

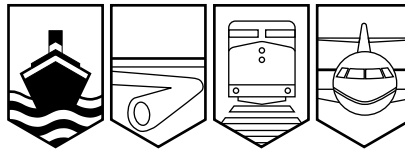
Transportation Safety Board
of Canada



Bureau de la sécurité des transports
du Canada

MARINE INVESTIGATION REPORT

M00W0220



COLLISION

BETWEEN

PASSENGER/VEHICLE FERRY *SPIRIT OF VANCOUVER ISLAND*

AND

PLEASURE CRAFT *STAR RUBY*

COLBURNE PASSAGE, BRITISH COLUMBIA

14 SEPTEMBER 2000

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

Collision

Between
Passenger/Vehicle Ferry
Spirit of Vancouver Island

and
Pleasure Craft
Star Ruby

Colburne Passage, British Columbia
14 September 2000

Report Number M00W0220

Summary

On the morning of 14 September 2000 shortly after departing her berth at Swartz Bay, B.C., the passenger/vehicle ferry *Spirit of Vancouver Island* increased to a customary speed and attempted to overtake the pleasure craft *Star Ruby* in the 460 m long narrow section of the buoyed channel of Colburne Passage. Neither vessel took effective collision-avoidance measures. A collision resulted. The pleasure craft sustained considerable damage and sank. The two persons aboard the *Star Ruby* were recovered and transported to a hospital, where they subsequently succumbed to their injuries.

Ce rapport est également disponible en français.

Other Factual Information

Particulars of the Vessels

	<i>Spirit of Vancouver Island</i>	<i>Star Ruby</i>
Official Number	816503	573760
Port of Registry	Victoria, B.C.	Port Angeles, Washington (WA)
Flag	Canada	United States of America (USA)
Type	Ro-ro vehicle/passenger ferry	Pleasure Craft; Tolleycraft
Gross Tons	18 747	16
Length	159 m ¹	9.72 m
Draught	F: 4.84 m A: 4.63 m	F: 0.60 m A: 1.12 m
Built	1993, Victoria, B.C.	1973, Kelso, WA
Propulsion	Twin Screw - 15 600 kW 4 x MAN model 6L 54/60	Twin Screw - 373 kW
Cargo Capacity	470 vehicles	N/A
Crew Members	55	1
Passenger Capacity	2050	N/A
Passengers on board	1076	1 guest
Owners	British Columbia Ferry Corp. (BCFC) Victoria, B.C.	Private Citizen Port Angeles, WA, USA

Description of the Vessels

The *Spirit of Vancouver Island* is a conventionally configured twin-screw ro-ro vehicle/passenger ferry with a service speed of 21 knots. She is fitted with twin controllable-pitch propellers, twin Becker rudders, two bow thrusters and a bulbous bow.

The two propeller shafts, each driving a controllable-pitch propeller, are controlled individually by single-lever controls. The levers are graduated in 10 speed settings both ahead and astern.



Photograph 1. *Spirit of Vancouver Island*

¹ 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 (SI) of units.

The *Star Ruby* is a pleasure craft of fibreglass construction. Its "Vee" hull includes hard chines, permitting the vessel to plane at speeds greater than 15 knots. The maximum speed attainable by the vessel is approximately 25 knots.

History of the Voyages

Star Ruby

On 14 September 2000, the *Star Ruby* was on the third day of a recreational cruise through Canadian waters from the vessel's home port of Port Angeles, WA.

The route taken by the *Star Ruby* took her north through Iroquois Passage into Colburne Passage, past the British Columbia Ferry Corporation (BCFC) Terminal at Swartz Bay, Vancouver Island, toward Satellite Channel. After having spent two nights in Victoria, B.C., the operator and his guest were travelling that day to Thetis Island for the weekend.

The *Star Ruby* was travelling independently of other pleasure craft in the vicinity. It entered Colburne Passage from Iroquois Passage in the company of several other pleasure craft in line astern. The engines were set in a position which gave her an estimated speed through the water of 9 knots. The vessel was being conned from the lower control station.

Within Colburne Passage, the vessels altered to port toward the buoyed channel which separates Piers Island from Vancouver Island. Reportedly, the *Star Ruby* continued past the multiple berths of the BCFC ferry terminal toward Gosse Passage, before resuming its position an estimated 100 m astern of the pleasure craft ahead (see Figure 1).

Spirit of Vancouver Island

The ferry *Spirit of Vancouver Island* was secured at Swartz Bay ferry terminal berth No.1 since her arrival at 1035² that morning. The vessel was secured port-side-to at her berth, parallel to the shore, with her stern to the loading ramp on a heading of 321° True (T). Since her arrival, the ferry had discharged and re-loaded vehicles and passengers and was preparing for its scheduled 1100 departure. At 1104, the *Spirit of Vancouver Island* received final clearance to sail from BCFC administration ashore. At the time of departure, the ferry's bridge team comprised the master assisted by the second officer and quartermaster. As the ferry left her berth, the third officer arrived on the bridge.

Before departure, the second officer made a visual check of Colburne Passage, advising the master of the presence of pleasure craft in the area, indicating to him visually the three vessels of greatest concern. The master both observed and acknowledged this information. These vessels were off the ferry's starboard beam, heading in the same direction as that to be travelled by the *Spirit of Vancouver Island*. At departure, one vessel, later identified to be the *Star Ruby*, was observed on an approximate bearing of 010° T, some 45° on the starboard bow, at an estimated range of 4 - 5 cables (740 - 925 m).

² All times are Pacific daylight time (coordinated universal time minus seven hours) unless otherwise noted.

