Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

MARINE INVESTIGATION REPORT
M05N0072

CAPSIZING AND LOSS OF LIFE

SMALL FISHING VESSEL *MELINA & KEITH II*
BONAVISTA, NEWFOUNDLAND AND LABRADOR, 70 nm E
12 SEPTEMBER 2005

Canada

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

Marine Investigation Report

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Summary

On the afternoon of 12 September 2005, the small fishing vessel *Melina & Keith II*, with eight persons on board, was hauling nets off Funk Island Bank, Newfoundland and Labrador. The vessel took on water through the side fishing door and subsequently capsized in approximate position 48°55.5' N, 051°17.5' W. Four persons were rescued and the body of a deceased crew member was recovered; three crew members are missing and presumed drowned.

Ce rapport est également disponible en français.

Other Factual Information

Name	*Melina & Keith II*
Official Number	809085
Port of Registry	St. John's, Newfoundland and Labrador
Flag	Canada
Type	Small Fishing Vessel
Gross Tonnage	126.62
Length[1]	18.78 m
Draught[2]	Forward: 3.0 m Aft: 3.2 m
Built	1988, Glovertown, Newfoundland and Labrador
Propulsion	One 373 kW diesel engine, single screw
Cargo	27 000 kg of shrimp, 4500 kg of turbot
Crew	7
Fisheries Observer	1
Registered Owner	Private Owner, Eastport, Newfoundland and Labrador

Description of the Vessel

The *Melina & Keith II* was a small fishing vessel of closed construction, with an all-steel, welded double-chine hull. The hull below the main deck was subdivided by transverse watertight bulkheads, enclosing a forepeak, water tanks, engine room, fish hold, cofferdam, fuel tanks, and lazarette. Crew accommodation forward and an extended shelter deck aft were located on the main deck, and the wheelhouse was one deck above the accommodation. A single weathertight door led from the accommodation onto the main deck aft, to starboard of which was a galley window. A hauling side door was fitted on the starboard side shell in way of the shelter deck.

Photo 1. The *Melina & Keith II* following the work deck enclosure

[1] See Glossary at Appendix B 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 of units.

The *Melina & Keith II* was one in a series of 65-foot fishing vessels, the first of which was built in 1982. Although similar in basic design, various modifications have been incorporated by individual owners. The *Melina & Keith II* was originally built with a work deck that was open to the environment. Due to the nature of the vessel, seas were frequently shipped, making for hazardous conditions on the work deck. The deck was fully enclosed in 2000, and four submersible pumps were installed for dewatering.

The *Melina & Keith II* was originally built as a longliner, but had undergone modifications over the years to become a multi-purpose vessel, capable of stern trawling or fishing fixed gear such as gill nets and long lines. These modifications included the following:

- installation of an A-frame on the stern;
- installation of winches on the shelter deck;
- fitting of stabilizers on the port and starboard quarters;
- full enclosure of the weather deck, enabling it to be made weathertight;
- installation of submersible sewage pumps on the weather deck for dewatering the enclosed deck;
- welding shut of the freeing ports;
- reconfiguration of the accommodation to house a crew of 12;
- enlargement of the wheelhouse;
- fitting of a steel railing around the perimeter of the monkey island (wheelhouse top), except for a small opening in the after area. While the three railings on the port side were continuous, only the top pipe rail on the starboard side was continuous; the bottom two were cut out to a size that would allow a liferaft to pass through.

The wheelhouse was fitted with communication and navigation equipment including

- VHF radiotelephone with digital selective calling (DSC)
- a vessel monitoring system (VMS)
- satellite telephone
- cellular telephone
- echo sounder/fish finder
- radars

History of the Voyage

On 06 September 2005, the *Melina & Keith II* departed Catalina, Newfoundland and Labrador, for a turbot and shrimp fishing trip with a crew of seven, plus a fisheries observer. The vessel was participating in a test fishery for turbot. On the way to the shrimp fishing grounds, the

vessel stopped to haul the gill nets. While stowing the turbot, a crew member sustained an injury to his hand and was thereafter unable to assist with the fishing operations. After hauling the 125 gill nets and stowing about 4500 kg of turbot and 725 kg of by-catch, the *Melina & Keith II* reset the gill nets and steamed northeast for about 80 nautical miles (nm) to fish for shrimp. By the morning of September 11, after three days of fishing, the vessel had over 27 000 kg of shrimp, filling 11 of the 15 pens in the hold. The remaining hold space consisted of two pens half full of turbot, one pen half filled with ice, and one with 725 kg of by-catch.

By the time the final haul of shrimp was taken back, the wind had increased from moderate to 40 to 45 knots from the northeast. The *Melina & Keith II* began to slowly make its way back toward the turbot gill nets in anticipation of hauling them in the morning before returning to port. At 0900 Newfoundland daylight time[3] on September 12, the crew members were awakened and called on deck to prepare the vessel for working the nets. At 1140, they began to haul the first fleet of 40 gill nets. The wind had subsided to northeast 15 knots, and the waves were estimated at 2 m.

