Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

MARINE INVESTIGATION REPORT
M06F0024

CREW MEMBER LOST OVERBOARD

SAIL TRAINING VESSEL *PICTON CASTLE*
376 nm SSE OF LUNENBURG, NOVA SCOTIA
08 DECEMBER 2006

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

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Summary

On the afternoon of 05 December 2006, the barque *Picton Castle* departed Lunenburg, Nova Scotia, bound for St. George's, Grenada, in the eastern Caribbean Sea. On board were 12 crew and 16 other persons who had signed on as trainees. On the evening of December 8, shortly before 2235, while in heavy weather, a deckhand was swept overboard from the leeward side of the vessel. An air and sea search ensued, but it was unsuccessful.

Ce rapport est également disponible en français.

Other Factual Information

Name of Vessel	*Picton Castle*
Official Number	14250
IMO[1] Number	5375010
Port of Registry	Avatiu, Cook Islands
Flag	Cook Islands
Type	Sail training vessel
Gross Tonnage	284
Length overall[2]	45.03 m
Draught	Forward: 3.0 m Aft: 4.4 m
Built	1928
Propulsion	Sail 515 kW Burmeister & Wain alpha diesel engine driving one controllable-pitch propeller
Crew and Trainees	On board: 12 crew, 16 trainees Maximum: 52
Operator	Windward Isles Sailing Ship Company, Ltd.

Particulars of the Vessel

Built in England in 1928 as a riveted steel-hulled side trawler, the *Picton Castle* was rebuilt in 1955 as a freighter. From 1996 to 1997, the vessel was refitted in Lunenburg, Nova Scotia (its operating base), as an ocean-going three-masted barque-rigged sail training vessel (see Photo 1). The decks are oiled pine wood. The hull is subdivided by five transverse watertight bulkheads, with watertight doors providing access to the main compartments.

Photo 1. *Picton Castle* (courtesy D. Moreland)

Twenty berths are located in the forecastle, eight of which are in the lower forepeak. The former hold has been divided to provide an eighteen-berth 'tween deck accommodation and main salon in the forward section, and a stowage hold in the after section. The engine room is located aft of the stowage hold. The master and mate cabins and a small mess room are located aft and

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1 See Glossary at Appendix B for all abbreviations and acronyms.

2 Units of measurement in this report conform to International Maritime Organization (IMO) standards or, where there is no such standard, are expressed in the International System of units.

below the quarterdeck. Below this area, there are two double cabins and a compartment for eight berths. According to the company's Web site, the vessel has berths for 40 sail trainees and 12 professional crew members.

The galley is located forward on the main deck and above the main salon. The charthouse, containing the navigational equipment, is located on the forward end of the quarterdeck (see Figure 1). A door at the after end of the charthouse provides access to the ship's office.

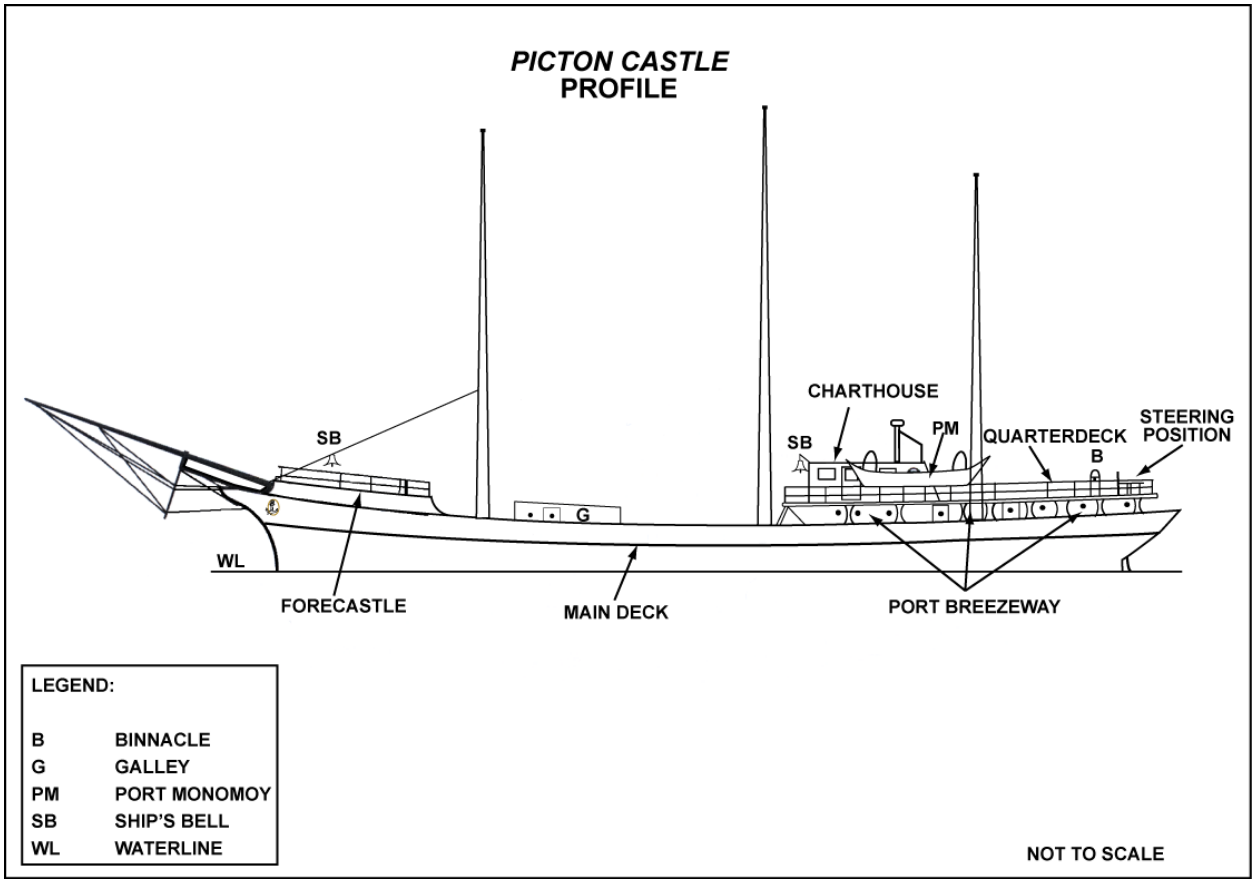

Figure 1. Profile of vessel's port side

The engine controls are located forward of the charthouse. The ship's magnetic compass and wheel are located at the after end of the quarterdeck.

A set of davits are fitted on each side of the quarterdeck. An open skiff with an outboard engine was stowed in the starboard davits. A monomoy,[3] the keel of which was about level with the quarterdeck, was stowed in the port davits.

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[3] A monomoy is a double-ended pulling and sailing surfboat.

Preparations for Departure

The *Picton Castle* returned to Canada from its fourth world circumnavigation voyage on 14 June 2006. The vessel later departed Lunenburg, at the end of June, to participate in a number of tall ship festivals, including a voyage to the Great Lakes. The vessel later returned to Lunenburg, and preparations were subsequently made for a winter voyage in the Caribbean. The voyage was to include the signing on and off of crew and trainees at various ports, as well as the vessel being refurbished for use in the television production of *Pirate Master*.

On November 21, the senior master, who was also the vessel company's managing director, handed over command of the vessel to the master. The senior master had been the vessel's only master since 1997, after the vessel was refitted as a sail training vessel. This voyage was to be the new master's first as master on the *Picton Castle*. He had previously sailed as chief officer on the vessel for 13 months during 2001-2002.

It was also to be the chief mate's first voyage on board. Because there was a lack of available documentation, he had to rely on verbal briefings and meetings to become fully familiar with the vessel's policies and procedures.

The deckhand[4] arrived on board the vessel on November 26. This would be the deckhand's second voyage on board this vessel—she had previously sailed on the vessel for five months in 2006. Most of the crew members and trainees[5] had joined the vessel around November 26, with familiarization tours conducted as each arrived on board. Some trainees were given a familiarization tour by the deckhand.

In preparation for the voyage, the crew, including the deckhand and trainees, participated in various drills, training sessions, and workshops including going aloft, sail-setting, bracing, and boat handling. A fire drill, during which hoses were charged, was conducted. Information sessions were held for the general alarm, muster stations, abandonment, and man overboard; however, no drills were conducted. Immersion suits were available but were not tried on before departure.

