Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

MARINE INVESTIGATION REPORT

M99W0033

NEAR-CAPSIZING

THE SMALL FISHING VESSEL "WESTISLE"
OFF CAPE BEALE, BRITISH COLUMBIA
1 MARCH 1999

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

Near-capsizing

The Small Fishing Vessel "WESTISLE"
Off Cape Beale, British Columbia
1 March 1999

Report Number M99W0033

Summary

On the morning of 1 March 1999, the herring seiner "WESTISLE" was experiencing rough seas off the west coast of Vancouver Island. Seawater shipped on deck, down flooded past an improperly secured aluminum fish-loading deck scuttle cover leading to the forward starboard cargo tank, causing a starboard list. Down flooding into the compartment increased when the cover became dislodged. When the unsecured deck cargo shifted suddenly to starboard, the vessel was reportedly heeled to an angle of about 70°. By ballasting and moving weights, the crew was able to return the vessel to a near upright position. Damage to the vessel was limited to seawater contamination of the main engine fuel injectors and fuel system. No injuries or pollution resulted from this occurrence.

Ce rapport est également disponible en français.

Other Factual Information

Particulars of the Vessel

	"**WESTISLE**"
Registry Number	802193
Port of Registry	Vancouver, British Columbia
Flag	Canada
Type	Herring Seiner
Gross Tonnage	99.49
Length	21.28 m
Draught (approximate)	Forward: 2.20 m Aft: 2.40 m
Built	1982, Vancouver
Propulsion	Marine diesel engine, 470 brake horsepower, driving a fixed-pitch propeller
Number of Crew	7
Registered Owner	Canadian Fishing Company
Owner at the time of the occurrence	B.C. Packers Ltd.

Description of the Vessel

The “WESTISLE” is a conventional, steel-hulled, West Coast herring seiner. Below decks forward are crew quarters followed by a machinery space with the main engine on the centerline and main fuel tanks to port and starboard. Each fuel tank is fitted with a float-type air vent located on the weather deck adjacent to the bulwark. A centerline tunnel extends aft from the machinery space between the longitudinal bulkheads of port and starboard cargo fish tanks (cargo tanks) to a watertight door leading to the lazaret.

On the weather deck forward, a short foredeck is followed by an enclosed superstructure comprising the wheelhouse and crew accommodations. On the port side of the superstructure’s aft and transverse bulkhead is a watertight door leading to the main working deck. A pursing winch is fitted on the centerline near midships. The hatch coamings of the four cargo tanks are divided into port and starboard compartments (see Appendix A). Fish-loading deck scuttles are fitted into and flush with the deck plating between the hatch coamings and bulwarks to port and starboard in way of the after end of the forward cargo tanks. Directly abaft the hatch coamings is a raised, athwartships-mounted net drum followed by a short after deck and transom stern fitted with a horizontal net roller.

An inflatable liferaft and cradle is fitted to port atop the superstructure.

History of the Voyage

At approximately 1000 Pacific standard time on 28 February 1999, the "WESTISLE" departed Campbell River, B.C. with a crew of seven.[1] The vessel was bound for the herring fishing grounds of Barkley Sound on the west coast of Vancouver Island.

By 0900 on 1 March 1999, winds were from the southeast and seas had risen to an estimated average height of five metres. Seawater was being shipped and retained on deck in increasing quantities and the vessel was developing a noticeable list to starboard. Shortly before 1000 it was discovered that the starboard forward deck scuttle cover to the cargo tank was missing and that the tank was nearly filled with seawater. At approximately 1000 there was a sudden and appreciable increase in the vessel's starboard list when the unsecured deck cargo, consisting of a herring seine net and diesel-powered workboat, shifted to the starboard side of the deck. The vessel was some two miles south of Cape Beale. With the vessel reportedly listed approximately 70° to starboard, the skipper transmitted a Mayday call via VHF channel 16. All way was taken off the vessel and the controls to the main engine set to "neutral".