The skipper was in the wheelhouse, and the crew and the observer were on deck, with the exception of the previously injured crew member, who was in the galley. While retrieving the nets, the vessel had a starboard list, and waves splashed in through the open hauling door on the starboard side, soaking the crew. Getting wet while hauling gear was not considered out of the ordinary.

The skipper came down on deck to help the crew haul back the gear and pick out the fish, while manoeuvring the vessel using the remote controls by the hauling door. As the nets came on board, the turbot was picked out and placed in a box on the port side of the centreline, and the gear was stowed on the vessel's starboard quarter. Unsuccessful attempts were made to move some gear to the port side. With over half of the nets of the fleet recovered, the vessel took a moderate roll to starboard and shipped about 5 cm of water on deck, which the pumps were able to manage. The vessel recovered, but then took another moderate roll to starboard, shipping about 15 to 20 cm of water. The vessel did not recover after this, and the submersible pumps could not keep up. Listing heavily, the vessel had a water depth of 20 to 25 cm on the starboard side.

The net hauler was stopped, the vessel taken out of gear and the skipper ran to the wheelhouse to check for alarms and to study the video monitors, which provided information from remote cameras located in various sections of the vessel. Seeing no water below decks on the video monitors, he began retrieving immersion suits from the wheelhouse storage locker. Shortly after the skipper left the fishing deck, the vessel took another heavy roll; this time, water poured in steadily through the hauling door. The persons on deck made their way to the outside of the wheelhouse on the port side. The crew member in the galley made his way to the wheelhouse via the accommodation, where he encountered the skipper. The two exited the wheelhouse where the skipper partially donned an immersion suit.

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[3] All times are Newfoundland daylight time (Coordinated Universal Time minus two and a half hours).

With the *Melina & Keith II* heeling heavily, all personnel assembled on the port side and stood on the side of the wheelhouse. The crew attempted to manually release the liferaft mounted on the port side of the wheelhouse top, but as it was overhead and behind the rails, they could not.

Events Following the Capsizing

At about 1529, the vessel was on its beam ends and it continued to roll until it was completely upside down. As it rolled, all eight of the personnel walked over the vessel's side until they stood on the bottom. The vessel's emergency position-indicating radio beacon (EPIRB) was seen floating with its light flashing after the vessel capsized. The personnel remained on the bottom of the overturned boat for two hours before the vessel sank in estimated position 48°55.5' N, 051°17.5' W.

As the vessel slipped below the surface at 1740, the personnel jumped in the water, but two were non-swimmers and disappeared almost immediately. No debris surfaced until 10 minutes later when the vessel's aluminum workboat floated to the surface. Four persons clung to the aluminum boat, but, when two pieces of styrofoam also floated up, two crew members left the boat and held onto the styrofoam. The skipper was floating in his immersion suit, and another crew member found a board to hang onto. One of the crew members holding onto the aluminum boat slipped under the water after about 45 minutes and was not seen again; the other held on, putting his arm through a hole in the bow.

The five remaining persons were in the water for about 90 minutes, until a fishing boat appeared. Four persons were rescued, but the fifth succumbed about 15 minutes before the vessel arrived on scene.

Search and Rescue

The EPIRB began transmitting shortly after the vessel capsized, and its 406 MHz emergency signal was received from a high-altitude geostationary operational environmental satellite (GOES)[4] by the Canadian Mission Control Centre (CMCC) in Trenton, Ontario, at 1532. The information from this satellite and the Canadian Beacon Registry, which was limited to the vessel's name and contact information, was sent to the Joint Rescue Coordination Centre (JRCC) Halifax, Nova Scotia, and then forwarded to the Maritime Rescue Sub-Centre (MRSC) St. John's, Newfoundland and Labrador, at 1536.

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[4] The GOES satellite only provides the hexadecimal (HEX) code, and this is cross-referenced at the Canadian Mission Control Centre (CMCC) with the Canadian Beacon Registry for the vessel name and contact information before forwarding on to the responsible Joint Rescue Coordination Centre (JRCC).

The following is an abridged version of search and rescue (SAR) activities:

- 1532 EPIRB signal picked up by GOES satellite
- 1535 to 1611 The duty SAR coordinator makes 14 calls to two contact numbers provided, receiving either busy signal or no answer
- 1623 Satellite Cospas-9 hit – two possible elemental positions
- 1624 to 1626 Two more calls to contact numbers
- 1631 Elemental hits close to Glovertown, Newfoundland and Labrador, and SAR file opened
- 1639 Checked VMS position
- 1640 MCTS calls *Melina & Keith II* by radio – no answer
- 1643 MRSC requests aircraft from JRCC
- 1644 Satellite Sarsat-8 hit. Position known for first time. MCTS calls any vessel in the area.
- 1650 Cormorant Helicopter R908 tasked
- 1650 to 1656 CCG vessels and fishing vessels tasked. MRSC calls satellite telephone number of the *Melina & Keith II*. No reply.
- 1700 MRSC broadcasts urgency message prefixed PAN PAN
- 1703 VMS shows *Lady Charlotte Star* in area
- 1717 Mayday Relay issued after more calls to satellite telephone and landline and tasking more vessels, including *Lady Charlotte Star*
- 1810 Helicopter R908 airborne
- 1920 *Lady Charlotte Star* arrives on scene, recovers first person from the water
- 1923 Helicopter R908 arrives on scene

At the time of the occurrence, there was one SAR coordinator on duty at the MRSC.

