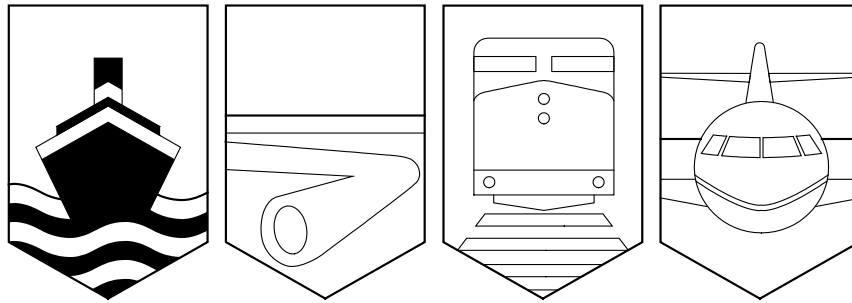




Transportation Safety Board
of Canada



MARINE OCCURRENCE REPORT

CAPSIZING

SERVICE VESSEL "VÉZINA NO. 1"

PORT OF QUÉBEC, QUEBEC

01 MAY 1995

REPORT NUMBER M95L0010

Canada

MANDATE OF THE TSB

The *Canadian Transportation Accident Investigation and Safety Board Act* provides the legal framework governing the TSB's activities.

The TSB has a mandate to advance safety in the marine, pipeline, rail, and aviation modes of transportation by:

- conducting independent investigations and, if necessary, public inquiries into transportation occurrences in order to make findings as to their causes and contributing factors;
- reporting publicly on its investigations and public inquiries and on the related findings;
- identifying safety deficiencies as evidenced by transportation occurrences;
- making recommendations designed to eliminate or reduce any such safety deficiencies; and
- conducting special studies and special investigations on transportation safety matters.

It is not the function of the Board to assign fault or determine civil or criminal liability.

INDEPENDENCE

To encourage public confidence in transportation accident investigation, the investigating agency must be, and be seen to be, objective, independent and free from any conflicts of interest. The key feature of the TSB is its independence. It reports to Parliament through the President of the Queen's Privy Council for Canada and is separate from other government agencies and departments. Its independence enables it to be fully objective in arriving at its conclusions and recommendations. Its continuing independence rests on its competence, openness, and integrity, together with the fairness of its processes.

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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 Occurrence Report

Capsizing

Service Vessel "VÉZINA NO. 1"

Port of Québec, Quebec

01 May 1995

Report Number M95L0010

Synopsis

On 01 May 1995, the service vessel "VÉZINA NO. 1" was participating in the towing of the "CAVALIER MAXIM" and was assisting the "SERVICE BOAT II". The crew of the "VÉZINA NO. 1", which was on the port quarter of the "CAVALIER MAXIM", hooked the eye of the tow-line over the single towing bitt in the middle of the afterdeck. During the inbound towage toward Louise Basin, the operator of the "VÉZINA NO. 1" tried to turn his boat 180 degrees to port as he intended to let his vessel be drawn backward. When the "VÉZINA NO. 1" executed this manoeuvre, she became girded on her starboard side and was unable to return to the upright. As a result of this and of the momentum of the tow, the "VÉZINA NO. 1" downflooded and capsized. The operator was unable to exit the wheel-house and he lost his life.

The Board determined that the capsizing of the "VÉZINA NO. 1" was initially the result of the manner in which the manoeuvre was attempted. In addition, the tow-line used for the towing operation was too short and the angle between the two attachment points was clearly too steep. Since the eye of the tow-line had been hooked over the towing bitt of the "VÉZINA NO. 1", the crew members were unable to keep control of the tow-line at all times, and they were unable to release it in case of emergency.

Ce rapport est également disponible en français.