On November 27, the crew and trainees signed the articles of engagement for the vessel.

A "four hours on, eight hours off" watch system was to be established for the voyage. However, the departure of the second officer (2/O) on November 30, two days before the planned date of departure, resulted in changing to a "six hours on, six hours off" watch system for the deck officers. The master, bosun, and a crew member, who was to be the acting 2/O, were to work the 0600-1200 and 1800-2400 watches. The chief officer was to work the 1200-1800 and 2400-0600

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4 Although there are a number of "deckhands" on board the vessel, unless otherwise stated, the term specifically refers to the deckhand who was lost overboard.

5 A sail trainee is a person, other than a member of the crew, who has paid money for his or her carriage on board the vessel and is expected to achieve a minimum level of competence to assist in the operation of the vessel. A trainee is assigned to a watch under the supervision of the crew.

watches. The remaining crew members and trainees were divided into groups and assigned to work one of the three "four hours on, eight hours off" watches. The deckhand, who had signed on the vessel as a volunteer deckhand,[6] was subsequently given the role and responsibility of a lead deckhand for a watch. As a lead deckhand, she was paired with another crew member—the purser, who does not normally stand a watch but who does perform day work—and assigned five trainees to work the 0800-1200 and 2000-2400 watches.

Due to adverse weather, the planned December 2 departure was postponed. The forecasts for December 5 and 6 showed two high-pressure systems filling in behind the low-pressure system, providing favourable winds for sailing south.

The ship's office was unable to hire a cook by the time of departure, and it was decided that crew members and trainees would be assigned galley duty on a rotational basis.

History of the Voyage

At about 1315 Atlantic standard time,[7] on December 5, the *Picton Castle* departed Lunenburg bound for St. George's, Grenada, which is located at the southern extremity of the Windward Islands in the eastern Caribbean Sea. The weather was overcast with a moderate breeze.

The departure was uneventful as the vessel proceeded on a southeasterly course under sail. Ship checks[8] were performed hourly. On the evenings of December 5 and 7, in accordance with the master's night orders, the watch reviewed the man-overboard procedures.

A cold front was expected with a major shift of winds. At 2100 on December 7, the winds recorded in the log book were Beaufort force 6.[9] Earlier that day, the crew had been preparing the vessel for heavy weather. Watertight doors and hatches were closed. Items secured before departure were checked to make sure that they were securely stowed and, where necessary, their lashings reinforced. Static safety lines, to assist the crew in moving about on deck, had been rigged midship; these were set up between the galley and the stairs leading up to the quarterdeck, as well as along the starboard side of the quarterdeck between the charthouse and

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6 Volunteer crew members are not paid, but are provided free room and board.

7 All times in this report are Atlantic standard time (Coordinated Universal Time [UTC] minus four hours) unless otherwise noted.

8 A common practice on board the *Picton Castle* at sea is to carry out ship checks to verify the seaworthiness and general state of the vessel. A typical ship check would be carried out by a deckhand who would inspect the various spaces above and below deck looking for water ingress, loose equipment, and chafe. The deckhand would also make contact with the engineer in the engine room; however, the engineer would carry out a ship check of the engine room and overboard discharges. A ship check by a deckhand was normally carried out on an hourly basis and took about 10 to 15 minutes to complete.

9 Windspeed is measured on the Beaufort scale, from force 1 to force 12. A force 6 wind is a strong breeze of 22 to 27 knots.

the taffrail. At 2135, the fore topmast staysail was struck because it had a large rip in the leech. At 2330, the vessel was hove to under the starboard clews of the lower topsails, waiting for the passing of the cold front. At 2400, the winds were recorded as Beaufort force 8.[10]

The deckhand continued to assist other crew members throughout the day and after the end of her watch at midnight, to until about 0400, when she retired to her bunk. At 0400, on December 8, the winds were recorded as Beaufort force 10.[11] Ship checks were being carried out hourly, and the vessel was rolling heavily in a beam swell.

During the 0000-0400 watch, with the vessel rolling heavily, members of the deck watch spent most of their time sitting in two groups on the port and starboard sides of the quarterdeck. Toward the end of the watch, the master arrived on the quarterdeck with a bottle of rum and gave a shot to each member of the deck watch including trainees.

Because of the severity of the weather, the 0400-0800 watch decided that all persons on deck were to be paired up, and that they were to remain on the windward side of the vessel.

At 0600, the deckhand got up for galley duty.

At about 0930, and after the front had passed, the main engine was brought on line. The master decided to proceed south to seek more favourable sea conditions. The winds at that time were recorded in the log book as Beaufort force 9.[12] The heavy weather conditions continued throughout that day.

The deckhand remained up and about during most of the day, helping to carry out regular duties such as assisting in the galley and securing and lashing items that might move about in heavy weather. At approximately 1500, the deckhand requested assistance from the purser to secure fuel and water containers that had come loose in the port breezeway. While they were re-lashing the containers, seawater was being shipped up to their knees.

At about 1815, the assistant engineer exited the engine room to check the main engine overboard discharge along the port side. However, she was prevented from doing so by the large volume of shipped seas flowing aft in the port breezeway. The chief engineer later decided that, in lieu of going into the breezeway to check the discharge, he and the assistant engineer would keep a close eye on the engine temperatures.

By 2000, the winds were northwesterly at Beaufort force 9. Helm orders at the time were to keep the wind between the starboard quarter and stern. The engine was full ahead, and the vessel's speed was 9 knots. It was reported that trainees were to be accompanied by crew members and that no one was to be alone on deck. The trainees had been previously told that, if they felt

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10 Force 8 winds are 34 to 40 knots and considered gale force.

11 Force 10 winds are 48 to 55 knots or "storm" force.

12 Force 9 winds are 41 to 47 knots or "strong gale" force.

uncomfortable being out on deck, they did not have to stand their watch and could remain below deck. By this time, most of the trainees were either too uncomfortable to be on deck or too seasick to report for their watch.

By 2100, the deckhand and a trainee had reported for their watch on the quarterdeck. The deckhand, however, expressed concern to the acting 2/O about her ability to handle the helm in the existing sea conditions. In addressing her concern, one of the two crew members due for relief then volunteered to take the deckhand's place at the helm. It was decided that this crew member and the acting 2/O would each take 30-minute turns at the helm. At this point, and after consulting with the master, the acting 2/O sent the deckhand below to get some rest. The deckhand was also told by the acting 2/O to begin ship checks in an hour's time. The other crew member from the previous watch was relieved and, after completing his ship check, went to the forecastle where he saw the deckhand discussing how to both carry out ship checks and get rest in between with a crew member.

At some time after 2100, but before 2200, as the master and a crew member were busy in the port breezeway attending to a fuel spill and re-lashing items that had again come loose, the vessel shipped a large amount of water on deck. This caused the master to lose his footing and fall. He subsequently instructed the watch that the port breezeway was off limits.

At about 2200, the master, surprised at seeing the deckhand on the quarterdeck, ordered her to go below to get some rest. The master later went below to his cabin to change into dry clothing.

At about 2230, both the crew member who had been taking turns at the helm since the previous watch and the trainee were relieved of their duties. They proceeded to go below deck to sleep. On the way, the crew member met the deckhand, who informed him that she was doing a ship check. The deckhand was wearing light clothing and a raincoat.

Shortly before 2235, the vessel heeled to port and a large wave struck the port side, lifting the monomoy in the port davits and flooding the port breezeway. The two crew members at the helm station immediately heard screams from port side aft. One of them briefly saw someone in the water astern of the vessel. The alarm was raised by yelling "man overboard," and the acting 2/O went forward to alert the crew. At this time, seas were estimated at 5 to 6 m.

Search and Rescue Operations

The crew members who were on the quarterdeck at the time of the person going overboard deployed the port-side man-overboard marker pole, with life ring and light. The starboard marker pole with a life ring and light was released, but the wind blew it onto the deck below, where it became entangled in the stern chocks before being freed and deployed. The crew was unable to maintain visual contact with the person who had fallen overboard. A crew member called out bearings and distances to the lighted marker poles and, although the poles were initially kept in sight, it became increasingly difficult to maintain visual contact due to the weather and sea conditions. Additional life rings fitted with lights, immersion suits, and lifejackets were also thrown overboard to help mark the area and provide the person in the water with items to remain afloat.

