessel also held a Record of Safety Equipment, which TC issued on 10 April 2008.

The *Island Queen III* had on board 2 minimum safe manning documents issued by TC, which allowed the vessel to operate with different crew complements depending on the number of passengers on board. Subsection 219(1) of the *Marine Personnel Regulations* (MPR) requires a vessel of less than 750 kW propulsive power on a sheltered waters voyage, such as the *Island Queen III*, to have a small vessel machinery operator as part of its complement. However, TC Marine Technical Review Board[18] Decision M10720 granted the *Island Queen III* the option of replacing the required small vessel machinery operator with a person who has received instruction on how to operate the vessel's machinery, and who is designated in charge of that machinery. The vessel was crewed in accordance with existing regulations.

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16 Vessels that are subject to the International Convention for the Safety of Life at Sea (SOLAS Convention) are referred to as convention vessels. The *Island Queen III* is not subject to the SOLAS Convention and therefore is referred to as a non-convention vessel.

17 Vessels are inspected and have certificates issued either by TC inspectors or by recognized organizations under the Delegated Statutory Inspection Program. The *Island Queen III* was inspected by TC inspectors.

18 The Marine Technical Review Board "review[s] applications for equivalencies to safety requirements or exemptions from non-safety ones. These applications concern individual Canadian vessels or the issuance of Canadian maritime documents to persons." (Source: Transport Canada, "Marine Technical Review Board (MTRB), available at https://www.tc.gc.ca/eng/marinesafety/rsqa-cea-mtrb-menu-316.htm [last accessed 24 February 2020]).

1.8 Personnel certification and experience

The master held a Master 150 Gross Tonnage, Domestic certificate that was first issued in 2012. The certificate was valid until 03 December 2017 and limited to vessels of up to 150 gross tonnage (GT) on a near coastal Class 2 voyage and vessels of up to 500 GT on a sheltered waters voyage. The master also held a Small Vessel Machinery Operator certificate, limited to vessels with engine power less than 750 kW engaged on a limited, near coastal Class 2 voyage or a sheltered waters voyage. The master also held the following certificates:

- Restricted Operator's Certificate—Maritime Commercial (ROC-MC)
- Marine Advanced First Aid (STCW)[19]
- Marine Emergency Duties (MED) Basic Safety and Small Passenger-Carrying Vessel Safety (MED A1/A2)
- MED Proficiency in Survival Craft and Rescue Boats other than Fast Rescue Boats (STCW)
- MED Advanced Firefighting (STCW)

The master began his professional marine career working for the company in 2005 as a deckhand, and acquired enough sea time to obtain his certificate as a mate on vessels of less than 60 GT. In 2006, he worked as mate and then as master on vessels less than 60 GT with another tour boat company in the area. After obtaining his Master 150 Gross Tonnage, Domestic certificate, he returned to Kingston & The Islands Boat Lines Ltd. in 2013. The master's professional experience was exclusively on small seasonal passenger vessels, mostly in a part-time or relief capacity.

The mate held a Chief Mate, Limited for a Vessel of 60 Gross Tonnage or More certificate, first issued in 2016. The certificate was valid only on board the *Island Queen III* until 23 May 2021, and only on sheltered waters voyages. The mate also held a Marine Advanced First Aid certificate and MED Small Passenger-Carrying Vessel Safety (MED A2) certificate.

The mate had worked seasonally as a deckhand and as a mate with another company from 2008 to 2015. He joined the crew of the *Island Queen III* in 2016, first as deckhand and then as mate.

The engineer held an MED Small Passenger-Carrying Vessel Safety Certificate (MED A2). He did not hold a certificate of competency and, according to Marine Technical Review Board Decision M10720, was not required to. The engineer had started working on the *Island*

[19] STCW stands for International Convention on Standards of Training, Certification and Watchkeeping for Seafarers. The abbreviation STCW used in text indicates that the training certificate was issued in accordance with STCW standards.

Queen III in this capacity in April 2017. Before this, he had not worked in the marine industry.

Of the 7 hospitality staff members on board, 5 held an MED Small Seasonal Passenger-Carrying Vessel Safety (Non-Certificated Personnel[20]) certificate, which is obtained by completing a 6-hour training course.[21] The other 2 staff members had been familiarized with the safety equipment and procedures for the vessel.

1.9 Passage planning and monitoring

Navigation is a process of planning the voyage and monitoring progress in relation to the vessel's planned route, including the projection of the vessel's path as the passage plan is carried out.

1.9.1 Planning

A vessel's passage plan is intended to enhance safety by highlighting high-risk areas and providing key information in a format that is readily available to those involved in the vessel's navigation. A passage plan helps to create shared situational awareness among bridge team members as the voyage progresses.

Subsection 14(1) of the *Charts and Nautical Publications Regulations*, *1995* states that, before proceeding on a voyage, the master of a Canadian vessel must ensure that the voyage has been planned using the most recent editions of the charts, documents, and publications that are required to be used.[22] The person responsible for voyage planning is required to take into account the annex to International Maritime Organization Resolution A.893(21), *Guidelines for Voyage Planning*.

Passage planning consists of 4 stages:

- **Appraising** all available information about the intended voyage, including reviewing the relevant charts and publications; predicting the vessel's condition; assessing the expected dangers; and gathering information about environmental and local weather conditions
- **Planning** the intended voyage, and identifying no-go areas and areas where special precautions must be taken

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20 "Certificated personnel" must hold a certificate of competency to fulfill their duties on board.

21 According to the vessel's minimum safe manning document, 4 crew members, in addition to the master, mate, and engineer, are required to be on board when the number of passengers exceeds 150. The *Marine Personnel Regulations*, subsection 205(4), require all personnel identified on the minimum safe manning document to hold an MED certificate.

22 Transport Canada, SOR/95/149, *Charts and Nautical Publications Regulations*, *1995* (last amended 01 July 2007), subsection 14(1).

- **Executing** the voyage plan while taking into account the prevailing conditions
- **Continuously monitoring** the vessel's progress against the intended plan throughout the voyage and gathering the pertinent local warnings[23]

The route that the *Island Queen III* followed on this cruise had been established by the company years before the occurrence. The documentation for this route consisted of course lines drawn on paper charts and labelled "Approved HOTI [Heart of the Islands] Route." However, standard passage planning information, including the course to steer, distance to pass the nearest point of land, no-go areas, and identified hazards, is not indicated on the charts.

In addition to the paper charts, a track from a previous voyage along the same route was permanently displayed on the vessel's ECS (Appendix B), and marine staff[24] were instructed to use this track for reference when navigating.

Prior to the occurrence voyage, there was no consideration of environmental conditions or vessel traffic along the route, nor was there a formal company requirement to do so.

The chief mate training manual[25] contains an instruction to marine staff regarding local weather concerns. It instructs marine staff to make an announcement that notifies passengers when the vessel's beam is turning in to a swell, and to use the more sheltered Bateau Channel instead of the usual Canadian Middle Channel when swells may impact the movement of passengers on the vessel. In addition, emails were sent to masters, to provide temporary instructions regarding vessel operation during periods of high water levels. No other documented procedures were provided to crew with respect to the navigation of the vessel. All instruction was provided verbally when the employees began working with the company.

1.9.2 Monitoring

The navigator must always be aware of the vessel's position and progress to ensure its safety. When operating in confined waters, the navigator visually references aids to navigation and natural features to ensure that the vessel is correctly positioned. However, the vessel's position is best monitored using a combination of visual references and other means, such as radar parallel indexing, or plotting the vessel's position on a paper or

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23 International Maritime Organization, Resolution A.893(21), *Guidelines for Voyage Planning* (adopted on 25 November 1999), Section 1.3.

24 "Marine staff" refers to the certified mariners on board: in this case, the master and the mate.

25 Kingston Thousand Island Cruises, *Training Manual, Chief Mate for Ship Exceeding 60 Gross Tonnage* (2007). This manual is part of a TC-approved training program for chief mate candidates to obtain a Chief Mate, Limited for a Vessel of 60 Gross Tonnage or More certificate.

electronic chart.[26] The use of a single navigational system or method constitutes a single point of failure; using several methods to monitor the ship's position is therefore fundamental to safe navigation.[27]

To navigate visually, a navigator relies on fixed navigational aids or landmarks to establish a line of position, which helps determine the vessel's position. Without the use of any equipment, a line of position can be determined by visually aligning 2 fixed objects in transit or by using range markers located on shore for this purpose. If these options are not available, navigators can establish a line of position using a bearing of a fixed object on shore.

In this occurrence, the master primarily monitored the *Island Queen III*'s progress visually. Although an ECS with a previous track was displayed on the bridge, it was only used to obtain water depth data and not to verify the vessel's position or projected track.

The master used the north side of Whiskey Island and the south side of Cartwright Point in transit to initiate the turn into Whiskey Cut. The visual cue to stop the turn was the vessel's bow lining up with the centre of Whiskey Cut. However, no visual cues were established or used to monitor the vessel's position throughout the turn.

1.9.3 Situational awareness and effective navigation

Situational awareness is the perception of elements in the environment, the comprehension of their meaning, and the projection of their status in the future.[28] To have and maintain situational awareness, a master must be aware of internal and external factors such as helm orders or wind conditions, understand how these factors will affect the vessel and its voyage, and predict the effect of these factors on the vessel's navigation. Maintaining situational awareness allows the master to make appropriate decisions and execute appropriate actions throughout the voyage.

Errors and biases may occur during navigation that impair situational awareness and subsequent decisions and actions. Expectation bias is the most common cause of recognition-related slips; an individual may believe they are seeing what they expect to see.[29] When an individual receives information contrary to their expectations, their performance may be slow or inappropriate.[30]

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26 Commodore D. Squires, *The Use of Visual Aids to Navigation, 2nd Edition* (Nautical Institute, 2013), p. 19.

27 N. Bowditch, *The American Practical Navigator: An Epitome of Navigation* (U.S. National Imagery and Mapping Agency, 2002), Chapter 25: Navigation Processes, p. 363.

28 M.R. Endsley, "Toward a theory of situation awareness in dynamic systems," *Human Factors*, Vol. 37, Issue 1 (1995b), pp. 32–64.

29 J. Reason, *The Human Contribution: Unsafe Acts, Accidents and Heroic Recoveries* (Ashgate Publishing, 2008), Ch. 3.

30 G. J. Alexander and H. Lunenfeld, FHWA-TO-86-1, *Driver Expectancy in Highway Design and Traffic Operations* (Cambridge, MA: United States Department of Transportation, April 1986).

The master had successfully navigated Whiskey Cut multiple times, by using the north side of Whiskey Island and the south side of Cartwright Point in transit to initiate the turn. The master therefore expected this alteration to be successful and continued with the planned alteration inputs, despite starting from a different heading than the planned heading. The master eventually recognized that the vessel was not properly aligned with Whiskey Cut and took corrective action to attempt to regain the planned track.

1.10 Safety management

The principal objectives of safety management on board vessels are to ensure safety at sea, prevent human injury or loss of life, and avoid damage to the environment. Ideally, to manage safety, a vessel operator identifies existing and potential risks, establishes safety policies and procedures to mitigate those risks, and provides a means of continuously gauging effectiveness to improve organizational safety where necessary.

A documented, systematic approach to safety management (known as a safety management system, or SMS) is one means of ensuring that individuals at all levels of an organization have the information and the tools needed to make sound decisions in both routine and emergency operations.

The identification and mitigation of risk is central to an SMS. According to the International Association of Classification Societies (IACS):

> Although it is not often referred to as such, the development and implementation of a documented safety management system is an exercise in risk management. The drafting or amendment of written procedures involves looking at the company's activities and operations, identifying what could go wrong, and deciding what should be done to try to prevent it. The documented procedures are the means by which the controls are applied.[31]

The international marine standard for safety management is the International Safety Management (ISM) Code.[32] For an SMS to be compliant with the ISM Code, it needs to meet the following functional requirements:

> 1. a safety and environmental-protection policy;
> 2. instructions and procedures to ensure safe operation of ships and protection of the environment in compliance with relevant international and flag State legislation;
> 3. defined levels of authority and lines of communication between, and amongst, shore and shipboard personnel;

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31 International Association of Classification Societies, *Guidance for IACS Auditors to the ISM Code*, IACS Recommendation No. 41, Revision 4 (December 2005), Corr. 1 (October 2016), p. 9.