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1.0 Factual Information

1.1 Particulars of the Vessels

	"VÉZINA NO. 1"	"SERVICE BOAT II"
Official Number	323039	158071
Port of Registry	Québec, Quebec	Montreal, Quebec
Flag	Canadian	Canadian
Type	Service vessel	Tug
Gross Tons	13.42	77.85
Length	9.5 m	19.93 m
Draught	F: 1.2 m	F: 1.2 m
	A: 1.3 m	A: 2.4 m
Built	1967, Québec, Quebec	1934, Montreal, Quebec
Propulsion	GM 671 engine, 123 kW	GM 71 engine, 257 kW
Owner	Sam Vézina Inc.	Sam Vézina Inc.
	Québec, Quebec	Québec, Quebec

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.

	"CAVALIER MAXIM"
Official Number	303396
Port of Registry	Québec, Quebec
Flag	Canadian
Type	Passenger vessel
Gross Tons	1,426.57
Length	178.20 m
Draught	F: 1.8 m A: 2.4 m
Built	1962, England
Propulsion	Two Detroit diesel engines, 1,044 kW
Owner	C.J. Bouchard Réparation Ltée Québec, Quebec

1.1.1 Description of the Vessel

The "VÉZINA NO. 1" was built to be used as a pilot boat in the Port of Québec. In 1987, her owner had to re-assign the vessel to other tasks such as towage and miscellaneous operations in the Port of Québec area. The wheel-house is amidship and the afterdeck is fitted with a towing bitt. However, there is no winch or towing hook with automatic tow-abort capability on the afterdeck of the "VÉZINA NO. 1".

1.2 History of the Voyage

On 01 May 1995, at 1322, the "CAVALIER MAXIM", originating from Petite-Rivière-Saint-François, Quebec, under tow by the "CAVALIER GRAND FLEUVE", arrived at the harbour limits inbound to Louise Basin to commence berthing procedures. The tug "SERVICE BOAT II" and the service vessel "VÉZINA NO. 1" took over from the "CAVALIER GRAND FLEUVE" approximately one mile downstream from the berth allocated to the "CAVALIER MAXIM".

³ **All times are EDT (Coordinated Universal Time (UTC) minus four hours) unless otherwise stated.**

Upon their arrival, and as agreed beforehand between the operator of the "VÉZINA NO. 1" and the master of the "SERVICE BOAT II", the latter vessel took the tow-line from the "CAVALIER GRAND FLEUVE" and positioned herself at the bow of the "CAVALIER MAXIM", while the "VÉZINA NO. 1" took up position on the port quarter. It was decided to proceed that way to facilitate entry of the "CAVALIER MAXIM" into Louise Basin. It had been agreed beforehand that the "VÉZINA NO. 1" would remain in that position until it was time to enter Louise Basin. She was then to move away from the "CAVALIER MAXIM" while controlling that vessel's stern during the entrance into the basin and during the berthing manoeuvres. A tow-line with a bridle had been handed to the "CAVALIER MAXIM", but because of the layout of the promenade deck on the passenger vessel, the crew could not accept that tow-line. The crew of the vessel under tow then ran a line out to the "VÉZINA NO. 1" from the fairlead aft on the promenade deck. The eye of the tow-line was hooked over the towing bitt on the afterdeck of the "VÉZINA NO. 1", and the length of the tow-line between the two vessels was about 10 metres.

After a few minor course changes, the "SERVICE BOAT II" called the "VÉZINA NO. 1" to ensure that the operation was proceeding smoothly. The "VÉZINA NO. 1" informed the tug that she was going under the counter of the "CAVALIER MAXIM". The tow-line was not long enough to enable the "VÉZINA NO. 1" to move forward and position herself on the port forward quarter of the passenger vessel, and thereby avoid going under the counter. The hull below the curtain plate a few metres above the waterline forms a sharp angle at the quarter of the "CAVALIER MAXIM".

