

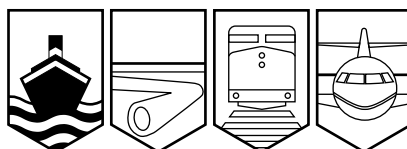
Transportation Safety Board
of Canada



Bureau de la sécurité des transports
du Canada

MARINE INVESTIGATION REPORT

M04L0050



GROUNDING

PASSENGER AND VEHICLE FERRY

CATHERINE-LEGARDEUR

SOREL, QUEBEC

27 APRIL 2004

Canada

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.

Marine Investigation Report

Grounding

Passenger and Vehicle Ferry *Catherine-Legardeur*
Sorel, Quebec
27 April 2004

Report Number M04L0050

Summary

In the early morning of 27 April 2004, the ferry *Catherine-Legardeur* left Sorel, Quebec, with 15 passengers and 12 vehicles bound for Saint-Ignace-de-Loyola, Quebec. After proceeding for 10 minutes on its scheduled river crossing in heavy fog, the ferry grounded approximately half a nautical mile downstream of the departure terminal. The vessel was refloated two and one half hours later and resumed service that day. No pollution or injuries were reported.

Ce rapport est également disponible en français.

Other Factual Information

Particulars of the Vessel

| <i>Catherine-Legardeur</i> | |
|----------------------------|--|
| Official Number | 805332 |
| Port of Registry | Québec, Quebec |
| Flag | Canada |
| Type | Passenger and vehicle ferry |
| Gross Tons | 1348.42 |
| Length ¹ | 55.4 m |
| Draught | Forward: 3.65 m Aft: 3.65 m |
| Built | Lauzon, Quebec, 1983 |
| Propulsion | Diesel, 2228 BHP, with two fixed-pitch propellers, one at each end |
| Crew Members | 7 |
| Passengers | 15 |
| Cargo | 12 vehicles |
| Owner | Société des traversiers du Québec |

Description of the Vessel

The *Catherine-Legardeur* is a double-ended ferry that carries passengers and vehicles across the St. Lawrence River between Sorel, Quebec, and Saint-Ignace-de-Loyola, Quebec. Both ends of the vessel are identical, each having a centreline rudder and propeller and a boarding ramp that provides vehicles with direct roll-on, roll-off convenience (see Photo 1). Dual engine and rudder controls are positioned at a central conning position in the wheelhouse, such that they can be readily activated by a single operator (see Photo 2).



Photo 1. Passenger and vehicle ferry *Catherine-Legardeur*

¹ Units of measurement in this report conform to International Maritime Organization (IMO) standards or, where there is no such standard, are expressed in the International System of units.



Photo 2. Bridge control consoles, looking either forward or aft

When the operator is facing in the desired direction of travel and the main engine control levers are both pushed forward, the rear propeller is in the “ahead” mode pushing the vessel, while the leading propeller is in the “astern” mode, pulling the vessel in the desired direction. Except for docking and undocking, the forward-facing rudder is kept amidships. The vessel is equipped with a gyrocompass, two gyro-stabilized radars and a global positioning system (GPS) receiver, as well as all other navigation instruments commensurate with the vessel’s class and service. The ferry was not equipped with an electronic chart system nor was it required to be by regulations.

History of the Voyage

At 1900 eastern daylight time² on 26 April 2004, the master and mate started their duty assignment on the *Catherine-Legardeur*. The ferry made its scheduled crossings every half hour and, at 0315 on 27 April, the ferry was stopped for the night at Sorel as scheduled. Visibility was reported to be good and operations had been uneventful. Later that morning, between 0500 to 0510, during preparations for the resumption of service, the master noticed that the visibility was reduced somewhat by fog. At 0510, visibility had cleared for about five minutes but then was again reduced as before.

At 0530, winds were negligible, but the fog reduced visibility to less than 30 m as the vessel prepared to unberth and start its northbound crossing from Sorel. The ship’s whistle was activated and lookouts were posted forward and in the wheelhouse. Both radars were turned on and set in relative motion display, unstabilized, head-up presentation.

² All times are eastern daylight time (Coordinated Universal Time minus four hours).

By 0535, the vessel was underway and once it cleared the Lanctôt basin and passed the jetties, it quickly fell off to starboard into the river current setting approximately 075° at two knots (see Figure 1). The master and mate both noticed that the gyrocompass repeater heading was rapidly turning to the east.

