



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

### Sinking

Sight-seeing Boat "TAN 1"  
in the Approaches to Anse aux Basques  
Les Escoumins, Quebec  
12 September 1993

Report Number M93L0004

TRANSPORTATION SAFETY BOARD  
OF CANADA  
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### *Synopsis*

The small open sight-seeing boat "TAN 1" departed Anse aux Basques, Quebec, at about 1515, 12 September 1993, with 13 persons on board, including the operator, on a sea mammal-watching cruise on the St. Lawrence River near Les Escoumins, Quebec. The cruise was expected to last approximately three hours.

At about 1750, following a mechanical failure, water began to flood the deck, waves broke over the stern, and the "TAN 1" capsized. The operator of the boat and the passengers ended up in the water, but they were quickly rescued by other sight-seeing boats in the area.

The Board determined that the outboard motors of the "TAN 1" stalled and could not be restarted because the fuel was contaminated with water. Shortly thereafter, the drifting boat was flooded by the stern and eventually capsized.

Ce rapport est également disponible en français.

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## 1.0 Factual Information

### 1.1 Particulars of the Vessel

TAN 1	
Licence Number	13D9752
Type	Open boat
Gross Tons <sup>1</sup>	5
Length	7.62 m
Depth	1.8 m
Built	1990, Quebec
Propulsion	Two Mercury outboard motors each capable of 150 HP <sup>2</sup>
Owners	Touriste, Aventure Nordique Inc. Les Escoumins, Quebec

#### 1.1.1 Description of the Vessel

The "TAN 1" is an open boat constructed of a sandwich of fibreglass over a balsa wood core. The steering position and the control console are located aft. This boat, which does not carry more than 12 passengers, is used mainly in the summer for sea mammal-watching cruises in the vicinity of Les Escoumins.

### 1.2 History of the Voyage

On 12 September 1993, the passengers reported to the company's shed where they were issued wetsuits and were briefed on the type of tour that they were about to take on the "TAN 1". At about 1500<sup>3</sup>, the passengers proceeded to the Anse aux Basques pier and boarded the boat. Before departure, the operator explained to the passengers that they had to

<sup>1</sup> 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.

<sup>2</sup> See Glossary for all abbreviations and acronyms.

<sup>3</sup> All times are EDT (Coordinated Universal Time (UTC) minus four hours) unless otherwise stated.

remain seated throughout the cruise except when the boat was stationary for watching sea mammals. The passengers were not, however, briefed on the location or use of the lifejackets carried on board. The jackets were kept in an underdeck locker, but there was no indication of where they were stowed.

At 1515, the "TAN 1" departed Anse aux Basques with 12 passengers and the operator on board bound for the watching sites. The boat ran along the north shore between Pointe à Otis and Pointe à Crapaud, Quebec, in search of sea mammals.

The south-west winds picked up speed, and the sea became increasingly choppy.

At about 1700, the "TAN 1" was travelling at high speed in heavy seas and was being tossed from wave crest to wave crest. While a wave larger than the others was being taken, all the passengers were lifted from their seats and then somehow fell back down on them; one of the passengers fell on the edge of a bench. The operator put the motors in neutral and helped this passenger, who complained of pain at the base of her spine. Her legs were paralyzed with pain and gave way under her; she was settled on one of the benches in front of the steering position. The operator offered to go back to port, but the passenger refused, because she did not want to end the cruise.

The operator returned to the steering position and found that the starboard motor had stalled, but he was able to restart it. The cruise continued at reduced speed. Waves were breaking over the stern and began to flood the opening in the transom. The starboard motor stalled again and the boat turned sideways to the waves. The operator used the port motor to straighten the boat head on to the sea. While he was trying to restart the starboard motor, the port motor stalled in turn.

Noting that the boat was sinking deeper and deeper by the stern, the operator asked the passengers to move to the bow, so as to raise the stern. While the operator was busy trying to restart the motors, the passengers asked him for containers to bail with, but he told them that he had none, and that it was too late anyway.