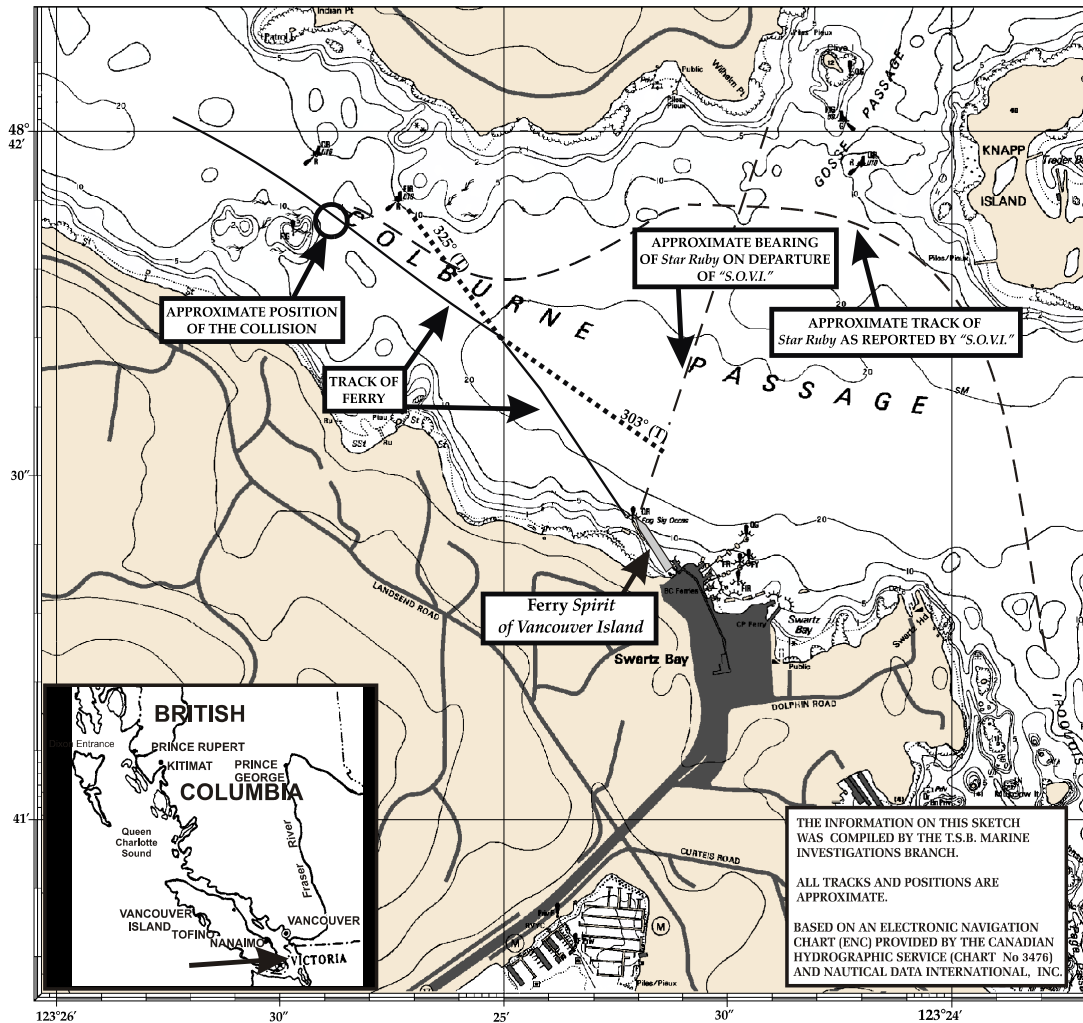


Figure 1. Area of the occurrence

Within the enclosed bridge of the ferry, the master, located at the port bridge-wing console, manoeuvred his vessel away from the berth. A signal of one prolonged blast of the ship's whistle was sounded to indicate the vessel's departure. Once clear, steering was transferred to the central steering position, and the quartermaster was ordered to steer 325° True & Gyro (T&G). The second officer, in addition to monitoring the vessel's progress, recorded the time of departure as 1105 in the bridge log and reported the vessel's departure to Victoria Marine Communications and Traffic Services (MCTS) on VHF channel 11. Victoria MCTS logs captured the time of the VHF departure call as 1106:45. Once clear of the berth, the master of the *Spirit of Vancouver Island* moved to the central console and increased the throttle setting to position No. 6 ahead. In an attempt to warn the adjacent pleasure craft, the master sounded seven blasts on the ship's whistle. Following departure, the engine-room data log recorded a maximum pitch reading of 71.1% at 1107:36.

From the central console, the master utilized parallel index lines pre-set in the memory of the radar as a visual aid to guiding his vessel through the buoyed channel 6 cables (1100 m) distant from the terminal. The channel is both the narrowest and shallowest portion of the passage along the routing toward Tsawwassen and only 460 m in length. The pre-determined optimum course for this transit is 300° T to maintain a distance of 2 cables (370 m) from the Vancouver Island shore. Three pleasure craft on the ferry's starboard bow were making toward this same

channel. In allowance for the pleasure craft ahead and to starboard of the ferry, the master initiated his course alteration to port in advance of the usual way-point, instructing the quartermaster to steer 303° T&G. To indicate this manoeuvre to vessel traffic in the vicinity, he sounded two short blasts on the ferry's whistle. This course would keep the *Spirit of Vancouver Island* the proven safe distance off the shallow water hazard on the ferry's port side.

In an attempt to understand the intentions of the pleasure craft ahead, a second signal of seven short and rapid blasts was sounded on the ferry's whistle. In response to these sound signals, *Miss Chief*, the lead pleasure craft that had already entered the buoyed channel, altered its course to the south to stand off the Green Beacon (LL 248.1) which marks the southwest side of the channel. The pleasure craft *Kana O II*, astern of the *Miss Chief* and approaching buoy "U18" (LL 248), initiated a round turn to starboard to clear the channel for the ferry. The *Star Ruby* was observed to maintain her course and speed, proceeding into the buoyed channel.

The *Spirit of Vancouver Island* accelerated through the water, increasing to a speed greater than that of the *Star Ruby*. With the two vessels on a slightly converging course, the distance between them closed. The master of the ferry observed that the *Star Ruby* began to "drift to port" and a third seven-blast signal was given. When the two vessels were both within the buoyed channel, an estimated 40 m between them, the *Star Ruby* was observed to make an abrupt course alteration to port from her position fine on the ferry's starboard bow, crossing into the path of the *Spirit of Vancouver Island* and disappearing from the bridge line-of-sight. The master was seated at the central console port chair; the second officer was viewing from the starboard side of the bridge.