The master, who had been changing into dry clothes in his cabin, ran to the charthouse and pushed the man-overboard button on the global position system (GPS) at 2235, marking the occurrence position. This was entered in the log as 38°47.0' N, 060°33.5' W. The vessel was approximately 376 nautical miles (nm) south-southeast of Lunenburg (see Appendix A).

As other crew members and trainees began to arrive on the quarterdeck, additional lookouts were posted. The gripes were loosened and preparations were being made to launch the starboard skiff, but it was decided that it would be too dangerous to do so in the prevailing sea conditions. The skiff eventually broke free from its davits and was swept overboard. It was recovered two days later.

Approximately 30 minutes after the alarm was raised, the vessel had manoeuvred back to within reach of one of the deployed life rings, which was found empty. Other deployed safety equipment was located and retrieved later during the search.

The crew was unable to send an alerting message via the single side band radio, even with the help of the instruction manual. At about 2320, MAYDAY broadcasts were made using the frequencies listed for the Canadian and United States coast guards, but there was no response. MAYDAY broadcasts were also made using very high frequency (VHF) radios in case a vessel was nearby, but there was no reply. Contact was eventually made at 2335 with the senior master in Lunenburg by satellite telephone. Having been informed of the occurrence, the senior master called 911 and, at 2338, was connected with the Joint Rescue Coordination Centre (JRCC) in Halifax, Nova Scotia. The vessel's position in the JRCC incident log was reported as 38°42.2' N, 066°31.4' W. The Rescue Coordination Center (RCC) in Norfolk, Virginia, United States, was then contacted and given the necessary information, because the occurrence area was in its area of responsibility.

Several headcounts had been taken, and at about 2340, the identity of the missing deckhand was confirmed. At about midnight, the trainees were sent below deck for their safety.

At 2352, the Canadian Mission Control Centre (CMCC) at Trenton, Ontario, informed JRCC Halifax that it had received a 406 MHz signal from the *Picton Castle*'s emergency position indicating radio beacon (EPIRB). The signal position was 38°40' N, 060°30' W. At 0010, the senior master was contacted and he confirmed that the vessel's last known position—now two hours old—was 38°42.2' N, 060°31.4' W.

The vessel's international maritime satellite communication system (INMARSAT-C) had also been used to broadcast a distress alert at 0026, which was received by RCC Norfolk, and the Maritime Rescue Co-ordination Centre (MRCC) in Falmouth, United Kingdom.[13]

By 0040, JRCC Halifax was informed that RCC Norfolk had made contact (by satellite telephone) with the vessel.

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[13] MRCC Falmouth is the United Kingdom's Global Maritime Distress and Safety System (GMDSS) Centre.

A Canadian search and rescue (SAR) C130 Hercules aircraft arrived on scene at 0350. It was determined by SAR authorities that the *Picton Castle*'s EPIRB had been activated but that it had not been deployed, and so the vessel was instructed to turn it off.[14] The Hercules deployed a self-locating datum marker buoy within the area of the safety equipment deployed by the *Picton Castle*, and commenced an expanding square search.

The *Picton Castle* continued searching through the night. Drift calculations and search patterns were established and the crew used handheld searchlights to try to locate the deckhand. However, some of the searchlights maintained their charge for only a short time and required frequent recharging. Electrical extension cables were then brought up on deck to ensure the continuous operation of at least two searchlights.

Most of the vessel's crew remained on deck, assisting with the search through the night and the following morning, by which time some had been awake for about 30 hours. Some crew members also sustained minor injuries, including one who fell while in the engine room, striking his head. No structural damage to the vessel was reported; however, there was some minor damage to sails, rigging, and the skiff, which broke free from its davits.

On four occasions during the early morning hours, some crew members reported hearing someone shouting from somewhere off the ship, but no one was seen or found.

In all, two Canadian and two United States SAR aircraft, as well as at least four commercial vessels, participated in the search, which lasted for three days before it was suspended on the evening of December 11. The *Picton Castle*, which had established a temporary "short" watch schedule for the officers and crew that allowed periods of rest, continued its search of the area until the following day. The deckhand was not recovered and is presumed drowned.

On December 24, the *Picton Castle* arrived at the island of St. Kitts where an investigator who was appointed by the Ministry of Transport for the Cook Islands joined the vessel to begin an investigation into the occurrence.

Weather Conditions

At 1830 on December 8, the United States National Weather Service's high seas forecast issued the following:

- hurricane-force wind warning with winds of 50 to 65 knots and seas of 17 to 27 feet from 38° N to 44° N within 180 nm east of a front extending from 48° N, 53° W to 37° N, 60° W to 31° N, 64° W;

- gale warning with winds 25 to 35 knots and seas 12 to 21 feet . . . from 31° N to 44° N west of 60° W, except where noted above.

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[14] The EPIRB was off at 0413.

The weather, as recorded in the vessel's log book for 2300 on December 8, indicated northwest winds of force 9 on the Beaufort scale, poor visibility, and squalls.

The marine weather forecasts were found to be valid.

Vessel Certification

The vessel was certified by the Cook Islands Ship Registry as a sail training vessel on 02 July 2004. The vessel was permitted to carry a complement of 52 officers and trainees in worldwide training, with provision for 60 guests to be carried on special limited water excursions, based on safety equipment, lifesaving capabilities, and bunk space.

The vessel's minimum safe manning certificate was issued by the Registrar of Ships, Cook Islands, on 15 March 2006. The certificate required a minimum of nine officers and ratings as follows: one master, one chief officer, two radiotelephone operators, four lead seamen, and one engineering officer.

The vessel's safety certificate was valid until 01 June 2007.

A certificate of authority, approved training program, was issued by the Registrar of Ships, Cook Islands, on 19 September 2003. This certifies that the vessel's training manual ". . . has been suggested and recognized by this authority as a training handbook for the subject vessel."

Personnel Qualifications, Training and Experience

The master held a certificate of competency as master, without limitation, issued by the Federal Republic of Germany in 2004. The certificate was endorsed by the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended in 1995 (STCW Convention), but it was not endorsed by the Cook Islands. Additionally, the master held an ocean-going yacht certificate with no limitations for motor and sail-equipped yachts. The master was issued a limited master's licence for a gross tonnage of up to 8000 in 1995, and an unlimited master's licence in 1997. The master's experience included command on a variety of sailing vessels. He had served in various positions on board sailing vessels since 1979. This was the master's first voyage in command of the *Picton Castle*.

The chief officer was issued a certificate as chief mate by the Government of the United Kingdom of Great Britain and Northern Ireland on 17 June 2005. The certificate was STCW Convention–endorsed with no area limitations for vessels with a gross tonnage of less than 3000, but it was not endorsed by the Cook Islands. He began his training for deck at sea in 1999. In 2004, he underwent training and served as 2/O aboard a square-rigged sailing vessel. This was the first officer's first voyage on the *Picton Castle*.

The acting 2/O was issued, but did not have in her possession on the day of sailing, a licence by the United States Coast Guard on 28 November 2006 to serve as a master of a steam, motor, or auxiliary sailing vessel of not more than 100 gross registered tons, and as a mate of a vessel of

not more than 150 gross registered tons, upon near coastal waters. The acting 2/O first began sailing in 2001, and had sailed on a number of sailing vessels. This was the acting 2/O's first voyage on the *Picton Castle*.

The deckhand first joined the *Picton Castle* in March 2006 as a trainee—a position she held for three months before becoming a deckhand for another two months. She had sailed on other sail training vessels including the *Concordia* and *Niagara*. At the time of the occurrence, she had received no formal training in marine-related emergencies and held no certificates of competency, nor was she required to.

Of the remaining eight crew members, four were making their first voyage on the *Picton Castle*. Five of the eight had received formal training in emergency procedures, and the use of lifesaving or firefighting equipment. Table 1 provides a summary of the certification and experience of the crew members.

Other than the master and the chief officer, none of the crew held a Global Maritime Distress and Safety System (GMDSS) general operator's certificate, nor was this required in the minimum safe manning certificate. Furthermore, because the vessel was not subject to the International Convention for the Safety of Life at Sea (SOLAS Convention), the crew was not required to comply with the GMDSS requirements.

