Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

MARINE INVESTIGATION REPORT
M05L0205

COLLISION

BETWEEN THE CONTAINER VESSEL *CAST PROSPERITY* AND THE TANKER *HYDE PARK* LAC SAINT-PIERRE, QUEBEC 26 SEPTEMBER 2005

Canada

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 Container Vessel *Cast Prosperity* and the Tanker *Hyde Park* Lac Saint-Pierre, Quebec 26 September 2005

Report Number M05L0205

Summary

On the afternoon of 26 September 2005, the container vessel *Cast Prosperity* and the tanker *Hyde Park* collided during an overtaking manoeuvre in the dredged channel in Lac Saint-Pierre, approximately 12 nautical miles southwest of Trois-Rivières, Quebec. Both vessels sustained considerable damage but were able to proceed to Montréal, Quebec, without assistance or further incident. No injuries or pollution were reported.

Ce rapport est également disponible en français.

Other Factual Information

Particulars of the Vessels

Name	*Cast Prosperity*	*Hyde Park*
IMO Number	9313199	7931856
Port of Registry	Hamburg	Monrovia
Flag	Germany	Liberia
Type	Container	Tanker
Gross Tonnage	16 324	22 103
Length[1]	169 m	173.5 m
Breadth	27.2 m	32.0 m
Draught	Forward: 8.8 m Aft: 9.4 m	Forward: 9.85 m Aft: 10.2 m
Built	2005	1982
Propulsion	B&W diesel engine, 12 640kW, driving a controllable-pitch propeller	B&W diesel engine, 9636 kW, driving one fixed-pitch propeller
Cargo	14 179 tonnes containerized cargo	29 274 tonnes unleaded gasoline
Crew	19	37
Registered Owner(s)	Reederei ms Eilbek GmbH, Hamburg, Germany	Zodiac Maritime Agencies, London, United Kingdom
Manager(s)	Wappen Reederei GmbH & Co, Hamburg, Germany	Zodiac Maritime Agencies, London, United Kingdom

[1] Units of measurement in this report conform to International Maritime Organization standards or, where there is no such standard, are expressed in the International System of units.

Description of the Vessels

The *Cast Prosperity* is a container vessel of modern construction with engine room and accommodation located aft. The vessel is equipped with a voyage data recorder (VDR) that records and stores important navigation, ship-handling and communication information. The vessel is fitted with a controllable-pitch propeller and semi-balanced articulated flap rudder.

The *Hyde Park* is a tanker with engine room and accommodation located aft. The vessel was built in 1982 and is therefore not required to carry a VDR. It was equipped with an AIS (automatic identification system) transmitter. Engine orders were given from the bridge using an engine-order telegraph.

Photo 1. The *Cast Prosperity*

Photo 2. *The Hyde Park*

History of the Voyage

On 26 September 2005, the container vessel *Cast Prosperity* and the tanker *Hyde Park* were both heading southwest (upbound), against a 1.5-knot current in the dredged channel through Lac Saint-Pierre, towards the Port of Montréal, Quebec. At the time of the occurrence, visibility was good at about 5 nautical miles. Winds were from the northeast at about 10 knots.

At 1730 eastern daylight time,[2] a pilot boarded the *Hyde Park* at Trois-Rivières, Quebec, relieving the previous pilot. The bridge team at that point consisted of the pilot, the master, an officer of the watch (OOW), and a helmsman. The engine telegraph was set to full manoeuvring speed and the vessel was soon making about 10 knots.[3]

At 1805, a pilot and an apprentice pilot boarded the *Cast Prosperity* at Trois-Rivières. Its bridge team then consisted of the pilot, the apprentice pilot, the master, the OOW, and a helmsman. The vessel began to make way with its propeller pitch control set to make a speed of about 12.5 knots.

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2 All times are eastern daylight time (Coordinated Universal Time minus four hours).

3 All vessel speeds are over the ground unless otherwise noted.

At 1841, the *Cast Prosperity* had closed to approximately eight cables astern of the *Hyde Park* and the two pilots made overtaking arrangements: the *Hyde Park* would move to the north side of the channel and reduce speed, and the *Cast Prosperity* would also reduce speed, move to the south side of the channel, and overtake the *Hyde Park* on its port side.

Ten minutes later, at 1851, the helmsman on the *Cast Prosperity* found it necessary to use a considerable amount of port helm (up to 23°) to maintain the desired heading of 235° Gyro (G). However, this information was not relayed to the pilot, nor did the pilot detect it from monitoring the rudder angle indicator. About one minute later, the vessels were beginning to draw parallel to each other about 75 m apart. At 1853, they had passed buoys S-31 and S-32; the *Hyde Park* had reduced speed and was making 7.3 knots, and the *Cast Prosperity* was proceeding at 10.7 knots (see Figure 1).

