

MARINE INVESTIGATION REPORT

M98M0061

COLLISION

BETWEEN

THE FAST FERRY CATAMARAN "INCAT 046"

AND

THE FISHING BOAT "LADY MEGAN II"

YARMOUTH HARBOUR, NOVA SCOTIA

4 SEPTEMBER 1998

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

### Collision

Between

The Fast Ferry Catamaran "INCAT 046"

and

The Fishing Boat "LADY MEGAN II"

Yarmouth Harbour, Nova Scotia

4 September 1998

Report Number M98M0061

### *Summary*

The fast ferry catamaran "INCAT 046" left Yarmouth, Nova Scotia, for a scheduled crossing to Bar Harbor, Maine, U.S.A. Visibility was near zero in thick fog. Meanwhile, the fishing vessel "LADY MEGAN II" was approaching Yarmouth Harbour after a fishing trip off the Nova Scotia coast. The navigating personnel of both vessels were using radar as the primary instrument to position their vessels. A few minutes after having agreed on a port-to-port passage in the area of a fixed light commonly known as "Bug Light", the vessels collided in the narrow Main Channel. The master of the fishing vessel sustained fatal injuries.

*Ce rapport est également disponible en français.*



## *Other Factual Information*

### *Particulars of the Vessels*

	<b>"INCAT 046"</b>	<b>"LADY MEGAN II"</b>
Port of Registry	Nassau, Bahamas	Digby, N. S.
Flag	Bahamas	Canada
Registry Number	730598	372335
Type	Wave-piercing catamaran	Fishing vessel
Gross Tons <sup>1</sup>	5617	82
Length	91 m	17 m
Draught	Forward: 3.2 m    Aft: 3.4 m	Forward: 2.1 m    Aft: 3.0 m
Built	1997, Hobart, Australia	1980, Meteghan River, N.S.
Propulsion	Four Ruston 20 RK 270 medium-speed diesel engines	Cummins KTA-1150, 500 hp.
Crew	23	3
Passengers	113	None
Registered Owner	Bay Ferries Limited Saint John, N.B.	Yarmouth Sea Products Yarmouth, N.S.

### *Description of the Vessels*

The "INCAT 046" is a wave-piercing fast ferry catamaran propelled by water-jets, with a service speed of 41 knots. Due to the high speed of the vessel, open deck space is reduced to a minimum. Passenger capacity is 762 with a minimum crew of 22. The car deck can accommodate up to 240 vehicles. The enclosed bridge of the vessel is modern in design. The arrangement is such that the officer conning the ship occupies the centre of three seats in front of a console which is located at the centre line of the wheelhouse with a navigator immediately to the right and an engineer to the immediate left. Steering is by means of a small wheel on the console.

Bay Ferries Limited, owner of the "INCAT 046", was International Safety Management (ISM) Code certified, valid at the time of the occurrence.

The "LADY MEGAN II" is a stern trawler of a design common in the Maritimes. The bridge was equipped with, among other equipment, two radars and a global positioning system (GPS) connected to a personal

<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.

computer operating electronic chart software. The vessel was operated by a crew of three, consisting of a skipper and two deckhands.

### *History of the Voyage*

On 4 September 1998, the "LADY MEGAN II" was inbound to Yarmouth Harbour after a two-day fishing trip on George's Bank. The engine was set to full power ahead which gave her a speed of nine knots through the water. The skipper had the con and handled all communications. A deckhand was in the wheelhouse but was not participating in the navigation of the vessel. The navigation was primarily done by means of radar. An electronic chart system using a raster chart coupled to the GPS was in operation and used as a secondary means of navigation.

At 2246 Atlantic daylight time,<sup>2</sup> the "LADY MEGAN II" contacted Saint John Marine Communications and Traffic Services (MCTS), known locally as "Fundy Traffic," and enquired about traffic in Yarmouth Harbour. She was told that the "INCAT 046" was currently inbound to Yarmouth Harbour and that she intended to sail the same evening at 2315.

At 2324, the "INCAT 046" departed her berth in Yarmouth Harbour for her run to Bar Harbor. The visibility was restricted in thick fog. No pilot was on board since there are no pilotage requirements in place in the area of this occurrence. The master had the con and was assisted by a navigator, the chief engineer and a lookout posted on the starboard wing. Three engines were in service at this time. The navigator was in charge of handling communications with Fundy Traffic and any other vessel in the area. He also recommended courses to steer to the master. Navigation and collision avoidance were primarily done by means of radar.

