Report on the investigation

of the capsize of

fv *Flamingo*

East of Harwich

on 7 July 2002

with the loss of four lives

Marine Accident Investigation Branch
First Floor
Carlton House
Carlton Place
Southampton
United Kingdom
SO15 2DZ

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Extract from

The Merchant Shipping

(Accident Reporting and Investigation)

Regulations 1999

The fundamental purpose of investigating an accident under the Merchant Shipping (Accident Reporting and Investigation) Regulations 1999 is to determine its circumstances and the causes with the aim of improving the safety of life at sea and the avoidance of accidents in the future. It is not the purpose to apportion liability, nor, except so far as is necessary to achieve the fundamental purpose, to apportion blame.

NOTE

This report is not written with liability in mind and is not intended to be used in court for the purpose of litigation. It endeavours to identify and analyse the relevant safety issues pertaining to the specific accident, and to make recommendations aimed at preventing similar accidents in the future.

CONTENTS

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

AB	-	Able-bodied seaman
CG	-	Coastguard
EPIRB	-	Electronic Position Indicating Radio Beacon
ETV	-	Emergency towing vessel
FV	-	Fishing vessel
GMDSS	-	Global Maritime Distress and Safety System
GPS	-	Global Positioning System
HRU	-	Hydrostatic Release Unit
kW	-	kiloWatt
m	-	metre
MHz	-	megaHertz
MRCC	-	Maritime Rescue Co-ordination Centre
PPI	-	plan position indicator
rpm	-	Revolutions per minute
SARSAT	-	Search and rescue satellite
SOLAS	-	Safety of Life at Sea Convention
UTC	-	Universal Co-ordinated Time
VHF	-	very high frequency
VTS	-	vessel traffic service

SYNOPSIS

On 7 July 2002, the Belgian beam trawler *Flamingo* sank just inside UK waters to the east of Harwich. Her crew of four was lost.

That evening, she had been fishing in the company of three other Belgian trawlers but, at 2253, Thames Coastguard was informed of an EPIRB alert from the vessel. She could not be contacted and a search and rescue operation began immediately.

*Flamingo'*s upturned hull was located, and the bodies of two of the four crew members were picked up. Neither was wearing a lifejacket.

The hull drifted with the tide until the following afternoon, when it was attempted to tow her towards a nearby sandbank, with the intention of beaching her. She sank shortly after the tow began.

A Belgian wreck recovery vessel raised *Flamingo* on 14 July, and she was taken to Zeebrugge, where the MAIB and the Belgian authorities examined her. The two missing crew members were not found.

The nets were being cleaned before the catch was brought on board. However, a weight of rocks and shells in the portside net caused it to break at a "weak link". This raised the vessel's centre of gravity, reduced her stability, and she capsized as a result.

There are indications that the vessel might not have capsized immediately, but remained with a large angle of heel for a short period of time. These indications include the EPIRB being manually activated, and the liferaft painter possibly having been manually released.

This tragic accident highlights the inherent dangers associated with beam trawling and the adverse effect on stability when operating fishing gear with derricks raised above the horizontal towing position.

It also illustrates the need for working-type lifejackets to be worn whenever crew members are working on deck. Doing so, might have saved the lives of *Flamingo*'s crew.

Recommendations have been made with regard to the wearing of lifejackets on the deck of fishing vessels, the risks to stability when operating beam trawlers, the effectiveness of quick release gear in preventing capsize, and the inherent dangers of the design of the "weak link".

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *FLAMINGO* AND ACCIDENT

Vessel details

Registered owner	:	BVBA Vaya Con Dios
Port of registry	:	Zeebrugge
Flag	:	Belgium
Type	:	Beam trawler
Built	:	1988
Construction	:	Steel
Length overall	:	23.82m
Gross tonnage	:	82
Engine power and/or type	:	Mitsubishi six-cylinder diesel producing 221kW at 1530 rpm. Fixed pitch propeller.
Service speed	:	About 10 knots

Accident details

Time and date	:	2232 UTC on 7 July 2002 (EPIRB time)
Location of accident	:	51°44.34 N 1°46.15 E
Persons on board	:	Four
Injuries/fatalities	:	All four crew lost
Damage	:	Vessel capsized and drifted inverted for about 15 hours until sinking. Wreck raised 6 days later. Apart from internal water damage, some structural damage occurred to masts, bulwarks and bilge keel during lifting.