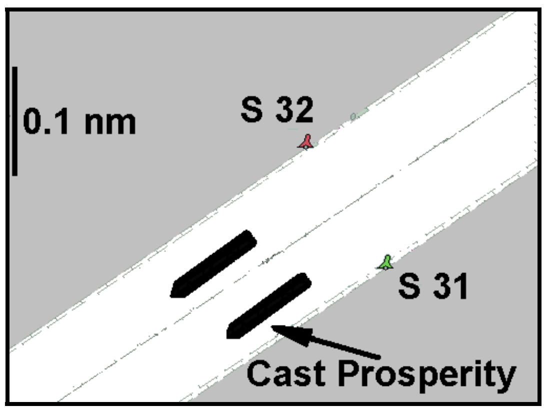

Figure 1. Relative position of vessels in channel at 1853 (to scale)

At about 1853, the *Hyde Park* sheered suddenly to starboard. To regain control, the pilot ordered hard-a-port helm and half ahead followed by full ahead. Once the vessel attained a course of 236° G, the engine telegraph was reduced to dead slow ahead. Shortly afterward, there was no longer any apparent speed difference between the two vessels; both were proceeding at approximately 8 knots. The *Cast Prosperity* pilot then used the very high frequency (VHF) radiotelephone to request that the *Hyde Park* pilot further reduce speed so the *Cast Prosperity* could complete the overtaking manoeuvre. The *Hyde Park* pilot agreed to the request, adding that he had just used “full ahead” power to correct a sheer to starboard.

Between 1855 and 1900, the *Cast Prosperity*’s propeller pitch was modified incrementally on several occasions, resulting in an overall increase in speed from 8.2 to 9 knots. The changes were carried out by the OOW, who used his discretion to interpret the pilot’s orders, which were delivered in unquantified terms. As its speed increased, the *Cast Prosperity* began to experience bank suction aft. The helmsman maintained the desired heading and prevented the bow from moving to starboard by applying more port helm. Again, this information was not communicated to any other members of the bridge team.

At about 1900, the *Cast Prosperity* pilot asked the *Hyde Park* pilot to further reduce speed. The *Hyde Park* pilot replied that he was unable to comply without losing manoeuvrability. Moreover, the *Hyde Park*'s speed had increased from 7.3 to 8.2 knots despite the fact that there had been no change from the previous command of dead slow ahead. Despite full starboard helm at this point, the vessel continued to move towards the *Cast Prosperity*.

For the next two minutes, the distance between *Hyde Park* and *Cast Prosperity* continued to decrease. Even with the *Hyde Park*'s engine telegraph set to stop, the tanker continued to accelerate, to more than 8.5 knots. Aboard the *Cast Propsperity*, the pilot requested greater speed and eventually full ahead, but was advised by the OOW that full manoeuvring speed had been reached.

With the vessels closing, the pilot of the *Hyde Park* asked for full ahead, in an attempt to pull away. As this was occurring, the push-to-talk button on the *Cast Prosperity's* VHF jammed in the transmit position, and could no longer be used by the *Cast Prosperity* to receive.

At 1902:30, the two vessels collided, making parallel body contact upstream of buoy S-43, with the bow of the *Hyde Park* coming alongside the mid-section of the *Cast Prosperity*. At about this time, the pitch control of the *Cast Prosperity* was set to zero and the vessel made momentary bottom contact with the south channel bank in position 46°13'48'' N, 072°46'24'' W.

On the *Hyde Park*, the engine telegraph was set to stop and then to full astern; despite this, the tanker continued advancing along the starboard side of the *Cast Prosperity* before coming to a stop (see Figure 2 for positions of vessels between buoy sets S-31/S-32 and S-43/S-44 during the overtaking manoeuvre).

