MARINE OCCURRENCE REPORT
M96M0150

FERRY CABLE FAILURE

CABLE FERRY “F-39”
WESTFIELD FERRY CROSSING
SAINT JOHN RIVER, NEW BRUNSWICK
15 OCTOBER 1996

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

Marine Occurrence Report

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Synopsis

On 15 October 1996, the cable used by the cable ferry "F-39" parted when the vessel was in mid-river on a regular run at the Westfield crossing between Baxter Point and Hardings Point, New Brunswick. In the high winds and waves, which subsequently hampered rescue efforts, the drifting ferry was carried down river. After approximately two hours, a line was attached to the "F-39" from a tug which had been dispatched to the scene, and the ferry was towed into the sheltered waters of McCormick Cove on Kennebecasis Island. No one was injured and there was no pollution or damage to the vessel.

The Board determined that the cable failed because localized wear and corrosion of the exterior strands of the cable had reached such an extent that the remaining strands failed in overstress.

Ce rapport est également disponible en français.

Appendices

1.0 Factual Information

1.1 Particulars of the Vessel

	"F-39"
Type	Cable ferry
Length Overall	24.38 m
Breadth	8.53 m
Depth	1.52 m
Built	1954
Propulsion	82 kW diesel/hydraulic cable drive
Owners	Government of New Brunswick, Department of Transportation, Fredericton, New Brunswick

1.1.1 Description of the Vessel

The "F-39" is a deck-loading, single-hulled cable ferry of swim-ended barge form and all-welded construction. The hull is subdivided by two transverse bulkheads into three compartments, comprising the machinery compartment and the end void compartments. The vessel is equipped with a hydraulically driven bilge pump capable of pumping out each of the compartments.

The "F-39" is capable of carrying a maximum of 11 automobiles or an equivalent combination of vehicles. Vehicle loading is by way of hydraulically operated centre-line ramps at either end of the main deck.

Propulsion for the ferry is provided by diesel-engine-driven hydraulic gear with the hauling cable arranged below deck on the centre line.

Two wooden deck-houses are located midships, one on each side of the vessel. One serves as storage for supplies and lifejackets, the other is the operator's control station.

The "F-39" is one of two cable ferries which operate the Westfield ferry crossing between Baxter Point and Hardings Point. The "F-39" normally performs a back-up role, but at the time of the occurrence, the primary

[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 (SI) of units.

[2] See Glossary for all abbreviations and acronyms.

ferry was being serviced, and the "F-39" was operating the crossing together with the cable ferry"F-79". The "F-39" was operating on the downstream cable.

1.2 History of the Voyage

On the morning of 15 October 1996, the"F-79" was not in service and was not manned, and the "F-39" was the operational ferry. At about 1110, an automobile with two adults and one child was embarked at Hardings Point and the "F-39" began the crossing. When the ferry was about halfway across the river, at about 1115, the cable parted and the ferry, which was now drifting free, began to be carried down river into Grand Bay by the high wind and river current.

The ferry operator attempted to contact the Provincial Mobile Communications Centre (PMCC) using the Department of Transportation (DOT) radio but was unsuccessful. He managed to contact the operator of the "F-52", a ferry which operates on Kennebecasis Bay, some six miles to the south-east of the Westfield ferry, and the operator of the "F-52" contacted DOT personnel in Sussex to inform them of the cable break.

Immediately on being informed that the ferry was adrift, DOT personnel in Sussex attempted to contact the contractor who provided towing services to the DOT. They were unable to reach the contractor but managed to contact another operator with a suitable vessel. That vessel, dispatched to the scene from Saint John, would reach the drifting ferry at about 1300. Meanwhile, the towing contractor, who had heard of the ferry being adrift from radio reports, departed for the ferry and arrived on scene at about 1255.

By the time the towing contractor's vessel reached the "F-39", the ferry was in the middle of Grand Bay, having drifted about five miles downstream.

