

MARINE OCCURRENCE REPORT

SINKING

**FISHING VESSEL "HILI-KUM"
HECATE STRAIT, BRITISH COLUMBIA
10 APRIL 1995**

REPORT NUMBER M95W0013

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- reporting publicly on its investigations and public inquiries and on the related findings;
- identifying safety deficiencies as evidenced by transportation occurrences;
- making recommendations designed to eliminate or reduce any such safety deficiencies; and
- conducting special studies and special investigations on transportation safety matters.

It is not the function of the Board to assign fault or determine civil or criminal liability.

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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 Occurrence Report

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Fishing Vessel "HILI-KUM"
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Synopsis

The "HILI-KUM" departed from an anchorage off Moresby Island, B.C., with a cargo of red urchins for discharge at Port Edward, B.C. En route, the weather deteriorated. On 10 April 1995, in following gale- to storm-force winds and rough seas, the vessel shipped large volumes of water on the afterdeck, settled by the stern, and sank stern first. The three crew members donned immersion suits, abandoned the vessel, and boarded a liferaft. Two of the three immersion suits were defective, and the liferaft capsized several times. Two of the crew succumbed to hypothermia and drowned; the survivor was rescued some five and a half hours later.

The Board determined that the "HILI-KUM" proceeded to sea despite a storm warning broadcast, and was being operated in following high winds and rough seas with the fish hold hatch cover not battened down. The cumulative effect of large volumes of seawater shipped on the afterdeck, the vessel's low freeboard aft, and the flooding/downflooding of the below-deck spaces aft caused the vessel to settle by the stern, lose reserve buoyancy, and sink stern first. The hypothermia and subsequent drowning of two of the crew is attributable to the poor state of repair of their immersion suits and to their exposure to the harsh weather conditions when the liferaft capsized.

Ce rapport est également disponible en français.

Table of Contents

	Page
1.0 Factual Information	1
1.1 Particulars of the Vessel	1
1.1.1 Description of the Vessel	1
1.2 History of the Voyage	2
1.3 Search and Rescue	3
1.4 Injuries to Persons	3
1.5 Vessel Certification	4
1.6 Personnel Certification and Training	4
1.6.1 Personnel History	4
1.7 Stability Requirement	4
1.7.1 Recent History of Vessel's Flooding	5
1.7.2 History of Repairs	5
1.8 Fish Hold Lining and Drainage	6
1.9 Hatch Securing Arrangement	6
1.9.1 Watertight Opening and Hull	6
1.10 Bilge Pumps	6
1.11 Loading Arrangement	6
1.12 Weather Information	7
1.12.1 Forecast	7
1.12.2 Weather Recorded	7
1.13 Risk-taking	7
1.13.1 Risk Assessment	8
1.13.2 Decision to Sail	8
1.14 Life-saving Equipment	8
1.14.1 Inflatable Liferaft	9
1.14.2 Immersion Suits - Regulatory Requirement	10
1.14.2.1 History of the Immersion Suits	10
1.14.3 Assessment of the Life-saving Appliances by the Department of National Defence (DND)	11
1.14.4 Survival Skills and Marine Emergency Duties (MED) Training	11
1.15 Distress Signals	12

2.0	Analysis	13
2.1	Ingress of Water	13
2.2	Circumstances Leading to the Sinking	13
2.3	Inflatable Liferaft and Safety	13
2.3.1	MED Training and Survival	14
2.4	Immersion Suit and Safety	15
2.5	Reason for the Distress Signals not Being Sighted	15
2.6	Action by the Regulatory Authorities	15
3.0	Conclusions	17
3.1	Findings	17
3.2	Causes	19
4.0	Safety Action	21
4.1	Action Required	21
4.1.1	Periodic Inspection of Liferafts	21
5.0	Appendices	
	Appendix A - Photographs	23
	Appendix B - Sketch of the Area of the Occurrence	25
	Appendix C - Liferaft Inflation Equipment	27
	Appendix D - Glossary	29

1.0 *Factual Information*

1.1 *Particulars of the Vessel*

"HILI-KUM"	
Official Number	171778
Port of Registry	Victoria, B.C. ¹
Flag	Canadian
Type	Packer
Gross Tons ²	44
Length	14.2 m
Crew	3
Built	1939, Alert Bay, B.C.
Propulsion	One eight-cylinder diesel engine, 235 BHP, driving a fixed-pitch propeller
Owner	Mr. Robert Cook Port Hardy, B.C.

1.1.1 *Description of the Vessel*

The wooden fishing vessel "HILI-KUM" was carvel built and of closed construction. The hull was divided into three watertight compartments by transverse bulkheads located at the forward and the after end of the fish hold. The accommodation/wheel-house was situated forward of amidships and included the galley, skipper's stateroom, and head. The crew accommodation in the forecabin was accessed through the engine-room. The general work area was aft. The vessel was utilized as a packer at the time of the occurrence. Aft of the accommodation, there was a fish hold and a lazaret. Access to the lazaret was by way of a watertight deck scuttle installed flush on the main deck. The lazaret was fitted with a pipe to drain water directly into the shaft space bilge.

1.2 *History of the Voyage*

After hull repairs were completed, the "HILI-KUM" departed Shearwater, B.C., on 08 April 1995. Later

¹ See Glossary for all abbreviations and acronyms.

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

that day, the vessel arrived and anchored in a small unnamed cove near Hot Springs, Moresby Island.