Position	Certificate/Qualification	Experience
Master	Master unlimited (Germany), STCW Convention–endorsed	Commanded various sailing vessels. First voyage as master of the *Picton Castle*.
Chief Officer	Chief mate (United Kingdom), STCW Convention–endorsed.	Square-rigged sailing on several vessels as 2/O since 2004. First voyage on board the *Picton Castle*.
Acting Second Officer	Master, 100 gross registered tons maximum, near coastal waters (United States)	Sailed on various sailing vessels. First voyage on board the *Picton Castle*.
Chief Engineer	1500 HP motor and unlimited steam engineer (United States)	Sailed on a variety of vessels and sailing vessels. First voyage on board the *Picton Castle*.
Assistant Engineer	No marine certificate	20 months' experience on board the *Picton Castle*.
Bosun	Master sail, 100 gross registered tons maximum (United States)	Sailed on various sailing vessels, and had worked as chief mate for four six-month seasons on a schooner. First voyage on board the *Picton Castle*.
Volunteer Deckhand (casualty)	No marine certificate	Sailed on various sailing vessels. Three months as trainee and two months as deckhand on board the *Picton Castle*.

Position	Certificate/Qualification	Experience
Deckhand 1	Various vessel-specific master limited certificates restricted to operating vessels with a gross tonnage under 60 within a harbour	Sailed on various sailing vessels. First voyage on board the *Picton Castle*.
Deckhand 2	STCW Convention basic safety training (United States)	Sailed on various sailing vessels. First voyage on board the *Picton Castle*.
Deckhand 3	No marine certificate	Sailed 23 months on board the *Picton Castle*.
Volunteer Deckhand	Coastal skipper for vessels up to 24 m (Italy)	Joined the *Picton Castle* in June 2006.
Purser	No marine certificate	Sailed 18 months on board the *Picton Castle*.

Table 1. Summary of the certification and experience of the master, officers, and crew of the *Picton Castle*

Overall, the experience of the 16 trainees was limited to small recreational sailing vessels in confined or sheltered waters. Most trainees had never been on board a vessel as large as the *Picton Castle* and had previously not been to sea. One of the trainees, who was a registered nurse and the vessel's medical officer, had previous sailing experience.

Policies and Procedures

The policies and procedures for the *Picton Castle* are contained in the *Handbook for Crew*. This document was prepared to orient new crew members to the vessel and to provide information on the vessel's operation, including the following:

- general orders, orders when underway, and officers' orders
- in-port policies and procedures
- crew duties
- workshops
- crew skills

Furthermore, policies and procedures and records were in place, including the following:

- engine room operating procedures and maintenance records
- deck and rig maintenance records
- garbage policy

Sail Trainee Programs

For many sail training vessels, trainee programs are undertaken for the purpose of character building and education through participation.

The operator of the *Picton Castle* advertises a training program that offers paying trainees the opportunity to learn traditional square-rigged sailing as a full member of the crew. Trainees are taught a number of skills, including sail making, rigging, and navigation, through the use of information sessions and workshops. There was no training syllabus or formal assessment process, nor was the training program intended to provide instruction to obtain certificates of proficiency.

Crew Familiarization and Safety Training Drills

Upon joining the *Picton Castle*, new crew members and trainees were given a familiarization tour by an officer or another crew member. The tours varied but, for the most part, they covered the layout of the vessel. Days in advance of boarding the vessel, each new crew member was mailed a copy of the *Handbook for Crew*. It informs the reader that firefighting, man-overboard and abandon-ship drills are to be performed regularly.

Emergency information was provided in the station bills (muster lists), and emergency procedures were posted in different parts of the vessel. The station bills addressed general quarters, fire and damage control, abandon-ship, and man-overboard situations. The station bills were revised according to the complement on board at the time. A copy of the station bill posted at the time of the occurrence was not available because it had been subsequently revised.

The emergency procedures described signals to be used for any emergency on board, including damage control. However, a subsequently revised station bill did not contain information concerning damage control. Liferaft assignments had been posted in different parts of the vessel on a separate sheet at the time of the occurrence. A subsequently revised list divided the officers, crew members, and trainees among the various survival craft.

Use of Safety Harnesses

The wearing and use of safety harnesses on deck when underway at night or during heavy weather is a standard operating procedure on many vessels, including most sail training vessels.

As an example of safety harness best practice, Transport Canada publication TP 13313E, *Standard Relating to Design, Construction and Operational Safety of Sail Training Vessels*,[15] recommends that safety harnesses be attached to lifelines of sufficient length to extend fore and aft along the weather deck on each side along the normal working area. Fastening points for the attachment of safety harnesses should be provided close to the companionway and on both sides of the control station. Efficient means of securing the lifelines of safety harnesses should

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15 April 1999. Note that the application of this standard is voluntary.

also be provided on exposed decks. Chest harnesses are acceptable for work on deck, but when going aloft, an approved full-body fall-arrest harness should be worn and the wearer should be trained in its use.

In this occurrence, crew members and trainees neither wore nor used safety harnesses when working on deck at night or during heavy weather. There were no established fastening points to which safety harnesses could be attached. The crew and trainees used their hands to hold onto the safety lines rigged along the main deck and quarterdeck.

The *Handbook for Crew* for the crew of the *Picton Castle* states that the use of a harness is optional except when directed. Although there is information that harnesses had not always been worn aloft, it was reported that it was the practice to wear and use a safety harness when going aloft on this voyage. The harnesses that were provided were of the belt type with a short lanyard, which confines the force of the fall to the area around the waist. Full-body harnesses are intended for use as body supports in work situations that involve the risk of falling, and consist of connected straps designed to distribute the force resulting from a fall over at least the thigh, shoulders, and pelvis. Some of the crew had brought their own harness.

Regulatory Requirements

The *Picton Castle* was under Cook Islands registry and was therefore subject to Cook Islands requirements. Part V of the Cook Islands' *Shipping Act, 1998* deals with safety and is modeled after several international conventions, including the SOLAS Convention of 1974 and the SOLAS Protocol of 1978.[16] However, the *Picton Castle*, as a sail training vessel with a gross tonnage of 284, was subject to few SOLAS Convention regulations.

No regulations had been adopted by the Cook Islands for the safety of vessels and crew not subject to the international conventions. However, at the time of the occurrence, regulations were being developed[17] to address safety issues pertaining to Cook Islands–registered sailing ships engaged in sail training and maritime education activities at sea under sail.

Vessel Inspections

As a vessel registered in the Cook Islands, the *Picton Castle* is subject to annual inspections by Cook Islands flag surveyors. On 21 March 2006, the vessel underwent a safety survey while in Cape Town, South Africa. No deficiencies were noted in the survey report.

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16 The Cook Islands is not a member of IMO but has acceded to both the SOLAS Convention and the SOLAS Protocol of 1988.

17 Rules for the Regulation and Certification of Sail Training Ships (Provisional). These rules are modeled after Transport Canada TP 13313E.

Transport Canada Inspections

Port state control (PSC) is a ship inspection program where a foreign vessel entering another state's waters is boarded by authorized inspectors of that state (that is, the port state) to verify the vessel's compliance with the international maritime conventions adopted by its flag state. Transport Canada decides which foreign ships to inspect based on a combination of risk analysis and random selection.

As a foreign vessel in Canadian waters, the *Picton Castle* was potentially subject to PSC inspections by Transport Canada. Transport Canada had not conducted any PSC inspections on the *Picton Castle*.

As a foreign vessel, the *Picton Castle* is not permitted to operate between Canadian ports unless granted a coasting licence issued under the *Coasting Trade Act* by the Minister of National Revenue (in effect the Canada Border Services Agency). The primary intent of the legislation is to protect the interests of the operators of Canadian vessels, while allowing a foreign vessel to access the coasting trade if a suitable Canadian vessel is not available (this determination is made by the Canadian Transportation Agency).

