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

MARINE TRANSPORTATION SAFETY INVESTIGATION REPORT M23C0143

COLLISION

Ferry *Svanoy* and pleasure craft
St. Lawrence River
Saint-Joseph-de-la-Rive, Quebec
02 July 2023

Canada

ABOUT THIS INVESTIGATION REPORT

This report is the result of an investigation into a class 3 occurrence. For more information, see the Policy on Occurrence Classification at www.tsb.gc.ca

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

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Executive summary

On the morning of 02 July 2023, the passenger ferry *Svanoy*, loaded with passengers and vehicles, departed the ferry dock at Saint-Joseph-de-la-Rive, Quebec, for its scheduled run to the dock at L'Isle-aux-Coudres, Quebec, located on the St. Lawrence River. Visibility was restricted due to dense fog.

Shortly after departing, and with the *Svanoy* master's permission, the chief officer left the bridge. The master was left alone on the bridge in charge of navigating, including steering and lookout. When the *Svanoy* was 0.35 nautical miles south-southwest of the departing dock and at a speed of approximately 8 knots, the master spotted a pleasure craft ahead. The master immediately sounded 1 blast of the ferry's foghorn to warn the pleasure craft and reduced speed. Moments later, the *Svanoy* and the pleasure craft collided.

The morning of the collision, the pleasure craft had departed a marina in Québec, Quebec, bound for Tadoussac, Quebec. The pleasure craft operator and 3 other occupants kept a visual and auditory lookout while monitoring traffic via an unregistered automatic identification system. Just before the collision, the pleasure craft operator noticed that 1 of the automatic identification system targets had changed from being static to being on a collision course. The operator then saw the silhouette of the *Svanoy* appear from the fog. The operator immediately pulled the craft's throttles back and altered course to port, but was unable to avoid the collision.

As a result of the collision with the *Svanoy*, 3 of the pleasure craft's occupants were thrown into the water while the 4th occupant was trapped below deck. The craft was substantially damaged, took on water, and began to sink. The 4 occupants were rescued by the ferry crew and were transported to a local hospital. The pleasure craft sank and the *Svanoy* sustained minor damage.

The investigation determined that neither the ferry master nor the pleasure craft operator used the signals prescribed in the *Collision Regulations* for restricted visibility to warn other vessels in the area of their presence, which greatly reduced the ability of the master and the pleasure craft operator to detect each other's presence. By the time they detected each other, the ferry and pleasure craft were in a close-quarters situation with risk of collision; neither the master nor the pleasure craft operator was able to take effective action to avoid the collision.

The investigation also determined that although the pleasure craft operator involved in this occurrence had completed an accredited boating safety course and held a valid Pleasure Craft Operator Card, his knowledge of signals, lookout, safe speed, collision avoidance, and navigation in restricted visibility was limited. The pleasure craft had a simple passage plan for the intended voyage, but the craft's occupants were unfamiliar with the navigation area and were unaware of the presence of a ferry service. The pleasure craft operator therefore did not have sufficient knowledge to navigate safely in the prevailing conditions at the time of the occurrence.

According to Transport Canada's *Competency of Operators of Pleasure Craft Regulations*, all operators of a pleasure craft fitted with a motor and used for recreational purposes on Canadian waters need to prove their competency. Transport Canada's training syllabus for the Pleasure Craft Operator Card is broad and covers many safety-critical topics. However, the depth of information provided by commercial boating safety course providers was found to be limited.

The TSB previously investigated a near-collision between a rental pleasure craft and a commercial cargo vessel,[1] where the pleasure craft was overturned and all its occupants ended up in the water. As part of that investigation, the TSB conducted a Canada-wide survey of marine pilots. The survey results indicated that the risk of collision between commercial vessels under pilotage and pleasure craft is widespread across Canada. It also identified better education and training for pleasure craft operators as the most important factor to help reduce the risk of collisions between pleasure craft and commercial vessels.

If the process to obtain a Pleasure Craft Operator Card does not provide pleasure craft operators with adequate knowledge of vessel operations, such as the *Collision Regulations* and principles of passage planning, and if there are no requirements for operators to remain current with this knowledge, there is a risk that they may not be capable of safe navigation in high-traffic waterways. Transport Canada is in the process of updating the *Competency of Operators of Pleasure Craft Regulations*, but the draft text has not yet been published. In the interim, the Board is concerned that the current requirements for training and certificating pleasure craft operators do not provide them with the depth of knowledge necessary for safe navigation on high-traffic waterways.

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1 TSB Marine Transportation Safety Investigation Report M22P0298.

1.0 FACTUAL INFORMATION

1.1 Particulars of the vessels

Name	***Svanoy***	**No official name**
International Maritime Organization (IMO) number	9035163	Not applicable
Official number / Registration Number	845629	QC5998860
Port of registry	St. John's, NL	Not applicable
Flag	Canada	Canada
Type	Passenger ferry	Pleasure craft, Doral 45 Alegria
Gross tonnage	2631	Not applicable
Length	83.3 m	13.79 m
Breadth	15.5 m	4.22 m
Design draft	4.3 m	Not applicable
Draft at the time of the occurrence	Forward 5.5 m, aft 7.6 m	Not applicable
Crew / Passengers	14 / 15	4 occupants
Built	1992	2006
Propulsion	1 diesel engine of 2111 kW	2x inboard diesel engine 480 HP
Owner	Can Fjord Holdings Ltd.	Private owner
Authorized Representative	Can Fjord Ferries Ltd.	Not applicable
Manager	Canship Ugland Ltd.	Not applicable
Classification society / recognized organization	DNV	Not applicable

1.2 Description of the vessels

1.2.1 *Svanoy*

The *Svanoy* is a double-ended, roll-on/roll-off passenger ferry[2] built in 1992 by Johan Drage AS in Norway (Figure 1). In 2022, the ferry was chartered by the Société des traversiers du Québec (STQ) from LOGISTEC Corporation, which acts as an intermediary between STQ and the vessel manager, Canship Ugland Ltd. (Canship). The *Svanoy* provides ferry service between Saint-Joseph-de-la-Rive, Quebec, and L'Isle-aux-Coudres, Quebec, with a schedule established by STQ.

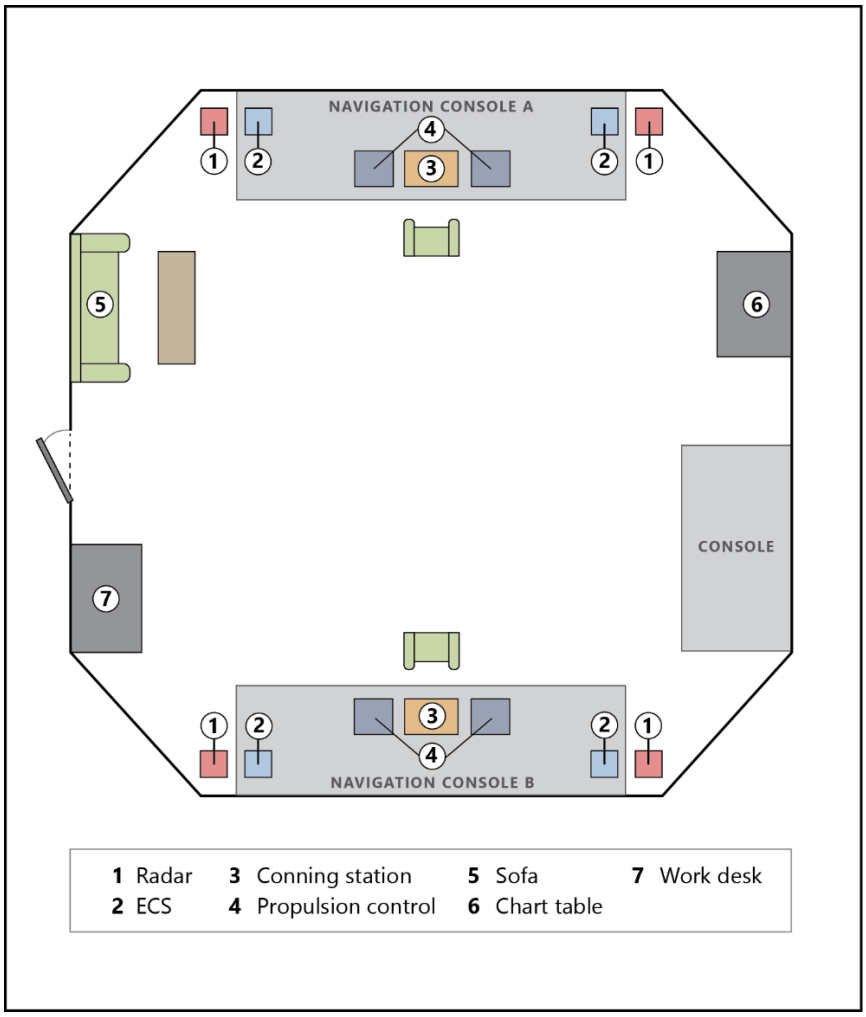
[2] A double-ended ferry allows vehicles to be loaded on and off at both ends of the vessel. Because the vessel's double-ended design does not have a distinct bow or stern, the vessel's fore and aft are relative to the direction the vessel is travelling.

Figure 1. The *Svanoy*, docked at La Malbaie, Quebec, on a foggy day (Source: TSB)

The ferry is certified to carry 289 passengers and 11 crew members, and is designed to carry 104 cars. The bridge is equipped with all required navigational equipment.
Two identical navigation consoles (Figure 2) are located on the bridge, 1 at either end. Each navigation console consists of a conning station, propulsion control, an X-band (3 cm) and an S-band (10 cm) radar, and an electronic chart system (ECS) that displays data from the vessel's automatic identification system (AIS). The ferry is also equipped with a global positioning system (GPS), a voyage data recorder (VDR), and a foghorn that can be operated manually and automatically.

The *Svanoy* carried all of the required certificates for a vessel of its class and intended voyages.

