

Transportation Safety Board  
of Canada



Bureau de la sécurité des transports  
du Canada

**MARINE INVESTIGATION REPORT  
M13N0001**



**LOSS OF TOW**

**TUG *CHARLENE HUNT* WITH  
PASSENGER VESSEL *LYUBOV ORLOVA*  
OFF CAPE RACE, NEWFOUNDLAND AND LABRADOR  
24 JANUARY 2013**

**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 M13N0001

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*Lyubov Orlova*  
Off Cape Race, Newfoundland and Labrador  
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### *Summary*

On 24 January 2013 at approximately 1345 Newfoundland and Labrador Standard Time, the United States-flagged tug *Charlene Hunt* lost its tow off Cape Race, Newfoundland and Labrador, when the towing arrangement failed in heavy weather. The lost tow, the decommissioned passenger vessel *Lyubov Orlova*, drifted in international waters and was presumed sunk. No pollution or injuries were reported.

*Ce document est également disponible en français.*

## *Factual information*

### *Particulars of the vessels*

	<i>Charlene Hunt</i>	<i>Lyubov Orlova</i>
IMO number	8842208	7391434
Port of registry	Narragansett, Rhode Island, U.S.	Unregistered
Flag	U.S.	Unregistered
Type	Tug	Passenger vessel
Gross tonnage	196	4251
Length <sup>1</sup>	30.3 m	90 m
Draught	Forward: 2.5 m Aft: 3.5 m	Forward: 4.6 m Aft: 4.6 m
Built	1962, Madisonville, Louisiana, U.S.	1976, Yugoslavia
Propulsion	V16 diesel engine (1790 kW) driving a fixed-pitch propeller	None
Crew	5	None
Registered owner	Hunt Marine 1, LLC (Narragansett, Rhode Island, U.S.)	Private owner (Toronto, Ontario, Canada)
Operations manager	Private consultant (Toronto, ON)	None

### *Description of the vessels*

#### *Charlene Hunt*

The *Charlene Hunt* is a coastal tug of steel construction that was built in 1962 (Photo 1). The vessel has a single propeller and rudder. The conning station, located in the wheelhouse that sits atop the deckhouse, is fitted with navigational equipment including radars, very high frequency radiotelephones, GPS, an automatic identification system, an electronic chart plotter, and an autopilot. The deckhouse includes a galley, storerooms, and accommodations. The towing winch is located aft of the deckhouse on the main deck. The *Charlene Hunt* also has an on-board satellite weather system used for instant access to weather and sea condition data.

Photo 1. *Charlene Hunt* (photo: Alan Knight)



<sup>1</sup> 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.

## *Lyubov Orlova*

The *Lyubov Orlova* was of typical passenger vessel construction (Photo 2). It was ice-strengthened and had been used for charter adventure cruises in the Arctic prior to being decommissioned in 2010 for financial reasons. The vessel's superstructure extended three-quarters the length of the vessel. The vessel had 2 fixed-pitch propellers and 2 rudders. There was no power on board, and the vessel's dead weight was 4160 tons.

Photo 2. *Lyubov Orlova*, January 2013



## *Initial business plan*

On 27 March 2012, the *Lyubov Orlova*, which was moored in St. John's, Newfoundland and Labrador, was purchased by a Canadian owner who began to prepare the vessel so that it could travel under its own power to the Dominican Republic, where it would be sold for scrap.

After initial work to prepare the vessel, the owner determined that the task was too extensive and costly and instead decided to charter a tug and have the vessel towed to the Dominican Republic. The owner's plan was to depart by October to avoid incurring additional wharfage fees. The owner, in partnership with a relative, employed an operations manager to oversee the project, arrange a bareboat charter<sup>2</sup> of a tug, and hire a crew. For the owner, business partner, and operations manager, this was their first towing operation.

In September, the partner chartered the tug *Charlene Hunt* and hired a crew in New Bedford, Massachusetts, U.S. In the 2 years prior, the *Charlene Hunt* had seen minimal use, and it was inactive in the 9 months prior to this voyage. The tug was to travel from New Bedford to St. John's, where the towing arrangement<sup>3</sup> would be assembled, and then proceed to the Dominican Republic with the *Lyubov Orlova* under tow. The estimated duration of the international voyage was 34 days.

## *History of the voyage*

On 24 November 2012, at approximately 0630 Eastern Standard Time,<sup>4</sup> the *Charlene Hunt* departed New Bedford for St. John's (Appendix A). The master, chief engineer (CE),<sup>5</sup> and 2 crew members were on board. The next day, at 0800 Atlantic Standard Time,<sup>6</sup> the stern tube cooling line in the engine room split and the tug began taking on water. The engine room

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<sup>2</sup> A bareboat charter is an arrangement whereby a vessel is rented without the provision of crew.

<sup>3</sup> A towing arrangement is the tension-carrying link between tug and tow.

<sup>4</sup> Coordinated Universal Time (UTC) minus 5 hours.

<sup>5</sup> This crew member was assigned the duties of chief engineer, but did not hold a chief engineer certificate.

<sup>6</sup> Coordinated Universal Time (UTC) minus 4 hours.

pumps were put into use to pump out the water, but by 1830, they could no longer keep up,<sup>7</sup> and the master broadcast a distress call. At this time, the tug was 25 nautical miles (nm) off Cape Roseway, Nova Scotia (Appendix A).

The Canadian Coast Guard (CCG) responded to the call and, upon arriving at the scene, provided additional pumps to the *Charlene Hunt*. The tug's 2 crew members were airlifted to Halifax, NS, by a Canadian Armed Forces helicopter, while the master and CE stayed on board and continued to pump out the engine room. However, the ingress of water continued. At approximately 2300, the tug began travelling toward Halifax under CCG escort, arriving in the port of Halifax at 0407 on 26 November. The 2 evacuated crew members returned to the tug and, along with the CE, made repairs to stop the ingress of water.

On 03 December, the tug departed Halifax for St. John's. However, when the tug was 12 nm off Cape Canso, NS, it encountered fuel filter problems with the auxiliary generator and altered course to Sydney, NS (Appendix A). On 04 December, the tug arrived in Sydney where the crew resolved the fuel filter issues. Four days later, the tug continued on its voyage to St. John's.

