



**Bundesstelle für Seeunfalluntersuchung**  
**Federal Bureau of Maritime Casualty Investigation**  
Federal Higher Authority subordinated to the Ministry of Transport  
and Digital Infrastructure

Investigation Report 499/15

**Serious Marine Casualty**

**Grounding of the  
multipurpose ship  
BBC MAPLE LEA  
on 17 December 2015  
in Lake Saint-Louis, Canada**

14 March 2017

The investigation was conducted in conformity with the Law to improve safety of shipping by investigating marine casualties and other incidents (Maritime Safety Investigation Law – SUG) of 16 June 2002, amended most recently by Article 1 of 22 November 2011, BGBl. (Federal Law Gazette) I p. 2279.

According to said Law, the sole objective of this investigation is to prevent future accidents and malfunctions. This investigation does not serve to ascertain fault, liability or claims (Article 9(2) SUG).

This report should not be used in court proceedings or proceedings of the Maritime Board. Reference is made to Article 34(4) SUG.

The German text shall prevail in the interpretation of this investigation report.

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## 1 Summary

The German-flagged multipurpose ship BBC MAPLE LEA cast off from the port of Sainte-Catherine in Canada on the morning of 17 December 2015 to commence her voyage to Falmouth in the United Kingdom. A pilot was on board for the passage through the Saint Lawrence Seaway. The BBC MAPLE LEA initially proceeded in a westerly direction on the Canal de la Rive Sud to turn in Lake Saint-Louis for lack of an opportunity to turn in the port of lading. The pilot favoured the fairway section west of buoy A13 for the turning manoeuvre. The area off the locks at Beauharnois was designated for the turning manoeuvre in the shipboard voyage plan, which would have entailed a detour totalling 13 nm (6.5 nm in each direction). The BBC MAPLE LEA's draught stood at 8 m.

The turning manoeuvre west of buoy A13 failed, which resulted in the BBC MAPLE LEA sailing out of the fairway south-west of buoy A18 and grounding there in an area with water depths of between 6 m and 7.3 m. The bow thruster was damaged in the process, which resulted in a small spill of hydraulic oil. The accident did not cause injury to any individual.

It was possible to haul the BBC MAPLE LEA free at about midday on the following day.

## 2 FACTUAL INFORMATION

### 2.1 Photo



Figure 1: Photo of the BBC MAPLE LEA

### 2.2 Ship particulars

Name of ship:	BBC MAPLE LEA <sup>1</sup>
Type of ship:	Multipurpose dry cargo ship
Nationality/Flag:	Federal Republic of Germany
Port of registry:	Hamburg
IMO number:	9358034
Call sign:	DDLO
Owner:	Auerbach Bereederung GmbH & Co. KG
Year built:	2007
Shipyard/Yard number:	China Changjiang Shipping Group Qingshan/QS2004 0306
Classification society:	DNV GL
Length overall:	138.93 m
Breadth overall:	21 m
Gross tonnage:	9,611
Deadweight:	12,746 t
Draught (max.):	8 m
Engine rating:	5,400 kW
Main engine:	MAK 6M 43 C
(Service) Speed:	14 kts
Hull material:	Steel
Hull design:	Double hull, double bottom
Minimum safe manning:	11

<sup>1</sup> As opposed to that visible on the photo of the ship, the name of the ship was changed to BBC MAPLE LEA on 1 February 2015

### 2.3 Voyage particulars

Port of departure:	Sainte-Catherine, Canada
Port of call:	Falmouth, United Kingdom
Type of voyage:	Merchant shipping, international
Cargo information:	Fragmented steel scrap
Manning:	17
Draught at time of accident:	D <sub>f</sub> 7.8 m, D <sub>m</sub> 7.9 m, D <sub>a</sub> 8.0 m
Pilot on board:	Yes
Canal helmsman:	No
Number of passengers:	0

### 2.4 Marine casualty information

Type of marine casualty:	Serious marine casualty, grounding
Date, time:	17 December 2015, 0755 <sup>2</sup>
Location:	Lake Saint-Louis, Canada
Latitude/Longitude:	φ 45°24.11' N λ 073°47.00' W
Ship operation and voyage segment:	Lake passage
Place on board:	Bow thruster
Human factors:	Yes, human error
Consequences:	Bow thruster damaged; spill of up to 10 l of hydraulic oil

Extract from the Official Electronic Nautical Chart

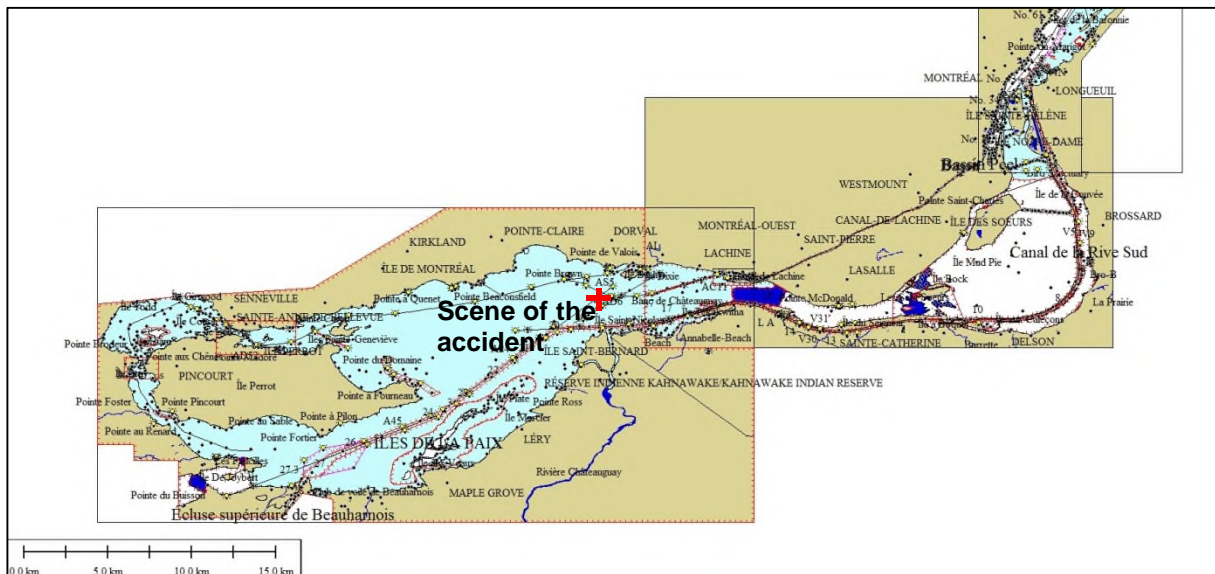


Figure 2: Nautical chart

<sup>2</sup> All times shown in this report are local = UTC-5



## **2.5 Shore authority involvement and emergency response**

Agencies involved: Vessel Traffic Service (VTS) Beauharnois Traffic,  
Transportation Safety Board of Canada (TSB)<sup>3</sup>,  
Coast Guard, Environment and Climate Change  
Canada (ECCC)<sup>4</sup>

Resources used: Two tugs and a helicopter

Actions taken: Oil barrier deployed; hauled free

Results achieved: Minor spill of hydraulic oil and distressed vessel  
hauled free

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<sup>3</sup> Bureau de la sécurité des transports du Canada

<sup>4</sup> Environnement et du Changement climatique Canada

### 3 COURSE OF THE ACCIDENT AND INVESTIGATION

#### 3.1 Course of the accident

The German-flagged multipurpose ship BBC MAPLE LEA cast off from the port of Sainte-Catherine at 0640 on 17 December 2015 to commence her voyage to Falmouth. A pilot was on board for the passage through the Saint Lawrence Seaway.

Weather conditions were good. A force 4 Bft north-west wind prevailed. Sunrise was at 0727. Apart from the pilot, the BBC MAPLE LEA's bridge was manned by the master, the chief officer (on watch), and a helmsman.

Since the Canal de la Rive Sud (marked blue in Figure 3) is just under 100 m wide, the BBC MAPLE LEA had to first sail the canal in a westerly direction so as to be able to subsequently turn in an open area not bound by banks on each side and then sail back toward Montreal.

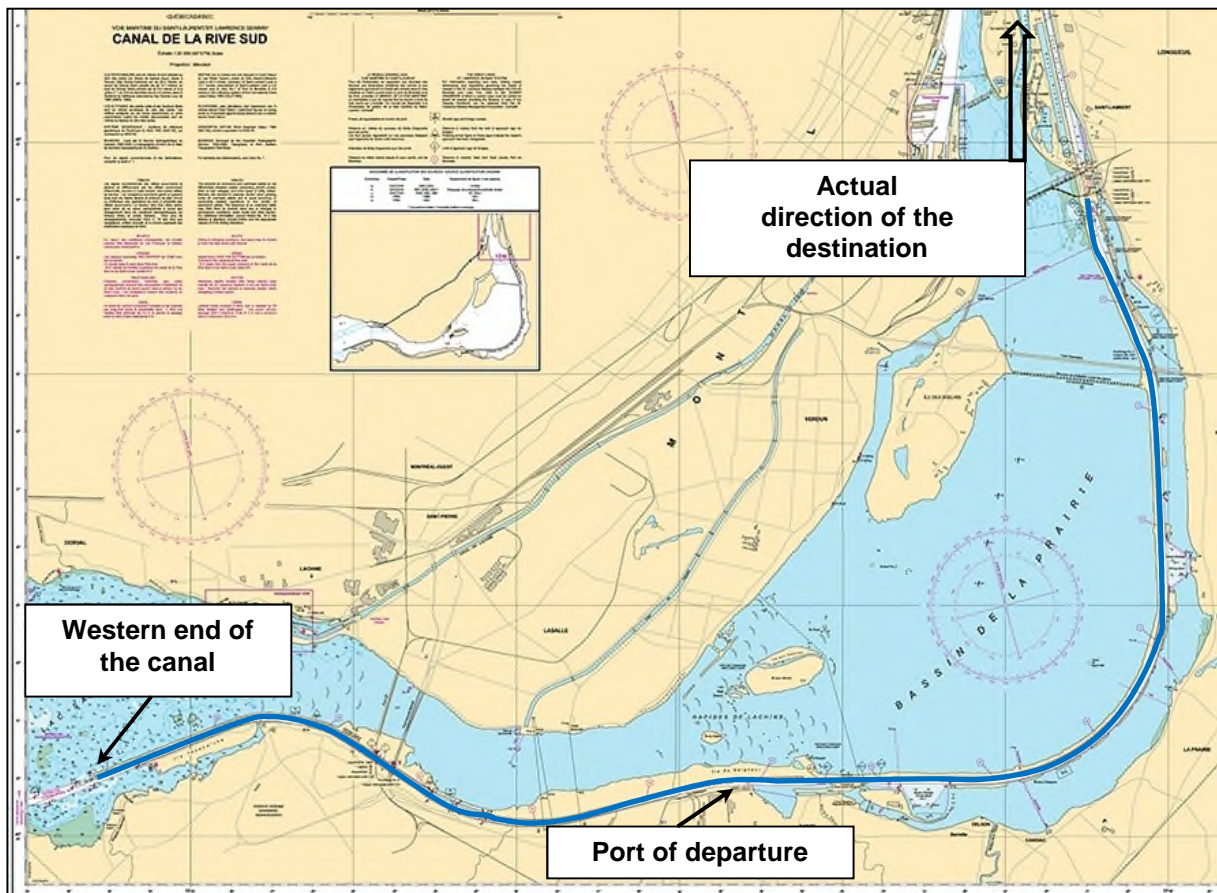


Figure 3: Nautical Chart CA1429 – Canal de la Rive Sud

During the passage through the Canal de la Rive Sud, the master of the BBC MAPLE LEA and the pilot discussed the forthcoming turning manoeuvre, inter alia. The area just off the lock at Beauharnois was designated for the turning manoeuvre in the shipboard voyage plan. When asked about this, the pilot advised

the master that the ship should be turned shortly beyond the western end of the canal in the fairway after buoy A13 (see Figure 4).

