MARINE INVESTIGATION REPORT
M00C0053

CONTACT WITH BOTTOM

BY THE TANKER "ALGOEAST"
AMHERSTBURG CHANNEL, ONTARIO
10 AUGUST 2000

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

On 10 August 2000, the "ALGOEAST" was upbound in the deep-draught portion of the Amherstburg Channel, Ontario, with a cargo of Bunker C for Sarnia, Ontario.

As the vessel approached buoys "D57" and "D56", the master, initially, did not interpret the lights he saw as those of a vessel crossing ahead and thus delayed his order for a required course alteration. The delay resulted in the vessel making contact with the bottom outside the deep-draught portion of the channel at 2142 eastern daylight time. The vessel sustained damage to its forepeak and double bottoms. No one was injured and there was no release of pollutants.

Ce rapport est également disponible en français.

Other Factual Information

Particulars of the Vessel

	"ALGOEAST" EX "IMPERIAL ST. LAWRENCE"
Official Number	371941
Port of Registry	Toronto, Ontario
Flag	Canada
Type	Oil Tanker
Gross Tons[1]	8,544.6
Length	131.5 m
Breadth	20 m
Draught	Forward: 7.1 m Aft: 7.4 m
Built	1977
Propulsion	B&W 6-cylinder diesel engine, single controllable pitch propeller, and bow thruster
Cargo	9157.9 cubic metres (8,863 tonnes) Bunker C
Crew	17
Owner(s)	Algoma Tankers Limited, St. Catherines, Ontario

Description of the Vessel

The "ALGOEAST" was originally built in 1977, as a double-sided, oil/product tanker by Mitsubishi Heavy Industry Ltd. of Japan but was converted to a double-hulled vessel with the addition of a new double bottom in April 2000. The vessel is built to Lloyd's Register of Shipping 100A1, Oil Tanker (cc) ESP Class 1A+LMC, and it has six cargo tanks fitted with heating coils capable of carrying 10 327 cubic metres[1] of product. The accommodation and machinery space are located aft. The vessel regularly carries heavy oil cargo for ports of the Great Lakes, St. Lawrence River, Eastern Canada, and the Northeastern United States.

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

History of the Voyage

On 10 August 2000 at 0705 eastern daylight time (EDT),[2] the "ALGOEAST" departed Nanticoke Harbour, on Lake Erie, loaded with 8,863 tonnes of bunker bound for Sarnia. The master developed and approved the vessel's voyage plan for the passage to Sarnia from a generic computerized voyage plan supplied by the company. As the generic plan was designed for a larger vessel with a forward bridge, the master had adjusted the plan to suit the "ALGOEAST" whose voyage plan included navigating three sets of range lights to transit Amherstburg Channel. A review of the voyage plan by the TSB confirmed the description of the listed range lights was correct and consistent with the hydrographic chart. The vessel is also equipped with a non-compulsory electronic chart with an integrated navigation system.

The vessel sailed to the western end of Lake Erie where it proceeded upbound (northward) in the Detroit River. As per the master's instructions, the officer of the watch called him one hour before the vessel reached the East Outer Channel light. At 2037, when the vessel approached the East Outer Channel, the master had the conduct of the vessel. The bridge team consisted of the master, the third officer, who was manning the starboard radar and handling radio communications, and the wheelsman. A trainee-master and an evaluator were also on the bridge. The evaluator was a representative from the ship's owner who was assessing the master's piloting capabilities through the Amherstburg Channel.

The vessel transited Lower Livingstone Channel and entered Amherstburg Channel. Amherstburg Channel is on the Canadian side of the Detroit River and leads up to the east of Bois Blanc Island. The channel is used for upbound vessels. The west half is the deep-draught channel and is 183 m wide. The United States National Ocean Service Chart 14848 indicates a channel depth of 27 ft (8.2 m) and a width of 225 ft (68.6 m).

When the "ALGOEAST" approached buoys "D 56" and "D57", the master was looking for the next range on which to steer, that of the fixed yellow lights of the Amherstburg Reach Range. Between buoys "D56" and "D57", the shipping channel changes direction by 17.5 degrees. At this location, the master delayed altering course to port because he saw two large white lights ahead that he thought could be a range of which he was unaware. The other officers of the bridge team also saw the lights but recognized there was a vessel further upstream crossing the channel from west to east. There was no exchange of information concerning the lights by the bridge team members until the officer manning the starboard radar indicated that there was a vessel up ahead. By that time, the lights of the Amherstburg Reach Range were coming into line.

