MARINE OCCURRENCE REPORT

M97L0019

STRIKING

OIL TANKER "IRVING ARCTIC"
TRAVERSE CAP-SANTÉ
ST. LAWRENCE RIVER, QUEBEC
07 MARCH 1997

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Summary

On 07 March 1997, the oil tanker "IRVING ARCTIC", under the conduct of a pilot, was proceeding in the St. Lawrence River upbound for Trois-Rivières, Quebec. While making a course alteration, the "IRVING ARCTIC" struck a shoal east of Brisants Sainte-Croix in the Traverse Cap-Santé. Helm manoeuvres were used to bring the vessel back to the middle of the channel. The bottom plating was holed, causing an ingress of water at the forepeak. There was no injury or pollution as a result of this occurrence.

Ce rapport est également disponible en français.

Other Factual Information

Particulars of the Vessel

	"IRVING ARCTIC"
Official Number	7343692
Port of Registry	Saint John, New Brunswick
Flag	Canada
Type	Oil tanker
Gross Tons[1]	21,673
Length	191.73 m
Draught	Forward: 9.91 m Aft: 10.52 m
Cargo	20,185.64 long tons of diesel oil 11,532.27 long tons of gasoline
Crew	23
Built	1974, Saint John, New Brunswick
Propulsion	One B&W 12,725 kW diesel engine
Owners	Irving Universal Saint John, New Brunswick

History of the Voyage

On 06 March 1997 at 0402 eastern standard time (EST)[2] in the Port of Québec, Quebec, two pilots boarded the "IRVING ARCTIC" to take the tanker to Trois-Rivières, Quebec. As berth No. 20 in the Port of Trois-Rivières was not available until the next day, the pilot and ship navigation personnel agreed to drop anchor in the Saint-Nicolas anchorage area.

The vessel departed the anchorage area on March 7 at approximately 0510. The first pilot had the conduct of the vessel. At about 0700 there was a watch change, and a new helmsman took over at the steering position. The officer of the watch (OOW) plotted the vessel's position on the chart. The second pilot took over the conduct of the vessel and the first pilot went below to have breakfast in the dining room. The vessel's

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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 All times are EST (coordinated universal time minus five hours) unless otherwise stated.

navigation was by visual and radar observation. The pilot used the parallel index method on the starboard radar while the master and the OOW kept watch on the port radar.

The weather was clear, with visibility of 10 nautical miles, and the winds were light. There was fast ice along the banks of the river, and the ice concentration in the channel was estimated at approximately 0.4. The log indicated a ground speed of approximately 10.5 knots.

On the Saint-Antoine course, the pilot used the radar to measure the distance between the vessel and the north shore and found that the vessel was slightly south of mid-channel. The pilot gave the order to steer 252° gyro (G). Using the Saint-Antoine range as a visual mark aft of the vessel, the pilot observed that further compensation was required and gave the order to steer 254°G. When the vessel returned to the middle of the channel, the helmsman was ordered to steer 250°G.

Off spar buoy Q46, the pilot ordered the helmsman to steer 260°G to initiate the alteration from the Saint-Antoine course to the Traverse Cap-Santé. At 0714 the pilot informed the Marine Communications and Traffic Services (MCTS) that the vessel had reached the Sainte-Croix calling-in point. At 0716 the OOW plotted the vessel's position as approximately half a cable northwest of the Sainte-Croix calling-in point.

The pilot adjusted the variable range marker of the starboard radar to a range of 2.2 nautical miles. While the pilot maintained a radar watch, it was asserted that the glare of the sun restricted his view of the automatic radar plotting aid. This account of events was not corroborated by the ship's navigation personnel. When the variable range marker was observed to have reached the image of the Donnacona wharf, the pilot ordered the helmsman to steer 270°G.

When the Hydro-Québec tower north of the Rivière Jacques-Cartier was in line with the Donnacona escarpment, an order was given to steer 280°G. The course alteration was made again as requested, but a check on the radar revealed that the variable range marker did not encompass the shore of Pointe Jacques-Cartier, which led the pilot to believe that the vessel was again south of mid-channel, and at once he ordered a course of 285°G.

