



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

Grounding

"FEDERAL MACKENZIE"
Verchères-Contrecoeur Channel, Quebec
14 July 1993

Report Number M93L0002

Synopsis

While upbound in the St. Lawrence River, the laden bulk carrier "FEDERAL MACKENZIE" grounded on the south side of the Verchères-Contrecoeur Channel, Quebec. There was no apparent damage to the vessel and there were no injuries.

The Board determined that the "FEDERAL MACKENZIE" grounded because of a loss of propulsion which, in turn, resulted in a loss of steering. The loss of propulsion was caused by the fuel control lever becoming displaced due to the vibration of the vessel while transiting a shallow channel.

Ce rapport est également disponible en français.

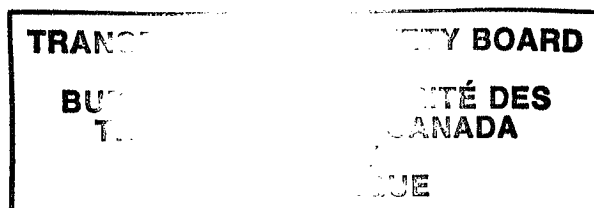


Table of Contents

	Page
1.0 Factual Information	1
1.1 Particulars of the Vessel	1
1.1.1 Description of the Vessel	1
1.1.2 Engine Controls	2
1.2 History of the Voyage	2
1.3 Composition of the Bridge Watch	3
1.3.1 Composition of the Engine-room Watch	3
1.4 Injuries to Persons	3
1.5 Damage	3
1.5.1 Damage to the Vessel	3
1.5.2 Environmental Damage	3
1.6 Certification	4
1.6.1 Vessel	4
1.6.2 Personnel	4
1.7 Personnel History	4
1.7.1 Master	4
1.7.2 Officer of the Watch	4
1.7.3 Helmsman	4
1.7.4 Pilot	4
1.7.5 Chief Engineer	4
1.8 Environmental Information	5
1.8.1 Weather	5
1.8.2 Tidal and Current Information	5
1.9 Navigation Equipment	5
1.9.1 Vessel	5
1.9.2 Shore	5

2.0	Analysis	7
2.1	Introduction	7
2.2	The Emergency Stand Fuel Control Lever	7
2.3	Loss of Directional Control	7
3.0	Conclusions	9
3.1	Findings	9
3.2	Causes	9
4.0	Safety Action	11
5.0	Appendices	
	Appendix A - Photographs	13
	Appendix B - Sketch of the Area of the Grounding	15
	Appendix C - Glossary	17

1.0 Factual Information

1.1 Particulars of the Vessel

"FEDERAL MACKENZIE"	
Official Number	231726
Port of Registry	Manila, Philippines
Flag	Philippine
Type	Bulk carrier
Gross Tons ¹	22,388
Length	222.54 m
Draught (at time of occurrence)	F ² :7.86 m A:7.86 m
Cargo	24,378 tonnes of steel products
Crew	23
Built	1983, Glasgow, Scotland
Propulsion	One four-cylinder Sulzer diesel engine rated 8,003 kW, driving a single controllable-pitch propeller. Bow thruster fitted.
Owners	Maple Shipping Corporation Manila, Philippines

1.1.1 Description of the Vessel

The "FEDERAL MACKENZIE" is a conventional-type bulk carrier with her cargo area forward and the bridge, accommodation, and engine-room aft.

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.

1.1.2 Engine Controls (See Photographs - Appendix A)

The main engine can be controlled from three different positions, namely:

- the emergency stand at the main engine;
- the remote control in the wheel-house; and
- the remote control in the engine-room.

Regardless of the fact that the main engine may be remotely controlled from the bridge or the engine-room, the control at the emergency stand can override the remote stations.

There are two levers at the emergency stand. Lever "A" controls the gear and is marked "Start", "Ahead", "Stop" and "Astern". Lever "B" controls fuel flow into the engine and is graduated 0 to 10. Below the "0" position is marked "Remote Control" at which position the lever is placed for such operation.

Lever "B" has a button control on its end which is used for operating a locking device. However, evidence indicated that the ratchet lock had worn down and had lost its effectiveness.

