

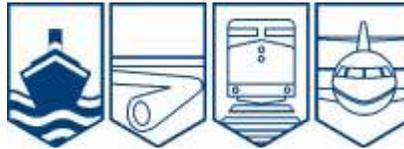
Transportation Safety Board
of Canada



Bureau de la sécurité des transports
du Canada

MARINE INVESTIGATION REPORT

M11M0017



CREW MEMBER LOST OVERBOARD

SMALL FISHING VESSEL *SILVER ANGEL*
5.5 NAUTICAL MILES SW OF CAPE SABLE ISLAND
NOVA SCOTIA
03 MAY 2011

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

Crew Member Lost Overboard

Small Fishing Vessel *Silver Angel*

5.5 nautical miles SW of Cape Sable Island,

Nova Scotia

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Report Number M11M0017

Summary

On the morning of 03 May 2011, at approximately 0450 Atlantic Daylight Time, a crew member from the small fishing vessel *Silver Angel* fell overboard while retrieving the paravane stabilizer. The captain, the only other crew member on board, made several unsuccessful attempts to rescue the crew member who was lost at sea.

Ce rapport est également disponible en français

Factual Information

Particulars of the Vessel

Name of Vessel	<i>Silver Angel</i>
Registry/Licence Number	820875
Port of Registry	Yarmouth, N.S.
Flag	Canada
Type	Small fishing vessel
Gross tonnage	81.6
Length ¹	16.2 m
Built	1999, Lower East Pubnico, N.S.
Propulsion	Cummins Kt19-17 4-stroke diesel 317 BHP
Cargo	Fishing gear and tote boxes
Crew	2
Registered owner/Manager	Charlesville Fisheries Ltd., East Pubnico, N.S.

Description of the Vessel

The *Silver Angel* is a small fishing vessel of closed construction, built in moulded, glass-reinforced plastic, with a wooden wheelhouse and accommodation forward, and the engine compartment beneath the wheelhouse. The hull below the main deck is subdivided by 3 transverse bulkheads that enclose (from forward) the crew accommodation space, the engine room, a fish hold and the steering gear compartment/lazarette.

The vessel was designed and built as a dragger and had operated as such for more than 11 years. It is powered by a marine diesel engine with a reverse/reduction gearbox driving a single fixed-pitch propeller and is fitted with a single-plate centreline rudder. Three diesel fuel tanks are arranged on board, one each on the port and starboard sides of the engine room, and another in the lazarette. A fresh water tank is located below the crew accommodation.



Photo 1. *Silver Angel*

¹ 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.

The working deck is aft, surrounded by a bulwark with a stern ramp. A large reel for the trawl net straddles the ramp and is mounted to the deck on the stern. Entry to the wheelhouse is aft through a hinged door on the starboard side of the upper deck or through an aft door on the main deck, into the accommodation, and up a stairwell next to the galley.

The working deck has a single raised hatch located along the center line that provides access to the fish hold. A single flush watertight hatch that provides access to the lazarette is fitted on the port quarter of the main deck. A large steel fish tank is hinged to the stern ramp.

A shelter deck covers the forward half of the work deck on both sides. Measurements of the starboard side are given in Photo 2. There are no specific handholds to assist in walking along the gunwale. A crew member can use hands along the upper edge, grab the bottom of the stanchions or reach the railing between the stanchions. While standing on the gunwale, a vertical hand grip reach of the railing is possible for 75 to 80% of males.²

