MARINE OCCURRENCE REPORT

GROUNDING

OF THE RO/RO FERRY "JOHN HAMILTON GRAY"
BORDEN HARBOUR, PRINCE EDWARD ISLAND
20 DECEMBER 1996

REPORT NUMBER M96M0176

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.

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Summary

Whilst attempting to depart Borden Harbour on a scheduled trip to Cape Tormentine, New Brunswick, the ferry, with 149 passengers and crew on board, grounded in the harbour. She remained aground for two days. No one was injured, there was no pollution and the vessel was undamaged by the grounding.

Other Factual Information

Particulars of the Vessel

	"JOHN HAMILTON GRAY"
Official Number	228838
Flag	Canada
Type	Ro/Ro Passenger and Vehicle Ferry
Gross Tons	11,260
Length	117m
Crew (at time of grounding)	33
Passengers (at time of grounding)	116
Built	1968 Davie, Quebec
Propulsion	Quadruple screw; Diesel - Electric.
Owners	Marine Atlantic, Moncton N.B.

Vessel Design

The vessel is of unusual design. Eight Fairbanks Morse Diesel prime movers, four on the port side and four on the starboard side, each drive a generator which can supply 1,365 kW at 900 V. The total power output at the generators is 10,902 kW. There are four propellers: two forward and two aft. Each propeller is driven by an electric motor. The propulsion motors fitted forward are each rated at 3,751 kW while the propulsion motors fitted aft are rated at 5,002 kW.

The system is set up so that the port side prime mover/generator sets supply electrical power to the propulsion motors on that side of the vessel. There is an identical arrangement on the starboard side. Up to three prime mover/generator sets may supply the forward motor on each side while all four prime mover/generators may supply an after motor.

An electro-mechanical change-over switch permits the transfer of control of the engines from the navigating bridge to the after mooring position.

A single rudder is mounted on the centre line between the two after propellers. The vessel has neither bow nor stern thrusters.

The vessel can be manoeuvred from "full ahead" to "full astern" without any noticeable effect on the prime mover, thus providing an unusual degree of manoeuvrability. It is possible to turn this vessel in her own length.

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[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.

The vessel is fitted with two bower anchors, the hawse pipes for which are fitted above the forward propellers.

Bridge Equipment

The navigating bridge is forward, in which is mounted a central engine control console. On the console is a change-over switch to transfer engine control to the after mooring position, from which there is an unobstructed view of the fantail.

The change-of-power control handle had a history of poor performance. Two to three weeks earlier, when departing Borden, this handle failed and "came off" in the master's hand. This had happened several times over the last few years. A 10 cm shifting spanner was available for use in case of such an emergency.

The bridge is well equipped with aids to navigation as well as two Very High Frequency Radio Telephones (VHF-RT). A Navigational Telex (Navtex) receives local weather forecasts in a paper printout form. On the morning of December 20 there was no paper in this machine.

An examination of the printed display of the Navtex revealed that the legibility of the display characteristics was compromised. The bottom portion of each character was missing. The printout could be read but the quality of the display was such that it did not allow for rapid discrimination of the characters. When a display is cluttered or unclear, the user is required to expend some effort in understanding what is presented. If that effort is seen to be greater than the perceived gain, the user may choose not to use the display and the information therein.

The Berth at Borden

The berth/breakwater is fitted with mooring bollards from the terminal to nearly the end of the berth. The side of the berth is protected by heavy timber fendering and at the knuckle by heavy rubber sheathing.

Ferry Schedule

From December to April, Marine Atlantic operated two vessels, the "JOHN HAMILTON GRAY" and the "ABEGWEIT" to provide a 24-hour, seven-days-a-week, short-haul ferry service between Borden, P.E.I., and Cape Tormentine, N.B. The masters are familiar with the demands of this trade. Their ability to handle these vessels is reflected in the statistics: since 1974, there have been 293,000 crossings, transporting 38,212,713 people, without a significant incident.

In 1996 the "JOHN HAMILTON GRAY" made approximately 2,190 trips between Borden and Cape Tormentine; of these, the master on board at the time of the grounding had made approximately 525, all without incident.

Operating Procedures

In a normal docking operation, when approaching one mile off the entrance, the first mate goes aft to the after docking position and signals the master of his presence before the turning manoeuvre begins. Main engine control is then transferred to the after docking position, after which the first mate continues the manoeuvre started by the master. The master then goes aft to resume the conduct of the vessel, and performs the final manoeuvre into the berth.