Shortly after the towing operation began, when the speed of the tow was an estimated two to three knots, the operator of the "VÉZINA NO. 1" informed the "SERVICE BOAT II" by radiotelephone that he intended to let his vessel be drawn backward. Before the message was acknowledged by the "SERVICE BOAT II", the "VÉZINA NO. 1" initiated a 180-degree turn to port to take up a stern-to-stern position behind the "CAVALIER MAXIM". However, when the "VÉZINA NO. 1" had turned through 130 degrees, the tow-line was fully extended, thus applying enough tension to gird the vessel, which was unable to return to the upright. The deck-hand on duty on the afterdeck tried to grab the fire axe to sever the tow-line, but he could not reach it because of the severe list of the vessel. Within one minute, the "VÉZINA NO. 1" became girded, downflooded, and capsized. The operator was unable to exit the wheel-house.

None of the crew members of the "CAVALIER MAXIM" had remained on the afterdeck to serve as look-outs for the towing operation and tend to the tow-line. The alert was given when the operator of the "VÉZINA NO. 1" shouted over the radio to stop pulling, and

some people on the "CAVALIER MAXIM" heard the deck-hand screaming. The Marine Communications and Traffic Services (MCTS) Centre was notified at once by the "SERVICE BOAT II", which advised that they had pulled one crew member of the "VÉZINA NO. 1" from the water, but that the other was still missing.

Immediately upon receiving the message, the MCTS Centre launched a search and rescue (SAR) operation. The CCGS "STERNE", a Canadian Coast Guard (CCG) helicopter and "ZODIAC" were dispatched to the scene of the accident. The "STERNE", which was in the vicinity, arrived on the scene about 15 minutes later, followed shortly by the other units. However, their efforts to save the operator were unsuccessful.

A few hours later, divers from a commercial firm retrieved the body of the operator, who had remained in the wheel-house.

1.3 Injuries to Persons

	Crew	Passengers	Others	Total
Fatal	1	-	-	1
Missing	-	-	-	-
Serious	-	-	-	-
Minor/None	1	-	-	1
Total	2	-	-	2

The autopsy report established that death was by drowning; the victim sustained no other injury.

1.4 Damage

1.4.1 Damage to the Vessel

The "VÉZINA NO. 1" was refloated two days later. Damage was limited to the electronic navigation instruments and the engine, which had to be replaced.

1.4.2 *Damage to the Environment*

Environmental damage resulting from the capsizing of the "VÉZINA NO. 1" was limited to the spillage of a few litres of diesel fuel, which caused only minor pollution.

1.5 Certification

1.5.1 Vessel

The "VÉZINA NO. 1" is registered as a pilot boat. The SIC 16 inspection certificate issued to the vessel by the CCG on 06 April 1995 is valid only when the vessel is operated as a pilot boat and service vessel in the Port of Québec, between Saint-Jean, île d'Orléans, and Saint-Nicolas.

1.5.2 Personnel

The operator of the "VÉZINA NO. 1" did not hold a valid certificate at the time of the accident. On 04 April 1984, he had been issued a master's certificate for small craft. The certificate was to be renewed each year, but the operator had not done so since 1990. The most recent certificate held by the operator of the "VÉZINA NO. 1" was endorsed as follows: "This certificate is only valid in pilot vessels not employed in commercial towing operations and operating on the St. Lawrence River between St. Nicholas and St. Jean (Orleans Island) P.Q."

The master of the "SERVICE BOAT II" holds a master's certificate for minor waters since 1961.

1.6 Personnel History

The operator of the "VÉZINA NO. 1" worked for over 25 years on pilot boats in the Port of Québec. In 1988, after losing the pilot boat service contract, the company had to diversify its operations, and the operator of the "VÉZINA NO. 1" was therefore given various assignments, including towing operations in the Port of Québec. He had received on-the-job training from the manager of the company to carry out this type of operation. The operator was not a good swimmer.

The master of the "SERVICE BOAT II" has been going to sea since 1951, and he has extensive experience of tugs and towing operations and manoeuvres.

1.7 *Weather and Tidal Information*

At the time of the accident, the winds were light and visibility was excellent; there was a slight ebb tide current in the area. Weather conditions and currents were not a factor in this occurrence.