While the ferry was being swung round off her berth, the navigator contacted Fundy Traffic to report departure. He then made radio contact with the "LADY MEGAN II". The "INCAT 046" was informed of the position of the fishing vessel and that it would hold off south of Bug Light<sup>3</sup> until the "INCAT 046" had passed "LADY MEGAN II".

After having swung, the ferry proceeded southbound toward the mouth of the harbour. Speed was gradually increased to about 13.4 knots through the water. The ebbing tide created a southerly current of about 2 knots. The Differential Global Positioning System (DGPS) indicated a speed made good of 15.4 knots.

The master, advised by the navigator, steered the ferry in the centre of the Main Channel. At 2333:35, the "INCAT 046" received a radio call from the "LADY MEGAN II". The skipper of the fishing vessel informed the crew of the ferry that the ferry was on his radar and that he had changed his intentions and he was now intending to go around Bug Light and wait on the east side of the Main Channel for the "INCAT 046" to pass by. The "INCAT 046" informed the "LADY MEGAN II" that she would round Bug Light in "probably about two minutes". The "LADY MEGAN II" informed the ferry that she should be around the light by then,

---

<sup>2</sup> All times are Atlantic daylight time (coordinated universal time minus three hours).

<sup>3</sup> "Bug Light" is the common name given to the light positioned on the southwest point of Bunker Island, No. H3826, position 43°48'44.5" N, 066°08'36.5" W.

reiterated her intention to hold off to the east of the Main Channel and confirmed a port-to-port passage. The engine setting of the fishing vessel was kept at the full speed ahead setting, a speed of about nine knots through the water. The "LADY MEGAN II" was also a target on the ferry's radars.

A second deckhand entered the wheelhouse of the "LADY MEGAN II" at this time and was asked to look out for the "INCAT 046". The first deckhand stood in the back of the wheelhouse without any particular duty. Meanwhile, the master of the "INCAT 046" altered course to starboard and took the ferry to the western edge of the 76 m wide channel. The shallow draught of the ferry allowed for her starboard side to be outside the Main Channel. The vessel's engine setting was changed to reduce speed to about eight knots. However, the vessel was still slowing down and was making about 11.2 knots over the ground when emergency procedures were taken.

At 2335:25, about 37 seconds after the end of the last communication, the navigator of the "INCAT 046" informed the master that the "LADY MEGAN II" was crossing ahead of the bow of the "INCAT 046". The engines were then set to stop. A few seconds later, the mast light and the green side light of the "LADY MEGAN II" were sighted close on the bow of the ferry. Her red side light also appeared soon after. The engines were then set to full power astern. The navigator of the "INCAT 046" called on the VHF radio for the "LADY MEGAN II" to alter course to starboard.

On the "LADY MEGAN II", the lookout suddenly sighted the forward white mast light of the "INCAT 046" dead ahead at close proximity. The hull of the "INCAT 046" was sighted shortly thereafter. He shouted to the other crew members to hold on, ducked and got down on the deck. The other crew member ran outside while the master kept his post at the conning station.

The collision occurred at about 2335:45, 111 m northwest of Bug Light on the western edge of the Main Channel at position 43°48.779' N, 066°08.665' W. Due to the design of the fast ferry catamaran, the fishing vessel did not glance off the hull, as commonly happens during a bow-on collision between a small and a large vessel. The fishing vessel's wheelhouse collapsed on impact with the underside of the weather deck, between the port pontoon and the centre hull of the "INCAT 046".

During the inspection of the "LADY MEGAN II" wreckage, the engine controls were found in the full power astern setting and the rudder in the hard-to-starboard position.

### *Rescue Operation*

Immediately after the occurrence, the "INCAT 046" reported the collision to Fundy Traffic, which in turn reported it to Rescue Coordination Centre (RCC) Halifax. The CCGC "WESTPORT" was the Search and Rescue (SAR) vessel closest to the scene of the occurrence and was immediately tasked to assist. However, the "WESTPORT" was in Westport, N.S., which is about two hours' steaming from Yarmouth. RCC also contacted the Yarmouth Royal Canadian Mounted Police (RCMP) detachment and the Yarmouth fire department. Meanwhile, the "INCAT 046" launched an inflatable craft (Zodiac) to locate the "LADY MEGAN II" which was believed to be underneath the ferry. Due to the complete darkness under the catamaran, it took seven minutes to locate the fishing vessel. All three crew members of the fishing vessel were accounted for. However, the master was trapped in the wheelhouse between his chair and the collapsed deckhead. Several unsuccessful

attempts were made by the crews of the both vessels involved to free the master while the fishing vessel was still under the ferry.