Figure 2. Diagram showing the *Svanoy*'s navigation consoles and bridge layout (Source: TSB)



1.2.2 Pleasure craft

The owners of pleasure craft QC5998860 purchased the craft in 2022 in Québec, Quebec. The pleasure craft was a Doral 45 Alegria cruiser built in 2006 (Figure 3) and constructed of fibreglass with two 480 hp inboard engines.

Figure 3. Pleasure craft QC5998860, docked at a marina in Québec, Quebec (Source: third party, with permission)

A partially covered cockpit was located on the upper deck and comprised a helm station on the forward starboard side, a dining area on the port side, and additional seating aft of the helm station. At the helm station were 2 adjustable seats, a navigation console equipped with a steering wheel, a very high frequency (VHF) radio with built-in AIS, a radar, 2 chart plotters, an autopilot, and a manually operated foghorn. A radar reflector was installed on the cockpit roof. A companionway led from the cockpit to the lower salon, galley, and 2 cabins.

The pleasure craft also carried personal flotation devices for all occupants on board, and an inflatable dinghy at the stern. At the time of the occurrence, the fuel tank contained approximately 1325 L of diesel oil.

1.3 History of the voyage

1.3.1 *Svanoy*

On the morning of 02 July 2023, the crew of the *Svanoy* prepared to depart the ferry dock at Saint-Joseph-de-la-Rive for the dock on L'Isle-aux-Coudres, located on the St. Lawrence River. The passengers had already embarked and the vehicles had been loaded. The ferry engines were tested, as well as steering and navigation equipment, and no deficiencies were

noted. The master and chief officer were on the bridge. Visibility was restricted due to dense fog.

At approximately 1000,[3] the mooring lines were let go and bridge personnel received an "all clear" notice from personnel attending the mooring stations on deck. The chief officer was at navigation console A and manoeuvred the ferry away from the dock.

By approximately 1003, the ferry was just clear of the dock and slowly moving ahead toward L'Isle-aux-Coudres. The chief officer handed over control to the master, who was at navigation console B, facing L'Isle-aux-Coudres.

The S-band radar was set on a 1.5 nautical mile (NM) range and the X-band radar was on a 3 NM range. A moving target was clearly visible on the S-band radar and was less distinct on the X-band radar because of clutter.

At about 1004, with permission from the master, the chief officer left the bridge. To compensate for the ebb current and remain on course, while also taking into account the presence of the oncoming ferry *Félix-Antoine-Savard* as indicated on the ECS, the master made alterations to starboard and gradually increased the *Svanoy*'s speed.

At 1006:30, while the *Svanoy* was 0.35 NM south-southwest of the departing dock at Saint-Joseph-de-la-Rive with a heading of 225° and making a speed of approximately 8 knots,[4] the master spotted a pleasure craft ahead. The master immediately sounded 1 blast of the ferry's foghorn to warn the pleasure craft and reduced speed. At 1006:35, the *Svanoy* and the pleasure craft collided (Figure 4).

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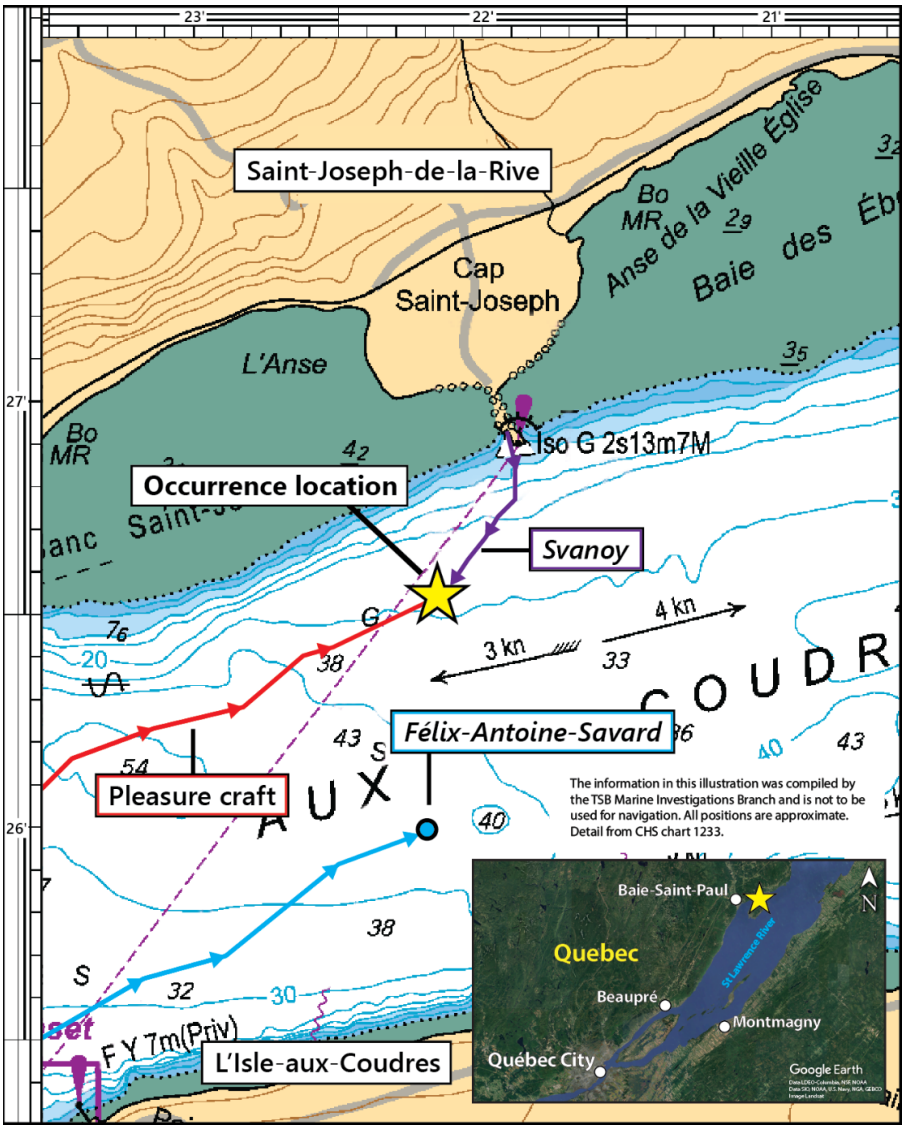
3 All times are Eastern Daylight Time (Coordinated Universal Time minus 4 hours).

4 All speeds in the report are speed over ground.

Figure 4. Chart showing the approximate vessel tracks for the *Svanoy*, the pleasure craft, and the *Félix-Antoine-Savard*, with an inset map of the occurrence location. (Source of main image: Canadian Hydrographic Service Chart 1233, with TSB annotations. Source of inset image: Google Earth, with TSB modifications)



Immediately following the collision, the *Svanoy*'s master informed the crew over ultra high frequency radio of the situation and ordered the crew to prepare and lower the ferry's rescue boat.

At 1009:37, the chief officer returned to the bridge and reported the collision over VHF radio to Marine Communications and Traffic Services (MCTS) Quebec. The chief officer was in charge of further radio and telephone communications with MCTS, the pleasure craft, vessels in the vicinity, and Canship's shore-based personnel.

At approximately 1010, the passenger ferry *Félix-Antoine-Savard*, en route from L'Isle-aux-Coudres to Saint-Joseph-de-la-Rive, approached the scene. The *Félix-Antoine-Savard* crew lowered its rescue boat onto the water in preparation for assisting rescue operations, if needed.

At 1011:35, the *Svanoy*'s chief officer attempted to establish VHF radio communication with the pleasure craft, but was unsuccessful.

At approximately 1017, the *Svanoy*'s rescue boat was lowered onto the water with 2 crew members on board. At about 1018, the rescue boat approached the partly submerged pleasure craft and recovered all 4 of its occupants. The occupants were transported to the dock in Saint-Joseph-de-la-Rive and were later taken to a local hospital.

At approximately 1135, the *Svanoy* returned to Saint-Joseph-de-la-Rive to disembark its passengers and unload vehicles. The vessel was temporarily removed from service by Canship for further investigation.

1.3.2 Pleasure craft

On 02 July 2023, at approximately 0700, pleasure craft QC5998860 departed a marina in Québec, Quebec, bound for Tadoussac, Quebec. The pleasure craft carried 4 occupants: 2 vessel owners (1 of whom was the operator at the time of the occurrence) and 2 guests. The weather was fair with light rain, and visibility was good.

Using a chart plotter for navigation and making speed of about 20 knots, the operator navigated the pleasure craft along the starboard-hand buoys of the navigational channel within the St. Lawrence River. The operator and other occupants kept a visual and auditory lookout while monitoring traffic in the vicinity via AIS. The pleasure craft's radar remained off throughout the voyage.

At approximately 0950, after leaving the buoyed channel, the pleasure craft crossed Passage de L'Isle-aux-Coudres, Quebec, and approached the north shore near Saint-Joseph-de-la-Rive. By this time, meteorological conditions had changed and dense fog had accumulated on either side of the passage, with fog patches in between. On the AIS, the operator observed a moving target off the pleasure craft's starboard quarter and a static target was visible at the dock of Saint-Joseph-de-la-Rive.

At about 1003, the pleasure craft was 1.4 NM from the *Svanoy*, which had just cleared the ferry dock at Saint-Joseph-de-la-Rive. The pleasure craft was about 65° to starboard from the ferry's course. A few moments later, the pleasure craft operator noticed that one of the AIS targets had changed from a static target to a target on a collision course. At that time, the operator was at the helm, 1 occupant was seated beside the operator, another occupant was in the seating area aft of the helm, and the 4th occupant was below deck.

At about 1006, the operator heard the 2 occupants in the cockpit shout in warning; he then saw the silhouette of the *Svanoy* appear from the dense fog heading toward the pleasure craft. The operator immediately pulled the craft's throttles back and altered course to port.

At 1006:35, the *Svanoy* and the pleasure craft collided.

The pleasure craft's hull was breached in the collision (Figure 5). Three of the craft's occupants were thrown into the water and managed to climb onto the craft after it righted

itself, while the 4th occupant was trapped below deck. Water entered the pleasure craft through the breached hull and the craft started to sink by the stern.