The vessel is loaded and discharged, embarked and disembarked through the stern door over the fantail. She has no bow or side doors and Company rules are such that the stern door must be closed before leaving harbour.

On departing Borden (and Cape Tormentine) the master has the conduct of the vessel from the navigating bridge. After the passengers have embarked and the vehicles have been loaded, the mooring lines are let go and the vessel is moved ahead approximately 6 to 9m to enable the stern door to be closed.

Decision to Sail

The master is solely responsible for the decision to depart or to remain at a berth. Reportedly, the management of Marine Atlantic recognized the experience and knowledge of its masters and was fully supportive of their decisions. The master did not feel under any pressure from Marine Atlantic management to maintain the ferry's schedule, and this was not a factor in his decision to sail.

Weather Forecasts

There were no procedures or standing orders in place concerning the use of the VHF and the Navtex to obtain weather forecasts.

The two VHF-RT sets, with which the vessel was equipped, were not utilised to obtain marine weather forecasts. The Navtex had run out of paper.

The master's experience was that the weather forecasts he obtained from a local radio station were sufficiently accurate for marine use. He was aware that the wind force over water generally decreases when it blows over land.

A marine weather forecast broadcast in plain language by Environment Canada at 0530 on December 20 stated, in part: "Storm warning continued. Winds southerly 25 to gales 35 knots increasing to southerly gales 35 to 45 this morning and to westerly gales 45 to 60 this afternoon." This forecast was not recorded by the master being relieved nor passed onto the relieving master. The relieving master and first mate listened to local radio station weather broadcasts on their car radios before joining the vessel. The master heard that the winds were southwest 20-30 km (10–16 knots). No member of the bridge team obtained the forecast from the VHF radio, nor was the Navtex consulted.

A local radio station broadcast a wind warning, which stated in part: "Forecast for Prince Edward Island at 0500 AM AST Friday, December 20. For today, wind warning continued, winds southwest 50 km/hour (27 knots) increasing to southwest 60 (33 knots) gusting to 90 km hour (49 knots) this morning."

Environment Canada maintains weather recording stations on P.E.I. at the following locations: (1) Charlottetown Airport, (2) Summerside Airport, (3) East Point and (4) North Point.
At 0800, station 1 recorded winds of 190°(T) 28 knots, gusting to 40 knots; at 0700, station 2 recorded winds of 170°(T) 20 knots, gusting to 34 knots; at 0800, station 3 recorded winds of 180°(T) 28 knots, gusting to 33 knots and, at 0800, station 4 recorded winds of 200°(T) 20 knots, gusting to 38 knots.

At 0900 these stations were reporting winds of (1) 220°(T) x 52 knots, (2) no report, (3) 250°(T) x 40 knots and (4) 210° x 50 knots.

Public forecasts for early Friday, December 20, were warning of winds from the southwest at 60 km (33 knots), with gusts to 90 km (49 knots). These forecasts were sent to the media (via news circuits) for broadcasting.

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[3] All times are AST (coordinated universal time minus four hours) unless otherwise noted.

At 0806 the wind, as measured by the ship's anemometer and recorded in the deck logbook, was SW 20 knots. The master estimated the force of the wind when the vessel was nearing the end of the breakwater to be 120 knots. That figure was neither observed from the ship's anemometer nor recorded in the logbook.

Reported Manoeuvres Prior to Grounding (times approximate)

On departure, the bridge team consisted of the master, a trainee master, the first mate and the quartermaster. The trainee master did not play an active part in the team.

0730 The relieving master boarded the vessel and assumed command after the master being relieved had made him aware of the functional state of the vessel including the fact that one of the eight prime movers (No. 3 port) was undergoing routine maintenance and was therefore not available to power a propulsion unit.

0806 The vessel departed the ramp after the mooring lines had been let go, and slowly moved ahead 6 to 9 m, during which time the stern door was closed and secured.

The vessel was manoeuvred near to the end of the berth/breakwater, at a distance off its northeast face of about 4.5 to 6 m. (The time elapsed since departure is unknown, as it was not recorded; but it was estimated to have been two or three minutes.)