At about 0048, the fishing vessel "SECORD 1" arrived on the scene with members of the RCMP and fire department on board. After paramedics examined the injured master, they advised that it was imperative to free him as soon as possible. The decision was then taken to tow the "LADY MEGAN II" out from underneath the "INCAT 046" using the "SECORD 1". While the crew of the "INCAT 046" transferred water ballast and moved the vehicles aft on the car deck to trim the vessel by the stern, the "SECORD 1" positioned herself to pull the "LADY MEGAN II" free of the ferry. The fishing warp of the "LADY MEGAN II" was made fast to the "SECORD 1". At about 0130, after two attempts, the "LADY MEGAN II" was freed from under the "INCAT 046".

The paramedics were transferred on board the "LADY MEGAN II" but were too late to revive the master. The fishing vessel was towed to Yarmouth where the body of the master was removed from the wreckage.

### *Injuries to Persons*

#### *"INCAT 046"*

None of the 113 passengers or 23 crew members was injured.

#### *"LADY MEGAN II"*

The master of the fishing vessel sustained fatal injuries when, as a result of the collision, the wheelhouse collapsed and trapped him in his chair at the conning position. One crew member suffered some scratches and the other crew member was not physically injured.

### *Damage to the Vessels*

#### *"INCAT 046"*

The "INCAT 046" sustained minor damage underneath the car deck, which is classified as a weather deck. Minor damage to the deck did not compromise the seaworthiness of the vessel.

#### *"LADY MEGAN II"*

The "LADY MEGAN II" sustained major damage. The wheelhouse, masts and rigging of the fishing vessel collapsed after contacting the section of the hull of the ferry underneath the car deck.

### *Certification*

#### *Vessels*

The “INCAT 046” was crewed, certificated and equipped in accordance with international conventions. The vessel complies with the *International Code of Safety for High-Speed Craft* (HSC Code). The “INCAT 046” was validly certified as being ISM compliant.

### *Personnel*

The master and officers of both vessels were in possession of valid certificates for their positions and the trade in which they were engaged.

### *Personnel History*

#### *“INCAT 046”*

##### *The Master*

The master had 20 years’ experience, most of which was on the eastern seaboard. He was certificated as Master, Intermediate Voyage. He received type rating training at the Australian Marine College in April 1998 and was issued a High-Speed Craft type rating certificate in May 1998. He was familiar with the geography of Yarmouth Harbour.

The master was working within the crew duty hours policy adopted by the company. Analysis of the master’s activity for the last 72 hours before the collision indicates that fatigue was not an issue affecting his performance at the time of the occurrence.

##### *The Navigator*

The navigator had 19 years’ seagoing experience, 15 of those years were served as a ship’s officer on ferries. He was certificated as Master, Intermediate Voyage. He received type rating training at the Australian Marine College in April 1998 and was issued a High-Speed Craft type rating certificate in May 1998. He was familiar with the geography of Yarmouth Harbour.

The navigator was working within the crew duty hours policy adopted by the company. Analysis of the navigator’s activity for the last 72 hours before the collision indicates that fatigue was not an issue affecting his performance at the time of the occurrence.

#### *“LADY MEGAN II”*

##### *The Skipper*

The skipper of the “LADY MEGAN II” had 18 years’ experience, about 10 of those years were served as master/skipper of fishing vessels. The majority of this experience was acquired on vessels having Yarmouth as home port. He was certificated as Fishing Master Class 2. As holder of this certificate, the master had received formal training in the operation of radar (Simulated Electronic Navigation—SEN 1).

He was thoroughly familiar with the geography of Yarmouth Harbour. Based upon a reconstructed 72-hour history from statements made by the survivors of the "LADY MEGAN II", the master was well rested at the time of the occurrence.

## *Weather and Current*

### *Weather*

At the time of the occurrence the winds were calm and thick fog was present in Yarmouth Harbour. Visibility was almost zero.

### *Current*

At 2335:45, the time of the collision, the tide was ebbing, causing a southerly current of about two knots in the Bug Light area.