32 International Maritime Organization, *ISM Code: International Safety Management Code* (Amended to 2013), preamble.

4. procedures for reporting accidents and non-conformities with the provisions of this Code;
5. procedures to prepare for and respond to emergency situations; and
6. procedures for internal audits and management reviews.[33]

However, an SMS that complies with the ISM Code is currently mandatory only for the following types of vessels that operate on international voyages:

- Passenger ships including passenger high-speed craft;
- Oil tankers, chemical tankers, gas carriers, bulk carriers and cargo high-speed craft of 500 GT and upwards; and
- Other cargo ships and mobile offshore drilling units of 500 GT and upwards.[34]

Proposed amendments to TC's *Safety Management Regulations* would also require the following Canadian non-convention[35] vessels to have an SMS that complies with the ISM code:

- A Canadian vessel of 500 GT and upwards;
- A Canadian vessel that is certified to carry more than 50 passengers; and
- A Canadian vessel that is more than 24 m in length and less than 500 GT.

Until the proposed amendments come into force, TC is encouraging vessel owners and operators to voluntarily develop an SMS that complies with the ISM Code.[36]

1.10.1 Safety management system for the *Island Queen III*

Under current regulations, the *Island Queen III* is not required to have an SMS. However, the vessel's managing company voluntarily developed an SMS, which it documented in a manual entitled *Kingston Thousand Island Cruises Safety Management System*. The manual was last revised by the company in 2014.

TC does not require or carry out oversight of voluntary SMS. Furthermore, the *Island Queen III*'s SMS is not certified or periodically reviewed by an independent auditor. The SMS manual states that the company's designated person will conduct a review of the overall system at the end of each sailing season. This review was last conducted in 2014, several years before the occurrence.

The SMS manual details the familiarization of new personnel with the vessel, its safety equipment, and individual duties in an emergency. The manual's familiarization process does not include making crew members aware of or familiar with the SMS itself. The

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33 Ibid., Section 1.4.

34 Transport Canada, "Safety Management System," available at https://www.tc.gc.ca/eng/marinesafety/dvro-4067.htm (last accessed on 25 February 2020).

35 Convention vessels are already required to comply with the *Safety Management Regulations*.

36 Transport Canada, "Safety Management System," available at https://www.tc.gc.ca/eng/marinesafety/dvro-4067.htm (last accessed on 25 February 2020).

investigation determined that crew were not aware of the company's SMS or of the on-board SMS manual.

The SMS manual also contains operational procedures, including a pre-boarding/departure checklist. However, not all of the company's operational procedures, requirements, and associated duties are documented in this manual. Prior to the occurrence, some requirements were communicated verbally to employees when they were hired. One such verbal requirement was to have 2 certified personnel in the wheelhouse to aid in watchkeeping while the vessel is navigating areas of the company's approved route that management has identified as confined areas. Whiskey Cut is one such area.

The SMS manual also contains crew procedures for emergency situations, such as grounding and downflooding. The procedure for grounding indicates the VHF radio communications that need to be made, although it does not indicate to whom the crew should direct these communications. The procedure for grounding also lists the duties crew should perform, including the distribution of lifejackets.

The procedure for downflooding provides instruction only for the vessel sinking with its freeboard submerged, which was not the situation on board the *Island Queen III* in this occurrence. The investigation found that the crew was unaware of the documented downflooding procedure.

1.11 Passenger management

In case of an emergency on board a passenger vessel, crew and passengers need to be appropriately equipped and informed. Crew members need training and documented emergency procedures that are practised regularly through drills to ensure that they can respond effectively to emergencies. Passengers need instructions on where to muster in the event of an emergency, where to access lifesaving equipment, and information on how to use that lifesaving equipment. The vessel's authorized representative[37] is responsible for ensuring that both the crew and the passengers receive safety training.[38]

Since 2006, the TSB has investigated at least 16 occurrences[39] involving passenger vessels, and 6 of these investigations identified issues relating to the management of passengers in an emergency (Appendix C). These issues include:

- No alarm being sounded to indicate an emergency
- Not assigning tasks related to the preparatory stages of an evacuation, such as notifying passengers of a potential emergency and mustering passengers

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37 An authorized representative is the person who is responsible under the *Canada Shipping Act, 2001* for all matters relating to the vessel.

38 Government of Canada, *Canada Shipping Act, 2001* (S.C. 2001, c. 26, last amended 13 December 2018), paragraph 106(1)(c).

39 TSB marine transportation safety investigation reports M06W0052, M07L0158, M09W0147, M10C0043, M10H0006, M12C0058, M13L0067, M13M0287, M14A0348, M14C0156, M15A0009, M15C0094, M15P0347, M16A0141, M16C0137, and M17P0098.

- Crew members responsible for passengers being left to improvise response in an emergency
- Difficulty counting passengers and identifying missing passengers
- Not accounting for all passengers before they left the vessel
- Emergency procedures with respect to passenger safety management not being practised in a realistic way
- The need for effective oversight of passenger safety by Transport Canada

1.11.1 Information provided to passengers

According to the *Fire and Boat Drills Regulations*,[40] immediately before or after a passenger-carrying vessel departs on a voyage, passengers must receive vessel-specific safety information and emergency procedures in the form of a safety briefing.[41] Subsection 13(3) of the regulations states that

> The master of a vessel referred to in subsection (2) shall ensure that the safety briefing:
>
> (a) informs the passengers of the essential actions they must take during an emergency;
>
> (b) specifies the location of lifejackets, survival craft and muster stations;
>
> (c) informs the passengers in each area of the vessel of the location of the lifejackets and survival craft that are closest to them;
>
> (d) instructs the passengers in the donning and use of their lifejackets;
>
> (e) is given in either or both official languages, according to the needs of the passengers;
>
> (f) is given on the vessel's public address system if the vessel has one; and
>
> (g) is given in a way that is likely to be understood by the passengers.[42]

Shortly after the *Island Queen III* departed the dock, a pre-recorded audio safety briefing played in English over the GPS-triggered tour commentary system. The tour commentary and safety briefing are available in several other languages through a receiver and headphones, which passengers can obtain from the canteen.

The briefing instructed passengers to follow the instructions of the master and crew in the event of an emergency. It also informed passengers that lifejackets were located on the main and upper deck, and that if passengers had any questions they should ask a crew

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40 Transport Canada, SOR/2010-83, *Fire and Boat Drills Regulations* (last amended 06 December 2013).

41 For voyages of more than 24 hours, a safety briefing and a practice muster of all passengers is required. For voyages of 24 hours or less, only a safety briefing is required.

42 Transport Canada, SOR/2010-83, *Fire and Boat Drills Regulations* (last amended 06 December 2013), subsection 13(3).

member. Passengers did not receive instructions on, or a demonstration of, how to don a lifejacket.

The *Fire and Boat Drills Regulations* also require crew to post illustrated instructions in English and French in all passenger spaces and at all muster stations[43] to inform passengers of the following:

- the alarm signals that will sound to indicate an emergency
- actions to be taken in the event of an emergency
- the location of the vessel's designated muster stations
- the correct method of donning a lifejacket[44]

At the time of the occurrence, the *Island Queen III* had a lifesaving equipment plan[45] posted on the main deck and the promenade deck, which indicated where muster stations and lifejackets were located on the main deck and the upper deck. There was also a poster on the main deck showing how to don a lifejacket. Muster lists indicating crew emergency duties were posted on the main deck and the promenade deck, with the note "General Alarm: Seven short whistle blasts followed by one long blast." None of the posters included emergency instructions for passengers.

Signage must also be posted on board to indicate where survival craft, lifejackets, muster stations, and embarkation stations are located, as well as directions to these stations.[46]

The *Island Queen III* had signage posted indicating where the lifejackets could be found on the main deck and the upper deck, and signage directing passengers from the promenade deck to the muster station on the main deck.

1.11.2 Passenger safety management training

To ensure that crew members are prepared to assist passengers in an emergency, all crew members who work directly with passengers on board a passenger vessel must have a Passenger Safety Management certificate. This requirement applies to crew members on Canadian passenger vessels of more than 500 GT that carry more than 12 passengers, and

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43 Ibid., subsection 5(2).

44 Ibid., subsection 5(1).

45 A lifesaving equipment plan is a diagram of vessel's general arrangement, showing the location, type, and quantity of lifesaving equipment on board. A passenger ship of 25 m in length or less, such as the *Island Queen III*, is not required to display a lifesaving equipment plan.

46 Transport Canada, C.R.C., c. 1436, *Life Saving Equipment Regulations* (last amended 17 June 2015), subsection 17(6).

those on a voyage other than a sheltered waters voyage.[47] This requirement does not apply to the *Island Queen III.*

Crew members obtain this certificate after completing the TC-approved Passenger Safety Management training course.[48] The 12.5-hour course includes

- 2.5 hours of crowd management training;
- 15 minutes of vessel familiarization training;
- 1.25 hours of training for personnel providing direct service to passengers;
- 45 minutes of passenger safety training; and
- 7.75 hours of crisis management and human behaviour training.

This training specifically addresses effective communication as well as controlling passengers and crew in an emergency.

No one on board the *Island Queen III* held, or was required to hold, a Passenger Safety Management certificate, because the vessel is 303.56 GT and operates on sheltered waters voyages.

All crew members required by the *Island Queen III*'s minimum safe manning documents to be on board must hold an MED certificate.[49] For non-certificated crew members, the Small Seasonal Passenger-Carrying Vessel Safety (Non-Certificated Personnel) certificate is required. Crew members obtain this certificate once they have completed a 6-hour vessel-specific training course that includes the basics of marine emergencies, emergency response, lifesaving appliances, and abandoning ship. This course is only required after 6 months of service on board the vessel. According to TC's approved course outline[50] for this type of vessel-specific course, 30 minutes are allotted for abandonment and survival instruction. This segment of training covers vessel abandonment to life rafts or platforms and other buoyant apparatuses, as well as hypothermia, panic, and crowd control.

Five hospitality staff members held an MED Small Seasonal Passenger-Carrying Vessel Safety (Non-Certificated Personnel) certificate, which they obtained by completing a 6-hour training course where crowd control was one of the items covered.

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47 Transport Canada, SOR/2007-115, *Marine Personnel Regulations* (as amended 03 February 2017), subsection 230(1).

48 Transport Canada, TP 13024, *Training Standards for Personnel on board Passenger-carrying Vessels* (2000, revised 2007).

49 Transport Canada, SOR/2007-115, *Marine Personnel Regulations* (as amended 03 February 2017), subsection 205(4).

50 Transport Canada, TP 4957, *Marine Emergency Duties Training Courses* (1998, revised 2007), section 9.6.

Certificated crew members are required to hold 1 of 3 MED certificates: Basic Safety, Small Passenger-Carrying Vessel Safety,[51] or Small Non-Pleasure Vessel Basic Safety. Of these certificates, only the Small Passenger-Carrying Vessel Safety certificate includes training on passenger management. Three crew members held MED Small Passenger-Carrying Vessel Safety certificates, which require 2 hours of instruction on passenger control. The master held an MED Basic Safety certificate, which did not require instruction on passenger control, and an MED Small Passenger-Carrying Vessel Safety certificate.

1.11.3 General alarm and emergency

Sounding an alarm gets the attention of passengers and crew and makes everyone aware of an emergency situation. The *Island Queen III*'s crew training manual cautions against sounding an alarm by ringing a bell or shouting over the vessel's PA system, because this could cause passengers to panic.[52] Instead, the manual suggests using discreet commands such as Code Red or Code Blue to inform crew members throughout the vessel that there is an emergency. Similarly, the company's guidance[53] in case of an emergency advises limiting crew communication with passengers to positive updates and reassurances.