1.2 BACKGROUND

Flamingo was a Belgian owned and registered beam trawler which fished regularly in the southern North Sea. Her fishing trips lasted about 10 days, before she landed her catch, normally, at the market in Zeebrugge. She regularly fished in the company of other Belgian trawlers.

At an unknown time before the accident, modifications were made to the vessel, without the knowledge of the Belgian authorities. The modifications included lengthening the derrick booms by just under a metre, and converting a forward space to a fresh water tank, to supply a newly fitted ice machine in the fish hold.

Two previous incidents had occurred while fishing in the same grounds off the east coast of England:

In March 2000, the starboard gear had caught fast, the gear was lost and the derrick bent.

In May 2002, a derrick (side unknown) was bent. A tug was requested to lift the gear out of the water, but was unable to do so. Her propeller then became fouled and the vessel was towed to Ostend.

A relief crew was on board at the time of the accident on 7 July 2002. The regular crew were on leave.

The 32 year old skipper had served on *Flamingo* on several occasions during the previous 10 months, as both mate and skipper. He held a Belgian coastal fishing skipper's certificate. He joined on 30 June 2002.

The 38 year old engineer had served on *Flamingo* for about 13 weeks during the previous 5 months. He held a Belgian engineer's service certificate.

The 40 year old AB held a Belgian watchkeeping certificate. He had served on *Flamingo* once before, from 14 April 2002 until 17 May 2002. He joined this trip on 25 May 2002.

The deckboy was 17 years old. He had worked on board *Flamingo* three times previously, for a total of about 7 weeks over the previous 9 months. He joined on 30 June 2002.

1.3 ENVIRONMENTAL CONDITIONS (ALL TIMES UTC)

At the time of the accident, the wind was south-west force 4, with a south-westerly swell of about 1 metre. The visibility was good and the skies were clear. High water at Harwich was at 2135. At 2200 the tide, at the EPIRB position, was setting 019°x 0.6 knots. At 2300 it was setting 024° x 1.1 knots. It was 5 days before a spring tide. Sunset was at 2011 and sunrise at 0343. The sea water temperature was about 14°C.

1.4 NARRATIVE (ALL TIMES UTC)

Flamingo left Zeebrugge at 1800 on 30 June 2002, intending to return on 9 July to land her catch at the market. She planned to spend her entire trip off the south-east coast of England.

Between leaving Zeebrugge and 7 July, the skipper, using mobile telephone text messages, frequently contacted the regular skipper, who was on leave. They discussed the fishing areas.

At 0700 on 7 July, the crew contacted the owner with regard to the high temperature of the main engine cooling water. That evening, *Flamingo* was fishing to the east of Harwich in the company of three other Belgian beam trawlers.

At 2232, Falmouth MRCC received a manually activated EPIRB alert on 406 MHz from an EPIRB registered to *Flamingo* in position 51°44.34 N 1°46.15 E.

At 2253, Thames CG was informed by telex of the alert. At 2256, *Flamingo* was called by Thames CG on VHF without response.

At 2309, Harwich lifeboat was tasked and the VTS at Harwich contacted. They reported several radar contacts in the area. Harwich lifeboat was launched at 2329.

At 0044 on 8 July, the Belgian fv *Asterias* contacted Thames CG and stated that they were alongside the capsized hull of *Flamingo* in a position about 3 miles north of the EPIRB position.

At 0101, Harwich lifeboat recovered the body of *Flamingo*'s engineer in position 51° 48.76 N 1° 47.92 E. He was fully clothed with oil skins, with no shoes, just socks. Shortly after recovering the body, the lifeboat recovered the EPIRB.

The search and rescue effort now included a pilot vessel, the Belgian trawlers, two lifeboats, a helicopter, a dredger and other passing vessels.