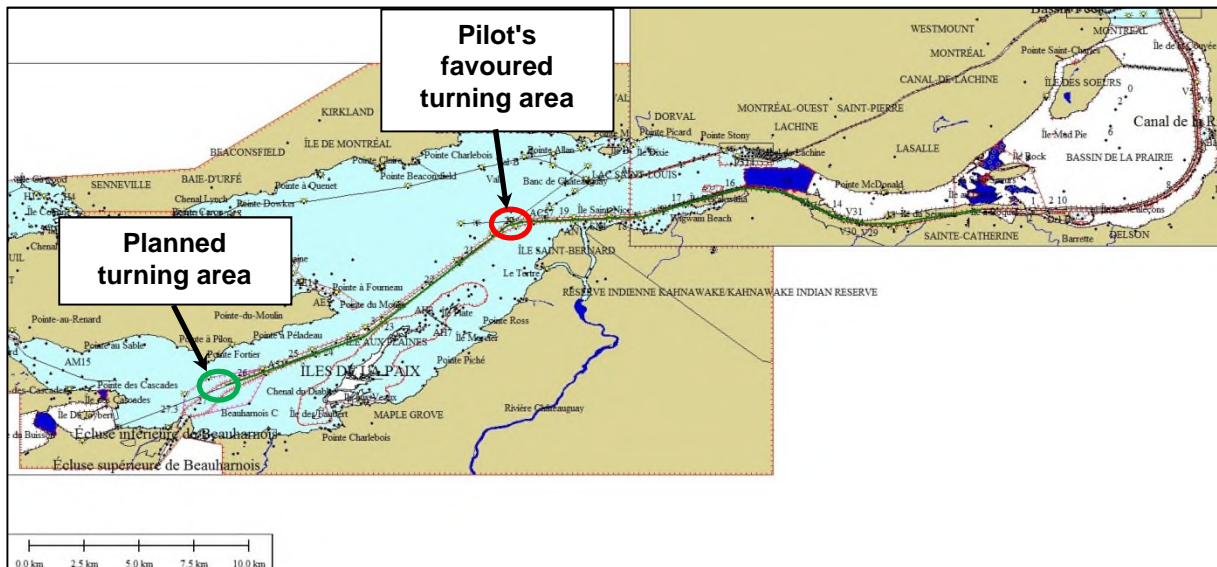


Figure 4: Original voyage planning of the BBC MAPLE LEA

The course of the fairway changes to a south-westerly direction west of buoy A13, causing it to widen to 355 m maximum between buoy pair A17/A18 (see Figure 5).

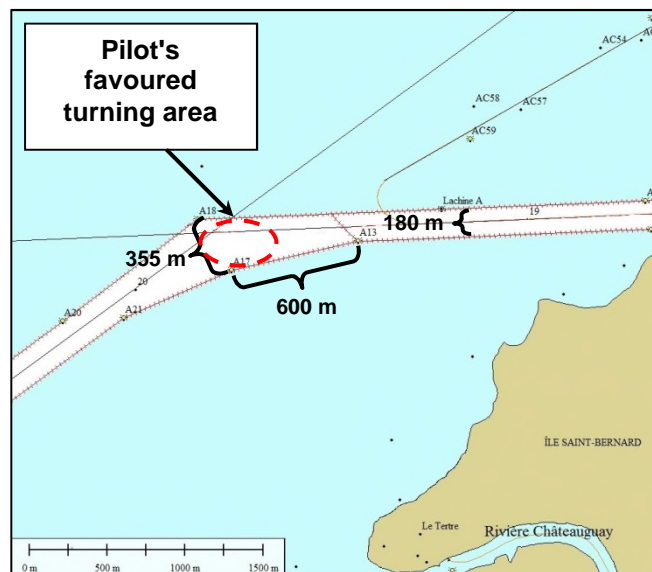


Figure 5: Pilot's favoured turning area

The depth of water in this area drops rapidly outside the fairway. The depth west of buoy A18 plotted in the official paper chart is 6.2 m (see Figure 7). The electronic nautical chart used by VTS Beauharnois Traffic shows 7.3 m in this area (see Figure 13). The BBC MAPLE LEA's forward and aft draughts stood at 7.8 m and 8 m respectively, whereas the water depth in the turning area originally earmarked stood at between 9.5 m and 10.5 m.

The pilot's favoured turning area was agreed upon, which shortened the route by 13 nm (6.5 nm in each direction).

At the beginning of the passage through the Canal de la Rive Sud at 0659, VTS Beauharnois Traffic contacted the BBC MAPLE LEA's pilot on VHF radio and inquired as to where the ship intended to turn. The pilot replied that he wanted to turn at buoy A13 if time permitted, as it was evident that the BBC MAPLE LEA would encounter a bulk carrier in Lake Saint-Louis. The VTS instructed the pilot to co-ordinate the turn with the other ship, which he complied with. The other ship was in agreement with the BBC MAPLE LEA turning at buoy A13.

The canal voyage passed according to plan. The pilot ordered the courses and rudder angles, which were executed and confirmed by the helmsman. At 0730, the BBC MAPLE LEA sailed from the canal into the Lake Saint-Louis fairway at a speed over ground (SOG) of 8.8 kts<sup>5</sup>. Lake Saint-Louis is non-tidal. The wind-induced wave height amounted to up to half a metre.

The master went to the conning position for the forthcoming turning manoeuvre to operate the bow thruster. At 0748, the BBC MAPLE LEA approached buoy A13 at 8.7 kts. The ship was proceeding in the middle of the fairway on a heading of 266°. The third officer and a helmsman arrived on the bridge to relieve the watch. The third officer went to the chart table with the chief officer, who was being relieved, for the handover.

After passing buoy A13, the pilot had the engine stopped, as well as the helm set to hard-a-port and the bow thruster to full to port briefly. The ship turned slightly to port (course over ground: 248°) still at a speed of 6.4 kts. When the ship reached roughly the middle of the turning area, the pilot had the bow thruster stopped and the engine set to full astern. Her momentum was carrying her at a speed of 5.3 kts. He also ordered the bow thruster full to starboard. The ship continued toward the western buoy line for almost a whole minute, however. Her rate of turn was almost zero (course over ground: 270°). The ship started to turn slowly to starboard only when her speed dropped to less than 4 kts at 0753. The BBC MAPLE LEA's bow crossed the western buoy line at 0755 and grounded there.

All attempts to refloat the ship failed.

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<sup>5</sup> The speeds mentioned below are SOG



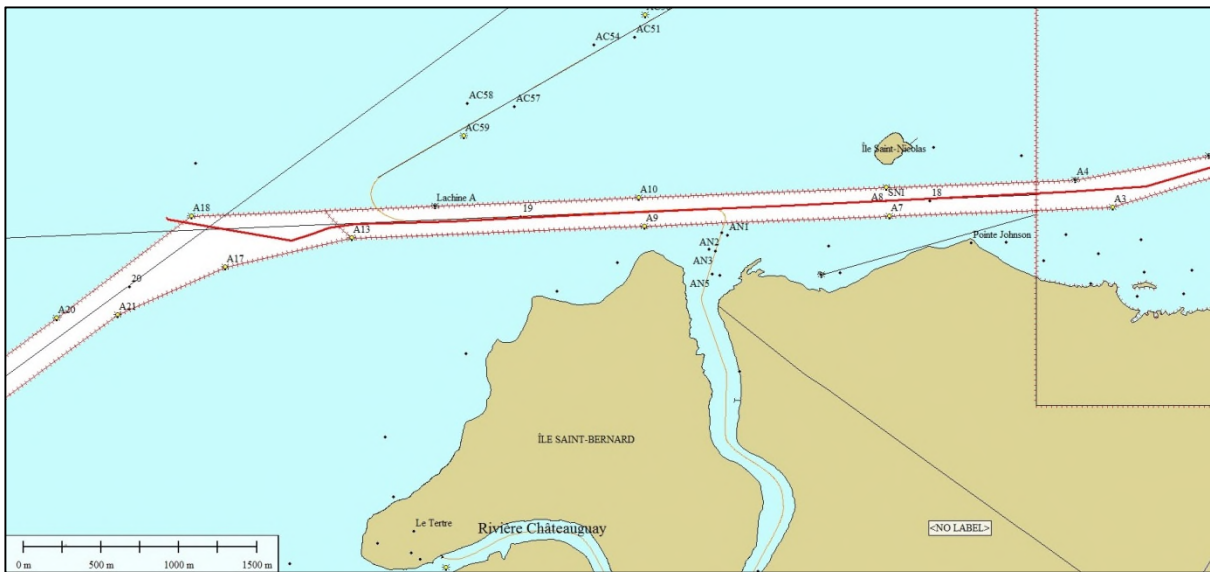


Figure 6: BBC MAPLE LEA's accident track



Figure 7: Extract from Paper Chart CA1429 from on board with the scene of the accident plotted

### **3.2 Action taken after the accident**

The master of the BBC MAPLE LEA let go the anchor. The crew checked the ship for damage, after which water ingress could be ruled out. Water depth soundings revealed that about 1/5 of the BBC MAPLE LEA's length (25-30 m) was grounded on the sandy bottom of the lake at the fore section.

The VTS cleared only one lane of the fairway for use by other shipping traffic following the accident.

Two hours after the accident, the master and pilot noticed a film of oil on the surface of the water at the forward section on the port side and notified the VTS. The crew deployed an oil boom around the fore section of the ship. The spread of the film of oil was monitored by helicopter. The owner's representative engaged a company specialised in oil spill combating, which from 1300 onwards deployed a further oil boom at the scene and absorbed the hydraulic oil that had leaked from the damaged bow thruster.

A pilot transfer took place at 1945.

The salvage plan agreed upon among the parties involved was executed on the following day and the BBC MAPLE LEA hauled free by two tugs at 1235. She then sailed without tug assistance to the port of Sainte-Catherine for the further damage survey and made fast there at 1503.

### **3.3 Investigation**

The Federal Bureau of Maritime Casualty Investigation (BSU) was notified of the accident on 21 December 2015. During the investigation, it co-operated with Canadian marine casualty investigators from the TSB<sup>6</sup> in accordance with the IMO<sup>7</sup> Casualty Investigation Code<sup>8</sup>. The TSB gathered evidence on board and interviewed the parties involved on 18 December 2015 after the BBC MAPLE LEA was refloated but later closed its investigation.

The BBC MAPLE LEA's owner provided all the documents and information requested for the marine casualty investigation by the BSU.

Changes in BSU staffing gave rise to a new internal lead while the investigation was ongoing, which delayed completion of the investigation. The public was informed on the progress of the investigation on 15 December 2016 through the publication of an interim investigation report.

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<sup>6</sup> See footnote 3 above

<sup>7</sup> International Maritime Organization

<sup>8</sup> Code of the International Standards and Recommended Practices for a Safety Investigation into a Marine Casualty or Marine Incident (Casualty Investigation Code) of 16 May 2008; Annex to IMO Resolution MSC.255(84)

### 3.3.1 Ship's propulsion and equipment

The BBC MAPLE LEA is driven by a MAK 6-cylinder long-stroke engine with a rated power of 5,400 kW. A variable pitch propeller is used for propulsion. The bow thruster's rated power is 500 kW.

The maximum rudder angle of the balance type rudder is 45°. The BBC MAPLE LEA requires 13 seconds for hard-over to hard-over.

Forward visibility from the conning position is not affected by the two shipboard cranes (see Figures 8 and 9).