There is a high false alarm rate associated with EPIRBs and the SAR coordinators must investigate a distress beacon for authenticity. This requires contacting the person(s) identified as 24-hour contacts on the EPIRB registration form to determine if the vessel is at sea and, if so, its location.

In this case, the SAR coordinator made 14 calls to the two 24-hour contact numbers – a home residence and a cell phone. No one responded to these calls at either number.

Injuries to Persons

Four persons were rescued. One crew member drowned; his body was recovered, and the three others are missing and presumed drowned.

Certification

The *Melina & Keith II* was subject to quadrennial Transport Canada (TC) inspections in accordance with the *Small Fishing Vessel Inspection Regulations* (SFVIR). The vessel was last inspected in August 2004 after a lengthy refit following a shipboard fire in 2003.

The skipper, who had been on fishing boats since he was a youth and was considered an experienced fisher, held a fishing master, second-class certificate, which exceeded the TC regulations for the voyage limits of home-trade, Class I required on this vessel. Although TC regulations required a mate with a minimum fishing master, fourth-class certificate, there were no other certified crew members on board. Three of the four survivors had marine emergency duties (MED) training; it is unknown if the other four crew members had.

Weather

Winds were from the northeast at 10 to 15 knots, with 2 m seas. The air temperature was 14°C and sea temperature was 14°C.

Pumping Arrangement for the Shelter Deck

The *Melina & Keith II* was fitted with four bilge wells, each with a submersible sewage ejector pump. The wells were located in the four corners of the enclosed fishing deck. Two pumps were capable of pumping 7.3 litres of water per second, while two larger ones could pump 8.2 litres per second.

Stability

Stability Requirements for a Small Fishing Vessel

As a small fishing vessel not exceeding 150 tons, gross tonnage, and not exceeding 24.4 m in length, the *Melina & Keith II* was subject to the requirements of the SFVIR. The owners were not required to submit stability data for approval because the vessel was used to fish for shrimp, crab, or groundfish. This is in contrast to vessels of the same size that were employed in catching herring or capelin, which must submit stability data for TC's approval. The minimum criteria for determining the stability of these vessels is STAB 4 of the TC publication *Stability, Subdivision and Load Line Standards* (TP 7301).

In 2000, the *Melina & Keith II* underwent major modifications that adversely affected its stability. TC did not request a stability assessment following the 2004 quadrennial inspection, nor did the owner.

Factors Affecting Stability

As the *Melina & Keith II* was not inclined, no stability data were available to assess its transverse stability. Most of the modifications carried out over the years resulted in additional weight added to the original lightship displacement and were located above the original centre of gravity, reducing the vessel's inherent transverse stability.

The vessel had an inherent starboard list, likely due to some fixed asymmetrical weights. Unless the liquid in tanks was asymmetrically loaded to compensate, this list was permanent. This reduced the potential righting energy of the vessel on the heeled side.

On the day of the occurrence, the vessel was heavily laden with shrimp, fish, and ice. The after fuel oil tanks were partly filled, the forward fuel oil tanks were full, the fresh water tank was partly filled, and the water ballast tanks were full, thereby reducing the freeboard.

The load in the fish hold was unevenly distributed: 10 886 kg, 13 608 kg, and 8165 kg of fish, shrimp, and ice were distributed in the port, starboard, and centre pens respectively. This distribution created a heeling moment, and the corresponding starboard angle of heel added to the permanent list.

The force resulting from hauling the gear through the side door contributed further to the starboard list. While retrieving the nets, the vessel had a starboard list and reduced freeboard. Waves entered via the opened hauling door on the starboard side. As the nets came on board, the turbot was picked out and the gear was stowed on the vessel's starboard quarter. This increased the heeling moment and the angle of heel, further reducing the vessel's transverse stability.

Lifesaving Equipment

Lifejackets were stowed in forward accommodation cabins, immersion suits were carried in a locker in the wheelhouse, and vests and floater suits were reportedly stowed in a deck locker. At the time of the occurrence, no crew members wore lifejackets or personal flotation devices (PFDs), and only the skipper was wearing an immersion suit.

The vessel was equipped with an eight-person and a ten-person inflatable liferaft, both of which were fitted with hydrostatic releases. There was also a five-person aluminium rowboat on board. Liferafts are commonly stowed on top of the accommodation and wheelhouses of fishing vessels. On the *Melina & Keith II*, the liferafts were on either side of the wheelhouse top and abutting the railing. The vessel's crew attempted to free the port liferaft but were hindered by the railing and were unable to do so.