0809 Approaching the end of the breakwater, both port side propellers were put into the full-ahead mode, with the starboard propellers full-astern, all with 80% power. The intent was to turn the vessel short round to starboard. Power output increased from 80% to 90%.

0810 As the vessel was turning to starboard and on a heading of approximately 130°(T), a strong wind from the southwest was encountered forcing the vessel bodily back into Borden Harbour.

0812 Power output increased from 90% to 100%.

0813 Power output increased from 100% to 110%.

0815 The bosun was ordered to ready the anchors for letting go.

0817 The first mate went to the after docking position with the intent of assuming the conduct of the vessel and to endeavour to manoeuvre the vessel, stern first, out of the harbour.

0819 Control of the main engines was transferred from the navigating bridge to the after docking position to enable the first mate to carry out the proposed manoeuvre, but full power was unavailable because one main drive propulsion unit (the port forward engine) indicated no power.

By this time the master had also run from the navigating bridge to the after mooring position, leaving the second mate, who had been summoned to the bridge after the start of the manoeuvre, on the navigating bridge. In order to operate the change-of-power control handle the first mate ran back to the navigating bridge as the master was of the opinion that the second mate was not sufficiently well versed in that procedure.

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[4] Power output quoted is relative to the power available; 100% is the continuous power rating of an electric motor and 110% is the short term power demand that may be made on an electric motor.

Full available power was finally achieved from the after mooring position. It was estimated that three to four minutes of full power manoeuvring time was lost in the changes-of-control from the bridge to the aft mooring position, from the aft mooring position to the bridge and from the bridge back to the aft mooring position.

0830 Vessel grounded east of the ranges (see chartlet).

0835 Began pumping out ballast.

1008 Starboard anchor let go with approximately 24 m of chain.

Two days later, at 0839 on December 22, assisted by two commercial tugs and CCGS "EARL GREY", the "JOHN HAMILTON GRAY" was refloated.

Qualifications and Experience—Master and Mate

The master began his service with Marine Atlantic in 1962. After serving in various roles including quartermaster, he was appointed second mate in 1971 and as master in 1975. Apart from a short time on Marine Atlantic's Newfoundland ferry service, his sea time, nautical knowledge and ship handling skills were gleaned on the Borden/Cape Tormentine trips. He possesses a Canadian-issued Certificate of Competency as an Ocean Navigator, Class One (ONI), a superior qualification to the minimum requirement for this class of vessel: Master, Ferry, Long Run.

The first mate possesses a Canadian-issued Certificate of Competency (ONI) and served as a relieving master between 1990 and 1994. He began his service with Marine Atlantic in 1973.

Analysis

Successful completion of a complex task such as manoeuvring a vessel depends on the operator having a complete and accurate understanding of what is going on around him. In order to develop and maintain this understanding, an operator needs first to ensure that the information he has is both reliable and valid. Although the master had available to him a number of sources from which he could have obtained accurate marine weather-related information, he relied solely on the least reliable and valid source, a weather forecast heard over his car radio. This forecast did not accurately indicate the strength of the expected winds or the gust factor.

The master's practice of obtaining weather from a local radio station precluded his being fully aware of all the factors affecting the situation. While knowledge of the accurate VHF marine forecast may not have changed the master's decision to depart Borden, it might have influenced him to employ alternative methods of leaving the dock, to order maximum engine power earlier or to remain at the dock until the weather moderated.

The practice of relying upon a local land radio station as the source of pre-departure weather information had been successful in the past, which most likely reinforced its continued use. Further, the lack of procedures or standing orders on the use of the VHF and the Navtex and the poor quality of the Navtex presentation may have also reinforced this practice. As evidenced by this occurrence, the practice carried with it the hazard of reduced situational awareness.

There was no mention of storm force winds in the forecast heard by the master and he did not exercise his discretion to postpone the departure of the vessel or to employ an alternative method of departure. Although the berth/breakwater is fitted with mooring bollards along most of its length, no use was made of mooring lines to hold the bow of the vessel up to the wind on departure. No endeavour was made to keep the vessel alongside the approach wall or to force the starboard bow on the heavy rubber on the knuckle to allow the wind to act on the starboard quarter and turn the vessel.

Due to the comparative closeness of the forward propellers and the bower anchor pockets, there was a reluctance on the part of the master to use an anchor to help to bring the vessel head up into the wind.

