

MARINE INVESTIGATION REPORT

M97W0194

FIRE IN ACCOMMODATION

SMALL FISHING VESSEL "WESTERN VIKING"

UCLUELET, BRITISH COLUMBIA

18 SEPTEMBER 1997

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

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Summary

While the vessel was moored at the Chevron Dock in Ucluelet, British Columbia, a fire started in the accommodation of the “WESTERN VIKING” when an electrical cable, inside a false deckhead, shorted out and burned. The fire was reported by a local resident at approximately 2245 and the Ucluelet Volunteer Fire Department arrived on the scene within about 25 minutes. Despite their best efforts, and those of the Coast Guard Auxiliary, the fishing vessel’s accommodation was severely damaged. The skipper, who had been sleeping in his cabin on the upper deck, was overcome by smoke and died in the fire.

Ce rapport est également disponible en français.

Other Factual Information

	"Western Viking"
Port of Registry	Prince Rupert, British Columbia (B.C.)
Flag	Canada
Official Number	327147
Type	Small Fishing Vessel
Gross Tonnage	83
Length	17.9 m
Draught	2.4 m
Built	1967, Prince Rupert, B.C.
Propulsion	Diesel engine—335 brake horsepower (BHP)
Number of Crew	2
Registered Owner	Don Murray, Surrey, B.C.

Description of the Vessel

The "WESTERN VIKING" is a wooden fishing vessel with a wood and aluminium house forward of amidships. The hull is divided into four compartments: forepeak, engine-room, fish hold, and lazarette. The fish hold is sub-divided into four tanked holds and is refrigerated. The lower deck of the house is wooden and has a cabin with accommodation for seven crew members forward, a washroom on the starboard side, and a galley/messroom aft. The upper deck of the house is aluminium with the wheel-house occupying the forward half and the skipper's cabin and washroom the after half. There are outside ladders from the after deck to the cabin top and an inside vertical ladder from the port side of the wheel-house down to the forward end of the lower cabin. The main engine and two generators are diesel engines. Both the main engine and the forward generator have power take-offs to drive hydraulic pumps to run the hydraulic refrigeration compressor motors.

History of the Accident

On the evening of 18 September 1997, the vessel was lying starboard side, at the Chevron floating dock in Ucluelet. The skipper was sleeping in his cabin abaft the wheel-house and the deck-hand was ashore, assisting the crew of another fishing vessel, mending nets on the Government wharf next to the Chevron dock.

At approximately 2245, the driver of a truck pulling out of the fish plant yard next door to the Chevron dock noticed a large amount of black smoke coming from the Chevron dock. He then saw flames in the galley door on the port after side of the accommodation of the

“WESTERN VIKING”. Using the cellular telephone in his truck, he called 911 and then went to see if he could help. He entered through the front gate, which was open, and went down onto the dock where he found people already there who were shouting to get the attention of the skipper.

The three crew members mending nets on the Government wharf also saw the fire and ran over to the Chevron dock. The Chevron dock was not open for commercial operations and the side gates in the metal fence surrounding the dock were locked. The three crew members climbed the fence and tried to get into the accommodation because they knew the skipper was sleeping there. The fire was too intense, and they could not get past the galley door from the after deck. During this attempt, the deck-hand of the “WESTERN VIKING” was burned on the arms and subsequently had to be taken to the hospital for treatment.

The Ucluelet Volunteer Fire Department responded to the 911 call. The fire chief was paged at 2303 and went directly to the scene; while the fire truck left the fire hall at 2309 and arrived at the side gate shortly thereafter. The locked side gate was the closest the fire truck could get to the dock where the “WESTERN VIKING” was moored. A 40 mm hose was pushed between the gate and the gatepost to the fire chief, who was inside the gate, along with the truck driver, who had previously served on the volunteer fire department. The two of them pulled the hose down to the dock. As soon as they could get over the fence, firefighters wearing breathing apparatus took over from the fire chief and the truck driver.

The firefighters managed to open the side gate and ran out two extra hoses to engage the fire from the dock. The first hose applied foam but the other two were water only. The fire chief, as was normal practice for boat fires, called for assistance from the local Coast Guard Auxiliary. The Coast Guard Auxiliary arrived on the scene in a rigid inflatable boat with a portable pump and they engaged the fire with a hose from the offshore side. However, the fire gained on the firefighters and spread upwards into the wheel-house and skipper’s cabin.