The flooding continued and the passengers were up to their knees in water when the water accumulating in the bottom of the boat lifted the lid of the underdeck locker, and the passengers found the lifejackets. It was 1750. Some passengers grabbed the jackets while the operator transmitted a very high frequency (VHF) radio call to the pilot boat "ABRAHAM MARTIN" requesting assistance. In the meantime, another Zodiac-type sight-seeing boat operated by the same company, the "TAN 3", headed toward the "TAN 1" to lend assistance.

Before the "TAN 3" could reach the "TAN 1", the latter capsized and sank by the stern, throwing all the occupants into the sea; some with their lifejackets unfastened, others with no lifejackets on at all. Three passengers managed to cling to the bow of the "TAN 1", but others were sent adrift.

Vessel Traffic Centre (VTC) Les Escoumins was alerted and it advised the sight-seeing boats in the area. The 13 occupants of the "TAN 1" were quickly pulled from the icy waters of the river, and, by 1805, all were safe and sound.

When the boats arrived at the Anse aux Basques pier, an ambulance was waiting, and four occupants who were suffering from hypothermia were taken to hospital in Les Escoumins.

### *1.3 Injuries*

The passengers were rescued safe and sound, although some of them had to be hospitalized to receive treatment for hypothermia due to immersion in cold water. The water temperature is estimated to be 15°C during the summer at this location.

### *1.4 Vessel Certification and Equipment*

As a five-ton boat, the "TAN 1" was not required to undergo regulatory inspections by the Ship Safety Branch of the Canadian Coast Guard (CCG). However, on 13 August 1993, following another marine occurrence, the CCG had forbidden the "TAN 1" from engaging in cruises because of equipment that did not comply with the Small Vessel Regulations or was missing altogether. On 19 August 1993, as the owner had obtained his radio licence and the equipment was in compliance with the requirements laid down in the Small Vessel Regulations, the CCG had lifted the detaining order.

#### *1.4.1 Operator's Certification and History*

The *Canada Shipping Act* (CSA) does not require the master of a vessel not over five tons that carries not more than 12 passengers to be certificated. The operator in charge of the "TAN 1" at the time of the accident has worked as a fisherman since 1974. He holds a Canadian Class 4 Small Fishing Vessel Master's Certificate issued in 1983, and has attended a Marine Emergency Duties (MED) course. He occasionally works as master of small passenger-carrying boats in the area of Les Escoumins.

### *1.5 Weather Information*

At the time of the accident, the weather was clear, visibility was good, the winds were from the south-west at between 15 and 25 knots, and the water and air temperatures were 15°C and 12°C respectively.

At 1600 on the day of the occurrence, the Quebec Meteorological Centre of Environment Canada issued a small vessel warning because of strong winds. The operator of the "TAN 1" heard the warning on his VHF radio, but he felt that he was sheltered from the wind and therefore continued the cruise. The height of the waves was estimated at approximately one or two metres.

## 1.6 *Life-saving Equipment and Clothing*

There were 13 lifejackets on board the "TAN 1", and, when the wreck was found in the Gulf of St. Lawrence on 26 September 1993, 4 were found still in the locker. The passengers found the lifejackets when the lid of the locker was lifted by the pressure of the water accumulated in the bottom, just a few minutes before the boat capsized. According to evidence from the passengers, there was no indication of where the lifejackets were stowed. Furthermore, the passengers had received no pre-departure briefings on the use of the lifejackets.

All the passengers were wearing a wetsuit/worksuit in more or less good condition. Some suits had holes in them, and others were threadbare or missing Velcro fasteners at the ankles and wrists. The boat's operator was wearing a Mustang vest and rubber boots.

## 1.7 *Radio Communications*

The operator of the "TAN 1" did not issue a distress call on channel 16 of the VHF radio; instead, he used channel 9 to call the pilot boat "ABRAHAM MARTIN", and channel 10 to inform that vessel that the "TAN 1" had a large ingress of water and that there were 12 passengers on board. This call was picked up by VTC Les Escoumins at 1751. The capsized boat could be seen at the Les Escoumins radar station.

At 1752, VTC Les Escoumins alerted other sight-seeing boats in the vicinity of the sinking, and, at 1755, a "Mayday Relay" was broadcast for a capsized boat with 12 passengers on board off Anse aux Basques. At 1805, the VTC was informed that all the occupants of the "TAN 1" had been rescued, and the "ABRAHAM MARTIN" requested that an ambulance stand by at Anse aux Basques.