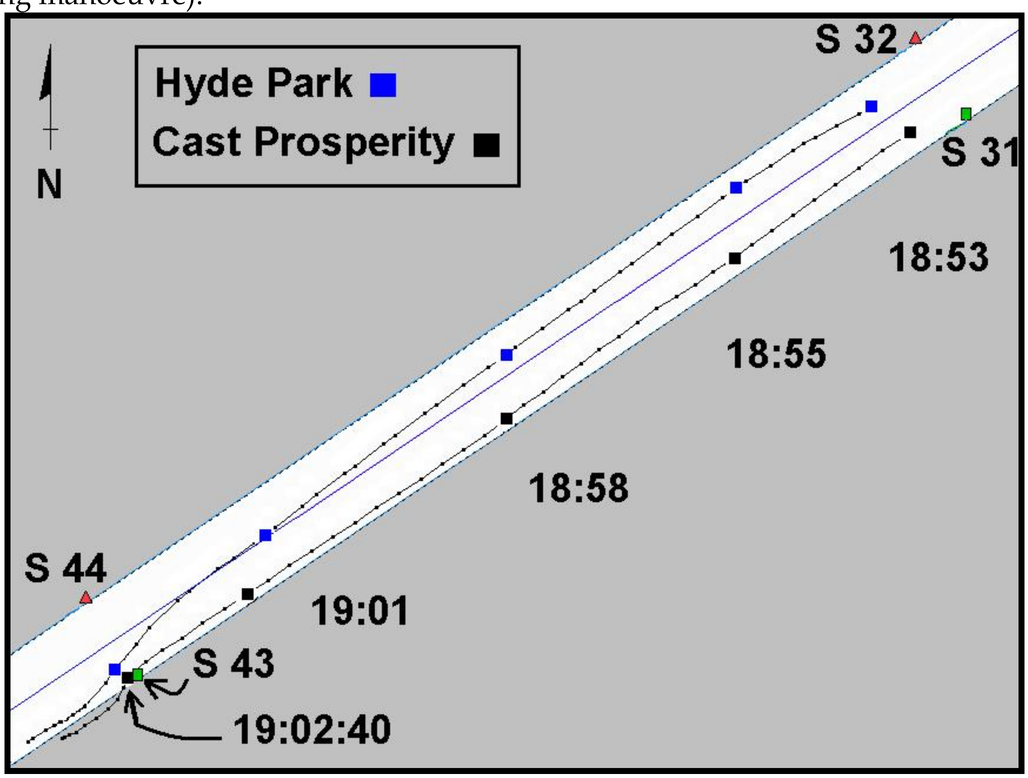

Figure 2. Vessel tracks during overtaking manoeuvre. Information derived from VDR and AIS inputs.

In the next few minutes, the *Hyde Park* manoeuvred back into the centre of the channel, disengaging from the *Cast Prosperity*. Thereafter, both vessels continued on their respective voyages to Montréal without assistance or further incident.

Damage to Vessels

The *Hyde Park* sustained substantial damage to its port side shell plating adjacent to the superstructure and cargo tanks Nos. 2, 7, and 8. Numerous web frames were set in or buckled, as was the deck plating and sheer strake at various locations. Although no tanks were reported breached, the smell of gasoline could be detected on deck.

The *Cast Prosperity* sustained damage to almost the entire length of the starboard side shell plating, including a hole measuring 1.5 m by 6 m between frames 148 and 160. The deck plating was buckled in various locations, as were a number of web frames.

Hydrodynamic Forces

Hydrodynamics is the science of forces that act upon vessels moving through a liquid.

Studies and experience with ship-to-ship interactions have established the following:

- As a vessel moves forward, hydrodynamic pressure cells are created around the ship and can best be characterized by high (+) and low (-) pressure areas, as seen in Figure 3;[4]

- When in the confines of a narrow channel, hydrodynamic forces between vessels are greater than when in open water due to the reduced flow capacity around the vessels and through the channel;

- When two ships pass or meet in the confines of a narrow channel, the squat[5] experienced by each vessel increases by a considerable percentage;[6]

- Hydrodynamic forces experienced by the vessels are proportional to the speed of the vessels through the water and inversely proportional to the distance between the vessels as well as the under-keel clearance (UKC) of each vessel;

- The overtaking ship's resistance increases once past the overtaken ship, and the latter's resistance decreases;[7]

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[4] C.B. Barrass, *Ship Design and Performance for Masters and Mates*, 2004, Elsevier Butterworth-Heinemann

[5] The tendency for a vessel's draught to increase as the vessel moves through the water.

[6] C.B. Barrass, *Ship Design and Performance for Masters and Mates*, 2004, Elsevier Butterworth-Heinemann

- "Any change in the delicate balance of pressure forces acting on a hull will cause . . . large longitudinal and lateral forces coupled with problems in ship handling. . . . The forces of interaction can be far greater than the force applied by a ship's rudder in a hard over position";[8]

- It is difficult to predict the onset and magnitude of hydrodynamic forces in the confines of a channel . . . in a manoeuvre involving large vessels;[9] and

- The hydrodynamic pressure zones can extend further than 100 m from a vessel.[10]