On 09 December, at approximately 1400 Newfoundland and Labrador Standard Time,<sup>8</sup> the *Charlene Hunt* arrived in St. John's. The partner and operations manager met up with the crew and started to design and construct the towing arrangement, mostly using parts salvaged from the *Lyubov Orlova*. The original master, operations manager, and CE were responsible for the design of the towing arrangement, and the CE was responsible for fabrication and welding operations. The partner was responsible for the procurement of specialty services, parts, and consumables, while the crew performed the labour. They also began to prepare the *Lyubov Orlova* for the voyage. On 28 December, the master and CE left the *Charlene Hunt* for time off.

On 13 January 2013, an assistant engineer and relief master, both newly hired, arrived in St. John's to join the tug for the voyage to the Dominican Republic. The following day, the CE returned from scheduled leave. Over the next few days, the partner, CE, and crew members completed the construction of the towing arrangement and finished preparing the *Lyubov Orlova* for the voyage.

On 23 January at approximately noon, the *Charlene Hunt* departed St. John's harbour towing the *Lyubov Orlova*. The relief master, the CE, the assistant engineer, and 2 crew members were on board. At approximately 1300, the crew released the assist tug and paid out the tow line. The tug and tow then travelled in a southerly direction for approximately 18 hours, until the master changed course 50° to starboard. After the course change, the tug began travelling directly into winds estimated at 40 knots and seas of 5 to 6 m. The master reduced the tug's speed and travelled 15 nm over the next 9 hours. The heavy weather persisted and, at approximately 1445 on 24 January, the towing arrangement between the *Charlene Hunt* and the *Lyubov Orlova* failed off Cape Race, NL, in position 46°30' N, 53°04' W (Appendix A and B).

The master immediately notified Marine Communications and Traffic Services (MCTS) in St. John's. The crew members retrieved the entire tow line but released the remaining pieces of the towing arrangement, as they had no means to haul them on board. The crew members

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<sup>7</sup> The crew also attempted to use the vessel's fire pump, but it would not start.

<sup>8</sup> All remaining times in the report are Newfoundland and Labrador Standard Time (Coordinated Universal Time minus 3.5 hours).

attempted to retrieve the *Lyubov Orlova*'s emergency tow line,<sup>9</sup> but the sea conditions hampered their efforts.

Throughout the remainder of 24 January and most of the next day, the *Charlene Hunt* stood by the *Lyubov Orlova* and reported to MCTS regularly. At 2000 on 25 January, the master reported to MCTS that the weather was further deteriorating and that ice was beginning to build up on the *Lyubov Orlova*. At 0600 on 26 January, the master reported that the *Charlene Hunt* was having difficulty standing by the *Lyubov Orlova* due to the rough sea conditions; the vessel was now separated from the tug by more than 8 nm.

At 1052, the master reported to MCTS that the *Charlene Hunt* was taking on water from a broken discharge valve in the engine room. The ingress of water forced the master to leave the *Lyubov Orlova* and depart for St. John's. At around noon, MCTS tasked the CCGS *Cape Roger* to meet the *Charlene Hunt* and escort it to St. John's. The *Cape Roger* joined the tug 4 hours later and began escorting it towards sheltered waters. By 0400 on 27 January, the *Charlene Hunt* entered sheltered water near Cape Spear, NL, where the crew began repairing the discharge valve.

At 1000 that morning, the *Cape Roger* notified Transport Canada Marine Safety and Security (TC) that the tug was in bad shape and was making temporary repairs. Shortly thereafter, TC ordered the *Charlene Hunt* to proceed to St. John's harbour when it was safe to do so. Three hours later, the tug arrived in St. John's harbour.

At 2100, the oil supply tug *Atlantic Hawk* reported sighting the *Lyubov Orlova* at 47°25' N, 050°36' W, drifting 30° true at 0.7 knots. The *Lyubov Orlova* continued to drift in a northeasterly direction, coming within 85 nm of the Hibernia oil production platforms (Appendix A and B).

On 30 January, the *Atlantic Hawk* retrieved the *Lyubov Orlova*'s emergency tow line and began to guide the vessel in a northeasterly direction with the wind and sea conditions, and away from the oil platforms, for approximately 44 hours. The *Atlantic Hawk* covered 105 nm at an average speed of 2.4 knots. Shortly after the *Lyubov Orlova* was clear of the oil platforms, TC contracted the oil supply tug *Maersk Challenger* to take over the tow and return the *Lyubov Orlova* to St. John's.

On 02 February, the *Maersk Challenger* arrived and took over the tow from the *Atlantic Hawk*. Once connected, the *Maersk Challenger* changed course for St. John's (approximately 250 nm away) and began towing the vessel southeast and into the sea conditions. Shortly after the course change, the emergency tow line failed.

On 23 February, the Halifax Rescue Coordination Centre reported that an emergency beacon registered to the *Lyubov Orlova* had started transmitting<sup>10</sup> in position 51°46' N, 35°41' W, approximately 700 nm east of St. John's. A second emergency beacon also registered to the *Lyubov Orlova* started to transmit on 08 March. The *Lyubov Orlova* is presumed sunk.

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<sup>9</sup> An emergency tow line is used when the main towing arrangement fails. The emergency bridle and its attachment are to be of the same strength as the main towing arrangement on the tow and are to be configured in such a manner that the emergency bridle can be retrieved without boarding the tow. A secondary main tow line and shackles are to be available on board the tug if required.

<sup>10</sup> The emergency beacon on the *Lyubov Orlova* was designed to start transmitting when submersed.

## *Personnel certification and experience*

The master on the *Charlene Hunt* (from New Bedford to St. John's) had 37 years of marine experience. He had 9 years of towing experience, mostly on inland voyages. The master had held the position of master for the past 21 years and had previously been master on the *Charlene Hunt*.

The relief master (on the occurrence voyage) had 35 years of experience in the towing industry and had been a master for the past 21 years. The relief master held the following U.S. certification:

- Master's Certificate Limited to 3000 Gross Tons Upon Oceans
- Master of Uninspected Towing Vessels
- Master of a Towing Vessel Upon Oceans

This was the relief master's first voyage on the *Charlene Hunt*. Although the relief master had sailed Alaskan waters prior to this voyage, the farthest north in the Atlantic Ocean he had ever been was New York, New York, U.S.; as such, the relief master had minimal experience with winter and icing conditions in the North Atlantic.

The CE was certified as an ordinary seaman and wiper.<sup>11</sup> Prior to this voyage, the CE was last on board the *Charlene Hunt* in 2008, when he had spent over 7 months refitting the tug. The CE's towing experience involved mostly inland voyages.