1.8 Radio Communications

1.8.1 Inter-Ship

During the towing manoeuvres, communications on channel 10 of the very high frequency (VHF) radiotelephone were normal. However, when the operator of the "VÉZINA NO. 1" transmitted a message to the "SERVICE BOAT II" to advise that he intended to let his vessel be drawn backward, that vessel was already in contact with the MCTS Centre and probably did not hear the message. This would account for the "SERVICE BOAT II" not acknowledging the message from the "VÉZINA NO. 1". Within one minute, the operator transmitted an emergency message asking the "SERVICE BOAT II" to stop pulling.

1.8.2 Marine Communications and Traffic Services Centre

At 13:42:50, the "SERVICE BOAT II" informed the MCTS Centre in Québec City, on channel 11 of the VHF, that she was proceeding toward Louise Basin. At 13:47:13, the Centre received another message advising that the "VÉZINA NO. 1" had capsized, that one crew member had been pulled from the water safe and sound, and that the other was missing.

1.9 Life-saving Equipment

The "VÉZINA NO. 1" was carrying the required emergency equipment. There were a liferaft, two lifebuoys, and six adult-size lifejackets on board. None of the life-saving gear was used when the vessel capsized, except for one lifejacket that the deck-hand grabbed from the wheel-house when the vessel began to list.

1.10 Search and Rescue

As soon as the "SERVICE BOAT II" released her tow-line, she proceeded toward the "VÉZINA NO. 1" and picked up the deck-hand. About 15 minutes later, the CCGS "STERNE", which had been alerted by the MCTS Centre, was on the scene. Also dispatched to assist in the search were a CCG helicopter and inflatable boat. A few hours after the occurrence, a team of commercial divers retrieved the body of the operator from the wheel-house. It is not the practice of the CCG to staff SAR vessels such as the "STERNE" with divers, and

there was no diver aboard the "STERNE" on 01 May 1995.

The fact that rescue divers are not permanently assigned to CCG SAR vessels, inter alia to aid persons trapped in submerged or semi-submerged vessels, generated significant local public interest after this tragedy. Therefore, the background to CCG policy follows.

In 1989, the CCG launched a program assigning teams of divers on board units of the fleet. The objective of this policy was to enhance the fleet's capability to carry out its missions from CCG vessels and bases. Provision of diving services was to be governed by the following parameters:

- a. a diving team was to be maintained in each Coast Guard ship or group of ships tasked for duty in the Arctic;
- b. diving teams were to be maintained in Type 500 and 600 vessels tasked to conduct primary Search and Rescue (SAR) operations. For purposes of this Order, "R" Class Cutters were considered to be Type 500 vessels;
- c. diving teams could be maintained in other ships if warranted by the ship's role;
- d. when no in-house divers were available, each Regional Manager Fleet Systems was to ensure that alternate services were available. This could mean, with the cooperation of Aids and Waterways, diving services provided by diving teams assigned to CCG bases or by commercial firms from the list of firms located near the operations zone.

In accordance with the 1989 policy, the "STERNE" and vessels of her class have never carried divers.

On 01 April 1992, a new CCG policy on diving operations came into effect. This policy called for the discontinuation of all diving operations from CCG vessels, and on 10 March 1992, Fleet Systems formally withdrew from diving operations for financial reasons. The cost of maintaining diving equipment, training the divers, and mandatory minimum dive times to keep the divers' certificates valid were factors which were taken into account in view of the economic context.

Although teams of divers were withdrawn from fleet vessels, in January 1995, a two-year pilot project was announced to establish a Dive Rescue Unit on the West Coast for marine casualties where divers would be required. The divers were assigned to high-speed hovercraft. The objective of the project was to determine the feasibility and effectiveness of this type of response unit for search and rescue missions. After some 15 months of operation, however, it was still not possible to assess this type of diving operations, as no opportunity had yet arisen to call upon the unit's services.

