

MARINE OCCURRENCE REPORT

**CAPSIZE AND SINKING OF THE
F.V. "STRAITS PRIDE II"
IN POSITION 47°58'N 51°54.8'W
WITH FATALITIES TO THREE
OF THE SIX-PERSON CREW
17 DECEMBER 1990**

REPORT NUMBER M90N5017



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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Capsize and Sinking of the F.V. "STRAITS PRIDE II" in Position 47° 58'N 51° 54.8'W with Fatalities to Three of the Six-person Crew 17 December 1990

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Synopsis

On 17 December 1990, the F.V. "STRAITS PRIDE II", inbound to St. John's, Newfoundland, from the fishing grounds with a two-third load of round (ungutted) codfish stowed in the fish hold, encountered adverse weather, capsized and sank throwing the six-person crew into the ice-cold waters. Three crew members who managed to board the inflatable liferaft were subsequently rescued, but the remaining three lost their lives.

The Transportation Safety Board of Canada determined that the vessel continued to fish after learning of a forecasted storm warning and that the combined effects of the weather, shipped seas, stowage of the catch, free surface effect of liquids, loss of the port paravane, and downflooding caused the vessel to capsize and sink by the stern. The suddenness of the capsizing precluded efforts by three of the crew to successfully abandon the vessel, displacing them into the sea. As they were wearing only normal winter clothing with approved lifejackets, their survival time was limited. The other three crew members boarded the liferaft from the sea and were rescued some eight hours later in a mildly hypothermic condition.

16 December 1992

Ce rapport est également disponible en français.

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1.0 Factual Information

1.1 Particulars of the Vessel

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"STRAITS PRIDE II"	
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Port of Registry	St. John's, Newfoundland

Official Number	802314
Type	Wooden longliner/ dragger
Gross Tonnage	93
Length	19.8 m ¹
Breadth	6.64 m
Built	1982, Eastern Shipbuilders, South River, Conception Bay, Newfoundland

Propulsion	Twin TAMD 120V Volvo Pentas, developing 540 BHP ² driving a single fixed-pitch propeller
Owner	Straits Pride II Enterprises Ltd. O'Donnell's, St. Mary's Bay, Newfoundland
Cargo	40,000 kg Round Cod

The fishery inspector had been informed by the skipper of the "STRAITS PRIDE II" that the vessel's quota

³ All Times are NST (Coordinated Universal Time (UTC) minus 3 1/2 hours) unless otherwise stated.

1.2 History of the Voyage

The "STRAITS PRIDE II" secured in St. John's harbour on 10 December 1990 awaiting suitable weather to commence an intended fishing voyage to the 3L Canadian Fishing Zone. While in port, a

¹ Units of measurement employed in this report conform to International Maritime Organization (IMO) standards or, where there is no such standard, are expressed in the International System (SI) of units.

²

Definitions necessary for all abbreviations and

previously troublesome Single Side Band radio telephone (SSB R/ T) was replaced by a new set.

The vessel, fully provisioned and with a crew of six, including the skipper, departed St. John's at 0400³, 15 December. After clearing the harbour, the outrigger booms and paravanes were lowered and set (see 1.8).

Upon arrival at the fishing grounds some 16 hours later, the search began for fish. For this voyage, the vessel was rigged as an otter trawler/ bottom dragger; the trawl was set and the first tow commenced at 1000, 16 December.

During the second tow at about 1230, a fishery inspector from the Department of Fisheries and Oceans boarded the "STRAITS PRIDE II" from the Fisheries patrol vessel "CAPE ROGER" in position lat 49°07'N, long 50°13.8'W. On completion of the routine inspection of the 9,000 kg catch stowed in the hold, the fishery inspector advised the skipper of a forecasted 'storm warning' before disembarking and returning to the "CAPE ROGER".

of 40,000 kg would most likely be filled later in the day and that, in all probability, the fishing vessel would be back in port before the onset of the storm. Up to that time, weather conditions were reportedly good. Several other similar-size vessels were also reported fishing in the area.

The "STRAITS PRIDE II" continued fishing in the same area throughout the remainder of the day until 0100, 17 December, when the quota of 40,000 kg had been reached. At 0130, after stowing the catch and securing the fishing gear, the vessel commenced the return trip to port from an approximate position of lat 49°05'N, long 50°10'W, in south-east winds at 20 knots, slight sea swell and light rain. The vessel was to make a generally south-westerly course back to port.

At 0630, in a very high frequency radio telephone (VHF R/ T) communication with the owner, the vessel indicated that she was 92 miles away, making seven knots with increasing winds and seas, and that all was well. Some eight hours later in a further communication with the owner, the vessel reported being 44 miles from port and, although all was well, conditions were worsening with 30- to 45-knot south-east winds and rough seas. By now, the vessel was shipping and retaining seas on deck.

Some 15 minutes later, the chain attached to the port paravane (locally referred to as a 'fish') parted under stress and a section of chain with the paravane was lost. The vessel listed slightly to starboard. It was considered too dangerous in the rough sea conditions to bring up the starboard paravane and raise the outrigger boom. There was no quick-release mechanism to jettison the paravane. In an effort to counteract the starboard list, fuel from the port side

engine-room tank, then about 90 per cent full, was shut off such that supply was then from the starboard tank, which was about 30 per cent full. The lazaret tanks had been depleted during the voyage.

At about the same time, the vessel began shipping and retaining on deck more seas than previously. The list to starboard was noted to be increasing. Various manoeuvres, including reduction in speed, were effected in an effort to clear the accumulating water from the weather deck, but neither running with nor into the seas proved effective.