At daylight, Harwich lifeboat launched its daughter boat and sounded around *Flamingo*'s hull with a hammer. Nothing was heard from inside the hull. The hull was in very good condition, the rudder appeared to be over to port and the propeller was turning slowly with the sea. A green line under tension was running across the hull from one side to the other. The hull was drifting with the tide **(see Figures 1, 2 & 3)**.

Figures 1, 2 and 3 - The capsized hull prior to sinking

At 0349, a Belgian helicopter with infra-red equipment guided Harwich lifeboat to a second body, that of the *Flamingo*'s AB. The position was 51°52.5 N 1°49.5 E. He was wearing jogging bottoms, socks and no shoes. He had suffered bruising above the right eye and on the left side of his forehead.

At 0540, Royal Navy divers were on the scene, having been landed on to Walton lifeboat by a CG helicopter. At 0621, a diver entered the water and was able to look through the wheelhouse windows. He tried the portside door but could not open it. He then moved around to the aft end and entered the mess room. He found no-one, so returned to the surface.

At 1237, the emergency towing vessel (ETV) *Anglian Monarch* arrived on the scene **(see Figures 4 & 5)**. At 1247, she attached a line to the hull with the intention of towing *Flamingo* to a sandbank and beaching her. At 1324, *Flamingo* sank, stern first, while being towed in position 51°56.02N 1°49.73E and in 40m of water.

On 9 July at 1300, the Belgian wreck recovery vessel *Norma* arrived at the location, and she anchored at 0100 the following day. Her personnel then began diving on the vessel with the intention of securing lifting slings and then raising her. Because of the depth of water and the tidal stream, dives could only be made during a short window around slack water. The vessel was lying almost upright, slightly over to starboard.

On 14 July, on the twentieth dive, the diver entered the water at 2042 and was clear of the water at 2148. At that time, heaving up of the vessel began. At 2210, the VHF antenna on the foremast broke the surface and, at 2245, the main deck was clear of the water. At 2300, an MAIB inspector boarded the vessel, together with a representative from the Belgian Maritime department. No bodies were on board **(see Figures 6 & 7)**.

At 0400 the next day, *Norma* sailed for Zeebrugge, with *Flamingo* secured to her stern, clear of the water. She arrived later that evening **(see Figure 8)**.

The postmortem on the two crew members determined that the cause of death was drowning.

The remaining two crew members, the skipper and deck boy, at the time of writing, had not been found.

Figures 4 and 5 - The ETV preparing to tow the capsized hull

Figure 6

The vessel being raised

Figure 7

Flamingo after raising

Figure 8

Flamingo being examined in Zeebrugge

1.5 FINDINGS AFTER THE VESSEL WAS RAISED

As previously stated, *Flamingo* was examined by an MAIB inspector and the Belgian Maritime department when the vessel was raised. The MAIB and the Belgian authorities then inspected her at length in Zeebrugge. The following are the findings of her condition after she was raised from the seabed:

1.5.1 Wheelhouse

An electronic navigation technician assisted the MAIB and the Belgian authorities to examine the bridge equipment on 18 July in Zeebrugge. The following was found:

Automatic pilot FAP-50

There was no visual internal indication of damage and/or malfunction. It was not possible to determine the settings at the time of the accident. All fuses in the relay box were intact. It was known that it was common practice for the vessel to be in auto-steering the whole time she was at sea.

Magnetic compass

Inspection of the magnetic compass and mirror showed no visual damage. The heading was correct.

Racal Decca CVP3500 fishplotter

The power control knob was in the “on” position, indicating that it was operational at the time of the accident. There was no floppy disc in the disc drive.

Decca fishplotter FM06086

The cathode ray tube was imploded on this unit. The power control knob was in the “on” position, indicating that it was operational at the time of the accident. There was no floppy disc in the disc drive **(see Figure 9)**.

Figure 9

Decca fishplotter with cathode ray tube imploded

Echosounder Furuno FVC261

Visual inspection of the unit showed no apparent damage. It was not possible to determine if the unit was operational at the time of the accident.