Under difficult conditions, a line from the towing contractor's vessel was made fast to the "F-39" and the ferry was towed into McCormick Cove on Kennebecasis Island where the passengers were disembarked. Later that evening, when the wind eased, the ferry was towed around Kennebecasis Island and docked at the cable ferry wharf at McColgan Point, where the vehicle was driven off.

The following morning, the "F-39" was towed back up river to Baxter Point where a new cable was strung. The ferry was back in operation by 1700 on 16 October 1996.

[3] All times are ADT (coordinated universal time (UTC) minus three hours) unless otherwise stated.

1.3 Injuries to Persons

No one was injured as a result of this occurrence.

1.4 Damage

This occurrence resulted in no damage to the ferry or the vehicle being carried.

1.5 Certification

1.5.1 Vessel

The "F-39" is one of several cable ferries operated on the Saint John River by the New Brunswick DOT. Under the terms of the *Constitution Act, 1867, Section 92 (10),* the Province of New Brunswick has exclusive jurisdiction over the operations of cable ferries within the province. This jurisdiction gives the province the right to set standards for the operation of the cable ferries, qualifications for persons operating the ferries, and standards for ferry safety. The ferry was not required to be inspected or certified by the Marine Safety Branch of Transport Canada, and had not been so inspected or certified.

There is no load limit on the weight of a vehicle carried on the ferries other than the provincial highway load restrictions in place.

1.5.2 Personnel

The ferry is operated by a crew of two: the operator, who controls the cable machinery, the ramps and the barricades from the control station; and a deck-hand, who directs traffic onto and off the ferry.

The crew of the "F-39" were not required to hold marine certification and they held none.

1.6 Weather Information

The morning of 15 October 1996 was overcast and clear.

1.6.1 Wind

Winds in southern New Brunswick on the morning of 15 October were gusty and mainly from the north-west. Sustained wind speeds were between 15 and 25 knots(kn), with gusts recorded between 25 and 35 kn.

Locally, the terrain is hilly, and given the alignment of the valley to the prevailing wind direction, a "channelling" effect would produce wind speeds higher than those forecast for areas of flat terrain.

An analysis by the Canadian Forces Meteorological and Oceanographic Centre (METOC) of the conditions present on that day indicates that, at the ferry crossing, sustained winds of 30 to 35 kn with gusts reaching 40 to 45 kn would have been experienced.

1.6.2 Waves

The METOC analysis suggests that wind-induced waves at the ferry crossing would have been about 0.5 m; downstream and into Grand Bay, wave heights would have been higher, reaching 1 to 1.5 m.

1.7 Provincial Cable Ferries

Cable ferries of the New Brunswick DOT are operated at the major river crossings 24 hours a day, 365 days a year. Vehicles of all types, including passenger vehicles, school buses, police vehicles, dump trucks, pulp wood trucks, low bed trucks with heavy equipment, along with their drivers and passengers, make use of the cable ferries, which function as part of the highway system.

Records from the New Brunswick DOT show that during the statistical year 1996–1997, the most recent period for which figures are available, 3,668,000 passengers and 2,061,000 vehicles were carried throughout the cable ferry system.

1.8 Westfield Ferry Crossing

1.8.1 Traffic

In 1996–1997, 949,000 passengers and 502,000 vehicles were carried on the Westfield cable ferries. Records indicate that during the school year the traffic includes 72-passenger school buses, which regularly use the ferries to carry school children between Baxter Point and Hardings Point.

Both ferries operate on a load-and-go schedule during peak traffic periods. During off-peak hours only one ferry operates. Traffic records indicate that at the time of the cable break the "F-39" had completed a total of 50 round trips since midnight, carrying 670 passengers, 358 automobiles and 25 trucks.

1.8.2 Location

The Westfield crossing is located some 10 miles north-west of downtown Saint John. The ferry connects with the western end of the Kingston Peninsula, a peninsula created by Kennebecasis Bay and Long Reach on the Saint John River.