## *Navigation Equipment*

### *Radars*

The "INCAT 046" carries two Racal Decca Bridgemaster 250 radars. One of the radars transmits on X-band and the other on S-band. The slotted waveguide antenna is 2.4 m in length for the X-band and 3.5 m in length for the S-band. The antennae produce a beam of one degree and two degrees in width, respectively. Side lobe attenuation within 10 degrees of the main lobe is -23 dB or less, and outside 10 degrees of the main lobe it is -30 dB for both radars. These radars have Automatic Radar Plotting Aid (ARPA) capabilities.

The "LADY MEGAN II" carried two Furuno radars: a model FR-1011 and a model 1830, both transmitting on X-band. The radar primarily used for navigation was the model 1830. Its "10 inch" rectangular daylight display measures 6×8 inches. The slotted waveguide antenna is 54 cm in length and produces a beam of four degrees horizontally. Side lobe attenuation within 20 degrees of the main lobe is -18 dB or less, and outside 20 degrees of the main lobe it is -23 dB or less.

### *Side Lights*

The side lights of the "INCAT 046" are mounted at frame 33 on each side of the vessel, 7.156 m above the waterline and about 45 m from the stem. They are separated by a distance athwartships of 24.5 m. The angle between a line parallel to the centre line of the vessel and the line of sight of the side lights is one degree inward. At such an angle and separation, the calculated minimum distance to see both lights simultaneously, if an observer is positioned right ahead of the vessel on the centre line, is 700 m. However, an inspection of the vessel showed a minimum distance of visibility for the simultaneous sighting of both side lights of 342 m. The characteristics of the side lights are within the limits of the criteria stipulated in the Dynamically Supported Craft Code.

### *Speeds and Stopping Distance*

After the collision, a speed trial was performed on board the “INCAT 046” with three engines in service, as they were the night of the collision, to determine the crash stop distance of the vessel. This was done by taking her to a preset speed and then setting the engine control to 100 per cent power astern. At a speed of 10 knots the ferry was able to come to a complete stop within 111 m, in about 30 seconds. The speed was then increased to 14 knots and the test performed again. The ferry was able to stop within 163 m, in about 45 seconds.

### *Bridge Procedures*

The bridge procedures on the “INCAT 046” are laid out in the ISM documentation of the ship. This documentation stresses that sound Bridge Resource Management (BRM) principles must be applied throughout each voyage. BRM principles were being applied the night of the occurrence.

The bridge of the ferry is designed to facilitate the application of BRM principles. The conning officer sits at the centre console and has access to, among other instruments, a radar, engine controls and communication equipment. The navigator sits immediately to the right of the conning officer and uses a second radar set and an Electronic Chart Display and Information System (ECDIS) to help him advise the conning officer of navigation information (course to steer, speed, dangers to navigation, traffic, radio communication, etc.). The conning officer also receives data from the chief engineer on matters related to the propulsion system of the vessel.

The bridge of the “LADY MEGAN II” is designed to be crewed by one person. Three crew members were in the wheelhouse, but the design of the wheelhouse is such that only one person can use the navigation instruments. As a result, the participation of one deckhand in the navigation was limited to assisting the skipper as a lookout. Thus, the conning officer could not and did not receive navigation information from the other crew members.

### *Lookout Requirements*

The “LADY MEGAN II” had posted a lookout one minute before the collision. The lookout was posted on the port side inside the wheelhouse.

The “INCAT 046” had posted a lookout about 10 minutes before the collision. The lookout was posted inside the wheelhouse on the starboard wing.

### *Fast Ferry and Close Quarters Situations*

Since beginning operation in May 1998, the “INCAT 046” had been involved in one reported close quarters situation in Yarmouth Harbour area. That occurrence, which also involved a fishing vessel, occurred on 21 July 1998 and was reported in writing to the TSB. In dense fog, an unidentified fishing vessel was detected on a collision course. The ferry took all way off and had stern way when the fishing vessel became visible. The unidentified fishing vessel reportedly altered course a few metres away from the ferry and avoided the collision. The unidentified fishing vessel did not report the close quarters situation with the “INCAT 046”.