While preparations were being made to abandon the vessel, the engineer descended into the machinery space where he used circulation pumps to flood the port forward cargo tank with seawater which reduced the vessel's starboard list. Meanwhile, a deck-hand ascended to the port side of the boat deck where he successfully deployed the vessel's eight-person inflatable liferaft. Other crew members engaged the main deck winch and repositioned the stern of the workboat to the port side of the centreline. The cumulative effect of the above returned the vessel to a near upright position. Soon after these emergency tasks had been completed, the main engine failed. It was later determined that fuel had become contaminated with seawater that had entered the starboard side fuel tank through the air vent.

Meanwhile at 1005, in response to the Mayday broadcast, the Rescue Coordination Centre in Victoria tasked a Canadian Coast Guard vessel to assist. Being without power and unable to manoeuvre, the "WESTISLE" was taken in tow. The tow was later transferred to "WESTERN BRAVE", a responding fishing vessel which assisted the "WESTISLE" to a shipyard in Port Alberni, B.C., for inspection and repairs.

The damage to the vessel was limited to seawater contamination of the main engine fuel injectors and fuel system.

No injuries or pollution resulted from this occurrence.

Certification, Training, and Personnel History

The "WESTISLE" was issued a Ship Inspection Certificate (SIC 29) by Transport Canada, Marine Safety on 16 June 1998. It is valid until 15 June 2002.

---

[1] All times are Pacific standard time (Coordinated Universal Time minus eight hours) unless otherwise noted.

The skipper held a Transport Canada certificate to command a fishing vessel of this size and type. This was the skipper's first assignment on board the "WESTISLE" but he has extensive experience operating fishing vessels of similar tonnage. Although not required by regulation, the engineer held a valid Third-Class Engineer certificate at the time of the occurrence.

The crew had recently joined the vessel. With the exception of the engineer and one deck-hand, none of the other crew members had attended Marine Emergency Duties training nor were they required to do so by regulation.

Weather and Current Information

The weather experienced by the vessel was similar to the marine weather forecast issued by the Pacific Weather Centre of Environment Canada. The weather forecast issued at 0440 on 28 February 1999 for the relevant portion of Vancouver Island's west coast called for southerly winds of 25 to 35 knots changing to westerly winds of between 30 and 40 knots. In the morning, seas were expected to reach heights of between five and six metres.

Stability Requirement

The initial Steamship Inspection Certificate (SIC 29) was issued on 10 June 1982 pending issuance of an approved Trim and Stability booklet which took place on 3 August 1982. No reported modifications have been made to the hull or equipment since that date. The booklet was approved based on an inclining experiment conducted on a sister ship MV "VAN ISLE" on 27 January 1981with 10 tons of permanent ballast placed at the bottom of the engine-room.

The vessel was engaged in commercial herring fishery at the time of the occurrence. The principal stability characteristics contained in the vessel's Trim and Stability booklet met or exceeded the criteria of the *Stability, Subdivision, and Load Line Standards STAB 4*, as detailed in the Transport Canada Publication TP 7301E.

Departure Load Condition

Prior to departure, the vessel's fuel and fresh water tanks were full. Approximately 46 cm of liquid cleaning solution had been added to each of the vessel's two port and two starboard cargo tanks, a practice common to many commercial fishing vessels. The vessel's initial amidship freeboard was 610 cm.

Cargo Tank Arrangement

There are four cargo tanks aboard this vessel: port and starboard forward tanks and port and starboard after tanks. Each of the forward tanks has a 30.10 m^3 capacity while each of the after tanks has an 18.36 m^3 capacity. Port and starboard tank hatch coamings have a uniform height of 91 cm and all four main hatch openings are fitted with watertight aluminum covers.