At the ferry crossing between Baxter Point and Hardings Point, the Saint John River is about 500 m wide with water depths, at mid-river, to about 12.5 m. The river at this point is subject to tidal action, and it is reported that partial salt water mixing occurs at the south end of Long Reach, upstream of the Westfield ferry crossing.

1.9 Cable Utilization and Inspection

1.9.1 Cable Utilization

The cable used at the Westfield crossing is a 670 m-long, 2.85 cm-diameter, high-performance, plastic-impregnated wire rope, with a nominal breaking load of 61.5 tons.

The incorporation of the plastic is intended to protect the wire strands by reducing the intrusion of moisture and abrasive material into the wire rope, and so increase the service life of the cable.

The cable in use at the time of the occurrence, having been installed on 07 July 1995, had been in service for 465 days when it parted on 15 October 1996. New Brunswick DOT records show that this period of use was significantly longer than that of any other cable at this installation in the previous eight years. The records show that cables that were new when they were installed had been changed after periods in service ranging from 116 days to 421 days, with an average service life of 253 days. Cables that had been used previously at crossings with larger spans had, on occasion, been installed at the Westfield crossing after damaged areas at either end of the cable had been removed.

There is no pre-determined service period after which cables are renewed; cable changes are normally undertaken when inspection reveals that unacceptable cable wear is occurring. The results of the weekly cable inspections are reported verbally and recorded in a diary. Monthly Ferry Inspection Reports are also completed by the area ferry supervisor. A stock of cables is maintained at the New Brunswick DOT depot in Sussex.

1.9.2 Scheduled Cable Inspection

The cable is inspected visually for signs of wear or broken strands weekly by a New Brunswick DOT employee under the supervision of the District Superintendent of Ferries. The cable used by the "F-39" had last been inspected on 07 October 1996.

Cable inspection consists of opening up the end roller cover and observing the wire as it passes into the ferry while the ferry completes a slow river crossing. Broken or crushed strands or burrs indicate that the cable is

wearing. The size of the inspection opening combined with the location of the guide rollers makes inspection of the entire cable surface difficult, most particularly the lower side of the cable as it passes the inspection point.

1.9.3 TSB Analysis of Broken Cable

The broken cable was recovered and samples from the break area and other sections, in addition to samples from new and used cables of the same type, were taken for physical examination at the TSB Engineering Laboratory.

Visual examination of the sections comprising the mating ends of the fractured cable revealed that the protective plastic coating had worn away over approximately one third of the diameter, with strands heavily corroded deep into the core of the cable. The outermost strands were worn completely through as a result of abrasion and others were broken as a result of corrosion. The fractured ends showed little deformation or "birdcaging" typical of tensile failure, indicating the cable was significantly weakened prior to failure. Further examination showed that the outer strands failed primarily in a brittle fashion as a result of corrosion while strands near the core exhibited "necking", a ductile deformation consistent with tensile overstress failure.

The localized heavy wear and loss of the exterior plastic in the fracture area was considered consistent with contact between the cable and the river bottom. Drag due to the current was considered responsible for most of the wear as the cable is dragged across the bottom each time the direction of the current reverses.

The TSB Engineering Laboratory report (LP 159/96) concluded that the cable failed as a result of localized wear and corrosion of the exterior strands having reached such an extent that the remaining strands failed in overstress.

1.10 Safety and Communications

1.10.1 Safety Equipment

Approved lifejackets for 67 adults and 49 children were located in the deck-house used for storage and were accessible from the car deck; one approved lifejacket was stored in the control station.

[4] This report is available upon request from the Transportation Safety Board of Canada.

The ferry was fitted with two 20-person liferafts, stowed on racks above hand-rail level, one at each end of the car deck. The racks are so constructed that when the securing strap is released, the liferaft canister can roll freely down the rack, and overboard. Raft boarding would be via the ramp.