The vessel's speed was reduced to about four knots and the vessel was checked for ingress of water. None was observed in any of the bilges; however, when a crew member checked the fish hold from the main hatch access, he reported seeing water on top of the fish. Pumps were activated, but little discharge was noticed as the water in with the fish was, apparently, not effectively draining to the pump suction. Under the deteriorating conditions, the skipper ordered all hands to don their lifejackets as he made a VHF R/T call to St. John's Canadian Coast Guard Radio Station (call sign VON) advising them of the situation of the "STRAITS PRIDE II" and requesting an escort for the vessel. It was then 1540, and the position was given as lat 47°58'N, long 51°54.8'W. The vessel was experiencing three- to five-metre waves and southerly winds at 40 to 45 knots and was steering a south-westerly course. (See Appendix A)

VON advised the "STRAITS PRIDE II" to provide hourly situation reports (SITREP) and reported that the Search and Rescue (SAR) vessel "SIR WLFRED GRENFELL" had been tasked at 1547. At 1604, during the final communication, the "STRAITS PRIDE II" advised VON that it was necessary to abandon the vessel.

On board the "STRAITS PRIDE II", the crew experienced difficulty in preparing and launching the aluminium lifeboat and the liferaft because, as the order to abandon the vessel was given, the starboard list had increased to such an extent that the starboard rail remained immersed. Before the crew could abandon to either, they were displaced into the sea

when a wave heeled the vessel over even further. The lifeboat had become swamped. The liferaft inflated in an upright position, and three crew members successfully boarded it. The efforts of the men in the liferaft to paddle to the other three crew members were overwhelmed by the wind and waves which caused the liferaft to drift away from those in the water. As successive waves struck the vessel, she heeled further and eventually capsized. The strong wind drifted the liferaft away and, as those in the liferaft continued their efforts to reach their fellow crew, the skipper was heard shouting warnings to keep (the liferaft) clear of the capsizing vessel and floating debris. The occupants of the liferaft, unable to manoeuvre to the assistance of the other crew members, could only watch as the distance between them increased until visual contact was lost. The "STRAITS PRIDE II" sank stern first.

A full scale SAR operation had been initiated on notification of abandonment and resulted in the safe recovery of those in the liferaft some eight hours after the capsizing. The bodies of the three other crew members, including that of the skipper, were recovered from the sea water at about 1100 the next morning.

1.3 Injuries to Persons

	Crew	Passengers	Others	Total
Fatal	3	-	-	3
Missing	-	-	-	-
Serious	-	-	-	-
Minor/None	3	-	-	3
Total	6	-	-	6

1.4 Description of the Vessel

The "STRAITS PRIDE II" was built of sawn frame wood construction in 1982-83, typical of the Newfoundland-style longliner/ dragger. The fishing vessel was built to a design approved by the Ship Safety Branch of the Canadian Coast Guard (CCG), Transport Canada and the Newfoundland Department of Fisheries' Fisheries Loan Board to meet the construction and loan-approval requirements respectively; however, the dimensions were altered during construction to suit the original owner still keeping within the approved scantling specifications of her tonnage class. The alteration

comprised raising the vessel's main deck by 27.94 cm, with a view to increasing the hold volume and, consequently, the fish-carrying capacity.

The "STRAITS PRIDE II" was built and inspected in accordance with the *Small Fishing Vessel Inspection Regulations* made pursuant to the *Canada Shipping Act (CSA)* for a vessel of that size and tonnage. The vessel's fish hold was divided into 12 pens by portable aluminium penboards. A 1.5 m x 2.2 m hatchway to the fish hold was provided with a scuttle in the after section of the coaming to facilitate loading of fish. Additionally, six flush deck scuttles, two each on the port and starboard sides and one each forward and aft of the main hatchway, were also provided for that purpose. Each scuttle was provided with an aluminium cover which could be secured watertight by a single-action, key-operated closing mechanism. The main aluminium hatchway cover was fitted with an independent watertight access. Access to the lazaret was by means of an aluminium manhole cover provided with a similar watertight closing arrangement.

1.5 Vessel Inspection and Certification

The vessel was last inspected by the Ship Safety Branch of the CCG on 11 June 1987. The vessel was reported to be in sound condition and well maintained.

The "STRAITS PRIDE II" was classed 'Home Trade II East Coast of Canada not more than 120 miles offshore'. The "STRAITS PRIDE II" had not been inclined and no stability data had been generated. There was no regulatory requirement for such stability data, nor was there a requirement to subdivide the fish hold into pens. However, the fish hold aboard the fishing vessel was subdivided into pens.

1.6 Fish Hold Lining and Drainage

Schedule III of the *Fisheries Inspection Act* requires that areas where fish and ice are stowed shall be provided with non-absorbent, non-corrosive materials and with a drainage system to effectively remove ice-melt water and ensure that fish and ice do not come in contact with bilge water or other contaminants. The "STRAITS PRIDE II" was fitted with a 'MASTER BOND' fish hold lining consisting of a sprayed-on 5-cm layer of foam overcoated by a sprayed-on 0.635-cm layer of epoxy resin to meet the requirement.

Portable corrugated aluminium covers about 30.5 cm wide, intended to provide access to the shaft compartment for maintenance purposes, formed the shaft tunnel top. Additionally, the aluminium covers in the after centre pen, when lifted, allowed the water in the fish hold to drain into the shaft compartment, from where it could be pumped overboard. This facility was used primarily when the hold was washed down. When the after centre pen was loaded with fish, these covers could not be removed and, as they were not watertight, some seepage from the hold into the shaft compartment could take place and contribute to hold drainage. Thus, the fish hold was fitted with an electric pump with suction to deal with any build-up.

It is customary for the fish to be placed on deck to permit water taken on board with it to drain off through scuppers/ freeing ports before stowage in the fish hold, and this was done on this occasion.

1.7 Fish Hold Penning

Although not required by regulations, but consistent with good seamanship practice, the fish hold aboard the "STRAITS PRIDE II" was divided into 12 pens with portable longitudinal and transverse divisions to prevent movement of fish carried in bulk.