The shore manager had no seafaring experience but had some business experience in shipping on the Great Lakes. The shore manager had minimal knowledge of the requirements for vessels involved in international voyages. The business partner had no marine experience.

## *Environmental conditions*

When the tug and tow departed St. John's on 23 January at 1200, gale and freezing spray warnings were in effect for the voyage waters. The 24-hour forecast was for westerly winds at 25 knots, increasing to 35 knots from the southwest by noon on 24 January. Eight nautical miles from St. John's harbour, the vessel experienced westerly winds at 30 to 35 knots with 3.4 m seas. At the time and location of the occurrence, the winds were estimated at 30 to 35 knots gusting 40 knots from the west-southwest with seas of approximately 5.5 m.

## *Vessel certification*

At the time of the occurrence, the *Charlene Hunt* held a U.S. Coast Guard certificate of documentation as a towing vessel coastwise. The tug also held a temporary Bolivian Ships Registry certificate, a safe manning certificate, and a ship radio station licence.

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<sup>11</sup> An ordinary seaman's main duty is to maintain the cleanliness of a vessel. A wiper is the most junior role in the engine room; a wiper's duties include cleaning the engine spaces and the machinery and assisting the engineers.

## *Vessel inspection for Bolivian registry*

In October 2012, the tug underwent an inspection by a surveyor representing Bolivia following an application to have the tug's registry changed to Bolivia. The inspection determined that the tug was unseaworthy<sup>12</sup> and not ready for certification. The surveyor provided a list of deficiencies to be rectified prior to resuming the survey and certification process. The list included the following:

- provide master's, officers', and crew's certification;
- provide a trim and stability booklet;
- provide international tonnage certificate and previous load line certificates;<sup>13</sup>
- provide a set of updated navigation publications and charts;
- conduct an underwater hull inspection to determine the need for further maintenance or repairs;
- ensure all wiring passing through the watertight bulkheads is properly closed and sealed;
- add protective covers to the engine room light fixtures;
- update life-saving and fire protection equipment and documentation to meet the requirements set out by the International Convention for Safety of Life at Sea; and,
- test the main and emergency fire pumps.

The crew addressed some of the deficiencies but a follow-up inspection did not take place, as the owner of the tug decided to abandon the process of obtaining a permanent Bolivian registration.

## *Port State Control*

Port State Control (PSC) is a vessel inspection system whereby foreign vessels entering a sovereign state's waters are boarded and inspected to ensure conformity with various major international conventions. PSC programs are regional in nature; that is, a number of countries sharing common waters have come together under a memorandum of understanding (MOU) to make sure that vessels trading in their area are not deficient. Canada is signatory to 2 PSC MOUs: the Tokyo MOU on the west coast and the Paris MOU on the east coast. The Paris MOU provides guidance regarding the inspection and detention of vessels, and contains provisions<sup>14</sup> regarding vessels entering a foreign state after suffering damage at sea.

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<sup>12</sup> Seaworthiness refers to the sufficiency of a vessel in materials, construction, equipment, and outfit for the trade or service in which it is employed.

<sup>13</sup> After a vessel has been marked with assigned load line marks, it is issued a load line certificate. This certificate provides information such as freeboard measurements related to the geographic area of operation. The vessel then requires periodic inspections to confirm that no changes have occurred to the hull or superstructure. As per International Maritime Organization requirements, load line certificates are required for vessels over 150 gross tonnes on international voyages; it was therefore a requirement for the *Charlene Hunt*.

<sup>14</sup> Paris Memorandum of Understanding on Port State Control, adopted 23 May 2013, Section 3.5.

## *Port State Control in Halifax*

On 27 November, after the *Charlene Hunt* took shelter in the Halifax harbour, TC conducted a PSC inspection<sup>15</sup> of the tug. TC identified deficiencies that needed to be rectified and required the following remedial actions:

- A letter of authorization is to be obtained from the United States Coast Guard (USCG) in lieu of a load line certificate.
- All fire dampers are to be fitted with closing devices before departure.
- The emergency fire pump is to be operational before departure.
- The cause of ingress of water into the engine room is to be determined and fixed before departure.
- The engine room bilges' oil is to be pumped to a reception organization ashore before departure from Halifax.
- The man overboard boat is to be pressurized and launched before departure.
- The locking plates on the fore and aft under deck beams and athwartships beams, which lock the starboard-side engine room stores/maintenance hatch are to be in place before departure;
- A protective shutter is to be supplied for the starboard side wheelhouse window, which is cracked.
- The engine room rail is to be reinstated.

TC required that these remedial actions be taken prior to the tug's departure.

## *United States Coast Guard flag state inspection*

On 30 November, following a request for a load line certificate (LLC) exemption<sup>16</sup> by the *Charlene Hunt's* operations manager, the USCG boarded the tug in Halifax and conducted a flag state inspection to obtain the exemption. The LLC and safety inspection included testing of the bilge and fire pumps and examination of the following:

- the watertight doors leading to the exterior deck
- the portholes
- the bilge pockets
- all piping and through-hull penetrations
- the wheelhouse window shutter repair

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<sup>15</sup> Where certain risks are identified on a foreign vessel in a Canadian port, TC has a mandate to conduct a PSC inspection. A PSC inspection verifies that the vessel and its equipment comply with Canadian and international regulations and that the vessel is manned and operated in compliance with these regulations.

<sup>16</sup> A load line certificate exemption is issued by the flag state or appointed classification society and exempts a vessel from some or all of the provisions of a load line certificate.

- the exhaust and intake covers
- the main deck scuttles and vents

The inspection also involved examining compliance with the following safety items: the carbon dioxide semi-portable fire extinguishing system with hose reel, the four B-11 portable extinguishers in the engine room, the 11 portable extinguishers throughout the vessel, the Safety of Life at Sea (SOLAS) “A” life raft, the 6 type-one PFDs, and the 6 immersion suits.

The USCG inspector determined the tug’s hull integrity to be sufficient to continue the voyage to St. John’s and issued a USCG load line exemption certificate,<sup>17</sup> which expired on 10 December 2012 or upon arrival in St. John’s harbour.

On 30 November 2012, following the USCG LLC and safety inspection, TC inspected the tug, found the deficiencies resolved, and instructed the master to notify the TC office in St. John’s upon arrival in accordance with the Paris MOU. The inspector then cleared the tug to sail.