Figure 5. Pleasure craft QC5998860 as seen from the deck of the *Svanoy* (Source: France Gagnon)

At 1008:32, using the VHF radio, 1 of the pleasure craft occupants broadcast "Mayday, Mayday, Mayday." MCTS Quebec immediately responded, but did not receive a response from the pleasure craft. MCTS Quebec relayed the craft's distress signal to nearby vessels.

At 1009:13, a second, partial Mayday call was broadcast from the pleasure craft. The 3 occupants who were on the pleasure craft eventually rescued the 4th occupant from inside the craft; the 4th occupant was unresponsive and CPR (cardiopulmonary resuscitation) was administered. All attempts by MCTS Quebec and the *Svanoy* to establish communication with the pleasure craft were unsuccessful.

By 1019, all of the pleasure craft's occupants were retrieved by the *Svanoy*'s rescue boat as the pleasure craft became submerged and CPR continued to be administered to the 4th occupant. When the rescue boat arrived at Saint-Joseph-de-la-Rive, the 4th occupant was revived. From Saint-Joseph-de-la-Rive, the 4 survivors were taken to a local hospital and treated for mild hypothermia in addition to injuries they sustained during the occurrence. The 4th occupant was transferred to a hospital in Québec for further treatment.

The pleasure craft sank to the riverbed at latitude 47°26'00" N, longitude 070°22'00" W. This location is in close proximity to submarine communications and power cables so, to avoid damage to the cables, on 05 December 2023, the pleasure craft was removed from the water by a salvage company and subsequently scrapped.

1.4 Environmental conditions

At the time of the occurrence, it was daylight with fog and visibility of 0.3 NM or less. There was a light breeze (4 to 6 knots) from the west. The swell height was 0.5 m and an easterly ebb current flowed at a speed of about 3 knots. The air temperature was 20° C and the water temperature was about 12° C.

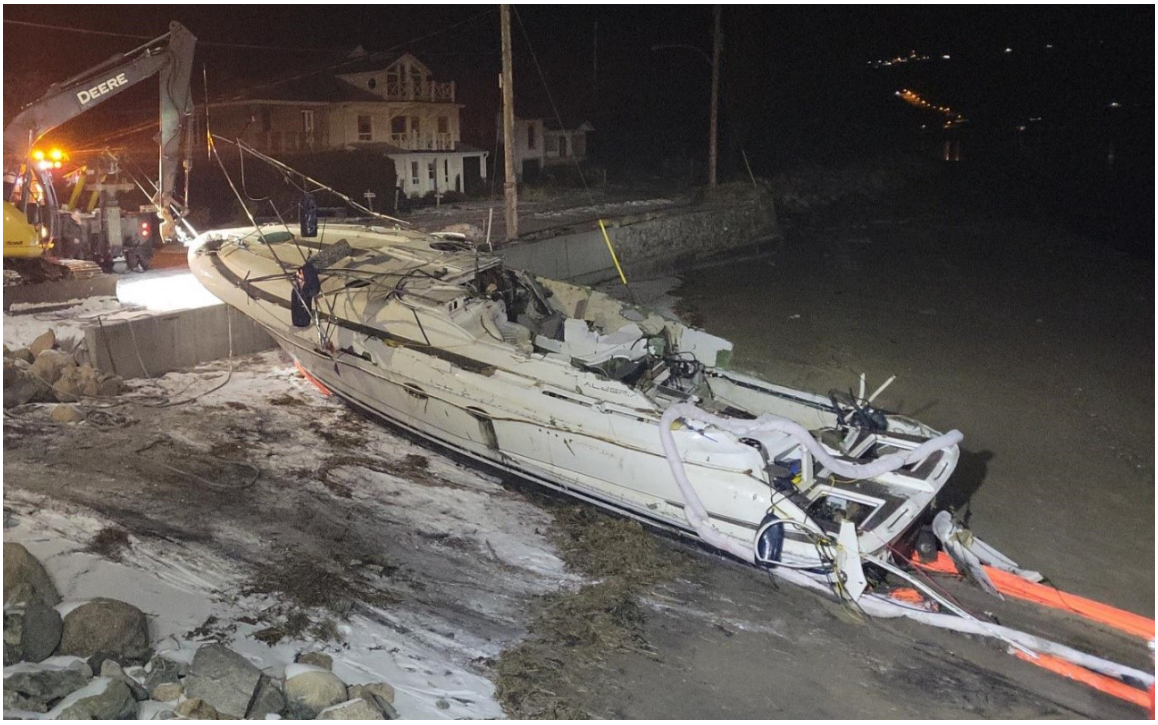
1.5 Damage to vessels

The *Svanoy* sustained minor cosmetic damage to its hull.

The pleasure craft was a constructive total loss. When it was salvaged (Figure 6), the following was observed:

- damage throughout the hull, especially to the aft starboard side that had collapsed under the force of impact with the ferry
- the cockpit enclosure, navigational equipment, electrical components, and steering were damaged
- the inflatable dinghy was missing and loose equipment was scattered

Figure 6. Pleasure craft QC5998860 after being salvaged (Source: Canadian Coast Guard)



1.6 Certification and experience

1.6.1 *Svanoy*

The master and the chief officer of the *Svanoy* held the required qualifications for their respective positions on board the ferry.

The master held a Master, Near Coastal Certificate of Competency. He had sailed for 13 years as a master and officer on ferries in Newfoundland and Labrador, and had sailed on the *Svanoy* as master since 2021.

The chief officer obtained his Watchkeeping Mate Certificate of Competency in 2021 and began work as a third officer on various vessels. In September 2022, he joined the *Svanoy* as second officer and was promoted to chief officer in January 2023.

1.6.2 Pleasure craft

Each of the pleasure craft owners had taken a boating safety course accredited by Transport Canada (TC) and held a Pleasure Craft Operator Card (PCOC). One PCOC was issued in 2009 and the other in 2012. One of the owners of pleasure craft QC5998860 had taken radio operator training and held a Restricted Operator Certificate–Maritime (ROC–M) that was issued by Industry Canada in 2009.

The 2 other occupants also held PCOCs.

The owners and other pleasure craft occupants had extensive experience in operating pleasure craft, mainly on recreational sailboats. They had frequently navigated Lake Ontario under foggy conditions without any adverse consequences.

1.7 Medical factors

Physiological and medical factors were not found to have been present in this occurrence.

1.8 Regulatory requirements

1.8.1 *Collision Regulations*

The *International Regulations for Preventing Collisions at Sea, 1972* (COLREGs), established by international convention, state, among other things, the rules of conduct to follow at sea when a risk of collision exists between vessels. Governments or states may adopt special rules for their waterways. The rules have been adopted by Canada as the *Collision Regulations* and "apply to all vessels upon the high seas and in all waters connected therewith navigable by seagoing vessels."[5]

For the safety and conduct of vessels in any condition of visibility, several *Collision Regulations* rules require that, among other things:

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5 Transport Canada, C.R.C. c. 1416, *Collision Regulations* (as amended 07 June 2023), Schedule 1: *International Regulations for Preventing Collision at Sea*, 1972 with Canadian Modifications, Rule 1(a).

- A proper lookout must be maintained by all available means to make a full appraisal of the risk of collision. A proper lookout is defined in Rule 5 as maintaining a lookout by "sight and hearing," as well as by all other available means.
- "Every vessel shall at all times proceed at a safe speed so that [it] can take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions."[6] When determining a safe speed, consideration is given to visibility, the density of traffic, the manoeuvrability of the vessel with special reference to stopping distance and turning ability in the prevailing conditions, and the limitations of radar.
- Radar equipment, if fitted, must be properly used, including radar plotting or other systematic observation of detected objects (targets).

Moreover, vessels must sound prescribed signals appropriate to the prevailing circumstances and conditions, such as a warning signal on departure (1 prolonged blast) and fog signals (1 prolonged blast at intervals of not more than 2 minutes).

The *Collision Regulations* include a rule specifically for the conduct of vessels in restricted visibility. Rule 19 states:

> (a) This Rule applies to vessels not in sight of one another when navigating in or near an area of restricted visibility.
>
> (b) Every vessel shall proceed at a safe speed adapted to the prevailing circumstances and conditions of restricted visibility. A power-driven vessel shall have [its] engines ready for immediate manoeuvre.
>
> (c) Every vessel shall have due regard to the prevailing circumstances and conditions of restricted visibility when complying with the Rules of Section I of this Part.
>
> (d) A vessel which detects by radar alone the presence of another vessel shall determine if a close-quarters situation is developing and/or risk of collision exists. If so, [it] shall take avoiding action in ample time, provided that when such action consists of an alteration of course, so far as possible the following shall be avoided:
>
> (i) an alteration of course to port for a vessel forward of the beam, other than for a vessel being overtaken,
>
> (ii) an alteration of course towards a vessel abeam or abaft the beam.
>
> (e) Except where it has been determined that a risk of collision does not exist, every vessel which hears apparently forward of [its] beam the fog signal of another vessel, or which cannot avoid a close-quarters situation with another vessel forward of [its] beam, shall reduce [its] speed to the minimum at which [it] can be kept on [its] course. [It] shall if necessary take all [its] way off and in any event navigate with extreme caution until danger of collision is over.[7]

6 Ibid., Rule 6.

7 Ibid., Rule 19.

1.8.2 *Navigation Safety Regulations, 2020*

According to the *Navigation Safety Regulations, 2020*, vessels such as the *Svanoy*[8] must make a VHF radio navigation safety call in certain circumstances.[9] A navigation safety call must contain information that is essential for safe navigation, including the vessel's identity, location, course and speed, and the specific condition of the vessel (e.g., not under command, restricted in its ability to manoeuvre, or engaged in fishing).

Paragraph 253(1)(j) of *the Navigation Safety Regulations, 2020* requires that a vessel make a navigation safety call as it departs from a berth. Paragraph 253(1)(k) of the same regulations requires that a vessel make a navigation safety call under any other circumstance where it is necessary for the safe navigation of the vessel or any other vessel. A navigation safety call must be made 15 minutes before, and again immediately before, departure. Under paragraph 253(4)(b), a vessel is exempted from making a navigation safety call if the vessel is reporting to a traffic communication centre.