At one end of the ferry, there is one life ring with line mounted in a bracket outboard on the side of the main deck; at the other end, a life ring with line is similarly mounted on each side of the ramp.

One fire station, with hose, is located at the end of the deck-house in which supplies are stored.

A 3.6-metre aluminium boat with oars is mounted at the side of the main deck on a cradle, outboard of the main deck. When released, the cradle rotates as the boat drops into the upright position at water level.

No anchor was fitted nor was one required to be fitted. An anchor provides a measure of control over a drifting vessel. During the course of the investigation, it was learned that on a previous occasion, when the cable parted at this location, the failed cable was jammed in the drive gear and the tethered ferry was swept into shore by the current.

1.10.2 Crew Training

Approximately two years before the occurrence, cable ferry crews had been given training in the use of marine safety and emergency equipment by a representative of the Canadian Coast Guard.

Topics covered in this seminar included the use of lifejackets, flares, fire fighting equipment, and the dangers of hypothermia. As well, several crew members had taken first aid training. New employees were trained by ferry supervisors, and ferry staff were monitored on an ongoing basis.

1.10.3 Radio Equipment

The "F-39" was fitted with two radios: a very high frequency (VHF) radio, with channels 6, 7, 16, and a broadcast frequency, used primarily to communicate with river traffic, and a New Brunswick DOT radio tuned to DOT channels. Operating instructions for the DOT radio and a card with station locations and station numbers were in the control station.

The VHF radio fitted to the "F-39" was known to be in poor working condition and was due to be replaced. During the occurrence, some difficulty with VHF radio communications between the ferry operator and other stations in the area was experienced as a result of the condition of the radio.
Analysis of transcripts of the marine VHF radio communications that took place between the ferry and other stations directly and indirectly involved in the incident revealed poor radio procedures and poor phraseology.

The ferry operator in charge of the ferry during the occurrence did not hold a Radiotelephone Operator's Restricted Certificate (RORC).

Operating the New Brunswick DOT radio to call the PMCC involves pressing "0" for ½ second. The new Ferry Operations Manual encourages ferry operators to make test calls to the PMCC operator so that they will be familiar with the procedure in the event of an emergency.

1.11 Marine Qualifications

Under the terms of the *Constitution Act, 1867,* the Province of New Brunswick has jurisdiction over Provincial cable ferries, and thus may set the qualifications of crew members. At the time of the occurrence no formal qualifications were required to operate "F-39".

Transport Canada issues a range of certification attesting to a person's qualifications for employment in marine operations on different types of vessels. On the deck side, this extends up to Master of a Foreign-Going Steamship, but less demanding certification and training is available, which ensures that the holder has acquired the necessary skills to cope with marine emergency situations.

The Transport Canada qualification "Certificate as a Lifeboat Man Qualified in Marine Emergency Duties," established under the *Canada Shipping Act, Regulations Respecting the Certification of Lifeboat Men and Qualifications in Marine Emergency Duties,* attests that a person holding that qualification is knowledgeable in:

a) the use, stowage, launching, loading, handling and care of all types of life-saving apparatus, appliances and equipment in all circumstances;

b) the use, stowage, handling and care of all types of distress signals, line-throwing appliances and rescue equipment;

c) passenger control and crew organization in emergencies of all types;

d) the prevention of fire, explosion, and the detection, containment and extinguishment of fire;

e) damage control in case of fire, explosion, collision, grounding or other damage to the ship;

f) survival procedures and techniques; and

g) search and rescue procedures and organization.

2.0 Analysis

2.1 Anchors

Because cable ferries operated by the New Brunswick DOT are not fitted with any type of anchor, in the event of a cable parting, there is no method by which the crew can exercise any control over the movement or aspect of the drifting vessel until such time as assistance arrives. The use of an anchor would also assist in preventing the ferry from being swept ashore should a failed cable be jammed in the drive gear as happened on a previous occasion. In such circumstances, the tethered ferry runs a considerable risk of hull damage when contacting the river bank. Although there is little room for additional deck machinery on a vessel such as the "F-39", consideration could have been given to providing a rudimentary, emergency-only, anchoring capability with a buoyed anchor, eliminating the need to install a sophisticated anchor-recovery system.