### *Port State Control in St. John’s*

Following the occurrence, the *Charlene Hunt* returned to St. John’s on 27 January 2013 and TC conducted another PSC inspection. Forty-two deficiencies were identified. Some of these had been identified and rectified in the Halifax PSC inspection. In addition, some of these had been identified by the October 2012 Bolivian inspection and were again identified during this inspection. They included the following:

- no master’s, officers’, and crew certification;<sup>18</sup>
- no international tonnage, load line, or safety management certificates;
- a lack of updated navigation publications and charts;
- a lack of watertight integrity due to leaky hatch covers, leaky exterior doors, a cracked window, deteriorated piping, electrical wires running through the bulkhead, and cracks on the deck near the towing winch;
- some inoperable lifesaving and fire protection equipment; and,
- no protective covers on the engine room light fixtures.

TC found the *Charlene Hunt* to be unseaworthy due to these deficiencies and detained the tug for more than 4 months. In June 2013, the tug was towed from St. John’s into U.S. waters.

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<sup>17</sup> The *International Convention on Load Lines*, 1966, as Amended by the Protocol of 1988, allows for exemptions under Article 6-4, which states that a vessel not normally engaged on international voyages but which, in exceptional circumstances, is required to undertake a single international voyage may be exempted from the requirements set out by the convention, provided that the vessel complies with safety requirements that are adequate for the voyage to be undertaken.

<sup>18</sup> The master and officers had joined the vessel in St. John’s and were not on board during the Halifax PSC inspection.

## *Guidelines for towing operations*

To help ensure safety at sea and prevent loss of life and environmental damage, the International Maritime Organization (IMO) has established guidelines for safe ocean towing.<sup>19</sup> In lieu of specific Canadian regulations, TC recommends the use of these guidelines for tug operations.<sup>20</sup> Marine surveyors and independent marine towing consultants have also established guidelines and standards available for towing operations.<sup>21</sup>

The IMO guidelines provide information on critical aspects of a towing operation, including voyage planning, designing and constructing the towing arrangement, preparing the towed object, and emergency planning.

### *Voyage planning*

The IMO guidelines specify the importance of ensuring that all aspects of a towing operation are planned in advance and note the master's responsibility to identify and account for the most adverse weather conditions that may be present on the intended route so as to ensure the adequacy of the towing arrangement. The guidelines also specify the need for the master to identify operational limits for the tow and have established procedures (such as weather routing or safe shelter locations) to prevent the tow from encountering conditions in excess of the limitations. The master must also have a contingency plan to cover the onset of adverse weather.<sup>22</sup>

The *Charlene Hunt* was equipped with a satellite weather system that provided instant access to weather and sea condition data. Prior to departure, the relief master had also accessed the current forecast, the further 24-hour forecast, and the 3-day forecast. The master had sailed in Alaskan waters in the winter but had no experience with North Atlantic winter weather conditions. Although the forecast was calling for gale force wind and freezing spray, the master estimated that they had a 3-day weather window to transit to Nova Scotia.

### *Designing and constructing the towing arrangement*

In designing and constructing the towing arrangement, the IMO guidelines specify the need for consideration of the following factors to ensure the towing arrangement is adequate for its intended purpose:

- the tow size, type, and condition;

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<sup>19</sup> International Maritime Organization, MSC/Circ. 884, Guidelines for Safe Ocean Towing, December 21, 1998.

<sup>20</sup> While TC has regulations specific to tugs and tows with crewed barges and those carrying oil, it does not regulate other types of towing operations. TC issued Ship Safety Bulletin 13/1988, Safety of Towed Ships and Other Floating Objects, on September 7, 1988 recommending that IMO guidelines be followed in lieu of specific regulations.

<sup>21</sup> For example, GL Noble Denton is a company of independent advisors in the oil and gas industry that has established technical standards for towing vessels. These technical standards are freely accessible on the GL Noble Denton website at [www.gl-nobledenton.com](http://www.gl-nobledenton.com) Last accessed 26 September 2013.

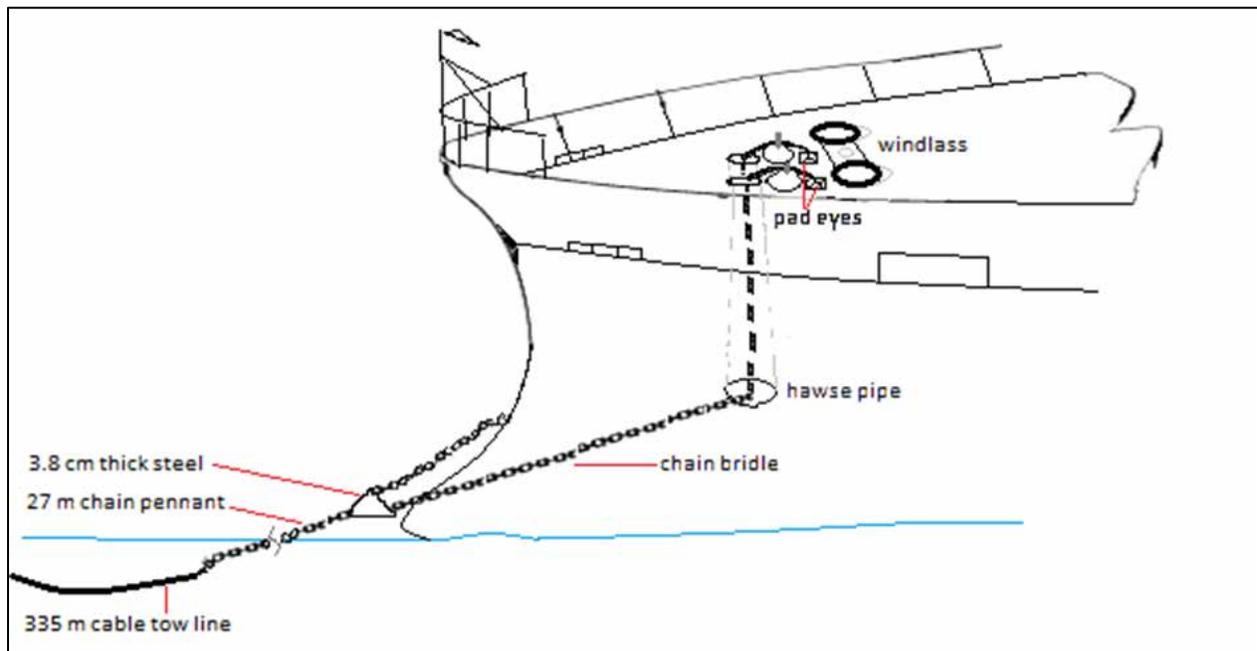
<sup>22</sup> International Maritime Organization, MSC/Circ. 884, Guidelines for Safe Ocean Towing, December 21, 1998.