At 1110, the third officer moved to the central console and selected the engine 'Emergency Manoeuvre' control to bypass the engines computerized control program. The engine controls were then moved to the full astern position by the master and the ship's whistle sounded. The two vessels collided. The *Spirit of Vancouver Island* bridge log records the time of collision as 1111, 14 September 2000. (Communication logs of VHF channel 16 at Victoria MCTS record the first call, reporting the collision, being received at 1110:30 from a pleasure craft. The ferry's engine room data recorder logs the time of maximum astern pitch as being 1110:49).

The Collision

The collision occurred some 6.2 cables (1148 m) from the Swartz Bay Terminal, within a triangle of water bounded by red buoys "U16", U18" and Colburne Passage Fl G South Beacon, in position 48°41' 53" N, 123° 25' 23"W. The bow of the *Spirit of Vancouver Island* came in contact with the port side of the *Star Ruby*, rolling the pleasure craft to starboard through an arc of approximately 100°. As the ferry continued forward through the water, the hull of the *Star Ruby*, between the port chine and keel, came into contact with the flared hull plating on the ferry's starboard side until the flow of water between the two vessels pushed the *Star Ruby* clear of the *Spirit of Vancouver Island* and the pleasure craft returned to the upright position in a swamped condition.

Rescue Operation

Immediately after the collision, the *Spirit of Vancouver Island* sounded three prolonged blasts on the whistle and a similar signal on the General Alarm bells, directing the crew to rescue boat stations. Victoria MCTS received a call on VHF channel 16 from the pleasure craft *Miss Chief* at 1112:25, indicating that the vessel was alongside the *Star Ruby*. At 1114:25, the *Spirit of Vancouver*

Island reported to MCTS on VHF channel 16 that her first rescue boat was away. The Rescue Coordination Centre (RCC) Victoria was contacted by MCTS at 1116 and additional resources were tasked. The *Spirit of Vancouver Island* volunteered only minimal communication to MCTS after the collision. This led to an initial confusion at both MCTS and RCC in their attempt to determine the location of the collision as well as the vessels involved.

Meanwhile, the heavily damaged *Star Ruby* remained upright, the superstructure awash, with the stern completely submerged. By 1122, the operator of the pleasure craft was able to extricate himself through a window on the port side of the cabin of that vessel. He was not wearing eyeglasses and appeared disoriented. He communicated to the rescuers that his hearing was impaired and that he was not travelling alone. However, it was not clear to those on scene exactly how many persons remained aboard before the operator was transferred to shore for medical attention.

The Canadian Coast Guard Cutter (CCGC) *Skua*, stationed at Ganges, Saltspring Island, was tasked to the scene by RCC and designated On-Scene Co-ordinator (OSC). The *Skua*, together with the station's Rigid Hull Inflatable, got underway without delay and advised RCC at 1121:03.

Concerned that the *Star Ruby* might sink, the rescue boat from the *Spirit of Vancouver Island* towed the pleasure craft into adjacent shallow water, while rescuers continued in their attempts to locate additional persons. At 1147, RCC was informed that a second person had been recovered from the *Star Ruby*. This person was immediately put into the care of emergency health services (EHS) personnel on scene and transferred to shore for medical attention.

The CCGC *Skua* arrived on scene at 1152. Although two persons were recovered from the *Star Ruby*, Royal Canadian Mounted Police (RCMP) divers made an underwater search while the Coast Guard conducted a sweep search in order to confirm that all persons aboard had been accounted for. No additional person was located.

Injuries to Persons

The operator of the *Star Ruby* sustained injuries when, as a result of the collision, he came into contact with rigid objects within the cabin of his vessel. Shortly after he was able to free himself from the pleasure craft, he suffered cardiac arrest and subsequently died while in the care of EHS personnel while en route to the hospital. His guest was unconscious when rescued. She did not regain consciousness and died three days later.

One crew member from the *Spirit of Vancouver Island*, who was in the ferry's rescue boat, suffered minor lacerations while attempting to gain entry through the cabin windows of the *Star Ruby*.

Damage to the Vessels and Environment

The *Spirit of Vancouver Island* sustained abrasions to the starboard corner of the main vehicle deck where it extends beyond the forward doors. An indentation 19 mm deep was observed in the 16 mm thick hull plating between frames 173 and 180 below the waterline.

The *Star Ruby* sustained major damage. The port side of the hull, forward of the beam and above the waterline, was significantly fractured and torn away, found hanging only from its forward edge. The port aft portion of the superstructure was torn away, leaving a gaping opening into the cabin. Below the waterline, between the port chine and the keel, the hull was gouged and torn open as a result of contact with a scupper pipe extending from the hull of the *Spirit of Vancouver Island* adjacent to the starboard anchor pocket. There was no discernable pollution.



Photograph 2. *Star Ruby*

Vessel & Personnel Certification and Personnel History

The *Spirit of Vancouver Island* was properly certificated, equipped and crewed in accordance with existing regulations. Additionally, the BCFC and the vessel held certification in accordance with International Safety Management Code (ISM) requirements.

The master and the second officer had extensive seagoing experience, with a minimum of six years on ferries operating from the BCFC Swartz Bay Terminal.

The *Star Ruby* had passed US Coast Guard Courtesy Examinations in 1999 and 2000. The operator of the *Star Ruby* was an experienced recreational boater and had taken a US Power Squadron "Boat Safe" course in May 1999. He was elderly and wore glasses fitted with corrective lenses, together with hearing aids to compensate for significant hearing loss in both ears.

Weather and Current Information

At the time of the occurrence, weather conditions as recorded in the bridge log of the *Spirit of Vancouver Island* were light airs, rippled seas and haze. The current in Colburne Passage leading up to the time of the occurrence was flowing in a ESE'ly direction at a maximum speed of ¼ knot.