1.8 Paravane-type Stabilizer Concept

The towing of submerged delta-shaped paravane devices (hereinafter referred to as the stabilizers) suspended from outrigger booms to port and starboard in order to reduce the amplitude of a vessel's roll is now a common and established practice on west coast fishing vessels and has been sporadically introduced on the east coast throughout the past decade.

1.8.1 Description of Paravane-type Stabilizer

The "STRAITS PRIDE II" had been equipped in 1984 with outrigger stabilizer booms which were owner-designed and fitted. Normally, as in this instance, the design is copied from those fitted on other vessels which are known to perform satisfactorily. However, aboard the "STRAITS PRIDE II", the booms were hinged at the bulwark rail instead of the mast to give a better damping effect to the vessel. Each boom was constructed of 1.27-cm-thick welded steel plate 10.06 m in length and 10.16 cm square in total length. The inboard end was hinged to the bulwark rail about mid-length of the vessel. The outboard end was fitted with a spring absorber to which a sheave block was attached. A 1.58-cm topping lift wire was secured to the outboard end of the boom and rove through a sheave at the mast head, down the mast to a "Pullmaster" winch that permitted raising and lowering of the stabilizer boom. Another 1.58-cm wire extended from another winch on deck and was shackled to an 18-m length of 1.58-cm chain which ran through the sheave at the end of the spring absorber. Shackled to the end of the chain was a paravane constructed of two 1.27-cm-thick steel plates welded one to the other; one in the vertical plane (rudder) and one in the horizontal plane. Each plate was triangular in shape 0.9 m on a side with their vertical and horizontal apex to a point. A 0.30-m length of 7.62-cm-diameter steel pipe filled with lead was welded to the apex to form a nose piece.

The total weight of the paravane was approximately 70 kg. The paravane was suspended

from the end of the stabilizer booms to a depth of approximately 10 m. (See Appendix B.)

induced righting moment and the vessel's inherent transverse stability.

1.8.2 Deployment of Paravane-type Stabilizer

The usual practice of vessels operating from Newfoundland is to set the stabilizer booms in the down position after clearing the berth, the paravanes being then suspended to their normal at-sea depth.

1.8.3 Loss of Port Paravane

The port paravane of the "STRAITS PRIDE II" was lost when the chain from which the paravane was suspended parted under stress for unknown reasons; the chain is of a common type fitted in a number of applications. This caused the vessel to heel to starboard and, as no quick-release mechanism was fitted and the weather was very adverse, the starboard paravane could not be jettisoned to offset the list and eliminate the danger from the downward force now acting on only one side.

The sinking of the vessel precluded retrieval and testing of the parted chain to determine the cause of its failure.

1.8.4 Regulations Governing Paravane-type Stabilizer

At present, there are no regulatory requirements governing either the construction or fitting of such devices nor their inspection. Indeed, very little is known about their operation, efficiency, design, etc. because their design is very much a word-of-mouth affair passed from one fisherman to another. A diagram of a vessel so equipped is attached in Appendix B.

An extensive search of the literature for data on the design and effects of these units on fishing vessels provided very little useful information. There has been no formal study of the overall effects of such stabilizers on vessel stability. It would, at this time, be only conjecture to try to determine the interaction of the

1.9 Weather

1.9.1 Harsh Environmental Conditions off Atlantic Canada and Weather

The Report of the Royal Commission on the Ocean Ranger Marine Disaster, June 1985, stated that there are few areas in the world which possess as severe environmental conditions as the continental shelf off Eastern Canada. Nowhere else are the combinations of wind, waves, fog and ice as perilous and as unpredictable as in that vast and varied expanse of ocean.

During the passage between the fishing grounds and St. John's, the "STRAITS PRIDE II" was required to transit the east coast marine weather forecast area, and while engaged in fishing in the 3L fishing zone, she would be in the Funk Island Bank and Northern Grand Banks weather forecast areas (see Appendix C) covered by the Newfoundland Weather Centre.

1.9.2 Need to Monitor Weather Forecasts

Section 2.2.1, subtitled "Weather Information", of the *Manual of Safety and Health for Fishermen*, TP 1283E (a Transport Canada publication), cautions fishermen that rapid changes can occur in the weather and emphasizes the need for periodic monitoring of forecast weather reports.

1.9.3 Weather Forecast

The Newfoundland Weather Centre of Environment Canada issued a 'Storm Warning Bulletin' (48 to 63 knots) at 0300, Sunday, 16 December for the Newfoundland marine areas covering the south-west, south and east coasts and the northern, south-eastern and south-western Grand Banks. The bulletin stated:

Storm Warning issued.

A trough of low pressure approaching Nova Scotia early this morning will cross the district tonight and Monday. South-easterly gales of 50 knots will develop ahead of the trough over the areas. Further details follow in the regular forecast issued concurrently.

This marine weather forecast and subsequent forecasts for that date continued to issue a storm warning for the vessel's fishing area and the areas to be transited on the return voyage to port. The forecast issued at 1000, 17 December downgraded the storm warning to a gale warning (34 to 47 knots) for those marine areas.

1.9.4 Weather Encountered

A summary of weather conditions for 15, 16 and 17 December for the area of occurrence as produced by the Newfoundland Weather Centre, Gander, Newfoundland, is as follows:

15 December:

Westerly winds at 30 knots over the area early in the day subsided to south-west 20 knots in the afternoon then regained strength in the evening to south-west 30 knots. Seas 3 m to 4 m subsided during the day to 2 m to 3 m. Flurry activity reduced visibilities to 3 miles at times in the morning. Visibility improved during the day as flurries subsided.

16 December:

Early in the morning, the winds were south-easterly at 15 to 20 knots and diminished further to south-west 10 to 15 knots near midday. In the evening, a ridge of high pressure passed and winds shifted to south-east 15 knots. Visibility remained good all day.