- the capability of the tug (bollard pull,<sup>23</sup> range, equipment, and crew);
- the strength of towing arrangement (type, diameter, expected maximum shock load,<sup>24</sup> scope, and configuration);
- operational and emergency considerations; and,
- the stability characteristics of the tug and tow.<sup>25</sup>

The length of the tow line is an important factor in a towing arrangement. When a tow line is sufficiently long, the weight of the tow line will cause catenary (sag) in the tow line between the tug and the tow. The catenary acts as a spring and softens the shock load on the towing arrangement.

The towing arrangement in this occurrence had been constructed mostly using materials salvaged from the *Lyubov Orlova*. The crew selected pieces of used anchor chain with the least wear to construct 2 towing bridles, each long enough to clear the vessel's bulbous bow (Figure 1).

Figure 1. Diagram of the towing arrangement on the *Lyubov Orlova*



The end of each bridle connected to the forward deck of the *Lyubov Orlova* via shackles and pad eyes that were welded to the deck between the windlass and the hawse pipes.<sup>26</sup> From each pad

<sup>23</sup> Bollard pull is the pulling capability of the tug at zero speed.

<sup>24</sup> A shock load refers to external forces acting upon the towing arrangement. These forces may be created by environmental conditions and interaction between the tug and tow.

<sup>25</sup> International Maritime Organization, MSC/Circ. 884, Guidelines for Safe Ocean Towing, December 21, 1998.

<sup>26</sup> A hawse pipe is a pipe that passes through the bow section of a vessel. The anchor chains pass through the hawse pipes. The *Lyubov Orlova* had 2 hawse pipes, 1 located on the port side and 1 on the starboard side.

eye, the bridles passed through an arrangement that secured them on the guide roller and then down corresponding hawse pipes. The used anchor chain failed at the point where the bridles passed through the guillotine/chain stopper<sup>27</sup> securing them on the guide roller located on the foredeck of the *Lyubov Orlova*. From the bottom of each hawse pipe, the bridles extended to a 3.8 cm-thick triangular steel plate. Another 27 m piece of salvaged anchor chain shackled to the steel plate served as a pennant. New shackles, each with a 45-ton safe working load, connected all of the towing arrangement components.

The towing arrangement also included a new steel tow line that was 365 m long and 3.8 cm in diameter, with a breaking load of 110 000 kg. Both IMO and marine towing consultants have established criteria available to help towing operators determine an appropriate length for the tow line. According to criteria provided by GL Noble Denton, a tug in the North Atlantic should have the ability to deploy a minimum of 650 m<sup>28</sup> of tow line to prevent excessive shock loads.

The towing winch drum on board the *Charlene Hunt* was capable of holding 365 m of 3.8 cm cable. As such, the available tow line length on the tug was approximately half the length recommended by GL Noble Denton and less than the IMO minimum guideline. The relief master had ordered a new shock line,<sup>29</sup> but the crew encountered problems attaching it between the tow line and the triangular steel plate. As a result, it did not become a working part of the towing arrangement.

### *Preparing the tow*

The IMO guidelines set out standards for the master to ensure the tow is adequately prepared to make the voyage safely. The guidelines specify that the tow should

- exhibit proper navigation lights and day shapes;
- be able to maintain watertight integrity throughout the voyage;
- have the rudders secured in the amidships position and the propeller shaft prevented from turning;
- hold a certificate as required by the International Convention on Load Lines; and,
- not proceed to sea until a satisfactory inspection of the tug and tow has been carried out. In special cases where the risks cannot be evaluated by nautical knowledge, seafaring, or experience, a survey should be conducted by a competent authority or organization.<sup>30</sup>

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<sup>27</sup> The guillotine/chain stopper housing is the strongest part of the anchoring equipment and is designed to take the load of the cable when a vessel lies at anchor. The International Association of Classification Societies' IACS requirements in relation to the strength of the stopper (guillotine) states that a chain stopper should withstand a pull of 80% of the breaking load of the chain.

<sup>28</sup> GL Noble Denton, Technical Policy Board, Guidelines for the Approval of Towing Vessels, Section 6.2.3, Last revised March 31, 2010, <http://www.gl-group.com/assets/downloads/0021-8.pdf> Last accessed September 26, 2013.

<sup>29</sup> It is recommended that towing arrangements incorporate a shock line that acts like a spring to help to absorb peak shock loads.

<sup>30</sup> International Maritime Organization, MSC/Circ. 884, Guidelines for Safe Ocean Towing, December 21, 1998.

In this occurrence, a number of tasks<sup>31</sup> were carried out to prepare the *Lyubov Orlova* for the voyage, but the vessel departed without the required navigation lights or load line certification, and it was not surveyed by an external authority prior to departure.

### *Emergency planning*

The IMO guidelines set out the following safety precautions to ensure emergency preparedness for towing operations:

- provide sufficient spare materials to reconstruct the towing arrangement;
- ensure the emergency tow line has sufficient strength in the weather conditions that exist; and,
- fit the tow with an anchor that is suitable for holding in severe weather conditions and is securely attached to a cable that is arranged for release in an emergency.<sup>32</sup>

In this occurrence, the crew assembled an emergency tow line that consisted of used 5 cm nylon mooring line salvaged from the *Lyubov Orlova*. GL Noble Denton guidelines suggest that the emergency tow line consist of an attachment point on the tow and an emergency bridle of the same strength as the main towing arrangement. The emergency tow line was not tested prior to departure and was not sufficient to withstand the shock loads present in the North Atlantic during the wintertime.

### *Oversight of towing operations*

The tasks of preparing the vessel and designing and assembling the towing arrangement were shared by the master, partner, operations manager, CE, and crew members. The towing arrangements did not follow a number of the IMO guidelines. Prior to the departure from St. John's, the relief master had expressed some concerns to the partner and operations manager about the length of the tow line and the strength of the used anchor chain. The towing arrangement was not inspected by TC, nor was there a requirement for it to be.