Radars

The *Spirit of Vancouver Island* is equipped with radars that have Automatic Radar Plotting Aid (ARPA) capabilities. Due to the limitations of ARPA while the vessel was accelerating and altering course and, as the visibility was good, no ARPA target was acquired.

As a result of the collision, the radar aboard the *Star Ruby* was damaged to a degree where it could not be determined whether it was in use at the time of the occurrence.

Communications and Marine Traffic Services

The collision occurred within Vancouver Vessel Traffic Services (VTS) Control Sector No. 1. In this sector, traffic is monitored by Victoria MCTS on VHF channel 11, the designated frequency for the area.

The *Spirit of Vancouver Island* has multiple VHF radiotelephones on designated frequencies, simultaneously monitoring BCFC VHF radio traffic, VHF channel 16 and MCTS 'Victoria Traffic' on VHF channel 11. The vessel communicated in accordance with the applicable MCTS reporting requirements.³

Neither the *Kana O II* nor *Miss Chief* was monitoring 'Victoria Traffic' on VHF channel 11 nor were they required to by regulation. As a result, neither vessel heard the ferry make her departure call to 'Victoria Traffic' on VHF channel 11.

The radio equipment aboard *Star Ruby* was damaged to a degree where it was not possible to determine if it was activated or, if so, what frequency was being monitored.

There was no radio communication between the ferry and the pleasure craft prior to the collision.

MCTS Radar Coverage

MCTS has radar coverage of these waters from antennae located at Mount Newton on Vancouver Island and Mount Parke on Mayne Island. The *Spirit of Vancouver Island* can be observed on the MCTS radar video recording upon departure from the terminal. However, the area of the occurrence is within a radar shadow area. Therefore, no track was recorded leading to the collision.

The *Star Ruby* was equipped with a radar reflector. Being 12 miles distant from the MCTS radar antennae, together with the vessel's size and poor radar reflective properties, her track was not recorded by MCTS radar equipment.

Nautical Charts

Both vessels carried US and Canadian charts and nautical publications. Charts and notebooks recovered from the *Star Ruby* indicate that the operator had planned his passage to Thetis Island in advance but he was not a frequent visitor to the area.

³ *Vessel Traffic Services Zones Regulations.*

There are three Canadian Hydrographic Service charts published which show tracks indicating BCFC ferry routes. However, none of the charts carried aboard the *Star Ruby* (either U.S. or Canadian) included tracks to indicate Swartz Bay as a terminus for ferry routes. The electronic Garmin "G" chart for the Strait of Georgia that was available to the operator indicates the Washington State ferry route between Anacortes, WA and Sidney, B.C. but not the BCFC ferry routes converging at Swartz Bay.

Manoeuvring Characteristics (Speeds and Stopping Distances)

Manoeuvring data for the *Spirit of Vancouver Island*, as determined during her sea trials, indicate that a 'Crash Stop' from an initial speed of 11.9 knots would result in a head reach of 431 m, with the vessel being stopped in the water, in an elapsed time of 97 seconds. This information, while formulated, was not readily available to the bridge team on the ferry.

During the vessel's speed trials, no speed comparisons were made with the graduated engine control settings, nor is there documentation showing what actual speed is achieved at the No. 6 setting ahead. However, subsequent to the collision, observation on board the vessel determined that the No. 6 setting gives a speed of approximately 13 knots. Also, analysis of MCTS data on the day of the occurrence, and comparative data from previous trips, shows that the *Spirit of Vancouver Island* was travelling at approximately 12 to 14 knots at the time of the collision.

The track of the *Star Ruby* was not recorded by MCTS radar equipment, hence her speed was not accurately established. Subsequent to the collision, the vessel's differential global positioning system (DGPS) and electronic map system were examined by the manufacturer in the hope of retrieving track data. However, water had found its way into both units and shorted out the internal batteries. This water damage, coupled with the physical damage sustained, caused the loss of the non-volatile memory.

During inspection of the *Star Ruby* wreckage, the engine controls were found in the 'astern' position, the power setting was 'at idle', and the rudders in the hard-to-port position. The engine tachometers at the vessel's upper control station were observed to be "stuck" at maximum rpm for each motor.

Bridge Layout

Spirit of Vancouver Island

The ferry makes use of an integrated bridge design which takes into consideration ergonomic principles. The conning officer sits in the port seat at the central console and has access to, among other instruments, radar, engine controls, and communication equipment. The navigator sits immediately to starboard of the conning officer and uses a radar and



Photograph 3. Bridge Layout - *Spirit of Vancouver Island*

VHF radio to advise the conning officer of navigation information (dangers to navigation, traffic, radio communications, etc.). Visibility forward and to each side of the bridge has been optimized through extensive use of glass.

To port and starboard of the console are pedestal-mounted gyro compass repeaters, each fitted with a pelorus. The vessel is steered from a helm position, manned by a quartermaster, located at the centreline abaft the console. Helm and propulsion controls are also located on consoles on each enclosed bridge wing, used primarily for docking and undocking. The gyro compass error was nil.

Star Ruby

The *Star Ruby* is fitted with a radar reflector and has both upper and lower control stations. At the time of the accident, the lower control station was in use. The upper control station, located above the main cabin, is situated on the vessel's centreline in an open "command" bridge. This station, although fitted with a fabric 'bimini' top, was otherwise open.

The lower control station is located at the forward end of the enclosed main cabin, with the main console on the starboard side. It was equipped with, among other equipment, an autopilot, two VHF radiotelephones, radar, and a DGPS integrated with electronic maps. From this control station, the view of adjacent waters was significantly restricted by overhead cupboards that had been suspended from the deck head at the forward end of the control station. The cupboards were mounted transversely from the port side to the vessel's centreline. The addition of these cupboards significantly impaired visibility to port. Additionally, the windows of the main cabin, port, starboard, and aft, were fitted with metal venetian blinds. The blinds on the port side of the main cabin were in the lowered and closed position, impairing visibility to port.