## *Analysis*

### *Meeting Agreement*

The *International Regulations for Preventing Collisions at Sea, 1972* prescribe the actions to be taken when two vessels meet in a narrow channel. Rule 9(b) of these regulations prescribes that a vessel less than 20 m in length shall not impede the passage of a vessel which can navigate only within a narrow channel or fairway. The draught of the "INCAT 046" would have permitted her to navigate outside the Main Channel. However, the size of the "INCAT 046" and the configuration of Yarmouth Harbour in the area of Bug Light, would have made such navigation unsafe. Because of this, the 17 m long "LADY MEGAN II" was required to not impede the passage of the "INCAT 046".

The Canadian modifications of these regulations prescribe the actions to be taken when two power-driven vessels meet in a narrow channel or fairway where there is a current or tidal stream. Rule 9(k)(i) prescribes that the vessel proceeding with the current or tidal stream shall be the stand-on vessel and shall propose the place of passage and indicate the side on which she intends to pass. The next paragraph of the same rule prescribes that the vessel proceeding against the current or tidal stream shall keep out of the way of the vessel proceeding with the current or tidal stream and hold as necessary to permit safe passage.

The day of the occurrence, the moon was almost full and large tide ranges were expected. The collision happened one hour and 46 minutes after high tide. An ebbing current could be expected. In fact, after the collision occurred, the "INCAT 046" took all way off and drifted. Her drifting speed was southerly (outbound) at two knots.

The "INCAT 046" was the stand-on vessel and the "LADY MEGAN II" the give-way vessel. As such, the "INCAT 046" was to propose the place at which the vessels would pass and indicate on which side she intended to pass. Although the navigation team of the "INCAT 046" did not specifically propose where the vessels would pass, the navigator initiated a call to "LADY MEGAN II", following Fundy Traffic instruction. The information received on the bridge of the "INCAT 046" was that the "LADY MEGAN II" intended to hold her position south of Bug Light. This agreement was acceptable to both vessels for a safe passage.

A few minutes before reaching the agreed-upon position for the passing of the vessels, the skipper of the "LADY MEGAN II" initiated a call to inform the ferry that he had decided to change the meeting agreement. At this time, the "INCAT 046" was already committed to the narrowest section of the Main Channel. Since the crew of the "INCAT 046" did not have the authority to specifically forbid such a change of plan, they informed the fishing vessel, without objecting to the new passage agreement, that the catamaran should be ready to come around the turn near Bug Light in possibly about two minutes. The master of the "INCAT 046" confirmed with the skipper of the "LADY MEGAN II" a port-to-port passing and manoeuvred his vessel beyond the western edge of the Main Channel. This was intended to allow maximum distance between the vessels at the time of the passing.

The collision occurred about one minute following this last communication. Although the "LADY MEGAN II" had the "INCAT 046" on her radar, the possible two minutes time interval communicated might have reinforced the decision of the skipper of the "LADY MEGAN II" to change the passage agreement.

### *Place of Passage*

Both vessels initially agreed to meet south of Bug Light. The “LADY MEGAN II” was to hold off until the “INCAT 046” had proceeded through the narrow channel and passed the bend around Bug Light. This place of passage was at a point where the Main Channel is 118 m wide and where the depth to the east of the channel would allow a vessel like the “LADY MEGAN II” to proceed in case of emergency.

The second place of passage agreed to was north of Bug Light. This place is situated where the Main Channel is only 76 m wide. Also, the depth to the east of the Main Channel at that point did not allow the inbound fishing vessel to proceed outside the Main Channel in case of emergency.

The “INCAT 046” has a beam of 23.8 m and the “LADY MEGAN II” has a beam of 6.7 m. If the first passing agreement had been carried out, the maximum distance between the vessels at the time of the passing would have been 87.5 m. The second place of passage proposed gave a narrower berth between the vessels of 45.5 m. Also, the second place of passage agreed upon did not allow the inbound fishing vessel to proceed outside the Main Channel if necessary. Since the fishing vessel could not leave the Main Channel at the second place of passage, the skipper had to keep a margin of safety between the bank and the starboard side of his vessel, which further reduced the distance available between both vessels.

Considering the above, the first agreed-upon passing place was safer than the place where the vessels met.

### *Marine Communications and Traffic Services*

The role of the Marine Communications and Traffic Services is of providing information. Notice to Mariners number 25 states that there is no intention of the part of the Coast Guard to attempt to navigate or manoeuvre ships from a shore station and nothing in the Notice overrides the authority of the master of his responsibility for the safe navigation of his ship. Information passed to the master by MCTS is intended to assist him in the safe conduct of his ship. However, a MCTS officer may, under specific circumstances, issue a direction to a ship and the ship shall comply with a direction.