1.11 Stability

The approval criteria set out in STAB. 3 of the CCG *Stability, Subdivision, and Load Line Standards*, entitled "Interim Standard of Stability for Ships Built or Converted for Towing", constitute a reliable yardstick for assessing the stability characteristics of the "VÉZINA NO. 1".

Based on the data from the stability booklet of the "VÉZINA NO. 1", dated 1989, the TSB conducted an independent study of the stability of the vessel. The results of this analysis indicate that the vessel meets all stability requirements of the STAB. 3 standard.

Part VIII of the Hull Construction Regulations outlines the stability requirements for vessels built or converted for towing. As a service vessel of over five tons gross tonnage built before 01 April 1972, the "VÉZINA NO. 1" is deemed to be an "existing ship" and is therefore exempt from these requirements.

2.0 Analysis

2.1 Personnel Certification

Under the Ships' Deck Watch Regulations, the operator of the "VÉZINA NO. 1" was required to be properly certificated to operate a vessel of this type and size.

The operator held a master's certificate for small craft that was renewable on a yearly basis. However, his certificate was not valid at the time of the accident. A notice regarding the renewal of his certificate had been sent to him in 1990 by the Ship Safety Branch of the CCG. The notice informed him that his certificate had been renewed four times, and that, this time, he would have to contact a Ship Safety examiner to set a date for an oral examination of a practical nature in order to renew his certificate. The operator did not comply with this notice from the CCG and he ignored the requirement to take an oral examination to renew his certificate.

At the start of each navigation season, the employer had asked the operator if he held a valid certificate; the operator had replied that everything was in order.

Furthermore, the operator's most recent certificate was endorsed as follows: "This certificate is only valid in pilot vessels not employed in commercial towing operations and operating on the St. Lawrence River between St. Nicholas and St. Jean (Orleans Island) P.Q."

2.2 Certification of the "VÉZINA NO. 1"

The registration certificate of the "VÉZINA NO. 1" indicates that the vessel is a pilot boat, whereas her inspection certificate indicates that she is a pilot boat (bateau-pilote) and a service vessel (navire de service).

Although the terms "service vessel" and "service boat" are not defined in the *Canada Shipping Act* or the regulations made pursuant thereto, the terms are used in marine technical manuals and recognized marine dictionaries. The definitions given for these two terms are significant: "service boats/vessels" are defined so as to include pilot boats, linesmen's boats, tugboats and supply boats.

Given the results of the TSB stability analysis, there is no reason why the "VÉZINA NO. 1" should not have engaged in towing operations on an occasional basis. However, it was the owner's responsibility to ensure that the vessel was crewed and equipped to accomplish these tasks safely.

2.3 *Manoeuvre Undertaken by the "VÉZINA NO. 1"*

Because of the sharp angle of the hull below the counter of the "CAVALIER MAXIM", the "VÉZINA NO. 1" could not remain on the port quarter of the passenger vessel, and the operator decided to initiate a manoeuvre to position his vessel stern-to-stern behind the "CAVALIER MAXIM". When the "VÉZINA NO. 1" turned away from the port quarter of the "CAVALIER MAXIM", the tow was making an estimated two knots.

The "VÉZINA NO. 1" initiated the turn to port to move to the desired position, and when she was perpendicular to the tow, the tow-line became taut, the vessel became girded on her starboard side, and her manoeuvrability was reduced.

During the towing operation, the doors to the wheel-house were secured in the open position, and this contributed to the downflooding, loss of stability, and capsizing.

2.4 *Tow-abort in Emergency Situations*

The tow-line between the two vessels was some 10.7 m long; the end on the "CAVALIER MAXIM" was made fast to the aft towing bitt on the promenade deck at a height of 7.9 m, and the other end, fitted with an eye, was hooked over the after bitt of the service vessel.

In this occurrence, the eye of the tow-line had been hooked over a towing bitt instead of the line being rove round the bitt; this is not normal practice, and is even to be avoided in towing operations. In towage practices, it is essential to keep control of the tow-line at all times, whether to slacken it or make it taut, and to be able to release the tow-line at all times.