The master then ordered helm to "port 10", and followed up quickly with "port 20". At 2142, as the vessel altered to port, it made contact with the bottom at reported position 42° 05.45'N and 083° 06.91'W, which is east of the eastern charted limit of the deep-draught portion of the channel. The vessel's speed prior to its contact with the bottom was reported to be 7.8 knots. Upon contact, the master ordered "hard to port", "midships", and then "hard to starboard", and steadied the vessel along the Amherstburg Reach Range. The master then ordered the vessel's double-bottom tanks be sounded. It was determined there was no ingress of water and no release of pollutants. The master decided to proceed to the anchorage area north of Fighting Island to anchor the vessel and to further assess the damage. At 2155, the master reported the incident by cellular telephone to Sarnia Traffic Services. He also reported his intention to proceed to the anchorage area. The VHF radio was not used at this time. At 2306 the "ALGOEAST" was at anchor in the anchorage area.

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[2] All times are in EDT (Coordinated Universal Time minus 4 hours) unless otherwise indicated.

While at anchor, a Transport Canada inspector, with representatives of the owner, Lloyds, and the ship's insurer examined the vessel for damage and found that contrary to initial damage reports, the forepeak had been breached and was flooded. An examination of the vessel's hull by a diver found a 1.2- to 1.5-m crack in way of the forepeak.

The vessel was given authorization by Transport Canada to proceed during daylight hours to the port of Sarnia. At 0840 on August 12, the "ALGOEAST" weighed anchor and proceeded to Sarnia. At the request of Algoma Tankers, a Great Lakes Pilotage Authority (GLPA) pilot boarded the vessel for the remainder of the voyage. At 1515, the vessel arrived in Sarnia, subsequently discharged, inerted its tanks, and underwent a full underwater survey.

Damage to the Vessel

The vessel sustained a shell fracture to its forepeak of approximately 1.2 m long and about 0.3 m to port of the centre line by which water entered the forepeak. The vessel also sustained internal and external damage to its double bottoms along the centre line which did not breach the vessel's watertight integrity.

Personnel Qualifications and Experience

On the navigation bridge was the master, third officer, and wheelsman. A trainee-master and an evaluator were also present. The ship's officers held certificates appropriate for this type of vessel and geographic area of operation.

The master had command of the "ALGOEAST" for two years. Over the past three years, he had made some 25 one-way trips along the Detroit-St. Clair River system.

The third officer had been sailing for 20 years on board a variety of vessels and had made numerous voyages in the Detroit-St. Clair River system. He had been on board the "ALGOEAST" since 12 July 2000, having previously sailed on the "ALGONOVA".

The wheelsman joined the vessel mid-July 2000, and this was his first voyage in the Detroit-St. Clair River system.

The evaluator, a company master, had made 38 one-way trips in the Detroit-St. Clair River system on other vessels. This was his first experience as an evaluator.

This voyage was the second evaluation for the master in these waters. The master was previously evaluated for the various sections along the river, and he had been informed he needed more experience in the Amherstburg Channel.
The trainee-master was on board to observe the voyage and to familiarize himself with the river. Over the past two years, he had made about 10 trips up and down the river as chief officer on a number of vessels. As chief officer on those voyages, his participation in navigation had been limited.

Weather and Current

The 2000 local time weather conditions, recorded by the US automated weather station on Grosse Île, was cloudy, visibility 10 miles (16 km), and north northeast winds at four knots. Bridge navigating team members reported similar conditions at the time of the occurrence, clear visibility, and light winds.

The United States National Oceanic and Atmospheric Administration's *United States Coast Pilot 6*, 29th edition, and the Canadian Hydrographic Service's *Sailing Directions, Great Lakes, Volume 1,* 10th edition, state "Because of current effects, mariners are advised to exercise caution when turning from Hackett Reach into Amherstburg Reach". The most recent data was taken approximately 400 to 460 m downstream from buoy "D56" by the US Corps of Army Engineers in July 1999. This data suggests a maximum current speed of 2.5 knots near the middle of the channel. The master and third officer were aware of the current's effects.

At 2145, the water level recorded at Amherstburg was 0.738 m above chart datum and was normal for this time of year.

Pilotage

The GLPA was established pursuant to the *Pilotage Act* and has jurisdiction for pilotage over the waters within the geographical boundaries as described in the *Act*. The Canadian waters of the connecting channels between Lake Erie and Lake Huron have been established by regulation as a compulsory pilotage area, and vessels operating within this area must be under the conduct of a pilot or the holder of a pilotage certificate.

Canadian vessels are exempted from compulsory pilotage provided the master and deck watch officers:

- are regular members of the vessel's complement.
- have been certified within the preceding 12 months by the owner of the vessel as having completed in the three-year period preceding the date of the certificate at least 10 one-way passages of the compulsory pilotage area.