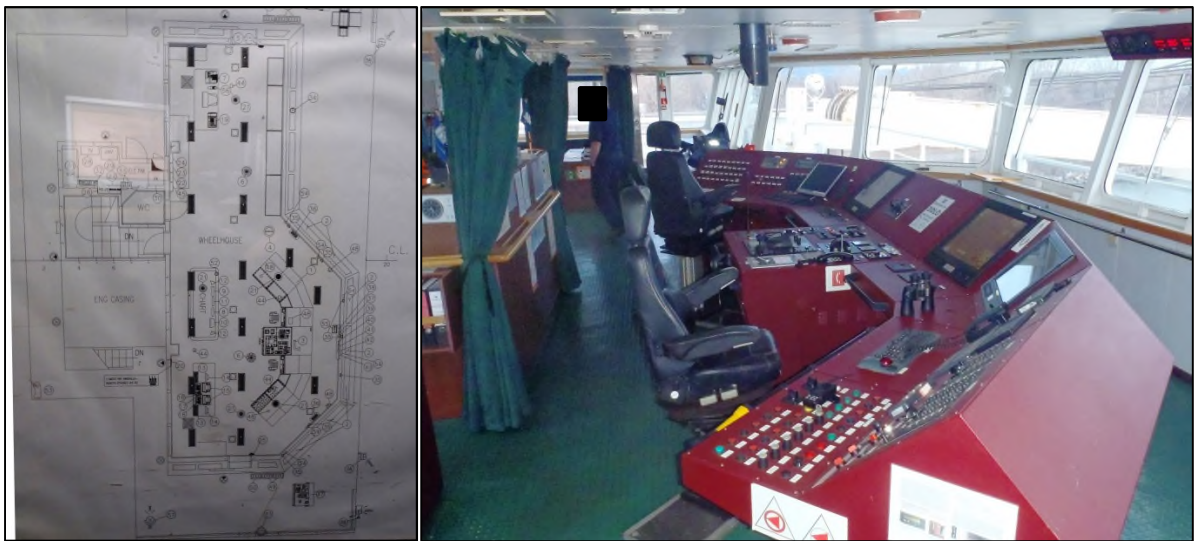


Figure 8: Wheelhouse of the BBC MAPLE LEA



Figure 9: Forward visibility from the conning position

The bridge equipment includes S-band and X-band radar systems made by Sperry Marine. The latest version of Official Paper Charts CA1429 and CA1430 were used for navigation. The Admiralty Sailing Directions – St. Lawrence Pilot from the United Kingdom Hydrographic Office were carried.

### 3.3.2 VDR recordings

The BBC MAPLE LEA is equipped with a VDR G4 voyage data recorder (VDR) made by Interschalt. The VDR worked properly. The recorded accident data were secured by a service company engaged by the TSB and provided to the BSU for the investigation. The following recordings were analysed for the period secured<sup>9</sup>:

- course, rate of turn and speed;
- radar recordings (X-band, one image recorded every 15 seconds);
- voice recordings of the bridge microphones;
- echo sounder recordings, and
- AIS position data of the vessel approaching the BBC MAPLE LEA from ahead.

The voice recordings indicate the extent to which the parties involved discussed the turning manoeuvre:

Time	Speaker	Information
054646	Pilot	[Reports the BBC MAPLE LEA's draught to VTS Beauharnois Traffic in French]
[...]		
055919	Pilot	"Two more coming down. And we'll follow the ship going up. There is one coming down. They will meet just at the end of the wharf here. When the other one passed, we go right behind her. We meet the other one most likely before the bridge. Then, if we're lucky, we can turn before there is another one down bound. If not, we'll turn further and go behind her."
	Master	"I have no rush, because weather is [snorts]."
	Pilot	"[Laughs] Six o'clock in the morning, six o'clock in the evening is no different."
[...]		
064425	Pilot	[Reports to VTS Beauharnois Traffic that the BBC MAPLE LEA is underway in French]
[...]		
064505	Beauharnois Traffic	[Asks the pilot in French] "Where do you want to turn?"
	Pilot	[In French] "If I have enough time for [oncoming vessel], I will turn at buoy A13."
	Beauharnois Traffic	[In French] "Please call [oncoming vessel] and arrange that"
	Pilot	[Calls oncoming vessel and advises on intended turning position. Oncoming vessel confirms: "Okay."]

Spreadsheet 1: Extract from VDR voice recording of discussion of the turning manoeuvre

<sup>9</sup> Periods covered:  
- NMEA data (raw data format): 1415 UTC on 15/12/2015 to 1444 UTC on 17/12/2015, and  
- Radar data and voice recordings: 0230 to 1429 UTC on 17/12/2015



Spreadsheet 2 below lists the recordings made before and during the turning manoeuvre. The helmsman's confirmations have not been listed in the interest of clarity. The highlighting or comments have been made and inserted by the BSU.

Time	Information	SOG in kts	HDG in °	COG in °	ROT in °/min	Echo sounder in m
074800	Pilot: "About five minutes we should be turning there. Two – six – zero."	8.8	266.4	267	-4.1	2.5
074816	Pilot: "Port ten." [Master speaks in the background]	8.8	266.4	267	-4.4	4.7
074841	Pilot: "Midship."	8.5	263.9	268	-12.9	2.3
074855	Master: "Over there or over there?" Pilot: [Reply inaudible]	8.4	260.7	269	-18.5	2.3
074858	Pilot: "Starboard twenty"	8.4	260.7	269	-19.8	2.5
074912	Pilot: "Hard starboard"	8.2	256.0	268	-21.4	2.3
074959	Pilot: "Midship"	7.2	244.9	259	4.3	3.6
075001	Pilot: "Stop engine"	7.2	244.9	259	4.7	4.1
075011	Master: "Engine stop" Pilot: "Port ten"	6.9	244.9	253	9.5	3.5
075015	Pilot: "Port twenty"	6.9	244.9	253	10.4	3.3
075027	Pilot: "Hard-a-port"	6.7	247.2	250	11.7	3.7
075043	Pilot: "Full thruster to port" Master: "Full to port"	6.4	250.2	248	14.4	3.5
075152	Pilot: "Stop thruster"	5.4	266.4	260	2.1	8.8
075154	Pilot: "Stop engine"	5.4	266.4	260	0.2	8.8
075159	Pilot: "Midship"	5.4	266.4	260	0.3	9.0
075201	Pilot: "Full astern" [VHF radio traffic of other ships can be heard in the background]	5.2	266.5	264	0.6	8.7
075211	Pilot: "Full astern" [quietly]	5.2	266.5	264	0.4	9.8
075220	Pilot: "Midship"	5.1	266.4	268	-0.3	10.0
075226	Pilot: "Full astern, Captain."	5.1	266.4	268	-0.6	10.0
075231	Master: "Full astern"	5.0	266.5	270	-0.6	10.2
075239	Pilot: "Full thruster to starboard"	5.0	266.5	270	-0.6	9.5
075240	Master: "Full to starboard"	5.0	266.5	270	-0.6	9.6
075251	Pilot: "She doesn't go any further?"	4.7	266.9	271	-0.0	9.3
075258	Master: "Two hundred sixty"	4.5	266.9	273	0.2	9.1
075310		4.5	266.9	273	-0.2	10.5
075320		4.2	266.9	275	-0.3	10.1
075327		3.9	267.5	276	3.5	10.0
075330		3.9	267.5	276	5.0	9.8
075340		3.9	267.5	276	7.2	9.8
075350		3.6	269.2	276	9.0	8.3
075400		3.3	271.7	276	10.4	8.6
075410		3.3	271.7	276	11.3	6.5
075420		3.0	274.4	277	13.1	5.6
075430		2.8	277.9	277	15.2	4.7
075440		2.8	277.9	277	17.8	5.5
075450		2.6	282.2	277	19.0	5.7
075500		2.3	287.0	278	20.0	5.5
075510		2.3	287.0	278	20.5	5.0
075520		2.1	292.2	282	22.5	3.0
075530		1.9	297.9	285	23.5	1.3
075535	[From this point, the rate of turn drops rapidly]	1.9	297.9	285	23.1	1.3
075540		1.9	297.9	285	20.3	1.3

Time	Information	SOG in kts	HDG in °	COG in °	ROT in °/min	Echo sounder in m
075550		1.7	303.0	288	0.6	1.3
075600		1.4	302.7	298	-11.7	1.3
075608	Pilot: "Hmmm?"	1.4	302.7	298	-11.0	1.3
075611	Pilot: [ <i>Inaudible</i> ] "port"	0.9	300.0	-	-10.9	1.3
075640		0.7	297.2	-	-11.1	1.3
075642	Pilot: "Hmmm" Master: "Touched" [ <i>inaudible</i> ]	0.6	294.5	-	-11.5	1.3
075658	Master/OOW: [ <i>Inaudible</i> ]	0.6	291.7	-	-11.8	1.3
075701	[OOW?]: "Full stop, yes?"	0.6	291.7	-	-11.8	1.3
075727	Pilot speaks with [master/OOW?]: [ <i>Inaudible</i> ]	0.7	285.9	-	-11.9	1.3
075806	Pilot: "Start thruster" [Master/OOW?]: "Start bow thruster"	0.8	279.9	-	-12.3	1.3
075811	Pilot: "Full thruster to port"	0.8	279.9	-	-12.5	1.3
075844	[Master/OOW?]: [ <i>Inaudible</i> ] Pilot: "Yeah"	0.7	270.7	-	-12.3	1.3
075908	Pilot: "Starboard ten"	0.8	267.5	-	-11.8	1.3
080002	Conversation [ <i>inaudible</i> ]	0.7	255.7	-	-11.3	1.3
080008	Pilot: [ <i>Inaudible</i> ] "two ahead" [OOW?]: "Two ahead" [?]: "Twelve ahead?" Pilot: "No. Two."	0.7	255.7	-	-11.3	1.3
080022	Master: [ <i>Inaudible</i> ] "two ahead"	0.7	252.9	-	-10.2	1.3
080042	Pilot: [ <i>Calls oncoming vessel</i> ] Oncoming vessel: [ <i>Replies; conversation inaudible</i> ]	0.6	247.9	-	-9.7	1.3
080135	[OOW? 3/O?]: "Not coming out or something?"	0.5	242.0	-	-6.3	1.3
080143	Pilot: "Hard-a-starboard"	0.5	240.5	-	-5.5	1.3
080220	Pilot: "Midship."	0.3	239.0	-	-0.4	1.3
080230	[ <i>Bridge crew: conversation drowned out by VHF radio traffic</i> ]	0.0	239.0	-	-0.2	1.3
080245	[ <i>Conversations with the pilot inaudible</i> ]					1.3
[...]						
080506	[ <i>Door slams</i> ] Master: "So, Mr Pilot, what we do?" [ <i>Reply inaudible</i> ]	0.0	232.0	-	0.5	1.3
080610	Pilot: "Yeah, I think we're aground."	0.0	231.0	-	0.3	71.7
[...]						
081020	[ <i>Various manoeuvres: helm hard to starboard, dead slow ahead</i> ] Pilot: "Stop engine"	0.0	224.5	-	4.6	61.7

Spreadsheet 2: Extract from VDR recording of the turning manoeuvre

The BBC MAPLE LEA's VDR also recorded position data, courses and speeds of ships in the vicinity. The bulk carrier with which the BBC MAPLE LEA's pilot discussed the turn at buoy A13 was still south of the lock at Beauharnois at the time of the discussion (see Figure 10). When the BBC MAPLE LEA began the turning manoeuvre, the other ship was north of the lock. She then sailed toward the BBC MAPLE LEA on a north-easterly course. After the grounding, at 0803, the distance between the two ships was still more than 4 nm.