For an operator at the lower control station seated at the helm, the arc of visibility from dead ahead through 50° on the port bow was essentially clear. However, from 50° to 70° on the port bow, visibility was hampered by overhead cupboards and restricted to a range of approximately 30 - 40 m from the vessel. With the blinds on the port side of the main cabin in the lowered and closed position, nothing abaft 70° on the port bow of the vessel was visible to the operator. A combination of vessel trim and an awning fitted above the after cockpit also further limited visibility astern when the vessel was underway at speed. When the *Spirit of Vancouver Island* began to move from her berth, she was abaft the port beam of the *Star Ruby*.

The enclosed cabin is in close proximity to the vessel's engine compartment. When the vessel is operating at speed, engine noise interferes with the operator's ability to detect sounds originating from outside the cabin.

Bridge Resource Management

Bridge personnel on the *Spirit of Vancouver Island* at the time of the occurrence had not received formal instruction in Bridge Resource Management (BRM). However, many BRM principles were being applied on the day of the occurrence. Currently, BRM training is not a regulatory requirement for vessels operating in this trade.

The bridge procedures on the *Spirit of Vancouver Island* are laid out in the ISM documentation of the ship. These procedures are contained in a vessel-specific manual and also in the *Senior Master's Standing Orders*, both of which are kept in the wheelhouse and were duly signed as being acknowledged by the ship's officers.

Traffic Patterns

There are now 40 vessels in the BCFC fleet, providing year-round service on 25 routes serving up to 46 destinations. In addition to commercial vessels, the inside coastal waters are traversed extensively by pleasure craft from Canada and the U.S. Many of the routes taken by pleasure craft put them in close proximity to BCFC terminals.

In the summer months, the large ferries depart hourly from both Swartz Bay and Tsawwassen between 0700 and 2200. The Swartz Bay terminal also serves as a terminus for other routes as well with vessels utilizing each of the terminal's five berths.

Analysis

Safe Speed/Action to avoid Collision

The *Spirit of Vancouver Island* was both accelerating and altering course throughout the short period of time after her departure and until collision. As the vessel was not on the MCTS radar screen, no tracks were plotted. Consequently, it is not possible to accurately establish her speed at any point in time.

The bridge log of the *Spirit of Vancouver Island* records 1105 as the time of departure and 1111 as the time of collision. Victoria MCTS logs indicate 1106:45 as the time the ferry communicated its departure on VHF and 1110:30 as the time a pleasure craft called to report the collision. Over a distance of 6.2 cables (1148 m), the MCTS times indicate that 3 minutes and 45 seconds elapsed between the time the ferry got underway and the time of collision. These figures result in an average speed over the ground of 9.9 knots. However, the vessel had been accelerating since departing from her berth and the maximum pitch for speed control setting No. 6 was achieved at 1107:36, almost 3 minutes prior to the collision. This would indicate that the vessel was travelling at a speed greater than 9.9 knots and had, in fact, achieved a velocity approaching 13 knots. The effect of the current setting in an ESE'ly direction at less than a ¼ knot would have been negligible. Analysis of MCTS data and comparative data from previous sailings agree with a speed of approximately 13 knots at the time of the occurrence.

Good seamanship practices dictate that speed be adjusted such that a vessel can be stopped within a distance appropriate to the prevailing circumstances, taking into consideration the manoeuvrability of the vessels involved.⁴ Soon after departure, the *Spirit of Vancouver Island* increased to a speed greater than that of the *Star Ruby*. This culminated in the ferry overtaking the *Star Ruby* in the narrow and shallow 460 m long section of the buoyed channel. In so doing, the ferry's ability to take proper and effective collision-avoidance action was first reduced and then eliminated.

Risk of Collision

Prior to the ferry's departure, the bridge team brought to the attention of the master three pleasure craft that could interfere with the ferry's passage. Once underway, the master elected to increase to his customary speed and overtake the pleasure craft, sounding two blasts to indicate a port course alteration. The master's primary concern then became the navigation of his vessel to the detriment of collision avoidance. While conducting the *Spirit of Vancouver Island* toward the buoyed channel, the master's attention became focussed on the parallel index lines of the radar in order to keep his vessel in that portion of the channel that would provide adequate draught for his vessel. The master did not use to advantage the traffic information he received from the bridge team. As the distance between the ferry and the pleasure craft decreased, warning signals were sounded on the ferry's whistle which resulted in two of the pleasure craft taking action and moving away from the path of the ferry; the *Star Ruby* did not. Consequently, by the time the ferry's master initiated emergency measures, it was too late to avert collision with the *Star Ruby*.

⁴

Rule 6, *International Regulations for Preventing Collisions at Sea, 1972*.

At departure, with the *Star Ruby* approximately 50° on the ferry's starboard bow, at an approximate range of 4 - 5 cables (740 - 925 m), the ensuing actions of both vessels resulted in the range closing, and although no compass bearings were being taken, relative bearings sighted by components of the ship's structure indicated a risk of collision. It is clear, therefore, that neither vessel used all available means to determine/evaluate the risk of collision.

Lookout

Maintaining a proper lookout is essential for situation appraisal, warning of risk of collision and preventing collisions. A lookout must be maintained by sight and sound and utilize all available and appropriate means - which could include radar and radio.⁵

Spirit of Vancouver Island

All members of the bridge team had sighted and were aware of the presence of pleasure craft in Colburne Passage, including the *Star Ruby*, in advance of departure.

Due to the difficulty in identifying individual pleasure craft by name and establishing VHF communications, passing arrangements are normally not made with pleasure craft over the radio; VHF R/T was not used by the ferry personnel to arrange a safe passage.

Star Ruby

As there was no survivor, and given the impact of the collision, the status of the operator's visual acuity and/or hearing aid at the time of the accident could not be established; nor was it possible to establish whether the operator's guest had heard the sound signals. Hence, the reason for *Star Ruby* not responding to the ferry's sound signals could not be determined. However, the most likely explanation is that the signals were not heard.