Further, in the prevailing conditions, it is likely that at least three shackles of chain (82 m) would have been necessary to bring the vessel head-to-wind without dragging the anchor. For the vessel to have remained afloat, such an amount of chain would have to have been deployed when the bow was no more than 75 m from the end of the breakwater.

Dropping the anchor at a distance of more than 75 m from the breakwater, given the combined length of ship and chain, could not have prevented the vessel from going aground in approximately the same position as she did.

It is unknown why the first transfer of control from the bridge to the after mooring station was not completely successful. Because the control transfer system is electro-mechanical, it is likely that a mechanical relay (or relays) did not function correctly at the moment of change-over. The temporary loss of control of all the available engines was not due to a fault in the propulsion machinery.

Although the power generating and distribution system is efficient, rapid and flexible, power supplied by the group of generators on the port side can only be distributed to the propulsion motors on the port side. The same is true for the starboard side generating/distribution system.

While the forward/aft power distribution options employed by the master may have compensated in some measure for the non-availability, due to routine maintenance, of No. 3 port prime mover, the fact remains that he had 25% less power available on the port than on the starboard side.

This reduction in power, and in the forward thrust on the port side, would have had a significant effect on the master's ability to turn the vessel's head to starboard into the wind. The increase in power to 110% at 0813 would not have altered the port/starboard ratio of available power.

It was not unusual to have one prime mover out of service for maintenance and, in normal circumstances, this would not affect the vessel's manoeuverability. On the day of the occurrence, however, maximum power ahead was required from the port propulsion motors to turn the vessel's head to starboard.

Findings

1. The Navtex had run out of paper and the presentation of its characters is not easily legible.

2. The radio equipment on board the vessel was not utilised to its potential to obtain marine weather forecasts.

3. The master did not fully use the bridge team (trainee master, first mate, quartermaster) to obtain a marine weather forecast.

4. The weather forecasts obtained from local radio stations were not as accurate as those available from marine weather broadcasts.

5. There was no mention of storm force winds in the forecast heard by the master and the decision to sail was based on this information.

6. Marine Atlantic placed the onus of responsibility on the master as to whether or not to leave the berth.

7. The master's principal experience was of the trade between Borden and Cape Tormentine, where he had successfully completed over 500 crossings in 1996.

8. Problems associated with the switch transferring power to and from the navigating bridge and the after control position caused a waste of time when the vessel was being manoeuvred in the confines of Borden Harbour.

9. Given that the change-over switch had a history of failure, the master could have saved valuable manoeuvring time had he retained the conduct of the vessel from the navigating bridge and assigned the first mate or trainee master to the after docking position as a lookout/spotter.

10. In the circumstances prevailing upon departure, the reduction in available power to the port side propulsion machinery limited the vessel's ability to turn to starboard into the wind.

11. In the unusual circumstances of the vessel not responding to helm and engine movements the maximum available main engine power was not immediately ordered.

12. No use was made of mooring bollards and lines or the end of the berth/breakwater to help turn the vessel head to wind and outwards from the harbour.

Causes and Contributing Factors

The master did not acquire the complete marine weather forecast available to him, which could have provided early warning of the gale-force winds encountered upon sailing. In the prevailing conditions upon sailing, the routine maintenance being carried out on No. 3 (port) prime mover reduced the vessel's ability to turn to starboard. Although the master employed the undocking/sailing techniques with which he was familiar, these were not successful. In the unusual conditions existing, the use of alternative techniques was not considered.

Safety Action

Action Taken

The service between Borden Harbour, P.E.I., and Cape Tormentine, New Brunswick, ceased operation in the spring of 1997 and the "JOHN HAMILTON GRAY" was sold and left Canadian waters. With a view to introducing changes to improve safety on their remaining operation, the owners reviewed their policies and procedures, solicited and obtained input from senior company masters with a view to introducing changes to improve safety.

Management has indicated that, with respect to the use of VHF radios and Navtex, guidance will be provided in obtaining and recording timely marine weather forecasts and ensuring the Navtex is loaded with paper.

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 10 December 1998.

Glossary

kW	kilowatt(s)
m	metre(s)
Navtex	Navigational Telex
Ro/Ro	roll-on/roll-off
V	volt(s)
VHF	very high frequency
VHF-RT	very high frequency radio telephone