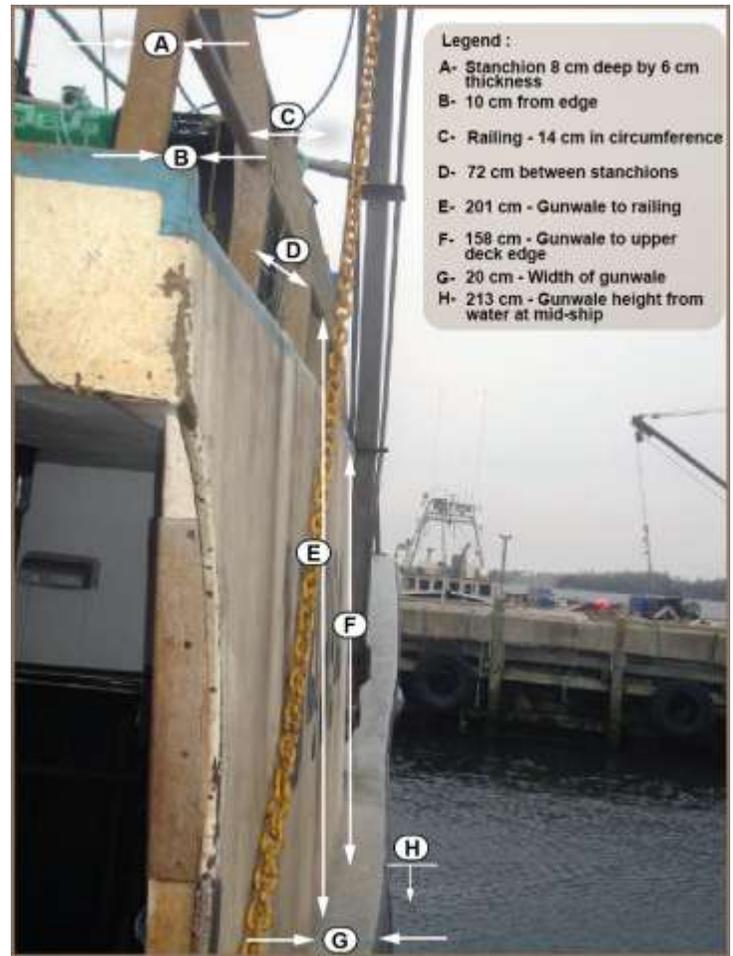


Photo 2. Vessel starboard side

History of the Voyage

At 1000³ on the morning of 2 May 2011, after offloading a catch of silver hake in East Jeddore, Nova Scotia, the vessel departed for East Pubnico, Nova Scotia with a captain and a deckhand on board. A second deckhand did not join the vessel for this trip, but instead drove by car to East Pubnico. Upon reaching East Pubnico, the second deckhand was to take the 2 other crew members home after the vessel had arrived. In East Pubnico, the vessel was to be hauled ashore for the Transport Canada (TC) quadrennial inspection.

Just before midnight, the captain and deckhand deployed the paravane stabilizers⁴ (Photo 3) as the northeast wind had increased to about 30 knots and the vessel was rolling about 25°. At midnight, the captain handed the watch over to the deckhand and gave the order to be called about 5 nautical miles south of Cape Sable Island,



Photo 3. Paravane

² S. Pheasant, *Bodyspace – Anthropometrics, Ergonomics* Francis, 1998, Table 10.3, page 180.

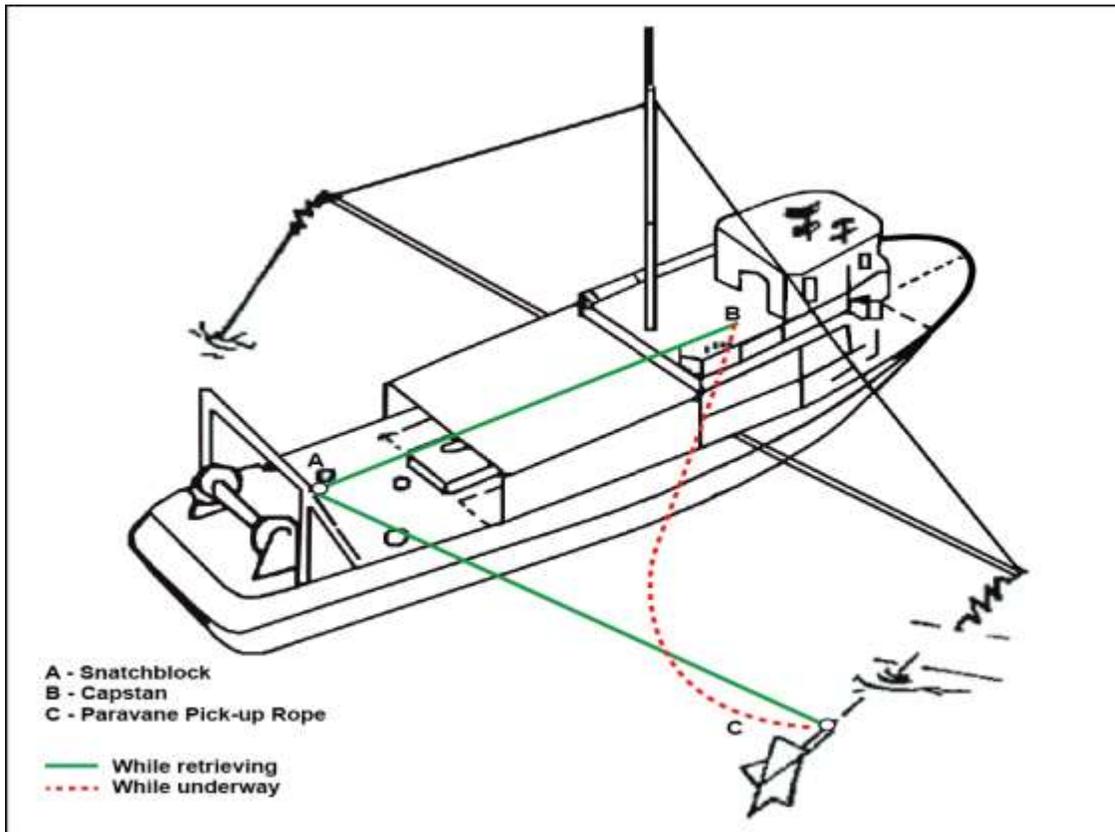


Figure 1. Arrangement of paravane stabilizers on the *Silver Angel*

Nova Scotia to retrieve both paravane stabilizers before entering an area of many lobster trap buoys. The captain then went to his cabin to sleep.