The upper control station of the pleasure craft provided an all-round view, but the lower station was being used, notwithstanding the confines of the buoyed channel. The operator's ability to maintain a proper lookout from the lower control station was restricted visually by the fitted cupboards as well as the lowered blinds on the port side of his vessel's main cabin. Additionally, the noise generated by the twin gasoline engines would have hampered his ability to detect the whistle signals being sounded by the *Spirit of Vancouver Island*. It can be concluded that a proper lookout was not maintained aboard the *Star Ruby*.

The *Star Ruby* was equipped with a VHF radio at the lower control station, but due to the design of this radio and the damage it sustained as a result of the collision, it could not be determined if the radio was on at the time of the accident or, if so, which channel was being monitored.

Monitoring of MCTS Frequencies

As a pleasure yacht that is less than 30 metres in length, the *Star Ruby* was not required to, and did not participate in the Vessel Traffic Services (VTS) scheme controlled by Victoria MCTS. Few recreational boaters are in the habit of monitoring the VHF traffic channels. The current practice

⁵ Rule 5, *International Regulations for Preventing Collisions at Sea, 1972.*

by some pleasure craft operators of not monitoring MCTS working frequencies deprives them of valuable navigational information, including traffic movement, on which sound navigational decisions can be based.

Action by Both Vessels and Collision

Prior to departure, the ferry's master was aware of the presence of pleasure craft in the vicinity, one of which was later identified to be the *Star Ruby*. After the ferry's departure and while it was increasing speed, the *Star Ruby* was initially to the starboard side of the channel, with the *Spirit of Vancouver Island*, on her port quarter, intending to overtake. As the speed of the ferry increased, the overtaking manoeuvre eventually culminated in the narrow, 460 m long section of the passage. Being an overtaking vessel, the ferry was required to keep clear of the *Star Ruby*.⁶

Between departure and the time of collision, other than the two short blasts indicating an alteration of course to port, seven short and rapid blasts were sounded on the ferry's whistle *three times* to indicate that the ferry was in doubt about the pleasure craft's intention. Although *Star Ruby* did not respond either by a sound signal or action to clear the channel and the subsequent action of that vessel resulted in it moving toward the path of the *Spirit of Vancouver Island*, the ferry's speed was neither reduced nor were the engines stopped or reversed in sufficient time to avert the collision.⁷

As the narrow channel was only 460 m long and given that the *Star Ruby* was proceeding at a speed of around 9 knots, a reduction in speed by the ferry to permit the *Star Ruby* to continue on and clear the channel would not have adversely affected her steerageway nor would it have had a significant impact on the schedule of the vessel by more than a few minutes. The safety of the ferry would not have been compromised by a reduction in speed to avoid an overtaking situation in the narrow section of the channel.

Given the conditions under which the *Star Ruby* engine controls and helm settings were found after salvage, objective conclusions as to positions of the controls just prior to the collision cannot be made. The *Star Ruby* was a vessel of less than 20 metres in length and, therefore, was required not to impede the safe passage of the ferry.⁸ Although the operator of the *Star Ruby* was an experienced boater, he did not take action in response to the warning signal sounded repeatedly by the ferry. This would suggest that he was unaware of the presence of the ferry until it was too late to take effective collision-avoidance measures. As neither person aboard the *Star Ruby* survived, it cannot be determined why the pleasure craft turned to port towards the bow of the *Spirit of Vancouver Island* when both vessels were travelling through this restricted portion of Colburne Passage.

Crew Training - BCFC

Following the collision, the crew of the *Spirit of Vancouver Island* successfully launched a rescue craft in approximately 3½ minutes, an indication that the ferry's crew was well trained and efficient in these respects. Once on scene, the crew of the rescue boat tried to do their best, but it

⁶ Rule 13, *International Regulations for Preventing Collisions at Sea, 1972.*

⁷ Rule 8, *International Regulations for Preventing Collisions at Sea, 1972.*

⁸ Rule 9, *International Regulations for Preventing Collision at Sea, 1972.*

was not until the arrival of the *CCGC Skua*, some 38 minutes later, that proper co-ordination at the accident scene took place. This resulted in a delay in the recovery of the second person from the *Star Ruby*.

When a marine distress situation arises, BCFC vessels on their various routes along the B.C. coast are often in a position to provide the first response until the arrival of the Coast Guard. In the course of its 40-year history, the crews of BCFC vessels have discharged their legal and statutory obligations in response to distress situations on countless occasions. These responses have evolved without co-ordination and without cross-training between RCC, MCTS and the BCFC.

Search and Rescue

Although the *Spirit of Vancouver Island* was involved in a collision with a pleasure craft within the Victoria MCTS reporting system, the collision was not reported to MCTS⁹ by the ferry. The collision was reported to Victoria MCTS by a pleasure craft in the area on VHF channel 16. About four minutes later, MCTS was advised by the *Spirit of Vancouver Island* that their rescue craft was launched.

Further, communication between the ferry, her rescue boat, and MCTS/RCC was scanty and incomplete, which did not permit accurate evaluation of the situation by RCC. Additionally, radio traffic on VHF channel 16 became very active post-accident. As a consequence, RCC was in receipt of conflicting information from various sources. This contributed to an initial confusion at both MCTS and RCC in their attempt to determine the position of the collision, the vessels involved and the number of persons at risk.

Pleasure craft were on scene almost immediately and a rescue craft from the *Spirit of Vancouver Island* was launched and alongside the *Star Ruby* without delay. Although the *Spirit of Vancouver Island* made every effort to assist the *Star Ruby*, the master did not assume many of the responsibilities of Incident Commander, as prescribed in BCFC policy, to co-ordinate rescue efforts on scene. Upon arrival on scene, the commander of the *CCGC Skua* assumed the role of the On-Scene Co-ordinator (OSC), as assigned. This was some 42 minutes after the collision. A Transfer of Command from the Incident Commander to the OSC¹⁰ did not take place. As a result, the OSC experienced difficulty in obtaining reliable information as to exactly what had transpired prior to his arrival. Without a single source of information, there was an abundance of sometimes conflicting information, all of which had to be either confirmed or re-confirmed. The absence of an interim OSC resulted in the loss of valuable time and resources essential to the success of a SAR mission.