Tugboats are typically fitted with an automatic tow-abort mechanism which can be activated from the wheel-house. The "VÉZINA NO. 1" was not so fitted, nor was she required to be. The service vessel had a fire axe on board to be used to sever the tow-line in case of emergency; however, events unfolded so quickly that the fire axe could not be used in this occurrence. None of the crew members of the "CAVALIER MAXIM" had remained near the attachment point to release the tow-line in case of emergency.

Ship Safety Bulletin No. 13/94, entitled *Towboat - Dangers Associated with Girding*, advises owners and operators of the hazards

associated with towing operations. It points out, among other things, that crews must remain constantly vigilant during such operations.

In addition, investigations conducted by the TSB in recent years into the causes of the girding and subsequent capsizing of tugboats have raised concerns about the frequency of such occurrences. Witness statements and other information collected in the course of these

investigations indicate that, once girded, tugs capsize so quickly that crew members do not have the time to operate the tow-abort control or use the available life-saving equipment. This has been a recurring feature of these occurrences.

2.5 Search and Rescue

As the wheel-house doors were open, the operator should have been able to escape by that route; however, he did not succeed in doing so and was most likely underwater for at least 15 minutes before the arrival of the CCG SAR units. The autopsy report established that death was by drowning.

Although SAR units of the CCG arrived promptly on the scene and the body of the operator was recovered by divers who arrived some time later and attempted resuscitation, nothing done was able to save him.

Once they are on the scene of an accident, divers need to observe the site, assess the risks, plan the dive and follow safety procedures before entering the capsized vessel, and this can occasion delays. Had CCG divers been carried on board the "STERNE", the outcome would not have been different.

2.6 Death of the Operator

As the operator sustained no head injury, the investigation examined the factors that could have prevented him from evacuating the wheel-house when both wheel-house doors were secured in the open position.

The sudden capsizing of the "VÉZINA NO. 1" would have thrown the operator off balance and induced stress in a critical situation. The rapid sequence of events, the sudden immersion of the victim, the fact that he was not a good swimmer and the reduced visibility once the vessel had capsized are all factors which may have contributed to the operator becoming disoriented and being unable to exit the wheel-house.

Investigations have revealed that some individuals who were known to be good swimmers lost their lives because they became disoriented on entering the water in an emergency situation.

3.0 Conclusions

3.1 Findings

1. The most recent certificate held by the operator of the "VÉZINA NO. 1" was not valid for commercial towing operations and was last renewed in 1990. At the time of the accident, the operator of the "VÉZINA NO. 1" did not hold a valid certificate for any operation on the St. Lawrence River.
2. The "VÉZINA NO. 1" meets all stability requirements of the STAB. 3 standard of the *Stability, Subdivision, and Load Line Standards*.
3. The tow-line between the "CAVALIER MAXIM" and the "VÉZINA NO. 1" was too short and the angle between the attachment points too steep for the intended turning manoeuvre.
4. The crew of the "VÉZINA NO. 1" took the eye of the tow-line on board and hooked it over the towing bitt in the middle of the afterdeck.
5. The "VÉZINA NO. 1" was not fitted with an automatic tow-abort mechanism to release the tow-line in case of emergency.
6. The "VÉZINA NO. 1" remained perpendicular to the tow after initiating a 180-degree turn to port.
7. The two doors of the wheel-house were secured in the open position during the towing operation, and this contributed to the downflooding. The non-watertight wheel-house floor plating was over the engine compartment.
8. None of the crew members of the "CAVALIER MAXIM" had remained near the attachment point during the towing operation.
9. Search and rescue (SAR) units arrived promptly on the scene. Attempts at resuscitating the operator, who had remained in

the wheel-house, were unsuccessful.

10. Had divers been on board the "STERNE", the outcome would not have been different. The autopsy report established that death was by drowning.