Fish-loading Deck Scuttles

To facilitate fish-loading operations, each cargo tank was fitted with 46 cm x 61 cm flush-deck scuttles located on the weather deck between the bulwarks and the mid-point of the cargo tank coamings. Each deck scuttle was provided with an aluminum watertight cover secured by a single, recessed, centre-locking bolt that could be tightened or loosened using a square-headed wrench designed for that purpose. The covers were not hinged or permanently attached by chain to the vessel's structure, although regulation required them to be so attached.[2]

Cargo Tank Pumping Arrangement

Pumping arrangements consisted of the main engine, and, if necessary, an auxiliary engine supplying power to a centrifugal pump of 5 cm in diameter with suction valves fitted to each of the four cargo tanks. Valves fitted to each tank permit the flow of seawater in or out of those tanks.

Fuel Tank Air Vent Check Valves

The fuel tanks were fitted with WINEL model RM1 vent check valves, designed such that the buoyancy of the ball effectively shuts off the aperture to the tank opening and prevents seawater from entering the tank. According to the manufacturer, these valves are not watertight at large angles of heel. Regular maintenance is recommended by the manufacturer to ensure proper functioning of the valve includes checking the seals, screens, and balls.

Stowage of Deck Cargo

At the time of the occurrence, a 5-ton herring seine net and 2-ton diesel-powered workboat were stowed on the centerline of the weather deck abaft the net drum, directly forward of the transom stern, ready to be deployed at the start of the fishing. Neither item was secured to any fixed point on the vessel's structure.

Life Saving Equipment and Safety Drill

In accordance with Transport Canada requirements, life-saving equipment on board the vessel included seven standard Department of Transport approved lifejackets and an eight-person inflatable liferaft. The liferaft was stowed in its cradle on the boat deck and was inspected and certified for eight people on 3 February 1999. It had been successfully deployed but remained unused when it became unnecessary to abandon the vessel. The vessel also carried seven immersion suits in compliance with the requirements of the *Fishing Operations Regulations* made pursuant to section 71 of the B.C. *Workers Compensation Act*; there is no requirement for the carriage of immersion suits for such vessels in the *Canada Shipping Act* regulations.

Both sets of regulations call for the master to ensure that the crew is aware of the location and use of emergency equipment. The *Fishing Operations Regulations* require that drills be conducted periodically and when there is a change in crew.

---

[2] *Small Fishing Vessel Inspection Regulations*, Section 23(3).

In preparation for abandonment, crew members had mustered in the galley where they attempted to don immersion suits and life jackets. Only one of the seven crew members actually wore an immersion suit. The remaining six persons found that the life jackets and the suits were too small. Crew members were 1.7 m to 1.9 m tall and weighed between 90 kg and 118 kg.

Analysis

Watertight Integrity of Deck Scuttles

The cover for the starboard flush-fitting deck scuttle had no visual indicator to determine if the cover in the scuttle's aperture was secured or was merely in place and unsecured. The lack of any positive indication could lead the crew to believe that the deck scuttle cover was well secured and watertight when, in reality, it was neither. The investigation revealed that the cover's locking mechanism had a tendency to jam against the scuttle's under-deck framework. This would cause the unsecured cover to be prone to dislodge in rough seas, thereby compromising the watertight integrity of the vessel's hull. There is no regulatory requirement for the deck scuttle fittings to be type-approved nor were they type-approved. Single-action closing mechanisms with positive indication that the scuttle covers are in the secured position are readily available on the marine market.

Although required by regulation, the deck scuttle cover was neither hinged nor secured by a chain to the vessel's structure. Consequently, when the cover became dislodged, it was lost. Thus, the designed means to restore the compartment's watertight integrity was no longer available.

Impact of Unsecured Deck Cargo on Vessel Safety

Although required by regulation, the deck cargo on board the "WESTISLE" was not secured to prevent it from shifting. When the deck scuttle became dislodged, seawater down flooded into the starboard forward cargo tank. The off-centre weight of seawater in the nearly full cargo tank caused the vessel to list to starboard and the unsecured deck cargo to shift to starboard. Increasing the danger of the situation even further was the free surface effect of liquid in all four slack cargo tanks and fuel and fresh water tanks. The vessel's transverse stability was markedly reduced such that the vessel heeled to approximately 70°. Securing the boat and the fish net in an efficient manner would have prevented them from shifting, which, in the event, contributed to the vessel's near-capsizing.