Muster lists are required by regulation[54] and must be displayed on board to indicate the duties that crew members are to perform when the emergency signal is sounded. The *Island Queen III*'s muster list indicates that there are 4 different alarms to initiate action:

- Code Red, followed by location to indicate fire in a specific location
- Code Blue, followed by location to indicate a person overboard from a specific location
- a general alarm consisting of 7 short whistle blasts followed by 1 long whistle blast
- an abandon ship by order issued by the master

The *Island Queen III*'s muster list specifies duties for all crew members to carry out in the event of a fire, a man overboard, or an abandon ship situation. The muster list also instructs crew to perform emergency duties as drilled and as detailed in the company's SMS manual and the crew training manual, if an alarm is heard.

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51 Training on Small Passenger-carrying Vessel Safety (MED A2) consists of a 26-hour course that includes basic safety and a 2-hour module on passenger control, with the goal of providing crew members with the knowledge and skills to keep passengers safe. Source: Transport Canada, TP 4957, *Marine Emergency Duties Training Courses* (1998, revised 2007), sections 6.1 to 6.6.

52 The company uses the Canadian Passenger Vessel Association's *Safety Training Manual: Small Seasonal Passenger-carrying Vessel Safety (non-certified)* for training the crew. The caution against ringing a bell or shouting is mentioned in the section "Emergency Response" (p. 16).

53 Kingston Thousand Island Cruises, *Safety Management System* (revised 09 January 2014), p. 20.

54 Transport Canada, SOR/2010-83, *Fire and Boat Drills Regulations* (last amended 06 December 2013), subsection 7(1).

Although procedures for grounding and flooding are not displayed or required to be displayed on the muster list, the vessel's SMS manual includes procedures for these situations. The procedures do not designate a signal that would initiate a response to such a situation, but they do direct crew to perform emergency duties for abandon ship as per the muster list, which include the mustering of passengers and distribution of lifejackets.

The vessel's SMS manual includes guidance on how to assess an emergency:

> Even though a vessel may be in difficulty, it may not be in immediate danger… *Preparation for evacuation may be a realization when the emergency evolves into an uncontrollable level* [emphasis added].[55]

The SMS manual also indicates when passengers and crew must abandon ship, such as when a fire is no longer controllable or water ingress becomes uncontrollable due to the first deck becoming submerged.

On the *Island Queen III*, no alarms were sounded after the vessel made bottom contact and passengers were not informed of the specifics of the occurrence.

1.11.4 Emergency drills

Conducting emergency drills familiarizes crew members with their vessel's emergency equipment and procedures, minimizing response time in a real emergency. Drills also highlight shortcomings in response plans, allowing for improvements to those response plans.

Crew are required to hold fire drills and survival craft drills regularly. The frequency of these drills depends on the type of vessel and class of voyage. For a passenger vessel on a sheltered waters voyage, like the *Island Queen III*, fire and survival craft drills must be held at least once during each 2-week period.[56] In addition, every member of the crew must participate in both a fire and survival craft drill once a month. During those drills, crew members perform the emergency duties assigned to them, including:

- Mustering passengers
- Locating and rescuing passengers who are unaccounted for
- Locating and rescuing crew members who are unaccounted for
- Preparing for the launch of survival craft

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55 Kingston Thousand Island Cruises, *Safety Management System* (revised 09 January 2014), p. 19.

56 Transport Canada, SOR/2010-83, *Fire and Boat Drills Regulations* (last amended 06 December 2013), subsections 20(1), 20(2), and 20(3); and section 21.

To achieve the greatest benefit and to the greatest extent possible, crew members are required to perform their duties during emergency drills as they would in a real emergency.[57]

The authorized representative of a vessel is required to develop procedures for the safe operation of the vessel and for dealing with emergencies.[58] The company's SMS manual includes procedures for emergencies such as a person overboard and a fire, as well as grounding and downflooding. These procedures are also included in the company's chief mate training manual.[59]

From April 2017 (the beginning of the sailing season) to the date of the occurrence, the crew of the *Island Queen III* performed emergency drills at the required intervals, completing 7 drills in total. All drills were performed at the dock after passengers had departed the vessel.

Three of these drills involved mustering crew, locating the emergency equipment, and operating some of the vessel's emergency equipment such as fire hoses and pumps. Crew performed the rest of the emergency drills as an evolving emergency scenario. At the beginning of the scenario, a fire was reported and crew mustered to fight it; then a person overboard was reported and crew simulated recovery; finally, an order to abandon ship was given and crew members donned lifejackets and disembarked on to the dock.

The mate would make all crew members aware that a drill would be conducted, and everyone would gather on the main deck before the drill began. The mate initiated the drills verbally; the general alarm was not sounded, and an emergency code was not announced over the PA system.

Crew members did not have a consistent understanding of how alarms would sound in an actual emergency and what actions should be taken when the alarms were sounded.

The crew did not conduct drills to practise either grounding or downflooding emergency procedures, even though the SMS manual instructs masters to vary emergency drills to include collision and grounding situations.

As per the muster list, the primary emergency duty of the master is to assume overall command in the wheelhouse. However, because the crew performed drills at the dock, the master was not required in the wheelhouse. Occasionally, the master would monitor the drill from the main deck. Communication with the wheelhouse via messenger was often simulated during drills, but not actually practised.

Drills practiced on board the *Island Queen III* started with an emergency already identified. For example, for an abandon ship drill, the drill started with the decision to abandon

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57 Ibid., section 17.

58 Government of Canada, *Canada Shipping Act, 2001* (S.C. 2001, c. 26, last amended 13 December 2018), paragraph 106(b).

59 Kingston Thousand Island Cruises, *Training Manual, Chief Mate for Ship Exceeding 60 Gross Tonnage* (2007), section 1.4: Grounding Procedure, p. 49.

already made. The master therefore was not required to consider the available information, including information provided to him by the crew, and perform an initial risk assessment. This risk assessment is required to determine if the situation is or may become an emergency, and how to respond.

1.11.5 Evacuation procedures

To ensure that passengers and crew are evacuated safely in the event of an emergency, all passenger vessels are required to have an evacuation procedure that outlines how all passengers and crew will be evacuated from the vessel within 30 minutes of the abandon ship signal being given.[60]

This requirement came into force in Canada in 1996. However, TC has not provided guidance to its inspectors on how to determine compliance. The primary means of determining compliance is for inspectors to witness an abandon ship drill and as much as possible assess the crew's ability to evacuate passengers within 30 minutes.

Similarly, TC has not established guidelines for operators to develop evacuation procedures, nor has TC established criteria for its inspectors to evaluate or accept evacuation procedure documentation. This issue was identified in a previous TSB investigation,[61] and the subject of a Board safety concern in another investigation .[62]

In 2015, a TSB letter to TC highlighted the Board's concerns regarding passenger safety on Canadian vessels. These concerns include passenger safety–related duties that are required by regulation but are not being identified on muster lists and in evacuation plans, as well as the absence of guidance to operators and inspectors on how to develop or evaluate evacuation plans. While TC's response to this letter highlighted actions planned to address the TSB's concerns about passenger safety-related duties not being identified on muster lists, there was no reference to evacuation plan guidance.

International guidance is available to help operators create and assess evacuation procedures. For example, the International Maritime Organization has guidelines for a simplified evacuation analysis for new and existing ships.[63] This evacuation analysis involves analyzing the characteristics of the ship and its survival craft, as well as passenger numbers and demographics, to determine the amount of time required to completely evacuate the vessel.

At the time of the occurrence, no detailed evacuation procedure had been developed for the *Island Queen III*. The vessel's muster list contained the only guidance to crew on how to

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60 Transport Canada, C.R.C., c. 1436, *Life Saving Equipment Regulations* (last amended 17 June 2015), section 111.

61 TSB Marine Investigation Report M06W0052.

62 TSB Marine Investigation Report M12C0058.

63 International Maritime Organization, MSC.1/Circ.1533, *Revised Guidelines on Evacuation Analysis for New and Existing Passenger Ships* (06 June 2016).

evacuate the vessel. Crew performed abandon ship drills to practise vessel evacuation, but passengers were not on board during these drills, and the abandon ship drills witnessed by TC inspectors did not include passengers.

1.11.6 Passenger accounting

Before a passenger vessel embarks on any voyage, the master is required to be aware of and record the number of people on board, noting any passengers who would need special care or assistance during an emergency.[64] This is to ensure that everyone on board is accounted for in an emergency if evacuation is necessary or if a search and rescue is required.

The general practice for passenger accounting on the *Island Queen III* is for a crew member to use a hand tally counter to manually count passengers as they board at the gangway. At the same time, passengers hand another crew member their ticket (which is issued by the ticket booth). The crew member tears the ticket in two and keeps one half, returning the other half to the passenger.

Once all passengers have boarded, a crew member tells the master how many passengers are on board as recorded by the hand tally counter. The master then contacts the ticket booth to inform staff there that the vessel is ready to depart. Staff at the ticket booth acknowledges that the vessel is ready to depart and tells the master how many tickets were sold for the cruise. If the hand tally count and the ticket sales software do not match, the master may ask if there are still passengers in the ticket area who have not boarded yet. The master may give the results of the hand tally count to the ticket booth staff. The vessel then departs.

If the number of passengers from the ticket sales software matches the hand tally count, the master considers the number of passengers on board to be confirmed. If the number does not match, once the vessel is underway, the mate retrieves the ticket stubs collected from the passengers and takes the ticket stubs to the wheelhouse to manually count them. The mate records the number of ticket stubs in the vessel logbook as the actual number of passengers on board, and informs the master of this number. The mate does not cross-check the number of ticket stubs against the number of passengers recorded by the hand tally counter. The crew also does not inform the ticket booth later on of the actual number of passengers on board as per this ticket stub count.

Once the mate has counted the ticket stubs and recorded the number of passengers, the mate records the number of crew on board for the occurrence voyage in the logbook. The number of crew and number of passengers are added together to give the total number of people on board.

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64 Transport Canada, SOR/2010-83, *Fire and Boat Drills Regulations* (last amended 06 December 2013), section 10.

At the time of the investigation, crew members could not recall the number of passengers counted on the hand tally counter for the occurrence voyage, or the number provided by the ticket booth staff; these numbers were not documented.

At the time of the occurrence, a manual count was underway, indicating that the hand tally and the ticket software results did not match. Because a manual count of the tickets was in progress, the crew did not know the actual number of passengers on board.[65]

After the occurrence, the TSB requested the number of passengers on board according to the ticket sales software. The company's response indicated that 279 tickets had been purchased[66] for the occurrence voyage: 243 adult tickets, 32 child tickets, and 4 infant tickets.[67,68]

In the logbook, the fields indicating the total number of crew and the total number of people on board on the occurrence voyage had been left blank.

In an emergency, crew members are required to assemble passengers and ensure they are all accounted for,[69] yet the vessel's muster list did not include the duty to count passengers or assign a crew member to this task. There was no procedure in place to count passengers as they disembark the vessel at the end of a cruise, and this practice is not required by regulation.

1.11.7 Lifejackets suitable for children

Lifejackets are specifically designed to turn an unconscious person face up in the water, as well as elevate a person's nose and mouth above the surface of the water to reduce the likelihood of water entering a person's airway. To achieve this, lifejackets provide buoyancy around the head and chest when properly secured to a person. To ensure the proper amount of buoyancy for a person's weight and the ability to properly secure the lifejacket based on the person's size, lifejackets are produced in different sizes.

In Canada, TC has approved 2 sizes of the standard type lifejacket: adult size for a body mass greater than 40 kg, and child size for a body mass of 40 kg and under. Internationally,

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65 Sometime after the vessel returned to the dock, crew recorded in the logbook that 274 passengers were on board during the occurrence voyage.

66 The ticket sales software may not give a true number of people on board, as people may buy tickets in advance of the voyage but not board the vessel.

67 At the time of the occurrence, the company's ticket sales software defined infant as 0 to 3 years of age, child as 4 to 12, and adult as over 12 years of age.