⁹ *Regulations Respecting Vessel Traffic Services Zones*, s 7(1)(b).

¹⁰ The B.C. Ferries Operations Manual states that "Incident command shall be transferred when a more qualified person arrives on site or a jurisdictional or agency change in command is legally required or makes good management sense."

Navigating Near Pleasure Craft

Compliance with the *International Regulations for Preventing Collisions at Sea, 1972*, which prescribe *safe practices* for collision avoidance, helps ensure that all mariners operate their vessels in a safe manner with due regard for fellow mariners, whether they are operating commercial vessels or pleasure craft.

Instances where the lack of professional courtesy and respect for fellow mariners have culminated in dangerous marine occurrences are on record. The need for commercial vessels and pleasure craft to operate in harmony has been recognized by Transport Canada. This is reflected in Ship Safety Bulletin No. 10/87, *Safe Navigational Practices - Professional Courtesy and Respect for Fellow Mariners*, which reads, in part:

Mariners in charge of larger vessels must recognize that smaller vessels are generally more vulnerable to the effects of passing vessels and should take appropriate action to prevent endangering these smaller vessels. Mariners operating smaller vessels must not impede the safe passage of larger, less manoeuvrable vessels; it would be dangerous to assume that mariners in charge of larger vessels can always see, appreciate and avoid endangering a smaller vessel.

Prior to departure, the bridge team brought to the attention of the master three pleasure craft that had the potential to interfere with the ferry's transit. The master acknowledged this information and the ferry sailed. Given that ferries often encounter large numbers of pleasure craft which sometimes pass at close range and that pleasure craft generally will keep out of the way of the ferries especially in restricted waterways, the master expected the *Star Ruby* to do likewise. This would account for the master attempting to overtake the pleasure craft instead of taking the more cautious approach of proceeding at a safe distance astern of the pleasure craft until clear of the narrow section of the buoyed channel.

Following this decision, the master's attention was focussed on navigating his vessel through the narrow channel to the detriment of traffic safety. First, the ferry's course was altered to port earlier than usual to give the pleasure craft more room. As the distance between the ferry and the pleasure craft was decreasing, seven short and rapid blasts were sounded on the ferry's whistle to indicate doubt as to the pleasure craft's intentions. The warning signals were sounded three times before the master took collision avoidance measures but the avoidance action was too late.

On the other hand, the operator of the *Star Ruby* should have been cognizant of the presence of the ferry traffic and the operational constraints placed on pleasure craft when navigating in Colburne Passage and in the vicinity of a ferry terminal. In the narrow channel, *Star Ruby* was required by the Collision Regulations to keep to the starboard side of the channel, not to cross in front of the other vessel and, being under 20 m, not to impede the passage of a vessel which can safely navigate only within a narrow channel.

In any event, neither vessel followed the prescribed rules for collision avoidance, which are based on the principle of mutual respect and professional courtesy for fellow mariners.

Factors Affecting Decision Making

Ferries provide an essential service to the community and are widely used as a means of daily commute. In keeping with the BCFC mission statement/operating objectives, management has informed the ship's personnel on a continual basis that, while safety and on-time performance are essential elements, safety takes precedence over sailing schedules.

Maintenance of B.C. Ferry Corporation published schedules is important to users of the service and creates formal and informal "on-time" performance criteria. Passengers and shore staff readily notice and comment on delays. This causes the ship's crew to establish and adhere to operational practices which have proven successful in maintaining expected performance levels. Therefore, when encountering situations which may not be within established norms, there may be a tendency to place importance on maintaining the schedule. Encountering pleasure vessels in Colburne Passage and other restricted areas is part of normal BCFC vessel operations. In this instance the *Spirit of Vancouver Island's* departure was essentially on time.

When considered in conjunction with the underlying subtle pressure to maintain "on-time" performance, the master's mental model, that small vessels generally move out of the way when a ferry approaches or sounds its whistle, could account for the decision to overtake the pleasure craft in the narrow section of the channel to the exclusion of other, safer navigational options.

Findings as to Causes and Contributing Factors

1. Upon departure from the terminal, the *Spirit of Vancouver Island* increased speed and attempted to overtake the *Star Ruby* within the narrow portion of Colburne Passage, thereby precipitating a close-quarters situation. The more cautious alternative, of proceeding at a safe distance astern of the pleasure craft until clear, was not taken.
2. Although there were sufficient cues to warn both vessels that a risk of collision existed, the *Spirit of Vancouver Island* and the *Star Ruby* entered the narrow section of the channel on converging courses.
3. The *Star Ruby* was apparently unaware of the presence of the *Spirit of Vancouver Island* and the situation was further aggravated by the pleasure craft not remaining to the starboard side of the channel.
4. For reasons not known, the *Star Ruby* turned to port towards the bow of the *Spirit of Vancouver Island* when some 40 m separated the two vessels, resulting in contact between the port side of the pleasure craft and the starboard side of the ferry.
5. The ability of the operator of the *Star Ruby* to maintain a proper lookout was hampered by the presence of cupboards on the port side, the lowered blinds and the ambient shipboard noise.
6. Neither the *Spirit of Vancouver Island* nor the *Star Ruby* was operated in a professional and courteous manner, having due regard to the safety of other vessels.

Findings as to Risks

1. The current practice by some pleasure craft operators of not monitoring the MCTS working frequency deprives them of valuable navigational information, including traffic movements, on which sound navigational decisions can be based.
2. While operating in the vicinity of the ferry terminal, precautions were not taken by the *Star Ruby* to safely transit the area.
3. None of the charts aboard the *Star Ruby*, (either U.S. or Canadian), paper or electronic, included ferry tracks in Colburne Passage.