In this occurrence, the *Svanoy* reported to a traffic communication centre at the beginning of its service. However, the *Svanoy* departed the ferry dock at Saint-Joseph-de-la-Rive in dense fog without making a navigation safety call or reporting its departure to MCTS Quebec.

1.8.3 *Marine Personnel Regulations*

According to the *Marine Personnel Regulations*,[10] in conditions of restricted visibility the *Svanoy*'s watch must be composed of an officer of the watch and a watch seaman. At the time of the occurrence, the *Svanoy*'s master was alone on the bridge in charge of navigating, including steering and lookout, in conditions of restricted visibility.

1.9 Passage planning

Safe navigation requires proper passage planning. A vessel's passage plan is intended to enhance safety by identifying high-risk areas and providing key information in a format that is readily available to those involved in the vessel's navigation. This critical process involves thoroughly preparing for a voyage by considering key navigational elements such as the vessel's course, course alteration points, local hazards and vessel traffic, regulatory requirements, and potential environmental factors that could affect the voyage.

The pleasure craft operator involved in this occurrence had a simple passage plan for the intended voyage. Another pleasure craft occupant was assisting the operator by plotting waypoints up to the destination, showing major course alterations, and adding more detailed legs as the voyage progressed. The pleasure craft also had a nautical chartbook on

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8 Transport Canada, SOR/2020-216, *Navigation Safety Regulations, 2020* (as amended 20 December 2023), subsections 204(1).

9 Ibid., section 253.

10 Transport Canada, SOR/2007-115, *Marine Personnel Regulations* (as amended 20 December 2023), subsections 216(1) and 216(6).

board. However, the pleasure craft operator was unfamiliar with the navigation area and was unaware of the presence of a ferry service.

1.10 Accredited boating safety course and certification

1.10.1 Certificate of competency for operating a pleasure craft in Canada

According to TC's *Competency of Operators of Pleasure Craft Regulations,*[11] all operators of a pleasure craft fitted with a motor and used for recreational purposes on Canadian waters must have proof of competency. Several documents are accepted as proof of competency, the most common being a PCOC.

To obtain a PCOC, candidates must pass a theory test. A TC-accredited boating safety course is optional, however it is strongly recommended. All of the boating safety courses that lead to the issuance of a PCOC are delivered by commercial course providers who are accredited by TC, and are based on TC's *Boating Safety Course and Test Syllabus* (TP 14932), which is broad and covers many safety-critical topics. Courses are available in classroom and online formats, in English and French.

The topics that must be covered in an accredited boating safety course include the following:

- responsibilities of a boat operator;
- minimum safety equipment required on board a boat;
- preventing unsafe situations once underway;
- planning and preparation for boating trips;
- sharing waterways with other vessels, including larger and less manoeuvrable commercial vessels (derived from the *Collision Regulations*);
- regulations that relate to pleasure craft; and,
- responding to in an emergency situation.

When the investigation reviewed a sample of PCOC course manuals that were available online, none of them provided guidance on how operators could determine if their pleasure craft was operating in an area of restricted visibility. Similarly, the hazard posed by larger commercial vessels was included, but guidance was limited to telling pleasure craft operators to be prepared to move and to be aware of the *Collision Regulations*, with no explanation of what manoeuvres are effective and what specific provisions of the *Collision Regulations* they need to be aware of.

According to TC's *Standard for Pleasure Craft Operator Card Testing Over the Internet* (TP 15080), "the total amount of time required to complete the Online Study Guide must be

[11] Transport Canada, SOR/99-53, *Competency of Operators of Pleasure Craft Regulations* (as amended 06 October 2020).

no less than three (3) hours"[12] before candidates take the final test. The final test consists of 50 multiple choice questions and candidates must correctly answer 38 of those questions to pass the test. The 50 questions are taken at random from 164 potential multiple choice questions that cover all topics. Thirty-nine of these potential questions are about different elements of the *Collision Regulations*. One question is about the definition of restricted visibility, 2 questions are about keeping a lookout, 1 question is about navigating in a narrow channel, and 2 questions are about safe speed. Five of the potential questions focus on basic passage planning. None of the test questions address the conduct of vessels in restricted visibility.

Once obtained, a PCOC does not expire and no refresher training is required. The PCOC does not restrict operators to specific waters, nor does it limit operators to a specific size or tonnage of pleasure craft. Whether operating a small open boat with an electric motor on a small lake, or a large yacht on a high-traffic waterway, the certification requirements are the same.

In 2018, TC began to discuss a proposal to amend the *Competency of Operators of Pleasure Craft Regulations* with marine stakeholders. The proposed amendments include significant changes to the process for selecting course providers, changes to the fee structure, giving the authority to the Minister of Transport to suspend or revoke accreditation and PCOCs for non-compliance, and changes to the use of the Rental Boat Safety Checklist as proof of competency. The pre-publication of the proposed regulations is expected in mid-2025.[13]

1.10.2 Graduated licensing

Graduated licensing programs provide a structured learning process, gradually increasing an operators skills and responsibilities concurrent with the increase in privileges that a given licence accords the operator. The Traffic Injury Research Foundation has identified graduated licensing as the "gold standard" for training new drivers, and graduated licensing programs have been adopted in Canada, New Zealand, the United States, and Australia, among other countries. These programs have been shown to decrease the rate of accidents for new drivers. For example, the overall rate of collisions for novice drivers in Ontario, Canada decreased by 31% in the 2 years following the implementation of graduated licensing in that province.[14]

While Canada has only 1 certification for the operation of all pleasure craft fitted with a motor on all Canadian waters, some countries have different categories of pleasure craft

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12 Transport Canada, TP 15030, *Standard for Pleasure Craft Operator Card Testing Over the Internet* (2010), section 6.2.

13 Transport Canada. Forward regulatory plan: Marine initiatives planned for April 2024 – April 2026, at https://tc.canada.ca/en/corporate-services/acts-regulations/forward-regulatory-plan/marine-initiatives-planned#regulations-amending-the-competency-of-operators-of-pleasure-craft-regulations (last accessed on 29 April 2025).

14 P. Boase and L. Tasca, *Graduated Licensing System Evaluation: Interim Report* (Toronto, Ontario: Safety Policy Branch of the Ontario Ministry of Transportation, 1998).

operator certification. For example, the Netherlands, a well-known seafaring nation, has implemented a graduated licensing program for pleasure craft operators. There are 3 types of recreational boating licences.[15] Every licence prescribes the boat size and waterways where the licence holder is allowed to navigate.

1.10.3 Refresher training

Training programs equip trainees with necessary knowledge and skills through theory, hands-on experience, and refresher training. Formal training provides a foundational understanding of systems, procedures, and safety protocols, while hands-on experience allows for practical application and reinforcement of knowledge.

Refresher training keeps skills and knowledge current and aligned with safety standards, ensuring operators can effectively recall and apply what they have learned. It corrects, if necessary, any deviations from safety protocols, and ensures ongoing proficiency and compliance, thereby enhancing overall performance and safety. Learning is a dynamic process of storing and retrieving information. The longer a person waits to retrieve the information after it is learned, the more difficult it is to retrieve that information.[16]

1.11 Human factors issues

In a complex system such as marine transportation, even the most comprehensive set of rules may not cover every possible scenario or the various ways individuals might interpret these rules. In marine operations, a variety of human factors issues can have an influence on the outcome of any given situation. These issues include adaptations, attention and situational awareness, human perception and reaction time, decision-making and risk perception, as well as cognitive biases.

1.11.1 Adaptations

An adaptation is a decision to deviate from established rules or procedures, and it is usually performed with the person being aware that their actions are contrary to those rules or procedures. Adaptations are often a result of not fully understanding the purpose of the rules or procedures, not anticipating the potential consequences of deviating from them, or from perceiving that the adaptations improve efficiency. When adaptations are performed without negative consequences, they can persist and become normal practice among crew members, eroding the safety margins that the rules and procedures were intended to

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15 Government of the Netherlands, Obtaining a Pleasure Boat Licence, at https://www.government.nl/topics/sailing-and-boating/obtaining-a-pleasure-boat-licence-groot-pleziervaartbewijs-gpb (last accessed on 11 June 2024).

16 D.M. McBride and J.C. Cutting, *Cognitive Psychology: Theory, Process, and Methodology* (SAGE Publications, 2017), p. 138.

provide.[17] To reduce the risk of adaptations, several activities can be put in place by management, such as monitoring and surveillance of operations, and refresher training.

In this occurrence, the bridge personnel of the *Svanoy* did not comply with certain regulations in effect during restricted visibility. The *Svanoy* departed the ferry dock at Saint-Joseph-de-la-Rive in dense fog, without making a VHF radio navigation safety call or notifying MCTS Quebec of its departure. The bridge personnel of the *Svanoy* also did not sound signals prescribed by regulations in recognition of restricted visibility. They regarded the loud sound of the fog signal as disturbing for the passengers and people living close to the ferry terminal, and the signal was perceived as being disruptive to crew communications.

1.11.2 Attention and situational awareness

In the dynamic and often unpredictable marine environment, where vessels navigate through changing weather conditions, encounter other vessels, and respond to navigation aids, vessel operators must continuously adapt their focus to evolving circumstances, making decisions that balance various factors like navigation, communication, and safety protocols.

Attention is a state in which cognitive resources are focused on certain aspects of the environment,[18] prioritizing certain stimuli based on relevance or significance. This selective process, driven by internal goals or external stimuli, helps a person concentrate on the most important information for further processing. Human attention, particularly in vision, is limited, and requires focus on a specific information source for accurate perception to the exclusion of others.[19] Attention can be switched rapidly from 1 information source to another; however, a person can attend well to only 1 information source at a time.[20] These limitations of attention require vessel operators to adapt their focus according to the situation.

Situational awareness is the perception of the elements in the environment, the comprehension of their meaning, and the projection of their status in the future.[21] In a dynamic environment, situational awareness requires that a vessel operator continuously extract information from the environment, integrate this information with relevant internal knowledge to create a coherent mental model of the current situation, and then use this

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17 J. Rasmussen, "Risk Management in a Dynamic Society: A Modeling Problem," in *Safety Science*, Vol. 27, Issue 2/3 (1997), pp. 183–213.