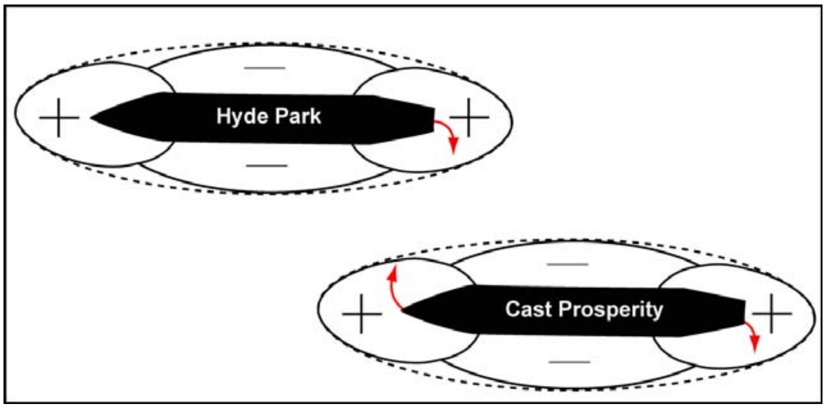

Figure 3. Vessel interactions during overtaking manoeuvre (pressure areas not to scale)

Under-keel Clearance

Lac Saint-Pierre is a shallow lake covering approximately 100 square miles and, in order to accommodate the passage of vessels, a channel has been dredged for most of its 15 nm length.

The *Cast Prosperity* attempted to overtake the *Hyde Park* between buoys S-31/S-32 and S-43/S-44; in this area, the navigable channel is 11.3 m deep and 245 m wide. Outside the channel, there is very shallow water, with the 5 m bathymetric line closing to the channel edge at buoys S-43/S-44 (see Figure 4).

On the day of the occurrence, water levels were approximately 0.18 m above chart datum.

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7 Dr. I.W. Dand, *Pilotage and Shiphandling – Interaction*, The Nautical Institute

8 Dr. I.W. Dand, *The Physical Causes of Interaction and its Effects*, National Maritime Institute, England

9 United States, National Transportation Safety Board Report MAR-89-07, Collision between the *Figaro* and the *Camargue*, Galveston Bay Channel, 10 November 1988

10 Germany's Federal Bureau of Maritime Casualty Investigation (Bundesstelle für Seeunfalluntersuchung or BSU) Report 45/04, Collision between the *Cosco Hamburg* and the *P&O Nedlloyd Finland* in the Elbe River, 01 March 2004

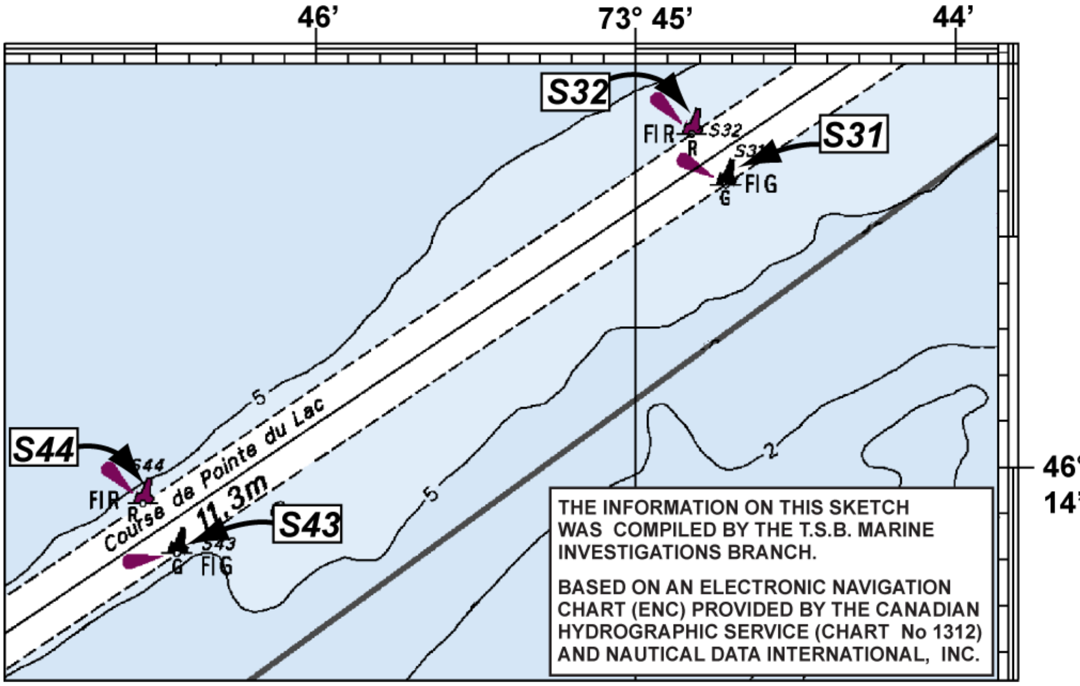

Figure 4. Area of occurrence: Blue shaded area indicates shallow water

When stationary, there would therefore have been approximately 2.1 m of water between the keel of the *Cast Prosperity* and the channel bottom, and 1.3 m for the *Hyde Park*. Due to squat, however, the *Cast Prosperity*'s actual UKC was approximately 1.7 m, and the *Hyde Park*'s was about 0.9 m.