When the navigation personnel monitored the radars, both set on the 1.5 nautical mile scale, the echoes of the nearby landmass were seen to be quickly shifting, creating a blurred image from which the navigation personnel were unable to determine the vessel's position. Without visual cues or an understanding of the radar information because of the blurred image due to the swing, the master and mate used the GPS receiver's changing readout to gain an appreciation of the vessel's speed. As an attempt was made to bring the vessel to a stop with the help of this navigation instrument, the lookout reported seeing buoys ahead. The master manoeuvred to avoid the buoys and, shortly thereafter, at approximately 0545, the vessel grounded in position 46°03'08" N, 073°06'09" W, on a heading of 168° gyro (see Figure 1 and Appendix A).

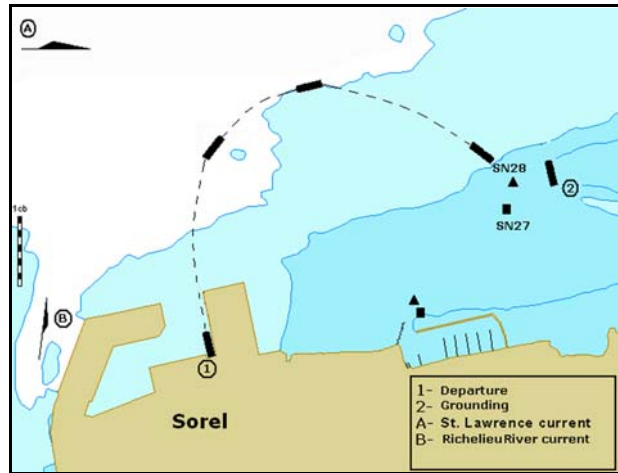


Figure 1. Approximate track of ferry to grounding

Attempts to free the vessel were made without success. Passengers and company officials were quickly made aware of the situation but the Marine Communications and Traffic Services (MCTS) were not alerted until 0624.

At 0817, the fog had lifted and, with the assistance of the tug *Ocean Gulf*, the *Catherine-Legardeur* was refloated. The ferry then continued its crossing to Saint-Ignace-de-Loyola, disembarked all vehicles and passengers, and returned to Sorel, empty, to undergo inspection (see Photo 3). No apparent damage was found and the ferry resumed service later that day.



Photo 3. *Catherine-Legardeur* with cleared deck

Short-Run Ferry Service

A short-run ferry is defined in the *Marine Certification Regulations* as a ship that operates in partially smooth waters between terminals that are not more than two miles apart and are in line of sight or nearly in line of sight. The Société des traversiers du Québec (STQ) operates a total of four short-run ferry services, one of which is the Sorel / Tracy / Saint-Ignace-de-Loyola crossing.

The vessel's certificate of inspection, which was valid until February 2005, permitted the vessel to operate on voyages within the limits of minor waters, Class II. There was no mention of any restrictions of service in reduced visibility and company procedures did not prohibit operation of the ferry under these circumstances.

On a short-run service, each ferry must be crewed by a navigation team of one master and one first mate. The *Crewing Regulations* specify the minimum certification necessary for each of these positions, namely a master, limited certificate for a short-run ferry, and a first mate, limited certificate for a short-run ferry. Persons who hold a master of a minor waters steamship certificate, such as the master on duty at the time of the grounding, are also eligible to work on these vessels as master or mate. For its four short-run ferries, the STQ presently employs 59 bridge keeping officers each certificated accordingly as either master or mate.

Personnel Experience

The master started his sea service in 1967, has been with this company on the *Catherine-Legardeur* since 1986, and has served as permanent master on the vessel since 1991. The master reported very few instances in this period where he had navigated in very restricted visibility.

Between 1990 and 2000, the chief officer worked in the engine room. Starting in 2000, he was employed alternately in the engine room and on deck/in the wheelhouse on a six-month rotation. Since 2002, he has worked full time as chief officer on board the *Catherine-Legardeur*. He has had a master, limited certificate for short-run ferry service since 1996.