18 American Psychology Association, *APA Dictionary of Psychology*, at https://dictionary.apa.org/attention (last accessed on 16 February 2024)

19 P. Foley and M. Moray, "Sensation, perception and systems design" in G. Salvendy (ed.), *Handbook of Human Factors*, (Wiley-Interscience, 1987), p. 69.

20 C. Wickens, "Information processing, decision-making, and cognition" in G. Salvendy (ed.), *Handbook of Human Factors*, (Wiley-Interscience, 1987), p. 95.

21 M.R. Endsley, "Design and Evaluation for Situation Awareness Enhancement" in *Proceedings of the Human Factors Society 32nd Annual Meeting*, Santa Monica, CA (1988), pp. 97–101.

model to anticipate future events. Problems can occur during any of the 3 steps of situational awareness when critical elements are not detected, their importance is not perceived, or their consequences are not anticipated.

1.11.3 Human perception and reaction time

Visual perception refers to the process of interpreting and making sense of visual information. It involves the complex interaction between a person's visual system, cognitive processes, and motor skills to perceive, process, and respond to visual cues in the environment. Visual perception enables vessel operators to gather information about their surroundings, detect potential hazards, and make informed decisions to navigate and control the vessel. In environmental conditions where visibility is good, visual perception can be accomplished over relatively long distances. However, environmental conditions such as a fog can affect visual perception and reaction time.

1.11.3.1 Reduced visual perception

Fog poses a dual threat to safety in marine transportation. Firstly, fog significantly diminishes contrast between objects and their background, making objects fainter and less distinct.[22,23] This reduction in visual stimulus can lead to a person's decreased situational awareness, making it difficult to identify objects, obstacles, or hazards in the path of navigation. Secondly, fog can impair a person's ability to gauge distances accurately.[24] As a result, perceived speed relative to surroundings is lower in fog than in clear conditions, leading to speed underestimation[25] and misjudging stopping distances.[26,27]

1.11.3.2 Slower reaction times

Reaction time is the result of perception, comprehension, decision, execution time, and mechanical response time. When visibility is low due to fog, vessel operators may have slower reaction times when they encounter unexpected situations or hazards,[28] for instance

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22 J.D. Bullough and M.S. Rea, "Impacts of fog characteristics, forward illumination, and warning beacon intensity distribution on roadway hazard visibility," *The Scientific World Journal* (2016).

23 P. Pretto, J-P. Bresciani, G. Rainer, and H.H. Bülthoff, "Foggy perception slows us down," *eLife 1*, e00031 (2012).

24 V. Cavallo, M. Colomb, and J. Doré, "Distance perception of vehicle rear lights in fog," *Human Factors*, Vol. 43, No. 3 (2001), pp. 442–451.

25 R. Snowden, N. Stimpson, and R. Ruddle, "Speed perception fogs up as visibility drops," *Nature*, Vol. 392 (1998), p. 450.

26 A. Buchner, M. Brandt, R. Bell, and J. Weise, "Car backlight position and fog density bias observer-car distance estimates and time-to-collision judgments," *Human Factors,* Vol. 48, No. 2 (2006), pp. 300–317.

27 J.O Brooks et al., "Speed choice and driving performance in simulated foggy conditions," *Accident Analysis and Prevention*, Vol. 43 (2011), pp. 698–705.

28 P. L. Olson, "Driver Perception Response Time," *SAE International Technical Paper 890731* (1989), pp. 682–686.

when they are unexpectedly confronted with an object at close range, because of the additional time required to interpret the event and decide on a response.[29] This delayed reaction can be especially problematic when quick responses are needed to avoid accidents.

In marine operations, the reaction time for manoeuvring a vessel is a critical factor in avoiding collisions, navigating through busy waters, or responding to emergency situations. Elements such as wind, waves, and current also add complexity to the situation, necessitating an awareness of the operating environment and the ability to respond effectively for optimal control and safety.

1.11.4 Decision making and risk perception

Decision making is a cognitive process used to select a course of action between alternatives. Several factors, circumstances, and biases can affect a person's decision making, including the objective or goal and the person's knowledge, experience, and training.[30] These factors can result in operating a vessel beyond the vessel's capability or beyond the operator's abilities.

Risk is a function of likelihood and adverse consequence. Risk perception is a component of decision making; it is the recognition and interpretation of an inherent risk in a situation. Vessel operators' risk perception can be altered by their relative experience of a situation; therefore, "situations that present a high level of risk for one person may present only low risk for another."[31] Vessel operators who have experienced more hazardous situations tend to have a lower perception of risk when compared to operators who have fewer experiences with hazardous situations.[32]

Vessel operators who repeatedly perform a dangerous activity with no, or few, adverse consequences may become desensitized or habituated to the high level of risk. Problems can arise when perceived risks no longer match the actual risks associated with an activity.

1.11.5 Cognitive biases

In complex situations, people often unconsciously rely on mental shortcuts, known as heuristics, and are subject to cognitive biases when evaluating their surroundings and making decisions. These shortcuts generally enhance efficiency by simplifying the cognitive load required to process vast amounts of information rapidly. While these shortcuts can be efficient in most cases, they can influence decision making. When used in conjunction with unclear or uncertain information, heuristics and biases can negatively impact decision making and lead to hazardous situations.

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29 P.L. Olson and M. Sivak, "Perception-Response Time to Unexpected Roadway Hazards," *Human Factors,* Vol. 28, No. 1 (1986), pp. 91–96.

30 M. R. Endsley, "Toward a Theory of Situation Awareness in Dynamic Systems," *Human Factors*, Vol. 37, No. 1 (1995), pp. 32–64.

31 M. Martinussen and D.R. Hunter, *Aviation Psychology and Human Factors, 2nd Edition* (2018), pp. 297–301.

32 Ibid.

One of these biases, called the plan continuation bias, is characterized as a deeply ingrained tendency for a person to persist with their original course of action even when changing circumstances necessitate a new plan.[33] This bias may stem from an inaccurate assessment of the situation,[34] a misjudgment of associated risks,[35] or an overestimation of one's ability to handle the situation.[36] In essence, when conditions change, the person may overlook or misinterpret new data, resulting in an underestimation of the risks linked to the altered conditions.

1.12 Safety management

A safety management system (SMS) is an internationally recognized framework that allows companies to identify hazards, manage risks, and make operations safer—ideally before an accident occurs. An SMS uses a documented, systematic approach to assess and manage operational risk, which provides individuals at all levels of a company with the tools they need to make sound decisions in routine and emergency operations. An SMS also assists companies in complying with applicable regulations. For example, a marine company's SMS may include procedures for navigation, as well as procedures specifically for navigation in restricted visibility.

The policies, procedures, practices, training, and culture of a company are the outputs of an SMS. Risk management within an SMS is an ongoing cycle that, for example, helps personnel ashore (such as company management) and crew on board to identify, assess, mitigate, and follow up on existing and potential risks to vessels, personnel, and the environment.

Although not required by regulation at the time of the occurrence, Canship voluntarily implemented an SMS[37] for the *Svanoy*. On 25 April 2023, the vessel's SMS was audited and certified by DNV, a classification society. The audit determined that the SMS complied with the requirements of the International Safety Management (ISM) Code.

Among other, the SMS manual for the *Svanoy* contains sections about SMS objectives, crew roles and responsibilities, crew qualifications, occupational health and safety requirements, safe work practices, hazard assessment, and emergency preparedness and responses.

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33 B.A. Berman and R.K. Dismukes, "Pressing the approach," *Aviation Safety World* (2006), p. 28.

34 E.K. Muthard and C.D. Wickens, "Change detection after preliminary flight decisions: Linking planning errors to biases in plan monitoring," *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* (September 2002), p. 1.

35 B. Léonore, V. Claude, F. Sophie, L. Fanny, and N. Claude, "The effects of success related pressure on information processing strategies and plan continuation error," *Proceedings of the International Symposium on Aviation Psychology* (2009), p. 6.

36 L. Bourgeon, C. Valot, A. Vacher, and C. Navarro, "Study of perseveration behaviors in military aeronautical accidents and incidents: analysis of plan continuation errors," *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* (2011), p. 4.

37 The safety management system (SMS) for the *Svanoy* was part of a quality and safety management system implemented by Canship.

The SMS manual describes the functions and roles of the master and the officer of the watch while navigating in restricted visibility. The procedure for navigation in restricted visibility requires, among other things, respecting the *Collision Regulations*, determining the need for a lookout, adapting the crossing schedule as needed, choosing a speed appropriate for the existing circumstances and conditions of reduced visibility, transmitting fog signals, switching to manual steering as needed, operating and using radars appropriately, and broadcasting safety calls.

At the time of the occurrence, although the *Svanoy*'s SMS manual contained a procedure for navigation in restricted visibility, that procedure was not followed by the crew.

1.13 Automatic identification system

AIS is an automated tracking system that enables vessels and shore stations within VHF range to exchange dynamic information about vessel position, course, and speed in real time. An AIS can also exchange programmed information such as the unit's Maritime Mobile Service Identity (MMSI) number, IMO number, call sign, vessel name and type, navigational status, and voyage details. An MMSI number is a unique 9-digit identifier assigned to a vessel for all its applicable VHF electronics, including an AIS transponder. Before an AIS can transmit vessel data, it must be configured with a valid MMSI number.

1.13.1 Data transmission and reception

An AIS unit transmits vessel data via 2 dedicated VHF channels, while simultaneously receiving data from other AIS-equipped vessels and objects within range. A vessel's GPS position (latitude and longitude) is continuously broadcast and updated every 2 to 10 seconds. The update rate may vary based on factors such as vessel speed and course changes. For example, when a vessel is stationary or moving slowly, the unit may reduce the frequency of position updates to save power and bandwidth. Conversely, if the vessel is rapidly changing course or speed, the update rate may increase to provide more accurate information to nearby vessels.