In addition, as the vessels became parallel during the overtaking, squat would tend to increase, further reducing each vessel's UKC.

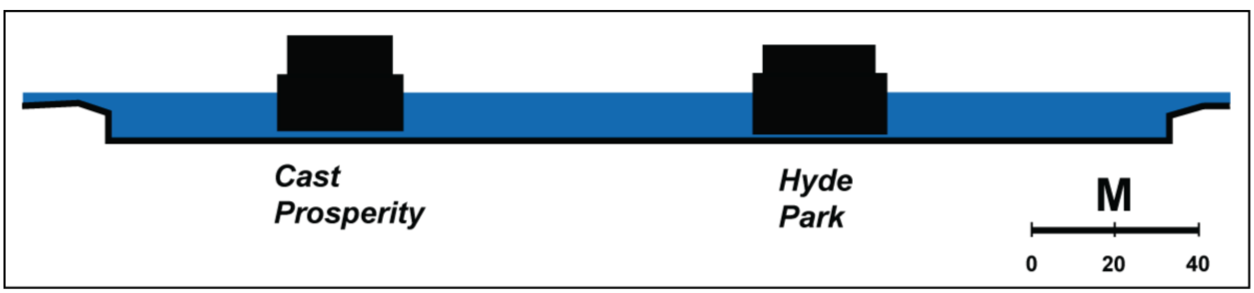

Figure 5. Outline of vessels, dredged channel, channel banking, and water depth on Lac Saint-Pierre, as seen from the stern

Vessel-Manoeuvring Training and Pilot Experience

Each vessel's pilot held a certificate of competency as master mariner. The pilot of the *Hyde Park* had four years' experience, and the *Cast Prosperity*'s pilot had six. Before becoming a pilot, each served a two-year apprenticeship, which included instruction on hydrodynamic forces and their effects. Two months before the accident, the pilot of the *Cast Prosperity* received further training in ship-manoeuvring and hydrodynamics, using manned models. The *Hyde Park* pilot had yet to take the manned-model training.

Bridge Resource Management

Bridge resource management (BRM) is the effective use of all available resources, human and technical, to ensure a vessel's safe passage. The term "resources" includes effective communication and teamwork skills, as well as the efficient use of technical equipment such as VHF radiotelephone, radar, and gyro.

Although both vessels communicated with one another in order to establish an overtaking arrangement, there were a number of instances in which not all members of each bridge team were aware of or informed of relevant or required information. These included:

- Between 1851 and 1900, the helmsman on the *Cast Prosperity* used an unusual amount of helm to maintain the desired heading; the helmsman did not relay this information to the other members of the bridge team, who did not detect the excessive amount of helm being used as displayed on the rudder-angle indicator.

- At 1853, the *Hyde Park* pilot did not immediately advise the other vessel of the action taken to correct a sudden sheer to starboard. The pilot only mentioned this later, after the pilot of the *Cast Prosperity* further requested a reduction in speed.

- Between 1855 and 1900, communication between the pilot and the OOW aboard the *Cast Prosperity*, with regard to engine orders, was delivered in unquantified terms.

- Neither bridge team made the other aware of the extent of the manoeuvring difficulties being encountered.

Voyage Data Recorder Testing and Certification

A VDR stores voyage information including bridge and radio telephone conversations, the vessel's course and speed, main engine control settings, rudder movements, and radar images.

The *Hyde Park* did not carry a VDR, nor was this required. The *Cast Prosperity*, as a more recently built vessel, carried a VDR as required. This equipment was approved in January 2005 by a German regulatory agency,[11] which found that it met the International Maritime Organization (IMO) standard of performance, including the quality of the recorded sound during playback mode.[12] This standard specifies, in part, that ". . . conversations at or near the conning stations, radar displays, chart tables . . . [be] adequately recorded."