The Board has previously addressed shortcomings in liferaft stowage and accessibility and issued Recommendation M93-03. In response, TC issued Ship Safety Bulletins (SSBs) 09/1993 and 03/2001, highlighting the recommended practice for the stowage of throw-over type inflatable liferafts. One recommended practice was that liferafts should be stowed such that, when lifted from their cradles, they can be deployed over the side of the vessel. In addition, TC initiated a study (March 1998) to consider methods of improving the stowage of lifesaving

equipment on board fishing vessels. One objective was the development of a low-maintenance, cost-effective, safe, and efficient system for the stowage and deployment of small liferafts. However, the study was never completed.

In the proposed Fishing Vessel Safety Regulations, anticipated to be completed in 2008, TC intends to pursue provisions that will require all liferafts to be stowed such that they will float free if a fishing vessel capsizes and sinks.

Distress Alerting

Distress-alerting equipment on board included a Class 1, 406 MHz EPIRB, a DSC-enabled VHF and a Global Maritime Distress and Safety System (GMDSS)–compliant satellite communication system (Sat-C), incorporated with the VMS, capable of sending a distress alert. The vessel also had a portable satellite telephone and a cellular telephone.

Emergency Position-Indicating Radio Beacon

The EPIRB floated free and transmitted the distress alert as designed. EPIRB signals sent to the Cospas-Sarsat system are used in roughly one real distress and safety incident per day worldwide.[5] However, statistics gathered in 2003 show that false distress alerts for the 406 MHz beacon are about 95 per cent worldwide. Furthermore, it can take the Cospas-Sarsat system up to 90 minutes to pinpoint the beacon's signal. In this occurrence, the signal was picked up within minutes by a GOES satellite, but it was not until 1644, or 72 minutes later, when the Sarsat satellite picked it up, that a position was known.

The initial GOES satellite hit from the *Melina & Keith II*'s EPIRB resulted in only the name of the vessel and two contact numbers. In many cases, with a simple telephone call, a vessel that has inadvertently set off an alarm can be found tied up in port.

The Canadian National Search and Rescue Secretariat's (NSS) EPIRB registration form has space to enter two telephone numbers (that is, home and office). Neither is specified as an emergency contact. On the back of the form, in small print, is written: "Give area code and number(s) where you can be reached 24 hours a day."

By contrast, the United States EPIRB registration form provides four spaces for "Primary 24-Hour Contact" numbers as well as four for "Alternate 24-Hour Contact" numbers – all in a section titled "Emergency Contact Information." This section specifies that such numbers must be for someone other than the owner. An additional four spaces are provided elsewhere on the form for contacting the owner/operator.

Digital Selective Calling Radio and Vessel Monitoring System

Neither the DSC radio nor the Sat-C distress alerts were manually activated. Neither the satellite nor the cellular telephones were used.

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5 SAR events assisted by Cospas-Sarsat data are available at www.cospas-sarsat.org.

A distress alert on a DSC radio is transmitted in about five seconds and accidental activation is unlikely.

In Newfoundland and Labrador, the Department of Fisheries and Oceans (DFO) implemented mandatory VMS coverage for most major domestic fisheries in 2004 for the purpose of fisheries management. A VMS allows the DFO to enhance its fisheries surveillance and enforcement capabilities, making a considerable contribution to the overall management of the fishery and providing additional data in support of science research. A VMS allows fishing vessel positions to be transmitted to DFO at regular intervals via a satellite communication system. The information is then relayed to a monitoring centre. Activating the associated distress button causes the transmission of a distress alert that contains the vessel's identity, the time, and positional information. The Inmarsat-C system assigns the highest level of priority to distress alerts and distress messages. Alerts are forwarded without delay from the Land Earth Station to the specified JRCC.

At the time of the occurrence, all SAR coordinators at MRSC St. John's had received formal and informal training on the Search Mission Management System (SMMS) and VMS, but the duty SAR coordinator never had the occasion to use the VMS to locate a distressed vessel.

Familiarization and Emergency Drills

There is no indication that the crew had received safety familiarization on the vessel or that emergency drills were regularly practiced. Some crew members did not know where the immersion suits were located.

Analysis

Stability

The *Melina & Keith II* had a starboard list as it took water over the bottom edge of the hauling door. This had an adverse effect on the stability because

- water accumulated to such an extent that the pumps could not manage it and the accumulation of water on the starboard side further exacerbated the situation;
- the added weight of shipped water raised the final centre of gravity;
- the freeing ports were welded shut, and this impeded the washed water from clearing the deck. The virtual centre of gravity was also raised due to free-surface effect of water on deck.