At about the time of the occurrence, only the “INCAT 046” and the “LADY MEGAN II” were reported in movement in Yarmouth Harbour warranting the issuance of directions. MCTS interacted with both vessels through the exchange of information only. The responsibility to navigate the vessels rested with their crews.

### *Position of the Collision*

As previously mentioned, the “INCAT 046” was equipped with an ECDIS, which receives navigational data from a DGPS. The DGPS is a positioning system with an accuracy of 10 m or better, 95 per cent of the time. There is no record of malfunction of the closest DGPS stations, nor of the “INCAT 046”'s DGPS equipment, at the time of the occurrence. The ECDIS system recorded that the shore station signal was received by the DGPS and positions displayed were corrected to DGPS accuracy. The ECDIS system in use on board the “INCAT 046” is a personal computer-(PC) based system that has the capability of automatically recording several days of past navigational data in memory. The data is recorded as received from the DGPS. It was possible to play

back the track of the “INCAT 046”. The track shows the DGPS positions of the “INCAT 046” at 10-second intervals for the day of the occurrence.

The “LADY MEGAN II” was equipped with a PC loaded with an electronic charting system. This PC was receiving navigational data from a GPS. Although this system was also capable of recording track, it had not been configured to do so by the operator. This option was not selected the night of the occurrence; therefore, it was not possible to play back the fishing vessel’s track for the 41 minutes prior to the collision.

GPS receivers have the capability of saving in memory the last few positions received before they are turned off. The GPS of the “LADY MEGAN II” was also analysed. There were 10 positions saved in the GPS memory. The last position stored in the memory was the closest one to the collision’s position. However, this last position—locating the “LADY MEGAN II” at 43°48.79' N, 066°08.63' W—does not appear, on close examination, to be totally accurate. This may be explained by the fact that the antenna of the “LADY MEGAN II” was damaged during the collision before power to the GPS was cut off.

Although the two recovered positions were slightly different it should be noted that the “INCAT 046” as well as the “LADY MEGAN II” were using radar for navigation. The DGPS positions confirm that the collision occurred on the western edge of the channel.

### *Radar Detection*

The navigator and master of the “INCAT 046” could see the “LADY MEGAN II” on radar. However, they could not make an automatic plot of the fishing vessel due to its close proximity to the navigational buoys. Furthermore, automatic plotting of a target vessel negotiating a bend in a narrow channel, at close proximity, would be at best of limited value. The navigator was watching the progress of the fishing vessel on his radar and estimating the fishing vessel’s movement.

The “LADY MEGAN II” was equipped with two radars. Both were in operation when she proceeded into the harbour. The Furuno radar model FR-1011 was set on a range of 1.5 nm. This range would not allow the operator to use the radar effectively for collision avoidance in a channel as narrow as the Main Channel of Yarmouth Harbour. The Furuno radar model 1830 was the preferred radar for navigation in close quarters situations. It was not possible to determine to what range this radar had been set at the time of the collision. However, a witness recalled having seen the echo of the “INCAT 046” at the edge of the screen a few minutes before the collision. Because the distance between the vessels was about 0.75 nm at that time, it is most probable that the range of the radar was set to this distance.

The “INCAT 046” appeared as an echo about half an inch in diameter at the edge of the screen. This would indicate a strong echo return from the ferry. This echo return would be even more predominant as the target approached. Under such a condition, the phenomenon called “side lobe effect” would be experienced.<sup>4</sup>

---

<sup>4</sup> When the radar pulse is emitted from the antenna radiator, some of the emitted total energy escapes on each side of the main beam; this escaped energy is called side lobe. These side lobes bounce on the target and return to the antenna while the main beam is not yet in line with the target. This will be represented on the radar screen by several echoes appearing on each side of the true echo. As the strength of the return echo increases so does the size of the false echo, making it difficult to discriminate between the two.

Two trials were performed on ships equipped with radars similar to the radar utilised by the “LADY MEGAN II” for close-quarters situations. During these trials, the radars of both vessels experienced side lobe effect.

A few seconds before the collision, the “LADY MEGAN II” had Bug Light close on her starboard bow and the “INCAT 046” dead ahead of the vessel. With those two large metal structures at close proximity, it is likely that the side lobe effect was present. This effect would have made the echoes lack in clarity, thus making it difficult to define the “INCAT 046” on the radar screen of the “LADY MEGAN II”. However, due to the technical characteristics of the “INCAT 046” radars and to the fact that the “LADY MEGAN II” was not a large target, the side lobe effect was not significant on the radars of the “INCAT 046”. During post-occurrence sea trials, both radars were observed to pick up targets big and small and to display them clearly.