The following day, the vessel loaded about 14,000 kg of red urchins in the hold and on the afterdeck and was moderately trimmed by the stern. She departed anchorage at about 2200³ for Port Edward with the stabilizers deployed. The weather and sea conditions were described as poor, with south-easterly winds at 35 knots (kn) gusting to 45 kn and 2 to 3 m seas.

By 0125, the winds had increased to 45 kn gusting to 50 kn, and seas of up to 7 m were recorded. The vessel was heading on a course of 350° magnetic (M) and shipping large volumes of seawater on the afterdeck.

The crew observed a change in the vessel's motion and realized that the stern was settling deeper into the water. The skipper reportedly switched on the electric bilge pumps from the bridge and sent the cook/deck-hand (hereinafter referred to as the cook) to the engine-room to retrieve the immersion suits. When the cook entered the engine-room, no water was visible in the bilge.

The cook picked up three immersion suits. He donned one while the skipper and the deck-hand donned the others. The zipper to the cook's suit was functional, but the zippers to the two other suits were defective.

The cook transmitted a MAYDAY message at 0128 on channel 16 of the very high frequency radiotelephone (VHF R/T) advising the Marine Communications and Traffic Services (MCTS) Centre at Prince Rupert that the vessel was taking on water by the stern about 20 miles east-south-east (ESE) of Sandspit.

The skipper and the deck-hand climbed up on the cabin roof and lowered the inflatable liferaft on to the foredeck. By this time, the vessel's stern was awash.

At about 0152, the skipper advised the MCTS Centre that his crew and he were abandoning the vessel into a six-person inflatable liferaft, and he shut down the main engine. The cook and the deck-hand picked up some ship's handheld distress signals and proceeded to the liferaft. The skipper pulled on the painter to inflate the liferaft, but he had to tug on it several times before the liferaft inflated.

The crew launched the liferaft and all hands abandoned the vessel into the water. They climbed into the liferaft and cut the painter, and the liferaft drifted away. Some five minutes later, at about 0230, the "HILI-KUM" sank stern first.

Some time later, the liferaft capsized and the crew crawled out of the canopy, and climbed on to the overturned liferaft. The skipper and deck-hand did not know how to turn it over, but the cook, who had received survival training, was able to right the liferaft single-handedly. He then boarded the liferaft and proceeded to assist the others, but they were unable to hold on to the lifeline, and the liferaft

³ All times are PDT (Coordinated Universal Time (UTC) minus seven hours) unless otherwise stated.

drifted away in the strong winds.

1.3 *Search and Rescue*

Upon receipt of the MAYDAY message, the MCTS Centre notified the Rescue Coordination Centre (RCC) Victoria, setting in motion an official search and rescue (SAR) response. A total of nine air units and six surface units were tasked.

Throughout the night, the cook periodically saw the searchlights of surface units approaching the liferaft, but his attempts to attract attention using handheld flares were unsuccessful. The liferaft capsized several times throughout the night, but each time the cook was able to right the raft and reboard it. He was rescued by the United States Rescue Helicopter "6021" at 0815, 10 April 1995, and transported to the Queen Charlotte City Hospital.

The search continued and the body of the skipper was recovered still wearing an immersion suit. SAR units recovered an identical suit in the area some time later. However, the deck-hand was not found.

1.4 *Injuries to Persons*

	Crew	Passengers	Others	Total
Fatal	1	-	-	1
Missing	1	-	-	1
Serious	-	-	-	-
Minor/None	1	-	-	1
Total	3	-	-	3

When rescued, the survivor was suffering from exhaustion and hypothermia, and had sustained a broken nose, and minor neck and back injuries. He was taken to a hospital, treated, and later released.

An autopsy determined that the skipper had succumbed to hypothermia and drowned. The deck-hand is still missing and is presumed drowned.

1.5 *Vessel Certification*

The then Ship Safety Branch of Transport Canada (TC), now TC Marine Safety, had inspected the "HILI-KUM" in March 1992 and issued a Ship Inspection Certificate (SIC 29) valid for a full term and due to expire in March 1996. The certificate limited the operation of the vessel to Home-trade, class III voyages not more than 20 miles offshore.

At the time of the last inspection, the attending inspector had not been informed by the owners or their

representative that the vessel leaked and that the float-operated automatic bilge pumps were in almost constant use when the vessel was operating in rough seas.

1.6 Personnel Certification and Training

Crew certification is not required on fishing vessels of less than 100 tons gross tonnage such as the "HILI-KUM". None of the crew was certificated.

There is at present no regulatory requirement for uncertificated crews of fishing vessels to undergo Marine Emergency Duties (MED) training. The program provides training in life-saving, abandonment, fire-fighting, and first aid with the use of appropriate equipment. The cook had taken survival training in the Canadian Navy; the other crew members were not knowledgeable in emergency procedures, nor had they undergone MED training. Further, no emergency drills had been conducted on the "HILI-KUM".

1.6.1 Personnel History

The skipper had 25 years' experience in the fishing industry. He had been an owner/operator of trollers and gillnetters for many years. He had leased the "HILI-KUM" in January 1995.

The cook had been engaged in the fishing industry since 1992. This was his first trip on the "HILI-KUM".

The missing deck-hand was an experienced fisherman who had fished with the skipper for a number of years. He had joined this vessel in 1995.

1.7 Stability Requirement

The "HILI-KUM" had not been inclined and no stability data had been generated. There was no regulatory requirement for such data. No stability data was available from any source to permit stability analysis nor were the vessel's plans available. The vessel had been in service since 1939, and there is no information to suggest that her stability was questionable.