Fuel Tank Air Vent Check Valve

When the vessel suddenly heeled some 70° to starboard, the ball check valve in the fuel tank's fresh air vent became immersed and seawater entered the tank, contaminated the fuel, and subsequently rendered the main engine inoperable. The float-type air vent is designed to close the aperture under normal rolling conditions at sea and is ineffective when the vessel is heeled to large angles. However, the main engine functioned long enough to supply power necessary

to pump water into the port forward cargo tank and to utilize the lifting gear to shift the workboat's stern to the port side of the centerline.

Reduction of Transverse Stability

The free surface effect of a liquid's movement within a ship raises its virtual centre of gravity and consequently reduces the transverse metacentric height.[3] Since metacentric height is a principal indicator of a ship's initial ability to remain upright, the elimination or reduction of free surface is essential in maintaining a vessel's stability.

In this instance, the adverse free surface effects progressively increased as the situation developed. The initial free surface effect was created when the four cargo tanks were partially filled with liquid cleaning agent prior to the vessel's departure. When the forward starboard cargo tank's watertight integrity was lost, the amount of water in the compartment progressively increased as seawater down flooded through the unsecured (and subsequently dislodged) deck scuttle cover. This caused the vessel's starboard list to progressively increase. As the list increased, the freeing ports became immersed and a larger amount of seawater was shipped and retained on the deck. The dangerous situation was further compounded when the unsecured deck cargo shifted to starboard and the starboard deck edge remained submerged. The vessel's inherent transverse stability characteristics and remedial action taken by the crew prevented more serious consequences to the occurrence.

Life-Saving Equipment, Emergency Drills, and Training

The crew was made aware of the storage location of life-saving equipment but no drills were conducted. Furthermore, the crew had not tried on the life jackets or the immersion suits. Not until the crew prepared to abandon the vessel did six of the seven crew members discover that their life jackets and suits were too small. Despite their above-average build, the crew had not tried on the personal life-saving equipment upon joining the vessel or prior to the vessel's departure.

Although the standard life jackets are designed to fit all adults, six of the seven crew members were unable to use them because of their build. Two of the crew members managed to don the life jackets, but because they were tight around the neck, they were forced to remove them.

Because Marine Emergency Duties training is not a pre-requisite for crew employed on fishing vessels of this size and type, it is imperative that the skippers conduct emergency drills to ensure that their crew members know the storage location and use of life-saving equipment and are made aware of their duties and responsibilities during an emergency.

---

[3] Metacentric height refers to the distance between a vessel's transverse metacentre and her vertical centre of gravity. It measures a vessel's ability to right herself from small angles of heel.

Findings

1. The design of the deck scuttle cover did not permit a person on deck to visually verify that the cover was properly secured.

2. The deck cover's securing arm had a tendency to jam against the scuttle's under-deck framework without effectively securing the cover.

3. While working in the seaway, the improperly secured flush-fitting deck scuttle cover of the forward starboard cargo tank became dislodged. Thus, the compartment's watertight integrity was lost.

4. The deck scuttle covers were neither hinged nor secured by a chain to the vessel's structure.

5. The vessel developed a starboard list when seawater down flooded through the improperly secured and subsequently dislodged flush-fitting deck scuttle cover.

6. The unsecured deck cargo shifted to starboard and caused the flooded vessel to list about 70°.

7. The free surface effect of the liquids in the four nearly full cargo tanks reduced the vessel's transverse stability prior to departure.

8. Pumping ballast into the port forward cargo tank and repositioning the workboat contributed to the vessel's recovery.

9. With the vessel heeled some 70° to starboard, the ball check valve in the fuel tank's fresh air vent became immersed, and seawater entered the tank and contaminated the fuel, rendering the main engine inoperable.