## 1.8 *Rescue*

After being informed of the accident, the "ABRAHAM MARTIN" and the Zodiac-type inflatables "RORQUAL" and "MARSOUIN" rescued one person apiece, and the "TAN 3" rescued 10.

## 1.9 *Calculation of Trim*

The stability conditions of the "TAN 1" were calculated based on the weight of the passengers and the operator, and of the maximum fuel load. The weight of the "TAN 1" on departure was 3,200 kg with a trim by the stern of 0.12°. The stern freeboard at the time was 116 mm. After 2 hours and 45 minutes of operation, the fuel load had decreased, and the weight of the boat was 3,150 kg on an even keel; the freeboard was then 184 mm.

The overhung outboard motors had been bolted on to a structure 686 mm from the transom. They could not be mounted right on the transom because the axis of the propellers was too close, thus creating a problem in bringing enough water to the propellers.

### *1.10 TSB Engineering Laboratory Report*

In their statements, all witnesses agreed that greyish smoke issued from the exhaust pipes of the motors even before they stalled. This indicates the presence of water in the fuel. Furthermore, the TSB Engineering Laboratory examined the two outboard motors of the "TAN 1" and noted, among other things, traces of prolonged contamination and deposits of salt and other substances in the fuel supply systems at the carburetors and other components.

The substances contaminating the fuel had to have come from the fuel tank. Several deficiencies were noted in the design of the tank, which quite clearly did not meet the Construction Standards for Small Vessels, Part IV.





## 2.0 *Analysis*

### 2.1 *Departure Preparations*

The operator of the boat has worked as a fisherman since 1974 and occasionally serves as master of small passenger-carrying boats for TAN Inc. At the time of departure, the operator had had a rest period and the 1500 cruise was to be his first of the day.

Before departure, the operator checked the fuel and the oil and started both engines, which turned over promptly. He then reported his departure and the number of persons on board to VTC Les Escoumins. The passengers received no pre-departure safety briefings, but they were told to distribute themselves evenly in the boat. The place where the lifejackets were stowed was not clearly indicated.

### 2.2 *Flooding of the Boat*

Because of the state of the sea on the St. Lawrence River, the boat stayed close to the shore during the cruise. When the boat travels at reduced speed or is still, water can enter through the opening in the transom, but when the boat speeds up, the water flows outward because of the Venturi effect.

Water began to flood the boat by the stern when both motors failed. The passengers were up to their knees in water when the pressure of the water accumulated in the bottom lifted the lid of the locker where the lifejackets were stowed. The passengers donned the lifejackets, but, before they could fasten them properly, the boat capsized and sank by the stern.

### 2.3 *Passenger Survival*

When the "TAN 1" capsized, nine passengers and the operator were rescued by the "TAN 3", which was a short distance from the scene of the sinking. The three other passengers clung to the bow of the "TAN 1" until they were rescued by two other Zodiac-type inflatables operating in the area and by the pilot boat.

Although they were worn, the wetsuits did enable the passengers to remain afloat and did slow the loss of body heat, thereby preventing hypothermia.

The operator of the boat was wearing a buoyancy vest and rubber boots. He had to be admitted to hospital where he was treated for a drop in his body temperature. Three passengers who were wearing wetsuits had to be treated because they were chilled.

## 2.4 *Design of the Fuel Supply System*

Laboratory tests were performed to analyze the likely reasons for the two outboard motors stalling. The boat's owner stated that the starboard motor had stalled a number of times since the beginning of the season. The boat had returned to the wharf several times from a cruise with only one motor working. These intermittent failures were at least partly due to the accumulation of water in the needle valves of the carburetors. When water accumulates in a carburetor, the fuel is held momentarily toward the cylinders, and the engine stalls.

Furthermore, the fuel supply system was fitted with four coalescing paper filters that were not designed to retain water from the fuel. However, there are filters on the market, specifically designed for marine use, that do retain water from fuel before it reaches the carburetor.

A water accumulator of the type used for recreational vehicles had been installed in the tank of the "TAN 1"; this suggests that the owner was worried about the presence of water in the fuel.