At 0450, the vessel arrived at the predetermined position and the deckhand woke the captain. The captain went to the wheelhouse and took the vessel out of gear. The deckhand went aft to retrieve the port paravane. A haul-up rope was attached to the paravane and secured on a cleat near the paravane boom on the upper deck on each side. When the captain arrived at the cleat on the port side, the deckhand had already retrieved the port paravane rope and secured it in a snatch block attached to the stay wire that connects the forward and aft gantry. The deckhand waited on deck for the paravane. The captain put a few turns around the small capstan, and heaved the port paravane above the port rail. The deckhand guided the paravane against the port bulwark as the captain lowered it with the capstan. The captain moved to the port side to pull up any slack and laid up the port paravane rope on its cleat while the deckhand went to the starboard side to retrieve the starboard paravane.

The captain then moved to the starboard side of the upper deck, let go the starboard paravane rope from the cleat and looked aft for the deckhand on the starboard aft gantry. Not seeing the deckhand, the captain assumed he was waiting for the line just aft of the upper deck and began

³ All times are Atlantic Daylight Time (Coordinated Universal Time minus 3 hours), unless otherwise stated.

⁴ In the local fishing industry, a paravane is commonly called a "fish."

crawling back on top of a row of nested tote boxes to pass the line to him. It was then that he saw the deckhand in the water about 3 to 5 m off the vessel's side, forward of the starboard aft gantry. At this time, the deckhand was calling out to the captain.

The captain quickly climbed back off the row of tote boxes and secured the starboard paravane line on its cleat. He then ran through the wheelhouse, down the stairwell next to the galley and out onto the back deck. He grabbed a gaff from the starboard side of the net reel on the stern and attempted to reach the deckhand with it. Unable to reach him, he ran forward, took a lifering from its bracket on the starboard side of the aft accommodation bulkhead, ran back aft and without uncoiling the rope, threw it with the line towards the deckhand. It fell approximately 4 m short.

He ran forward again and picked up a coil of $\frac{3}{8}$ inch rope just aft of the starboard towing warp winch, but by the time he reached the stern he could no longer see the deckhand. The captain ran to the wheelhouse and at 0458 sent a distress signal on channel 16 very high frequency (VHF) radio advising that he had a man in the water in position latitude 44°18'42" N and longitude 065°41'18" W (Appendix A). He then undertook a search for the deckhand. The search was unsuccessful.

Search and Rescue

Approximately 25 fishing vessels, 2 Canadian Coast Guard cutters (CCGC) and 1 Canadian Coast Guard Auxiliary (CCGA) vessel responded to the Mayday and participated in the search. The first vessel arrived on site at about 0510 and recovered the lifering thrown by the captain. The lifering was redeployed to monitor drift until it was removed from the water at 0831. A Cormorant SAR helicopter was tasked at 0508, commencing its sortie at 0624 and arriving on site at 0714. The Cormorant ended its sortie at 1003. A second Cormorant sortie began at 1047 and the helicopter remained on site until 1320. A Canadian Forces fixed-wing Aurora aircraft was deployed to the site. It conducted a search from 1331 until 1520. A CCGC escorted the *Silver Angel* to East Pubnico and they arrived in port at 1034. JRCC reduced the search at 1700 on 03 May 2011.

Injuries

The deckhand was lost at sea.

Fishing Company Description

The registered owner of the *Silver Angel* owns and operates a fleet of 5 draggers and 1 lobster boat all over 15 gross tons. This company also owns and operates a fish processing plant. The *Silver Angel* is one of 3 company vessels that normally operate out of East Jeddore. The other vessels normally operate from the home port in East Pubnico. The company employs, at times, more than 100 employees in the plant and on its vessels.

Company Management of Crew Safety

The company's health and safety policy states a commitment to provide a healthy and safe work environment to prevent harm and injuries. The policy identifies that all are responsible to identify risks and ways to eliminate or mitigate them. This policy, as written, applies to all

employees of the company and was implemented at the fish plant, but not on board the vessels. The company delegated all on board safety-related matters to the captains of its vessels.

The company owner frequently discussed fishing operations with the captains and crew members. During some of these discussions, safety items were raised. The company had previously taken safety actions following those discussions. In one instance, a specific safety policy for vessel operations was established, mandating that, when in port, paravane stabilizers were to be placed on the deck and not left hanging on the boom. This was to prevent a paravane from falling accidentally and causing injury or damage.