Radars

The vessel's two radars are each capable of being operated in the "gyro-stabilized" mode. This display shows the land masses and buoys as fixed, even when the vessel alters course. This affords the navigator a better appreciation of the situation in conditions of restricted visibility and allows parallel indexing to be accomplished. The normal procedure aboard the *Catherine-Legardeur* is to use the unstabilized mode, which in good visibility, does not impair spatial orientation, as the radar display shows an image of the land masses moving relative to the head-up position of the ship and is representative of the (same) land masses as viewed from the wheelhouse looking forward.

Blind Pilotage Proficiency

To navigate safely in restricted visibility, blind pilotage is knowing one's vessel's position, course made good, speed over the bottom as well as handling characteristics such that the vessel is guided on its intended track in a precise fashion. This is accomplished with the aid of the instruments at hand in the wheelhouse, while exterior visual aids are not necessarily available. Blind pilotage requires specific training in the use of navigation instruments.

Expertise at carrying out blind pilotage is acquired through training in Simulated Electronic Navigation (SEN). There are three course levels available: SEN 2 (most comprehensive), SEN 1, and SEN L (limited version). However, SEN training is not required for short-run ferry certificates of competency. Nevertheless, 20 of the 59 STQ officers had either taken the SEN 1 or SEN L training course. The master of the *Catherine-Legardeur* had not received SEN training, although in-house training was provided to all navigation officers by the STQ in 1995 and 1996. The company is committed to ensuring that all navigation personnel have at least the SEN L training by 31 March 2006. The in-house training included radar use, although blind pilotage techniques were not emphasized.

The SEN 1 course covers the use of all electronic aids to navigation. The SEN L course is centred around radar use with an emphasis on collision avoidance. This latter course was developed in response to a need for radar training of the many individuals who hold certificates of competency that do not require the SEN 1 or SEN 2 course. However, the SEN L syllabus does not cover blind pilotage.

Since 2002, before issuing continued proficiency endorsements for master, minor waters certificates, Transport Canada conducts informal on-board oral tests to verify the master's basic practical knowledge of and familiarity with the radar as applied to the specific navigation equipment used on board. In this case, the master had received his continued proficiency endorsement before this practice was established.

Analysis

Effective Use of Navigation Equipment

The navigation team did not make full use of all navigational equipment. The vessel was on a short run, and the master and the mate were familiar with the area, having had extensive experience. However, when the ferry started falling off to starboard rapidly, the bridge team became confused and were unable to remedy the situation.

Blind Pilotage Expertise

The events of this occurrence took place under blind pilotage conditions. The parallel index technique on a marine radar in relative motion display, stabilized, north-up presentation is used to accomplish a blind pilotage voyage; other navigation equipment was not used to full advantage.

The master had not received SEN training and his expertise in using radar and other navigation aids in blind pilotage situations was limited. His proficiency at manoeuvring and navigating the vessel across the river was reliant on using visual cues. When visibility was reduced by fog to less than 30 m, the master could not carry out the series of tasks he routinely used to cross the river, as all visual reference was lost. Once clear of the harbour, the vessel quickly fell off to starboard into the easterly flowing river current. The master, being unable to interpret the changing radar display images or information from other navigation equipment, became disoriented. Since no counter rudder and engine manoeuvres were carried out to correct the situation in a safe and timely manner, the ferry veered off its intended course and ran aground.

Although the SEN 1 training initiates navigators to blind pilotage, it is SEN 2 that fully integrates these techniques into work practices. SEN L training, on the other hand, does not broach the subject of blind pilotage. SEN training generally is not required for short-run ferry competency certification, although upcoming regulatory changes will see SEN L become compulsory for master, limited certification when vessels are equipped with radars. When issuing continued proficiency endorsements, Transport Canada now assesses the master's basic practical knowledge of and familiarity with the type of radar on board the specific vessel. However, it is unlikely that this practice will effectively address the issue of blind pilotage situations. The new measure would help confirm the individual's ability/familiarity to operate the vessel-specific radar equipment.

Groundings attributable to crews using visual navigation techniques in a blind pilotage environment have occurred in the past.³ On the *Catherine-Legardeur*, the bridge team was essentially trained and experienced in visual navigation, but undertook a blind pilotage voyage. The absence of blind pilotage training precludes the navigation personnel from acquiring these techniques. Acknowledging that severely restricted visibility appears to be a rare occurrence in the Sorel / Tracy / Saint-Ignace-de-Loyola region, the masters and mates cannot reasonably be expected to safely execute short-run ferry services under these prevailing conditions.