Lifesaving Equipment

Liferafts

Although both inflatable liferafts were fitted with hydrostatic releases and one was reported to have been cut free, neither came to the surface. The devices are designed to activate when submerged to a depth of more than 4 m, and should have been at that depth when the vessel was upside down; however, the release mechanisms may not have activated. Taking into account the length of time the vessel remained afloat after capsizing, water may have entered through the drainage holes, filling the rigid canister, until it lost residual buoyancy. Nevertheless, at least one of the liferafts should have risen to the surface.

Although crew members attempted to cut the port liferaft free, they were unable to lift it from the cradle. Because the vessel sank, the precise reason for the liferafts not surfacing could not be determined. However, the arrangement of the railing on the monkey island would restrict the port liferaft from floating free with the vessel listed to starboard.

In small fishing vessels, it is common for liferafts to be positioned on top of the wheelhouse where they are unlikely to interfere with fishing operations. In such circumstances, crew members must make their way to the top of the wheelhouse to release a liferaft from its cradle. While the size of small fishing vessels, their physical limitations, and the need to keep liferafts clear of fishing operations present challenges for liferaft stowage, options are available. These include

- a cutout in the railing that allows the liferaft to pass through;
- a cradle design allowing the ready launch of the liferaft clear of the vessel's side;
- the provision of a mechanical launching mechanism with minimum maintenance requirements; and
- the provision of a physical barrier to prevent fouling of the rigging during launch.

Although the common positioning of liferafts hampers rapid deployment in an emergency, depriving the crew of valuable lifesaving equipment, TC does not provide guidance to its inspectors to help them determine the optimum positioning of the liferaft on board.

Personal Flotation Devices

Due to the rapid escalation of emergencies leading to the abandonment of small fishing vessels, crew members have little time to don PFDs. Because lifejackets (required by regulations) are cumbersome, they are not worn and their bulk presents a hazard with respect to their entanglement in fishing gear. Personal full-length lifesaving devices that are practical to don, together with a need-to-wear requirement, could help mitigate some of the risks, thereby increasing chances of survival in cold, Canadian climatic conditions.

Although proposed reforms to the *Canada Shipping Act* address the use of PFDs in an open boat or while on deck, and although TC strongly encourages their use, the current draft states only that PFDs should be "readily available." Without a need-to-wear component, fishers will continue to be at high risk during abandonment.

Distress Alerting

The capsizing occurred suddenly, leaving the skipper and crew little time to prepare. When the skipper realized that there was a problem, he left the deck for the wheelhouse to study the video monitors, but knew that the vessel was in danger by the time he got there. After retrieving immersion suits, he had little time to activate the distress feature on the DSC radio or the Sat-C system; hence, no additional distress alerts were sent.

The EPIRB signal was thus the only indication that the vessel was in trouble. However, an EPIRB signal that is received in conjunction with another indicator of distress – such as a DSC alert, Inmarsat-C alert, or verbal Mayday, VHF (satellite telephone call or cellular telephone call) – would provide prompt validation of the distress.

Search and Rescue

At the time of the occurrence, there was only one SAR coordinator on duty. Additional support was requested once it was apparent that this was a real emergency. In the absence of accurate information available from the Canadian Beacon Registry, valuable time was lost in ensuring that the emergency was real.

One potential aid for SAR coordinators is the VMS. In this occurrence, the SAR coordinator did not check the positional data for the *Melina & Keith II* until just before obtaining a composite satellite position. Although SAR coordinators had previously used the VMS to identify fishing vessels in the vicinity of a distressed vessel, and by another coordinator to verify the location of a distressed vessel, the system had never been used by this duty SAR coordinator as a primary means to identify a distressed vessel's location.

The quality of information required by the Canadian Beacon Registry, in conjunction with the VMS not being used to advantage at an early stage, resulted in the loss of valuable time to validate the distress.

Search and Rescue Response

Although the vessel capsized a half hour before the end of regular Department of National Defence (DND) working hours, for which DND has a 30-minute response standard, tasking of SAR air resources occurred after working hours. As such, the primary SAR air resources at Canadian Forces Base Gander were operating on the quiet hour standard of a two-hour (maximum) response time. The response helicopter (R908) departed for the scene 80 minutes after being tasked and it is not possible to determine the impact of this on the eventual outcome.

In 1992, the Auditor General of Canada, after conducting a review[6] of the national SAR program, noted that neither the CCG nor DND had established service standards covering all time elements of SAR response. The Auditor General also noted that, although service standards need to be developed, response times may have to be longer for less-populated areas in which there are few incidents and where resources may be located some distance away.

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6 *1992 Report of the Auditor General of Canada*, Chapter 8, Section 8.39.

The Auditor General's 1994 follow-up on action taken in response to the 1992 observations and recommendations noted that the CCG and DND have "neither established nor used time-based search and rescue service standards to plan for resources and indicate to the public the expected response standards for search and rescue resources. They continue to believe that time-based service standards would not be beneficial or practical because they do not provide a true indication of the effectiveness of the search and rescue program."[7]

In 1999, the NSS conducted a review of SAR response services,[8] noting that, although the DND prescribes 30-minute and two-hour response capabilities for working hours and quiet hours respectively, the CCG nonetheless maintains a maximum 30-minute response standard 24/7 for primary SAR vessels. The report also noted that resource availability determines DND's SAR standby position and that the 30-minute standard during working hours does not always coincide with the days or time of peak SAR activity.