AIS units are divided into 2 classes:

- Class A: for vessels that are subject to the *International Convention for the Safety of Life at Sea* (SOLAS) and non-convention, Canadian flagged vessels other than pleasure craft as described in the *Navigation Safety Regulations, 2020*.[38]
- Class B: for all other vessels, including pleasure craft.

The systems within these classes have varying capabilities and update rates. Class A systems generally have faster update rates and transmit more information than Class B. However, within these classes, there can still be some variability in update rates based on the specific equipment and configurations used.

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38 Transport Canada, SOR/2020-216, *Navigation Safety Regulations, 2020* (as amended 20 December 2023), subsection 118(1).

The *Svanoy* was equipped with a Class A AIS unit. The AIS signal transmitted from *Svanoy* was received by the pleasure craft involved in this occurrence, as well as by other vessels navigating in the occurrence area and by MCTS.

The pleasure craft was equipped with a VHF radio, with a built-in Class B AIS. The system had been installed by a technician in the month preceding the occurrence. The pleasure craft owners did not obtain an MMSI number from Innovation, Science and Economic Development Canada.[39] Without an MMSI number, an AIS unit receives signals from nearby vessels but does not transmit its own signal in turn. The pleasure craft's data was therefore not transmitted to other vessels and its target was not visible on the *Svanoy*'s ECS.

Each time an AIS unit without an MMSI number is turned on, it emits a visual and audible alarm to notify the user that no MMSI number has been programmed. To continue normal AIS operation, the operator must press a key to confirm use without a programmed MMSI number. A small icon at the top of the handset display indicates whether the device is transmitting an AIS signal or is in "stealth mode." However, the chart plotter connected to the device does not display a warning to indicate that the AIS is not broadcasting.

1.13.2 Reliance on automatic identification systems

When people rely on technology, such as navigation aids or safety systems, they may develop a high degree of trust in these systems to perform their functions accurately and consistently. While these tools are valuable, an overreliance on technology can result in reduced vigilance.[40] People may depend on automated alerts or warnings from technology to signal any issues or changes in the environment. They might assume that if no alarm sounds, everything is under control, which can lead to reduced vigilance over time.[41]

Reduced vigilance can diminish the ability to maintain effective situational awareness.[42] People may not notice potential hazards or changing conditions, which can be critical in safety-critical environments like navigating through fog.

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39 Before 2015, Innovation, Science and Economic Development Canada was known as Industry Canada.

40 R. Parasuraman, R. Molloy, and I.L. Singh, "Performance Consequences of Automation-Induced "Complacency," *The International Journal of Aviation Psychology,* Vol. 3, Issue 1 (1993), pp. 1–23.

41 K.L. Mosier and L.J. Skitka, "Human decision makers and automated decision aid: made for each other?" in R. Parasuraman and M. Mouloua (eds.), *Automation and Human Performance: Theory and Applications* (Lawrence Erlbaum Associates, Inc., 1996), pp. 201–220.

42 M.R. Endsley, "Automation and situation awareness," in R. Parasuraman and M. Mouloua (eds.), *Automation and Human Performance: Theory and Applications*. (Lawrence Erlbaum Associates, Inc., 1996), pp. 163–181.

Research has shown that data provided by an AIS is not reliable in many cases.[43,44] AIS data often contains errors, affecting its collision prevention capabilities. These issues are linked to inadequate set-up, infrequent updates, insufficient operator training, and system designs that do not fully consider maritime operational complexities. The research suggests several improvements to increase AIS reliability, including rigorous installation checks, comprehensive user training, and a review of AIS programming to support accurate data handling. It also highlights the necessity for regulatory changes that enforce standardized training and strict oversight of AIS data by maritime authorities to enhance the system's effectiveness in navigation and collision avoidance.

To address these concerns, TC issued Ship Safety Bulletin 10/2016, which states:

> It has come to Transport Canada's attention that there have been occasions where a vessel's AIS information has not been accurate. Some of the information, such as ship's position, may be incorrect because the ship's global navigation satellite system (GNSS) antenna and AIS antenna reference points were not correctly set on installation. This correct system installation is critical to ensure the vessel's position, and its relation to other vessels is accurately displayed.
>
> Other potential discrepancies could be caused by input errors from the operator (i.e. destination, estimated time of arrival (ETA), cargo, draught) and/or poorly configured or calibrated ship sensors (i.e. speed, heading, course over the ground).[45]

Other maritime authorities have also issued guidelines and notices on the use of AIS with other navigational tools. For example, in 2021, Transport Malta, the government body that oversees transport in Malta, published an information notice concerning the use of VHF radio communication and AIS for collision avoidance. The notice states:

> Although AIS equipment provides additional navigation information for collision avoidance decision making, it is not a replacement for other navigational and anti-collision information which is derived from marine radar plotters or other methods of systematic observation. The primary electronic anti-collision instruments are Radar and ARPA [automatic radar plotting aid]. Due to the high risk of confusion, misunderstandings and misinterpretation, VHF radio and AIS should not be relied upon singularly for collision avoidance.[46]

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43 A. Wall, P. Brooks, A. Mokhtari, and J. Wang, "Automatic Identification System (AIS): A Human Factors Approach" (Liverpool John Moores University, UK & Chabahar Maritime University, Iran, January 2008).

44 T. Emmens, C. Amrit, A. Abdi, and M. Ghosh, "The promises and perils of Automatic Identification System data," *Expert Systems with Applications*, Vol. 178 (September 2021).

45 Transport Canada, Ship Safety Bulletin 10/2016: Automatic Identification System (AIS) (07 October 2016), at https://tc.canada.ca/en/marine-transportation/marine-safety/ship-safety-bulletins/automatic-identification-system-ais-ssb-no-10-2016 (last accessed on 09 September 2024).

46 Government of Malta, Transport Malta, "Information Notice 34: The Use of VHF Radio Communication and AIS for Collision Avoidance" (Malta Transport Centre, 2021), at https://www.transport.gov.mt/include/filestreaming.asp?fileid=5063 (last accessed on 21 July 2024).

1.14 Previous occurrences

In addition to this occurrence, there have been 235 occurrences[47] that were reported to the TSB between 2017 and 2023 where recreational craft and commercial vessels were involved in close-quarters situations with a risk of collision. In many of these occurrences, the commercial vessels involved took evasive action to prevent a collision. Fifteen of these occurrences involved collisions.[48]

1.14.1 TSB Canada-wide pilot survey

In 2022, the TSB launched an investigation into marine occurrence M22P0298, in which the general cargo vessel *Saga Beija-Flor* and the pleasure craft BC4010135 came into a close-quarters situation and were at risk of collision in Vancouver Harbour, British Columbia. The pleasure craft was overturned and its occupants entered the water. The occupants were subsequently recovered by vessels in the area and were transported to a local hospital.

As part of its investigation, the TSB conducted a survey of licensed marine pilots across Canada. The survey was launched to collect additional data on the risk of collision between pleasure craft and commercial vessels under pilotage in Canada. The TSB received 76 complete responses during the 17 days the survey was accessible.

Among other questions, the survey asked pilots how often they have experienced close quarters or a risk of collision with pleasure craft while piloting. Seventy-nine percent of respondents indicated they had experienced such situations occasionally or with some regularity, with 55% of all respondents indicating the latter.

Fifty-one percent of respondents indicated they never or only sometimes reported risk-of-collision situations that they encountered with pleasure craft.

The results of the survey indicate that risk-of-collision situations between commercial vessels and pleasure craft are widespread and generally underreported in Canadian waters. Additionally, better education and training for pleasure craft operators was identified by respondents as the most important factor to help reduce close-quarters situations and risk of collision with commercial vessels.

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47 The TSB generally does not investigate occurrences solely involving pleasure craft unless there are significant safety concerns or the occurrence results in a major loss of life or environmental damage.

48 Data on all marine transportation occurrences reported to the TSB is available at www.tsb.gc.ca/eng/stats/marine/data-6.html. It is updated monthly.

2.0 ANALYSIS

This analysis will focus on the various aspects of navigation in restricted visibility, the use of procedures for navigation in restricted visibility in the safety management system (SMS) for the *Svanoy*, the certification for pleasure craft operators, and the reliance on an automatic identification system (AIS).

The investigation determined that no component or machinery failure, on either the ferry *Svanoy* or pleasure craft QC5998860, contributed to this occurrence.

2.1 Navigation in restricted visibility

To avoid the undesirable consequences of an accident in restricted visibility, mariners must be well-prepared to navigate and use all available means to make a full appraisal of the risk of collision. In this occurrence, the *Svanoy* was equipped with an X-band (3 cm) and an S-band (10 cm) radar, and an electronic chart system (ECS) that displays data from the vessel's AIS. The ferry was also equipped with a global positioning system (GPS), a voyage data recorder (VDR), and a foghorn that can be operated manually and automatically. The pleasure craft was equipped with a very high frequency (VHF) radio with built-in AIS, a radar, 2 chart plotters, an autopilot, and a manually operated foghorn.

2.1.1 Audible signals

The *Collision Regulations* require vessels to sound specific signals appropriate to the prevailing circumstances and conditions.

The *Svanoy* departed the ferry dock at Saint-Joseph-de-la-Rive in dense fog, without sounding a warning signal on departure (1 prolonged blast), and proceeded without sounding a fog signal (1 prolonged blast at intervals of not more than 2 minutes). This adaptation, which was not in accordance with the *Collision Regulations,* was influenced by the bridge personnel's perception that the loud sound of the signals could disrupt communications among the crew, and disturb ferry passengers and riverside residents. Over time, such adaptations can become normal practice when they do not result in negative consequences, eventually becoming routine among bridge personnel. In this occurrence, the absence of fog signals reduced the vessel's ability to be audibly detected by other vessels while navigating in restricted visibility.

As the *Svanoy* departed the ferry dock, pleasure craft QC5998860 crossed Passage de L'Isle-aux-Coudres and approached the north shore near Saint-Joseph-de-la-Rive. The occupants of the pleasure craft did not perceive the fog as dense enough to necessitate the use of the on-board manual foghorn.