1.7.1 Recent History of Vessel's Flooding

There is conflicting information with respect to the condition of the vessel's deck and hull. According to a shipyard where work was carried out in January 1995, the hull was in need of caulking and refastening, and the afterdeck was in need of replacement.

A deck-hand who joined the vessel in February 1995 reported that the overall condition of the "HILI-KUM" was poor: the deck leaked, the bulwarks were loose, and there was a leak in the hull that could not be located.

In early March 1995, the vessel experienced severe flooding problems while alongside the dock at Port Edward. The skipper awoke to find that about 30 cm of water had accumulated in the engine-room bilge. The water was pumped out, but, reportedly, the source of the ingress could not be located.

On 19 March 1995, the vessel experienced flooding problems off Banks Island, B.C., and additional pumps had to be placed on board to pump out the water. Following that incident, the vessel was dry-docked at another shipyard and the deck seams were filled and payed with "boatlife". When the vessel was refloated, the only leak observed was the one in way of the shaft which had been there historically. At this time, a float-operated bilge pump was installed in the shaft tunnel.

The cause of the historical leak in the vicinity of the shaft was never established and, consequently, was never addressed.

1.7.2 History of Repairs

Reportedly, carrying urchins on deck had scraped the paint and caused superficial damage to the deck caulking. The owners had contemplated fibre-glassing the deck as a means to resolve the problem.

The repairs to the vessel included the following:

- 1978 Forefoot and hull planks repaired.
- 1982 Hull completely caulked and motors replaced.
- 1992 Twelve planks including false keel replaced (Ship Inspection), hull recaulked, and keel cooler pipes repaired.
- 1995 Stern bearing renewed; rudder, shaft and propeller replaced; deck recaulked; and hull refastened and recaulked as necessary.

The owners did not notify TC Marine Safety of the 1995 repairs. The regulatory authority was made aware of the vessel's flooding. The manager of the Cove Island Boatworks reportedly brought the vessel's inferior condition to the attention of a TC Marine Surveyor; however, there is no record of this report at TC Marine Safety nor does the surveyor have any recollection of such information. No inspection of the vessel was carried out.

1.8 Fish Hold Lining and Drainage

In May 1993, the hold of the "HILI-KUM" was divided longitudinally and converted to two insulated fibre-glassed compartments to meet the requirements of the *Fisheries Inspection Act*. To remove any excess water from the holds, a pump in the engine-room had to be manually activated from either the engine-room or the afterdeck.

1.9 Hatch Securing Arrangement

The hatch securing arrangement comprised a custom-made cover with steel bars and wooden wedges to batten down the hold. In this instance, two sheets of plywood were used to cover the hatch; the hatch cover was not used, and the hold was not battened down.

1.9.1 Watertight Opening and Hull

Any breach in the watertight integrity of the hull vitally affects the seaworthiness of the vessel and, consequently, the safety of the crew. Despite Ship Safety Bulletins Nos. 1/83, 4/87 and 16/92, the practice of keeping watertight openings unsecured when not in use continues. The Board, concerned with this practice, previously recommended that the Department of Transport develop and implement measures to ensure that effective training and procedures are in place to preserve the watertight integrity of the hull⁴.

1.10 Bilge Pumps

The vessel was fitted with seven pumps capable of pumping the bilges, three of which were automatically activated. Of the seven pumps, two were hydraulic, three electrical, one gasoline-driven, and one manual.

1.11 Loading Arrangement

The vessel loaded about 5,400 kg of urchins in the hold, and about 8,600 kg on the afterdeck. The urchins were carried in mesh bags, each weighing between 90 kg and 225 kg. Two tiers of urchins were stowed in the fish holds, with a sheet of plywood separating them; the top tier was covered with a nylon tarpaulin to keep fresh water off.

⁴ Recommendation M93-01 from TSB Report No. M93M4004 on the "CAPE ASPY".

Urchins were then loaded on the afterdeck, starting at the aftermost end (working forward) and extending up to the middle of the hatch cover. They were stowed to a height of about 1.8 m and covered with nylon tarpaulins which were secured to the vessel's rail.

The skipper was aware that a storm warning was in effect for the area and decided to leave an additional 4,500 kg of urchins behind.

1.12 Weather Information

1.12.1 Forecast

The marine weather forecast issued by the Pacific Weather Centre of Environment Canada for the area called for south-easterly gales as early as 1745 on 08 April 1995. Gale warnings were first issued at 0545, 09 April and upgraded to storm warnings at 1745. South-easterly winds of 40 kn to storm-force 50 kn, with seas of up to 6 m, were forecast. Stronger winds of 55 kn were forecast for 10 April.

1.12.2 Weather Recorded

The weather recorded by recording stations is consistent with that encountered by the vessel. At 1800 on 09 April, the Sandspit Airport recorded south-easterly winds of 20 kn, which increased to gales of 34 kn at 2230, and then peaked to gales of 46 kn with gusts of up to 60 kn at 0318 on 10 April.

The Environment Canada buoy (46183) located 32 miles north-east of Sandspit measured wave heights of 1 m at 1700 on 09 April, which gradually increased to 2.5 m by 0130 on 10 April, and rose to 6.2 m by 0928 on 10 April.

During SAR operations, the Department of Fisheries and Oceans vessel "TANU" recorded seas of up to 15 m and wind speeds of up to 70 kn.

1.13 Risk-taking

Fishing, in general, is a high-risk occupation, and the traditional attitude of the fishermen is to accept the risks involved⁵. Threats posed by the hostile environment are often down-played. In this instance, the skipper, who was under financial pressure, proceeded from anchorage despite a forecast of bad weather conditions and without battening down the hatches.