Vessel Certification

The *Silver Angel* had a quadrennial inspection by TC in 2007. Following this inspection, a short term certificate was issued to the vessel pending the completion of a satisfactory simplified stability (roll) test. A final inspection was carried out in April 2008. On 21 May 2008, an inspection certificate was issued for a non-passenger vessel exceeding 15 tons but not exceeding 150 tons. The certificate, which was due to expire on 04 May 2011, authorized the vessel to operate on voyages up to near coastal voyage, Class I.

The *Marine Personnel Regulations* (MPR)⁵ were updated and came into force with the *Canada Shipping Act* (CSA), 2001, on 1 July 2007. As a result, the *Silver Angel* was required to carry a minimum safe manning document on board after the next periodic inspection of the vessel, which was due and scheduled for 4 May 2011 in East Pubnico. On 17 May 2011, TC issued a safe manning document requiring a minimum crew of 3, a certificated master and mate, and a deckhand with marine emergency duties (MED) A1 training.⁶

Personnel Certification and Experience

The captain held a Fishing Master IV certificate of competency. He had 37 years' experience fishing, including more than 5 years as captain with this company and 2.5 years as captain of this vessel. He had MED and first aid training but the first aid certificate had expired.

The deckhand had no formal marine training or certification. He had fished for about 20 years, which included operating a lobster boat as captain and owner for about 5 years. He had 2 years' experience on this vessel and 3 years on a smaller dragger with the same captain, crew and company. He did not have MED training.

Retrieving the Paravane Stabilizer

The procedure used on the other large draggers owned by the company to retrieve paravane stabilizers did not rely on a haul-up rope leading into the water attached to the paravane. Instead, the rope led from the cleat on the upper deck, through the snatch block and was attached to the paravane chain by a shackle at all times. A second rope was attached to this shackle and was secured directly to the cleat on the upper deck. This was done to keep the shackle and rope out of the water when the paravanes were deployed. When retrieving the paravane, this shackle would slide down the chain towards the paravane, raising it as the rope is heaved in on the capstan.

On the *Silver Angel*, the haul-up rope for retrieving the paravane stabilizer ran from a cleat on the upper deck and was secured by a shackle to a circular hole in a steel stiffener on the top of the paravane. When deployed, the rope was in the water and the drag of the water when moving ahead produced too much strain on the rope to leave it in the snatch block. Therefore, when the paravanes were deployed, the rope was secured directly to the cleat on the upper deck.

⁵ Transport Canada *Marine Personnel Regulations*, Section 202.

⁶ See Appendix B for information about the MED A1 course outline.

When retrieving a paravane (Figure 1), a crew member on the upper deck would remove the haul-up rope from the cleat and walk it aft, passing it down to a deckhand waiting on the after deck. If nested tote boxes remained between the cleat and after end of the upper deck (Photo 4), the crew member would walk or crawl aft on the boxes, passing the rope to the waiting deckhand, who would climb the gantry and put it in the snatch block. On the *Silver Angel*, it was not necessary to walk on the gunwale to retrieve the paravane haul-up ropes when following this procedure.



Photo 4. Nested tote boxes on upper deck against the starboard rail.



Photo 5. Demonstration of walking along the gunwale while holding onto the stanchions.

When retrieving the starboard paravane, the deckhand on the *Silver Angel* normally walked along the gunwale (Photo 5), taking the haul-up rope and bringing it to the snatch block on his own. When arriving at the starboard cleat, the crew member on the upper deck gave slack if necessary. The deckhand had performed this task successfully hundreds of times in the past, and displayed a great agility in doing so. No other crew member walked on the gunwale, choosing instead to wait on deck until the haul-up rope was passed down to them. Company management was not aware of the deckhand's practice.

Weather and Sea Conditions

At the time of the occurrence, winds were north-easterly 20 to 30 knots. Air and sea temperatures were 4.3°C and 6°C respectively. Seas were 3 m. Visibility was poor due to fog and it was still dark, as twilight occurred at 0542 and sunrise at 0614.

Lifesaving Equipment

Lifesaving equipment on board *Silver Angel* included 4 lifejackets, 3 immersion suits, a 4-person Ovatek liferaft with a hydrostatic release, 2 liferings – one with a line stowed on the accommodation bulkhead forward of the starboard towing winch and one with a light stowed on the forecastle deck on the forward wheelhouse bulkhead – and one float-free EPIRB.