Issuance of a coasting licence is subject to the payment of the applicable duty (if any) and a ship safety inspection by Transport Canada. In July 2004, a coasting licence was issued to the operator of the *Picton Castle*, permitting it to use the vessel to participate in the Tall Ships 2004 event. Transport Canada inspected the *Picton Castle* and issued a letter of compliance for coasting trade licence (Ship Inspection Certificate [SIC] 10). The SIC 10 was valid for one month and certified that the certificates and documents relating to the vessel were valid, and that appropriate lifesaving equipment was carried on board. There was no information to indicate that the vessel had applied for a coasting trade licence and was inspected before visiting Canadian ports during the summer of 2006.

In the absence of a valid coasting trade licence, the permissible length of stay for a foreign, non-duty-paid vessel in Canada is 30 days from the inward clearance. If the vessel needs repairs, however, the local Canada Border Services Agency office has the discretion to permit a longer stay. The *Picton Castle* is regularly granted extensions for the duration of its stay at its operating base in Lunenburg while it undergoes maintenance or repairs between planned international voyages. Any work undertaken would be subject to inspection by the Cook Islands.

Industry Standards for Sail Training Vessels

Sail training has grown over the years, with dedicated organizations/programs in over 20 countries. Many of these vessels are owned and operated by charities, foundations, and schools.

The unique issues associated with sail training vessels have been recognized by sail training associations and organizations in Canada, the United Kingdom, the United States, and other countries. For example, the Canadian Sail Training Association provided input in the development of TP 13313E. This voluntary standard was developed to address safety issues pertaining to Canadian mono-hulled sailing vessels engaged in sail training activities at sea.

In the United States, the American Sail Training Association, of which the *Picton Castle* is a member, participated in the establishment of the *Sailing School Vessels Act of 1982*, which governed the standards and regulations for sail training vessels. The United States Coast Guard *Marine Safety Manual, Volume III, Marine Industry Personnel*, provides information and program interpretations on statutory and regulatory issues relating to the manning of sailing school vessels operated by the United States Merchant Marine Academy and State Maritime Academy. In addition to taking into consideration the vessel's route and specific characteristics, vessels equipped with one or more masts must carry a seaman (able seaman or deckhand as appropriate) for each mast and an additional able seaman for each square-rigged mast. For vessels with a gross tonnage of 100 or more on ocean voyages, the three-watch standard is to be used, and at least 65 per cent of the deck crew must be able seamen.[18]

The *Racing & Sailing Rules and Special Regulations*, 2008 Edition, of Sail Training International, a United Kingdom–based charity with worldwide membership that promotes the development and education of young people through the sail training experience, contains details for the participation of vessels in events organized by the charity. For example, the special regulations state that clipping points for safety harnesses are to be provided adjacent to workstations such as the helm, sheet winches, and masts.[19] Vessels such as the *Picton Castle* are to provide such arrangements as are compatible with their standard operating procedures for those working on the weather decks. The special regulations also strongly recommend that at least 50 per cent of the permanent crew, including the captain/master, should have undertaken approved training in safety and survival within the five years before the start of an event organized by Sail Training International, which is to include practical, hands-on sessions.[20]

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18 In addition to having the appropriate sea service to qualify for an endorsement as able seaman, the applicant must be qualified professionally as demonstrated by the applicable examination or educational requirements (*U.S. Code*, Title 46, Subtitle II, Part E, Chapter 73, Section 7306). An able seaman—sail, the holder of which is permitted to serve as able seaman only on sailing school vessels, requires six months' deck service on sailing school or equivalent sail vessels on oceans or navigable waters of the United States.

19 *Racing & Sailing Rules and Special Regulations*, 2008 Edition, Rule 5.03.

20 *Racing & Sailing Rules and Special Regulations*, 2008 Edition, Rule 6.

Analysis

Decision to Sail

The North Atlantic winter season is characterized by frequent adverse weather with winter storms occurring as early as mid-November. On a sail training vessel, the experience of the crew members and their ability to perform in adverse weather should be taken into consideration. New or inexperienced crew members and trainees need the first few days of a voyage to become accustomed to being underway and familiar with onboard operations. The *Picton Castle* departed Lunenburg in early December, with half the crew new to the vessel and some having limited training or relevant experience. The trainees had little or no sea-going experience, and although the four officers had previous experience on sail training vessels, it was the first time on board the *Picton Castle* for three of them. In addition, seasickness would necessarily be a factor in the first few days, with some personnel likely to be incapacitated in the forecast heavy weather.

Having delayed the departure for several days due to adverse weather, the senior master and master made a conscious decision to depart Lunenburg based on their interpretation of the marine weather forecasts that:

- the developing gale in the southeast would have moved to the northeast ahead of the vessel, and
- favourable sailing conditions would be associated with the approach of a high-pressure system.

However, the high-pressure system was forecast to move through the area quickly and be replaced by a developing low-pressure system. As low-pressure systems move from land to sea in the winter, there is a large contrast between the cold dry air associated with the passage of the low/cold front and the warmer moist sea air. This combination frequently results in rapid intensification of the low-pressure system and the winds. In summer, the temperature contrast is not as significant; therefore, the wind intensity is weaker.

Although it was reported that long-range forecasts were taken into consideration on a daily basis—so as to determine when conditions would be favourable to sail—the 96-hour wind, wave, and surface pressure forecasts clearly indicated storm conditions for the occurrence time and area. These forecasts were issued at 1200 UTC on 04 December 2006 and were valid until December 8. The 96-hour forecasts predicted a low-pressure system over Newfoundland with gale force winds southwest of Nova Scotia. Mariners need to be aware that, when sailing in winter months, weather conditions can change rapidly and can be quite intense. Consequently, when planning voyages, longer-range forecasts should be taken into consideration.

The senior master was also aware that further delays, in combination with the onset of winter at sea that would make the voyage more difficult, could potentially jeopardize the voyage to the Caribbean. Crew and trainees had already been selected and payments made for various legs of the voyage. Arrangements were also being made for the use of the vessel in a television production. Given the financial benefit associated with proceeding with the voyage, this increased pressure to sail.

Effectiveness of Onboard Communications

Several instances of a lack of communications among the crew were evident in this occurrence. Not all of the officers were aware that some crew members were putting in longer hours, helping out where they could. Moreover, crew members and trainees were not informed of all measures taken, including:

- the procedures established by the 0400-0800 watch to stay along the windward side of the vessel and to remain in pairs while on deck,
- the decision by the chief engineer to forego checking the port-side overboard discharge because of the weather, and
- the master's decision to make the port breezeway off limits.

On the evening of the occurrence, the deckhand had expressed concerns to the acting 2/O about her ability to handle the helm in the existing sea conditions. As a result, the master gave permission for her to go below. However, she was also told by the acting 2/O to carry out ship checks, a fact of which the master was unaware. Consequently, the master was not expecting to see the deckhand again on deck on the evening of the occurrence. When he later saw her and ordered her below to get rest, it is likely that the deckhand understood the order in the context of getting rest in between ship checks because there was no discussion/order to cease carrying out ship checks. It is also likely that, because she would have reported to the quarterdeck only after the completion of the ship check, she would have been unaware of the order not to enter the port breezeway.

A number of TSB investigations have highlighted the fact that accidents are often the product of ineffective, incomplete, untimely, or misunderstood communications.[21]

This occurrence again highlights the importance of clear, complete, and well-understood communications, be they among bridge team members, between deckhands, or between trainees. Without such communications, crews will continue to make assumptions that can be a detriment to their safety.

Crewing Level and Certification

Flag states are responsible for evaluating and approving proposals submitted by vessel operators for establishing the minimum number of required crew. In doing this, flag states are known to refer to IMO Resolution A.890 (21), *Principles of Safe Manning*. However, there are no standard methods or formulae for doing so. Nevertheless, a flag state must make a critical and objective assessment of crewing proposals for each particular ship, taking into account its operation.

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21 TSB investigation reports M99M0062, M00C0026, M97N0071, and M98C0004.

Operating a sail training vessel can be a demanding endeavour, one requiring a large number of people for sail handling. Further, it is incumbent upon the vessel operator to ensure a sufficient number of well-trained crew members so as to be able to respond to any emergencies. On this vessel, the physical effort necessary for sail handling and dealing with emergencies required the combined efforts of both trainees and crew members.

As a party to the STCW Convention, Cook Islands–registered vessels were generally subject to the provisions of the Convention. However, because this vessel was not subject to the STCW Convention and because there were no specific requirements in place regarding certificates of competency and minimum number of crew for sail training vessels, the level and type of manning was determined in consultation with the Ship Registry's technical advisor. In Canada, there are requirements concerning certification and minimum number of crew, but, like the Cook Islands, none specific to sail training vessels.