There is a warning light in the engine control-room to show that the engine is being controlled from the emergency stand. There is no such light on the bridge, where warning lights indicate "Engine-room Control" or "Wheel-house Control" only.

The wheel-house indicator light "Wheel-house Control" remains lit if the emergency stand lever "B" is moved out of the remote control position.

A number of alarms are activated if the engine stalls.

The controllable-pitch propeller revolves in a pivoting Kort nozzle which acts as a rudder.

1.2 History of the Voyage

After an uneventful Atlantic crossing, the "FEDERAL MACKENZIE" arrived at the Les Escoumins pilot station at 1940³ on 13 July 1993. The vessel continued her voyage up the St. Lawrence River, bound for Toledo, Ohio, USA, under the conduct of a Canadian pilot. The engines were on bridge control.

At 2107, 14 July, the vessel was proceeding up the Verchères-Contrecoeur Channel (see Appendix B for sketch of the area) at a speed of 10 knots over the ground. Evidence

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

indicates that there was considerable vibration attributed at the time to shallow water beneath the keel. During the transit of the channel, the main engine failed. The engine-room employees were unable to restart the engines in time to avoid the grounding.

When propulsion was lost, the vessel veered to port. Despite corrective helm action, the swing accelerated. At 2122, the vessel moved out of the navigable channel and grounded on the south side, approximately one cable east of buoy M79 in position 45°48'18"N, 73°19'19"W.

Soon after the vessel grounded, lever "B" (fuel control) of the emergency stand was found in the "0" position. No one in the engine-room had moved the lever. After the lever was replaced in the remote control position, the main engine was restarted but attempts to refloat the vessel were unsuccessful until 0830, 19 July 1993, at which time she resumed her voyage to Toledo.

1.3 Composition of the Bridge Watch

At the time of the occurrence, the bridge watch consisted of a pilot, an officer of the watch (OOW), and a helmsman.

1.3.1 Composition of the Engine-room Watch

At the time of the occurrence, the engine-room watch consisted of an engineer of the watch (EOW), an electrician, and an oiler.

1.4 Injuries to Persons

There were no injuries.

1.5 Damage

1.5.1 Damage to the Vessel

There was no apparent damage to the vessel.

1.5.2 Environmental Damage

There was no pollution.

1.6 *Certification*

1.6.1 *Vessel*

The vessel was certificated, manned, and equipped in accordance with existing regulations.

1.6.2 *Personnel*

The master, the OOW, and the pilot held qualifications appropriate for the class of vessel on which they were serving and for the voyage being undertaken.

The engineers held qualifications appropriate for the rating of the machinery on board.

1.7 *Personnel History*

1.7.1 *Master*

The master had served in this capacity for 18 years and had been master of the "FEDERAL MACKENZIE" since 24 March 1993.

1.7.2 *Officer of the Watch*

The OOW had five years' experience as a deck officer. He joined the "FEDERAL MACKENZIE" on 28 March 1993. Working a routine sea-watch system, he was quite rested when reporting for duty at 2000.

1.7.3 *Helmsman*

The helmsman had three years' experience as a deck-hand and had acted as a helmsman throughout that period. He had been aboard the "FEDERAL MACKENZIE" since 26 March 1993.

1.7.4 *Pilot*

The pilot had conducted vessels in his designated area for 18 years. His schedule was such that an adequate rest period was provided between each assignment.

1.7.5 *Chief Engineer*

The chief engineer had served in this capacity aboard the "FEDERAL MACKENZIE" for 10 months, having had previous experience on similar vessels.

1.8 *Environmental Information*

1.8.1 *Weather*

At the time of the occurrence, the weather conditions observed were good with south-westerly winds of 10 knots and good visibility. These conditions resembled the forecast issued earlier by Environment Canada.

1.8.2 *Tidal and Current Information*

The tidal influence at Contrecoeur is not significant. Between Lanoraie and Sorel, Quebec, the river current has an average rate of 1.8 knots to 2.0 knots.

1.9 *Navigation Equipment*

1.9.1 *Vessel*

The navigation equipment was found to be in good working condition. It was not a contributory factor to this occurrence.

1.9.2 *Shore*

The shipping channel has a minimum width of 244 m and a least depth of 10.7 m.