Photo 6. Lifering with line

Fishermen Falling Overboard

From 2000 to July of 2011 in Canada, 47 out of a total of 153 fatalities for fishing vessels were fishermen falling overboard,⁷ making it the second highest cause of accidental deaths in the fishing industry. During that period, 10 successful recoveries were reported.⁸

In the United States, for the period between 1994 and 2004, fishermen falling overboard accounted for 24% of the total fatalities in commercial fishing. As part of its commercial fishing vessel program, the United States Coast Guard (USCG) has identified that when survival suit and personal floatation devices (PFD) are used, survival rate is twice as high, and that any floatation device will improve chances of survival.⁹

In 2004, the document *Fish Safe: A Handbook for Commercial Fishing and Aquaculture* was prepared by an advisory committee led by the Nova Scotia Fisheries Sector Council and published to address workplace health and safety in the fishing industry. The initial production of 5000 copies was distributed across Nova Scotia to government departments and fishing organizations or upon request.

At the time of the occurrence, there was a copy of this handbook in the *Silver Angel* wheelhouse. The introduction of the handbook concludes: “This handbook is all about staying out of trouble when we can and being prepared for trouble when it comes anyway.”¹⁰ The handbook outlines a risk management approach to address the issue of fishermen falling overboard, with the first step being one of prevention (minimizing the likelihood), and the second step being one of response (mitigating the consequences). A number of key points from this approach in the handbook have been extracted from the publication and can be found in Appendix A.

⁷ Statistics derived from TSB’s MARSIS database.

⁸ The figure of 10 successful occurrences may not be reliable since these types of occurrences are under-reported.

⁹ United States Coast Guard Commercial Fishing Vessel Safety Program, Fish Safe Info, March 30, 2006, Issue 4, http://www.uscg.mil/d1/prevention/docs/4e_falls_overboard.pdf. See comment above. Website last accessed on 9 May 2012.

¹⁰ Nova Scotia Fisheries Sector Council, *Fish Safe: A Handbook for Commercial Fishing and Aquaculture* (Yarmouth 2004), <http://www.gov.ns.ca/lae/healthandsafety/docs/FishSafe.pdf>. Website last accessed on 9 May 2012.

More formally, the United Kingdom fishing vessel safety folder establishes a risk assessment approach to address health and safety in the fishing industry.¹¹ In regards to the risk of falling overboard, the guidance booklet for the fishing vessel safety folder emphasizes the need to be prepared and points to the necessity for fishermen to identify and manage the safety risks:

Whilst the likelihood of anyone falling overboard may seem unlikely on a small vessel and very unlikely on a larger vessel, the consequence may well be death and thus the highest 'severity rating' must be given. This means that action must be taken to lessen the risk.¹²

Falling into cold North Atlantic water involves an initial cold shock. The effects of cold shock are the most dangerous and potentially lethal when a person is suddenly immersed in water below 15°C.¹³ This can be quickly followed by exhaustion while the person attempts to stay afloat, increasing rapidly if they are not wearing a PFD and especially when in choppy seas. Hypothermia, the loss of body heat due to its transfer to the ocean, can occur within 35 minutes in cold water; bodily functions slow down and this can eventually lead to death. A rapid recovery of the person in the water is therefore critical to increase the person's chances of survival. This requires each vessel to have a man overboard (MOB) rescue plan in place should the crew be required to retrieve a crew member who has fallen into the water.

Fishing Vessel Safety

On 16 March 2010, the Transportation Safety Board (TSB) released its *Watchlist*, identifying 9 critical safety issues investigated by the TSB that pose the greatest risks to Canadians, one of which was the loss of life on fishing vessels. With an average of 12 fatalities per year between 2005 and 2009, the TSB remains concerned about the lack of both a safety culture and a code of best practices. The *Watchlist* also highlighted the need for the industry to adopt and promote safe operating procedures and practices to increase the safety knowledge of fishing vessel operators.

Furthermore, in August 2009, the TSB launched an in-depth safety issues investigation into small fishing vessel safety in Canada. The study will provide an overall view of the situation across the country and will identify systemic issues with a view to improving the safety of small fishing vessels.

¹¹ Seafish Marine Services, Fishing Vessel Safety Folder, UK, May 2007
http://www.seafish.org/media/Publications/SafetyFolder_052007.pdf. Website last accessed on 9 May 2012.

¹² Seafish Marine Services, Guidance Booklet for the Fishing Vessel Safety Folder, UK,
<http://www.seafishmarineservices.com/Safety%20Folder/Guidance%20Booklet/Guidance%20Booklet%20for%20the%20Safety%20Folder.pdf>. Website last accessed on 9 May 2012.

¹³ Dr. C.J. Brooks, K.A. Howard, et. al., "Chapter 10 – Drowning is Not a Helpful Diagnosis Written on the Death Certificate," *Survival at Sea for Mariners, Aviators and Search and Rescue Personnel*, North Atlantic Treaty Organization and Research and Technology Organization (February 2008)
[http://ftp.rta.nato.int/public//PubFullText/RTO/AG/RTO-AG-HFM-152//\\$\\$AG-HFM-152-ALL.pdf](http://ftp.rta.nato.int/public//PubFullText/RTO/AG/RTO-AG-HFM-152//$$AG-HFM-152-ALL.pdf). Website last accessed on 9 May 2012.