68 The company later provided the TSB with revised ticket sales numbers from the software, indicating that 274 tickets had been purchased for the occurrence voyage: 238 adult tickets, 31 child tickets, 2 infant tickets, and 3 tickets of unknown age category.

69 Transport Canada, SOR/2010-83, *Fire and Boat Drills Regulations* (last amended 06 December 2013), paragraph 14(c).

the International Maritime Organization has approved the International Convention for Safety of Life at Sea (SOLAS) type lifejacket in 3 sizes: adult size for a body mass of 43 kg or greater, child size for a body mass of 15 kg or greater but under 43 kg, and infant size for a body mass under 15 kg. These SOLAS type lifejackets are also approved by TC.

The *Life Saving Equipment Regulations* require every vessel more than 5 GT and certified to carry more than 12 passengers, such as the *Island Queen III*, to carry 1 lifejacket for each member of the complement. In addition, the vessel must carry lifejackets that are suitable for children for at least 10% of the complement, or 1 for each child on board, whichever is greater.[70] These regulations make no reference to lifejackets that are suitable for infants.

A passenger vessel subject to SOLAS on a voyage less than 24 hours is required to carry a number of infant lifejackets equal to 2.5% of the number of passengers on board.[71] Passenger vessels operating domestically, such as the *Island Queen III*, are not subject to SOLAS.

TC defines passengers as follows:

> ***adult*** means a person who is 12 years of age or older.
>
> ***child*** means a person who is five years of age or older but under 12 years of age.
>
> ***infant*** means a person who is under five years of age.[72]

According to TC's *Fire and Boat Drills Regulations,* for unlimited and near coastal Class 1 voyages, voyages longer than 12 hours, or voyages with assigned passenger berths, the name and gender of each passenger as well as whether each passenger is an adult, child, or infant must be recorded and kept on shore.[73] Vessels on a sheltered waters voyage, such as the occurrence voyage, are not required to record or retain these details.

The *Island Queen III* carries 310 adult-sized lifejackets, 1 for each member of the maximum complement plus 2. Thirty-one lifejackets suitable for children are also carried on board, equivalent to 10% of the maximum complement.

The company does not have a procedure for counting the number of children on board the *Island Queen III.* This prevents the crew from either ensuring that the number of children remains at or below the number of lifejackets suitable for children on board, or increasing the number of suitable lifejackets to ensure that there is 1 lifejacket for each child on board.

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70 Transport Canada, C.R.C., c. 1436, *Life Saving Equipment Regulations* (last amended 17 June 2015), paragraph 17(5)(b).

71 International Maritime Organization, International Convention for Safety of Life at Sea (SOLAS Convention), Chapter III, Part B, Section I, Regulation 7, section 2.1.1.

72 Transport Canada, SOR/2010-83, *Fire and Boat Drills Regulations* (last amended 06 December 2013), subsection 11(4).

73 Ibid., section 11.

1.12 Training and familiarization

The authorized representative of a vessel is required to ensure that each member of the crew, including the master, becomes familiar with the vessel, its equipment, operational instructions specific to the vessel and their assigned duties.[74] The authorized representative is also required to retain records of this training.[75]

Non-certificated crew members on board the *Island Queen III* complete approved MED training followed by on-board familiarization with the vessel and its equipment. If a crew member has not completed approved safety training before working on board, the crew member is required to complete additional on-board familiarization and training. A training register was maintained on board, indicating which crew members had received on-board familiarization and safety training, when this training was completed, and the topics that were covered.

In addition to the training and experience a new master of the *Island Queen III* acquired while obtaining his or her certificate of competency, the company provides additional training and familiarization before the new master assumes the position of master on a company vessel. The training and familiarization of masters who are new to company vessels is partly based on the individual being familiar with the vessel by working as a deckhand and then as first mate, and eventually at the helm under the supervision of the senior master or another experienced master. The senior master verbally informs the new master of best practices, company procedures, and geographical areas requiring special attention, while assessing the new master's knowledge and ability. Once the senior master determines that the new master is ready to conduct the vessel, the senior master authorizes the new master to perform the duties of master without supervision.

The company does not have a documented policy detailing the training and familiarization of its masters, nor does it retain records of masters' training and evaluation. And after initial training, at the time of the occurrence, the company did not monitor or follow up to ensure that masters comply with company procedures or best practices.

One undocumented company procedure that is passed along to new masters during their initial training is the requirement to have 2 crew members in the wheelhouse while the vessel is in areas that the company has identified as requiring special attention. Whiskey Cut is identified as one of several such areas along the route taken on the occurrence voyage.

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74 Transport Canada, SOR/2007-115, *Marine Personnel Regulations* (as amended 03 February 2017), subsection 206(1).

75 Ibid., paragraph 206(2)(b).

1.13 Accident reporting

1.13.1 *Shipping Casualties Reporting Regulations*

The *Shipping Casualties Reporting Regulations* require the master, any certificated officer, operator, member of the crew, pilot, or person responsible for a ship to report without delay an incident by radio communication to a Canadian radio ship reporting station.[76]

1.13.2 Canadian Coast Guard

The Canadian Coast Guard (CCG) recommends that

> [i]n the interest of ensuring the highest level of safety, mariners should immediately notify the Canadian Coast Guard, through any Marine Communications and Traffic Services Centre, of any situation which is or may be developing into a more serious situation requiring assistance from the Search and Rescue (SAR) System. The need for the earliest possible alerting of SAR Authorities to potential maritime emergencies cannot be over-emphasized.[77]

The CCG has emphasized the importance of crew using the vessel's marine VHF radio as the primary means of alerting the CCG in an emergency. This ensures that the alert goes directly to the local Marine Communications and Traffic Services centre, which has operators on standby at all times, thereby reducing the risk of a delayed response if the CCG is contacted by another means.

1.13.3 Company procedures

The company's SMS manual and chief mate training manual describe the emergency procedures for all vessels in the company's fleet. In both manuals, the procedure for grounding states that "The Mate assesses the situation and reports the damages to the Master. Master will then make the necessary VHF radio communications, and contact the office."[78,79] The manuals also indicate that TC's Marine Safety Office must be informed of any emergency.

After the *Island Queen III* made bottom contact, the master contacted the senior master ashore by cellphone to inform the senior master of the incident and the master's decision to

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76 Transport Canada, SOR/85-514, *Shipping Casualties Reporting Regulations* (last amended 01 July 2001), subsection 4(1) and paragraph 4(2)(a).

77 Canadian Coast Guard, *Notices to Mariners 1 to 46, Annual Edition 2018* (2018) Section D: Search and Rescue, Subsection 29A: Early Notification of Search and Rescue Authorities of Developing Situations.

78 Kingston Thousand Island Cruises, *Safety Management System* (revised 09 January 2014), p. 18.

79 Kingston Thousand Island Cruises, *Training Manual; Chief Mate for Ship Exceeding 60 Gross Tonnage* (2007), Section 1.4: Grounding Procedure, p. 49.

return to Kingston. The senior master then informed TC's office in Kingston by telephone. The CCG Marine Communications and Traffic Services centre was not contacted.

1.14 Active recommendations

Although not required by regulation, the company that operated the occurrence vessel had voluntarily implemented an SMS. This SMS was not audited or certified, nor was it formally put into practice.

Following an occurrence on 23 June 2002 in which the amphibious passenger vehicle *Lady Duck* took on water and sank in the Ottawa River and 4 passengers drowned,[80] the Board recommended that

> the Department of Transport take steps to ensure that small passenger enterprises have a safety management system.
>
> **TSB Recommendation M04-01**

The TSB has repeatedly identified the need for domestic vessels to have an effective SMS, an issue that has been on the TSB's Watchlist since 2010. The Board has noted that effective oversight of SMS by TC is not always provided, and that an SMS is not required for some companies. To address this safety issue, the Board also noted the following:

> Requiring companies to have an effective SMS is only half of the issue, however: there must also be appropriate regulatory oversight. Numerous TSB investigation reports have found that Transport Canada (TC) is not always effective at identifying companies' ineffective processes and intervening in a timely manner.[81]

This issue was added to the Watchlist as the result of a number of investigations[82] in which the Board found hazards and risks in the operation of a vessel that had either not been identified or not been addressed by the operator. Other investigations[83] have also addressed shortcomings in the implementation of SMS, in which operators had not identified hazards associated with an operation, resulting in a lack of mitigation strategies for those hazards.

In 2014 and again in 2018, TC updated industry on the proposed amendments to the *Safety Management Regulations*, which would apply to 3 groups of vessels and the companies that manage them. Tier 1 would include vessels that fall under the International Convention for Safety of Life at Sea (SOLAS), Tier 2 would include non-convention vessels over 500 GT and

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80 TSB Marine Investigation Report M02C0030.

81 Transportation Safety Board of Canada (TSB), "Safety management and oversight," available at http://www.tsb.gc.ca/eng/surveillance-watchlist/multi-modal/2018/multimodal-01.asp (last accessed 27 February 2020).

82 TSB marine investigation reports M15P0347, M11W0091, M10C0043, M06F0024, and M02C0030.

83 TSB marine investigation reports M09W0141 and M06W0052.

non-convention vessels certified to carry more than 50 passengers, and Tier 3 would include non-convention vessels over 24 m in length and less than 500 GT.[84] Under the proposed amendments to the regulations, the *Island Queen III* would be required to have an SMS subject to audit and certification.

The Board notes that TC is currently undertaking analysis of the *Safety Management Regulations* to determine if the scope of the proposed amendments could be expanded. The Board is unaware of the scope of the consultations and what the new proposal for the *Safety Management Regulations* may contain. Therefore, the response to Recommendation M04-01 is currently assessed as Unable to Assess.[85]

1.15 TSB Watchlist

The TSB Watchlist identifies the key safety issues that need to be addressed to make Canada's transportation system even safer.

Safety management and oversight is a Watchlist 2018 issue. As this occurrence demonstrates, formal safety management processes are not required on small passenger vessels. And when operators voluntarily implement safety management systems, the systems do not receive any oversight from TC to ensure that the system is effective.

ACTIONS REQUIRED

Safety management and oversight will remain on the Watchlist until:

- Transport Canada implements regulations requiring all commercial operators in the air and marine industries to have formal safety management processes, and effectively oversees these processes.
- Transportation operators that do have an SMS demonstrate to Transport Canada that it is working—that hazards are being identified and effective risk-mitigation measures are being implemented.
- Transport Canada not only intervenes when operators are unable to manage safety effectively, but does so in a way that succeeds in changing unsafe operating practices.

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84 Transport Canada has proposed that a Tier 3 vessel would be required to comply with the safety management requirements, but would not be subject to the audit and certification requirements.

85 An Unable to Assess rating is assigned if no response has been received to the recommendation or if the response received does not contain sufficient details to enable the Board to make a meaningful determination on whether the safety deficiency will be reduced or eliminated. The TSB will follow up with the respondent to seek a more comprehensive response and will reassess the deficiency on an annual basis or when otherwise warranted.

2.0 ANALYSIS

The TSB investigation into the bottom contact and subsequent flooding of the passenger vessel *Island Queen III* determined that the vessel deviated from its planned route to avoid vessel traffic and did not return to the planned route before making contact with the bottom.

This analysis will focus on navigation planning and monitoring, situational awareness, passenger safety management, safety management systems, and alerting of search and rescue (SAR) services.

2.1 Factors leading to the occurrence

As the *Island Queen III* proceeded toward Cedar Island, the master continued past the planned alteration point into Deadman Bay, to avoid a fleet of sailing dinghies off Point Henry. The master's usual planned course up Deadman Bay was 045° true (T). Once past the dinghies off Point Henry, the master altered course to approximately 010°T to avoid a second fleet of sailing dinghies off the northern end of Cedar Island; this put the vessel's heading 35° from the planned route. Once the master saw Whiskey Island and Cartwright Point in transit, he applied 5° starboard helm to initiate the turn into the channel between Whiskey Island and Cartwright Point (known as Whiskey Cut) as usual. From this heading, the vessel had to swing 35° more than usual so that the bow could be aligned with the centre of Whiskey Cut.