1.13.1 Risk Assessment

When people successfully perform a risky act on-the-job, they often change their attitude or opinion about the personal risk involved. They tend to discount the risk and come to believe that the activity is

⁵ Study by the Coast Guard Working Group on Fishing Vessel Safety.

not risky, or they tend to develop a sense of their own invulnerability. The more often they are successful at the dangerous act, the more likely they are to believe that, although the practice may be dangerous in a general sense, nothing bad will happen to them. This attitude can lead them to repeat the act, and a vicious circle can be set up. The more often they do it, the more they feel justified in their sense of invulnerability. The more comfortable they become with the sense of invulnerability, the more likely they are to reduce the safety margin and engage in riskier behaviour.⁶ It is ironic that, as the subjective evaluation of personal risk decreases, the odds of an accident happening are actually increasing.

1.13.2 *Decision to Sail*

Sea urchins are a perishable product, and it is the skipper's responsibility to ensure that they reach the processing area in good condition and as quickly as possible.

The "HILI-KUM" was smaller than the other urchin packers operating in the area. The vessel, therefore, had to make three trips to the other vessels' two to receive a fair share of the product.

The skipper was under financial pressure to pay his crew and the vessel owners. He had fallen behind in payments on a loan co-signed by his father.

The skipper had leased the boat since December 1994. He was known as a producer and often sailed in poor weather when other skippers remained in port. Although aware of the bad weather forecast, he elected to sail.

The owners were in the process of obtaining a larger, more modern packer for the skipper to operate.

1.14 *Life-saving Equipment*

The life-saving equipment on the "HILI-KUM" included six lifejackets, a six-person inflatable liferaft, and three immersion suits.

1.14.1 *Inflatable Liferaft*

Liferaft Servicing Requirement

The inflatable liferaft is required to be serviced annually by an accredited service depot. The validity of the SIC 29 issued to the "HILI-KUM" was contingent upon meeting this requirement. The onus is on the owners to ensure that the required servicing is carried out. TC Marine Safety has no regime in place

⁶ Taylor, S.E., and Brown, J.D. "Illusion and Well-Being: A Social Psychological Perspective on Mental Health." *Psychological Bulletin*, 1988. 103, 193-210.

to ensure that liferafts do undergo the mandatory annual servicing.

Servicing History of the Liferaft

The six-person, SOLAS "B"-type liferaft was manufactured by Beaufort (Air-Sea) Equipment Ltd. in the United Kingdom in October 1973. A perusal of the liferaft log shows that, during the 23 years' service of the liferaft, it had been serviced five times: in May 1978, July 1983, June 1988, August 1989, and February 1992; the last three servicings were in the presence of a ship inspector from TC Marine Safety.

Requirement for Compliance with Canadian Standards

In 1973, there was no liferaft manufacturing facility in Canada. Hence, all liferafts in use were imported. Only liferafts manufactured on or after 01 July 1986 are required to comply with the new standards, which call for larger-size water pockets. Those manufactured prior to that date were permitted to remain in service until scrapped, as long as they met the original standards. There is no requirement for subsequent stability tests, and no maximum limit is set for a liferaft to remain in service. The water pockets on the liferaft in use were smaller than those required by the current standards.

Capsizing of the Liferaft

The liferaft, which was fitted with small water pockets, capsized about a dozen times. Reportedly, the tendency for the liferaft to capsize diminished somewhat when the single occupant was positioned away from the door toward the centre of the liferaft. The cook single-handedly righted the liferaft several times, and was exhausted by the time he was rescued.

Inflation of the Liferaft

The regulatory minimum length of the liferaft painter is 15 m, and some manufacturers use a minimum length in excess of this requirement. The inboard end of the painter is connected to the pull/operating cable which activates the (non-toxic) gas cylinder, which inflates the liferaft. The whole length of the painter has to be hauled out of the canister before the liferaft can be inflated. In this instance, the liferaft was inflated on the foredeck. The skipper, after hauling the long length of the painter, had to give several hard tugs before the inflation process commenced. The survivor expressed dissatisfaction about the time required to haul the length of the painter.

Crew Knowledge and Training

Neither the skipper nor the deck-hand knew how to right the capsized liferaft. Further, the crew did not inflate the floor of the liferaft, and they did not close the entrance cover to provide insulation from the cold as they were fearful of becoming trapped within the liferaft when it capsized repeatedly.

1.14.2 Immersion Suits - Regulatory Requirement

There is no mandatory requirement for vessels of this size and type to carry immersion suits under the regulations made pursuant to the *Canada Shipping Act*. However, the *Workers' Compensation Act of British Columbia, Fishing Operations Regulations* which came into effect 01 January 1995 stipulate, under Section 31(1), that "every fishing vessel must carry, for each crew member, one immersion suit meeting standards acceptable to the Board."

The skipper carried three immersion suits for his crew, all of which were stowed in the engine-room.

1.14.2.1 History of the Immersion Suits

The date of manufacture of the immersion suits could not be established. The skipper of the "HILI-KUM" owned three immersion suits, which he had purchased in April 1978 for use on the fishing vessel "ROGERS PASS". That vessel sank in November 1978 in Zeballos, B.C., with the immersion suits on board. The suits were not recovered until the vessel was salvaged in April 1979. It could not be confirmed if any maintenance had been done on the immersion suits after they were recovered. When the "HILI-KUM" was leased, the skipper took two of these suits and one immersion suit, with the name "RAMPANT" stencilled across the back, on board. This last suit, he had borrowed from a friend.