2.2 Passenger Safety

The operators are not required to hold any marine certificate of competency or marine safety certification to operate the cable ferries, which are used to transport many vehicles and passengers (including school children) each year. The liferaft and emergency equipment seminar conducted by the Canadian Coast Guard was the only training in the use of lifesaving appliances they had received. Ferry crew who have received the necessary level of marine safety training are more likely to be able to make effective use of the life-saving and fire-fighting equipment fitted on the ferries, and to ensure passenger safety in the event of an emergency.

2.3 Cable Replacement

The deterioration of the protective plastic coating and the outer strands of the failed cable in the area of the break suggests that visible signs of the poor condition of the cable had been present for some time before the break occurred. They were not detected at the weekly inspections carried out prior to the failure. The fallibility of the presently scheduled visual inspections suggests that more stringent measures, such as cable life limits and periodic, more thorough, examination of the cable should be instituted.

2.4 Radio Communications

Because of the poor condition of the marine VHF radio fitted on the "F-39", the ferry operator had to relay messages through another ferry in the system. In a developing emergency, the speed of communication can be crucial in limiting detrimental effects.

In an emergency, the training that an operator has received in qualifying for a RORC could be critical in ensuring effective communication and expediting assistance.

3.0 Conclusions

3.1 Findings

1. The ferry cable was in contact with the river bed where it was subject to the effects of the river current and tidal action.

2. Repeated dragging of the cable over the bottom resulted in a breakdown of the protective plastic coating and accelerated deterioration of the cable.

3. Erosion of the exposed outer strands continued until the remaining strands of the cable parted under load.

4. The cable in the area of the break was heavily corroded deep into the core prior to the failure.

5. Routine weekly examinations did not detect the extent of the deterioration of the cable.

6. The cable failed after an extraordinarily long service period; however, no life limit for ferry cables had been established.

7. The ferry was in mid-stream when the cable parted, and was out of control, drifting with the river current, wind and tide, until a tug arrived on scene.

8. The ferry was not fitted with an anchor for the crew to deploy to minimize the ferry's drift or prevent a grounding or a collision.

9. The condition of the marine very high frequency (VHF) radio fitted to the ferry caused difficulties in establishing communications with respect to the emergency.

10. The operator did not hold a Radiotelephone Operator's Restricted Certificate (RORC).

11. The ferry crew were not required to hold marine qualifications and had received only introductory training in marine emergency procedures and safety equipment during a training seminar held by the Canadian Coast Guard.

12. There was no system in place for independent safety inspections to be carried out on the cable ferries, their equipment or operators.

3.2 Causes

The cable failed because localized wear and corrosion of the exterior strands of the cable had reached such an extent that the remaining strands failed in overstress.

4.0 Safety Action

4.1 Action Taken

4.1.1 Cable Replacement Schedule

Following this occurrence, the TSB forwarded a copy of the laboratory analysis report on the damaged cable to the New Brunswick Department of Transportation (DOT). The TSB understands that the DOT has now conducted a study of the life span of ferry cables to determine average operational life in the prevailing conditions, with a view to optimizing a replacement schedule. (Several factors such as winter ice, high currents and high winds affect the life span of a ferry cable.) For the "F-39" cable ferry, it was determined that the replacement cycle should be less than 303 days, taking into consideration a replacement before winter.