This type of accumulator, however, is designed to recover water in a fuel tank caused by condensation where the quantity of fuel is small. The fuel also could have been contaminated with water through the supply system as well as through the vent pipe, which had no mechanism to prevent water from leaking in.

The suction in the tank for supplying the starboard motor was 30 mm behind the one serving the port motor; during acceleration, the water, with a specific density greater than that of fuel (in the present case, gasoline), moved toward the back of the tank thereby causing the intermittent failures due to suction of water rather than fuel.

## 2.5 *Arrangements to Counteract Flooding*

The boat was fitted with two bilge pumps; one manual and the other electric. The manual pump, fitted on the port side of the boat near the steering position, was not operational because the inlet and outlet couplings were not connected and the piece of wood used as a lever to operate the pump was missing. The electric pump, with a capacity of approximately 9,000 litres an hour, was connected to a three-way switch (Auto, Off, Manual) as indicated on the control console; it was connected to a fuse and an indicator light. The DC power supply was checked, and the fuse was in good condition.

It was further observed that when the switch was set to "Manual", the bilge pump could operate continuously only if the switch was kept in that position. When the boat reached the TSB Engineering Laboratory, the bilge pump switch was set to "Auto". In this position, the pump operates only if it is connected to a float indicating the water level, and it comes on when water is detected accumulating in the bilges.

In the course of the laboratory tests, it was noted that the indicator light, located above the bilge pump switch, was not connected to any power source. No float or wiring which could have served such a purpose was found in the hold. The bilge pump was removed and tested, and it proved to be in good working order. Nothing indicates that the operator was aware that the bilge pump was not operational.



## 3.0 *Conclusions*

### 3.1 *Findings*

1. The fuel was contaminated because the fuel tank and fuel filters of the fuel supply system were inadequate.
2. The "TAN 1" capsized because there was no effective means of evacuating water which accumulated on board. Neither the manual nor the electric bilge pump was operational before departure.
3. The capsizing of the "TAN 1" happened unexpectedly, and all the occupants were thrown into the water.
4. The location of the lifejackets was not indicated and the passengers had received no safety instructions regarding the lifejackets before departure.
5. The operator was wearing a Mustang vest whereas the passengers were all wearing wetsuits, some of which had holes in them. The operator and three passengers were chilled when they were rescued.
6. Considering the design of the boat and the condition of the motors, the "TAN 1" was not seaworthy.

### 3.2 *Causes*

The outboard motors of the "TAN 1" stalled and could not be restarted because the fuel was contaminated with water. Shortly thereafter, the drifting boat was flooded by the stern and eventually capsized.



## 4.0 *Safety Action*

### 4.1 *Action Taken*

#### 4.1.1 *Seaworthiness*

In March 1994, the TSB Engineering Laboratory examined the "TAN 1" and produced a survey report. In May 1994, the Canadian Coast Guard (CCG) was informed of safety deficiencies that jeopardized the seaworthiness of the "TAN 1", in particular: water contamination of the fuel due to the size and location of the vent pipe and to the lack of a marine filter to retain water; the fuel gauge on the control console was not connected to a level detector in the tank; the filling hole of the fuel tank was cracked and the cap had two vent holes through which water could enter the tank; several other shortcomings of the tank constituted a fire hazard; the motor control levers were improperly adjusted; the electric and the manual bilge pumps were not operational; and the boat did not meet the Construction Standards for Small Vessels (TP 1332) from Transport Canada.

Although the "TAN 1" was not legally bound to meet the regulatory requirements, the CCG, upon receipt of the TSB letter, provided technical advice to the owner of the "TAN 1" with a view to remedy the deficiencies noted.

#### 4.1.2 *Modifications*

In 1994, the owner made several improvements to the "TAN 1": the stern was enclosed and six watertight tanks were built along the sides of the boat; a stern watertight tank provides more flotation under the motors; two 250-litre fuel tanks were installed in a watertight compartment fitted with a fume detector and a bilge air vent; the filters of the fuel supply system were replaced; two new outboard motors (200 HP each) were installed; a new electric and manual bilge pumping device was installed; the control console was modified to incorporate the very high frequency (VHF) radio antenna and a more efficient radar reflector. A new radar and an independently battery-powered radiotelephone were added to make the boat safer.