1.14.3 *Assessment of the Life-saving Appliances by the Department of National Defence (DND)*

Inflatable Liferaft

After the occurrence, the liferaft was visually inspected prior to inflation testing, and the findings drawn included the following:

- the canopy half section was pulled away from a glued seam;
- the interior light was unserviceable, possibly due to the cable run being damaged;
- some canopy entrance door fasteners were missing;
- the canopy exterior coating was delaminating and sticky, and some righting straps were missing;
- the conduit for the firing cable was kinked some three inches from the body. A straight pull proved difficult, but was easier by the third tug, suggesting the presence of salt crystals or corrosion under the firing head disk.

Immersion Suits

Post-occurrence inspection of the three immersion suits revealed that:

- the suit worn by the survivor was in good condition and appeared to be of newer construction than the other two suits, which were in fair condition;
- the zippers on the two victims' suits were unserviceable. On one of them, the slider assembly was separated from one side, frozen in the up position, and missing numerous teeth. The corrosion found on the sliders and zippers of those two suits is consistent with exposure to salt water and lack of lubrication or maintenance;
- all suits exceeded the buoyancy test requirements set forth in the standards⁷.

1.14.4 *Survival Skills and Marine Emergency Duties (MED) Training*

The Board, concerned that the lack of knowledge and skills regarding life-saving equipment and survival techniques on fishing vessels reduces the fishermen's chances of survival in emergency situations, has recommended that the Department of Transport ensure that fishermen receive formal training in life-saving equipment and survival techniques⁸. TC Marine Safety has been consulting with the fishing industry to reduce to 15 gross tons the tonnage for fishing vessels required to have a certificated master, and it is envisaged that certificated masters of fishing vessels will receive MED training. However, crews, in general, will not be required to acquire survival skills.

1.15 *Distress Signals*

⁷ National Standards of Canada - *Marine Abandonment Immersion Suit Standards*.

⁸ Recommendation M92-06 from TSB Report No. M90N5017 on the "STRAITS PRIDE II".

When the crew sighted the searchlight of a vessel at about 0315, they activated two of the distress signals from the "HILI-KUM" within a period of about 10 minutes, but the signals went unnoticed. The remaining distress signals that had been brought aboard the liferaft were lost overboard when the liferaft capsized.

Some time later, the cook, by then the lone occupant of the liferaft, saw the searchlight of a vessel. He activated three of the six handheld flares from the liferaft kit, but they too went unnoticed. The remaining liferaft distress signals were lost overboard in subsequent liferaft capsizings.

2.0 *Analysis*

2.1 *Ingress of Water*

The sinking of the vessel precluded any structural examination and, consequently, the precise condition of the hull and deck at the time of the accident cannot be established. However, the survivor reported seeing some water leaking into the forward accommodation. It is not unusual for the seams of a 45-year-old wooden fishing vessel to experience some leakage due to working in a seaway. Further, given the vessel's history of shaft space flooding, it is likely that she was already experiencing some leakage. The fact that the vessel sank stern first and the engine-room bilge was reportedly dry would suggest that the leakage and accumulation of seawater was principally aft, in the lazaret and/or shaft space.

2.2 *Circumstances Leading to the Sinking*

As the vessel was operating in following winds of up to 50 kn and quartering seas of up to 6 m, large volumes of seawater were shipped on the afterdeck. The vessel was fitted with railings on the afterdeck which would allow water to rapidly drain off overboard. However, the shipped seas were such that a varying volume of seawater was continually on the afterdeck.

The weight of the seawater would further aggravate the situation, progressively decreasing the vessel's already low after freeboard, causing the vessel to settle more by the stern. Because the custom-designed fish hold hatch covers were not used and the temporary plywood infill hatch cover was not battened down, shipped seawater most likely downflooded into the hold. The retention of shipped seas on deck and the downflooding led to progressive flooding, loss of reserve buoyancy, and the vessel sinking stern first.

2.3 *Inflatable Liferaft and Safety*

Inflation of the Liferaft on Deck

It is not known why the skipper inflated the liferaft on deck. This procedure was unsafe inasmuch as it left the liferaft vulnerable to damage. In this instance, however, it was fortuitous that the liferaft was inflated on deck because the conduit for the firing cable was kinked and several hard tugs on the painter were required to initiate inflation. Overcoming the difficulties associated with inflating the liferaft would have been much more difficult for the crew in the water.

Method of Inflating the Liferaft

Instances are on record where crew members have found themselves in the water without lifejackets before the liferaft could be launched or inflated. During abandonment, the cumulative effect of the anxiety resulting from the situation and the loss of valuable time associated with hauling the length of the painter to inflate the liferaft may decrease the survival time of a non-swimmer. The survivor expressed dissatisfaction regarding the time it took to haul on the long length of painter. An alternative and/or supplementary method of activating inflation of the liferaft, as is currently fitted on some liferafts, can prevent loss of valuable time and maximize the chances of survival of personnel.

Issues Respecting the Capsizing of the Liferaft

As the liferaft was fitted with small water pockets, it was more prone to capsizing in high winds and rough seas than liferafts fitted with larger water pockets. Although the new standards call for larger-size water pockets to enhance stability, existing liferafts were not required to be upgraded to meet the Canadian standards when these were introduced. The safety of personnel using older liferafts may be compromised because no limitation is placed on the life expectancy of liferafts and because vessels still carry liferafts which were manufactured before the new standards came into force.