Other Findings

1. Manoeuvring data for the *Spirit of Vancouver Island* compiled during sea trials was not posted on the bridge for ready reference. Speeds for the control settings were not compiled during sea trials.
2. Communication between the ferry, her rescue boat and MCTS/RCC was minimal and incomplete, resulting in loss of valuable time in reconfirming information essential for the success of the SAR mission.
3. While the crew of the rescue boat of the *Spirit of Vancouver Island* responded quickly, they had received little or no training in the recovery of survivors other than in man-overboard situations originating from their own vessel. There is no regulatory requirement for the training of commercial shipboard rescue boat crews in SAR situations.
4. The ferry's master did not assume the role of Incident Commander or interim OSC, did not report the accident to the authorities in a timely manner, and communication with SAR authorities was minimal.

Safety Action Taken

1. The Canadian Coast Guard, Office of Boating Safety, maintains a publication, *Safe Boating Guide*, which offers important information for pleasure craft operators. In the section headed "Marine Communication and Traffic Services", which describes MCTS functions and services, the following phrase was added as a result of the occurrence: "When recreational boaters operate in close proximity to larger commercial shipping, they can learn the intended movements of ships by passively monitoring the appropriate VTS sector frequency."
2. The BCFC has initiated Bridge Resource Management training for their ferry officers and the master of *Spirit of Vancouver Island* participated.
3. BCFC has established contact with the Canadian Coast Guard Pacific Region with a view to obtaining a small craft training program for BCFC crews in order to better prepare them for emergency response requirements.

Safety Action Required

Small Vessels Operating in Close Proximity to Ferries

Passenger and vehicle ferries, navigating in narrow channels and in the vicinity of berths/terminals, are often restricted in their ability to manoeuvre simply because there is little room to do so. Furthermore, the handling characteristics of these vessels are such that it takes a longer time to reduce speed and stop. Many ferries may proceed at speeds comparable to or greater than that of small vessels. Operators of small vessels, therefore, need to be vigilant and avoid situations which may impede the passage of such ferries.

General information about ferry routes and berths is contained in charts (including electronic charts) and publications. Use of this information helps to ensure a safe voyage. Furthermore, the *Charts and Nautical Publications Regulations, 1995*, require vessels to carry charts and publications on board in respect of the area in which the vessel is being navigated. The *Sailing Directions, British Columbia Coast (South Portion)*¹¹, for example, describes where ferries operate to and from and that a ferry could be encountered anywhere along the charted route. The publication gives a general direction of the ferry route. Though most Canadian charts in use indicate ferry routes, there are some charts, including those carried aboard the *Star Ruby*, that do not. Also, while the route of the Washington State ferry was indicated on the rudimentary map of the Strait of Georgia, displayed on the GPS handheld used aboard the *Star Ruby*, it did not indicate the routes of BCFC. Consequently, the lack of information about local ferry routes, routines, and practices may continue to put operators who are unfamiliar with the area in which they are navigating at risk.

Collision and close-quarters situations between ferries and small vessels in narrow channels and in the vicinity of ferry berths are not uncommon and have been reported in waterways across Canada. Since 1990, there have been 12 collisions, resulting in two deaths (from this occurrence), and 118 close-quarters situations in Canadian waters involving ferries reported to the TSB (see tables 1 and 2). Of the 12 collisions, 8 were considered to have occurred in the vicinity of ferry berths and two in narrow waterways. Recreational-type craft were involved in five of the occurrences, the rest involved a variety of vessel types.

Collisions reported to TSB involving ferries since 1990	
Newfoundland	0
Nova Scotia	0
New Brunswick	2
Prince Edward Island	0
Quebec	5
Ontario	0
British Columbia	5
Total	12

Table 1. Collisions reported to TSB involving ferries since 1990.

¹¹ Vol. 1 Sixteenth Edition, Fisheries and Oceans Canada, 1999.

Close-quarters situations reported to TSB involving ferries since 1990	
Newfoundland	4
Nova Scotia	11
New Brunswick	4
Prince Edward Island	5
Quebec	7
Ontario	5
British Columbia	82
Total	118

Table 2. Close-quarters situations reported to TSB involving ferries since 1990.

Of the 118 close-quarters situations, 82 occurred in British Columbia. Of the remaining 36 close-quarters situations in the rest of the country, 15 were considered to be in the vicinity of ferry berths and in restricted waterways.

Fishing vessels accounted for most of the close-quarters situations on the east coast, while in British Columbia, recreational-type craft, fishing vessels and others (e.g., tugs, water taxis, seaplanes, barges, large bulk carriers) each accounted for approximately one-third. There is anecdotal evidence to suggest that the number of close-quarters situations reported to the TSB under-represents the actual number which occur in Canadian waters. Operators of vessels involved in close-quarters situations tend to consider them as 'one-time' events and accept them as being 'hazards of the trade' and thus not reportable.

Because of the large number of close-quarters situations reported in British Columbia, five geographic areas were examined in further detail (see Table 3). Four of the areas were in the vicinity of ferry berths, namely: Tsawwassen; Swartz Bay; Horseshoe Bay; and, Departure Bay. The fifth area was Active Pass, a narrow channel east of Vancouver Island through which ferries commonly navigate. These areas accounted for approximately 37 per cent of the close-quarters situations.

Close-quarters situations reported in British Columbia by selected area	
Active Pass	10
Departure Bay	5
Horseshoe Bay	6
Swartz Bay	6
Tsawwassen	3
Total	30

Table 3. Close-quarters situations reported in British Columbia by selected area.

The *International Regulations for Preventing Collisions at Sea, 1972*, require vessels to keep clear of each other. Small vessels are not to impede the passage of large vessels which can safely navigate only in a narrow channel or are constrained by their draught. Small vessel operators, including operators of foreign vessels, who may be unaware of local ferry routes, routines and practices, and the dangers of operating in close proximity to ferries, will continue to be at risk.

Given that some Canadian and US charts and publications do not indicate ferry routes or contain information about ferry routines and practices, the Board is concerned that the risks associated with the identified deficiency will continue to compromise the safety of small vessels operating in the vicinity of ferry terminals and in restricted waterways.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 01 May 2003.