It took 35 to 40 minutes to get the fire under control. A positive pressure fan was used to clear smoke before the firefighters made an attempt to enter the deck house at wheel-house level to locate the skipper. The skipper was not in his cabin and his body was found on the floor of the lower cabin just inside the door from the galley. Autopsy results determined the cause of death to be asphyxia resulting from smoke inhalation. The results also revealed ethanol intoxication with a blood ethyl alcohol level of 52 mmol/L (0.24%).

Throughout the fire, the forward generator continued to run and keep the refrigeration plant operating. After the fire, the vessel was moved to the Government wharf and the 17 tons of tuna in the fish hold were unloaded and the generator stopped.

Firefighting, Training and Equipment

Members of the Ucluelet Volunteer Fire Department are trained by the Justice Institute of British Columbia, in Nanaimo, and they practise and continue their training in-house at the Ucluelet Fire Hall. The Justice Institute training “Level 1” is for land-based structures, and “Level 2” covers some basic use of foam. Training for “land-based firefighters who respond to marine vessel fires”, based on the National Fire Protection Association Inc. (NFPA) 1405 Guide, is available at the Justice

Institute Fire and Safety Training Centre in Maple Ridge, but it is not normally taken by volunteer fire departments.

The Ucluelet Fire Department uses a Class A foam which can be used on ordinary combustible materials such as wood, cloth, paper, rubber, and many plastics. It also contains no hazardous materials and is highly biodegradable and is used on forest fires. When used with the appropriate applicator, the foam can cling to vertical bulkheads in a low-expansion form, or form high-expansion foam to fill a space. There were adequate supplies of the foam on the truck and at the fire hall. The truck had both a “bubble-cup” nozzle and a medium expansion nozzle for use with the foam carried by the department.

The first hose used by the firefighters was fitted with the “bubble-cup” nozzle that created a low-expansion foam and was the only nozzle used during this fire. The fire chief knew that the water hoses, used later, would dilute the foam that had already been applied to the fire, but he decided that he needed water to gain control of the fire.

Crew Work Schedule

The vessel was converted from black cod to tuna fishing in Vancouver prior to sailing for the fishing grounds on 07 July 1997. The first trip lasted 27 days before returning to port for 4 days’ rest. The second trip lasted 21 days followed by 4 days’ rest in port. The third trip had lasted 17 days before bad weather had driven the fleet into Ucluelet for shelter on 17 September 1997. While at sea, the skipper and deck-hand shared the duties involved in operating the vessel, and fished extensively. There were no regular hours of work; both men worked whenever it was necessary for the navigation of the vessel or for fishing operations, which some days was as many as 20 hours.

The vessel arrived in Ucluelet at 2000 on September 17, after taking 10 hours to complete the final 40 miles into port, because of bad weather. Visitors kept the crew on board and it was late that night before they got to the hotel to sleep. On the morning of September 18, the skipper and deck-hand went down to the “WESTERN VIKING” and moved the vessel to another dock to take on water and stores. No fuel was loaded because there was still sufficient fuel on board for the remainder of the fishing trip. No fish was discharged. After storing, the vessel was moved to the Chevron dock to lay over until 0200 on September 19, when they were to depart for the fishing grounds. The skipper and deck-hand then went to the local hotel for lunch and refreshments.

Inspection of the Vessel after the Fire

An initial inspection was done in Ucluelet, to determine the areas of the vessel affected by the fire.

The vessel was towed to Vancouver, immediately after being unloaded, where a thorough inspection of the engine-room, wheel-house, and cabins was undertaken to determine the initial source of the fire.

The engine-room had suffered very little damage which was concentrated directly above the horizontal run of the main engine exhaust pipe under the after ventilation duct. The after ventilation duct was constructed of wood and was lined with foam rubber, approximately 25mm thick, to silence the engine noise where the duct

passed through the lower cabin. As the duct burned in the cabin area, the burning foam fell down onto the exhaust and continued to burn, creating a burn pattern above the exhaust. This caused a small amount of damage to the deckhead and some wiring in the vicinity of the duct. The remainder of the engine-room was untouched by the fire but it was covered in residue from the smoke drawn down the after ventilation duct by the generator engine, which was running. Above the generator, at the forward end of the engine-room, there were two more ventilation ducts, which supplied most of the air for the engine. Several of the electrical breakers for the accommodation and wheel-house lighting were found to have tripped, but no other breaker was tripped.