Analysis

Man Overboard

The *Silver Angel* stopped to retrieve the paravane stabilizers while approaching East Pubnico, Nova Scotia in darkness. The vessel was rolling to angles of about 25° in 30 knot north-easterly winds. After retrieving the port side paravane, the deckhand crossed the deck to the starboard side and out of sight of the captain. Shortly after, when the deckhand did not appear when expected on the starboard side, the captain saw that the deckhand was in the water.

The investigation was unable to determine with certainty what caused the deckhand to fall into the water. It is possible that the deckhand fell overboard from the working deck or while climbing onto the gunwale. Indeed, the most likely scenario is that before the captain arrived on that side of the vessel, he climbed onto the starboard gunwale to retrieve the pick-up rope (something he had done many times previously), and fell after losing his footing and/or handhold as the vessel rolled in the seas. Despite efforts by the captain, he was unable to rescue the deckhand.

Retrieving the Paravane Stabilizers

Arrangement of Gear

On most fishing vessels there are methods for retrieving paravane stabilizers that present little risk. The methods for retrieving the paravanes on the other large draggers owned by the company ensure that there is no benefit (real or perceived) to walking on the gunwale, removing that risk of falling into the water. With those vessels, there is also no need either to walk or crawl on tote boxes, nor climb a gantry to put the paravane pick-up rope into a snatch block, mitigating the risks associated with these activities as well.

The retrieval arrangement on the *Silver Angel* increased the risk of falling overboard during the retrieval of the paravane stabilizers, as it did not preclude a crew member from walking along the gunwale. Furthermore, the placement of the tote boxes made the alternative method of paravane retrieval hazardous because crew members would have to make their way across these boxes while being close to the side of the vessel without the protection of the railing.

Deckhand's Practice

The deckhand worked in the fishing industry most of his life, and he was known for his agility when moving around the vessel, including his practice of walking along the gunwale to retrieve the starboard paravane. Other crew members perceived this skill to be an asset. He probably started this practice to save time while waiting for the other crew member to finish his task on the port side. This practice, however, represented a clear risk of falling into the water, given that the small width of the gunwale did not provide for a balanced foothold, and that the deckhand had to grab either the stanchions or the railing while pulling the paravane rope along the gunwale. After completing this task successfully hundreds of times, it had become his normal practice. Despite the other option available to retrieve the paravanes, the deckhand's practice of walking on the gunwale was never addressed and continued unchecked.

Crew members may not fully assess the dangers of a behaviour when they perceive the risk to be low, particularly when they have successfully performed the same task many times in the past. Fishermen are routinely in danger of falling overboard while working near the rail and over the water. Many fishermen also routinely walk the gunwale in port carrying gear and equipment on and off the vessel and when docking. While it is normally not required on most fishing vessels, there are times a crew member may have to walk the gunwale while the vessel is at sea to clear gear or repair damages to equipment.

Because many fishermen are accustomed to walking on the gunwale while in port, they may not consider the necessity of donning personal protective equipment (PPE) before stepping onto the gunwale while the vessel is at sea. Over time, routine exposure to the practice of walking on the gunwale can desensitize crew members to the serious risks associated with it. Having seen the deckhand walking on the gunwale on numerous occasions, the crew of the *Silver Angel* became desensitized to the risks involved. The practice of walking on the gunwale while at sea, without the use of proper safety equipment, puts crew members at increased risk of falling into the water and subsequently reduces their chances of survival.

Personal Protective Equipment

The approved type of lifejacket required to be carried on fishing vessels must meet rigorous buoyancy standards and have the ability to turn an unconscious person in the water to a face-up position. Although personal flotation devices (PFDs) are not a direct substitute for Transport Canada (TC) approved lifejackets, they have the advantage of offering better freedom of movement if worn while working and provide a means of keeping afloat a person who has fallen overboard. Subsequent to the occurrence, TC issued a ship safety bulletin (SSB)¹⁴ accepting the replacement of approved lifejackets with PFDs under certain conditions, one of which is that they are being worn when it is deemed that risk can be decreased by wearing them.

Another type of PPE that can be used to enhance crew safety is the safety harness and accompanying lanyard. An approved safety harness can be used to anchor oneself to a secure part of the vessel to prevent a fall into the water.

In this occurrence, the deckhand was not wearing a safety harness or PFD. As such, when he fell overboard, not having been secured to the vessel, he lacked the flotation and extra visibility that a PFD would provide. This reduced his chances of survival and rescue.

Vessel Operating Level

When a crew member falls overboard, decisive actions must be taken quickly. The crew member's chance of survival will depend on the effectiveness of the crew left on the vessel. In order to achieve a successful rescue, it is critical that crew members keep the MOB in sight; close the distance between the vessel and the MOB; and retrieve the MOB from the water and onto the vessel. Some of these actions must be performed simultaneously. Therefore, an adequate number of crew members must be available to work as a cohesive team and apply the principles of MOB retrieval exercised during emergency drills.