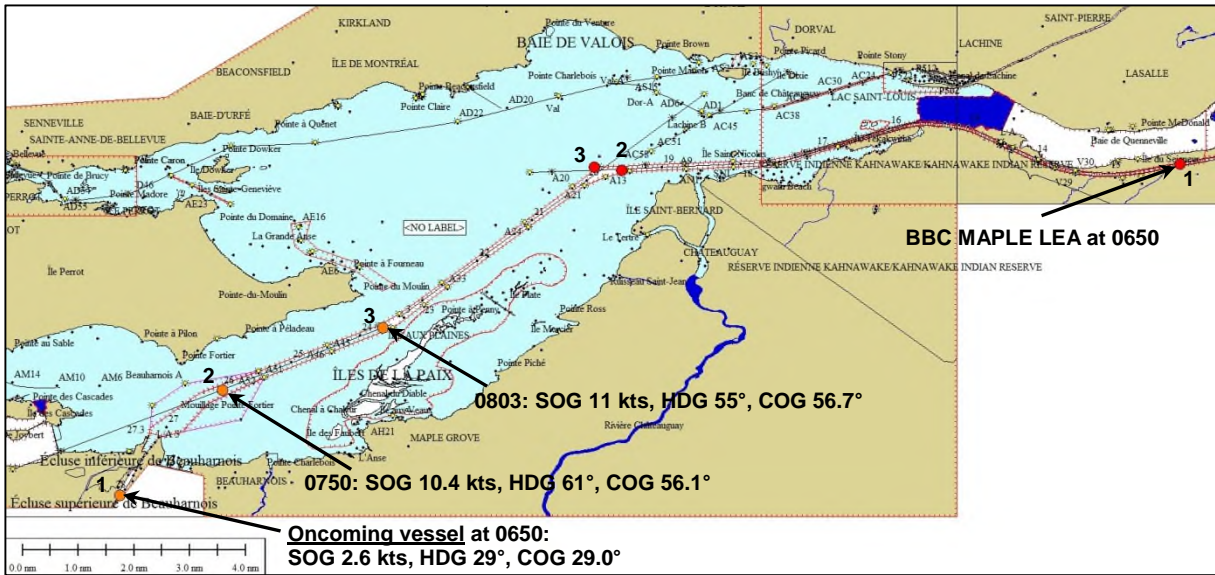


Figure 10: Positions of the oncoming vessel before and after the accident

The radar data also recorded by the VDR indicate that the BBC MAPLE LEA's bow was on the buoy line (A18 and A22) at 075325 (see Figure 11).

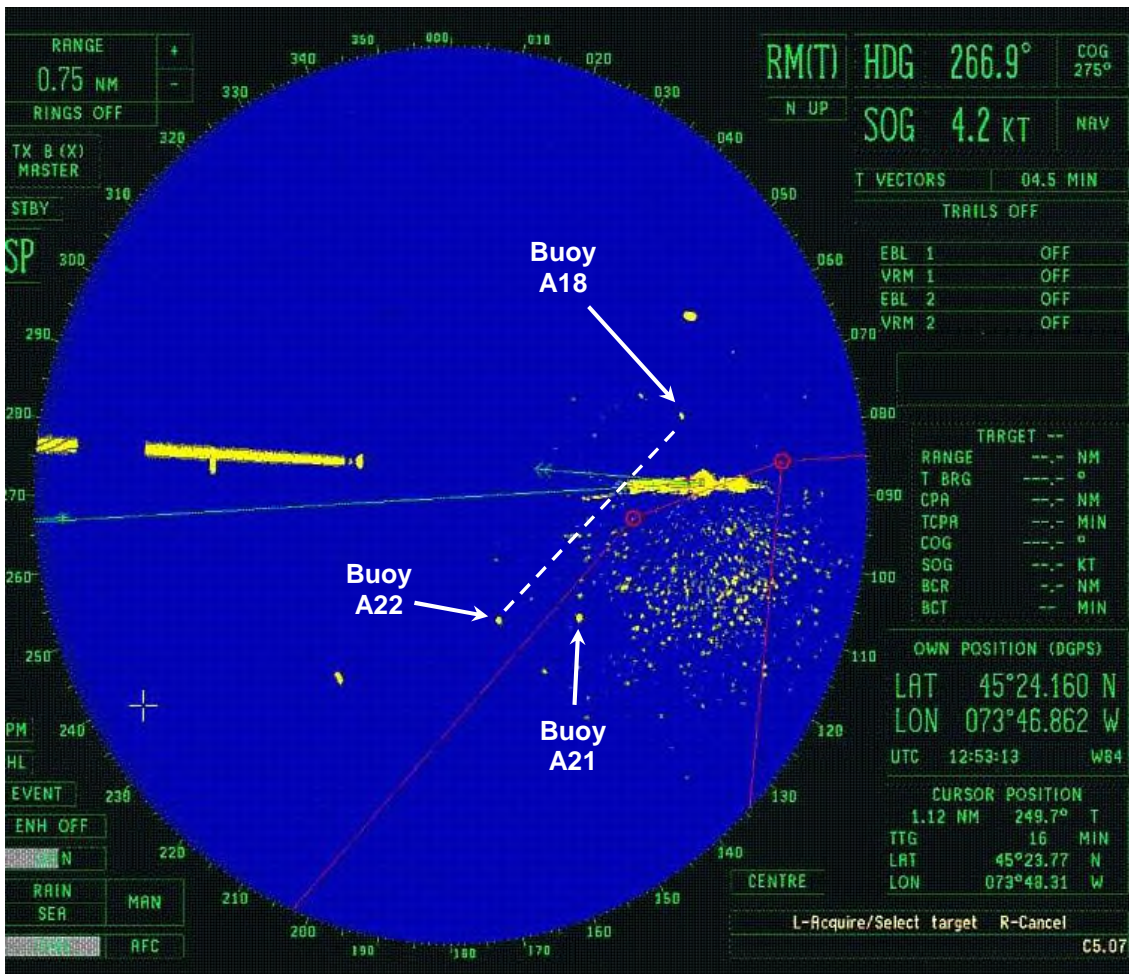


Figure 11: Radar plot at 075325



At the time of the accident, the BBC MAPLE LEA was about half a ship's length outside the fairway (see Figure 12).

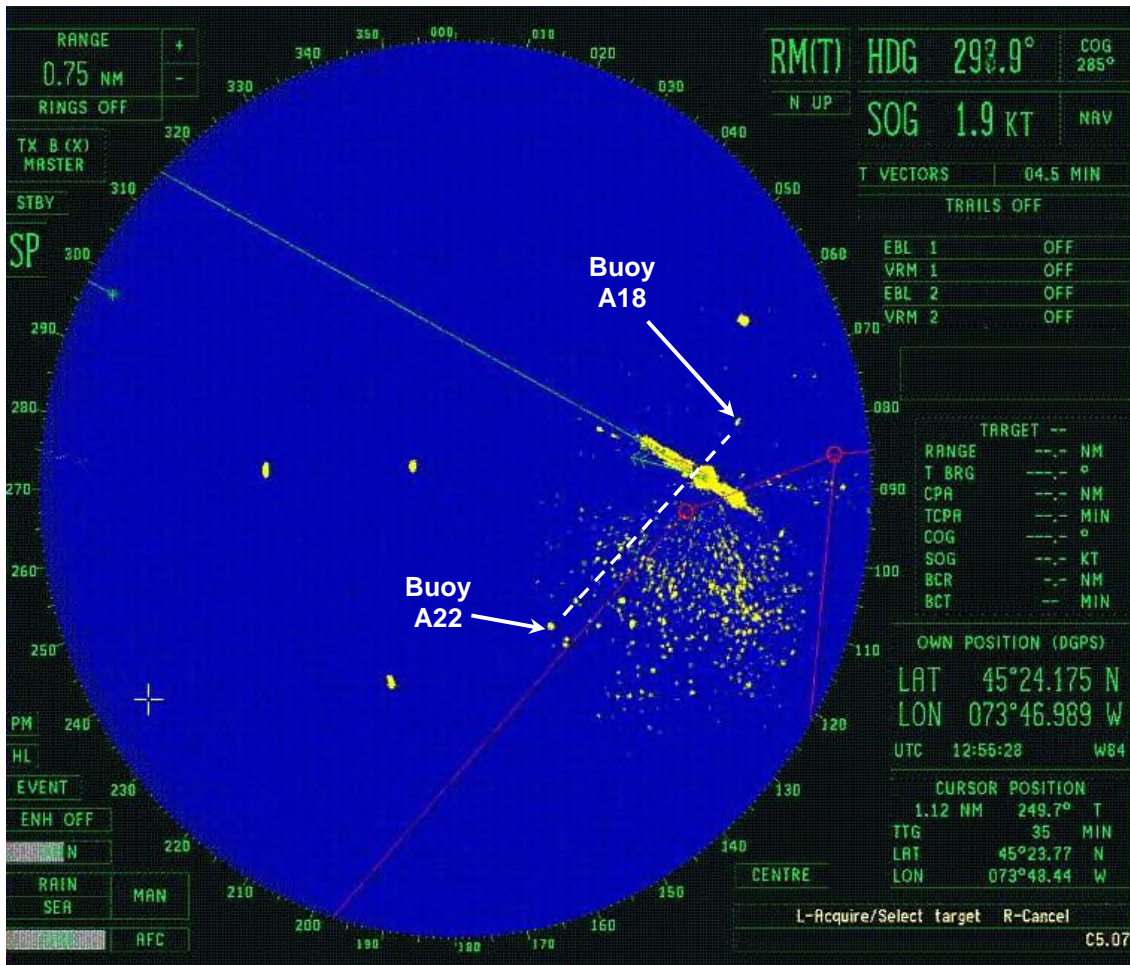


Figure 12: Radar plot at 075535 – time of accident

### 3.3.3 Recordings of the VTS

The TSB provided the AIS and VHF radio recordings of VTS Beauharnois Traffic to the BSU for the marine casualty investigation. The VHF recordings were referred to so as to compare and reference chronologically the bridge microphone recordings from on board the BBC MAPLE LEA. The shipboard times were consistent to the second with the UTC times from the VTS recording.

The AIS recordings of the VTS were provided to the BSU in the form of a video. The period covered is 073837 to 080530. The AIS recordings are superimposed over an electronic nautical chart, which shows the depths in feet rather than in metres. One foot is equal to 0.3048 m. The charted depths north and west of buoy A18 (scene of the accident: 20 or 24 ft) are equivalent to 6.096 m and 7.3152 m.

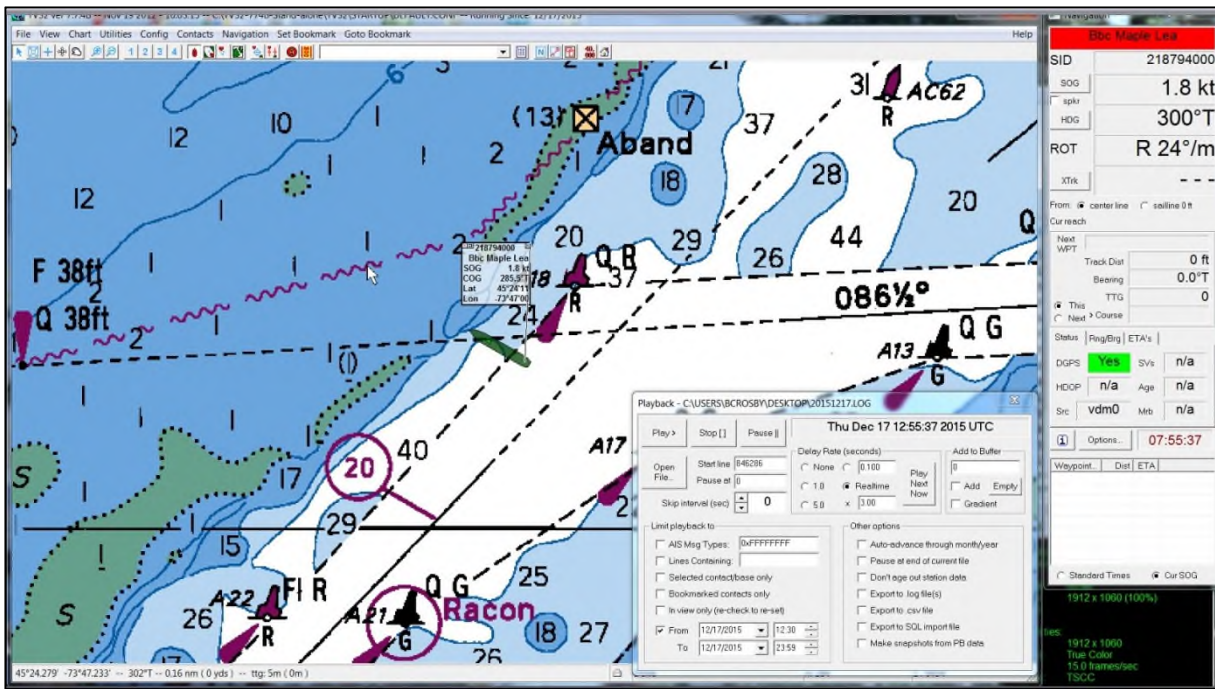


Figure 13: AIS recording at 075537 (time of accident)

## 4 ANALYSIS

### 4.1 Bridge team

The BBC MAPLE LEA's bridge was manned by an experienced crew on the day of the accident. The German master has been employed on the BBC MAPLE LEA since 2009 and has held his current position since 2014. The Ukrainian chief officer and Philippine helmsman have worked on the BBC MAPLE LEA since 2013 and 2014 respectively.