This exemption was introduced initially as a temporary measure until such time the masters and deck watch officers became certified to pilot their vessels.[3] However, it has become standard operating practice for owners of vessels operating in the Great Lakes pilotage areas.

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[3] *Ministerial Review of Outstanding Pilotage Issues*, Report to Parliament, Minister of Transport, November 1999.

The GLPA reported that the master of the "ALGOEAST" and the evaluator were certified by the owner of the vessel as satisfying the requirement for exemption from compulsory pilotage for the waters in which the occurrence took place. An assessment of the pilotage capabilities of the master was not undertaken or required by the GLPA.

The evaluator had no formal assessment training other than skills acquired as a ship's master. He had not been provided with any guidance to assess pilotage capabilities. Therefore, he conducted the evaluation in a manner to which he had been previously assessed in 1999. While he had discussed the use of turning points with the master the assessment was conducted primarily by silent observation and included limited interaction with the navigating bridge team.

Requirements for Exemption from Pilotage

In November 1999, the Minister of Transport directed the GLPA to strengthen the requirements for exemption from compulsory pilotage by, *inter alia*, requiring 15 one-way trips instead of 10, with five of these trips having been completed in the 12 months preceding the request for exemption, and that the vessel in a compulsory area have on board two officers who have met the minimum trip requirements. Subsequently, the GLPA consulted with a shipowners association during the latter months of 2000 and early 2001. The consultations culminated with the GLPA forwarding proposed amendments to the *Great Lakes Pilotage Regulations* to Transport Canada.

On 15 April 2001, the Minister of Transport requested the GLPA to defer its regulatory submission pending an evaluation of the current requirements for exempting vessels from compulsory pilotage within the GLPA waters using Pilotage Risk Management Methodology (PRMM) procedures. The PRMM, which is anticipated to be completed by the beginning of 2002, is to address the issue of exempting domestic vessels from compulsory pilotage and will take into account factors such as training and certification.

Meanwhile, the GLPA has developed a training manual to address the need for assessing the pilotage skills for mariners who have been granted exemptions based on a prescribed number of trips. The training manual, modelled on a training manual for apprentice pilots, prescribes appropriate training and examination to verify the pilotage skills for Great Lakes mariners.

The GLPA is working to put into place a computerized audit system for monitoring the number of trips by officers certified and seeking certification by owners of vessels. Presently, owners of exempted vessels provide signed affidavits stating that an officer has completed the minimum trip requirement but do not provide information on the number of trips made by an officer, nor are they required to do so when submitting their certifications to the GLPA.

On Board Electronic Navigation System

Navigation log data from the electronic chart system's hard disk contains a record of electronic information from both external sensing devices and screen presentations. In this instance, the recording interval was 10 seconds and each log entry contained the following information: date, time, vessel latitude, vessel longitude, position source, vessel heading, heading source, vessel course made good, and vessel speed made good. In addition, since a global positioning system (GPS) was used for positioning, the number of satellites in use and in view was also logged electronically.

According to the data log files, the vessel had been navigating within the recommended limitations of the channel for most of the passage, with one exception. Approximately 25 minutes prior to reaching the position of the occurrence, there were a series of log recordings that indicated the vessel sailed very close to the western edge of the deep-draught channel. The position of the bottom contact reported by ship's navigating personnel corresponds (within 15 m) to the vessel's track recorded by the vessel's electronic chart with an integrated navigation system.

In order for navigation charts to be presented in readable format on this particular navigation display unit, hydrographic and geographic waterway information is transformed into electronic vector format. This was completed by the manufacturer and packaged in folios for specific areas. The best vector scale chart to sail the area, United States National Ocean Service Chart 14848, had been properly loaded automatically for viewing by the navigating personnel.

Analysis

Implementation of Bridge Resource Management

The objective of Bridge Resource Management (BRM) is to ensure the safety of the ship, its personnel and cargo, and protection of the environment. BRM emphasizes teamwork to optimize the use of all available resources, including equipment, written information, procedures, and personnel. All members of the bridge watch team have a role to play, and for BRM to be effective, there must be clear channels of communication and an environment conducive to open discussions, especially during critical phases of a passage.

Although the master and his bridge team had received training in BRM, they did not apply the related principles at the time the vessel approached buoys "D 56" and "D57"; the master was looking for the next range on which to steer. When the master sighted the white lights ahead, he made an assumption that he was looking at a new range installation. He did not immediately validate his observations with his bridge team who saw the same lights and interpreted them to be a vessel crossing ahead. This interpretation was confirmed by radar observation. The bridge team assumed that the master had reached the same interpretation as they had and did not communicate to him that the lights ahead were those of a crossing vessel. Although the roles of the evaluator and the trainee master were not clearly established in advance and they were not part of the bridge team or responsible for the vessel's navigation, in an effective BRM environment, they would have spoken out upon recognizing deviations from established practices affecting the vessel's safety.