All navigation aids in the area were reported to be in position and operating normally at the time of the occurrence.

2.0 *Analysis*

2.1 *Introduction*

The consequences of this occurrence could have been of a far more serious nature. A critical alarm system was not fitted. Furthermore, a situation which had been developing over a period of time, through wear and tear, had apparently gone unnoticed and/or unheeded.

2.2 *The Emergency Stand Fuel Control Lever*

The vessel's Operations Manual for Diesel Engines RL76 states in part that, if the emergency fuel lever (lever "B") is taken out of its position "Remote Control" and turned to position "0", the pressure in the air control system falls to zero. The air escapes from shut-down servomotor 5.06 and the engine is stopped by interruption of the fuel supply to the injection pumps through the regulating linkage.

As no one in the engine-room had touched lever "B", it is most likely that it moved by itself from the "Remote Control" to the "0" position where it was found after the grounding.

Shortly before the grounding, the vessel had experienced considerable vibration because of the effect on the propeller of the shallow water through which the vessel was moving. Because the ratchet used to hold the lever at a predetermined setting was worn, the vibration experienced could have been enough to displace the lever to the "0" position.

When lever "B" moved to the "0" position, the engine stopped because of fuel starvation. Because the emergency stand controls override the other control stations, no subsequent movement of these other controls could correct the situation.

The reason for the engine failure was not readily apparent to those attempting to restart the engine in the engine control-room because the engine had stalled and all the related alarms were on. It was thus difficult to identify the light which indicated that the engine was being operated from the emergency stand.

2.3 *Loss of Directional Control*

The vessel was fitted with a steerable Kort nozzle instead of the conventional propeller and rudder. Although this type of steering system is more efficient at moderate-to-high engine revolutions, its performance is less efficient at lower revolutions as its efficiency depends on propeller thrust.

In this case, propeller thrust was lost when the engine failed, causing the vessel to lose directional stability almost immediately. After the engine failed, no subsequent movement of the helm could steer her back into the channel.

3.0 *Conclusions*

3.1 *Findings*

1. The "FEDERAL MACKENZIE" grounded because of a loss of propulsion and directional control.
2. The main engine stopped because of fuel starvation caused by the emergency stand fuel control lever dislodging from the "Remote Control" to the "0" position.
3. It is most likely that the lever was dislodged from the "Remote Control" position by the considerable vibration caused by the vessel navigating at 10 knots with a minimal underkeel clearance.
4. Although the engines were being controlled remotely from the wheel-house, the controls at the emergency stand override all others.
5. Because of the absence of an appropriate warning light on the bridge, the crew members in the wheel-house were not immediately aware of the loss of engine power.
6. It was difficult for those attempting to restart the engine in the engine control-room to identify the warning light which indicated that the engine was being operated from the emergency stand, particularly as a number of alarms relating to the stalled engine were lit.
7. As the steering is governed by the thrust of the propeller in a Kort nozzle, the steering ceased to function when the main engine failed.