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11 Germany's Federal Maritime and Hydrographic Agency (Bundesamt fur Seeschiffahrt und Hydrographie or BSH)

12 International Maritime Organization, Resolution A.861(20), Performance Standards for Shipborne Voyage Data Recorders, 27 November 1997

Although stringent audio standards are applied at the time of manufacture, vibrations, ventilation, and other ambient noises on the bridge of a vessel underway can severely reduce the quality of recorded audio data. The testing of the sound quality on this vessel was not conducted under normal operating conditions, nor is this required by the IMO standard.[13]

The investigation revealed that the quality of the VDR bridge audio recording on the *Cast Prosperity* was so poor that many conversations were unintelligible during playback. Furthermore, although radar images of the accident were recorded every 15 seconds, due to either an improper installation of video transmission cables or an interface failure on the radar side, no radar images were visible.[14]

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13 In a similar occurrence in 2004, the vessel *Rithi Bhum* was involved in a collision, and the subsequent investigation by Germany's Federal Bureau of Maritime Casualty Investigation (BSU) determined that the recorded bridge audio quality was poor. BSU Report 343/04 (Collision Between MV *Rithi Bhum* and MV *Eastern Challenger* with Subsequent Foundering of MV *Eastern Challenger* in the South China Sea, 14 November 2004)

14 Ibid

Analysis

As vessel size continues to increase and UKC is optimized, occurrences such as this can be expected to occur with greater frequency on the St. Lawrence River if no further measures are taken.

Hydrodynamic Interaction

It is common for a faster vessel to overtake a slower one on the St. Lawrence River. The Lac Saint-Pierre section is no exception and, based on that factor, the decision to overtake was deemed acceptable by both pilots.

However, other considerations should be taken into account during such a manoeuvre, such as the local bathymetry, speed through the water, horizontal separation, relative speed differentials, and UKC.

In this occurrence, two large vessels were side-by-side and moving forward in a narrow channel, each with less than 1.7 m of UKC. This situation compounded the hydrodynamic forces already in effect.

At least 11 minutes before the collision, there were clear indications of hydrodynamic interaction. At 1851, 23° of port helm was required to maintain the *Cast Prosperity*'s desired heading. Similarly, at about 1853, the *Hyde Park* sheered to starboard, as its stern was forced towards the overtaking *Cast Prosperity*. A substantial increase in propeller thrust and port helm was then required to stabilize the vessel on its intended heading.

In the two and a half minutes before the vessels collided, the *Cast Prosperity* failed to achieve a speed of greater than 9.1 knots—despite a propeller-pitch setting that should have produced a higher speed.[15] This is a demonstration of the classic trapping phenomenon while overtaking in confined waters.[16] The *Hyde Park*, meanwhile, continued to accelerate forward, being drawn towards the *Cast Prosperity* despite the engine telegraph set at dead slow ahead and the helm set hard to starboard (see Figure 5).

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15 In open water, the vessel could have been expected to exceed 12 knots.

16 The Nautical Institute, Conference on Shiphandling, Plymouth Polytechnic, 1977

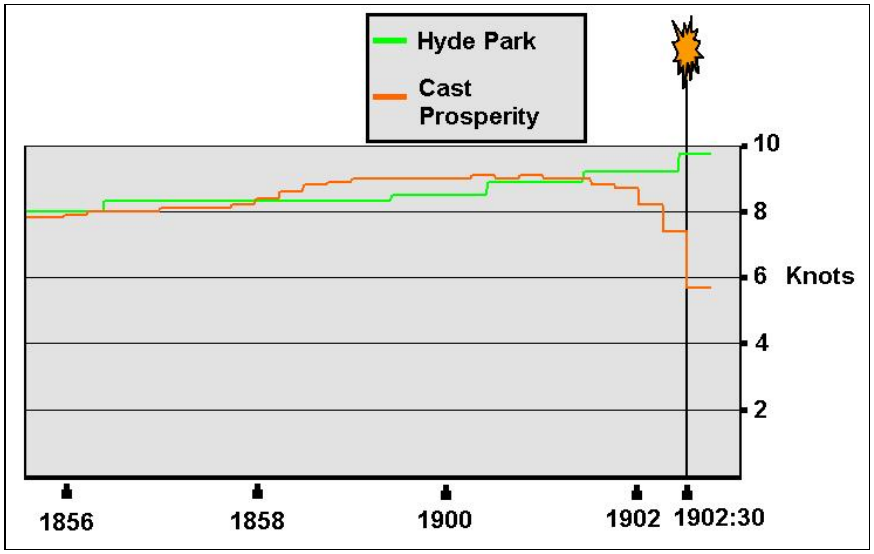

Figure 6. Vessel speeds over ground[17]

Following a similar occurrence in the Elbe River in 2004, Germany's Federal Bureau of Maritime Casualty Investigation (BSU) demonstrated, via tank testing of scale model ships and computer modelling, that the actual pressure zones around the vessels in a restricted waterway extend much further than 100 m.[18]

Although both pilots were experienced at carrying out overtaking manoeuvres, neither appreciated the strength of the hydrodynamic forces at work, and therefore the need for early and decisive action by both vessels to prevent them from being drawn together.