This issue was reviewed again after 1999 as part of the Strategic Transition Initiative Project, which was completed by the NSS in 2002. In December 2004, the Interdepartmental Committee on Search and Rescue approved the objectives and principles to be used in the development of specific levels of service for each federal department in the SAR program with the understanding that each SAR partner would further refine the level of service relative to their operations.

A TSB review of reported marine occurrences involving SAR air response between 1995 and 2005 indicates that at least 60 per cent of occurrences took place during working hours.

The NSS report concluded that "a lack of strategic management within the SAR program has resulted in each department developing standby postures in isolation, without consultation with other SAR departments. As a result, there is no common rationale driving standby postures."

The report recommended that ''the standby postures of primary SAR resources should be determined primarily through an analysis of demand for services."

No further review of SAR readiness and standby position has been conducted by the NSS since 1999. Although local DND SAR commanders have the discretion to realign SAR standby periods to coincide with periods of greatest SAR activity, DND policy limits the 30-minute standby position to 40 hours per week, indicating that resource availability continues to be the primary factor in determining SAR response standards.

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7 *1994 Report of the Auditor General of Canada*, Chapter 2, Section 2.57.

8 National Search and Rescue Secretariat, Review of SAR Response Services, sections 40 to 43, 1999, accessed 28 May 2007 at www.nss.gc.ca/site/reports/responsereview_e.asp.

Onboard Operational Safety

During vessel operations, the skipper is responsible for personnel and equipment safety.

In this occurrence, there were practices in which risks were not fully recognized. These included the following:

- Fishing continued in choppy seas with a near-full hold, despite a starboard list.
- Crew members were not made aware of the location of immersion suits, did not regularly participate in emergency drills, and were unfamiliar with the liferafts and the hydrostatic units.
- Despite the regulatory requirement, there was no qualified mate to help coordinate an emergency response or abandonment, or help with day-to-day activities and decision making.
- The crew was not instructed to proceed to emergency stations or don immersion suits.

Such unsafe practices are common on small fishing vessels. This is due to a combination of reasons including the lack of a safety culture, perception or appreciation of risks, and a lack of awareness.

For instance, an individual's perception that the probability of an accident is low is increased with each successful voyage completed. As an individual becomes more comfortable, the threshold of risk is increased and can lead to more unsafe practices,[9] thus placing the vessel and crew at a greater risk.

Findings as to Causes and Contributing Factors

1. The *Melina & Keith II* was fishing in choppy seas with a near-full hold, a starboard list, and beam to the wind. When the vessel's pumps could not keep up with the water ingress that flowed in over the hauling door, the vessel heeled over to starboard and capsized.

2. The freeing ports were welded shut, impeding the shipped water from clearing the deck.

3. The cumulative effect of the loading condition and the accumulation of water on deck in the prevailing conditions resulted in the loss of transverse stability.

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[9] G.J.S. Wilde, *Target Risk,* Toronto, PEE Publications, 1994.
J. Adams, *Risk*, London, UCI Press, 1995.

Findings as to Risk

1. The quality of information required for the Canadian Beacon Registry is not conducive to saving valuable time to validate distress.

2. Although the common positioning of liferafts hampers rapid deployment in an emergency, depriving the crew of valuable lifesaving equipment, Transport Canada does not provide guidance to its inspectors to help them determine the optimum positioning of the liferaft on board.

3. Neither the current regulations nor the proposed regulatory requirement for the carriage of personal flotation devices (PFDs) and lifejackets address the risk posed by fishers not wearing the equipment while working on deck.

4. The *Melina & Keith II* underwent major modifications that adversely affected its stability. TC did not request a stability assessment following the 2004 quadrennial inspection, nor did the owner.

5. The unsafe practice of operating without a certificated mate on board left the skipper to act on his own with no qualified watch relief and with no other designated person to assist in sending distress alerts or coordinate abandoning the vessel.

Other Finding

1. The Vessel Monitoring System was not used in a timely manner to confirm the vessel's location.

Safety Action

Action Taken

Beacon Registration

In April 2006, the TSB issued Marine Safety Advisory (MSA) 06/06 addressed to the National Search and Rescue Secretariat (NSS) regarding the adequacy of EPIRB registration forms and the associated emergency contact numbers. The MSA noted that, given that search and rescue (SAR) coordinators are under a heavy workload and have previously had difficulty contacting fishing vessel owners/operators via contact numbers, the EPIRB registration form may require updating or revision.

The NSS responded that it was in the process of updating the Canadian Beacon Registry, that it was considering the TSB suggestions, and that it would implement them in the overall project plan. The NSS also assured the TSB that it will continue to maintain accurate and useful information in the Canadian Beacon Registry and work with the regulating agencies to promote registration and maintenance of accurate information.