As the vessel began to turn toward Whiskey Cut, the master did not apply additional helm to account for the deviation from the planned course. As a result, more time and distance was required to turn the vessel in to Whiskey Cut than would be required if the master had followed the usual planned route. The vessel's deviations from the planned route and lack of additional helm caused the vessel to travel north of the intended track, deeper into Deadman Bay and closer to Cartwright Point than planned. From this position, the vessel's heading had to be altered approximately 35° beyond the usual 105°T to align the bow on the centre of Whiskey Cut, requiring even more time and distance to turn as the vessel continued to approach Cartwright Point. The planned route required the vessel to turn 65° to enter Whiskey Cut; the master's deviation from the planned route resulted in a turn of approximately 130°.

The vessel's high sides and shallow draft make it susceptible to the effects of wind. Due to the vessel's deviation from the planned course, the vessel was broadside to the southerly wind for a longer period of time than planned, and the wind set the vessel even further north of the planned course line.

Because the master was navigating visually and the only indicator of the vessel's position was the bow's alignment with the centre of Whiskey Cut, he was not aware of the vessel's position relative to the planned route throughout the turn. This created a loss of situational awareness, which contributed to the vessel deviating north of the intended track as it turned toward Whiskey Cut. The master had successfully performed the alteration into

Whiskey Cut many times before. The expectation that this alteration would be successful would have affected the master's situational awareness and delayed his response to information contrary to his expectations.

Once the master observed that the vessel was north of the planned route, he made a series of small corrections to return the vessel to the centre of the channel; however, there was limited time and distance to correct the vessel's course. When the master applied corrections to the vessel's course, they were not early enough or significant enough to return the vessel to its intended track. As the vessel's bow swung toward the centre of Whiskey Cut, the vessel's stern made contact with the bottom on the north side of Whiskey Cut, near Cartwright Point, puncturing the bottom shell plating.

2.2 Passage planning, visual navigation, and position monitoring

2.2.1 Passage planning

Passage planning involves thoroughly planning a voyage to identify hazards that a vessel may be exposed to, and proactively implementing measures to eliminate or reduce exposure to those hazards.

The *Island Queen III*'s route had been established and approved by the company years before the occurrence; passage planning immediately before the occurrence voyage was therefore limited. The presence of sailing traffic was a known seasonal activity in the area. Prior to departure, the bridge team did not discuss factors such as the effects of wind conditions and vessel traffic in the approach to Whiskey Cut, nor did the crew identify strategies to mitigate the associated risks, such as setting no-go criteria or planning alternative routes around Whiskey Cut. Although the vessel follows the same route multiple times a day and the bridge team was familiar with route hazards, factors such as weather and vessel traffic pose different hazards from voyage to voyage along the same route.

Prior to each voyage, if bridge teams do not assess the operational hazards that the vessel may encounter, there is a risk that these hazards will not be mitigated effectively.

2.2.2 Visual navigation and position monitoring

Monitoring a vessel's position and its progress relative to the planned route is essential to marine navigation. By using all available navigation methods, equipment, and resources (including additional personnel), a vessel operator can accurately determine and cross-check the vessel's position. Using only one method or source of information does not allow for cross-checking to identify errors, creating a single point of failure.

For visual navigation to be effective, a vessel's operator must establish visual cues to accurately determine and monitor the vessel's position. On board the *Island Queen III*, the master used visual navigation as the sole means of navigation.

The master used a natural transit to initiate the turn into Whiskey Cut, and once he initiated the turn, no other visual cues were established to monitor the vessel's position throughout the turn. The vessel was turned until the bow lined up with the centre of Whiskey Cut. The

act of aligning the bow with the centre of Whiskey Cut is not a means of establishing the vessel's position, because this alignment can be achieved from multiple positions.

Without establishing and monitoring fixed visual cues, visual navigation was ineffective in determining the *Island Queen III*'s position relative to its planned route. The master was therefore not fully aware of the vessel's deviation from the intended track.

Although other sources of information and methods of navigation were available, none of these were used to cross-check the visual navigation, allowing the inaccuracy of the navigation method used to go undetected and the vessel to deviate from the intended route.

Relying on a single means of monitoring the vessel's position prevented the cross-checking of the vessel's position and contributed to navigational errors not being detected.

The mate was in the wheelhouse with the master at the time of the occurrence, because the company had given verbal instructions to have 2 people in the wheelhouse when the vessel was in confined waters. However, the mate was counting tickets as the vessel approached Whiskey Cut and was not monitoring the navigation of the vessel. As a result, the mate did not detect the vessel's deviation from the intended track.

2.3 Passenger safety management

To ensure that passengers are prepared for an emergency situation, it is important that they be managed appropriately during all phases of the voyage. This includes directing them to a safe area of the vessel, preventing them from entering unsafe areas, and mustering them at muster stations in the event of an evacuation. Furthermore, shipboard procedures and training dictate that crew members are to begin carrying out their emergency duties when signalled to do so by an alarm.

2.3.1 Passenger familiarization

Passengers will likely be unfamiliar with the vessel they are travelling on and the marine lifesaving equipment that is on board for their protection. For this reason, a vessel-specific passenger safety briefing is required at the beginning of each voyage to inform passengers of what to do in an emergency.

At the beginning of the occurrence voyage, a pre-recorded safety briefing was played over the *Island Queen III*'s audio commentary system. This briefing told passengers where they could find lifejackets on board and that they were to follow crew instructions in an emergency. However, the briefing did not state when the lifejackets would be required or how they would be distributed. Passengers did not receive instructions (either verbally or through a demonstration) on how to don the lifejackets.

Furthermore, the briefing did not tell passengers where the muster stations were located, or when and how they should assemble at these stations.

If crew members do not familiarize passengers with the vessel's lifesaving equipment and emergency procedures, such as how and where to proceed to the muster stations, before an emergency occurs, they will have to give this information to passengers for the first time in

an actual emergency, when time is limited and passengers may be experiencing shock or panic. This situation will delay and compromise the effectiveness of the established emergency response procedures.

If passengers are not familiarized with the vessel's emergency procedures and lifesaving equipment before the voyage, there is a risk that passengers and crew will not be prepared to respond to an emergency in a safe and timely manner.

2.3.2 Passenger safety management training

The objective of passenger safety management training is to ensure that crew members are prepared to assist passengers in an emergency and minimize the risks to passenger safety. Formalized training approved by Transport Canada (TC) ensures that crew members obtain a certain level of knowledge and preparation, to improve the safety of passengers.

Because the *Island Queen III* is not a vessel greater than 500 gross tonnage (GT), its crew is not required to complete formal passenger safety management training. Instead, the crew's exposure to passenger safety management is limited to a small portion of the Marine Emergency Duties (MED) training and vessel-specific familiarization. Less than 15 minutes are allotted for passenger safety management (panic and crowd control) in the Small Seasonal Passenger-Carrying Vessel Safety (non-certificated personnel) MED training course, whereas the Passenger Safety Management training course dedicates 2.5 hours to this subject.

Despite its tonnage and class of voyage, the *Island Queen III* carries up to 301 passengers, often multiple times per day. Having this many passengers on board a relatively small vessel requires the ability to manage passengers during an emergency situation. Because the requirement for passenger safety management training is based on the vessel size and type of voyage rather than on the number of passengers on board, large numbers of passengers travelling on small passenger vessels are not benefiting from crews who have been trained in passenger safety management.

If all passenger vessel crews are not adequately trained in passenger safety management, there is a risk that crew members will not be prepared to manage passengers effectively in emergency situations.

2.3.3 Passenger accounting

In any emergency, an accurate count of passengers is vital. To ensure that all passengers and crew are accounted for, crew conduct a passenger count at muster stations or in the lifeboats. If needed, SAR resources will conduct a count of rescued or recovered passengers. An accurate passenger count in an emergency depends on having an accurate count of the passengers on board the vessel before it sails.

On the *Island Queen III*, the crew determined how many passengers were on board by manually counting passengers as they boarded, and then comparing that number to the number of tickets sold. If these numbers matched, the vessel sailed and the crew was confident that the number of passengers on board was correct. However, in this occurrence,

these numbers did not match and the vessel still sailed with the crew knowing that the number of passengers on board was in question. The crew attempted to resolve this discrepancy after the vessel sailed by manually counting the ticket stubs.

At the time of the occurrence, the mate was in the process of manually counting the ticket stubs. Because this task was not completed, the exact number of passengers on board at the time of the occurrence was unknown. Furthermore, the number of crew on board at the time of the occurrence was not recorded. These omissions would have prevented the crew or SAR resources from ensuring that everyone on board was accounted for if the vessel had to be abandoned.

If companies do not implement an accurate method of determining the number of people on board before the vessel's departure, there is a risk that not all passengers and crew will be accounted for in an emergency.

2.3.4 Requirements for child and infant lifejackets on board

Although obtaining an accurate count of the passengers on board is a requirement for passenger vessels on all voyages, passenger vessels operating on sheltered waters voyages (such as the *Island Queen III*) are not required to specify how many passengers are adults, children, or infants. Therefore, the *Island Queen III*'s crew makes no distinction between the number of adults, children, or infants when manually counting passengers. However, the company's ticket sales software is capable of recording these categories of passengers. For the occurrence voyage, the software recorded 243 adult tickets, 32 child tickets, and 4 infant tickets sold. The ticket sale software records are not provided to the vessel's crew.

Although there is a requirement for a suitable lifejacket for every person on board, there was no procedure in place on the *Island Queen III* to ensure that this requirement was met, especially for children. The *Island Queen III* carried only 31 lifejackets suitable for children, which is 10 percent of the complement. Therefore, with 32 children and 4 infants on board at the time of the occurrence, there were not enough lifejackets suitable for children on board. On voyages such as school trips, when the number of children on board may be significantly higher than on the occurrence voyage, no procedure is in place to ensure that more than 31 lifejackets suitable for children are available on board.

If passenger vessel operators do not have a procedure to ensure that the appropriate type and number of children and infant lifejackets are on board, there is an increased risk of injury or death in an emergency.

2.3.5 Evacuation procedures

Predetermined evacuation procedures that are practised through regular drills give crews the knowledge, skills, and confidence they need to manage passengers effectively in an evacuation.

At the time of the occurrence, no evacuation procedures had been developed for the *Island Queen III*. Although TC regulations in force since 1996 require every passenger vessel to have procedures for the safe evacuation of everyone on board within 30 minutes, TC did not

verify compliance with this requirement during its annual inspections of the vessel. Furthermore, TC has not established guidelines for operators to develop such procedures, nor has TC established criteria for the inspectors to evaluate or approve these procedures.

If passenger vessel operators do not develop vessel-specific evacuation procedures, and there is no appropriate oversight to evaluate these procedures, there is a risk that crews and passengers will not be prepared for the safe evacuation of the vessel in an emergency.

2.4 Training and familiarization

The *Marine Personnel Regulations* state that companies must provide policies, procedures, or instructions to their masters to ensure the vessel's crew is familiarized and competent.

Although the company has not developed a formal training procedure for its masters, on-the-job training is provided to new masters. Hands-on training and verbal instructions are provided with regard to operating the vessel and becoming familiar with the vessel's route. Verbal instructions are provided with regard to company procedures and best practices.

The company's requirement to have 2 people in the wheelhouse during the transit through Whiskey Cut was established after the company evaluated the route and determined that extra precautions were required to mitigate risks such as track deviations in this confined area. This requirement was not documented in a procedure; instead, crew members were informed verbally of this requirement.

The absence of a documented procedure can give rise to an unclear and inconsistent understanding of what those 2 people are expected to do. Without clear expectations of what tasks are to be performed, crew members may end up doing tasks such as counting tickets and completing the logbook instead of cross-checking the vessel's position.

Without any monitoring process or follow-up after initial training, the company has no mechanism to confirm compliance with company procedures relayed to masters in their initial training.

If operators do not ensure that masters are formally familiarized with and trained in documented operating procedures, and that they follow these procedures, there is a risk that unsafe practices will develop, exposing vessels and passengers to known hazards.