A heightened awareness of the many factors involved during these manoeuvres could have helped both bridge teams break the cycle of action and reaction between the vessels.

In the absence of sufficient information regarding all factors affecting inter-vessel hydrodynamics, pilots may have a less-than-adequate appreciation of the inherent risks and the need for coordinated avoidance action.

Following this and two other similar collisions in Germany and the United States, the marine community now has more information regarding the forces at work during overtaking situations. This information needs to be better applied to the conduct of vessels in the St. Lawrence River—especially given the increasing size, and in particular the beam, of vessels, and the optimization of UKC.

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17 The speed over the ground (SOG) for the *Cast Prosperity* was obtained from its voyage data recorder. The *Hyde Park*'s SOG was obtained from the electronic chart recording on the pilot's laptop computer.

18 BSU Report 45/04, Collision between the *Cosco Hamburg* and the *P&O Nedlloyd Finland* in the Elbe River, 01 March 2004

Neither the Laurentian Pilotage Authority nor the Corporation des pilotes du Saint-Laurent central[19] has guidelines to help pilots reduce the risk of severe hydrodynamic interactions between vessels in meeting and overtaking situations.

Bridge Resource Management and Inter-Vessel Communication

BRM is the effective use of all available resources, human and technical, to ensure a vessel's safe passage. As noted earlier, team members used unquantified terms to communicate speed orders and did not verify information from navigational equipment. Moreover, communication among bridge team members—and between vessels—was less than adequate.

In the Elbe River occurrence, the German report states that, "in view of the lack of concrete standard values for passing distances during overtaking, communication between [vessels] . . . is extremely important in avoiding suction effects."

On board the *Hyde Park* and *Cast Prosperity*, an environment of ineffective BRM, combined with poor communication between the vessels, prevented both bridge teams from recognizing the developing situation and taking timely action.

Very High Frequency Equipment Failure

Less than a minute before the collision, the push-to-talk button on the *Cast Prosperity*'s VHF radiotelephone jammed in the transmit position. As such, it could no longer be used by the *Cast Prosperity* to receive. The *Hyde Park* could hear bridge conversation on the *Cast Prosperity* but could no longer reply. By this point, however, the vessels were already being drawn together. The jammed button therefore likely had no effect on the final outcome.

Voyage Data Recorder Issues

Radar Image

The download of the *Cast Prosperity*'s VDR revealed that no radar targets had been recorded, even though the unit's emergency backup button had been activated within the required time. This was due either to the connections of two wires that had been reversed or an interface failure on the radar side. Without adequate follow-up testing under realistic working conditions, errors of this nature are likely to go undetected.

While some administrations, such as the United Kingdom's Maritime and Coastguard Agency and Germany's Federal Maritime and Hydrographic Agency (Bundesamt fur Seeschiffahrt und Hydrographie or BSH) have put in place measures to help ensure operational adequacy of recorded data, the quality of VDR data on other vessels may remain less than useful.

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19 Corporation of pilots who work in this compulsory pilotage area.

Bridge Audio Recording

The download of the *Cast Prosperity*'s VDR revealed that the quality of the recorded bridge audio was so poor that many conversations were unintelligible.

Following a similar conclusion from an investigation into a 2004 occurrence, Germany took the position that the IMO mandate type approval of VDR equipment and that the quality of bridge audio recordings be verified under realistic sea operating conditions. Germany also urged the IMO to improve its VDR performance standard by requiring a separate audio track for each microphone on the bridge.

In this occurrence, although the VDR had been tested upon installation and found operational, the quality of the recording was not verified under actual or realistic working conditions, nor was this required by the standard. This precluded confirmation that the in-service recordings would be of sufficient quality to effectively aid marine investigations.

Findings as to Causes and Contributing Factors

1. Neither pilot appreciated early enough the strength of the hydrodynamic forces at work, nor the need for early and decisive action to prevent the vessels from drawing together.

2. Ineffective bridge resource management and poor communication between the vessels prevented both bridge teams from recognizing the developing situation and taking timely action.

Finding as to Risk

1. Neither the Laurentian Pilotage Authority nor the Corporation des pilotes du Saint-Laurent central has guidelines to help pilots reduce the risk of severe hydrodynamic interactions between vessels in meeting and overtaking situations.