Radars Furuno FR800 and FR1510

Visual inspection of both units' PPIs and scanners showed no apparent damage. On both units the power knob was in the "on" position, indicating the unit was operational at the time of the accident. The FR800 was found to be set to the 6-mile range, it was not possible to determine the range setting on the other radar.

GPS Furuno GP70 and Furuno GP31

Visual inspection of both units showed no loose contacts. As the units were operated by soft-touch power buttons it was not possible to determine if they were operational at the time of the accident.

The VHF and GMDSS DSC receivers were found with their power switches turned to "on".

Other wheelhouse findings

The wheelhouse clock was found to have stopped at 1159 and 9 seconds.

The main engine throttle control was found at about 60% ahead. The main engine was clutched in **(see Figure 10)**.

The six winch controls were all found in the "brake on" position, except for the outboard starboard control, the gilson, which was found forward in the "freefall" position **(see Figure 11)**.

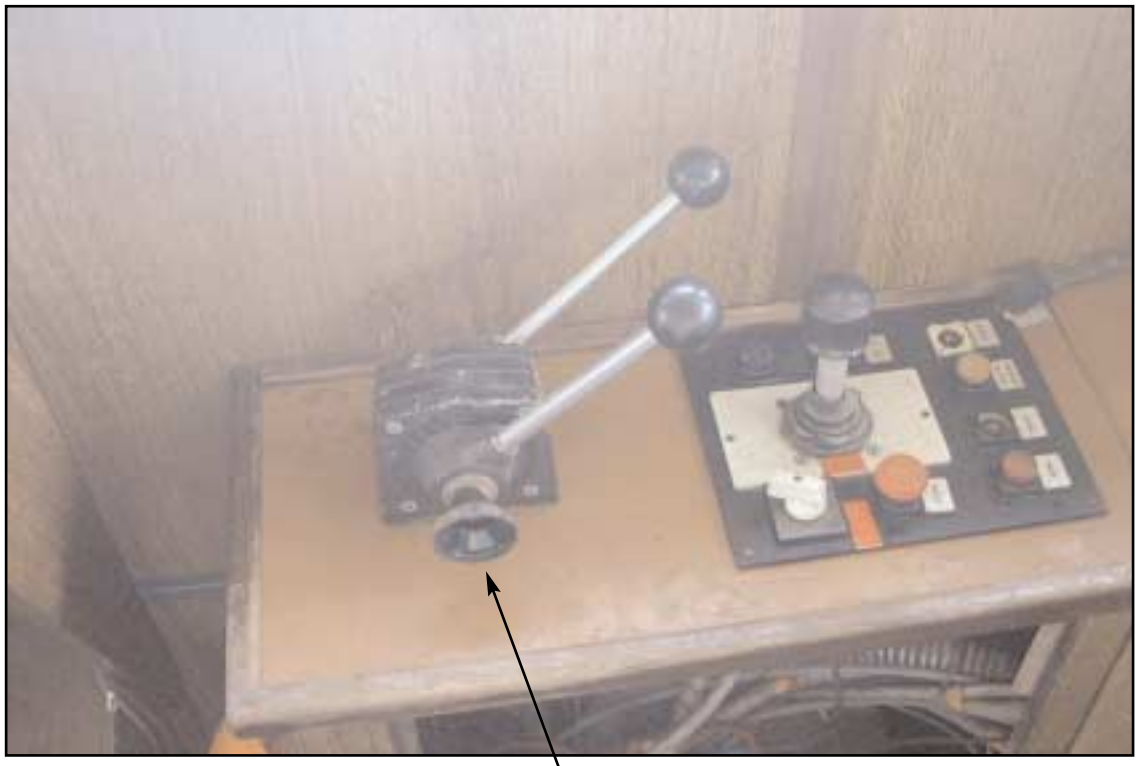
The logbook was not found, although the front cover was located in the mess room.

The lighting panel indicated that navigation lights were displayed for a vessel trawling and hauling her gear.

The fish hold temperature control was set to +2°C.

Several panels had come loose and were scattered around the wheelhouse.