17 December:

Morning winds over the area of concern were south-east near 30 knots, increasing to south-east 35 knots in the afternoon. Winds likely peaked late in the afternoon to south-east 40 knots with gusts in the low fifties. By late evening, winds shifted and diminished to south 15 to 20 knots. Seas near 3 m in the morning increased to 5 m to 6 m by late evening. Visibility was reduced to 3 miles in rain and mist in the morning then further reduced to 1 to 2 miles during the afternoon. Visibility improved to 3 to 6 miles after the winds shifted to the south.

At the time of the accident, the "STRAITS PRIDE II" was in the east coast marine weather area and had reported increasing south-east winds of 30 to 45 knots with rough seas.

1.9.5 Decision to Continue Fishing

The "STRAITS PRIDE II" experienced south-east winds of up to 45 knots at the time of occurrence in the east coast weather area where storm-force winds of

40-50 knots had been forecast. The first warning of the storm-force winds was issued in the early morning forecasts of 16 December, some 36 hours before the time of the occurrence, and before the vessel had commenced fishing.

When the storm warning was first issued, the vessel was some 160 miles from St. John's. At the service speed of nine knots, sufficient steaming time was available to the "STRAITS PRIDE II" to have reached port before the onset of the storm.

The decision to continue fishing was made based on the prevailing weather, barometric readings and experience. The impending storm forecast had been monitored and there had been a reminder of that forecast by the fishery inspector, but the "STRAITS PRIDE II" did not commence the return voyage until 0130, 17 December, some 22 hours after the first storm warning was broadcast.

1.10 Loading Arrangement

The loading of the 12 fish pens was started with the forward centre pen followed by the outboard pens, working aft in the same manner until nine pens were filled. Thus, with a quota of 40,000 kg of fish and with each pen holding about 4,500 kg, this method of loading was a good measure of the catch taken. This load represented two thirds of the vessel's load-carrying capacity.

Having been fitted with deck-scuttles (loading access hatches) to various pens, the portable aluminium penboards were fitted prior to loading. The transverse penboards were permanent and fitted up to the deckhead. The longitudinal ones would only be fitted to the underside of the deck beams thus providing a space such that when a pen was filled above that board level, the catch could spill over into an adjacent pen.

When the "STRAITS PRIDE II" encountered rough seas and started shipping and retaining water on deck, some of the water found its way in with the fish cargo. All hatches were reportedly keyed tight and the cause of the ingress was not known.

1.11 Bilge Pumping Arrangement

The "STRAITS PRIDE II" was fitted with an approved bilge pumping/ piping arrangement. When fish was stowed in the hold, water accumulated in that space was pumped out by the automatic 4.4-L/s electric pump fitted in that space. The engine-driven main hydraulic pump had suction to the accommodation, engine-room and lazaret spaces and an additional suction beneath the fish hold. If and when the water accumulated in the fish hold was beyond the electric pump's capacity to cope, the lifting of the corrugated aluminium cover in way of the after centre pen would permit that water to drain into the space beneath, from where it could be pumped out.

Each pump overboard discharge was fitted with a non-return valve through-hull fitting above the load waterline.

1.12 Assessment of the Ingress of Water

The vessel advised VON of experiencing difficulties and of water ingressing the fish hold, but the other spaces were not affected at that time. All pumps were then in operation.

Just before VON was called for escort assistance, the crew member who had checked the fish hold space for water ingress advised the skipper that there was water in with the fish but that none was visible in the three empty after pens, and it was therefore not necessary to lift the cover in the after centre pen. No water was evident in the engine-room or accommodation spaces.

1.13 Abandonment

When the order to abandon was given, all crew members were wearing approved lifejackets. The vessel was heeled over to starboard and taking seas on deck faster than they could be cleared. The starboard quarter was continually awash and the vessel rolled heavily in the rough seas. Three crew members placed the aluminium lifeboat on deck from its stowed position on shelter deck top while two others launched the liferaft container over the port side. The liferaft quickly drifted aft to the extent of its painter which then fouled in the trawl door before it could be inflated. One crew member, on deck, climbed atop the net roller to free the painter but before he could reach it, the painter came free and the raft was pulled back by those on the shelter deck top. The liferaft was then inflated by a quick hard tug on the painter.

Difficulty was being experienced by the crew in retaining a foothold on the wet and frequently awash deck and in controlling the lifeboat which was washed to and fro overboard while partially filling with water in the confused seas. Successive waves on the port side heeled the vessel further over as the two men on the shelter deck top who jumped for the liferaft landed in the water and subsequently boarded the liferaft. As the crew member on the net drum was trying to dismount, the vessel's sudden motion pitched him into the sea, near the liferaft; he was assisted aboard the liferaft from the sea. The liferaft was then pulled around the stem to the starboard side where the other three crew members were seen floating in the water. The three in the water were heard shouting for help as those in the liferaft tried to paddle to their aid. The skipper was seen clinging to the swamped lifeboat with the other two men further aft. The winds and waves forced the liferaft to drift away. Suddenly, the "STRAITS PRIDE II" rolled out on her beam ends, and as the mast and the port side stabilizer boom came down near the lifeboat, the skipper called out to keep the liferaft clear. The vessel completed capsizing and sank stern first. Despite its occupants' rigorous paddling, the liferaft continued to drift further away from the three men in the water until visual contact was lost. It was dull and towards the latter part of daylight.

Wet, cold and somewhat in a state of shock, the three men in the liferaft tried to make themselves as comfortable as possible. They were comforted by the knowledge that their radio call for help had been responded to. However, they were not aware that the floor of the liferaft should have been inflated by the pump in the liferaft's kit.

1.14 Life-saving Equipment

This section deals with the life-saving equipment carried by the vessel and used by the crew.

1.14.1 Inflatable Liferaft

The inflatable liferaft was serviced on 16 January 1987. It is a regulatory requirement that such liferafts be serviced on an annual basis.