3.2 *Causes*

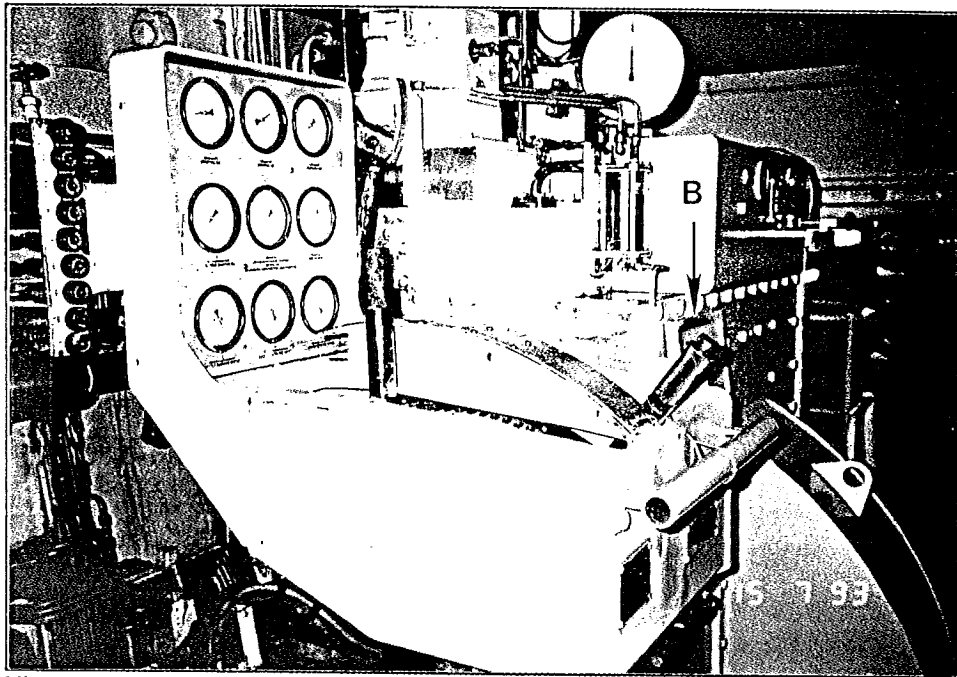
The "FEDERAL MACKENZIE" grounded because of a loss of propulsion which, in turn, resulted in a loss of steering. The loss of propulsion was caused by the fuel control lever becoming displaced due to the vibration of the vessel while transiting a shallow channel.

4.0 *Safety Action*

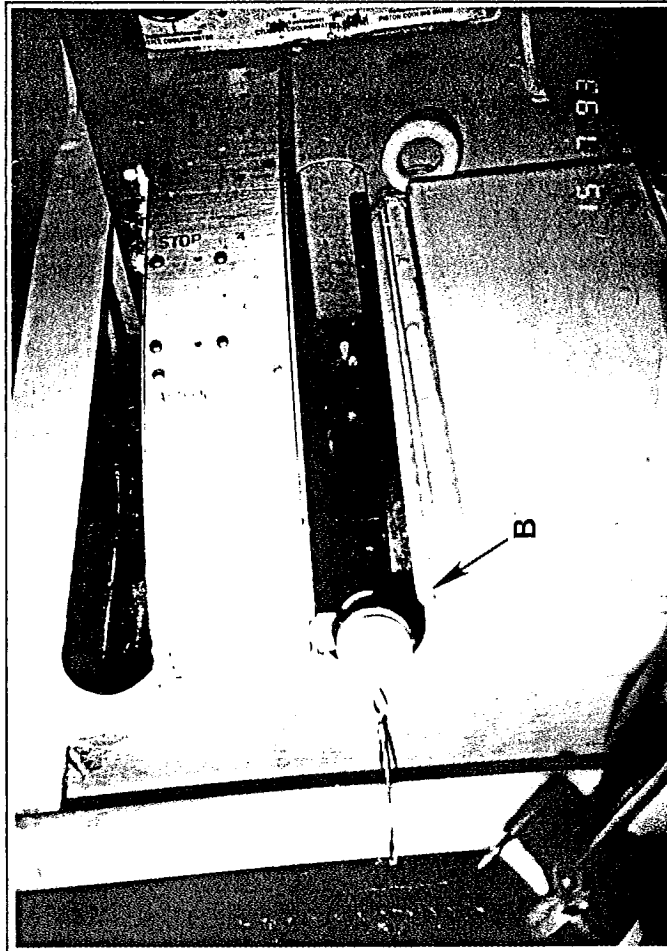
The Board has no marine safety recommendations to issue at this time.

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 07 December 1995.