Certification and Safety

There is a disparity between the standard terms of the vessel's certificate of inspection and the bridge team's certification of competency. Under such circumstances, limitations as to where or when and under what conditions a ship can operate can be annotated on the certificate of inspection. For example, when a vessel is not equipped with radars, there may be an annotation specifying minimum visibility. Since the *Catherine-Legardeur* is equipped with gyro-stabilized radars, there is no visibility restriction noted on the certificate of inspection. Although the bridge team may have the requisite certificates of competency for such a vessel, in practical terms, they are without blind pilotage expertise and do not have the competency to safely operate in severely restricted visibility. Consequently, without regulatory restrictions, such as can be noted on the certificate of inspection of the *Catherine-Legardeur*, the STQ may operate its short-run ferries in severely restricted visibility even though its crews do not have the training to do so.

³ TSB occurrence Nos. M03L0130 (passenger hydrofoil *Sirius I*), M02L0092 (*Corona Borealis*), and M03L0063 (small passenger vessel *Nouvelle France*).

On the other hand, the STQ:

- is aware of the operational parameters of its vessels and the certification limitations of the vessels and the officers,
- is obliged to employ personnel who are appropriately certificated and adequately trained to operate the equipment on board their vessels, and
- is required to provide directives for guidance of shipboard and shore-based personnel.

The owner has recognized the benefits of SEN training. About one-third of the ship's officers have received SEN 1 or SEN L training and all ship's personnel will have this training by 31 March 2006. Under these circumstances, the owner should provide clear guidance to the navigation personnel as to the operational parameters of their vessels to ensure that only officers who have received proper radar training and are capable of conducting blind pilotage are permitted to transit in times of restricted visibility. Although not required by regulation, other equipment that could have improved in real-time spatial orientation, such as an electronic chart system, were not fitted on the vessel.

Findings as to Causes and Contributing Factors

1. Severely restricted visibility in dense fog reduced the bridge team's spatial orientation to a point where they were unable to take appropriate measures to avoid grounding.
2. Without regulatory limitation, the Société des traversiers du Québec (STQ) operated its short-run ferry service in any condition of visibility even though the crew could not safely execute this service in severely restricted visibility.

Finding as to Risk

1. As SEN L training does not address the issue of blind pilotage regime, the safety of short-run ferries operating in restricted visibility will continue to be compromised.

Other Finding

1. Marine Communications and Traffic Services (MCTS) were advised of the grounding approximately 40 minutes after the event.

Safety Action Taken

Société des traversiers du Québec

Following the occurrence, the company conducted an internal investigation as per its procedures. On 11 May, the report was submitted to company managers citing human error. The report contained medium- and long-term recommendations including:

- that an evaluation of the competency of all navigation officers of the Sorel / Tracy / Saint-Ignace-de-Loyola crossing be undertaken and to reassess the qualifications to operate safely the ships of this crossing;
- that the company formally establish SEN L as the minimum radar training for all STQ officers; and
- that an evaluation be made on the feasibility of equipping all fleet vessels with an electronic chart system and an automatic identification system.

Over the summer and fall of 2004, a detailed evaluation of navigation practices during inclement weather, such as restricted visibility, was undertaken.

Company procedures for each short-run ferry were modified according to local operating conditions. For the four short-run ferry services, the following was added to the restricted visibility procedure:

- master to be assigned radar duty and pay close attention to the intended route;
- mate to be assigned vessel controls and follow master's instructions;
- lookout assigned in the wheelhouse during the crossing and, on approaching the wharf, another lookout forward; and
- blind pilotage practice using the restricted visibility procedure (master using instruments and mate at controls).

Blind pilotage practice is to be undertaken by all masters and by all mates who replace masters for at least one crossing during each of their seven-day work periods. All blind pilotage exercises are to be consigned in the vessel's logbook.

Safety Concern

Transport Canada

Transport Canada now conducts informal on-board tests to verify the master's knowledge and familiarity with the type of radar on board a specific vessel before issuing continued proficiency endorsements for master, minor waters certificates. This procedure, instituted in 2002 and promulgated through examiner's notices, still leaves a large measure of discretion to local examiners on whether to conduct an oral exam, and/or practical exam, or even to decide if it is necessary for the candidate to take SEN 1 training. Such a procedure leads to an *ad hoc*

assessment of the individual's ability to perform, that may not fully take into account the risks associated with operations in varying conditions and circumstances. In any event, this new procedure does not fully address the deficiency identified in this occurrence—ensuring that the vessel certification of inspection and personnel certification are in harmony. The Board is concerned that the deficiency identified in this occurrence is not fully addressed. Given the action initiated by the owner, the Board will continue to monitor the issue.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 21 April 2005.