The BSU is not in possession of any information about the advising pilot, as citing Canadian legislation, the TSB did not provide the interview carried out with the pilot for the German investigation. The contact details for the pilots' association responsible for the pilot were also denied on the same grounds. Following that, the BSU contacted the authority responsible for the pilot (APL<sup>10</sup>) in writing but no answer was received from there. The use of a pilot is compulsory in the area in which the BBC MAPLE LEA was operating.

The working environment on the bridge was professional and amicable according to the recording of the conversations there. The language used on board is English. However, the master and the third officer, who arrived on the bridge shortly before the accident to relieve the watch, also conversed in German. The pilot spoke English with the crew and French with the VTS. The BBC MAPLE LEA's master and watchkeeping officers have no knowledge of French. The pilot did not translate the discussions for the ship's command, which did not actively request a translation, either.

<sup>10</sup> Administration de pilotage des Laurentides / Laurentian Pilotage Authority



## 4.2 Voyage preparation

The area off the lock at Beauharnois south-west of buoy pair A51/A52 was designated for a turning manoeuvre in the BBC MAPLE LEA's original voyage planning (see Figure 4). Including the anchorage area, this area would have had a section stretching 1 nm and water depths of more than 10 m throughout available (see Figure 14).

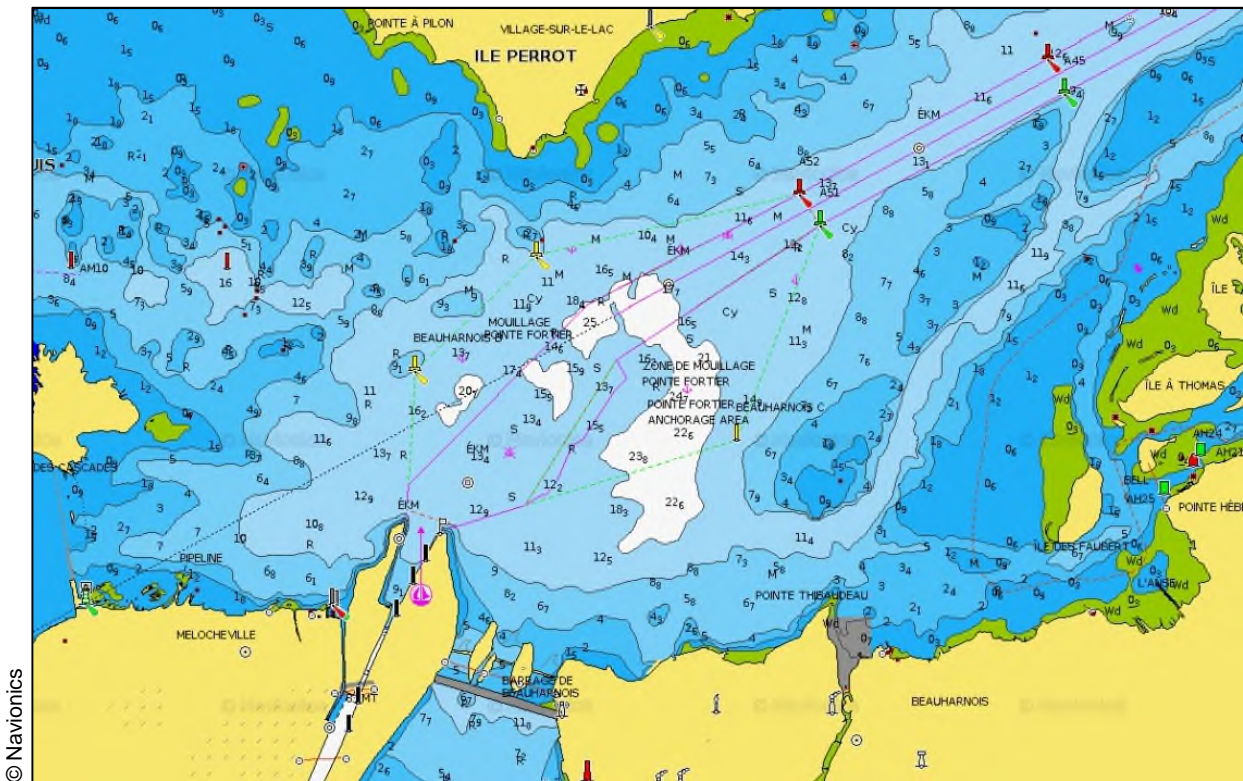


Figure 14: Originally planned turning area

Indeed, turning there would have entailed a detour of 13 nm (6.5 nm in each direction) as compared to turning west of buoy A13, as proposed by the pilot. Accordingly, the BBC MAPLE LEA would have been underway 45 minutes longer in each direction based on a speed of 8.7 kts. However, the master told the pilot that he was reportedly not in a hurry ("I have no rush," see Spreadsheet 1) and in so doing made clear that from the perspective of the ship there was no reason to turn sooner and thus in the narrower fairway. The pilot was adamant about his favoured option and did not encounter any further objections. From the perspective of the BSU, this discussion is not open to challenge because the ship's command of the BBC MAPLE LEA was entitled to trust their experienced pilot with knowledge of the local area. Moreover, VTS Beauharnois Traffic did not object to the announcement of the pilot that he intended to turn at buoy A13, as long as this was co-ordinated with the later oncoming bulk carrier. Accordingly, the BSU concludes that the fairway section west of A13 determined by the pilot was generally suitable for turning manoeuvres. However, turning off the lock at Beauharnois would have posed a lower risk due to the larger sea room.

### 4.3 Execution of the turning manoeuvre

The passage through the Canal de la Rive Sud went according to plan. The pilot gave all commands to the helmsman directly in English, who confirmed and executed them. Numerous course alterations were necessary due to the winding course of the canal, meaning the pilot should have already been familiar with the BBC MAPLE LEA's handling characteristics upon reaching Lake Saint-Louis at 0730. The pilot announced that they were approaching the planned turning area. From then on, the master operated the speed controller and bow thruster as ordered by the pilot.

The actual turning manoeuvre was not discussed between the pilot and ship's command in detail. Apart from the turning area, there was no further discussion. The BSU assumes that the pilot intended to turn the BBC MAPLE LEA over starboard on the spot using the bow thruster. The course of the voyage recorded by the VTS and the shipboard VDR shows clearly that the reduction in speed was too late for such a manoeuvre, however (see Figures 15 to 27).

The BBC MAPLE LEA approached buoy A13 at a speed of 8.7 kts (see Figure 15). She was sailing in the middle of the fairway when the pilot initiated a port turn at 074816 ("Port ten" – see Spreadsheet 2).

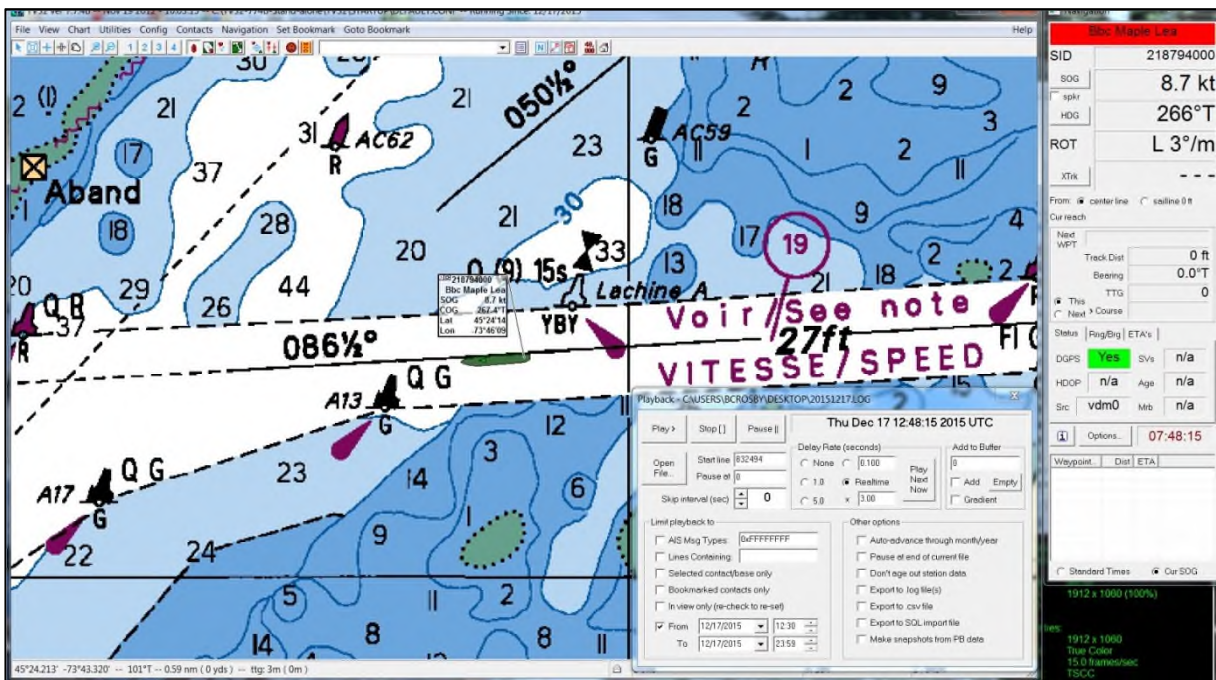


Figure 15: AIS plot at 074815 – approaching buoy 13

After passing buoy A13, the pilot had the rudder set in the opposite direction briefly ("Midship... Starboard twenty... Hard starboard... Midship"). The BBC MAPLE LEA had developed a rate of turn of  $-21.4^\circ$  to port, which changed to  $4.3^\circ$  to starboard within 47 seconds as a result of the rudder being set in the opposite direction. The pilot had the engine stopped. The master confirmed the engine stop and executed it. The speed stood at 7.2 kts (see Figure 16).