Effective August 2006, the registry was amended as part of the Canadian Beacon Registry Update project. The current form now includes two clearly identified sections: Owner Contact Information and Required Emergency Contact Information. The Emergency Contact section calls for the identification of primary and secondary 24/7 contacts, with the explanatory warning: "Do not include owner, unless not aboard."

Stability

Over the years, the Board has expressed concern that the lack of stability assessments of small fishing vessels compromises their safe operation. The Board has made two recommendations (M03-05 and M03-06, issued in November 2003) to Transport Canada (TC), calling for some form of stability assessment/verification for new and existing inspected small fishing vessels. In 2005, following the accident involving the *Ryan's Commander*, the Board was concerned that, in the absence of meaningful action to address past recommendations, fishers continued to be placed at undue risk. It therefore made another recommendation (M05-04) urging TC to immediately implement recommendations M03-05 and M03-06.

In response to Recommendation M05-04, TC indicated that, in advance of the new Fishing Vessel Safety Regulations, it had established an interim policy for determining, based on a list of risk factors, whether a small inspected fishing vessel requires a stability booklet. This interim measure provides important additional information for the master and took effect 07 March 2006.

TC has issued Ship Safety Bulletin (SSB) 04/2006, entitled *Safety of Small Fishing Vessels: Information to Owners/Masters about Stability Booklets*. The bulletin outlines the process that vessel owners and operators must follow to determine if their vessel requires a stability booklet and how to obtain one. The bulletin applies to all owners and operators of fishing vessels, new and existing, that are between 15 and 150 gross tons and less than 24.4 m in length.

The interim actions and measures taken by TC will substantially reduce the risks associated with safety deficiencies identified in recommendations M03-05 and M03-06. The response was therefore assessed as Fully Satisfactory.

Electronic Position Reporting

Following the capsizing and sinking of the *Melina & Keith II*, the superintendent of Maritime Rescue Sub-Centre (MRSC) for the Canadian Coast Guard (CCG) Newfoundland and Labrador Region circulated a memo to SAR coordinators regarding reporting systems such as the Information System on Marine Navigation (INNAV), the Automated Information System, and the Vessel Monitoring System (VMS). The memo pointed out that, while these systems are not regulated for the provision of maritime distress alerting, they can be useful tools in the handling of maritime SAR incidents that involve unlocated distress alerts and 406 MHz EPIRBs, or for identifying resources that may provide assistance. The memo instructed SAR coordinators to use these resources at their earliest opportunity so as to ensure effective SAR response.

Search and Rescue Reviews

As a result of the *Melina & Keith II* accident, two reviews were conducted, one regarding SAR operations, the other dealing with standards. These resulted in 18 and 17 recommendations, respectively. Many have since been implemented, and the remainder are in progress. Included in these recommendations are the following:

- SAR coordinator refresher and continuous training on electronic information gathering systems such as VMS and Cospas/Sarsat operation (in progress);
- review the air SAR standby posture (in progress);
- all emergency position-indicating radio beacons (EPIRBs) should be equipped with global positioning system (GPS) (in progress);
- duty SAR coordinators to be mindful of the standby posture of Department of National Defence (DND) primary resources respecting the change from 30 minutes to two-hour response times at 1600 local time (completed); and
- updating of the *National Search and Rescue Manual* (in progress).

Safety Concern

The issue of positioning of fishing vessel liferafts and the float-free requirements has been addressed several times over recent years. In 1993, the *Cape Aspy*[10] accident gave rise to Board Recommendation M93-03 that resulted in TC issuing SSB 09/93. A TC study initiated in March 1998 to consider methods of improving the stowage of lifesaving equipment on fishing vessels was never completed. Fishing vessel occurrences involving loss of life[11] raised similar issues and eventually led to another SSB (03/01). TC also issued a *Small Fishing Vessel Safety Manual* (TP 10038) in 2003, which recommends that liferafts be installed where they can be easily launched, but where they will float free if the ship sinks before launching.

In updating its response to Board Recommendation M93-03 in November 2006, TC advised that provisions requiring float-free liferafts will be proposed to be adopted in the Fishing Vessel Safety Regulations and would be similar to those included in the amended *Life Saving Equipment Regulations* for passenger vessels. The Fishing Vessel Safety Regulations are expected to be finalized in 2008.

In the interim, TC intends to issue a new SSB addressing the stowage of liferafts and inflatable rescue platforms. This new bulletin will combine the existing points contained in SSBs 09/1993 and 03/2001 and will also have additional information with regard to the optimum positioning of the liferafts.