#### 4.1.3 *Safety of Small Sight-seeing Boats*

In its report on the investigation into the grounding of the "TAN 1" on 11 August 1993, the TSB issued three marine safety recommendations aimed at making small sight-seeing boats safer (TSB Report No. M93L0003). The Board recommended that:

The Department of Transport develop training standards and certification requirements for the operators of small sight-seeing boats that carry fare-paying passengers;

(M96-01, issued April 1996)



The Department of Transport amend the regulations to require sight-seeing boats that carry fare-paying passengers to be fitted with adequate radio equipment and to report to the VTC, before departure, the number of persons on board; and

(M96-02, issued April 1996)

The Department of Transport and the Department of Fisheries and Oceans, in cooperation with police forces and SAR personnel, explore means of improving the monitoring and inspection of small passenger-carrying commercial vessels.

(M96-03, issued April 1996)

## 4.2 *Action Required*

### 4.2.1 *Construction Standards and CCG Inspections*

The "TAN 1" and other similar five-ton category boats are not required to undergo CCG safety inspections as prescribed in the Hull Inspection Regulations. The TSB Engineering Laboratory tests revealed several deficiencies, inter alia, regarding the construction of the hull, the fuel tank and the maintenance of the motors. Furthermore, the substandard design and construction of the fuel tank and stern transom allowed the ingress of seawater into the fuel tank which led to the contamination of the fuel supply system of both outboard motors. In addition, the defective bilge pumps were unable to discharge the water and there was no other means to bail the water. Under these conditions, the "TAN 1" was not seaworthy, and capsized.

In 1993, as a parallel measure to the by-then defunct "Small Passenger Vessel Compliance Program", the Quebec office of the Ship Safety Branch of the CCG randomly inspected 18 small sight-seeing boats in the area of Tadoussac, Quebec. None of these boats complied with the regulations as safety equipment was either defective or missing altogether, and notices were issued to that effect. The most common deficiencies noted were lifejackets; navigation lights; radio operator's certificates; radar reflectors; distress signals; lifebuoys; fire extinguishers; anchors, and bilge pumps.

Every year, more than 40 sight-seeing boats are operated in the Tadoussac area without having been inspected by the CCG, but the passengers who board these small boats assume that they are seaworthy and safe. In the Laurentian region, there are more than 100 boats of all shapes and sizes offering sight-seeing cruises.

In the absence of mandatory requirements, CCG surveyors do not have the necessary regulatory instruments to improve the safety of these boats. They rely on the operators to maintain their boats in a seaworthy condition. However, many operators do not have the level of knowledge necessary to properly assess the safety shortcomings. As a result, passengers are unwittingly exposed to inherently unsafe operations in that the vessels they

board may not be seaworthy or the life-saving or emergency equipment may not be adequate. The Board therefore recommends that:

The Department of Transport require all small boats that carry fare-paying passengers to undergo safety inspections to ensure their seaworthiness and operational safety.

M96-04

#### 4.2.2 *Safety Instructions*

Every year, often in adverse weather conditions, a large number of small sight-seeing boats carry passengers along the St. Lawrence estuary. The vast majority of these passengers are not familiar with the life-saving equipment and survival techniques used in marine emergency situations. Normally, the passengers are not informed of safety measures to be taken under normal conditions and in emergency situations.

Indeed, in this occurrence, the passengers had no knowledge of the location or use of the lifejackets carried on board since they had received no pre-departure instructions regarding the life-saving equipment.