Ref.: 499/15

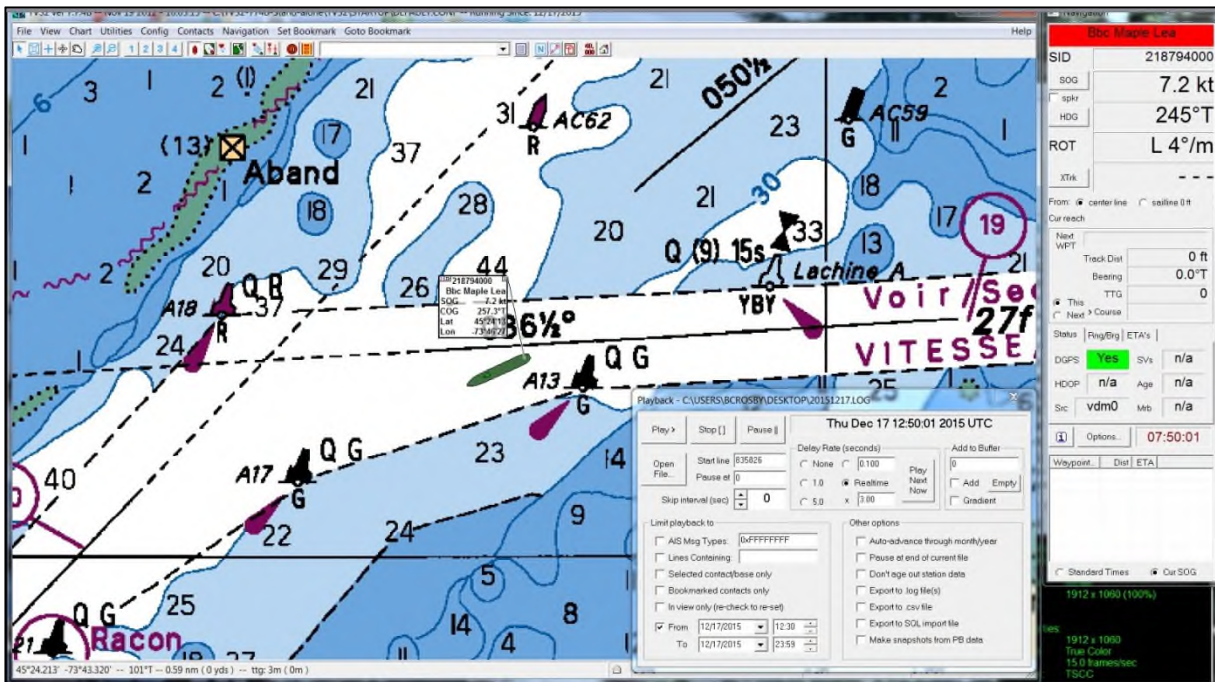


Figure 16: AIS plot at 075001 – "Stop engine"

The pilot then tried to make a port turn ("Port ten... Port twenty... Hard-a-port"). The starboard turn initiated by setting the rudder in the opposite direction continued for 30 seconds (at a rate of turn of 14.4°), however. At 075043, the pilot issued an order for the bow thruster to be set to "Full to port." Due to the speed of the ship, which still stood at 6.4 kts (see Figure 17), the bow thruster had hardly any effect, however.

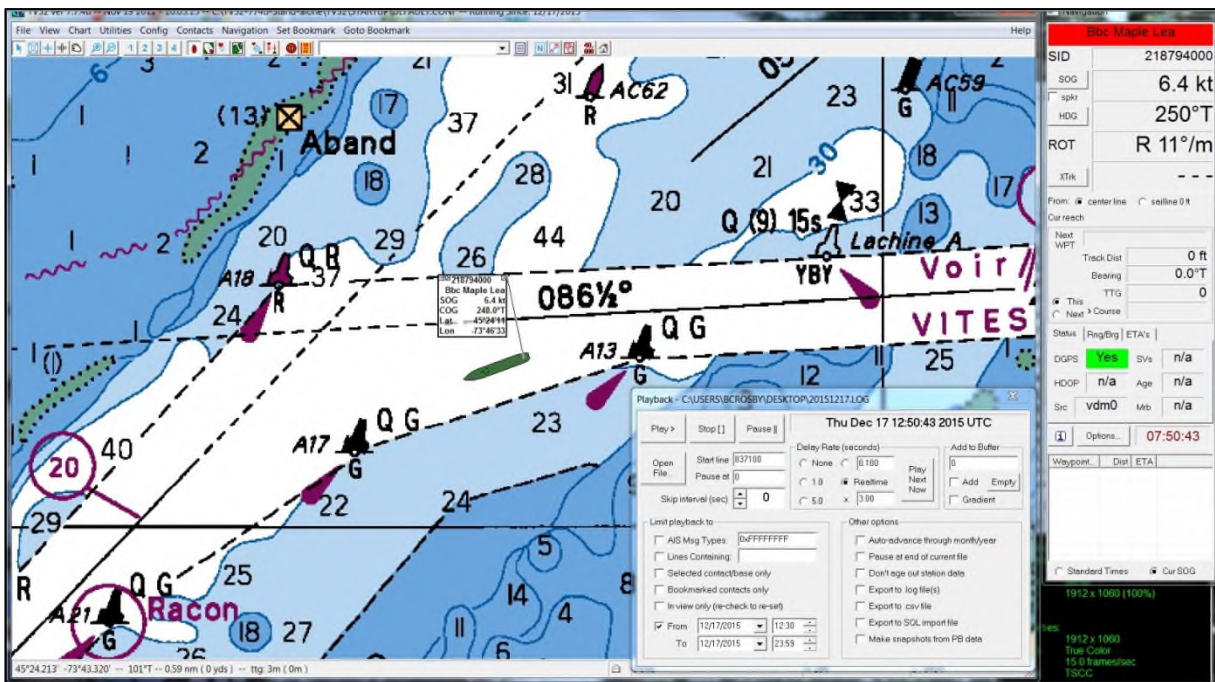


Figure 17: AIS plot at 075028 – "Hard-a-port"



Ref.: 499/15

Due to the previously ordered port rudder angle, the rate of turn dropped again. The pilot had the bow thruster and engine stopped and the helm set to midships. The BBC MAPLE LEA had reached the middle of the turning area and with hardly any rate of turn (2.1° to 0.3°). She still proceeded at a speed of 5.3 or 5.4 kts (see Figures 18 and 19).

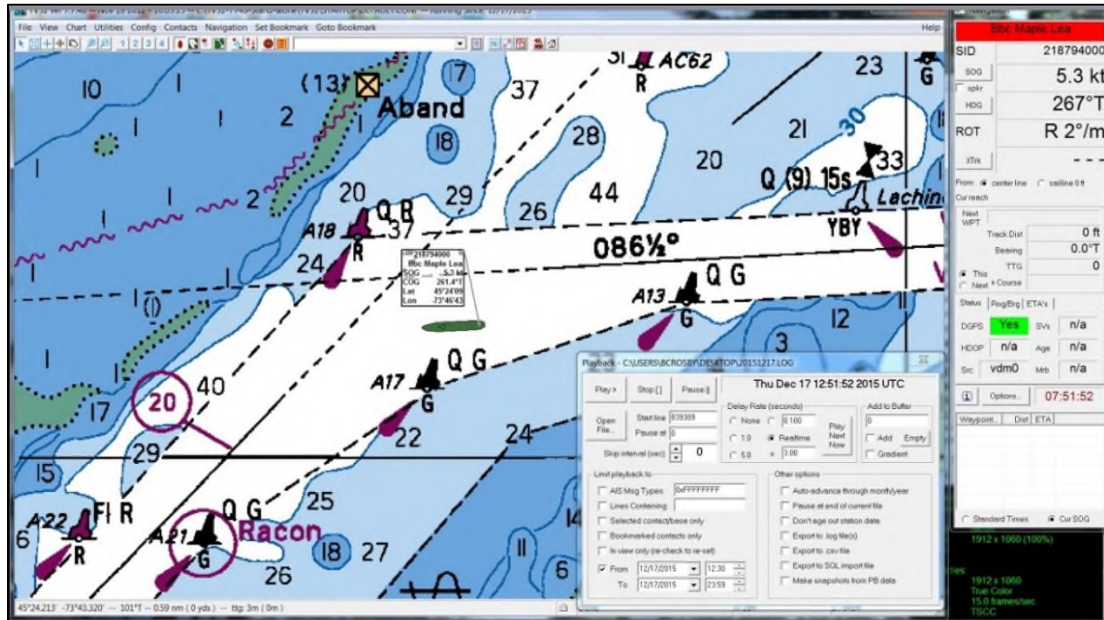


Figure 18: AIS plot at 075152 – "Stop thruster"

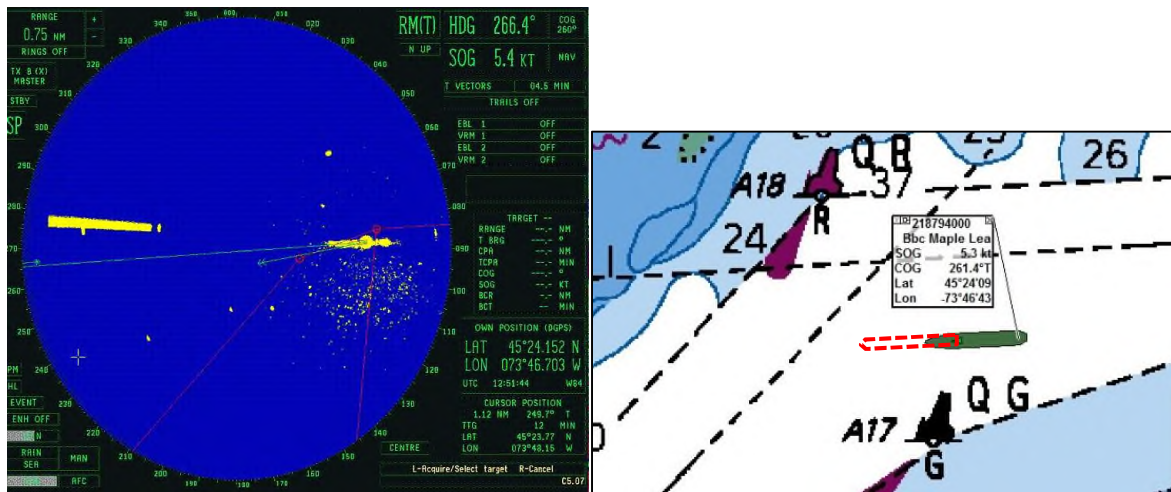


Figure 19: Radar plot at 075152 – positional deviation

A comparison of the AIS and radar images reveals a deviation with regard to the ship's position. The position of the AIS antenna in Figure 18 (green triangle on the fore section of the ship's contour) is shown incorrectly. It is actually located above the bridge about 126 m away from the bow. The entry was made correctly on board. The ship's positions, which were verified by the BSU's investigators using the radar plots, are therefore much further ahead, as can be seen in the recordings of the VTS (see Figure 19 as compared to Figure 18). All the same, the turning manoeuvre is shown here using the AIS plots, as they are superimposed over a nautical chart with depths charted.

Ref.: 499/15

The pilot ordered the engine to "Full astern" at 075202 while the rate of turn was neutral. This order was drowned out by the simultaneously incoming VHF radio traffic of uninvolved vessels and therefore not executed by the BBC MAPLE LEA's master, however. The ship continued on a 264° course at a speed of 5.3 kts over ground toward the buoy line between fairway buoys A18 and A22 (see Figure 20).

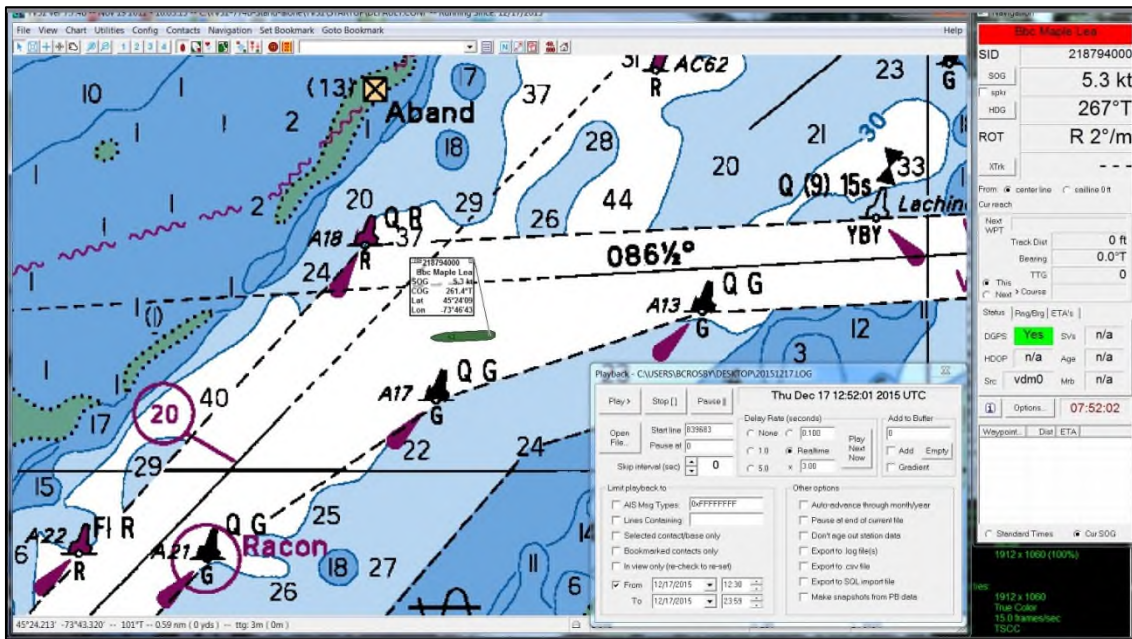


Figure 20: AIS plot at 075202 – "Full astern"

The pilot repeated the order quietly at 075211 and then with more urgency at 075226. The master only confirmed and executed the last repetition. Accordingly, the BBC MAPLE LEA had sailed on a westerly course at a speed of more than 5 kts for 24 seconds during this important phase of the turning manoeuvre (see Figure 21).