As the purpose of the entrance cover is to protect the liferaft occupants against the elements, it is imperative that the cover be closed. However, the liferaft capsized frequently, and the lone survivor was fearful of being trapped within the liferaft. Consequently, he had little option but to keep the liferaft entrance open to the detriment of his chances of survival. His exposure to the adverse weather conditions, in conjunction with the non-inflated liferaft floor, could account for the lone survivor's hypothermic condition when rescued some five and a half hours later. The cook's survival can be attributed to his immersion suit functioning satisfactorily.

2.3.1 MED Training and Survival

Only the cook, who had undergone survival training, survived; the other two crew members, who had neither MED training nor survival training, did not. Although the cook's immersion suit was the only one in which the zipper functioned satisfactorily, his survival, nonetheless, can be attributed in great part to the survival training he had received--he was able to right the liferaft single-handedly a dozen times, and therefore could be sheltered partially from the elements.

This occurrence once again highlights the need for MED training which includes survival techniques.

2.4 Immersion Suit and Safety

The chances of survival of crews are increased by the carriage and wearing of survival suits. The *Workers' Compensation Act of British Columbia* requirement for the carriage of these suits, which extends beyond the requirements of TC Marine Safety, initiated a new practice among B.C. fishermen, that of

taking personally owned immersion suits with them from vessel to vessel. This has created a problem in monitoring the maintenance of the suits, as they are moved from one vessel to another. The onus is on the skipper to ensure that the immersion suits are maintained in good working order. Because the suits are for use in emergency situations, and because there is no requirement for either servicing of the suits or for the crew to be trained in their care and maintenance, instances are on record where the suits have malfunctioned with tragic consequences.

2.5 *Reason for the Distress Signals not Being Sighted*

As the crew in the liferaft launched distress signals but these were not sighted by the rescue vessels, the following factors must be taken into consideration:

- the rescue vessels were operating in winds of up to 70 kn and seas of up to 15 m; they were subjected to heavy rolling and pitching; and they were shipping heavy seas and sprays;
- there were white foam patches on the seas;
- the height of eye above sea level of the crews on the rescue vessels was low; and
- the liferaft was at sea level and subjected to motion in high waves.

The above factors would have substantially reduced the visibility from the bridge of the rescue vessels, and might account for the handheld flares not being sighted.

2.6 *Action by the Regulatory Authorities*

Although liferaft servicing is required annually, TC Marine Safety has no regime in place to monitor compliance with the regulations in the interval between the required quadrennial inspections of the vessel. Despite the fact that TC Marine Safety was present at the last three liferaft inspections and that liferaft service records were available which would have indicated that the annual servicing of the liferaft had not been carried out, no corrective measure was taken to have the owners comply with the requirements.

3.0 *Conclusions*

3.1 *Findings*

1. The skipper was aware that a storm warning was in effect for the area to be transited, but he elected to depart from port to complete the passage.
2. The decision to sail was, in part, attributable to financial pressures on the skipper and the complacency associated with risk-taking.
3. The "HILI-KUM" was operating in following gale- to storm-force winds and rough seas and was shipping large volumes of seawater on the afterdeck.
4. The weight of the shipped seawater progressively decreased the vessel's already low after freeboard and caused the vessel to settle by the stern.
5. The custom-designed hatch securing arrangement was not used; instead, plywood was used to cover the fish hold on the afterdeck.
6. The seawater accumulated on the afterdeck gained access to the fish hold by way of the non-watertight hatch closure.
7. Some seawater gained access to the below-deck spaces through the deck and hull seams.
8. The cause of the historical leak in the vicinity of the shaft was never established.
9. The retention of shipped seas and downflooding of the fish hold and below-deck spaces led to progressive flooding, loss of reserve buoyancy and the vessel sinking stern first.

Ship Inspection

10. Transport Canada (TC) Marine Safety was aware of the vessel's flooding, but did not inspect the vessel because it had not been notified of the 1995 repairs.
11. The validity of Ship Inspection Certificates is contingent upon the liferafts being serviced annually, but TC Marine Safety has no regime in place to monitor compliance.

Inflatable Liferaft

12. The liferaft was made vulnerable to damage by being inflated on the foredeck.
13. Valuable time was lost and difficulties were encountered in inflating the liferaft due to the length of the painter and the kink in the conduit for the firing cable.
14. The 23-year-old liferaft carried on the vessel was fitted with small water pockets and was more prone to capsizing than more recent models of liferaft.
15. A grandfather clause allows vessels to carry such liferafts.
16. The cook single-handedly righted the liferaft, which capsized about a dozen times.
17. The liferaft entrance cover was, of necessity, left open, thereby depriving the survivor of protection against the harsh conditions.
18. The open entrance cover, the non-inflation of the liferaft floor, and frequent submersion of the survivor in seawater contributed to his hypothermic condition when he was rescued.

Distress Signals

19. The distress signals activated by the occupants of the liferaft went unnoticed, and some of the signals were lost overboard when the liferaft capsized.
20. The survivor's ability to attract the attention of the rescue vessels was hampered when distress signals were lost overboard.

Immersion Suits

21. The new practice of individuals carrying their own immersion suits from vessel to vessel has created a problem in monitoring the maintenance of these suits.
22. The immersion suits, which are required to be used in an emergency, were stowed in the engine-room and not in a conveniently accessible location.
23. Two of the three immersion suits previously had been submerged in salt water for some time, and their zippers were corroded and unserviceable.
24. The immersion suits worn by the victims provided very little thermal protection.
25. Neither the vessel nor the owners had any regime in place to ensure that the immersion suits

were maintained in good order.