11. As the operator sustained no head injury, the rapid sequence of events accounts for the fact that he became disoriented and was unable to exit the wheel-house.

12. Neither the *Canada Shipping Act* nor its regulations contain a definition of the terms "service boat" or "service vessel".

3.2 Causes

The capsizing of the "VÉZINA NO. 1" was initially the result of the manner in which the manoeuvre was attempted. In addition, the tow-line used for the towing operation was too short and the angle between the two attachment points was clearly too steep. Since the eye of the tow-line was hooked over the towing bitt of the "VÉZINA NO. 1", the crew members were unable to keep control of the tow-line at all times, and they were unable to release it in case of emergency.

4.0 Safety Action

4.1 Action Taken

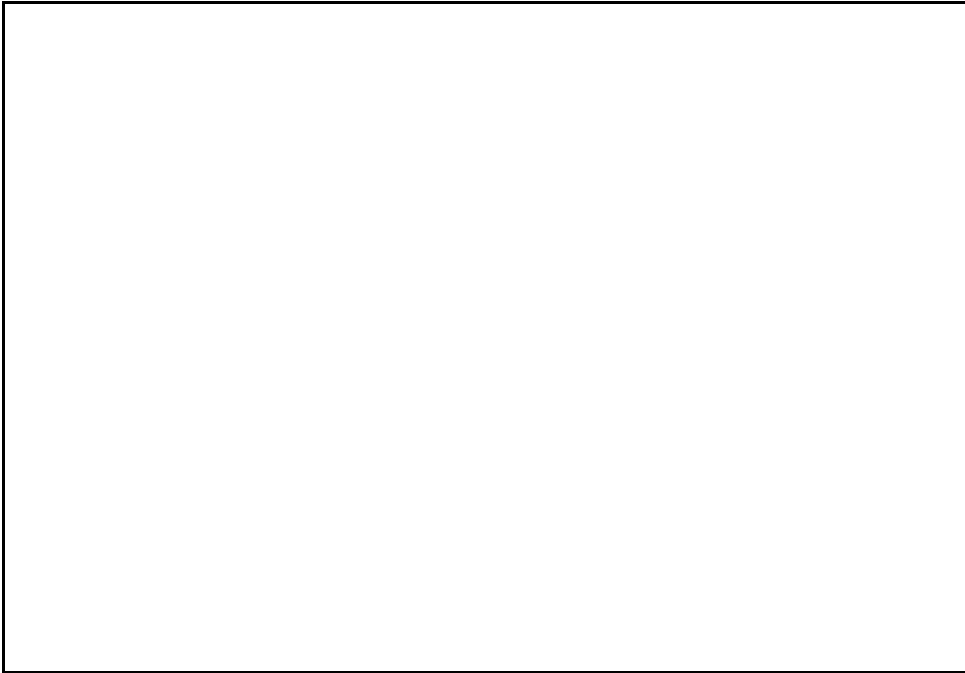
4.1.1 Rescue Diving Capability

Following the collision between the tug "ARCTIC TAGLU" and the fishing vessel "BONA VISTA" (TSB Report No. M93W1050), the Canadian Coast Guard (CCG) reviewed its diving policy and embarked on a two-year rescue diving pilot program to determine the effectiveness of rescue diving. CCG rescue divers have completed their training and the pilot program is operating out of the CCG Hovercraft Base Sea Island, in Richmond, British Columbia.

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 19 June 1997.

Appendix A - Sketches of the "VÉZINA NO. 1"

Appendix B - Photograph



Appendix C - Glossary

A	aft
CCG	Canadian Coast Guard
CCGS	Canadian Coast Guard Ship
EDT	Eastern daylight time
F	forward
IMO	International Maritime Organization
kW	kilowatt
m	metre
MCTS	Marine Communications and Traffic Services
Que.	Quebec
SAR	search and rescue
SI	International System (of units)
TSB	Transportation Safety Board of Canada
UTC	Coordinated Universal Time
VHF	very high frequency
°	degree