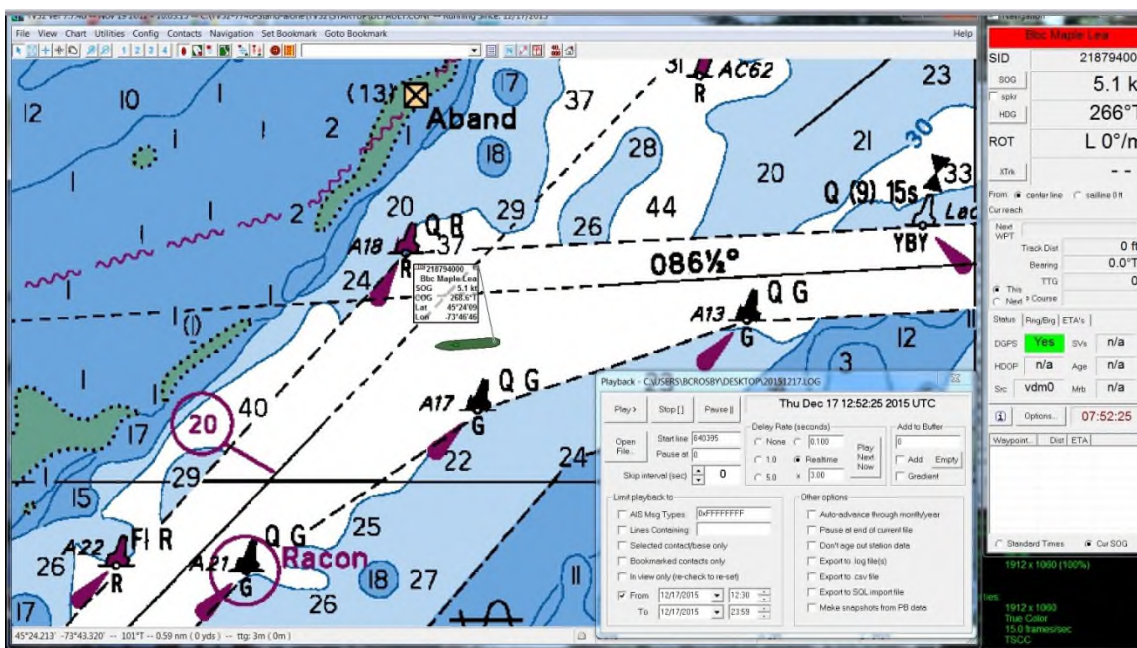


Figure 21: AIS plot at 075225 – "Full astern, Captain"



Ref.: 499/15

The pilot ordered the bow thruster "Full to starboard" at 075239. However, this had little effect due to the speed of still 5 kts (see Figure 22).

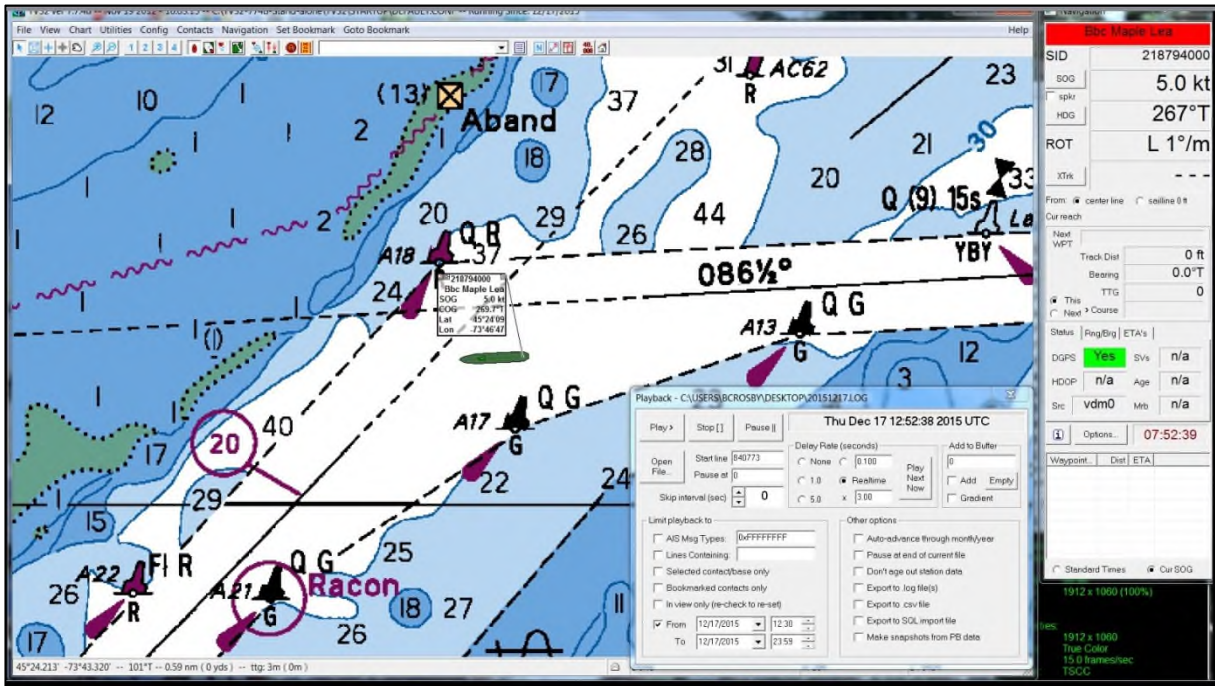


Figure 22: AIS plot at 075239 – "Full thruster to starboard"

The BBC MAPLE LEA continued toward the western buoy line for almost a whole minute (see Figure 23).

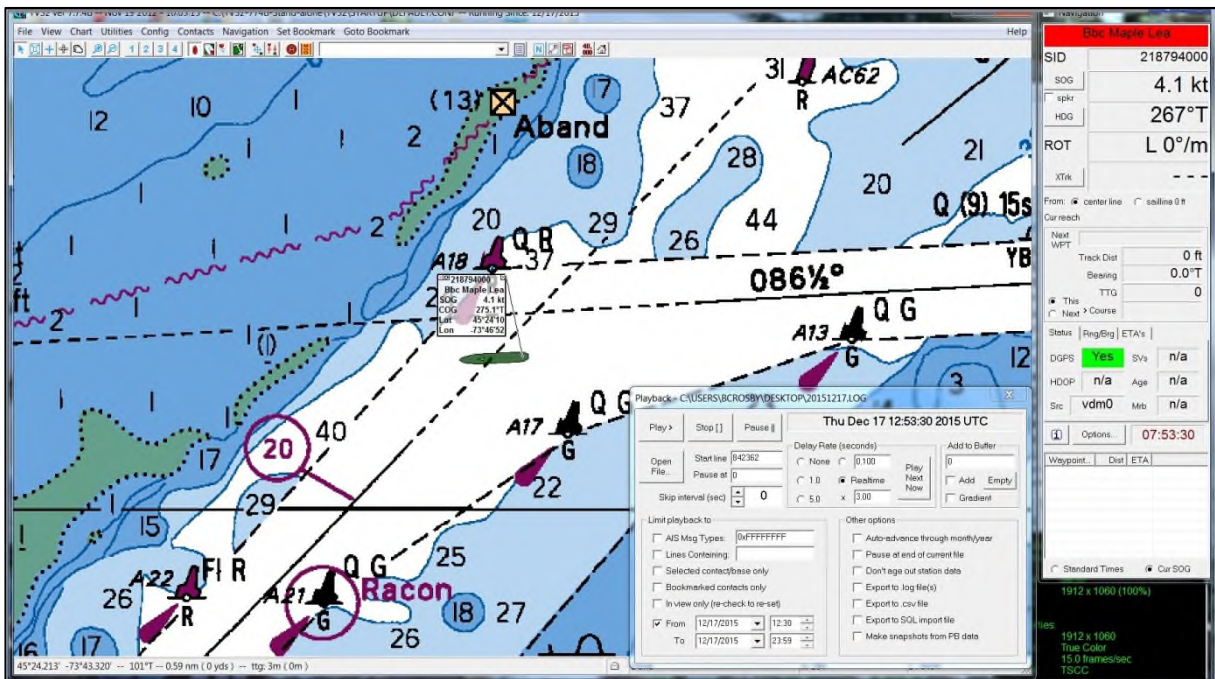


Figure 23: AIS plot at 075330



Ref.: 499/15

The bow thruster only started to have an effect in that a turn to starboard developed when the ship's speed fell below 4 kts (see Figure 24).

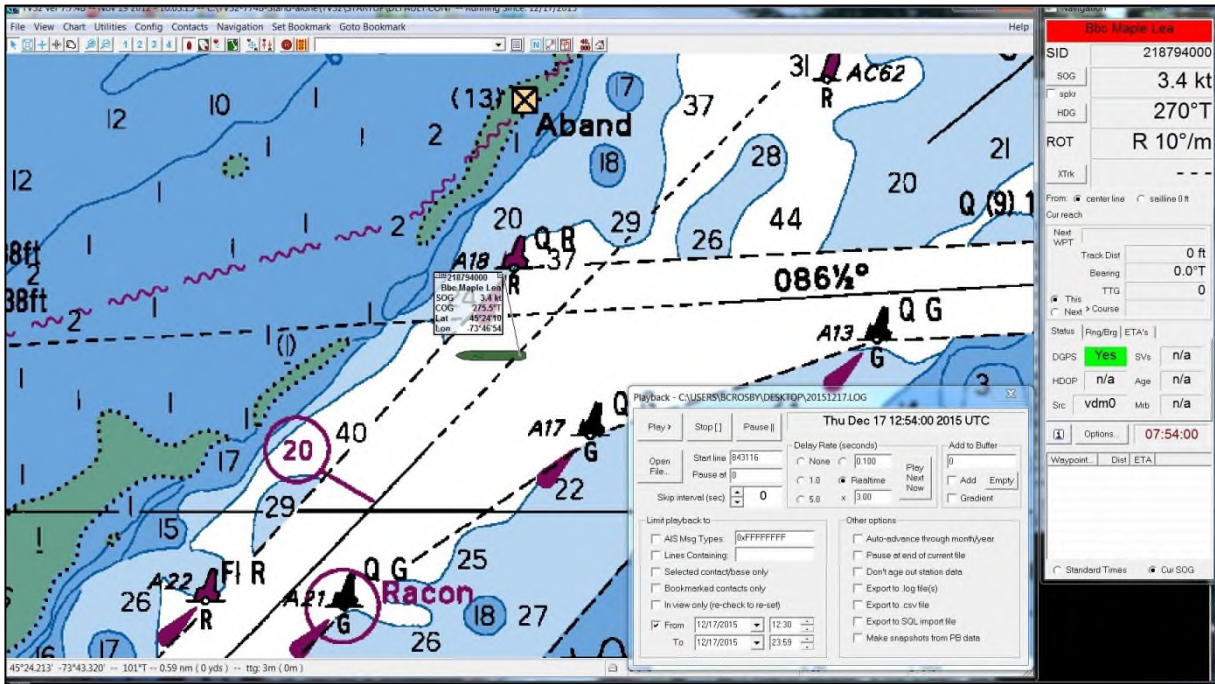


Figure 24: AIS plot at 075400

The starboard turn increased concomitantly with the falling speed of the BBC MAPLE LEA. However, the ship had already crossed the western buoy line at 075325 (see Figures 11, 25 and 26).