Figure 10



Main engine clutch and throttle controls

Figure 11

The starboard fishing controls (as found after raising)

1.5.2 Fishing gear and derricks **(see Figures 12,13 & 14)**

Both derricks were topped to about 50° from the horizontal and about 45° abaft the beam. The derrick heads would have been around 8.5 metres above the waterline in this position.

The gilson lines were made fast, under tension, to the bulwarks on each side of the accommodation.

The topping lifts, runners and blocks all appeared to be undamaged and in good condition.

The quick release gear, at the end of each derrick, had not been tripped.

The beams were suspended about 5 metres below the derrick head on each side.

The starboard side gear was intact. There was a hole of about 1.6 metres diameter, centred about 4 metres from the cod end. Some recent repairs were noted around the hole. The cod end was secured, some dead fish and about 250 – 500kg of stones were in it. The beam and chains appeared to be undamaged.

The port side gear appeared to be undamaged, however, the bottom 6 metres of the net was missing. The break had occurred at the “weak link”, designed to break first in the event of excess weight **(see Section 2.6)**.

1.5.3 Machinery

The rudder was found to be hard-to-port. No defects could be found with the steering gear.

Visual examination found that the propeller, Kort nozzle, rudder and stock were undamaged.

The fuel oil daily service tank alarm was switched on.

The aft engine room bilge alarm junction box was inspected and a loose wire for the alarm system was found. The engine room bilge alarm was switched off.

All four bilge suctions were closed and the two-way valve was positioned for bilge suction operation.

The port generator was running and had a load of 52 amperes at the time of the accident.

A bank of batteries, normally stowed on the port side of the engine room, was found wedged behind the starboard generator.

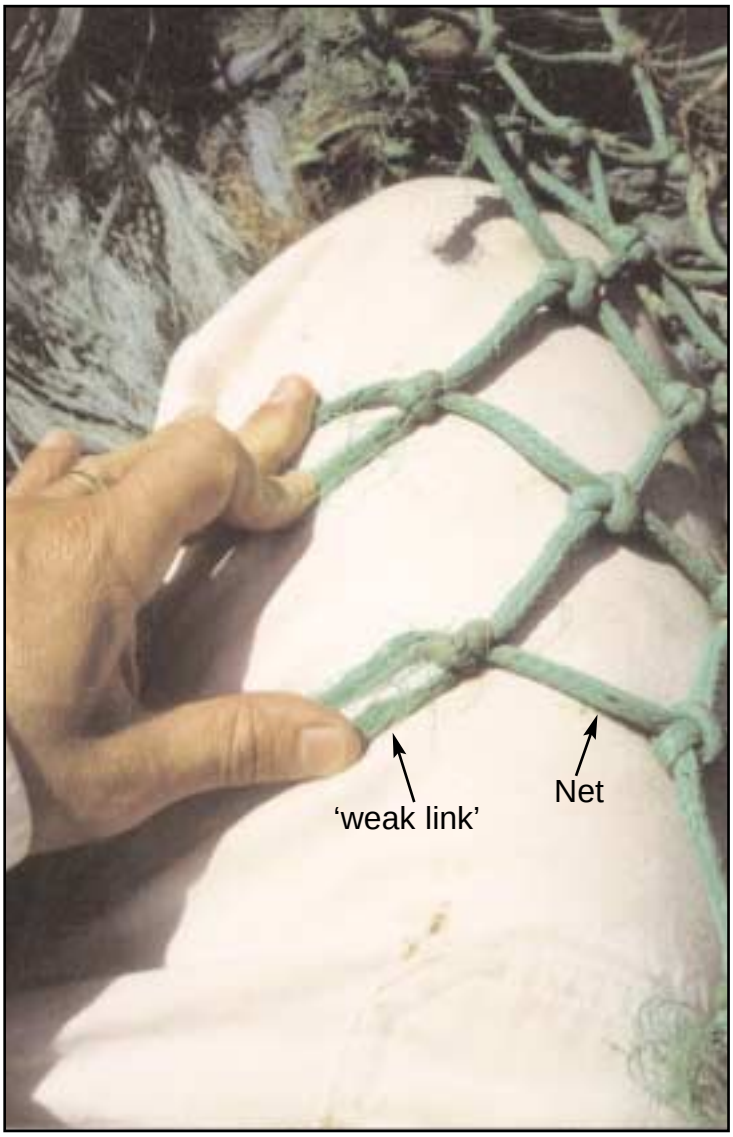
Figure 12

Port net and beam (starboard net in background)