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10 TSB reports M93M4004 (*Cape Aspy*), M95M0128 (*Lady Candace*), M98L0149 (*Brier Mist*), M98W0189 (*Eldorado*), and M99M0142 (*Joseph & Sisters*)

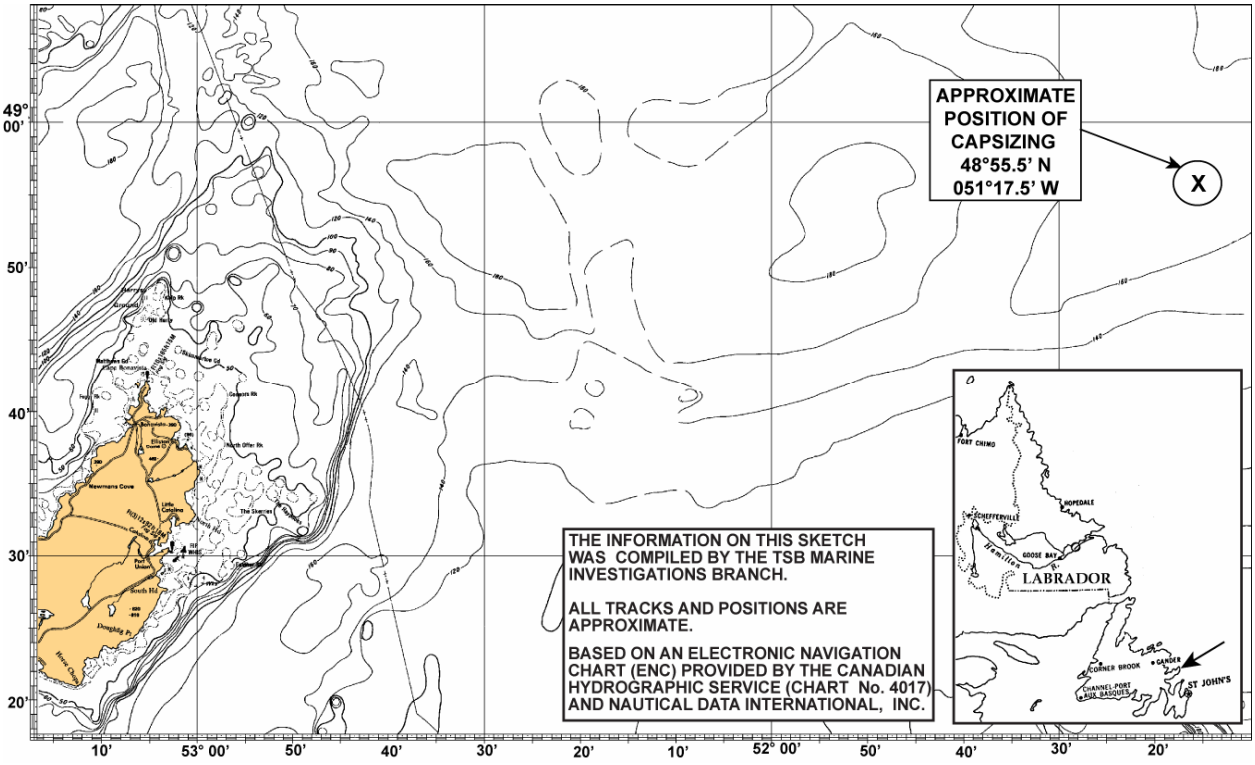
11 Ibid

The Board is concerned that, until such time that regulations are put in place and fishing vessel liferafts are positioned optimally and arranged to float free in the event of the vessel sinking, crew members continue to be at risk in such circumstances.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 29 May 2007.

*Visit the Transportation Safety Board's Web site (**www.tsb.gc.ca**) for information about the Transportation Safety Board and its products and services. There you will also find links to other safety organizations and related sites.*

Appendix A – Occurrence Area



Appendix B – Glossary

CCG	Canadian Coast Guard
cm	centimetre
CMCC	Canadian Mission Control Centre
DFO	Department of Fisheries and Oceans
DND	Department of National Defence
DSC	digital selective calling
EPIRB	emergency position-indicating radio beacon
GMDSS	Global Maritime Distress and Safety System
GOES	geostationary operational environmental satellite
GPS	global positioning system
HEX code	hexadecimal code
IMO	International Maritime Organization
Inmarsat	international maritime satellite organization (international telecommunications company)
INNAV	Information System on Marine Navigation
JRCC	Joint Rescue Coordination Centre
kg	kilogram
kW	kilowatt
m	metre
MCTS	Marine Communications and Traffic Services
MED	marine emergency duties
MHz	megahertz
MRSC	Maritime Rescue Sub-Centre
N	north
nm	nautical mile
NSS	National Search and Rescue Secretariat
PFD	personal flotation device
R908	Cormorant helicopter
SAR	search and rescue
Sat-C	satellite communication system
SFVIR	*Small Fishing Vessel Inspection Regulations*
SMMS	Search Mission Management System
SSB	Ship Safety Bulletin
TC	Transport Canada
TP	Transport publication
TSB	Transportation Safety Board of Canada
VHF	very high frequency
VMS	Vessel Monitoring System (by satellite)
W	west
°	degree
°C	degree Celsius
'	minute