2.5 Emergency response

To prepare for an on-board emergency, the vessel operator develops response procedures, crew members are familiarized with these procedures, and drills are conducted to practise and improve the response. Through the repetition of drills, crew members become increasingly familiar with and proficient in their emergency duties, and are able to act instinctively when an emergency occurs. On a passenger vessel, crew members face the additional challenge of needing to manage large numbers of people of varying ages and abilities. When crews practise duties related to passenger safety in accordance with comprehensive and documented procedures, the emergency response is more likely to be successful.

The *Island Queen III* has emergency response procedures for fire, man overboard, and abandon ship, which are detailed on the vessel's muster list. The muster list also indicates the alarm that identifies the type of emergency and initiates the response procedure. These procedures are drilled routinely; however, they are usually initiated verbally by the mate after the crew has gathered in a common area. While this allows the crew to practise the duties assigned to them in a drill, it does not simulate how the crew would be alerted to a real emergency. The absence of emergency alarms during drills likely contributed to the inconsistent understanding of alarm signals among the *Island Queen III*'s crew.

If appropriate alarms or signals are not sounded during drills, there is a risk that crew will be unsure how to proceed in response to an emergency.

In this occurrence, there was insufficient communication and no sounding of alarms even when it was evident that an incident had occurred, leading to initial confusion among crew members regarding what they were required to do. Only the master and the mate were aware of what had happened and participated in the response to the incident. Certain crew members were assigned tasks to respond to the flooding only when they asked the master and the mate what was happening. The duties that needed to be carried out to respond to the emergency were not communicated clearly in this occurrence.

If predetermined alarms or signals are not used to communicate a need for an emergency response, there is a risk that passengers and crew will not be made aware of an emergency in a timely manner.

The vessel's safety management system (SMS) also contains procedures for other emergencies, including grounding and downflooding. These procedures had never been drilled before the occurrence, and crew were not aware of them, or of the alarm or signal that would sound to initiate an appropriate response. The crew was therefore unprepared to respond to the bottom contact incident in this occurrence.

The master was also unfamiliar with how to assess this type of incident, what response was required, and how to initiate the response. A flooding situation, along with all other emergencies that were not immediately catastrophic, required the master to perform an initial risk assessment to ascertain what to do. However, the company had limited procedures or criteria on how to perform such risk assessments; for example, evaluating the risk of evacuating multiple passengers versus the risk of proceeding with water ingress. Even during the emergency drills, the master was not required to perform any detailed risk assessment of the scenario. The master therefore had limited exposure to performing risk assessments of an evolving situation, especially related to flooding.

The company's guidance to the crew for assessing an emergency states that the crew should evaluate whether the incident is an actual emergency before preparing passengers for a possible evacuation. This approach to emergency response delays the communication of information to passengers and, in this occurrence, likely contributed to the master not sounding an alarm or providing information to passengers and crew. Not informing the

passengers of the situation limited their ability to understand what might have been required of them in this occurrence.

During emergency situations, even if no immediate danger is perceived, it is prudent to take emergency precautions such as mustering passengers as early as possible to avoid having to carry them out later, when conditions may be rushed or otherwise less than optimal.

If crew do not take early and organized action to prepare passengers for possible evacuation, there is a risk that an evacuation will not be effective.

Passengers and crew noticed when the vessel made bottom contact; the vessel shook and a loud noise was heard. Because no alarm was sounded and there was no communication from the master over the vessel's public address system, crew members were unsure what actions they should take with respect to emergency response.

The company's emergency procedure for grounding directs the crew to complete the duties as stated on the muster list for abandoning ship, which includes the distribution of lifejackets. However, without having practised the emergency procedure for grounding, crew members did not know what they were required to do in this situation and they did not distribute lifejackets to passengers.

The master was in the wheelhouse throughout the occurrence and relied on the crew to provide timely and accurate information to make decisions. Information was primarily relayed by a crew member acting as a runner, and by the mate who visited the wheelhouse with an update. With the information available to the master, he was not fully aware of the response activities underway or how much water was in the steering compartment until the vessel was secured at the dock.

The master was not always in the wheelhouse during emergency drills, and so crew often simulated the relaying of information. Simulating the relay of information does not allow crew to identify shortcomings in this procedure and improve upon them, and it does not allow the master to practise assessing an emergency from the wheelhouse based on information provided by the crew.

Furthermore, crew conducted drills without passengers on board, resulting in missed opportunities to practise and improve passenger management procedures, which likely contributed to the limited communication with passengers in this occurrence. The crew's ad hoc response to the bottom contact and flooding focused primarily on dewatering the vessel with minimal attention to informing, preparing, or instructing the passengers.

The drills carried out on board the *Island Queen III* did not accurately represent a real emergency and therefore prevented the crew from practising all of the emergency duties they would be required to carry out. During drills, alarms were often not sounded, and there was no communication between the crew and the wheelhouse. There was no assessment of the situation to determine if it was an emergency, and no passengers were involved in the drills.

If drills are not conducted in a realistic manner and do not take into account the preparation of passengers, there is a risk that crew members will not become familiar with the emergency procedure or perform their assigned duties in a real emergency.

2.6 Safety management systems

For an SMS to be effective, it needs to be implemented and continuously improved with a cycle of "plan, act, review:" planning the operations, putting the plan into action, reviewing the effectiveness of the operations and of the SMS itself, then adjusting the plan to make any necessary improvements. Working within this framework increases employees' awareness of and commitment to safety management, and internal reviews and periodic external verification help identify weaknesses that can be rectified.

The company had voluntarily implemented an SMS that fulfilled many of the requirements of the International Safety Management (ISM) Code. A level of risk assessment and mitigation was present, as evidenced by the undocumented procedure of having 2 crew members in the wheelhouse in confined waters. However, because the company was not required to have an SMS, there was no requirement to have the system certified or audited. Crew members were not aware of the SMS or of its procedures for routine and emergency operations. This shortcoming in the system was not identified, because the system had not been reviewed by a third party for initial certification or periodically thereafter. Similarly, for several years before the occurrence, the company's designated person had not completed an annual internal review in accordance with the SMS.

Although proposed changes to the *Safety Management Regulations* would include passenger vessels such as the *Island Queen III*, these proposals have been discussed by TC since 2008. There is no indication when or if the proposals will come into force.

If companies do not implement and maintain an SMS with review processes and external oversight, there is a risk that weaknesses of the system will not be identified and that the SMS will not be effective in the safe management and operation of company vessels.

2.7 Alerting search and rescue services

Masters and companies operating small passenger vessels should alert SAR services as soon as possible after an incident takes place. Doing so gives SAR resources time to plan their response and increases the chances of a successful rescue. Waiting until the situation has deteriorated into an imminent emergency before alerting SAR resources reduces the time available to initiate and affect a successful rescue. For example, in situations where people have entered the water, timeliness is paramount, given the high risk of hypothermia and drowning.

The company had developed procedures to prepare for and respond to emergencies; however, these procedures did not indicate that vessel crew and other company personnel should alert SAR services as soon as possible to ensure timely assistance.

When the *Island Queen III* made bottom contact, neither the master nor the company informed the Canadian Coast Guard. The master considered that the vessel was able to return to the dock where the crew and the passengers could safely disembark. Nevertheless, the situation could have evolved differently and compromised the vessel's seaworthiness.

If SAR resources are not alerted in a timely manner following an occurrence, there is a risk that their response will not be timely, effective, or coordinated.

3.0 FINDINGS

3.1 Findings as to causes and contributing factors

These are conditions, acts or safety deficiencies that were found to have caused or contributed to this occurrence.

1. The master continued past the planned alteration point to avoid a fleet of sailing dinghies.

2. The vessel's deviations from the planned route and lack of additional helm caused the vessel to travel north of the intended track.

3. Without establishing and monitoring fixed visual cues, visual navigation was ineffective in determining the *Island Queen III*'s position relative to its planned route. The master was therefore not fully aware of the vessel's deviation from the intended track.

4. Relying on a single means of monitoring the vessel's position prevented the cross-checking of the vessel's position and contributed to navigational errors not being detected.

5. The mate was counting tickets as the vessel approached Whiskey Cut and was not monitoring the navigation of the vessel. As a result, the mate did not detect the vessel's deviation from the intended track.

6. When the master applied corrections to the vessel's course, they were not early enough or significant enough to return the vessel to its intended track.

7. The vessel's stern made contact with the bottom on the north side of Whiskey Cut, near Cartwright Point, puncturing the bottom shell plating.

3.2 Findings as to risk

These are conditions, unsafe acts or safety deficiencies that were found not to be a factor in this occurrence but could have adverse consequences in future occurrences.

1. Prior to each voyage, if bridge teams do not assess the operational hazards that the vessel may encounter, there is a risk that these hazards will not be mitigated effectively.

2. If passengers are not familiarized with the vessel's emergency procedures and lifesaving equipment before the voyage, there is a risk that passengers and crew will not be prepared to respond to an emergency in a safe and timely manner.

3. If all passenger vessel crews are not adequately trained in passenger safety management, there is a risk that crew members will not be prepared to manage passengers effectively in emergency situations.

4. If companies do not implement an accurate method of determining the number of people on board before the vessel's departure, there is a risk that not all passengers and crew will be accounted for in an emergency.

5. If passenger vessel operators do not have a procedure to ensure that the appropriate type and number of children and infant lifejackets are on board, there is an increased risk of injury or death in an emergency.

6. If passenger vessel operators do not develop vessel-specific evacuation procedures, and there is no appropriate oversight to evaluate these procedures, there is a risk that crews and passengers will not be prepared for the safe evacuation of the vessel in an emergency.

7. If operators do not ensure that masters are formally familiarized with and trained in documented operating procedures, and that they follow these procedures, there is a risk that unsafe practices will develop, exposing vessels and passengers to known hazards.

8. If appropriate alarms or signals are not sounded during drills, there is a risk that crew will be unsure how to proceed in response to an emergency.

9. If predetermined alarms or signals are not used to communicate a need for an emergency response, there is a risk that passengers and crew will not be made aware of an emergency in a timely manner.

10. If crew do not take early and organized action to prepare passengers for possible evacuation, there is a risk that an evacuation will not be effective.

11. If drills are not conducted in a realistic manner and do not take into account the preparation of passengers, there is a risk that crew members will not become familiar with the emergency procedure or perform their assigned duties in a real emergency.

12. If companies do not implement and maintain a safety management system (SMS) with review processes and external oversight, there is a risk that weaknesses of the system will not be identified and that the SMS will not be effective in the safe management and operation of company vessels.

13. If search and rescue resources are not alerted in a timely manner following an occurrence, there is a risk that their response will not be timely, effective, or coordinated.

3.3 Other findings

These items could enhance safety, resolve an issue of controversy, or provide a data point for future safety studies.

1. Kingston & The Islands Boat Lines Ltd. voluntarily developed its safety management system (SMS) to assist in the safe operation of the company's vessels, even though small passenger vessels are not required to implement an SMS.

4.0 SAFETY ACTION

4.1 Safety action taken

4.1.1 Transportation Safety Board of Canada

The TSB received a SECURITAS[86] report before the occurrence about similar safety issues relating to passenger management, evacuation procedures, and emergency preparedness on a passenger vessel operated by another company in the Kingston area. On 08 and 09 October 2017, TSB investigators visited 4 other vessels operated by 4 different companies in the same geographical area to better understand and verify these common safety issues. As a result, TSB investigators identified 19 safety issues relating to passenger management, emergency preparedness, and lifesaving equipment on 1 or more of the vessels.

These safety issues were described in Marine Safety Advisory Letter No. 02/18 — Safety Issues on Passenger Vessels Navigating in the Thousand Islands Area. The safety advisory letter was sent on 09 April 2018 to the 4 companies that investigators visited. The purpose of the letter was to provide this information to the companies so that appropriate measures could be taken in advance of the 2018 cruise season. The TSB requested that it be informed of any action taken. None of the companies responded to the safety advisory letter.