Given the operating conditions and the lack of formal safety and operating standards, the Board believes that, in order to reduce the severity of accidents and to better prepare for emergency situations, passengers must be well informed of any safety precautions and measures that apply to them. Therefore, the Board recommends that:

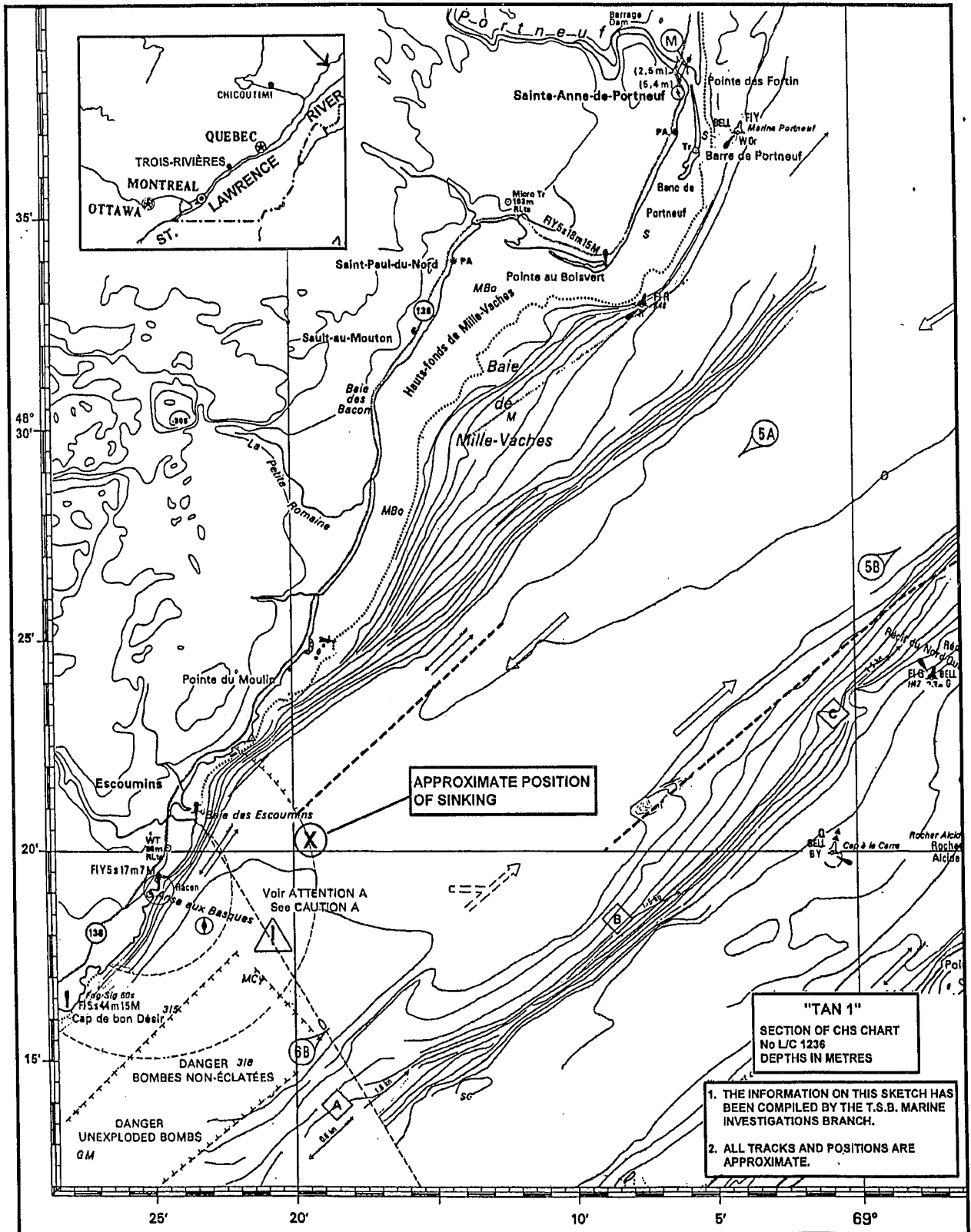
The Department of Transport require the operators of small sight-seeing boats to provide pre-departure safety instructions to the passengers for normal operating conditions and for emergency situations.