There is currently no mandatory requirement for BRM training. However, the owner is providing BRM training to officers and expects it to be used. An integral component of a company training program like BRM is validation of course objectives through noticeable change and improved practices. While masters and mates are evaluated by the company for their pilotage capabilities, less emphasis is placed on ensuring that the skill and knowledge acquired during BRM training is translated into enhanced navigation practices.

Evaluating for Pilotage

Compulsory pilotage areas are established to protect the environment from marine accidents and to enhance operational safety. Within these areas, a vessel must be under the conduct of a competent person. The determination of a person's competencies requires an appropriate evaluation of the person's abilities,

knowledge, and skills. The success of an evaluation is determined by the knowledge and experience of the evaluator, the quality and nature of the evaluation criteria, and a process that is objective.

To evaluate and verify the skills and knowledge of its masters and mates to safely navigate in the confined waters of the Great Lakes and St. Lawrence River system, Algoma Central Marine, the business unit which operates the dry-bulk cargo vessels, put into place a "pilotage program" for its vessels in May 2000. Algoma Central Marine evaluators have a "train the trainer" course for training other masters within the fleet to be evaluators. However, at the time of the occurrence, the owner did not have such a program in place for its liquid-bulk vessels, which included the "ALGOEAST". In the absence of evaluation criteria, an evaluation carried out by a subject matter expert is susceptible to subjectivity, value judgement, and error.[4]

Algoma Central Marine's "pilotage program" for dry bulk cargo vessels primarily addresses evaluating the knowledge of its employees. Evaluating job behaviour is based on only one subjective question, "Did the team adequately apply BRM?" In the context of pilotage, delegation, teamwork, decision making, and communications are essential factors; evaluation criteria should address these aspects separately. It is relatively easy to evaluate skills and knowledge by assessing answers to specific questions and examining discrete tasks which can be measured directly, for example, which radio frequency is to be used in a specific location. However, it is much more difficult to assess tasks which are of a team nature or those requiring interaction with others. This may be more subjective in nature and requires an evaluator who is conversant with the subject matter and criteria which can be used to assess overall job behaviour.

Reporting an Accident

The benefit of having vessels maintain a continuous listening watch on a common radiotelephone channel when operating in confined waters is to allow vessel crews to become immediately aware of circumstances where it may be necessary for them to take early action. This occurrence was reported to a marine traffic regulator by cellular telephone rather than by VHF radio. While there are no regulations requiring that such a report be made by VHF radio, use of a cellular telephone to report an accident effectively pre-empts other vessels of the opportunity to take immediate precautionary measures.

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[4] John Patrick, *Training Research and Practice*, London: Academic Press, 1992.

Accuracy of Electronic Positioning

From the data log files, the TSB was able to evaluate the accuracy of the position from the GPS data in real-time with differential corrections. While transiting the Amherstburg Channel, no major system malfunctions were recorded by the electronic chart system, and past track data was logged without interruption at the set 10-second intervals. At the time of the occurrence, the positioning information provided by the GPS receiver was considered accurate.

Findings as to Causes and Contributing Factors

1. The master, initially, did not interpret the lights he saw as those of a vessel crossing ahead and delayed his helm order to port. Consequently, the vessel made contact with the bottom while outside the deep-draught portion of the channel.

2. Although most of the navigating personnel had received BRM training, BRM principles were not applied on the vessel at the time of the occurrence.

Findings as to Risk

1. The current exemption for vessels does not require an assessment of the pilotage skills of masters and navigation officers.

2. The absence of evaluation criteria for pilotage skills increases the risk of a subjective evaluation and an inaccurate assessment.

3. The current practice of not evaluating the shipboard personnel in the implementation of BRM practices has the potential to compromise the safe navigation of vessels.

4. There was no formal follow-up evaluation of the training to ensure that BRM principles were integrated into daily operations.

5. Use of a cellular telephone to report an accident prevents other vessels from the opportunity to take immediate precautionary measures.

Safety Action

Action Taken by Algoma Central Marine

On 31 August 2000, the owner adopted and implemented the Algoma Central Marine Pilotage Program for its liquid-bulk vessels.

A directive was issued to vessels stating that BRM principles are to be exercised regardless of the situation.

It is proposed that an evaluator will be issued written instructions stating his objectives and that he is part of the bridge team.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 25 October 2001.

Appendix A – Sketch of the Occurrence Area