The wheel-house was severely damaged from the deckhead down to approximately one metre above the deck. All the electronics in the wheel-house were completely destroyed, and most equipment cases had melted in the heat and flames. Several of the wheel-house windows melted or broke during the fire. The skipper's cabin was burned from the deckhead down to approximately 1.5 metres above the deck. His bunk was intact and the foam mattress had not burned. The door to the cabin from the wheel-house was severely burned on the wheel-house side and only partially burned on the cabin side.

The same damage pattern was also found in the lower cabin and galley. Deckhead and beams in the lower cabin were extensively and heavily charred, with the most severely affected area being in way of the cross passage in the cabin. Upper portions of the bulkhead panelling were severely fire damaged and the panelling around the water heater in the cross passage had been consumed completely. The upper bunks on the port side had collapsed onto the lower bunks when the supports burned through. Four Freon 502 refrigeration gas cylinders were stowed on the port aft lower bunk. All four cylinders had burst the safety discs during the fire, and the gas had escaped into the fire zone. Most of the carpet in the lower cabin was intact and not even scorched, although it was buried under debris from the burned deckhead panelling and other burned panelling from the bulkheads. The only deck area showing fire damage was the after end of the lower cabin, adjacent to the door to the galley and where the skipper was found. The galley windows had burst with the heat and were missing. Over the galley, the aluminium upper deck had melted and burned in parts. The galley stove was intact, none of the top covers had been displaced, and the carburettor still had fuel in it. The upper half of the galley had suffered heavy fire damage but the lower half was less affected.

Abraded Electrical Cable

When the heavily charred beams in the lower cabin cross passage were inspected closely, several electrical cables in that part of the false deckhead were found to have no insulation left. One heavy-duty, two-core, electrical cable ran up the back of the water heater locker and across the cabin deckhead, inside the false deckhead panelling. This cable showed signs of having shorted out and burned where it passed through a plywood panel as it exited the water heater locker. The cable had separated as it had burned.

The cable was traced from a breaker in the forward end of the engine-room, marked "120 volt ac power to the wheelhouse dc rectifier," across the engine-room deckhead and into the water heater locker. It ran up the bulkhead behind the water heater, through a hole drilled in the deck beam and exited the locker through another hole in a fixed plywood panel into the space between the deckhead and the false deckhead panels. Each deck beam through the cabin had been drilled and the cables fed through the holes without securing clips, in the same manner as house wiring is run through frames. Transport Canada *Ship Safety Electrical Standards*,

TP127E, state in section 13, subsection 23, that “cables shall be effectively supported and secured in order to prevent chafing or other injury”. At the time of inspection, the breaker in the engine-room, as found, was still in the “on” position. This wiring was part of either the original wiring circuitry or wiring that was installed many years before.

Pieces from each side of the separation point of the cable (approximately 10 cm) were cut off and sent to the TSB Engineering Laboratory for analysis. The lab report states:

The as-received sections of the power supply cable [. . .] comprise two pairs of stranded copper wire approximately 5 cm in length. Both wires were fused together, one pair showing a single globule of melted copper at the one end, the other with one wire having a globular end and a second region of fusion approximately 1.8 cm from the fused end [. . .] A number of individual melted wire ends were noted adjacent to the main regions of fusion and one or two small copper spheres were found attached to the wires surfaces and to the larger globules. The remainder of the wires were a reddish brown colour typical of high temperature exposure. The inherent flexibility of the wire’s strands had been lost and the wire was easily crumbled into smaller fragments of brittle material. No trace of the original insulation or burned residues of the same were found. The greenish crystalline material deposited on the globular ends and on the adjacent wire surfaces is considered to be copper corrosion by-products formed post-incident from exposure to salt water.