M96-05

*This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson, John W. Stants, and members Zita Brunet and Maurice Harquail, authorized the release of this report on 28 February 1996.*

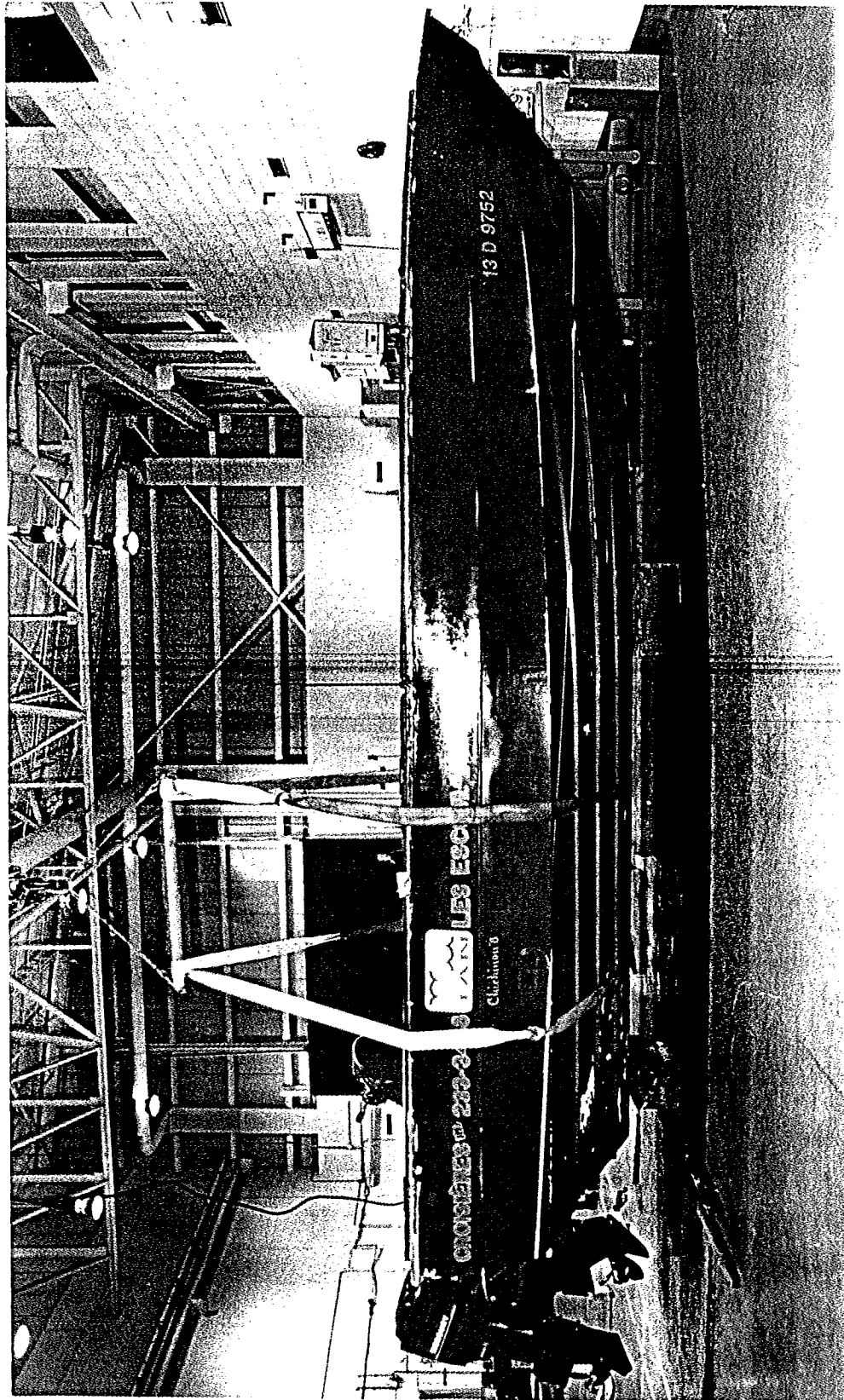


Appendix A - Sketch of the Area of the Occurrence





Appendix B - Photograph





## Appendix C - Glossary

C	Celsius
CCG	Canadian Coast Guard
CSA	<i>Canada Shipping Act</i>
EDT	eastern daylight time
HP	horsepower
IMO	International Maritime Organization
kg	kilogram(s)
m	metre(s)
MED	Marine Emergency Duties
mm	millimetre(s)
SI	International System (of units)
TSB	Transportation Safety Board of Canada
UTC	Coordinated Universal Time
VHF	very high frequency
VTC	Vessel Traffic Centre
°	degree(s)