¹⁴ Transport Canada, Ship Safety Bulletin 02/2011

The *Silver Angel* usually has a complement of 3 crew members. However, at the time of the occurrence, because the vessel was on a delivery trip and not fishing, only the captain and the deckhand were on board. When the deckhand fell overboard, the captain was the only person left on board to perform all the previously identified actions. Moreover, because of the size and design of the *Silver Angel*, the captain could not maintain sight of the deckhand at all times, as he was going back and forth to obtain equipment to rescue him. These activities also prevented the captain from manoeuvring the vessel closer to the deckhand.

Risk Assessment for Man Overboard Emergencies

The ability of a crew to react efficiently to any emergency depends on many factors, all of which must be carefully considered by owners and operators.

One aspect is determining the appropriate operating level of the vessel and the crew's corresponding skill set and training needs. For example, in the case of a MOB emergency such as encountered on the *Silver Angel*, one should consider the vessel's size and layout when determining the minimum crew level required on board to respond adequately. The number of crew required to rescue a man overboard on a single-decked vessel would be very different from a multi-decked vessel. It is the responsibility of the captain and owner to ensure the operating level of a vessel is appropriate for the voyage undertaken. Furthermore, frequent and effective emergency drills help prepare crew members to react quickly and efficiently to various emergency situations, particularly given a man overboard where time is of the essence.

Another aspect that must be considered is the provision of adequate emergency equipment and the stowage of this equipment to ensure ease of access. This aspect will also be influenced by the design of the vessel and the number of crew available to use it. On the *Silver Angel*, the lifering was not stowed in a location that was readily accessible from the working deck, nor was there any equipment available, such as a sling or a ladder, for recovering an MOB.

When an MOB is brought alongside the vessel, their recovery onto the deck could be a very difficult, if not impossible, task for one person. The difficulty is increased depending on the potential exhaustion or unconsciousness of the MOB, and the height of freeboard. There are various tools and methods available to assist in lifting an MOB onto the deck, including the use of any on-board winch or manual hoist. These tools and methods need to be identified in advance to help ensure a quick and successful recovery.

Finally, the provision and appropriate use of PPE such as PFDs or safety harnesses should be consistent with the types of activities performed on board. For example, an approved safety harness can be used to anchor oneself to a secure part of the vessel to prevent a fall into the water when there is a risk of this occurring.

The *Fish Safe – Handbook for Commercial Fishing and Aquaculture* on board the *Silver Angel* clearly states the need to be prepared for emergencies, and describes measures to take in advance to this end, thus encouraging fishermen to plan for different scenarios. However, no emergency drills had been carried out on the *Silver Angel* before the occurrence, and there was no specific equipment on board for recovering an MOB. In addition, no measures had been taken to ensure that there was a sufficient number of crew on board to handle an MOB emergency and that crew members wore personal floatation devices when at risk of falling into the water.

Where owners and operators have not conducted a thorough risk assessment resulting in appropriate safety policies, crew members may continue to be at unnecessary risk in the case of emergency situations such as man overboard.

Management of Risk on Fishing Vessels

Risk indicates the need for some action to address a safety issue and helps prioritize efforts to generate risk control options. Risk assessment consists of 2 main sub-processes: analysis of the probability of adverse consequences and analysis of the severity of adverse consequences.

A risk management system on a vessel attempts to formalize how risks are identified, assessed, and managed. Effective risk management requires organizations to be cognizant of the risks involved in their operations, to competently manage those risks and to be committed to operating safely. For example, the risk of MOB, albeit perceived as unlikely, is nonetheless high given the consequences of falling into the cold waters of the Atlantic Ocean.

The company did not have a formalized risk management system, nor is it required by regulation. This resulted in a fishing operation where

- the practice of walking along the gunwale to retrieve the paravane went unchecked;
- the arrangement of tote boxes posed a hazard to the crew if they retrieved the paravane by not going along the gunwale;
- the rigging of the gear used to retrieve the paravanes allowed for the option to walk along the gunwale;
- there was a lack of dedicated safety meetings and emergency drills;
- the operating level that was not adequate to address emergency situations;
- PFDs or safety harnesses were not provided or worn by crew members when working on deck; and
- the lifering was not easily accessible.

The company operating the *Silver Angel* is not unique in this respect. As part of the TSB safety issues investigation into small fishing vessel safety in Canada currently underway, consultations with over 300 fishermen and others in the fishing community were carried out across the country. Fishermen were asked to identify how they manage risks on board their vessel. None of them identified any form of dedicated risk management system, although, as demonstrated by this occurrence, the benefits in terms of safety are substantial. This applies equally as well to the single vessel owner/operators who would also benefit from such systems. For a single vessel owner/operator, a risk management approach might include holding regular safety meetings, emergency drills and crew familiarizations, and then recording the results.