For towing operations involving crewed barges or those carrying oil, TC requires a marine safety inspector (MSI) to inspect the towing arrangement and has the following regulations in place:

- ensure that the tug and oil barge towing equipment are in all respects capable of maintaining safe control over the oil barge in all foreseeable circumstances;
- ensure that all variables related to the characteristics of the tug and tow are accounted for when making tug/tow matching decisions (i.e. bollard pull requirements);
- establish a formal tow line inspection schedule and procedure; and,

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<sup>31</sup> Among other tasks, the crew ballasted the vessel, welded stops to fix the rudders in a neutral position, sealed and secured the portholes and doors, closed all seawater inlet and outlet valves, and installed embarkation ladders.

<sup>32</sup> International Maritime Organization, MSC/Circ. 884, Guidelines for Safe Ocean Towing, December 21, 1998.

- establish procedures for ensuring that the strength of tow lines and other rigging gear (such as winches, chains, bridles, and shackles) is adequate for the intended operation and is maintained to a high standard of reliability.<sup>33</sup>

TC currently has no regulations or inspection requirements for other towing operations. However, following an occurrence in September 2011 when the tow line between the Greek-registered tug *Hellas* and the decommissioned bulk carrier *Miner* failed in heavy weather while en route to Turkey,<sup>34</sup> TC created a committee to develop a policy on the inspections of tug and tows bound for international voyages. The draft policy provides MSIs with a framework to assess tugs and tows leaving from Canada on international voyages. Under the policy, TC would assess every towing operation departing Canadian waters on a deep sea voyage to ensure compliance with Sections 111 and 189 of the *Canada Shipping Act, 2001*<sup>35</sup> and limit operations that threaten the safety of navigation and the environment. At the time of the occurrence, only the TC Quebec region had integrated this draft policy into its vessel inspection standards.<sup>36</sup>

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<sup>33</sup> Transport Canada, TP 11960 E, Standards and Guidelines for the Construction, Inspection and Operation of Barges that Carry Oil in Bulk, Appendix A, 1995.

<sup>34</sup> Transportation Safety Board of Canada, Marine occurrence M11M0042 (*Miner*). Following this occurrence, the *Miner* eventually grounded and was not recovered.

<sup>35</sup> Section 111 of the *Canada Shipping Act, 2001* requires every master to comply with any direction given by an MSI to cease any operation or procedure that poses risk because of unsafe conditions. Section 189 empowers the Minister to specify the route, pace, and manner by which the vessel must proceed, in the case where the vessel may discharge or has discharged a prescribed pollutant.

<sup>36</sup> Since this occurrence, TC Atlantic region has also integrated this draft policy into its vessel inspection standards.

## *Analysis*

### *Events leading to the loss of tow*

At approximately 1200 on 23 January 2013, the tug *Charlene Hunt* departed St. John's towing the decommissioned vessel *Lyubov Orlova*. The towing arrangement was constructed primarily from salvaged materials and no testing was conducted on the towing arrangement by the master. In addition, the tow line was less than the recommended length.

Prior to departure, the master is responsible for ensuring the towing arrangement is adequate for the intended voyage. In this case, the master did not have the towing arrangement inspected by a third party organization or regulatory body. There are no regulatory requirements to have Transport Canada (TC) inspect the towing arrangement.

The towing operation had not been properly planned in advance and the operational limits of the towing arrangement were unknown to the relief master. Upon review of the forecasted weather conditions, the relief master estimated that they had a weather window of 3 days for the voyage to Nova Scotia and departed St. John's harbour. The relief master did not appreciate the severity of the environmental conditions to be expected for the season and voyage area. The relief master was therefore unaware of whether the towing arrangement was sufficient to make the voyage safely.

After leaving the protective lee of the Newfoundland shore and rounding Cape Race, the tug and tow encountered heavy seas. The *Charlene Hunt* had no additional tow line to pay out to soften the shock load and reduce the strain of the towing arrangement. This strain likely created chafing of a chain link on the guillotine/chain stopper. In addition, the available shock line had not been installed. Subjected to increased forces caused by the combined 40 knots winds, 5-6 m seas, and the course change to starboard into the wind, the chain link eventually failed at the guillotine/chain stopper.

### *Adequacy of the towing arrangement*

Both the quality of materials used in construction and the design of a towing arrangement can significantly affect its ability to withstand peak shock loads.

Over a period of time, chain in a damp and salty environment may deteriorate, thus making a visual assessment of its strength unreliable. A more reliable strength assessment is conducted by a pull test on a section of the chain, whereby the chain is pulled to the breaking point, and then the results are evaluated to determine the breaking strength. In this occurrence, although the relief master visually inspected the towing arrangement and had concerns regarding the strength of the used anchor chain, no pull test was conducted. Therefore, the master could not ascertain if the towing arrangement was of sufficient strength to make the voyage safely, as its operational limits were unknown.

To reduce the shock load on the towing arrangement, the length of the tow line, chain pennant, or bridles can be increased, or a synthetic spring (shock line) can be inserted into the towing arrangement. When the tow line, chain pennant, and bridles are collectively of sufficient length, the catenary acts as a spring to soften the shock loads experienced by the towing arrangement.

In this occurrence, the relief master did not have additional tow line to pay out when the sea conditions increased and was therefore unable to generate the additional catenary necessary to soften the shock load acting on the towing arrangement (Appendix C). Furthermore, although the relief master had identified the need for a shock line and ordered one prior to departure, the crew had difficulties attaching it and the tug and tow left without the shock line becoming a working part of the towing arrangement.

### *Voyage planning*

The practice of voyage planning is applicable to all vessels on all types of voyages. Preparing a voyage plan involves anticipating all known navigational hazards and adverse environmental conditions to ensure the safe passage of the vessel. To mitigate the inherent risks present in this towing operation (strong shock loads, unpredictable and severe weather conditions, limited access to emergency assistance), proper planning and preparation were essential.

In this occurrence, the relief master had assessed the weather forecasts, but was unfamiliar with the severe environmental conditions that could be encountered in the North Atlantic and had not adequately prepared to compensate for them. Although the relief master's contingency plan for adverse weather prior to crossing Gulf of St. Lawrence was to take refuge in St. Mary's Bay, NL, he gave minimal consideration to other weather routing options. During the voyage, the wind and sea conditions increased significantly. Rather than turn around or seek shelter until the weather subsided, the relief master reduced speed and made minimal headway for approximately 9 hours, at which point the towing arrangement failed. Without sufficient planning and research, the relief master did not account for the maximum environmental conditions given the season and area of tow.

Without adequate voyage planning, risks that endanger the tug and tow, the crew, and the environment may go unidentified.