The safety advisory letter was also sent to Transport Canada (TC). A response was received from TC on 15 May 2018, indicating that TC inspectors would conduct unannounced monitoring inspections of passenger vessels during the 2018 cruise season.

4.1.2 Kingston & The Islands Boat Lines Ltd.

Following the occurrence, Kingston & The Islands Boat Lines Ltd. changed how the pre-departure safety briefing is delivered to passengers on board the *Island Queen III*. In addition to the pre-recorded audio safety briefing as delivered on the occurrence voyage, a crew member is positioned on each deck and physically demonstrates the proper procedure for donning lifejackets. This change was implemented before the 2018 season.

The company's safety management system (SMS) has been reviewed and revisions have been made to reflect current operating practices. A new practice of holding an annual marine staff meeting has been put in place, with the first meeting held in May 2019. The meeting focused on numerous operating procedures concerning the operation of the company's vessel fleet, as well as a review of the revised SMS.

A marine officer training log checklist has been implemented for new or returning marine officers to record the training received by each officer in relation to the approved chief mate training manual.

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86 SECURITAS is a TSB program that allows anyone to make confidential reports about safety in the air, marine, pipeline, and rail modes of transportation.

The company has also developed a detailed evacuation procedure for the *Island Queen III.* The plan describes the evacuation process, from the launching of life rafts by the crew to the boarding of the life rafts by all passengers.

A closed-circuit television camera has been installed in the wheelhouse of the *Island Queen III* to monitor and supervise marine staff operating the vessel to ensure that their actions are consistent with company policy and procedures and with industry best practices. A notice has also been posted in the wheelhouse indicating that a 2-person wheelhouse policy must be followed in all confined areas.

4.1.3 Transport Canada

In response to the concerns raised in the TSB's safety advisory letter, TC began conducting unannounced monitoring inspections of passenger vessels in the Thousand Islands area in the spring of 2018. While conducting these inspections, Marine Safety inspectors checked for safety issues identified in the safety advisory letter, including unobstructed emergency exits, functionality and availability of firefighting and lifesaving equipment, and effective safety briefings. These inspections resulted in a number of vessel operators being issued deficiency notices requiring them to address the identified issues by a specific date.

In the fall of 2018, TC introduced the Passenger Vessel Checklist, which Marine Safety inspectors must complete during monitoring and periodic inspections conducted on Canadian passenger vessels. The checklist focuses on the safety issues identified in the safety advisory letter.

From September 2018 to December 2018, TC conducted its concentrated inspection campaign with a focus on maintenance and safety procedures. This campaign, which took place in all regions, targeted all vessel types, including passenger vessels. Approximately 30 passenger vessels were inspected, several of which operated out of Kingston, Ontario. The results of both the campaign and the Passenger Vessel Checklist are being reviewed by TC to identify passenger vessel safety issues that require improvement and the appropriate corrective action to be taken.

4.2 Safety concerns

On 08 August 2017, the passenger vessel *Island Queen III*, with 279 passengers on board, was on a 3-hour sheltered waters cruise in the Thousand Islands area of the St. Lawrence River when it made bottom contact off Kingston, Ontario, that resulted in the flooding of the steering compartment. The vessel was able to return to the dock without assistance and evacuation of the vessel at sea was not required.

4.2.1 Availability of sufficient lifejackets for all children and infants on board

Among the 279 passengers on board the *Island Queen III*, there were 32 children and 4 infants; these numbers were unknown to the master and crew, and they were therefore unable to confirm that a suitable lifejacket for each child and infant was on board at the time of the occurrence.

The *Life Saving Equipment Regulations* require every vessel more than 5 gross tonnage (GT) and certified to carry more than 12 passengers to carry 1 lifejacket for each member of the complement.[87] In addition, the vessel must carry lifejackets that are suitable for children for at least 10% of the complement, or 1 for each child on board, whichever is greater. In the day excursion industry, the presence of children on board is not uncommon as families partake in sightseeing and eco-tourism activities, and the number of children on board may at times exceed 10% of the complement.

Furthermore, there is no Canadian requirement for a vessel to carry lifejackets that are suitable for infants, unlike international requirements for the carriage of lifejackets in infant size for a body mass under 15 kg.

Passenger vessels such as the *Island Queen III* are not required to count and record the number of children and infants on board for each voyage.[88] Without actively counting the number of children and infants on board, operators have no way to confirm that they have a sufficient number of suitable lifejackets for the children and infants on board. In this occurrence, the master and crew were unaware of the number of children and infants on board because there was no procedure to determine and record the number of children and infants on board, nor was one required by regulation.

The Board is concerned that, without TC requirements for the carriage of infant-sized lifejackets on board vessels, and for vessel operators to ensure the number of child- and infant-sized lifejackets on board equals or exceeds the number of children and infants on board, there remains a risk that vessels may not have a sufficient number of suitably sized lifejackets for children and infants. The Board will continue to monitor this situation with a view to assessing the need for further action on this issue.

4.2.2 Development and oversight of vessel-specific evacuation procedures

The *Island Queen III* did not have a procedure to evacuate its passengers within 30 minutes of an abandon ship signal being sounded, as required by regulation. Furthermore, TC does not have a procedure to oversee compliance with this requirement.

The absence of evacuation procedure development and regulatory oversight has been identified in other TSB investigations.[89] Similarly, another 5 TSB investigations[90] identified

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87 Transport Canada, C.R.C., c. 1436, *Life Saving Equipment Regulations* (last amended 17 June 2015), paragraph 17(5)(b).

88 According to section 11 of the *Fire and Boat Drills Regulations*, for unlimited and near coastal Class 1 voyages, voyages longer than 12 hours, or voyages with assigned passenger berths, the name and gender of each passenger as well as whether each passenger is an adult, child, or infant must be recorded and kept on shore. (Source: Transport Canada, SOR/2010-83, *Fire and Boat Drills Regulations* [last amended 06 December 3013], subsections 11(1) and 11(2)).

89 TSB marine transportation safety investigation reports M06W0052 and M12C0058. See also Appendix C for a summary of these occurrences.

90 TSB marine transportation safety investigation reports M07L0158, M12C0058, M13L0067, M13M0287, and M15A0009.

the absence of passenger safety-related duties in evacuation procedures or muster lists, and the fact that this absence was not identified through annual vessel inspections.

To ensure that passengers and crew are evacuated safely in the event of an emergency, all passenger vessels are required to have an evacuation procedure that outlines how all passengers and crew members will be evacuated from the vessel within 30 minutes of the abandon ship signal being given.

Although this regulatory requirement is in place, TC has no formal procedure to assess if this requirement is being met. Operators who develop evacuation procedures have no approval process to confirm their procedure meets the requirement or to obtain approval from the regulator. Presently, each inspector is left to determine how this requirement is assessed; the requirement is most frequently assessed by the inspector witnessing a drill on board the vessel. This provides little insight as to the crew's ability to evacuate passengers from the vessel, as drills are almost always conducted without passenger involvement.

The Board is concerned that, until such time as TC implements a formal validation and approval process for passenger vessel evacuation procedures, there remains a risk that crew members and passengers will not be prepared for the safe evacuation of the vessel in an emergency. The Board will continue to monitor this situation with a view to assessing the need for further action on this issue.

4.2.3 Training in passenger safety management for crew members on passenger vessels carrying more than 12 passengers

From the time the *Island Queen III* made bottom contact until the vessel docked and passengers disembarked, the crew members were tasked with managing the safety of all passengers on board in an emergency situation.

The emergency duties assigned to any crew members relating to passenger safety fall largely within the domain of crowd management. Therefore, to successfully perform such duties, crew members require knowledge and skill in crowd management, as well as a basic understanding of crisis management and human behaviour in emergencies.

Following a May 2003 occurrence involving the roll-on/roll-off passenger ferry *Joseph and Clara Smallwood*, a TSB investigation[91] revealed a number of safety deficiencies related to emergency duties performance and training. A performance analysis indicated that crew members did not possess the knowledge or skills to adequately perform their emergency duties, and the TSB subsequently issued a safety concern about the adequacy of passenger safety management training. Although crew members in that occurrence met regulatory

91 TSB Marine Transportation Safety Investigation Report M03N0050.

requirements at the time, additional training in crowd management, crisis management, and human behaviour would have better prepared them to respond.

Similarly, following the March 2006 occurrence involving the roll-on/roll-off passenger ferry *Queen of the North*, the TSB investigation[92] again found a number of safety deficiencies related to emergency duties performance and training.

On 01 July 2007, the *Marine Personnel Regulations* came into force, which require crew members assigned to assist passengers in an emergency to have a Passenger Safety Management Certificate. The 12.5 hours of training required to obtain this certificate are specific to the management of passengers in an emergency, and the course is required for crew members working on Canadian passenger vessels with a GT of more than 500 that carry more than 12 passengers and are on a voyage other than a sheltered waters voyage.

Crew members on smaller passenger vessels or passenger vessels making a sheltered waters voyage where passenger safety management training is not required receive training in passenger management as a small part of the required Marine Emergency Duties (MED) training. In the case of the Small Seasonal Passenger-Carrying Vessel Safety (Non-Certificated Personnel) MED Training, which was completed by many of the staff on board the *Island Queen III*, the course covers the basics of marine emergencies, emergency response, life-saving appliances, abandoning ship, and crowd control. This entire training is completed in 6 hours, and crowd control is 1 small component.

There are currently 1145 passenger vessels of 500 GT or less and only 115 passenger vessels greater than 500 GT registered in Canada.[93] Crews of these smaller passenger vessels, or passenger vessels making a sheltered waters voyage, are required to perform the same duties and evacuate passengers in the same amount of time (30 minutes) as crews of larger passenger vessels, often while carrying more passengers than larger vessels. Yet crews of these smaller passenger vessels are not required to complete the same training as crews on larger vessels. The current requirement to complete the passenger safety management training is based on vessel tonnage and the voyage type, not the number of passengers the crew must manage; the size of the vessel and the voyage type make little difference to managing passengers in an emergency. The number of passengers has the greatest impact on passenger safety management, yet this is not the primary consideration in the requirement for this specialized training.

Passengers on vessels of 500 GT or less are at higher risk because they do not have the benefit of crew members trained in passenger safety management. These passengers would only benefit from the appropriate training of officers and crew with respect to passenger safety management if there are no tonnage and voyage limits. No safety action has been

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92 TSB Marine Transportation Safety Investigation Report M06W0052.

93 Search of Transport Canada Vessel Registration Query System at 26 November 2019 (available at https://wwwapps.tc.gc.ca/Saf-Sec-Sur/4/vrqs-srib/eng/vessel-registrations/search, last accessed on 3 March 2020). Includes all passenger vessels and ferries greater than 5 GT up to and including 500 GT.