Survival and Training

26. The cook, the only crew member who had undergone survival training, survived; the other two did not.
27. There is no regulatory requirement for the crew of fishing vessels of this size and type to undergo Marine Emergency Duties (MED) training.
28. The cook's survival can be attributed to the donning and the proper functioning of the immersion suit and to his survival training.

3.2 *Causes*

The "HILI-KUM" proceeded to sea despite a storm warning broadcast, and was being operated in following high winds and rough seas with the fish hold hatch cover not battened down. The cumulative effect of large volumes of seawater shipped on the afterdeck, the vessel's low freeboard aft, and the flooding/downflooding of the below-deck spaces aft caused the vessel to settle by the stern, lose reserve buoyancy, and sink stern first. The hypothermia and subsequent drowning of two of the crew is attributable to the poor state of repair of their immersion suits and to their exposure to the harsh weather conditions when the liferaft capsized.

4.0 *Safety Action*

4.1 *Action Required*

4.1.1 *Periodic Inspection of Liferrafts*

Crew survival in emergency situations at sea depends to a large extent on the capability, reliability, and availability of survival equipment. Thus, the Life Saving Equipment Regulations require that inflatable liferafts on all vessels, including fishing vessels, be inspected and serviced annually. At present, there is no regime in place to ensure that liferafts receive the mandatory servicing.

As revealed by the investigation into this occurrence, the liferaft on-board the "HILI-KUM" had not been inspected annually by a technician from an accredited service depot nor had this fact been monitored by Transport Canada (TC). This is not an isolated instance of non-compliance with the Life Saving Equipment Regulations. The Board previously expressed concern that the requirement to have liferafts serviced annually is frequently ignored and that the practice of many fishermen to have their liferafts tested only during the vessel's quadrennial inspection apparently is often tolerated by the regulatory authorities⁹. Failure to perform the annual servicing may simply be an oversight because liferaft and vessel inspection cycles do not match, or it may be a result of owners/operators not viewing the liferaft inspection as being as necessary as repairs to the vessel or equipment required for day-to-day operations. The Board believes that failure to service liferafts annually permits defects to go undetected and uncorrected, thereby unnecessarily jeopardizing the crews' chances of survival in emergency situations at sea. Therefore, the Board recommends that:

The Department of Transport implement procedures to verify that liferafts on all vessels including fishing vessels are serviced as required by the Life Saving Equipment Regulations.

M97-01

The design of the 23-year-old liferaft carried on the "HILI-KUM" was such that the raft capsized several times; therefore, the entrance cover was left open, leaving the occupant exposed to the harsh environment. In a previous occurrence, the sinking of the tug "PATRICIA B. McALLISTER", four crew members drowned and one died of hypothermia because the vessel carried an old liferaft which did not meet current design requirements. In its report on that occurrence, the Board recommended that the Department of Transport promote awareness of the limitations of older-type liferafts and encourage owners/operators to acquire appropriate replacements¹⁰. In response, TC acknowledged that there is no legislation to force owners to replace older liferafts and that such liferafts will eventually be replaced due to old age. It further stated that TC Marine Safety promotes awareness among mariners of the limitations of older liferafts and encourages replacement with more modern models.

⁹ TSB Report No. M90N5017.

¹⁰ Recommendation M93-12 from TSB Report No. M91L3010, issued in September 1993.

To date, the Board is not aware of any specific action, other than the abovementioned, that would hasten the replacement of outdated liferafts. Moreover, the Board believes that the apparent widespread non-compliance with the one-year servicing requirement for liferafts is allowing older liferafts to remain on fishing vessels. Since many fishermen continue to rely upon outdated liferafts for their survival in the event of vessel abandonment, the Board recommends that:

The Department of Transport set deadlines for the mandatory replacement of all liferafts failing to meet current standards.

M97-02

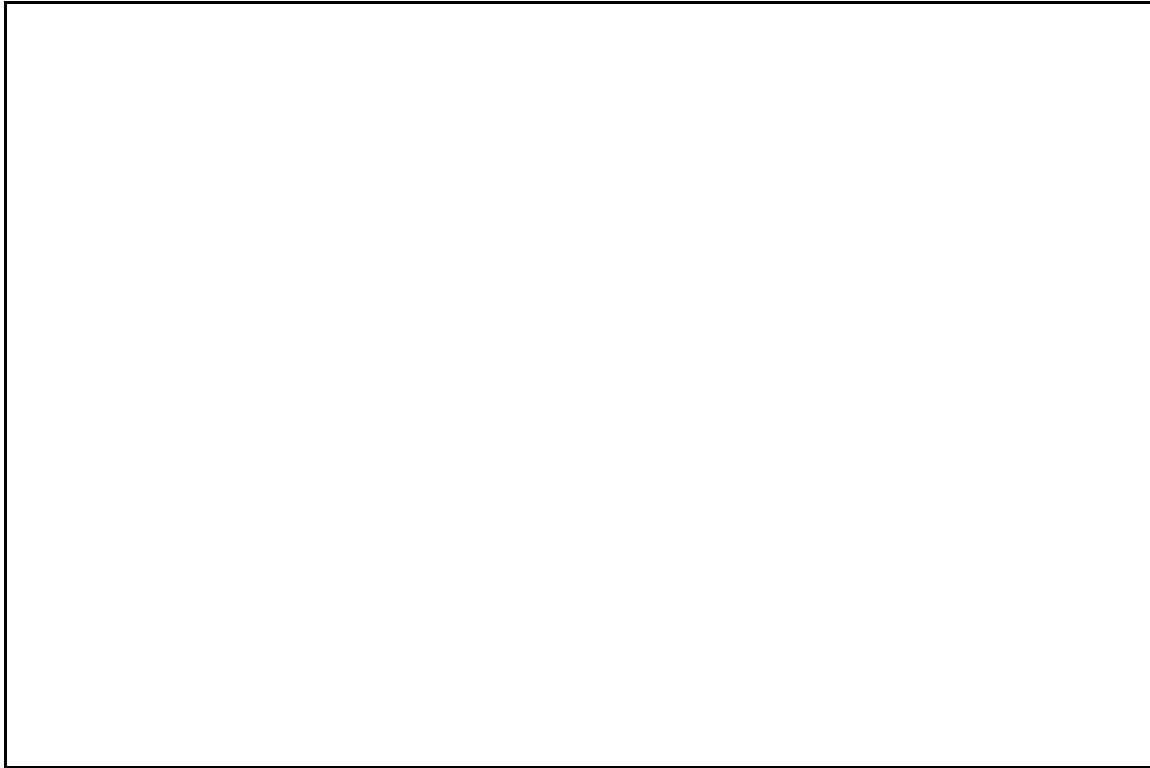
In the interim, the Board recommends that:

The Department of Transport explore programs that would encourage owners/operators to acquire appropriate replacement liferafts prior to the established deadlines.

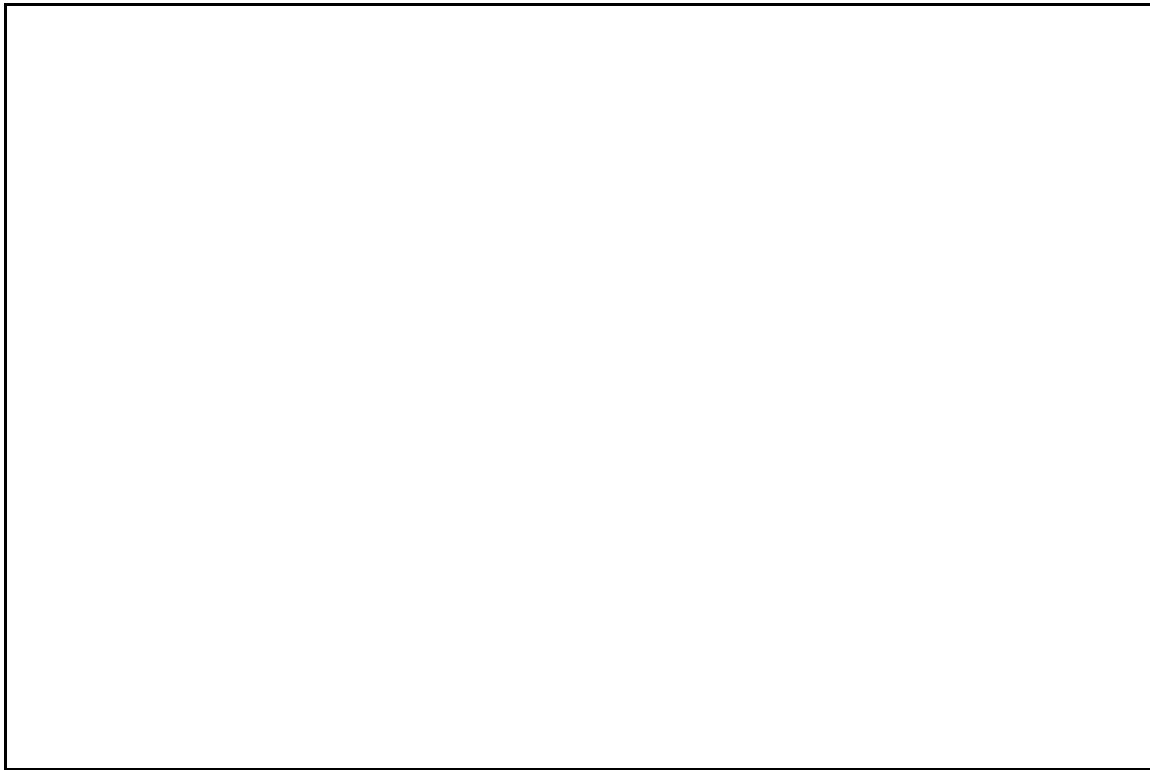
M97-03

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson Benoît Bouchard and members Maurice Harquail, Charles Simpson and W.A. Tadros, authorized the release of this report on 23 April 1997.

Appendix A - Photographs



The F/V "HILI-KUM"



Renewed planking and recaulking at port quarter

Appendix B - Sketch of the Area of the Occurrence

Appendix C - Liferaft Inflation Equipment

Appendix D - Glossary

B.C.	British Columbia
BHP	brake horsepower
cm	centimetre
DND	Department of National Defence
ESE	east-south-east
IMO	International Maritime Organization
kg	kilogram
kn	knot
M	magnetic
m	metre
MAYDAY	Prefix for distress message
MCTS	Marine Communications and Traffic Services
MED	Marine Emergency Duties
PDT	Pacific daylight time
RCC	Rescue Coordination Centre
SAR	search and rescue
SI	International System (of units)
SIC	Ship Inspection Certificate
SOLAS	Safety of Life at Sea
TC	Transport Canada
TSB	Transportation Safety Board of Canada
UTC	Coordinated Universal Time
VHF R/T	very high frequency radiotelephone
°	degree