However, the liferaft and its equipment performed as designed when used at the time of the occurrence and neither problems nor difficulties were experienced.

1.14.2 Distress Signals

The vessel and the liferaft were provided with distress signals and these were effectively used to attract attention. Some eight hours after abandoning the vessel, the distress signals were first deployed from the liferaft and sighted by the rescue aircraft. Subsequently, when the navigation lights of the rescue vessel "SIR WILFRED GRENFELL" were sighted, the last of the signals were utilized.

1.14.3 Lifejacket/ Clothing Worn by Crew

The six crew members were warmly dressed in normal winter clothing and were wearing standard approved lifejackets. When rescued, the three persons in the liferaft were found to be in a mildly hypothermic condition.

1.14.4 Anti-exposure Worksuit Requirement

There were no anti-exposure worksuits or survival suits aboard the "STRAITS PRIDE II", nor is there a regulatory requirement for them to be carried aboard vessels of this size and type.

1.15 Sea Water Temperature and Survival Time

Sea water temperatures were not recorded in the area during the search; however, information obtained from Fisheries and Oceans data indicates that surface sea temperatures of 3-5°C would not be uncommon for that time of the year. It is apparent that in the prevailing

wind conditions there would have been a considerable wind chill factor which would have contributed to body heat loss and have adversely affected the victims' survival time.

1.16 Swimming Capabilities

Four of the total crew of six were capable swimmers; three of the crew died, including the two non-swimmers.

1.17 Search and Rescue

At 1604, when VON was advised that the crew was abandoning the "STRAITS PRIDE II", a full scale SAR operation was initiated by Marine Rescue Sub-Centre St. John's. The SAR vessel "SIR WILFRED GRENFELL" had been tasked. AMAYDAY RELAY was transmitted by VON giving the distress position as lat 47°58'N, long 51°54.8'W.

Nine vessels and three aircraft were tasked to the search area. On-scene weather conditions were given as SW winds 35-40 knots, five-metre seas, two-mile visibility. The "SIR WILFRED GRENFELL" was alerted by the chartered King Air aircraft at 2344 that it was over a liferaft after sighting flares activated from the liferaft. The SAR vessel rescued the three crew members, who, once aboard the vessel, were treated for various stages of hypothermia. They remained on board during the remainder of the search.

The search continued for the three missing crew members until 1000, 18 December, when the Rescue Helicopter R301 reported sighting and recovering a body in position lat 48°05.8'N, long 51°56'W. The body was then transported to the "SIR WILFRED GRENFELL". At 1149, the "SIR WILFRED GRENFELL" reported that R301 had recovered the other two bodies from position lat 48°02'N, long 51°57'W and was transporting them to St. John's Airport. The "SIR WILFRED GRENFELL" then departed for St. John's where, upon arrival at the Coast Guard Base, she secured alongside at 1549, 18 December.

Resources were then stood down and the SAR case closed.

1.18 Qualifications and Crew Experience

Certificates of Competency are issued by the CCG upon a candidate passing the examination, or meeting the requirements, prescribed by Part II of the CSA

As the "STRAITS PRIDE II" was a fishing vessel of less than 100 tons gross tonnage, the CSA, Part II, Certificates of Officers, did not require that any of the crew be certificated; however, the skipper held a Fourth Class Motor Certificate of Competency and the mate held a Fishing Master Class III Certificate of Competency. The skipper and the mate had 15 and 20 years of seagoing experience. Both had survived three previous losses at sea.

The surviving three crew members had varied sea experience ranging from 8-13 years and the fourth member, who lost his life, was an experienced seaman who had survived several past occurrences. Of the three survivors, two had each survived at least one past occurrence.

1.19 Marine Emergency Duties (MED) Training Requirement

As a prerequisite to obtaining Certificates of Competency, both the skipper and mate were required to complete a MED program which provides training in life-saving, abandonment, fire-fighting and first aid with the use of associated equipment in those emergencies. There is at present no regulatory requirement for uncertificated crew of fishing vessels to complete a MED course. None of the three survivors had completed any such training and, although one of them had survived the three previous losses involving the skipper and mate, none was aware that the floor of the liferaft should be inflated as an essential requirement for providing greater rigidity and comfort and, most importantly, for helping to insulate from the frigid sea water.

1.20 Stability

Because the "STRAITS PRIDE II" was a small fishing vessel of less than 150 tons gross tonnage, the CSA or regulations made pursuant thereto, did not require that the vessel be inclined to generate stability data, and these data were, in fact, not generated. No stability data were available from any source to permit stability analysis.

2.0 Analysis

2.1 Introduction

While en route from the fishing grounds to St. John's with a catch of about 40,000 kg of round codfish stowed in 9 of the 12 fish pens, the "STRAITS PRIDE II" heeled to starboard when the port paravane chain parted. The resultant list progressively increased with each roll in the adverse weather conditions, until the vessel downflooded, capsized and eventually sank with fatalities to three of the six-person crew.

2.2 Paravane-type Stabilizers

2.2.1 Development of Paravane-type Stabilizers

Development has been on an individual and generally empirical basis, with few records and little formal study to determine the precise interaction of the induced righting moments and the vessel's inherent transverse stability. Few problems have been reported and experience has shown the effectiveness of the practice, but it is not without risk. The safe functioning of the submerged delta-shape plates is largely dependent on the towing speed and their complementary operation to port and starboard, such that the righting moment caused by the downward force generated on one side is synchronized with the upward roll of the vessel on that same side.

If the port and starboard synchronization is disturbed or lost, an athwartship moment can be applied to the vessel when she is rolling towards the paravane generating the most downward force, and the vessel's roll may actually be increased on that side. The synchronous and complementary operation would be eliminated if a paravane were lost or if the boom and/ or the rigging on one side were to fail. Similarly, the operation would be significantly disturbed if one paravane surfaced or became fouled with floating kelp,

abandoned nets, submerged debris or obstructions on the seabed.