Appendix A – Sketch of the Occurrence Area

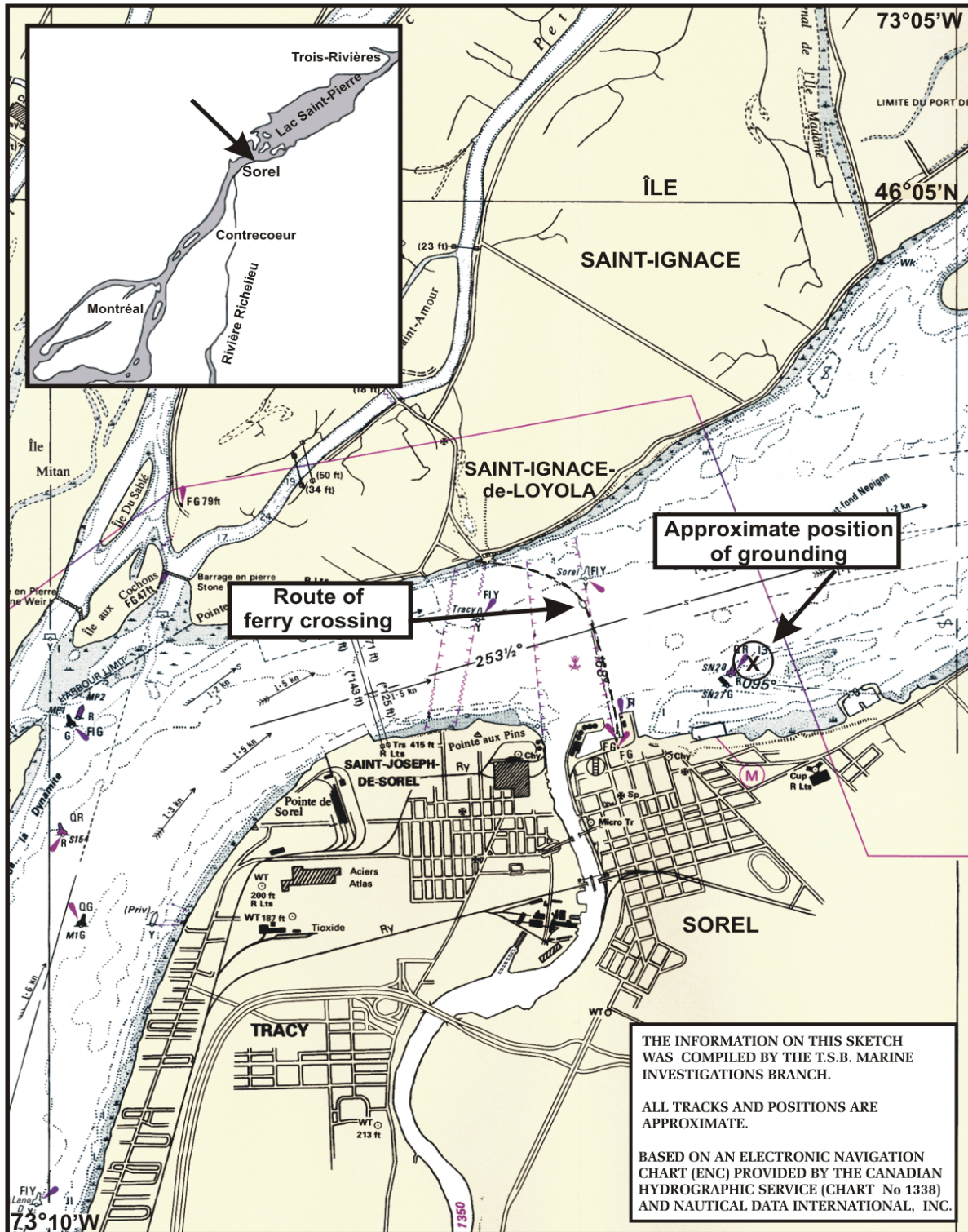


Figure 2. Intended track by the ferry