### *Speed*

Rule 6 of the *International Regulations for Preventing Collisions at Sea, 1972* prescribes that every vessel “shall at all times proceed at safe speed.” However, the rules do not dictate at what speed a vessel should proceed but enumerate factors to be taken into account when determining a safe speed.

*Inter alia*, the rules prescribe that all vessels should take into consideration the state of visibility, the traffic density and the manoeuvrability of the vessel. Also, vessels with operational radars must take into consideration, among other factors, the characteristics, efficiency and limitations of the radar equipment.

The term “safe speed” is relative. Vessels must proceed at a speed safe for the existing conditions. If a vessel is involved in a collision, it does not necessarily mean that the vessel was proceeding at an unsafe speed. As conditions change, the speed considered safe for a particular vessel also changes.

The speed of the “INCAT 046” was set to 13.4 knots over the water at the departure from the dock and kept steady until the passage agreement was modified. When this occurred the speed was reduced to 9.2 knots over the water and was still decreasing when emergency actions were taken. At 9.2 knots, the fast ferry catamaran can stop, in case of emergency, in less than 111 m.

The speed of the “LADY MEGAN II” was set to about 9 knots through the water (full speed ahead). At this speed, a small fishing vessel can stop in a short distance. Also, the only other traffic in the harbour, the “INCAT 046”, was visible on her radar. However, as both vessels approached each other, it is likely that the side lobe effect took place and the image on the radar screen of the “LADY MEGAN II” was not clear enough to allow the skipper to accurately determine the position of the “INCAT 046”. The conditions had deteriorated but the speed of the “LADY MEGAN II” was not reduced until emergency collision-avoidance action was taken.

### *Visibility of Side Lights*

The side lights of the “INCAT 046” are mounted at about mid-length of the vessel and 7.156 m above the waterline. From a position 100 m directly ahead of the vessel, the ship’s sides do not allow an approaching vessel to see the “INCAT 046” port and starboard side lights.

The navigating personnel of the “INCAT 046” were able to sight the running lights of the

“LADY MEGAN II” a few seconds before the collision and immediately estimate her relative course. However, it was not possible for the crew of the “LADY MEGAN II” to sight the side lights of the “INCAT 046” before the collision. In these close quarters circumstances, the fact that the crew of the “INCAT 046” could see the side lights of the “LADY MEGAN II” means that the crew of the “LADY MEGAN II” latterly could not see the side lights of the “INCAT 046” due to the design of the ship—and not because of bad visibility due to fog.