2.2.2 Effect of Lost Paravane on Vessel Stability

When the port paravane of the vessel was lost, the progressive heel to starboard would have increased with the downward thrust on the starboard paravane. Immediate emergency action was taken in that the vessel's speed was reduced to four knots. However, as the vessel rolled further out to starboard, return to the upright was slowed and successive wave action could have caused the heel to increase, eventually leading to capsize. This list would have been further aggravated by the effect of wind and weather acting on the vessel's port side.

2.3 Ingress of Water in Fish Hold

Generally, the working of a wooden vessel in a seaway in heavy seas and load conditions, such as in this instance, may have permitted some seepage of water, more so as the decks had been intermittently awash.

The ingress was considered minor in that it did not readily drain through the fish to the pump suction or to other empty pens. However, when water mixes in with the fish, it permits easy movement of the fish as the vessel works in a seaway.

2.4 Factors Adversely Affecting the Vessel's Transverse Stability

The arrangement of the penboards was such that it could permit the top of the cargo to shift transversely whenever a pen or pens were loaded to or above the height of the penboards, and the resultant transverse shift of weight in heavy seas would have had a detrimental effect on the vessel's transverse stability. This situation would have been further complicated when water found its way in with the (fish) cargo.

In the seaway, the weight of the water shipped and retained on deck reduced the vessel's freeboard, and the starboard heel due to the lost paravane caused the water to shift to starboard, thus progressively increasing the vessel's heel.

Whenever there is a free surface due to an amount of liquid aboard a vessel, there is a loss of effective GM due to a virtual rise of the vessel's centre of gravity and a loss of transverse stability caused by the movement of liquid in partially filled compartments when the vessel rolls. This movement may involve a large shift of weight.

The effect of the wind and waves on the vessel, together with the free surface effect created as the fuel, lubricating oils and hydraulic and fresh water in tanks were depleted during the voyage, and the water shipped and retained on deck, all adversely affected the vessel's transverse stability. The loading arrangement of the catch and the seepage of sea water into the compartment facilitated the movement of the cargo to the detriment of the vessel's transverse stability.

2.4.1 Freeing Ports

The freeing ports aboard the "STRAITS PRIDE II" were similar to those, as sighted, aboard a sister ship and were arranged in the bulwarks on the weather deck.

It was not possible to establish the freeing port areas. The quantity and rate of water shipped on deck under the prevailing weather conditions were such that the freeing ports could not rapidly drain the water from the weather deck.

3.0 Conclusions

3.1 Findings

1. Following the initial broadcast of the storm warning and a reminder from the fishery inspector, the "STRAITS PRIDE II" did not seek shelter but continued to fish.
2. The port paravane of the vessel's stabilizer system was lost when its chain parted under stress during near-storm conditions.
3. There was no emergency means to release/jettison the remaining paravane.
4. When the port paravane was lost, the vessel heeled to starboard, thus reducing the vessel's freeboard on that side.
5. The extent to which the loss of the port paravane contributed to the accident could not be established nor could its detrimental effects be fully appreciated because of a lack of substantive information available on the subject.
6. The penning of the fish hold was such that it allowed fish in the hold to shift over the top of the boards to starboard, further aggravating the vessel's starboard list.
7. The depletion of tank liquids during the voyage created a free surface effect which adversely affected the vessel's transverse stability.
8. The weight of the water shipped and retained on deck reduced the vessel's freeboard and caused free surface effects that adversely affected the vessel's transverse stability.
9. The water shipped on deck found its way into the fish hold, facilitating movement of the fish to the detriment of the vessel's transverse stability.
10. The starboard list and downflooding progressed until the vessel lost all positive stability, capsized and sank.
11. The sudden capsizing of the vessel precluded safe abandonment.
12. Three of the crew of six who were thrown in the water did not manage to board the liferaft because it blew away from them, despite paddling attempts by its occupants.
13. Lack of waterproof thermal protection, the wind chill factor of the cold storm-force winds and the cold sea water temperature of 5°C severely limited the survival time for those in the water.
14. The floor of the liferaft was not inflated because its occupants were not fully knowledgeable in the use of such rafts.
15. Two of the victims died of hypothermia and the third died of drowning associated with hypothermia. The three survivors in the liferaft were suffering from mild hypothermia when rescued.

3.2 Causes

The vessel continued to fish after learning of a forecasted storm warning, and the combined effects of the weather, shipped seas, stowage of the catch, free surface effect of liquids, loss of the port paravane, and downflooding caused the vessel to capsize and sink by the stern.

4.0 Safety Action

4.1 Action Required

4.1.1 Marine Emergency Duties (MED) Training

In this abandonment, the survivors in the liferaft were not familiar with the liferaft equipment and its operation. The three survivors of the "STRAITS PRIDE II" were not aware that the floor of the liferaft, in which they spent about eight hours before being rescued, needed to be inflated to provide insulation from the frigid sea's surface and to improve the rigidity of the raft. Although one of them had experienced an abandonment, having survived the loss of another fishing vessel some eight months earlier, none of them had received formal MED training.

MED courses levels A1 and A2 cover life-saving equipment and survival techniques including inter alia, the proper inflation, repair and use of liferafts and their equipment. Some survival skills can be learned on the job. However, it is believed that certain other skills essential to survival can only be learned in a formal training environment such as a MED course.

At present, only certificated officers and crews are required to have MED training. Uncertificated crews are not required to receive such training. Currently, on fishing vessels of more than 100 gross registered tons (GRT), only the master is required to have certification. Approximately 98 per cent of Canadian commercial fishing vessels are less than 100 GRT and the majority of them are manned by uncertificated crews. However, Ship Safety Bulletin No. 10/88 recommended that all such crews complete MED level A1 training, and that such courses be taken as early as possible and in no case later than six months after first going to sea.