The above observations are considered to be consistent with the exposure of the cables to a very intense localised source of heating. The form of the melted ends of the wires and the patterns of fusion of both the individual and the stranded wires are characteristic of electrical shorting which could have occurred following a loss of electrical insulation. The damage is considered too localised for the effects to have resulted from any exposure to a more widespread fire.

This two-core cable was the only one that could be found that had this separated globular end; all other cables were intact, although the cables in the accommodation areas had no insulation left after the fire.

Analysis

Access from the land to the dock at which the vessel was moored was limited because the dock was not being used for commercial operations and the access gates were padlocked.

The insulation of the electrical cable supplying power to the wheel-house dc rectifier was abraded where it passed through a thin vertical panel at the top of the locker in which the hot water heater was located. The panel had been drilled and the wire fed through without any support, or any securing which would have prevented the cable from chafing with the vessel’s movement and vibration. When the insulation chafed through, the two-core cable shorted out and the copper wire burned, setting fire to the wood beams inside the false deckhead panelling. The chafing occurred in a location in which it would not be immediately obvious to personnel on board the vessel. Further, a properly rated circuit breaker installed in a suitably installed electrical distribution

system would have sensed the over-current created by the short circuit, thereby activating the circuit breaker's trip mechanism and disconnecting the damaged cable from the electrical supply. Due to the extensive fire damage, it could not be ascertained why the circuit breaker in the engine-room, as found, was in the "on" position.

The skipper and deck-hand had been working extensive hours at sea fishing with only 7 partial days off during the previous 75 days. The demands of fishing and navigating the vessel with only two people on board would have resulted in the disruption of the normal circadian rhythms of both persons. The long periods worked each day, over the previous 17 days at sea, would have left both persons with a heavy "sleep debt," and the noise and movement of the small fishing vessel at sea would not have provided a "soporific environment". It is likely the quality of sleep obtained was poor and non-restorative. This would suggest that both the skipper and the deck-hand were suffering from fatigue as a result of inadequate sleep and circadian disruption.

The skipper's blood ethyl alcohol level of 52 mmol/L (0.24%), found during the autopsy, combined with fatigue would have contributed to slowing his response to the stimuli of smoke, heat, and noise from the fire.

The firefighting efforts first involved the application of a Class A foam, and then followed up with three water hoses negating the effect of the foam. The "bubble-cup" nozzle used by the firefighters produced a low-expansion foam suitable for a liquid or forest fire. Available on the truck was a medium expansion nozzle that had the potential to fill the spaces on board to better effect, but the fire chief decided that water hoses were needed to gain control of the fire. The training taken by volunteer fire departments in British Columbia does not normally include fighting shipboard fires, and the Ucluelet Volunteer Fire Department had not received such training.

Findings

1. Electrical wiring was led through holes drilled in deck beams and plywood panels without being effectively supported and secured to prevent abrasion.
2. The rectifier supply wiring chafed at the point where the cable went through a vertical fixed plywood panel and the loss of insulation allowed the two wire cores of the cable to short out and start a fire.
3. The cable that shorted was concealed in the false deckhead in the lower cabin and this prevented the chafing of the cable from being noticed by those on the vessel and likely contributed to the fire being established before the skipper was alerted.
4. The side gate to the dock, the closest access for the fire department, was locked and caused a delay in getting more than one hose deployed to fight the fire.