In the United States, requirements are in place regarding certificates of competency and the minimum number of officers and ratings. For vessels similar to the *Picton Castle*, they must carry at least one able seaman for each mast and an additional able seaman for each square-rigged mast. In total, 65 per cent of the unlicensed crew must be able seamen. To qualify for an endorsement as an able seaman, a minimum service of six months and the successful completion of an approved able seaman course, which may be taken in lieu of the United States Coast Guard able seaman endorsement examinations, are required. Also, the three-watch system applies. Had the *Picton Castle* been subject to these United States requirements, the vessel likely would have required two additional certificated officers for the watch system and three other members of the deck crew to be qualified as able seamen.

When the vessel encountered adverse weather conditions, the crew was unable to rely on the trainees for assistance. Consequently, the crewing level became inadequate—with the result that crew members had to rely on each other to perform duties during off-watch periods.

Fatigue

Two causes of fatigue are inadequate quantity/quality of sleep, and the disruption of circadian rhythms.

Before the time of the occurrence, crew members were not getting sufficient rest because they were performing duties during their off-watch periods. When coupled with deteriorating weather and seas, the conditions were conducive to fatigue. In addition, it is questionable to provide alcohol to members of the deck watch, who may have already started to be affected by fatigue, while sailing in adverse conditions.

The deckhand had been awake for all but two hours the night before the occurrence and was below deck for only three to four hours on the day of the occurrence. Although it could not be determined how much sleep she had during these periods, it is unlikely that she was able to sleep for the entire period; as a result, she was fatigued and suffering from a reduced level of awareness at the time of the occurrence.

The master, officers, and crew members remained on deck to take part in the SAR. By noon on the day following the occurrence, some crew members reported having been awake 25 to 30 consecutive hours. The need for sleep typically recurs after about 15 or 16 hours of being awake, even for someone well rested. A person who does not obtain required sleep will develop a sleep debt and will be subject to performance degradation.

Performance degradation as a result of fatigue manifests itself in many ways, including falling asleep against one's will (micro-sleeps), failure to respond, slowed reactions (physical reaction and the speed of thought processes), incorrect actions, flawed logic and judgement, increases in false responses, increases in memory errors, vigilance decrement, reduced motivation, laxity, and an increased propensity for risk taking.[22]

Trainee Safety

As a sail training vessel, the *Picton Castle* regularly carries trainees on board, many of whom may not have any previous experience at sea. Consequently, it may be necessary to assign crew members responsibility for ensuring the safety of trainees during an emergency.

To be adequately prepared to respond to trainees during an emergency, crew members require knowledge and skill in this area, as well as a basic understanding of crisis management. Without this, crew members may not be fully prepared to meet the demands of an actual emergency, to the detriment of vessel, crew, and trainee safety. In this instance, only the master had formal training in crowd control and crisis management.

Crew members who are assigned responsibility for the safety of trainees in an emergency, but who lack formal training in crowd control and crisis management, may inadvertently compromise the safety of those for whom they are responsible.

Emergency Alarm Signals

The general emergency, fire, and man-overboard alarms are signalled by shouting and ringing one of the two ship bells—located on the quarterdeck forward of the charthouse and on the forecastle, respectively. The vessel is not fitted with an alarm system to provide immediate, local warning of emergencies to spaces that are used for sleeping and to other work spaces below deck, including the engine room. Although the absence of an alarm system did not delay the response of the crew in this occurrence, the presence of effective alarm systems is critical to timely alerting of crew members and trainees in an emergency.

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22 D.F. Dinges, *Performance Effects of Fatigue*, Fatigue Symposium Proceedings, November 1995, National Transportation Safety Board and NASA Ames Research Center.

Safety Management

Effective safety management requires all organizations, large or small, to be cognizant of the risks involved in their operation, to be competent to manage those risks, and to be committed to operating safely. However, there is no regulatory requirement in Canada or the Cook Islands for operators of sail training vessels such as the *Picton Castle* to have a safety management system.

There are particular risks associated with sail training vessel operations such as the requirement to go aloft, the importance of wind and weather to manoeuvrability, and the number of trainees likely to be aboard at any time. The investigation indicated that some of the company's administrative and operating procedures were informal. There was no effective safety management structure/system in that the policies and procedures concerning the operation of the vessel were both informal and undocumented. The procedures contained in the *Handbook for Crew* were limited to general instructions to the crew and standing orders of the vessel.

For example, there were no specific policies or procedures in place for:

- the planning and conduct of safety drills and equipment deployment;
- the training, qualifications, or instructions for crew members charged with the responsibility for trainees;
- ensuring that crew members had the necessary training for performing duties assigned in accordance with the station bill;
- the planned maintenance and record keeping of onboard equipment and machinery;
- the use and maintenance of personnel protective equipment, clothing, and devices; and
- the consumption of alcohol while on watch.

An effective safety management system helps ensure that individuals at all levels of an organization have the knowledge and the tools to effectively manage risk, and the necessary information to make sound decisions in any operating condition. This requires that the operators of sail training vessels identify and evaluate existing safety risks so that preventive action can be taken or the risk minimized. Operators must also establish safeguards and safe practices, and put into place the means to continuously gauge performance so as to improve shipboard safety where necessary. Such measures, when effectively implemented, provide multiple safety defences.

In the absence of an effective safety management structure, there is the risk that unsafe conditions and practices will remain unidentified and unaddressed.

Sail Training Programs

A training program, whether it is initial training, familiarization training, or refresher training, should result in the trainee being able to perform the required tasks to a predetermined, measurable, and demonstrable level of competence. To achieve this, a formal training program should consist of:

- an analysis of the training needs (identification of training needs, specification of training objectives, identification of the training content);
- development of the content (determining and organizing the learning, determining assessment methods, selection of delivery methods, preparation of learning plans); and
- implementation and monitoring of the training (conduct of the training, assessment of the trainees, evaluation of the efficacy of the training).

A clear understanding of the crew's skill levels and abilities is particularly important in situations where trainees with little or no previous experience may be called upon to assist crew members with emergencies at sea, or where they are hired for uncertificated positions. In this occurrence, some of the crew had gained all of their experience while on board the *Picton Castle*.

Although the *Picton Castle* advertises a sail training program, it is relatively unstructured. It is based primarily upon on-the-job training, and lacks a structured curriculum or formal performance assessment. Therefore, it may not fully take into account the risks associated with operations in varying conditions and circumstances. Without structured training objectives with measurable evaluation criteria, the ability of trainees to recognize risks and perform safely cannot be accurately assessed.

Sailing in Adverse Weather Conditions

Although the most prudent action that can be taken is to avoid adverse weather conditions, this may not always be possible. In such cases, it is important that adequate preparations be taken to secure the safety of the vessel and crew. In general, the main deck of a large sailing vessel is considered to present the greatest risk of someone being swept overboard in heavy seas. Accordingly, it is common practice for safety nets to be rigged between shrouds above the bulwarks and safety lines to be run fore and aft. In this occurrence, despite rolling and pitching during hours of darkness and despite water being shipped on deck, the crew did not take adequate measures to prevent someone from being swept overboard in prevailing conditions. Despite an awareness by the crew that the main deck, and in particular the port breezeway, was shipping a significant amount of water, safety nets were not rigged. Safety lines had been rigged inboard on the main deck, but their effectiveness was diminished because safety harnesses were not worn. The absence of fitted fastening points to which safety harnesses could be attached also negated the effectiveness of wearing harnesses.

Alerting Search and Rescue Authorities of an Emergency

Any delay in alerting SAR authorities increases the on-scene response time. In this occurrence, the crew members of the *Picton Castle* were unable to contact either Canadian or United States SAR authorities via the single side band radio. They were able to contact the senior master at his home in Lunenberg using a satellite telephone. In turn, the senior master notified SAR authorities using a regular, land-line telephone.

When the vessel later arrived in Charleston, South Carolina, United States, in May 2007, the single side band radio, which had been serviced before the vessel's departure to send and receive e-mail and weather information, was replaced.