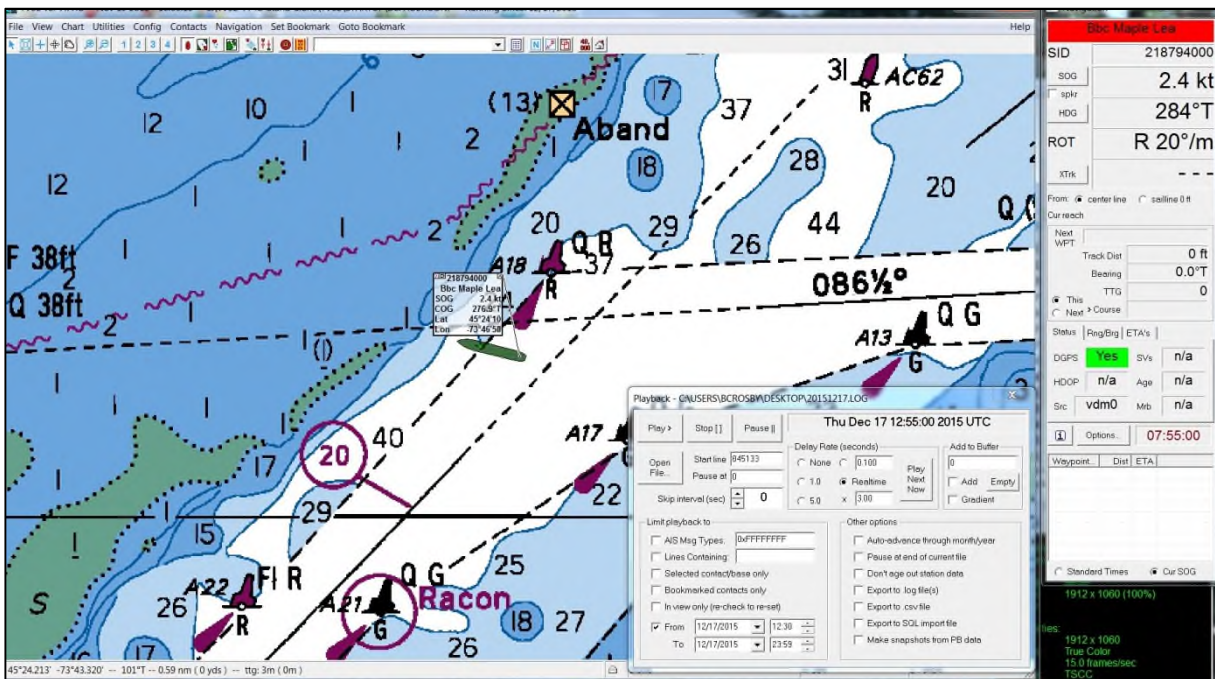


Figure 25: AIS plot at 075500



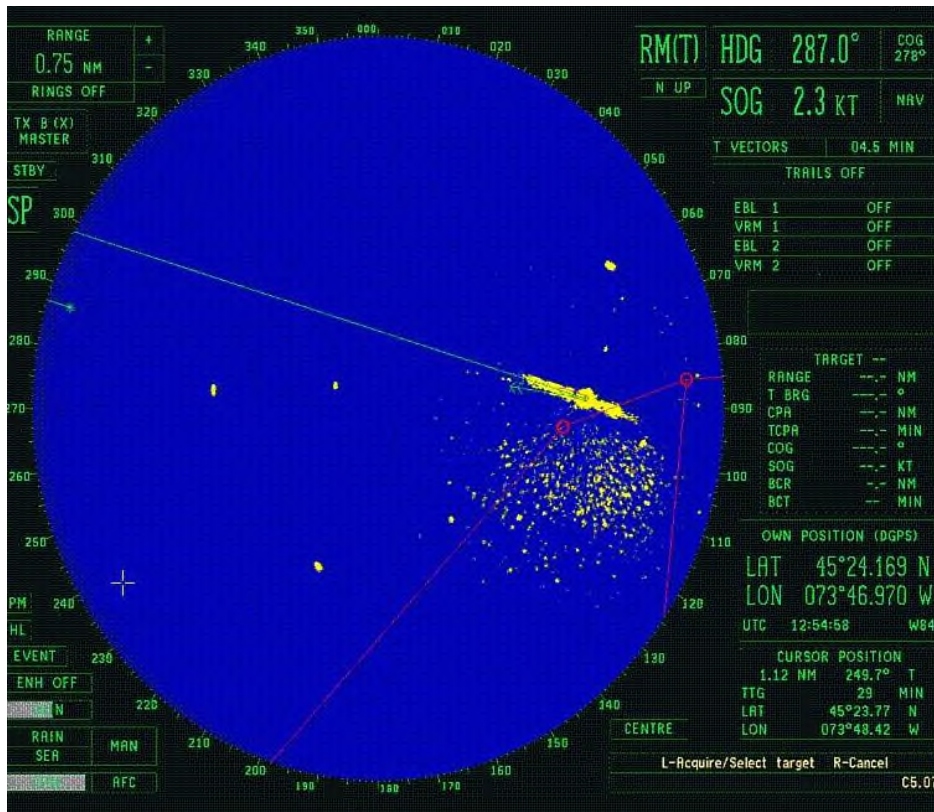


Figure 26: Radar plot at 075502

In water depths of some 7.3 m west of buoy A18, the BBC MAPLE LEA was unable to complete the starboard turn despite a rate of turn of 23°. Her bow ran aground at 075535, she then turned to port and after the unsuccessful attempts to refloat her again was situated outside the fairway (see Figure 27).



Figure 27: AIS plot at 075920 – position after the grounding

#### **4.4 Action taken after the accident**

The BSU's investigators regard the actions taken on board and ashore after the accident to contain the minor marine pollution and regarding traffic safety as appropriate and reasonable.

Based on the documents provided, it is not possible to assess the extent to which the BBC MAPLE LEA could have been refloated shortly after the accident, for example with alternating hard-over rudder angles (so-called fishtailing) at full astern. The voice recordings of the VDR permit the conclusion that the ship's command and pilot were divided with regard to the required manoeuvres. The voice recordings after the accident are difficult to understand because they are drowned out by VHF radio traffic and conversations were carried out comparatively quietly. Consequently, it was only possible to analyse fragments of numerous discussions. In this respect, it would have been extremely helpful for the BSU's investigators if they had been able to analyse the pilot's statement, without which it is only possible to surmise that the pilot did not want to obstruct the bulk carrier approaching from the south-west on the fairway. Since she was still several nautical miles away from the BBC MAPLE LEA at the time of the accident, it would have been quite possible to slow down or stop her to allow more time for the attempts at refloating the distressed vessel.

## 5 CONCLUSIONS

The accident was essentially caused by excessive speed during the turning manoeuvre. The BSU's investigators view critically entering the turning area at a speed of more than 8 kts. Here the speed should have been reduced earlier to make better use of bow thruster manoeuvres within the very limited area of the fairway. At a speed of 6.4 kts in the turning area, the first bow thruster manoeuvre ordered by the pilot could not have any effect.

The fact that bow thruster manoeuvres can only have an effect at a reduced speed is due to hydrodynamic effects and generally part of basic navigational knowledge. Since it was not possible for the BSU's investigators to make contact with the pilot or analyse his statement to the Canadian investigators, they were unable to clarify the reasons for this choice of manoeuvre. The second bow thruster manoeuvre was also ineffective for too long. It was only possible to initiate the intended turn – albeit too late – when the speed dropped to less than 4 kts. The accident was additionally facilitated by the fact that the BBC MAPLE LEA's master failed to hear an important command of the pilot ("Full astern"). Consequently, valuable time was lost at the worst conceivable moment.

### 5.1 Communication

This accident was also facilitated by the fact that international recommendations and standards for co-operation between bridge crews and pilots were not complied with to the extent necessary. Effective co-operation starts with communication on the bridge, as "the master, bridge officers and pilot share a responsibility for good communications"<sup>11</sup>.

Although the BBC MAPLE LEA's pilot and ship's command agreed on a location for the turning manoeuvre, the actual manoeuvre was not discussed. The pilot intended to turn in a starboard direction using the bow thruster but initiated this manoeuvre when the ship's speed was still far too high. Neither the master nor the officer on watch drew his attention to this.

### 5.2 Interaction of the bridge team

The officer on watch was occupied with handing over the watch to the third officer during the turning manoeuvre. Both were at the chart table. In the opinion of the BSU, it would have been essential to postpone the handover of the watch to enable the officer on watch to devote his attention to the turning manoeuvre.

IMO Resolution A.960(23) states that "masters and bridge officers have a duty to support the pilot and to ensure that his/her actions are monitored at all times"<sup>12</sup>.

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<sup>11</sup> IMO Resolution A.960(23): Recommendations on Training and Certification and on Operational Procedures for Maritime Pilots other than Deep-Sea Pilots, Annex 2 paragraph 2.2

<sup>12</sup> IMO Resolution A.960(23), Annex 2 paragraph 2.3

The STCW Code<sup>13</sup> states with regard to the navigational watch that

"Under the master's general direction, the officers of the navigational watch are responsible for navigating the ship safely during their periods of duty, when they will be particularly concerned with avoiding collision and stranding.<sup>14</sup>"

"If at any time the officer in charge of the navigational watch is to be relieved when a manoeuvre or other action to avoid any hazard is taking place, the relief of that officer shall be deferred until such action has been completed.<sup>15</sup>"

The watch's relief arrived on the bridge at 0750 when the turning manoeuvre in the narrow fairway had already begun. Had the turning manoeuvre been monitored attentively, it would have had to have been noticed earlier that the bow thruster manoeuvres ordered by the pilot were destined to be unsuccessful and that the master had not heard the pilot's full astern order. The simultaneous handover of the watch made this impossible. Accordingly and typical of most cases, it was a series of multiple circumstances that led to the accident. Co-operation between the bridge team, consisting of bridge crew and pilot, within the meaning of the internationally binding regulations took place only to a very limited extent.

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<sup>13</sup> International Convention on Standards of Training, Certification and Watchkeeping for Seafarers

<sup>14</sup> STCW Code, part A, chapter VIII (Standards regarding watchkeeping) section A-VIII/2, part 3 point 10

<sup>15</sup> STCW Code A-VIII/2, part 3-1, point 23



## **6 ACTIONS TAKEN**

The BBC MAPLE LEA's owner has already taken the following action to prevent future accidents of a similar nature regardless of the findings of the BSU's investigation:

- The fleet and staff were notified of the incident in a circular and reminded of proper co-operation with a pilot (planned itinerary, language during manoeuvre, discuss ship's manoeuvring characteristics at current stability, etc.).
- The accident scenario will be discussed in detail during all the master and officer briefings, drawing attention to the risks involved.
- A computer-based tutorial has been installed on all the ships in the fleet, which contains the following courses:
  - introduction to resource management;
  - resource management and accident prevention;
  - bridge watchkeeping, and
  - working with pilots.
- In addition, it is planned that senior officers will attend maritime resource management courses. The Crewing department is currently evaluating this measure.

## **7 Findings**

The safety investigation was only able to review the accident from the perspective of the ship. Important issues, such as the accident rate in the sea area used in the present case for turning or the previous experiences of the deployed pilot and other pilots, who carry out turning manoeuvres there, remained unclear, as the authority responsible for the pilot remained silent.

With regard to possible improvements in the areas of bridge team management and navigational watch, the owner concerned has already taken appropriate action within its fleet to avoid similar accidents in the future. Therefore, the BSU is not issuing safety recommendations.

## **8 SOURCES**

- Investigations of the Canadian TSB
- Written statements
  - Ship's command
  - Owner
  - Classification society
- VDR recordings from on board the BBC MAPLE LEA
- AIS and VHF recordings of VTS Beauharnois Traffic
- Port State control records