The *Navigation Safety Regulations, 2020* require vessels such as the *Svanoy* to make a VHF radio navigation safety call under certain circumstances and conditions, such as when departing from a berth or when the call is necessary for the safe navigation of the vessel or other vessels. In this occurrence, because the *Svanoy* departed from the ferry dock in restricted visibility, the vessel was required to make a navigation safety call or report its

departure to Marine Communication Traffic Services Quebec. The bridge personnel's decision to depart without a VHF radio navigation safety call, which constituted an adaptation to the requirements of the regulations, prevented nearby vessels from being informed of the ferry's departure and presence in the area.

Finding as to causes and contributing factors

Neither the ferry nor the pleasure craft used the prescribed signals for restricted visibility to warn other vessels in the vicinity of their presence. The ability of both the ferry and the pleasure craft to detect each other's presence and location was therefore significantly reduced.

2.1.2 Lookout

A proper lookout, as defined in Rule 5 of the *Collision Regulations*, shall be maintained at all times by sight and hearing, as well as by all other available means, to fully appraise the risk of collision. Moreover, the *Marine Personnel Regulations* prescribe that, in conditions of restricted visibility, the navigational watch on vessels such as the *Svanoy* must be composed of an officer of the watch and a watch seaman.

After the *Svanoy* departed the ferry dock, the master was alone on the bridge and solely in charge of navigation, steering, and keeping a lookout. His attention was predominantly focused on the ECS to determine the ferry's course, compensate for the current, and to monitor the movement of the ferry *Félix-Antoine-Savard* to maintain a safe distance apart. Although the pleasure craft was not visible on the ECS, it was visible on both radars, but its target went unnoticed. The dense fog prevailing at the time of the occurrence had a substantial impact on visual perception, restricting visibility to 0.3 nautical miles (NM) or less, that decreased situational awareness. Navigating without adequate radar monitoring precluded the detection of the presence and the course of the pleasure craft.

Attention is a limited resource and vessel operators must continuously prioritize the critical aspects of their environment to which they will devote their attention. While selective attention helps operators focus on what they perceive as most important for ensuring safety, it can also lead to the omission of important information in their surroundings.

Finding as to causes and contributing factors

At the time of the occurrence, the ferry master, who was alone on the bridge, was in charge of navigating (including steering and lookout) in conditions of restricted visibility. His focus on the ECS, which did not show the pleasure craft, rather than on the radar, which did show the pleasure craft, meant that the pleasure craft's presence went undetected.

Meanwhile, the pleasure craft operator was primarily using the craft's AIS to monitor vessel traffic and had another occupant maintain a lookout. While the craft's radar was functional, it was off.

Finding as to causes and contributing factors

The pleasure craft operator was monitoring vessel traffic using the craft's AIS. Reliance on this single aid to navigation, without use of radar, limited the pleasure craft operator's ability to detect the ferry in time to take action to avoid a collision.

2.1.3 Safe speed

The *Collision Regulations* stipulate that when determining a safe speed, consideration shall be given to, among others, the visibility, the density of traffic, the manoeuvrability of the vessel with special reference to stopping distance and turning ability in the prevailing conditions, and the limitations of a radar set. Consequently, every vessel shall at all times proceed at a safe speed so that it can take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions.

Fog can impair the ability to gauge distances accurately. It can cause an operator's perceived speed relative to surroundings to be lower, leading to speed underestimation and misjudgment of stopping distances.

Shortly after departing the dock, the *Svanoy*'s course was altered to starboard. The ferry's speed was gradually increased to 8.2 knots. When speed is increased, the reaction time to take evasive manoeuvres, such as course alteration, is reduced. The ferry required a considerable distance to stop to avoid a collision due to its inertia.

At the same time, the pleasure craft was approaching the ferry at approximately 1.4 NM and 65° to starboard from the ferry's course, at a speed of approximately 20 knots. At this speed and in the given visibility, the reaction time to take evasive actions was drastically reduced, increasing the risk of a collision. The pleasure craft operator relied on the effectiveness of the pleasure craft's AIS to navigate safely through reduced visibility, assuming that as long as no alarms or warnings were triggered, everything was under control (see Analysis Section 2.4). This reliance on the AIS, combined with an underestimation of the risks, led to maintaining the same course and speed despite the prevailing conditions—a decision influenced by plan continuation bias, which is the tendency to persist with the original plan even when circumstances change.

Finding as to causes and contributing factors

Given the vessels' speeds, the master of the *Svanoy* and the pleasure craft operator had limited time to make a full appraisal of the situation and the risk of collision. By the time the vessels detected each other, they were in a close-quarters situation on a collision course.

2.1.4 Actions to avoid collision

Rule 19 of the *Collision Regulations* concerns navigation in restricted visibility. Among other things, the rule stipulates that operators, as far as possible, shall avoid altering a course to port for a vessel forward of the beam, or toward a vessel abeam or abaft the beam.

In restricted visibility, vessel operators may experience slower reaction times when encountering unexpected situations or hazards because they need additional time to

interpret them and decide on the appropriate course of action. This delay can be critical when quick responses are needed to avoid accidents.

By the time the ferry appeared on the pleasure craft's AIS display as a target with a risk of collision, the ferry and pleasure craft were already in a close-quarters situation. When the operator saw the ferry unexpectedly appear from the dense fog, he immediately pulled the craft's throttles back and altered course to port.

Finding as to causes and contributing factors

The pleasure craft operator altered course to port and reduced engine power to avoid the ferry. This manoeuvre was inappropriate to prevent a collision and the pleasure craft remained in the path of the ferry.

Although the *Svanoy* was navigating in restricted visibility, its radars were not being monitored. The master of the *Svanoy* did not detect the pleasure craft until it was visible from the bridge. When unexpectedly confronted with an object at close range, additional time is required to interpret the event and decide on a response. In response to seeing the approaching pleasure craft, the master sounded 1 prolonged blast on the ferry's foghorn to warn the pleasure craft and reduced speed. However, by the time the pleasure craft was detected it was too late to take effective action to avoid a collision, such as altering course or stopping the vessel.

Finding as to causes and contributing factors

Due to the late visual detection of the pleasure craft, the master of the *Svanoy* was not able to take effective action, which contributed to the collision.

2.2 Procedures for navigation in restricted visibility

Restricted visibility, such as fog, significantly increases the risk of collision. In addition to regulatory requirements, such as those set out in the *Marine Personnel Regulations* and *Collision Regulations*, documented procedures and measures are essential to mitigate this risk and to maintain the overall safety and reliability of operations. These procedures may include prescribed actions like sounding fog signals, maintaining a lookout, and adapting speed.

Canship Ugland Ltd.'s SMS manual for the *Svanoy* contains a procedure for navigation in restricted visibility. This procedure describes the functions and roles of bridge team members to ensure the safe passage of the vessel.

In this occurrence, the bridge team omitted critical steps to ensure safety of navigation in restricted visibility, which increased the level of risk for those aboard the vessel as well as other vessels in the vicinity.

Finding as to risk

If procedures essential for safe navigation (such as navigating in restricted visibility) are not used by a vessel's bridge team, the safety of crews, passengers, and vessels may be compromised.

2.3 Pleasure craft operator certification

Knowledge of the *Collision Regulations* and proper passage planning are fundamental to safe navigation and collision avoidance, particularly while navigating on shared public waterways with vessels of varying sizes and speeds, including ferries; in unfamiliar areas; and in adverse weather conditions.

All operators of a pleasure craft fitted with a motor on Canadian waters must have proof of competency. Several documents are accepted as proof of competency, the most common being a Pleasure Craft Operator Card (PCOC). To obtain a PCOC, candidates must pass a theory test. The test may be taken online or in person. Transport Canada's (TC's) *Boating Safety Course and Test Syllabus* (TP 14932) for the PCOC is broad and covers many safety-critical topics which should be covered in an accredited boating safety course. However, a boating safety course is optional for PCOC candidates, and as businesses that are in competition with each other, commercial course providers are driven to offer courses that do not take longer than the minimum 3 hours required by TC. Three hours of training does not allow course providers sufficient time to provide in-depth coverage of any topic.

When the investigation reviewed a sample of PCOC course manuals that were available online, none provided guidance on how operators could determine if their pleasure craft was operating in an area of restricted visibility. The hazard posed by larger commercial vessels was included, but guidance was limited to telling pleasure craft operators to be prepared to move and to be aware of the *Collision Regulations*, with no explanation of what manoeuvres are effective and what specific provisions of the *Collision Regulations* they need to be aware of.

Although the pleasure craft operator involved in this occurrence had completed an accredited boating safety course and held a valid PCOC, he did not know that per the *Collision Regulations* rules on signals, lookout, safe speed, and navigation in restricted visibility, he was required to use all available means, including the radar, sounding a fog signal, and adjusting the pleasure craft's speed to suit the conditions. He was also not aware that altering the pleasure craft's course to port in an attempt to prevent collision with the ferry should be avoided per the *Collision Regulations*' Rule 19. He therefore did not have sufficient knowledge to navigate safely in the prevailing conditions at the time of the occurrence.

Numerous occurrences reported to the TSB, including this occurrence, demonstrate that pleasure craft operators are not operating with the depth of knowledge necessary for safe navigation, particularly on extended voyages or on high-traffic waterways. Without adequate knowledge of the *Collision Regulations* and principles of passage planning,

pleasure craft operators may not be capable of safely navigating unfamiliar and high-traffic waterways, especially in adverse weather conditions.

A PCOC is valid for life, and there is no requirement for periodic refresher training or knowledge checks for card holders. However, refresher training is crucial for maintaining and updating the knowledge of safety regulations and safe navigation practices acquired during initial certification. As marine environments and regulations evolve, refresher training could ensure that pleasure craft operators remain proficient and that their practices are compliant with the latest safety standards. Based on some countries' experience, the implementation of a graduated licensing program can also be a solution for a structured learning process, gradually increasing operators' skills and responsibilities.

Finding as to risk

If the process to obtain a PCOC does not provide pleasure craft operators with adequate knowledge of vessel operations, such as the *Collision Regulations* and principles of passage planning, and if there are no requirements for operators to remain current with this knowledge, there is a risk that they may not be capable of safe navigation in high-traffic waterways.