4.1.2 Fitting Anchors on Ferries

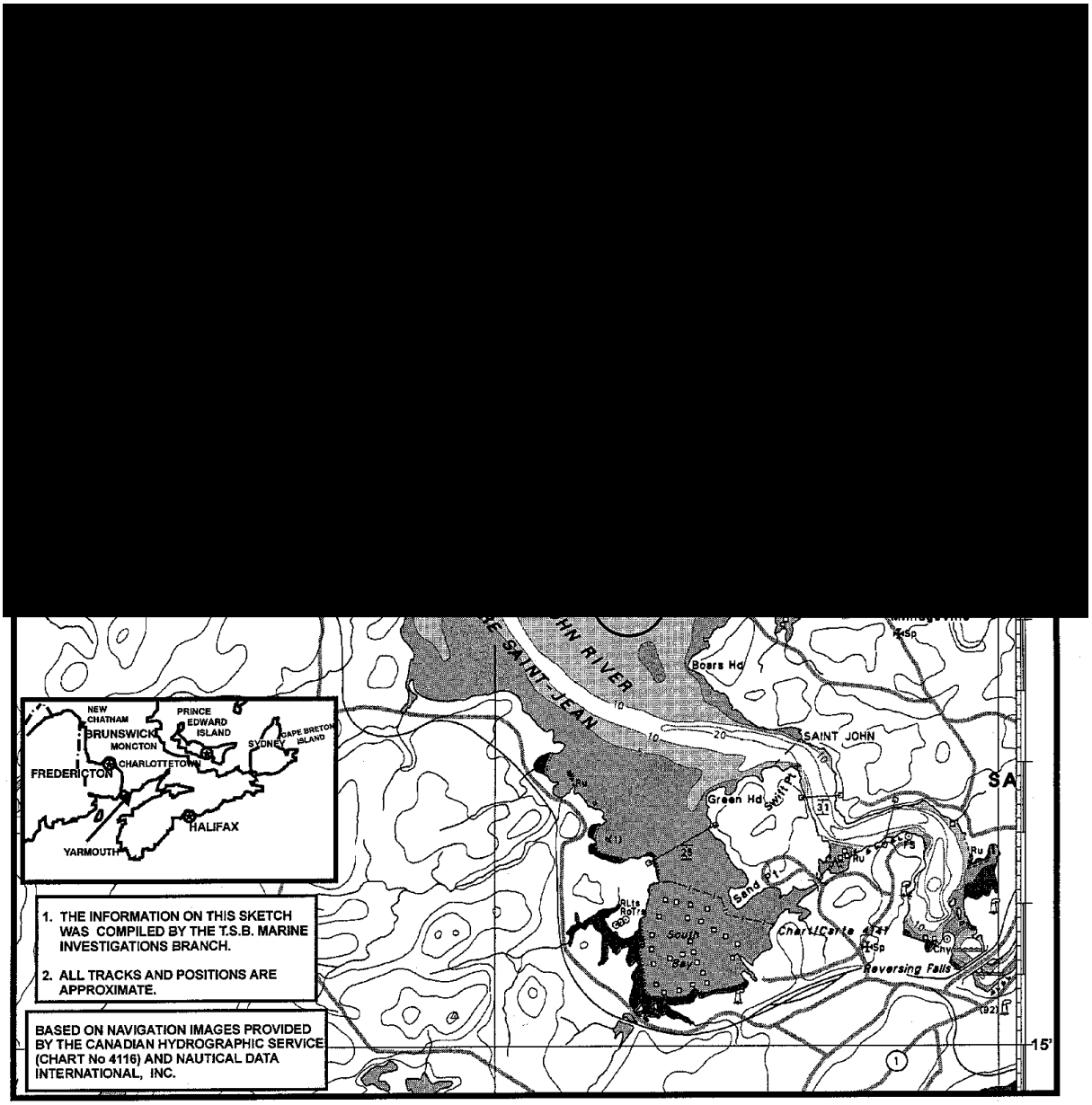
The DOT has reportedly established a capital expenditure program to install anchors on its fleet of short run cable ferries, over the next two or three years.