## *Conclusions*

### *Findings*

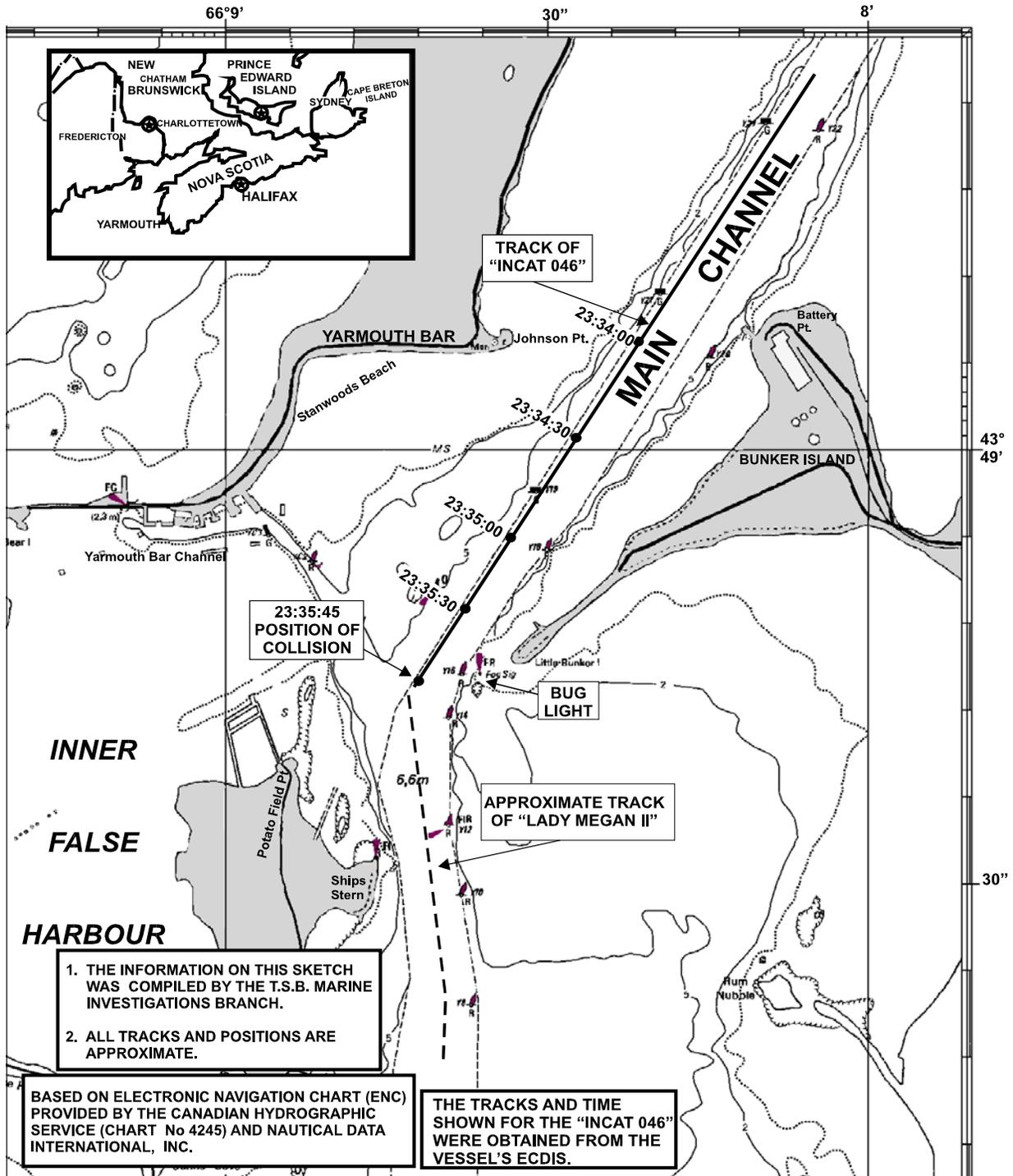
1. Visibility was reduced in thick fog, and navigation was conducted primarily with radar.
2. Both vessels had made radio contact and had agreed on a passing south of Bug Light.
3. Shortly afterwards, the skipper of the “LADY MEGAN II” notified “INCAT 046” of a change to the first passage agreement, which was acknowledged by “INCAT 046”.
4. The engine setting of the “LADY MEGAN II” was full speed ahead, which gave the fishing vessel a speed of about 9 knots through the water. Speed was not reduced after the passage agreement was modified and conditions changed.
5. The speed of the “INCAT 046” was reduced to 9.2 knots through the water and the vessel was steered to the western edge of the Main Channel after the passage agreement was modified and conditions changed.
6. It is likely that the radar of the “LADY MEGAN II” was affected by the close quarters phenomenon of side lobes—making it difficult to determine the exact position, course and speed of the “INCAT 046”.
7. It was not possible to determine to what range the radar used for navigation on the “LADY MEGAN II” was set at the time of the collision.
8. There was more room for both vessels to manoeuvre south of Bug Light as per the first agreement reached, than north of Bug Light where the vessels collided.
9. The “LADY MEGAN II” crossed over the 76 m wide channel and collided with the “INCAT 046” at the western edge of the Main Channel.
10. The crew of the “LADY MEGAN II” did not see the side lights of the “INCAT 046” at any time, initially because of the existing visibility and subsequently because the fishing vessel was close to the bow of the catamaran where her lights, positioned on the outside of each hull, were not visible.

### *Causes and Contributing Factors*

The "LADY MEGAN II" and the "INCAT 046" collided when the fishing vessel was steered across the Main Channel in the path of the ferry. Factors contributing to the accident were that the "LADY MEGAN II" did not adhere to either the original or second passing agreement and did not reduce speed when the conditions of navigation changed. Also, the "INCAT 046" did not challenge the proposed second passage agreement.

*This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 8 August 2000.*

Appendix A - Sketch of the Occurrence Area





*Appendix B - Photographs*