Meanwhile, at 0724, the OOW used the port radar to measure the distance from the vessel to the Donnacona wharf and to the point at Cap-Santé. The position plotted on the chart showed that the vessel was south of mid-channel. Now in the approaches of the Traverse Cap-Santé, the pilot discovered that the object that he was using as a visual mark was not spar buoy Q50, but a piece of ice, and he ordered "hard over" and pointed to starboard. The OOW, surprised by the helm order, looked toward the Sainte-Croix range aft of the vessel and noticed that the vessel was south of mid-channel. Before the helm reached hard-a-starboard, the pilot ordered 310°G. In the following moments, the pilot ordered a series of helm manoeuvres to steady the vessel in the middle of the channel.

The master, witnessing these manoeuvres, turned his attention to the echo-sounder plotters, which showed a significant decrease in water depth. Concerned that the vessel had struck bottom, he at once ordered the first mate and the third engineer to sound the compartments. At 0730 the OOW again plotted the vessel's position. The position showed that the vessel had returned to the middle of the channel.

At 0805 the first mate advised the navigation team that there was an ingress of water in the forepeak. No other ingress of water was reported in the vessel's lower compartments. The main engine was slowed in anticipation of dropping the anchor. The MCTS were informed of the manoeuvre, and the anchor was let go off Lotbinière, Quebec, at 0822.

At 0932 it was noted that the forward draught had increased to 11.13 m. The crew transferred cargo aft until the vessel was on an even keel with a draught of 10.67 m. At 1018 the tanker departed the anchorage and, at 1704, arrived at berth No. 20 in the Port of Trois-Rivières.

The strong current in the Port of Trois-Rivières prevented divers from inspecting the hull. On March 10 the vessel anchored at Baie-Comeau, Quebec, and an underwater inspection the next day revealed that the damage was confined to a crack in the bottom plating under the forepeak.

On March 7, at approximately 0724, the tide gauge recorders at Neuville and Portneuf indicated water levels of 4.60 m and 4.15 m above chart datum. Based on the mean water level between the two tide gauges and the tanker's forward draught, the available information suggests that the vessel struck the shoal east of Brisants Sainte-Croix.

Passage Planning and Pilotage

Bad weather and icing in the channel sometimes unduly prolong a pilotage assignment. In anticipation of an increased workload during the winter season, two pilots are assigned to each vessel.

The pilot was not required to submit, and had not submitted, a passage plan to the vessel's personnel. The navigation personnel had not prepared a detailed passage plan which might have shown, among others things, courses to steer, parallel index distances, and wheel-over positions to assist in the navigation. Instead, they relied on the pilot's expertise. The pilot and the vessel's personnel had not shared navigational information, apart from a brief exchange at the beginning of the assignment.

In 1995 the Board published *A Safety Study of the Operational Relationship Between Ship Masters/Watchkeeping Officers and Marine Pilots* (TSB Report No. SM9501), which contained several recommendations regarding Bridge Resource Management (BRM). In particular, the Board recommended that the Department of Transport require that, as part of their initial hand-over briefing, pilots obtain the master's agreement to the intended passage plan, and invite the bridge team's support by having the OOW plot and monitor the vessel's position at regular intervals and report the position to him with respect to the agreed passage plan (TSB Recommendation M95-08). Regarding team work, the Board further recommended that the Department of Transport require that the initial training syllabus for all ship officers be modified to include demonstration of skills in BRM (TSB Recommendation M95-09); and that all ship officers and pilots be required to demonstrate skills in BRM before the issuance of Continued Proficiency Certificates to the former (TSB Recommendation M95-10) or before the issuance or renewal of a pilotage licence to the latter (TSB Recommendation M95-11).

Analysis

The conduct of a vessel involves the simultaneous observation of a host of cues, the interpretation of those cues and the selection of an appropriate course of action. In confined waters, with a vessel being constantly manoeuvred, the bridge navigation team (pilots and ship's officers) need to know the unique characteristics of the area in order to assess them. In such situations, the watch kept by the bridge navigation team is all the more critical and demanding, since any delay in decision making has the potential to jeopardize the safety of the vessel.

BRM is a navigational technique that helps to improve the efficiency of the bridge navigation team's decision making. BRM involves making judicious use of all available resources to ensure that the navigation of the vessel is properly executed. For effective BRM, it is essential that the pilot discuss with the other members of the navigation team the passage plan the pilot intends to follow. It is essential that deviations from the plan that have the potential to compromise the safe navigation of the vessel be queried. It is also important that an atmosphere conducive to communication be fostered by the pilot and the vessel's personnel and that it be maintained throughout the passage.