4.1.3 Upgrading Ferry Standards

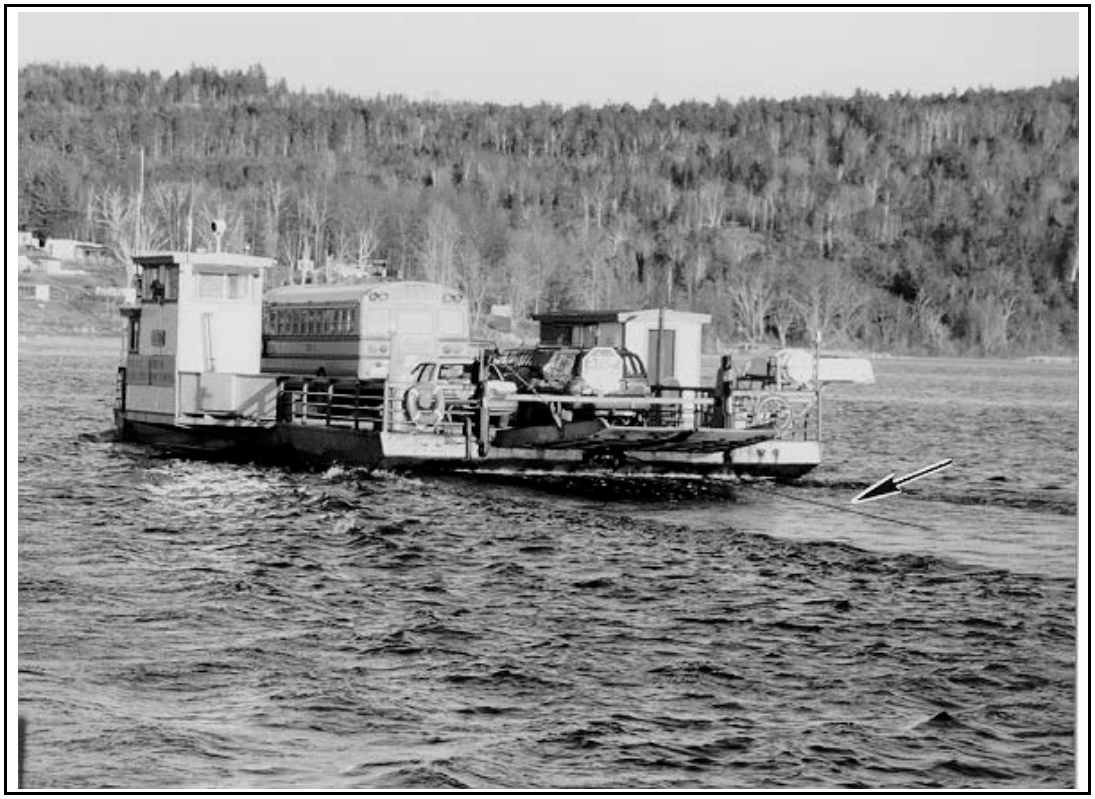
Since the occurrence, the radios on "F-39" have been replaced, a Ferry Operations Manual has been developed based on the requirements of the *Canada Shipping Act,* maximum loading limits established for each ferry, and arrangements have been made to provide Marine Emergency Duties (MED) training for ferry personnel. Other planned improvements include making bulkheads watertight, replacing wood cabins with steel structures, improving bilge pumping systems, and addressing any other areas covered under regulations.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson Benoît Bouchard, and members Maurice Harquail, Charles Simpson and W.A. Tadros, authorized the release of this report on 22 July 1998.

Appendix A - Sketch of the Area of the Occurrence



Appendix B - Photographs



Appendix C - Glossary

ADT	Atlantic daylight time
DOT	Department of Transportation
IMO	International Maritime Organization
kn	knot(s)
kW	kilowatt(s)
m	metre(s)
METOC	Canadian Forces Meteorological and Oceanographic Centre
PMCC	Provincial Mobile Communications Centre
RORC	Radiotelephone Operator's Restricted Certificate
TSB	Transportation Safety Board of Canada
VHF	very high frequency