10. Neither the approved standard life jackets nor the immersion suits fit six of the seven crew members because of their above-average build.

11. Although the crew was new to the vessel, emergency drills were not conducted nor were the vessel's life jackets and immersion suits tried on prior to the emergency.

Causes and Contributing Factors

The "WESTISLE" developed a starboard list when seawater down flooded into the forward starboard cargo tank through its improperly secured and subsequently dislodged flush-deck scuttle cover. The unsecured deck cargo shifted and increased the starboard list to some 70°, submerging the weather deck. Factors contributing to the occurrence were: the tendency of

the scuttle cover locking mechanism to jam against the under-deck framework, and the practice of not securing the deck cargo.

Safety Action

Action Taken

Following the occurrence, the flush-fitting deck scuttle securing mechanism was modified.

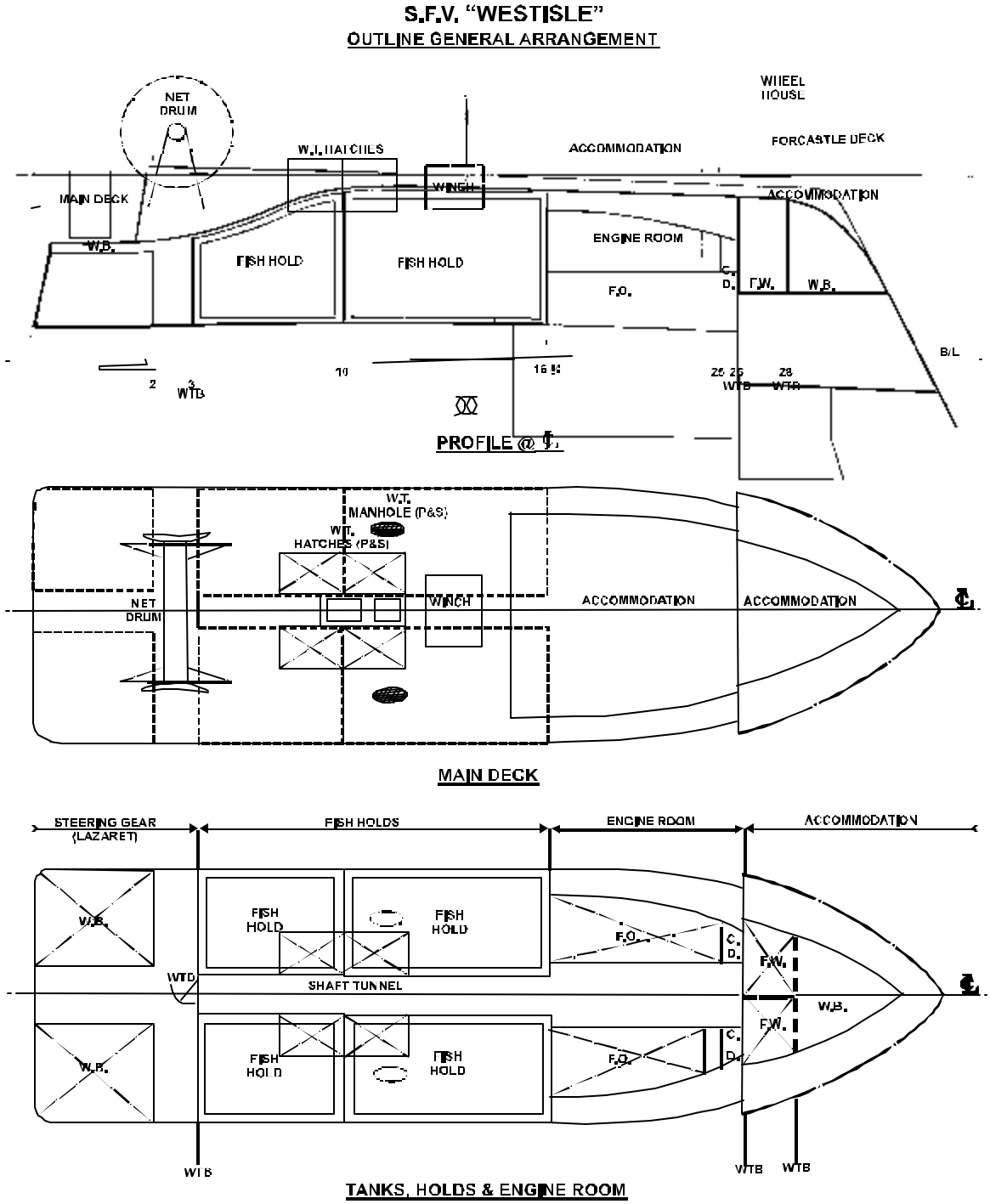
Transport Canada tested the vessel's starboard fuel tank vent valve and found it in good working order up to but not beyond 20° of incline.