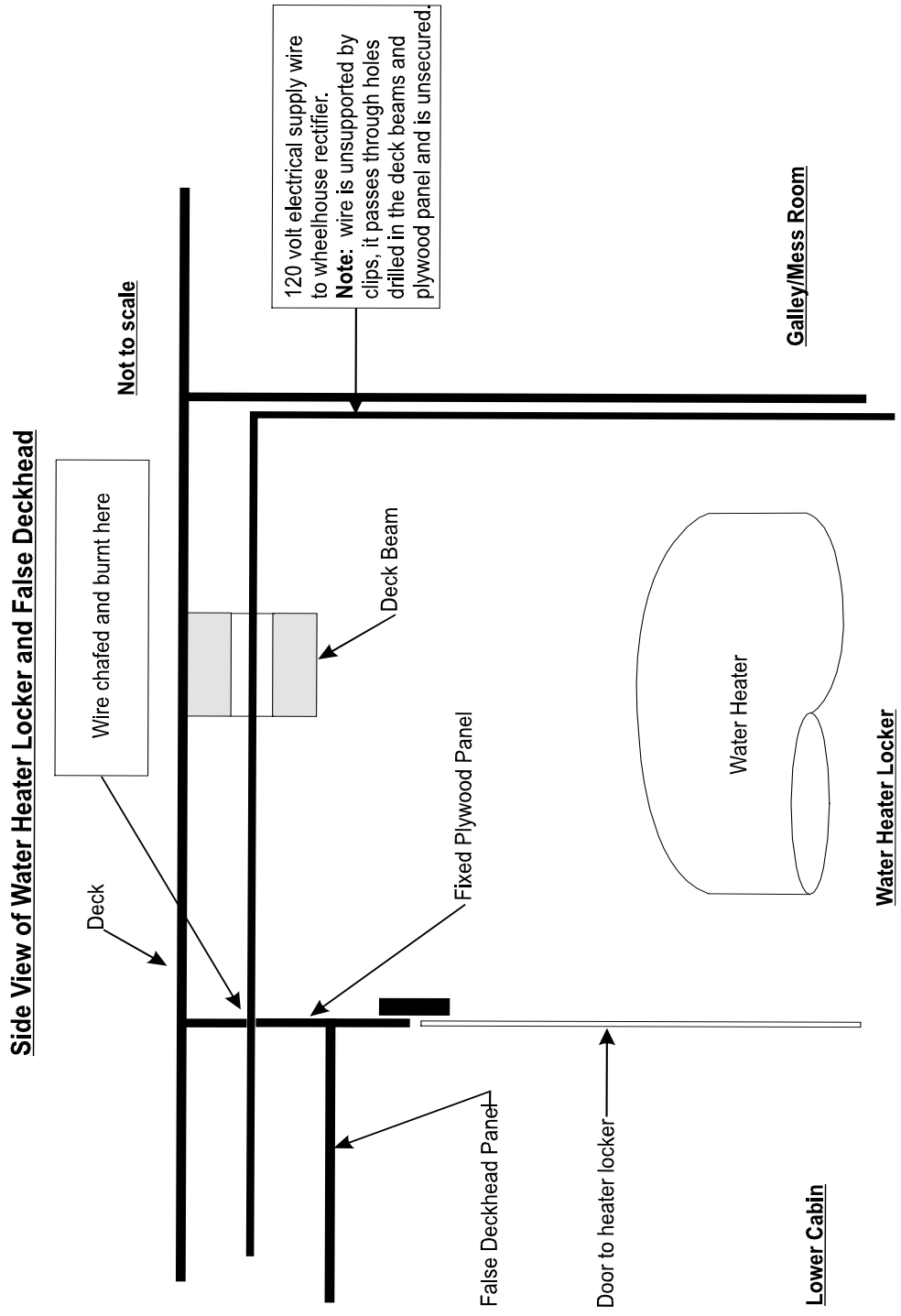
5. The initial use of foam on the fire was neutralised when the second and third hose teams used ordinary water hoses and this was further exacerbated by the Coast Guard Auxiliary using a salt water hose from the outboard side of the vessel.
6. Volunteer fire departments in British Columbia do not normally receive training in fighting shipboard fires.
7. The skipper and deck-hand were suffering from fatigue as a result of inadequate sleep and circadian disruption during their heavy work schedule over the previous 75-day period.
8. The skipper's high blood ethyl alcohol level and fatigue likely contributed to his not detecting the warning signs of the fire in time to escape the conflagration.

Causes and Contributing Factors

The fire was caused by a short in electrical wiring supplying power to the wheel-house. The cable was not properly supported and the insulation had chafed where the cable passed through a plywood panel. The cable run was inside a false deckhead and the chafing could not readily be detected by those on board. The skipper's high blood ethyl alcohol level and fatigue from his recent heavy work schedule likely contributed to his not detecting the fire and being overcome by smoke before he could escape. Initial deployment of firefighting equipment was delayed because the vessel was berthed at a dock that was not in commercial use and where the access gates were locked.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 28 July 1999.

Appendix A - Sketch of Water Heater Locker and False Deckhead



Appendix B - Photographs



Vessel at Ucluelet government wharf after the fire



Wharf where vessel was moored at time of fire