While contact was made with RCC Norfolk and SAR authorities in the United Kingdom using INMARSAT-C, it was not until about 48 minutes after the initial call to JRCC Halifax that RCC Norfolk was speaking directly to the vessel. The benefit of direct contact with local authorities is particularly apparent in that it allows an immediate and accurate exchange of information, in addition to the coordination of the search activities.

Findings as to Causes and Contributing Factors

1. The decision to sail, in order to meet scheduled commitments, did not take into full consideration the available long-range forecasts indicating impending adverse weather—particularly given the limited training of the crew in emergencies and the limited experience of the trainees.

2. The master was unaware that the deckhand had been ordered to carry out hourly ship checks, and it is likely that the deckhand understood the master's order to go below only in the context of getting rest in between ship checks.

3. In the absence of effective and timely coordination of onboard communication, it is likely that the deckhand was unaware of the order not to enter the port breezeway, the area where it is believed she was carrying out a ship check when she was swept overboard.

4. The deckhand was likely affected by fatigue and a loss of alertness at the time of the occurrence.

5. The deckhand was swept overboard when a large wave shipped water along the port side of the vessel.

6. Despite the large amount of water being shipped on deck, safety nets were not rigged above the bulwarks of the main deck and breezeway.

7. Safety lines had been rigged inboard on the main deck, but their effectiveness was diminished because safety harnesses were not worn. The absence of established fastening points to which safety harnesses could be attached also negated the effectiveness of wearing a harness.

Findings as to Risk

1. In the absence of an alarm system to provide immediate, local warning to spaces used for sleeping and other work spaces below deck, crew members and trainees may not be alerted in a timely manner to emergencies.

2. In the absence of an effective safety management structure, there is the risk that unsafe conditions and practices will remain unidentified and unaddressed.

3. Crew members assigned the responsibility for the safety of trainees in an emergency, but who lack formal training in crisis management, may compromise safety.

4. The vessel's relatively unstructured training program is based primarily upon on-the-job training, with no structured curriculum or formal performance assessment. Without predetermined learning objectives and measurable evaluation criteria, assessment of a trainee's ability to perform becomes subjective, and may not fully take into account the risks associated with operations in varying conditions and circumstances.

5. Reliance on trainees may result in crew members having to perform additional duties, thus compromising safety.

Safety Action

Action Taken

Investigations into this Occurrence

Following the occurrence, the Cook Islands Ministry of Transport promptly ordered a preliminary investigation and appointed as investigator the North American and Caribbean region Deputy Registrar for Maritime Cook Islands Ltd., the Cook Islands–based company and corporate administrator of the Cook Islands Ship Registry. The report of the preliminary investigation was completed 19 February 2007. The Cook Islands Ministry of Transport then convened a Board of Marine Inquiry to review the findings of the preliminary investigation. The Board subsequently issued its final report in 2007, a copy of which was provided to the TSB in August 2007.[23]

Under the international *Code for the Investigation of Marine Casualties and Incidents*,[24] Canada, as a substantially interested State, offered to assist the Cook Islands with its inquiry into this occurrence and provided some comments on the final report of the Board of Marine Inquiry. The TSB reviewed the final report and other information available and decided that there was the potential to learn more about the underlying safety deficiencies that led to this occurrence. A better understanding of these deficiencies should lead to a reduction of the risks and advance safety for all sail training programs.

Onboard Practices and Procedures

After the occurrence, a number of actions were implemented on board the vessel, including the following:

- A strobe light is to be worn at all times by all crew members and trainees while on deck.
- The breezeways are to be lit at night.
- No crew members or trainees are to walk alone on deck.
- Crew members and trainees are to be monitored to ensure sufficient rest.
- All hands are to wear a harness at night and in heavy weather.
- All trainees are to wear a harness when aloft.

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[23] The electronic version of the report provided to the TSB was undated; however, it was reported that the date of the report was 02 August 2007.

[24] International Maritime Organization, Resolution A.849(20), adopted on 27 November 1997.

On 01 February 2007, the Registrar of Ships, Cook Islands, directed the master/owner of the *Picton Castle* to attend to the following items on or before 15 March 2007:

- That there be written safety procedures instructions for all contingency and emergency operations for the vessel such as flooding, man overboard, and heavy weather, and including the wearing of safety harnesses and the ability to clip into safety lines, and the wearing of flotation devices equipped with lights;

- That formalized training and exercises in emergency procedures be scheduled, conducted, logged, and properly documented, including training for heavy weather, donning of lifejackets and immersion suits, wearing of harnesses, and the operation of rescue boats;

- That a system be established to conduct and document a variety of surprise drills;

- That there be a planned maintenance system on board; and

- That safety equipment lost during the occurrence be replaced.

Based on the information provided by the master/owner, the Registrar of Ships was subsequently satisfied with all of the items but one. The Registrar of Ships was not satisfied that a written planned maintenance system was in place, but was satisfied that the vessel was generally well maintained, as was confirmed in an annual survey and inspection conducted in May 2007.

Safety Audit

An audit of the systems and procedures of the *Picton Castle* was carried out from 10 to 15 May 2008, on behalf of the Cook Islands. The audit indicated the changes that the operators had made to the vessel and its program as a consequence of the loss of the deckhand. The results of the audit included the following:

- The training program of the *Picton Castle* was rewritten and formalized.
- A new alarm system was installed.
- The safety management structure was completely overhauled.

Additional measures were also implemented, including the following:

- Static jacklines and netting were fitted along the breezeways.
- All crew and volunteers are now required to have, as a minimum, basic safety training.
- A supplement providing new information and updating current information contained in the *Handbook for Crew* was prepared.
- A Safety Manual was prepared and addresses a number of areas including shipboard operations, maintenance, emergency procedures, and certification.

- A pre-prepared *Code of Practice Training Manual*[25] developed for use on board vessels required to comply with the United Kingdom requirements for small commercial vessels is being used to further educate crew and trainees on the purpose and use of lifesaving equipment, the procedures for abandonment, and methods of survival.

Canadian Standards for Sail Training Vessels

Transport Canada has begun updating its existing *Standard Relating to Design, Construction and Operational Safety of Sail Training Vessels*, TP 13313E. On 05 December 2007, Transport Canada met with members of the Canadian Sail Training Association to review the draft program for onboard training. A subsequent meeting was held in January 2008 to seek their involvement in the development of a sailing vessel training standard.

A consultant was hired and additional work is being done to provide the necessary level of details to guide sail training organizations to develop their own manuals and to seek approval from Transport Canada. It is anticipated that a draft standard will be submitted to the next meeting of the Canadian Marine Advisory Council, to be held in the fall of 2008.

Transport Canada has also begun the process of implementing a policy as an interim measure until requirements for sail training vessels are developed under the *Special-purpose Vessel Regulations*. Under the policy, a Canadian sail training vessel undertaking sail training activities may choose to comply with the requirements of TP 13313E. Alternatively, the vessel may be certified as a passenger vessel, in which case, it must meet all of the applicable provisions of the *Canada Shipping Act, 2001*, and its regulations.

Sail training vessels choosing to comply with TP 13313E will be limited to structured sail training activities only—operations such as short cruises, sometimes used as fundraising activities, will not be permitted because they are considered passenger operations.

Port State Control Inspection

On 14 May 2008, Transport Canada carried out a port state control inspection on board the *Picton Castle*. Various areas of the vessel were inspected and abandonment and fire drills were carried out. No deficiencies were reported.

Safety Concern

Sail training vessels invariably carry young and inexperienced trainees. The professional officers and crew are often volunteers with a diverse range of experience and qualifications, and they may only be assigned to a ship for a limited period of time. This situation requires structured management procedures based on sound principles in order to maximize safety.

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[25] Published by I.C. Brindle & Co., Dorset, England, 2nd Edition, May 2005.

Presently, there are at least 10 Canadian-registered sailing vessels offering sail training programs. Although it is difficult to estimate the extent to which unsafe conditions and practices may be present on board sail training vessels, five occurrences have been reported to the TSB since 1997, including two recently that have prompted Transport Canada to review issues relating to inspection, crewing, certification, and training programs on sail training vessels.

The Board acknowledges the initiative by Transport Canada; however, the Board believes that the overall safe operation of sail training vessels could be enhanced through the adoption of comprehensive safety management practices.