In the absence of practical and active risk management systems for fishing vessel operations, unsafe conditions may remain unidentified and unaddressed, thereby putting the vessel and its crew at risk.

Conclusions

Findings as to Causes and Contributing Factors

- The deckhand probably fell from the vessel's gunwale while attempting to retrieve the starboard paravane pick-up rope, losing his footing and/or handhold as the vessel rolled in the seas.
- The arrangement of retrieval gear on board the vessel allowed for the retrieval of the paravane pick-up rope via walking along the gunwale.
- The deckhand's practice of walking on the gunwale was never addressed and continued unchecked.
- The deckhand was not wearing a safety harness or PFD. As such, when he fell overboard, not having been secured to the vessel, he was lacking the floatation and the extra visibility that a PFD would provide. This reduced his chances of survival and rescue.
- The captain, left alone on board the vessel, was unable to carry out all of the activities necessary to position the vessel and recover the deckhand from the water.
- The prevailing environmental conditions reduced the deckhand's ability to survive in the cold ocean, and may have contributed to the deckhand falling overboard as well as hampering the rescue.

Findings as to Risk

- Where owners and operators have not conducted a thorough risk assessment resulting in appropriate plans and procedures with regards to emergency drills, operating levels and emergency equipment, crew members may be at unnecessary risk in the case of situations such as man overboard.
- The practice of walking on the gunwale when at sea, without the use of proper safety equipment, puts crew members at increased risk of falling into the water and subsequently reduces their chances of survival.
- In the absence of practical and active risk management systems for fishing vessel operations, unsafe conditions may remain unidentified and unaddressed, thereby putting the vessel and its crew at risk.

Safety Action

Action Taken

Company

- Although the company's health and safety policy remains the same, the company implemented an occupational health and safety program on 16 August 2011. This program includes specific detailed references to the safe operation of the vessels.
- A captain and a crew member were added to the safety committee under the company's health and safety program. They have been given the responsibility of reporting any safety concerns that they identify to the committee on a monthly basis.
- The company has re-rigged the paravane stabilizer haul-up ropes to ensure crew members cannot access it by walking on the gunwale and will remain on deck when retrieving the paravane stabilizers.
- The company has provided water-activated inflatable PFD vests for each crew member on its vessels.
- The company has issued a directive for all crew members to wear a PFD when working on board its vessels.
- The company is reviewing procedures to retrieve a man overboard from the water and receive the crew member safely back on board the vessel. This includes a modified aluminum ladder that rests on the gunwale and extends several feet into the water.
- The starboard aft lifering has been moved aft of the starboard winch and an additional lifering has been added aft of the port winch.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 18 April 2012. It was officially released on 16 May 2012.

Visit the Transportation Safety Board's website (www.bst-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

Selections taken from the Nova Scotia Fisheries Sector Council, *FISH SAFE – A Handbook for Commercial Fishing and Aquaculture*, 2004

Measures to mitigate and minimize risks associated with a fisherman falling overboard:

1. The **right to know** about workplace hazards – including how to identify hazards and protect themselves from those hazards. The **right to participate** in decisions related to health and safety. The **right to refuse** dangerous work. The goal of this system is to get people working together to identify and control situations or hazards that could cause harm. (Page 6)
2. Use a pre-sailing checklist. Before leaving port, make sure the boat is properly prepared. (Page 8)
3. Prepare and submit a float plan. (Page 9)
4. Wear personal flotation devices (PFD) when working on the main deck. Newer PFDs are lightweight and designed for good mobility. (Page 14)
5. Know how to rescue someone who's fallen overboard. Death by cold-water immersion can occur within minutes in the frigid waters of the North Atlantic. (Page 16) Although a PFD will keep you above the surface of the water, it will not protect you from the elements, in particular frigid water. When water is extremely cold and the risk of falling in is high, wear a floater suit or other survival gear. The extra minutes the suit can keep you alive may allow time for a rescue. (Page 91)
6. Know how to find a missing crew member. Transmit a Distress to alert other boats in the area and the local rescue authorities. (Page 17)
7. Understand the hazards. Hazards are generally divided into four categories: **physical**, **atmospheric**, **biological** and **ergonomic**. A hazard is a "risk or chance associated with danger." (Page 18)
8. Use safety gear – personal protective equipment ... includes any clothing or equipment that helps to protect you from injury. Fall protection includes both fall restraint and fall arrest. (Page 29)
9. Danger Falling overboard. Always wear a PFD and a fall arrest system. Even a rope tied to a secure post or rail will keep a gaffer from falling overboard. (Page 59)

Appendix C – Sketch of the Occurrence Area