Other Findings

1. Failure to verify the quality of the voyage data recorder (VDR) recording under actual or realistic working conditions precluded confirmation that the in-service recordings would be of sufficient quality to effectively aid marine investigations.

2. The jammed push-to-talk button on the *Cast Prosperity's* very high frequency (VHF) radiotelephone likely had no effect on the outcome.

Safety Action

Action Taken

Department of Fisheries and Oceans/Canadian Coast Guard

On 13 October 2005, the Canadian Coast Guard (CCG) convened a meeting with members of the Corporation des pilotes du Saint-Laurent central, the Laurentian Pilotage Authority (LPA), Transport Canada (TC), and the TSB. The goal was to discuss the facts of this occurrence with a view to assessing any latent unacceptable risks. The TSB made a presentation of the facts as they were known at the time. One area of interest was the hydrodynamic interaction between deep-draught vessels in confined channel waters.

On 29 May 2006, the TSB convened a meeting with the aforementioned parties and also made individual presentations to the concerned pilots. More detailed descriptions of the facts and events leading up to the collision were shared, in order to communicate the dangers associated with overtaking manoeuvres between deeply laden vessels in restricted waters.

The difficulty of predicting the onset and magnitude of the hydrodynamic effects was emphasized by the TSB, citing the similarities with the National Transportation Safety Board report of the *Figaro* and *Camargue* collision in the Galveston Bay entrance on 10 November 1988. The lack of guidance for pilots attempting these manoeuvres was also underscored.

On 29 June 2007, the CCG issued a Notice to Mariners with regard to large beam vessels in excess of 32.5 m which stated that, in order to provide safe access to these vessels, the CCG, along with TC and the LPA, have agreed to undertake a study to determine the maximum beam allowed for these vessels to safely navigate the St. Lawrence River between the ports of Québec and Montréal.

This action was due to the fact that vessels in excess of the maximum beam for which the channel was designed are now transiting the St. Lawrence River. Until the study has been completed, several interim measures were put in place that must be respected by vessels transiting between the Montréal/Québec region of the St. Lawrence River with a beam between 32.5 m and 40.1 m, and vessels with a beam greater than 40.1 m were prohibited from transiting upstream of the port of Québec.

International Maritime Organization

At the 83rd meeting of the International Maritime Organization (IMO) Marine Safety Committee (MSC) held in October 2007, improvements to the voyage data recorder (VDR) performance standard were proposed by Germany, Egypt, and India. Evaluation of data retrieved from existing VDR installations has shown that, in many cases, audio recordings are of poor quality and sensor signals are not recorded. Sensor failure that is not recognized during operation has, in certain cases, made it impossible to use the stored data for the intended purpose.

The MSC has delegated to the Safety of Navigation (NAV) Sub-Committee, as a high priority item, amendments to performance standards for VDRs and simplified voyage data recorders (S-VDRs). Included in this will be the proposals of Germany, Egypt and India.

Safety Concern

Guidance for Ship Handlers in Restricted Waterways

In this occurrence, each vessel's speed through the water, as well as the relative speed between the two vessels and the physical location of the occurrence, played a critical role in the eventual outcome. Although the effects and causes of ship interactions are generally well known, specific and quantitative guidance is lacking for ship handlers. For example, it has only recently been demonstrated through testing that the actual pressure zones around the vessels in a restricted waterway extend much further than the previously accepted rule of thumb of 100 m.

From time to time, pilots and crews, both in Canada and elsewhere, continue to experience the adverse consequences caused by hydrodynamic interaction between vessels in restricted waterways. Following this and similar collisions in Germany and the United States, the marine community now has more information available regarding the forces at work during overtaking situations. However, this information needs to be better applied to the conduct of vessels in restricted waterways, especially given the increasing size of vessels with a corresponding decrease in under-keel clearances (UKCs).

Neither the LPA nor the Corporation des pilotes du Saint-Laurent central has guidelines taking into account local bathymetry, speed through the water, horizontal separation, relative speed differentials, and UKC to help pilots reduce the risk of adverse hydrodynamic interaction in meeting and overtaking situations. Given the increasing size of vessels and the trend of smaller UKCs, risk of occurrences of a similar nature could increase on the St. Lawrence River if no corrective measures are taken.

The Board is encouraged to see that area-specific risk assessments in regard to vessels in excess of 32.5 m in breadth were undertaken and that interim measures were put in place for such vessels transiting between Montréal and Québec.

The Board is concerned, however, that, without adequate guidance, pilots and crews may not be able to mitigate risks associated with hydrodynamic interaction and to avoid collisions during meeting and overtaking situations in the future.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 04 September 2008.

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