### *Vessel seaworthiness*

The seaworthiness of a vessel is critical to the safety of its crew, the environment, and the success of any operation. The responsibility for ensuring that a vessel is seaworthy and suitable for its intended operation ultimately lies with its master and owners.

The *Charlene Hunt* was approaching the end of its normal life cycle and had been out of service for the majority of the 2 years prior to this voyage. It had a number of deficiencies that had not been rectified prior to the voyage, including the following:

- an inadequate towing winch that was unable to stow the minimum recommended length of tow line;
- no load line certificate;
- a lack of structural and watertight integrity, as identified during vessel inspections; and,
- several inoperable pieces of lifesaving equipment and lifesaving equipment that was missing.

Following multiple inspections, neither the regular master nor the relief master ensured that all of the vessel's deficiencies were permanently resolved.

The partner and operations manager had minimal knowledge in the marine towing industry, and were thus unaware of the limitations that existed on the *Charlene Hunt*. Although the tug was able to stand by the *Lyubov Orlova* for a period of 36 hours after the towing arrangement failed, it was unable to retrieve the tow due to the weather and sea conditions. Subsequently, the tug began to take on water due to a broken discharge valve in the engine room and departed to seek shelter.

If vessels that are unseaworthy continue operating, there is a risk that the safety of the crew and the environment will be compromised.

### *Guidance for towing operations*

The owner/master is ultimately responsible for the safe operation of the tug and tow. Although there are no regulations in Canada with respect to the design, construction, and inspection of towing arrangements, towing operators can consult available guidelines for towing arrangements. In addition, they can have the towing arrangement inspected by either an experienced master or marine surveyor to ensure it is adequate for its intended purpose.

In this occurrence, the crew did not follow guidelines while preparing the towing arrangement, nor did they seek expert advice. With the exception of the tow line and shackles, the towing arrangement was constructed of used parts that had been salvaged from the *Lyubov Orlova*. With no safe working load documentation on any of these salvaged materials, the actual strength of the towing arrangement was unknown. Furthermore, the tug and tow departed St. John's without the ability to anchor the tow or reconstruct the towing arrangement. In addition, the emergency tow line was inadequate.

If masters/owners do not ensure the adequacy of towing arrangements, the safety of towing operations and the environment may be compromised.

TC has drafted a policy that would require towing operations departing Canada for deep sea voyages to be inspected. However, this policy is not yet in effect.

### *Port State Control*

Under Port State Control, TC is permitted, but not required, to inspect foreign vessels. When the *Charlene Hunt* arrived in Halifax following damage at sea, TC performed a PSC inspection and identified 9 deficiencies. Following repairs, the TC inspector was satisfied that the vessel could complete the voyage to St. John's, considering the nature and length of the voyage, and cleared the tug to depart. Before the vessel's departure, TC requested that the master of the *Charlene Hunt* contact the TC office in St. John's upon arrival. However, the master did not report his arrival to TC in St. John's, nor did TC conduct any further inspection of the *Charlene Hunt* prior to its departure with the tow.

The TC inspection following the loss of the tow and the vessel's return to St. John's revealed numerous deficiencies. It is reasonable to conclude that, had an inspection been undertaken prior to the departure of the vessel with the tow, some of these deficiencies would have been identified.

If Port State Control is not exercised and vessels that are unseaworthy are permitted to continue operating, there is a risk that the safety of the crew and the environment will be compromised.

## *Findings*

### *Findings as to causes and contributing factors*

1. The relief master did not adequately prepare to compensate for the environmental conditions that were encountered.
2. Available guidelines respecting the design and construction of towing arrangements were not followed.
3. The towing arrangement was inadequate for the intended voyage.
4. As the tug and tow rounded Cape Race, Newfoundland and Labrador, it was exposed to wind and sea conditions that eventually caused the towing arrangement to fail.
5. The tug was able to stand by the tow despite the weather and sea conditions but eventually departed due to mechanical difficulty.

### *Findings as to risk*

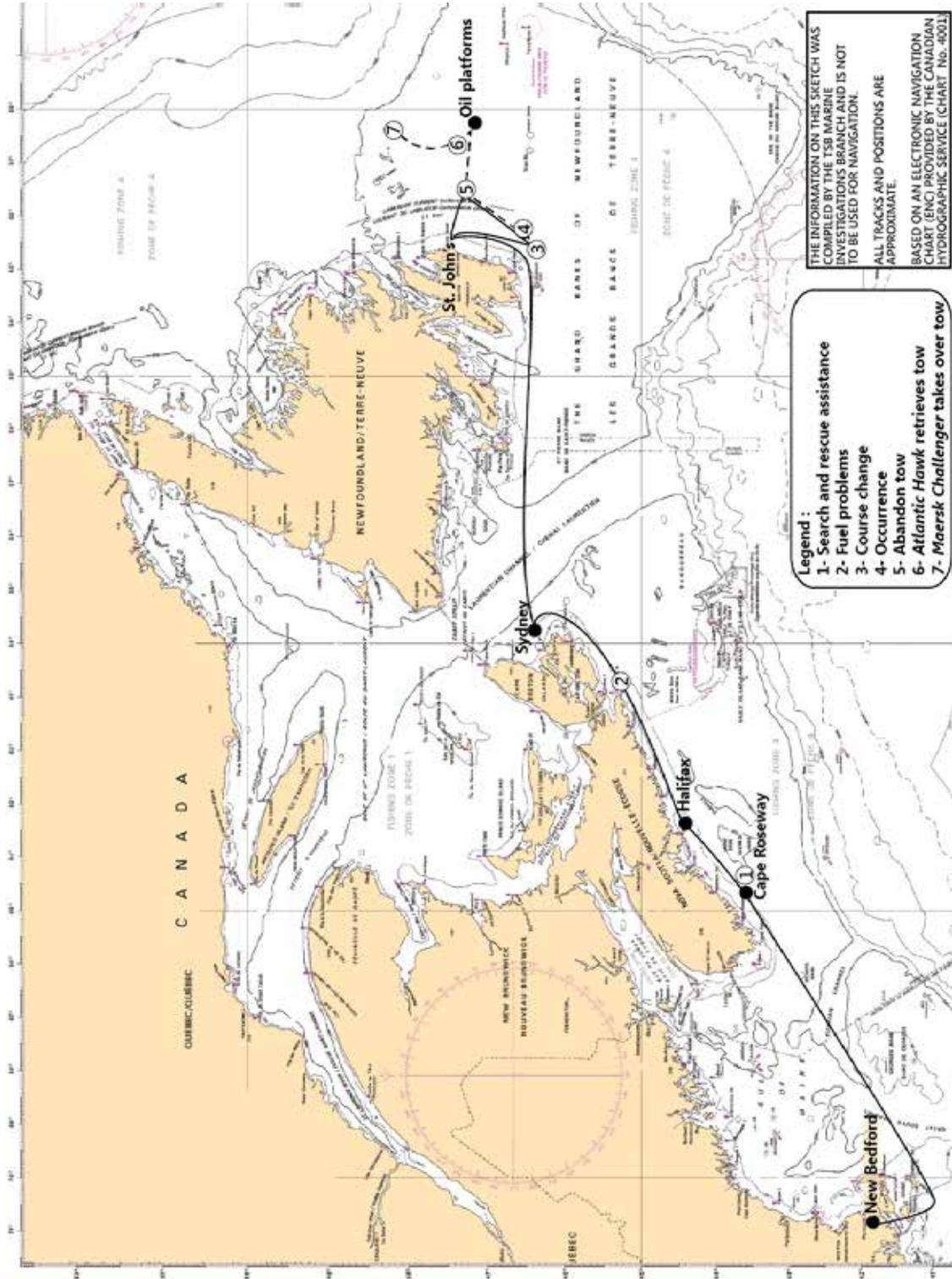
1. Without adequate voyage planning, risks that endanger the tug and tow, the crew, and the environment may go unidentified.
2. If Port State Control is not exercised and vessels that are unseaworthy are permitted to continue operating, there is a risk that the safety of the crew and the environment will be compromised.
3. If masters/owners do not ensure the adequacy of towing arrangements, the safety of towing operations and the environment may be compromised.