Appendix A - Photographs

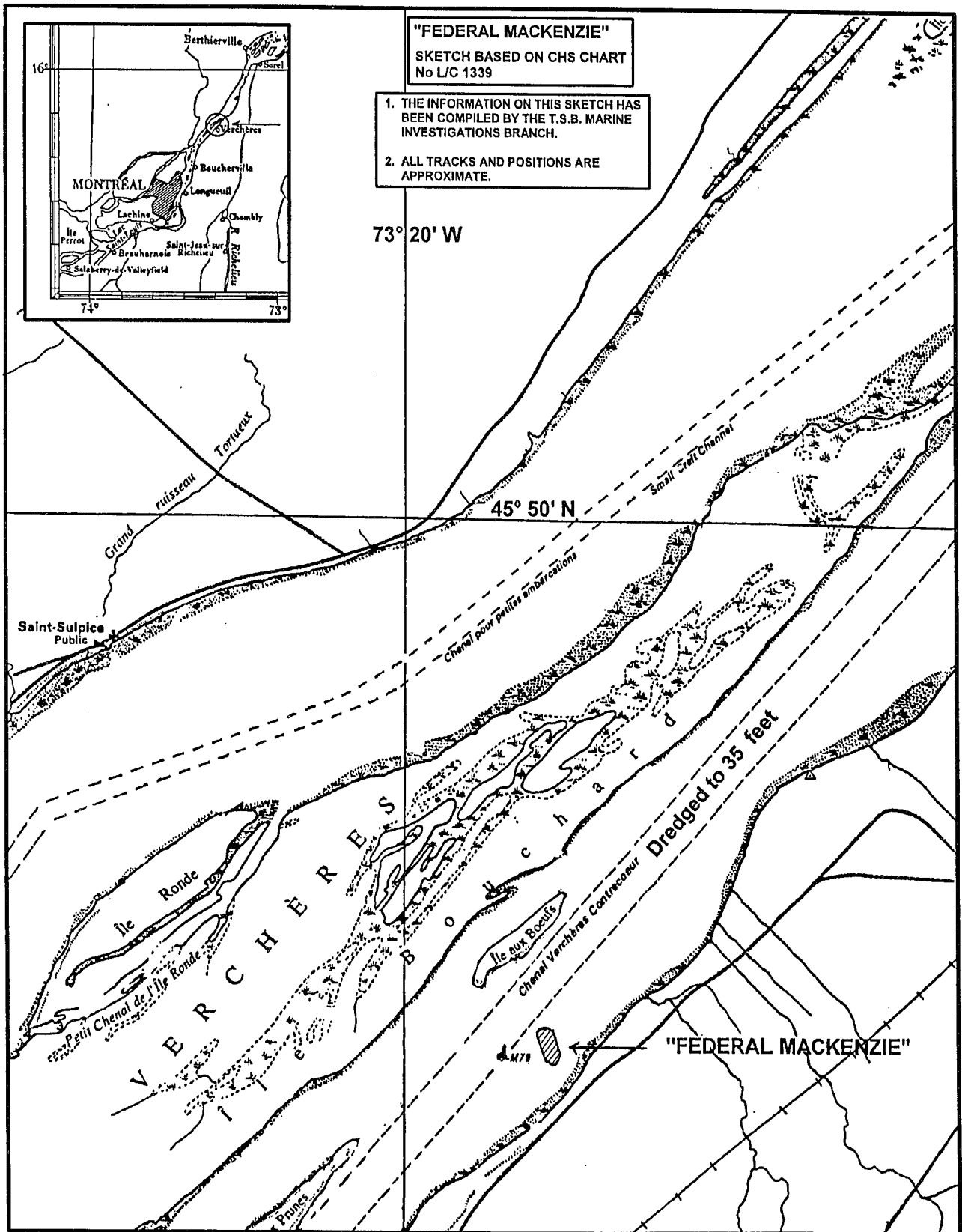


The emergency stand at the main engine.



Note: The wire was fitted to lever "B" and the grab rail after the accident to prevent the lever from vibrating upward.

Appendix B - Sketch of the Area of the Grounding



"FEDERAL MACKENZIE"
 SKETCH BASED ON CHS CHART
 No L/C 1339

1. THE INFORMATION ON THIS SKETCH HAS BEEN COMPILED BY THE T.S.B. MARINE INVESTIGATIONS BRANCH.
2. ALL TRACKS AND POSITIONS ARE APPROXIMATE.

73° 20' W

45° 50' N

"FEDERAL MACKENZIE"

Appendix C - Glossary

A	aft
EDT	eastern daylight time
EOW	engineer of the watch
F	forward
IMO	International Maritime Organization
kW	kilowatt(s)
m	metre(s)
N	north
OOW	officer of the watch
SI	International System (of units)
TSB	Transportation Safety Board of Canada
UTC	Coordinated Universal Time
W	west
°	degree(s)
'	minute(s)
"	second(s)