Transport Canada issued *Ship Safety Bulletin* No. 13/99 stressing the importance of regular training in emergency procedures.

Transport Canada instructed its western region marine inspectors to verify that all fishing vessel fish scuttle covers are permanently secured to the vessel.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 6 December 2000.

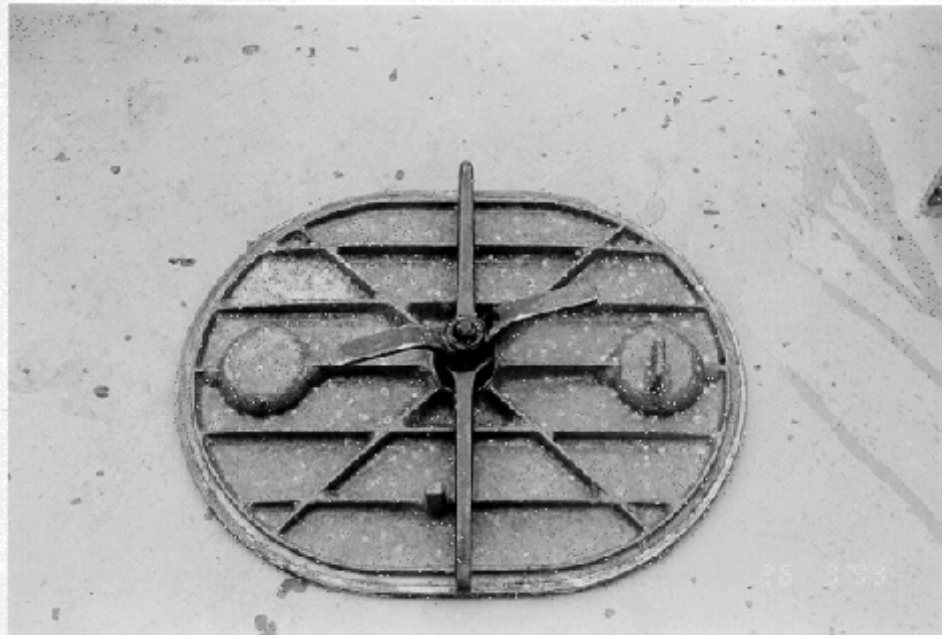
Appendix A - Sketch of the Vessel



Appendix B - Photographs

The "WESTISLE" on 3 March 1999, secured at the premises of Alberni Engineering in Port Alberni, B.C. Note the stern of the work boat is located to port of the centreline, where it was placed at the time of the occurrence.

New aluminum flush-deck cover designed by Manly Marine Closures, Ltd., identical to that which became dislodged during the occurrence. Note the recessed locking bolt, with its fitted bronze key in place.



Under-deck locking mechanism of an aluminum flush-deck cover, designed by Manly Marine Closures, Ltd., identical to that which became dislodged aboard the "WESTISLE" on 1 March 1999

Starboard fuel tank vent (circled) that became submerged during the occurrence and failed to prevent seawater from down flooding into the tank itself.