Equally qualified members of the navigation team, either the vessel's personnel or the pilot, can conduct a vessel in confined waters. What distinguishes the pilot from the vessel's personnel is knowledge of local conditions. This expertise enables the pilot to assess the cues observed and take action faster. On the other hand, the vessel's personnel has greater knowledge of the vessel's characteristics and crew. To reduce the risk of an accident, it is essential that the pilot and the vessel's personnel pool their knowledge and work together. BRM helps to optimize the contribution of each member of the navigation team.

The bridge of the "IRVING ARCTIC" is not designed to optimize communication among members of the navigation team. The port and starboard radars, used respectively by the vessel's personnel and the pilot, are some 10 m apart. The ergonomics of this conventional bridge, compared to an integrated bridge system, are less conducive to the flow of information necessary for effective BRM; the navigation equipment is more spread out. Consequently, the navigation personnel and the pilot cannot monitor all the instruments at once without leaving their respective positions. To reduce the effect of these poor ergonomics, it is essential that the members of the navigation team—including the pilot—make an extra effort to communicate among themselves.

The presence of ice flows along the edge of the channel and the reported glare of the sun on the radar screen may account for the pilot mistaking a piece of ice for spar buoy Q50. Using radar information and visual cues, the pilot had determined that the vessel was south of the intended track. Although he was aware of other cues, the pilot elected to rely on a point of reference on the radar that he believed to be buoy Q50 but which was, in fact, a piece of ice. He became perceptually confused; upon recognizing the error, the pilot gave helm orders to regain the centre of the channel. As a BRM regime was not implemented, communication between the pilot and the OOW with respect to navigation was less than optimal. The OOW had just plotted the vessel's position indicating that the vessel was south of mid-channel, but this information was not conveyed to the pilot. The OOW was aware that a belated course alteration to starboard was inappropriate. The overdue course alteration was not noticed in time because there was no interaction between the pilot and the vessel's personnel.

As there was no BRM and no passage plan known to all the members of the navigation team, the vessel's personnel were unable to analyse the cues quickly and effectively, to seek clarification from the pilot and/or recognize pilot error at an early stage and effect timely remedial measures to ensure safe transit.

Findings

1. All relevant BRM elements were not applied throughout the passage and communication between the pilot and the navigational personnel was less than optimal.

2. A passage plan had not been discussed between the pilot and the vessel's personnel.

3. The vessel's personnel used a traditional method of navigation that did not allow for close monitoring of the vessel's progress.

4. The vessel's personnel were unable to analyse the conduct of the vessel quickly and effectively.

5. Although the pilot acquired radar and visual cues that the vessel was south of mid-channel, he turned his attention to a buoy.

6. The ergonomics of the vessel's conventional bridge design, as compared to an integrated bridge system, are less conducive to easy communication between the members of the bridge navigation team.

7. The pilot relied on a buoy to make a course alteration and mistook a piece of ice for spar buoy Q50.

8. The vessel's personnel did not advise that the vessel was south of mid-channel.

9. The pilot was perceptually confused, and allowed the vessel to leave the channel.

10. The vessel struck a shoal on the edge of the channel, at full speed.

Causes and Contributing Factors

The striking of the "IRVING ARCTIC" on a shoal on the edge of the channel can be attributed to both the pilot's misinterpretation of a visual cue and the vessel's navigation personnel having not effectively monitored the conduct of the vessel. The pilot placed emphasis on what he believed to be a spar buoy, to the point of disregarding other visual and radar cues. The pilot became perceptually confused before realizing his error. Communication between the vessel's navigating personnel and the pilot was less than optimal. The navigation techniques used on board were such that the vessel's personnel did not correct the navigation error in time to

prevent the vessel from leaving the channel. The vessel struck a shoal before the pilot could bring her back to the middle of the channel.

Safety Action

In July 1997, a few months after this occurrence, a task force was created to develop a BRM training program. The task force—with representatives of shipowners, maritime training schools, pilotage authorities, and mariners' and ship officers' unions—developed course content and set instructor qualifications, course length, enrolment numbers and certification criteria.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson Benoît Bouchard, and members Jonathan Seymour, Charles Simpson, W.A. Tadros and Henry Wright authorized the release of this report on 10 December 1999.