*This report concludes the Transportation Safety Board's investigation into this occurrence. The Board authorized the release of this report on 21 May 2014. It was officially released on 19 June 2014.*

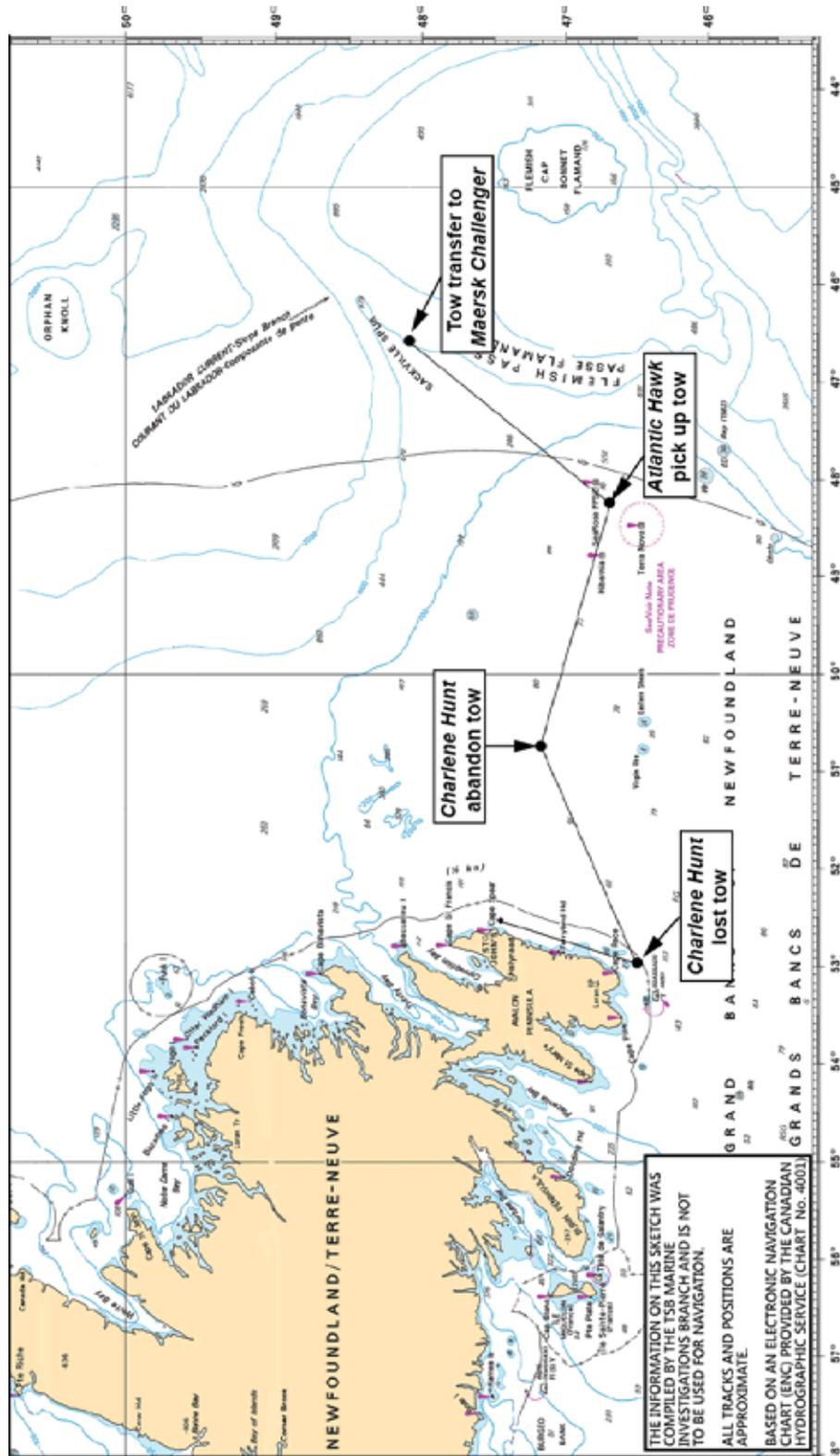
*Visit the Transportation Safety Board's website ([www.bst-tsb.gc.ca](http://www.bst-tsb.gc.ca)) for information about the Transportation Safety Board and its products and services. You will also find the Watchlist, which identifies the transportation safety issues that pose the greatest risk to Canadians. In each case, the TSB has found that actions taken to date are inadequate, and that industry and regulators need to take additional concrete measures to eliminate the risks.*

# Appendices

## Appendix A – Entire voyage route



Appendix B – Area of the occurrence



### *Appendix C – Catenary between tug and tow*

This diagram illustrates how the catenary changes as the length of the tow line increases. A tow line of 650 m absorbs more peak shock loads than a tow line of 365 m.