Between 1986 and 1991, 34 Canadian fishing vessels were recorded as being lost due to capsizing, foundering and sinking, involving abandonment. Having to abandon their vessels, 71 fishermen died in this same period. It is believed that the number of

such losses was exacerbated by a lack of understanding of safety considerations routinely covered in MED training.

There is no academic qualification or certification required for individuals to enter the high-risk fishing industry. In an emergency situation requiring prompt action, their lack of knowledge with respect to life-saving or fire-fighting techniques could be a hindrance and significantly reduce the crew members' chances of survival.

In view of the demonstrated vulnerability of fishing vessels to marine emergencies and the long history of loss of life associated with abandonment at sea, the Board recommends that:

The Department of Transport ensure that personnel who regularly crew closed-construction fishing vessels receive formal training in life-saving equipment and survival techniques.

M92-06

4.1.2 *Anti-exposure Worksuits*

The Royal Commission on the Ocean Ranger disaster recognized that the offshore of the east coast of Canada is one of the most hostile environments in the world. Average mid-winter sea surface temperatures offshore on the eastern seaboard and in the Gulf of St. Lawrence range from 0 to 2 degrees Celsius. The mid-summer range is from 8 to 16 degrees Celsius.

In the harsh marine environmental conditions off Canada's east coast, all personal life-saving equipment should incorporate both thermal protection and buoyancy. Although lifejackets meet rigid buoyancy standards and have the ability to turn an unconscious person in the water to a face-up position, they provide poor thermal protection. While the survival time for a person immersed in cold water and wearing a lifejacket is often measured in minutes, the survival time for a person wearing an anti-exposure worksuit could run to several hours; individuals clad in such suits have been rescued following 18 hours of immersion in cold water.

At the time of the accident, the "STRAITS PRIDE II" was not carrying any anti-exposure worksuits or survival suits aboard, nor is there a regulatory requirement to carry such suits aboard vessels of this size. However, Division 8 of the latest draft amendments to the *Small Fishing Vessel Safety Regulations* (SFVSR) proposes the carriage of one anti-exposure worksuit or immersion suit for each member of the crew complement. Consultation with the industry for implementation of this amendment is ongoing.

Recently, the coroner's report on the sinking of the fishing vessel "NADINE", in December 1990 in the Gulf of St. Lawrence, determined that the crew members did not know how to put on their survival suits and that some suits did not fit the bigger crew members; as a result, most of those aboard died quickly of hypothermia. Only the skipper managed to put on his survival suit, and he survived eight hours in icy waters.

Between 1986 and 1991, the four primary causes of loss of life in the Canadian fishing industry were: man overboard, foundering, capsizing and sinking. About 90 per cent of the fatalities involved vessels under 60 GRT—generally small fishing vessels. Foundering, capsizing and sinking usually result in crews having to abandon ship. Under such conditions, protection against hypothermia is an important aid to survival. The cause of death for two of the crew members of the "STRAITS PRIDE II" was determined to be hypothermia secondary to exposure to 2–4° C cold water; the three survivors also showed signs of hypothermia when rescued.

In view of the perennially high risk to Canadian fishermen of being in a survival situation in extremely hostile waters, the Board recommends that:

The Department of Transport expedite its revision of the *Small Fishing Vessel Safety Regulations* which will require the carriage of anti-exposure worksuits or survival suits by fishermen.

M92-07

4.1.3 Paravane-type Stabilizers

In this occurrence, the port paravane was lost and the downward force on the starboard paravane contributed to the vessel's starboard heel. Since the remaining paravane could not be released or jettisoned, the starboard heel continued to increase, resulting in downflooding of the vessel until she capsized and sank. Similar effects may be encountered if either of the paravanes breaks water or catches an obstruction such as a net, kelp, etc. At least one other Canadian fishing

vessel has capsized due partly to the loss of her starboard paravane stabilizer.

Although research and studies have been conducted on various configurations of paravanes as roll-damping devices, no formal studies or research materials could be found on the impact of paravane failure on vessel stability. At present, there is no standard for the design, performance, and installation of paravanes on Canadian fishing vessels. Hence, many fishing vessels across Canada have been operating with paravane stabilizers without the benefit of proper guidelines. (It is understood that the Canadian Coast Guard intends to require quick-release mechanisms aboard fishing vessels equipped with paravane stabilizers.)

In view of the widespread use of paravane stabilizers as a roll-damping device by Canadian fishing vessels with little knowledge of their inherent limitations and dangers, the Board recommends that:

The Department of Transport sponsor research on the dynamics and limitations of paravane stabilizers on fishing vessels with a view to developing adequate guidelines for fishermen on their design, performance, and installation.

M92-08

4.1.4 Freeing Ports

Any inability to adequately drain shipped seas off the deck will impair the stability of the vessel in two ways: higher centre of gravity and free surface effect. Although the area of freeing ports on the "STRAITS PRIDE II" was in accordance with the rules requirements, shipped water could not rapidly drain from the weather deck.

Since 1981, 28 fishing vessels and several lives have been lost at sea due to vessels being swamped. In many cases, after the loss, it was not possible to determine the effectiveness of the freeing ports in draining shipped water off the deck. However, it is suspected that inadequate drainage of shipped water

from the deck is often contributory to the loss. For example, in 1984, all three crewmen on the fishing vessel "STANLEY CLIPPER" died when the vessel turned over and sank after taking heavy seas on board. Inadequate freeing port areas were found to be causal to the sinking. The British Marine Accident Investigation Branch recently attributed the sinking of the fishing vessel "PREMIER" to overwhelming seas and recommended dissemination of information on freeing port areas.