2.4 Reliance on an automatic identification system when navigating

An AIS provides real-time information to vessel operators about nearby vessels and their positions, which helps mitigate the risk of collision with other AIS-fitted vessels. While an AIS is a valuable tool, an overreliance on this technology may lead to decreased vigilance, potentially compromising a vessel operator's ability to maintain effective situational awareness.

At the time of the occurrence, the *Svanoy* was fitted with an AIS that was used for vessel detection. The AIS had detected the presence of the ferry *Félix-Antoine-Savard* and displayed its target on the *Svanoy*'s ECS, indicating to the master that the AIS was operational. However, the AIS did not detect the pleasure craft because the pleasure craft's AIS was not programmed with a Maritime Mobile Service Identity number and, therefore, was not broadcasting a signal.

The pleasure craft was also equipped with an AIS that provided the operator with information about nearby vessels and their positions. Throughout the voyage, vessel targets were acquired by the pleasure craft's AIS, displayed on screen, and subsequently encountered by the pleasure craft, giving the operator positive confirmation that the AIS was operational. The operator therefore relied on this system and assumed that as long as no alarms or warnings were triggered, there was no risk of a close-quarters situation or collision. Consequently, the operator was confident that using the AIS without radar, in addition to a visual lookout, was sufficient for safe navigation in restricted visibility.

While the *Svanoy* was moored at the ferry dock at Saint-Joseph-de-la-Rive, it appeared on the pleasure craft's AIS as a stationary target but did not catch the attention of the pleasure

craft operator who did not know of the ferry service in the area. Shortly after the *Svanoy*'s departure, and once both vessels were in a close-quarters situation, the *Svanoy*'s target status changed to a target on a collision course on the pleasure craft's AIS. The pleasure craft's AIS warned the craft operator of the *Svanoy*'s presence, but the operator had limited time to make a full appraisal of the situation and of the risk of collision.

This occurrence demonstrates that relying solely on an AIS does not provide vessel operators with a comprehensive situational awareness, especially considering the potential limitations of the functionality of these systems, as demonstrated by research on AIS reliability.

The use of AIS does not relieve watchkeepers from other navigational duties such as maintaining a lookout and using all available means, including radar, to assess collision risks.

Finding as to risk

If vessel operators rely solely on AIS for vessel detection when other means are available, vessels without an AIS, or those with an AIS that does not broadcast, may not be detected, increasing the risk of close-quarters situations and collisions.

3.0 FINDINGS

3.1 Findings as to causes and contributing factors

These are the factors that were found to have caused or contributed to the occurrence.

1. Neither the ferry nor the pleasure craft used the prescribed signals for restricted visibility to warn other vessels in vicinity of their presence. The ability of both the ferry and the pleasure craft to detect each other's presence and location was therefore significantly reduced.

2. At the time of the occurrence, the ferry master, who was alone on the bridge, was in charge of navigating (including steering and lookout) in conditions of restricted visibility. His focus on the electronic chart system, which did not show the pleasure craft, rather than on the radar, which did show the pleasure craft, meant that the pleasure craft's presence went undetected.

3. The pleasure craft operator was monitoring traffic while using the craft's automatic identification system. Reliance on this single aid to navigation, without use of radar, limited the pleasure craft operator's ability to detect the ferry in time to take action to avoid a collision.

4. Given the vessels' speed, the master of the *Svanoy* and the pleasure craft operator had limited time to make a full appraisal of the situation and of the risk of collision. By the time the vessels detected each other, they were in a close-quarters situation and on a collision course.

5. The pleasure craft operator altered course to port and reduced engine power to avoid the ferry. This manoeuvre was inappropriate to prevent a collision and the pleasure craft remained in the path of the ferry.

6. Due to the late visual detection of the pleasure craft, the master of the *Svanoy* was not able to take effective action, which contributed to the collision.

3.2 Findings as to risk

These are the factors in the occurrence that were found to pose a risk to the transportation system. These factors may or may not have been causal or contributing to the occurrence but could pose a risk in the future.

1. If procedures essential for safe navigation (such as procedures for navigating in restricted visibility) are not used by a vessel's bridge team, the safety of crews, passengers, and vessels may be compromised.

2. If the process to obtain a PCOC does not provide pleasure craft operators with adequate knowledge of vessel operations, such as the *Collision Regulations* and principles of

passage planning, and if there are no requirements for operators to remain current with this knowledge, there is a risk that they may not be capable of safe navigation in high-traffic waterways.

3. If vessel operators rely solely on automatic identification systems for vessel detection when other means are available, vessels without an automatic identification system, or those with an automatic identification system that does not broadcast, may not be detected, increasing the risk of close-quarters situations and collisions.

4.0 SAFETY ACTION

4.1 Safety action taken

4.1.1 Canship Ugland Ltd.

Following the occurrence, Canship Ugland Ltd. conducted an internal investigation and produced a report. The company also took the following actions:

- A letter was sent to *Svanoy* bridge personnel to reinforce navigational procedures.
- On 21 June 2023, the company issued to its fleet an internal ship safety bulletin (SSB-09-2023) on best practices for navigating in restricted visibility.
- The radar blind sectors were evaluated and posted on the *Svanoy*'s bridge.
- The X-band radar magnetron was replaced. It was in a good order but was overdue for replacement.
- In September 2023, a meeting was held with Société des traversiers du Québec to discuss safe speed, speed reductions in very heavy fog, and possible schedule suspensions. It reinforced a master's discretion to modify speed and/or suspend schedules.

4.2 Safety concern

4.2.1 Pleasure craft operator certification

On the morning of 02 July 2023, the passenger ferry *Svanoy*, loaded with passengers and vehicles, departed the ferry dock at Saint-Joseph-de-la-Rive, Quebec, for its scheduled run to the dock at L'Isle-aux-Coudres, Quebec, located on the St. Lawrence River. Visibility was restricted due to dense fog. When the *Svanoy* was 0.35 nautical miles south-southwest of the departing dock, the master spotted a pleasure craft ahead. Moments later, the *Svanoy* and the pleasure craft collided.

As a result of the collision with the *Svanoy*, 3 of the pleasure craft's occupants were thrown into the water, while the 4th occupant was trapped below deck. The craft was substantially damaged, took on water, and began to sink. The 4 occupants were rescued by the ferry crew and were transported to a local hospital—3 of the occupants sustained minor injuries and 1 sustained a serious injury. The pleasure craft sank and the *Svanoy* sustained minor damage.

The pleasure craft was being navigated in conditions of restricted visibility using an unregistered automatic identification system and visual lookout; the pleasure craft operator did not recognize that the conditions limited his ability to perceive other vessels. When the ferry unexpectedly appeared from the dense fog, the pleasure craft operator pulled the craft's throttles back and altered course to port to avoid the ferry. Due to the late visual detection of the ferry, the pleasure craft operator was not able to take effective action to avoid a collision.

The pleasure craft had a simple passage plan for the intended voyage, but the pleasure craft occupants were unfamiliar with the navigation area and were unaware of the presence of a ferry service.

According to Transport Canada's (TC's) *Competency of Operators of Pleasure Craft Regulations*, all operators of a pleasure craft fitted with a motor and used for recreational purposes on Canadian waters need to prove their competency. According to TC, the most common way to prove competency is to obtain a Pleasure Craft Operator Card (PCOC). To obtain a PCOC, candidates must pass a theory test. A TC-accredited boating safety course is optional but encouraged, and it must take no less than 3 hours. However, given that boating safety course providers are businesses, and the providers are in competition with each other, there is no incentive to provide in-depth coverage of any topic. The training syllabus for the PCOC is broad and covers many safety-critical topics. For example, restricted visibility is listed in the syllabus as a hazard, but when the investigation reviewed a sample of PCOC course manuals that were available online, none of them provided guidance on how operators could determine if their pleasure craft was operating in an area of restricted visibility. Similarly, the hazard posed by larger commercial vessels is included, but guidance is limited to telling pleasure craft operators to be prepared to move and to be aware of the *Collision Regulations*, with no explanation of what manoeuvres are effective and what specific provisions of the *Collision Regulations* they need to be aware of.

Awareness of the *Collision Regulations* is insufficient to ensure safe navigation. Operators require some depth of knowledge of the *Collision Regulations* and proper passage planning, which are fundamental to safe navigation and collision avoidance. This is particularly true while navigating on waterways in proximity with vessels of varying sizes and speeds such as ferries, in unfamiliar areas, and in adverse weather conditions. Boating safety courses and the PCOC test do not cover the various sizes of pleasure craft that may be operated, the different types of voyages operators might undertake, the diverse areas they might navigate, or the potential weather conditions they may encounter. The boating safety courses do not cover the fundamental principles of passage planning. As a result, operators may be unprepared for situations they encounter. This is also a risk for people who rent pleasure craft, where a Rental Boat Safety Checklist is considered sufficient proof of competency for the period of the rental.

The TSB previously investigated a near-collision between a rental pleasure craft and a commercial cargo vessel, where the pleasure craft was overturned and its occupants ended up in the water.[49] As part of that investigation, the TSB conducted a Canada-wide survey of marine pilots. The survey results indicated that the risk of collision between commercial vessels under pilotage and pleasure craft is widespread across Canada. It also identified better education and training for pleasure craft operators as the most important factor to help reduce the risk of collisions between pleasure craft and commercial vessels.

If the process to obtain a PCOC does not provide pleasure craft operators with adequate knowledge of vessel operations, such as the *Collision Regulations* and principles of passage planning, and if there are no requirements for operators to remain current with this

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49 TSB Marine Transportation Safety Investigation Report M22P0298.

knowledge, there is a risk that they may not be capable of safe navigation in high-traffic waterways. TC is in the process of updating the *Competency of Operators of Pleasure Craft Regulations*, but the draft text has not yet been published. In the interim, the Board is concerned that the current requirements for training and certificating pleasure craft operators do not provide them with the depth of knowledge necessary for safe navigation on high-traffic waterways.

This report concludes the Transportation Safety Board of Canada's investigation into this occurrence. The Board authorized the release of this report on 04 June 2025. It was officially released on 10 July 2025.