Effective safety management enables operators to identify the hazards associated with their operation, to assess the risk arising from them, and to identify mitigation strategies to reduce the risks to the lowest possible level.

This investigation has demonstrated that, in the absence of enforceable standards or effective, formalized safety management procedures, safety deficiencies can multiply. It does not matter where the ship is registered. For the *Picton Castle,* regulation was minimal, and there were no flag state standards or guidelines specific to sail training vessels. This is not limited to the Cook Islands. Although sail training vessels registered in Canada benefit from TP 13313E, this standard is neither mandatory nor comprehensive, and it does not require an operator to have a safety management system.

Most sail training vessels are unique, and it is difficult to apply usable prescriptive rules to them individually, or as a group. Ideally, appropriate regulations would be incorporated into the relevant International Maritime Organization (IMO) conventions and become applicable following adoption by flag states. The result would be an effective international regime enforceable by port states (through port state control) and by flag states.

In the meantime, some national authorities have adopted guidelines, standards, and regulations for sail training vessels. Individual authorities, however, only have jurisdiction over vessels sailing under their national flag or others operating domestically.[26]

In the United States, regulations are in place that take into account the particular characteristics and specialized operations of sailing school vessels.[27] Additionally, a number of European administrations have signed a Memorandum of Understanding (MOU) recognizing certificates for the safe operation of traditional ships in European waters, as well as certificates of competency for crews on traditional ships.[28] The MOU, which is based in part on the International Safety Management Code (ISM Code), provides guidance to operators of

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26 Typically, carrying passengers between two domestic ports, but not applicable to a foreign ship calling at a domestic port in the course of an international voyage.

27 *Code of Federal Regulations*, Title 46, Chapter I, Part 169.

28 The MOU was signed on 28 November 2005 by Denmark, Estonia, Finland, Germany, The Netherlands, Norway, Spain, Sweden, and the United Kingdom.

traditional vessels with a gross tonnage of up to 500 and recognizes the difficulty that sail training vessels may have in trying to meet today's requirements. It therefore allows for the implementation of other technologies and operational matters that give an adequate level of safety.[29]

As noted above, Transport Canada, in cooperation with the Canadian Sail Training Association, is working on an update of TP 13313E, with a specific focus on training. Transport Canada is also in the process of adopting an interim measure giving sail training operators the option of complying with either TP 13313E or with the regulatory requirements for Canadian passenger vessels. This interim policy would prevail until specific measures are in place under the *Special-purpose Vessel Regulations*.

The Board is concerned that these measures may not result in the adoption of effective safety management systems on sail training vessels under Canadian jurisdiction. The Board therefore encourages Transport Canada to adopt a proactive approach with the specific objective of an early introduction of a safety management system for sail training vessels.

Further, the Board is concerned that foreign sail training vessels calling at Canadian ports in the context of an international voyage do not have the defences afforded by an effective safety management system. The Board therefore encourages Transport Canada to take a proactive position at IMO with the objective of bringing all sail training vessels within the scope of the appropriate international conventions, while recognizing their special character.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 24 July 2008.

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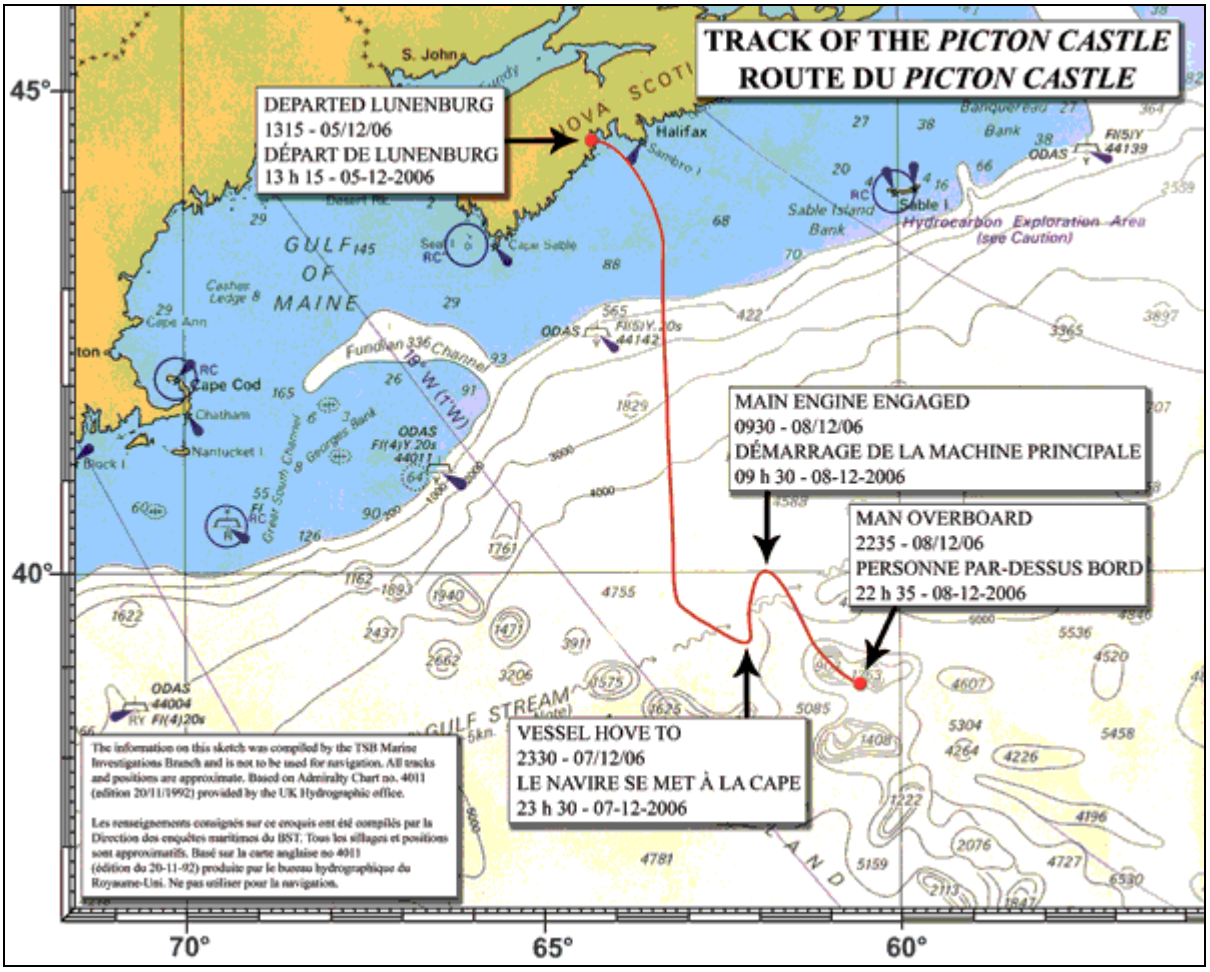
[29] Annex II.2, *Guidance for the Implementation of a Safety Management System for the Operation of Traditional Ships based on the International Safety Management, ISM Code*.

Appendix A – Sketch of the Occurrence Area



Appendix B – Glossary

CMCC	Canadian Mission Control Centre
E	east
EPIRB	emergency position indicating radio beacon
GMDSS	Global Maritime Distress and Safety System
GPS	global positioning system
HP	horsepower
IMO	International Maritime Organization
INMARSAT-C	international maritime satellite communication system
ISM Code	International Safety Management Code (International Management Code for the Safe Operation of Ships and for Pollution Prevention)
JRCC	Joint Rescue Coordination Centre
kW	kilowatt
m	metre
MHz	megahertz
MOU	Memorandum of Understanding
MRCC	Maritime Rescue Co-ordination Centre (United Kingdom)
N	north
nm	nautical mile
PSC	port state control
RCC	Rescue Coordination Center (United States)
S	south
SAR	search and rescue
SIC	Ship Inspection Certificate
SOLAS Convention	International Convention for the Safety of Life at Sea
STCW Convention	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended in 1995
TP	Transport publication
TP 13313E	*Standard Relating to Design, Construction and Operational Safety of Sail Training Vessels*
TSB	Transportation Safety Board of Canada
UTC	Coordinated Universal Time
VHF	very high frequency
W	west
2/O	second officer
°	degree
'	minute