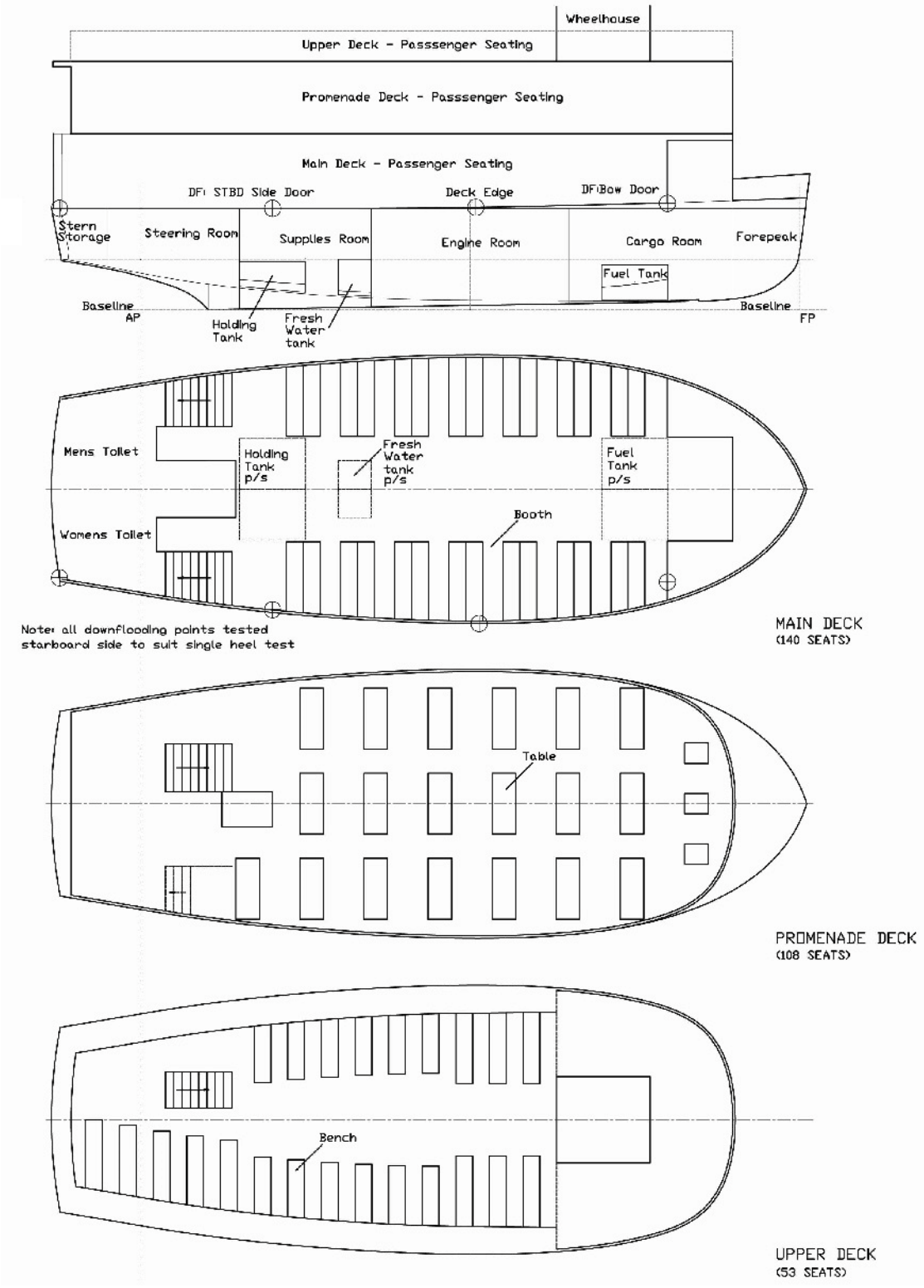
taken to address the fact that crew members on passenger vessels of 500 GT or less do not require such training, regardless of the number of passengers and voyage parameters.

The Board is concerned that, until such time as the crew members of all vessels carrying more than 12 passengers are required to complete appropriate training in passenger safety management, there remains a risk that crew members will not be prepared to manage passengers effectively in emergency situations. The Board will continue to monitor this situation with a view to assessing the need for further action on this issue.

This report concludes the Transportation Safety Board of Canada's investigation into this occurrence. The Board authorized the release of this report on 08 January 2020. It was officially released on 30 April 2020.

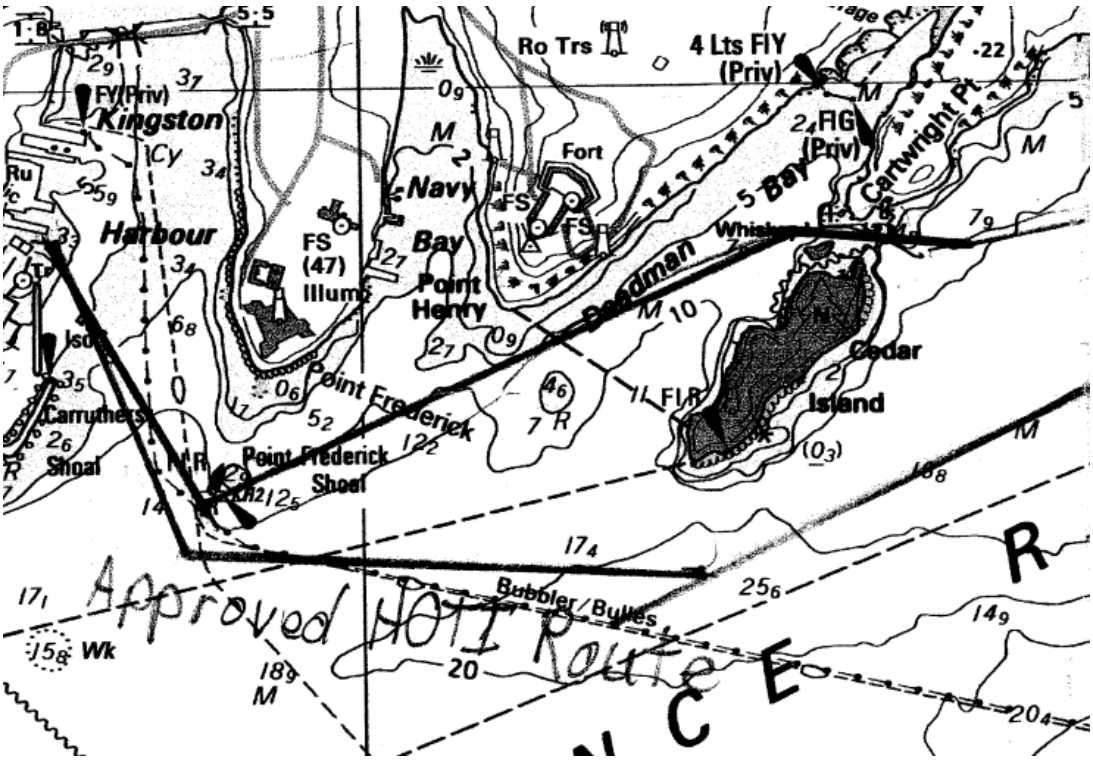
APPENDICES

Appendix A – General arrangement of the *Island Queen III*

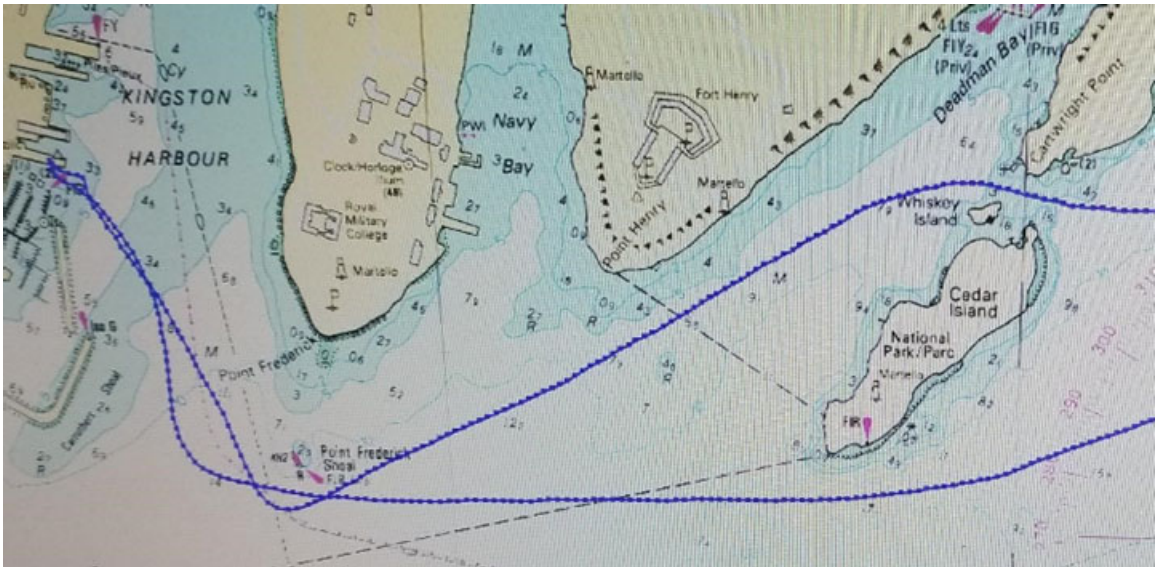


Source: MetalCraft Marine Inc., *Intact and Damage Stability Information Booklet For "M.V. Island Queen III"* (02 February 2011)

Appendix B – Approved route for the Heart of the Islands cruise



Company-approved route (solid black line) through Deadman Bay and return south of Cedar Island, as drawn on Canadian Hydrographic Service Chart 1439. Source: Kingston & The Islands Boat Lines Ltd.



Company-approved route (blue line) through Deadman Bay and return south of Cedar Island as displayed on the *Island Queen III*'s electronic charting system. Source: Kingston & The Islands Boat Lines Ltd.

Appendix C – Previous occurrences

M06W0052 (*Queen of the North*) – On 21 March 2006, the passenger and vehicle ferry *Queen of the North* departed Prince Rupert, British Columbia, for Port Hardy, British Columbia, with 59 passengers and 42 crew members on board. After entering Wright Sound from Grenville Channel, the vessel struck the northeast side of Gil Island. The vessel sustained extensive damage to its hull, lost its propulsion, and drifted before it sank. Passengers and crew abandoned the vessel before it sank. Two passengers remained unaccounted for following evacuation procedures. The TSB investigation found that those responsible for passengers had difficulties counting passengers and identifying those missing.

M07L0158 (*Nordik Express*) – On 16 August 2007, in darkness and good weather, the passenger vessel *Nordik Express* struck Entrée Island while approaching the entrance to Harrington Harbour, Quebec. The vessel sustained severe damage, water ingress, and quickly developed a starboard list. After the vessel was brought alongside the dock, the 156 passengers disembarked. There was no pollution and no one was injured. The TSB investigation identified several shortcomings with respect to duties related to passenger safety, including not sounding an alarm, leaving the crew members who were responsible for passenger safety to improvise their response, not addressing tasks related to the preparatory stages of an evacuation, and not performing a passenger count at disembarkation.

M12C0058 (*Jiimaan*) – On 11 October 2012, the passenger vessel *Jiimaan* grounded while approaching the ferry terminal in Kingsville, Ontario. The 34 passengers and crew remained on board until the vessel was refloated the next day, after which time the *Jiimaan* was escorted to the port of Leamington, Ontario. The TSB investigation identified shortcomings in emergency procedures with respect to passenger safety management, and that crew members had not practised these procedures in a realistic way. This investigation also highlighted the need for effective oversight of passenger safety by Transport Canada (TC).

M13L0067 (*Louis Jolliet*) – On 16 May 2013, the passenger vessel *Louis Jolliet* ran aground off Sainte-Pétronille, Île d'Orléans, Quebec, while on a cruise with 57 passengers on board. The vessel sustained minor damage to the hull. The passengers and some crew members were evacuated onto 2 pilot boats and a tug. The TSB investigation identified shortcomings in emergency procedures with respect to passenger safety management and that crew members had not practiced these procedures in a realistic way. This investigation also highlighted the need for effective oversight of passenger safety by TC.

M13M0287 (*Princess of Acadia*) – On 07 November 2013, the roll-on/roll-off passenger ferry *Princess of Acadia*, carrying a total of 87 passengers and crew, sustained a main generator blackout and grounded while approaching the ferry terminal at Digby, Nova Scotia. The TSB investigation identified shortcomings in emergency procedures with respect to passenger safety management and that crew members had not practiced these procedures in a realistic way. This investigation also highlighted the need for effective oversight of passenger safety by TC.

M15A0009 (*Grace Sparkes*) – On 21 January 2015, the roll-on/roll-off passenger ferry *Grace Sparkes*, with 8 crew and 4 passengers on board, was transiting the harbour channel at Burnside, Newfoundland and Labrador, when it struck Burnside Rock. The vessel continued its voyage and docked at Burnside a few minutes later. The TSB investigation identified that passengers were not informed of a potential emergency. Shortcomings in emergency procedures with respect to passenger safety management were also identified, and it was found and that crew members had not practiced these procedures in a realistic way. This investigation also highlighted the need for effective oversight of passenger safety by TC.