In Canada, both the *Large Fishing Vessel Inspection Regulations* (LFVR) and the proposed SFVSR adequately stipulate the requirement for freeing ports. However, it is not uncommon to find freeing ports welded or bolted shut to prevent the catch or equipment from slipping through. Apparently, the crews do not realize the perilous effect of retained water on deck. Further, inappropriate stowage of fishing gear and equipment may hamper the rapid and effective freeing of shipped water from the deck even if the vessel is provided with freeing ports of adequate area.

In view of the criticality to vessel stability of maintaining adequate freeing port areas in heavy seas, and in view of the continuing occurrence record of vessels being swamped by seas, the Board recommends that:

The Department of Transport emphasize, through a safety awareness program for operators, officers and crews of fishing vessels, the effects of inadequate drainage of the decks on vessel seaworthiness.

M02-09

4.1.5 Portable Fish Hold Divisions

To control the movement of fish carried in bulk, every fishing vessel engaged in the carriage of herring or capelin in bulk is required by the LFVR to be fitted with both longitudinal and transverse portable fish hold divisions. Although it was not required by regulation, the "STRAITS PRIDE II" was fitted with portable aluminium fish hold divisions. Since longitudinal penboards on the "STRAITS PRIDE II"

could only be fitted up to the underside of the deck beams, the spaces between beams allowed fish to shift over the top of the penboards to starboard, further aggravating the list initially caused by the loss of a paravane.

Improper penning of the fish hold has resulted in the loss of several vessels. A 50 GRT fishing vessel, "CHIEF SEEGAY", listed and sank as a result of cargo shift over the penboards in 1975, and at least two Newfoundland fishing vessels capsized for the same reason in 1988.

Frequently, fishermen set the height of the penboards such that the catch can flow over into the adjacent pens. This practice of fish hold penning has become common on many fishing vessels in Newfoundland. Although this practice facilitates quick and easy loading, it can create excessive free surface effect, unless all holds are pressed up to maximum capacity. An analysis of past vessels lost indicates that few fishermen fully understand the free surface effect and fewer still appreciate the substantial loss of transverse stability which occurs when even a few centimetres of water are shipped and retained on deck.

Some pertinent guidelines on the arrangement and scantling of penboards are contained in the LFVR. However, the Board believes that few fishermen understand the free surface effect of fish in partially loaded pens and the grave consequences of cargo shift that can ensue from improper penning of fish holds. The Board therefore recommends that:

The Department of Transport, in collaboration with the fishing industry, implement a safety program to educate fishermen and fishing vessel operators about the potential dangers of shifting cargo due to improper penning.

M02-10

4.2 Safety Concern

4.2.1 Periodic Inspection of Liferrafts

The liferaft on the "STRAITS PRIDE II" functioned as intended. However, during the investigation, it was

discovered that this liferaft had last been inspected almost four years before the occurrence. The *Canada Shipping Act Life Saving Equipment Regulations* stipulate that inflatable liferafts must be tested annually.

Currently, fishing vessels over 150 GRT are inspected and Ship Inspection Certificates are issued on an annual basis. Since large fishing vessels are inspected yearly, vessel owners generally comply with the requirement for annual testing of liferafts. However, fishing vessels of less than 150 GRT are inspected and their Certificates of Inspection are re-issued quadrennially. Validity of such certificates is contingent upon the liferafts being serviced annually by accredited service personnel. However, since the vessels are inspected for certification every four years only, some small fishing vessel owners apparently ignore the annual servicing requirement for liferafts. Instead, they opt for quadrennial servicing of their liferafts to coincide with the issue of their vessel inspection certificates. Apparently, this practice by the fishermen has often been tolerated by the Canadian Coast Guard.

The Board is concerned that the practice followed by some small fishing vessel owners of not having inspections performed regularly may be prejudicial to safe abandonment.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson, John W. Stants, and members Gerald E. Bennett, Zita Brunet, the Hon. Wilfred DuPont and Hugh MacNeil, has authorized the release of this report.

Appendix A - Chart - Area of Occurrence

Appendix B - Typical Paravane-type Stabilizer Layout

*Appendix C - Marine Forecast Areas - Newfoundland
Weather Centre*

Appendix D - Photograph - "STRAITS PRIDE II"
- Typical Deck and Penboard Arrangement
in *Way of the Fish Hold*

Appendix E - Glossary

BHP	brake horsepower
C	Celsius
CCG	Canadian Coast Guard
cm	centimetre(s)
CSA	<i>Canada Shipping Act</i>
F.V.	fishing vessel
'fish'	Delta wing shaped devices towed from the ends of booms, one on each side of the vessel, used to dampen/ reduce the roll motion of a vessel.
free surface and its effect	Whenever there is a surface of liquid which is free to move, there is a loss of effective GM due to a virtual rise of the vessel's centre of gravity and the loss of stability caused by the movement of liquid in partially filled compartments/ tanks when the vessel rolls. This movement may involve a large shift of weight.
GM	The distance between the transverse metacentre and vertical centre of gravity, and an indication of a vessel's ability to right herself when heeled over.
GRT	gross registered ton(s)
IMO	International Maritime Organization
kg	kilogram(s)
L/s	litre(s) per second
lat	latitude
LFMR	<i>Large Fishing Vessel Inspection Regulations</i>
long	longitude
m	metre(s)
MAYDAYRELAY	Relay of a distress signal to other vessels.
MED	Marine Emergency Duties
N	north
NST	Newfoundland Standard Time
R/T	radio telephone
SAR	Search and Rescue
scuttle	A small opening cut through a hatchway, deck or bulkhead to provide access for loading fish and provided with a metal cover that can be secured watertight.
SFVSR	<i>Small Fishing Vessel Safety Regulations</i>
SI	International System (of units)
SITREP	situation report

SSB	Single Side Band
stability	Vessel's ability to remain on an even keel.
SW	south-west
TSB	Transportation Safety Board of Canada
UTC	Coordinated Universal Time
VHF	very high frequency
VON	call sign of the St. John's Coast Guard Radio Station
W	west
°	degree(s)
'	minute(s)