Figure 13

Port net parted end

Figure 14



Port net

1.5.4 Accommodation

The mess room was found in a chaotic condition. The cooker was lying on its front, and the fridge on its side, both having come free from their securing arrangements. Books, clothing, plates and cooking utensils were strewn around the space, along with mud and pools of water. A plate of food was found in the microwave. It was not possible to determine the microwave settings at the time of the accident.

The toilet was found with the door closed, but unlocked. Nothing was in the toilet apart from some cleaning materials.

The cabin space was also found to be in a chaotic condition. Clothing, shoes, blankets and medicinal supplies were scattered around the space.

1.5.5 Lifesaving appliances

The liferaft floated free in its valise, without inflating, when the vessel sank. The Walton lifeboat recovered it. The hydrostatic release unit (HRU) was found in place on the accommodation top, just aft of the funnel. The weak link was intact and unbroken. The securing strap was in place, secured to the aft end of the cradle, with the other end free.

The Harwich lifeboat recovered the EPIRB. The HRU was missing, but the manual release pin was found secured to the mounting on the aft end of the funnel.

The rigid polyester red raft was found with its line caught around the vessel's handrails, when *Flamingo* was raised.

Five lifejackets, of the type required to be carried by the safety equipment certificate, were found in the cabin space, six were carried on board. All six of the working-type lifejackets were found in the winch room.

The SOLAS emergency radio was missing from its stowage place in the wheelhouse.

1.5.6 Doors/openings

The port side wheelhouse door was closed, the starboard wheelhouse door was open but not secured. The starboard side accommodation door was closed. The engine room entrance was secured open. The aft accommodation door was closed. The cabin space emergency escape hatch on the aft end was down, but not secured, and was noted to be opening and closing with the release of water from the space as the vessel was being raised. The fish hatch was secured closed with both securing clips. The hinged flap from the conveyor belt, which was used to transfer fish into the hold after cleaning and gutting, was found to be unsecured. The forward store hatch was found secured closed.

1.5.7 Other

A quantity of dead fish was found in the fish hold, along with about 100 fish boxes.

Various items in the forward store were found piled up on the starboard side.

The hull was intact, with the paintwork – both above and below the waterline – in very good condition.

1.5.8 Damage

The following damage was noted and was thought to have occurred during the raising operation:

- Handrails on the aft port accommodation top were missing
- Coaming at the aft starboard corner of the wheelhouse top was buckled
- Electric cabling on the foremast had been cut
- Mainmast top was fractured and hanging by cabling
- Starboard bilge keel was buckled

No bottom damage was seen.

1.6 BEAM TRAWLING

Flamingo was a beam trawler. This is a method of fishing whereby a derrick extending over either side of the vessel tows a net attached to a heavy beam.

While towing, the beams remain in contact with the seabed, and also keep the mouths of both nets open. Between each beam and its net is a chain mat, which is intended to disturb fish and encourage them to rise and to swim into the mouth of the net as it slides over the seabed.

Once within the net's mouth, fish migrate through a converging section of the net, known as the belly, towards the net's closed end, known as the cod end. The cod end is that part of the net which is hauled on board by a simple lifting arrangement known as the gilson, when connected to a line called a "lazy decky". This line is attached to the shoe of the beam. The other end leads to the cod end's entrance and to a line which encircles its throat. When the gear reaches the surface, weight is taken on the "lazy decky" using the gilson **(see Figure 15)**.

Once on deck, the cod end is opened to release the fish.

The derricks can be lowered and raised with a multi-purchase block arrangement leading to the gantry head and winch. In the towing condition, each derrick is horizontal and is located fore and aft by two stays attached to its head.

Flamingo had three controls for each side's gear in the wheelhouse. Each control had three settings;

Lever back; this releases the brake pneumatically so that the winch, for the particular wire, can be operated.

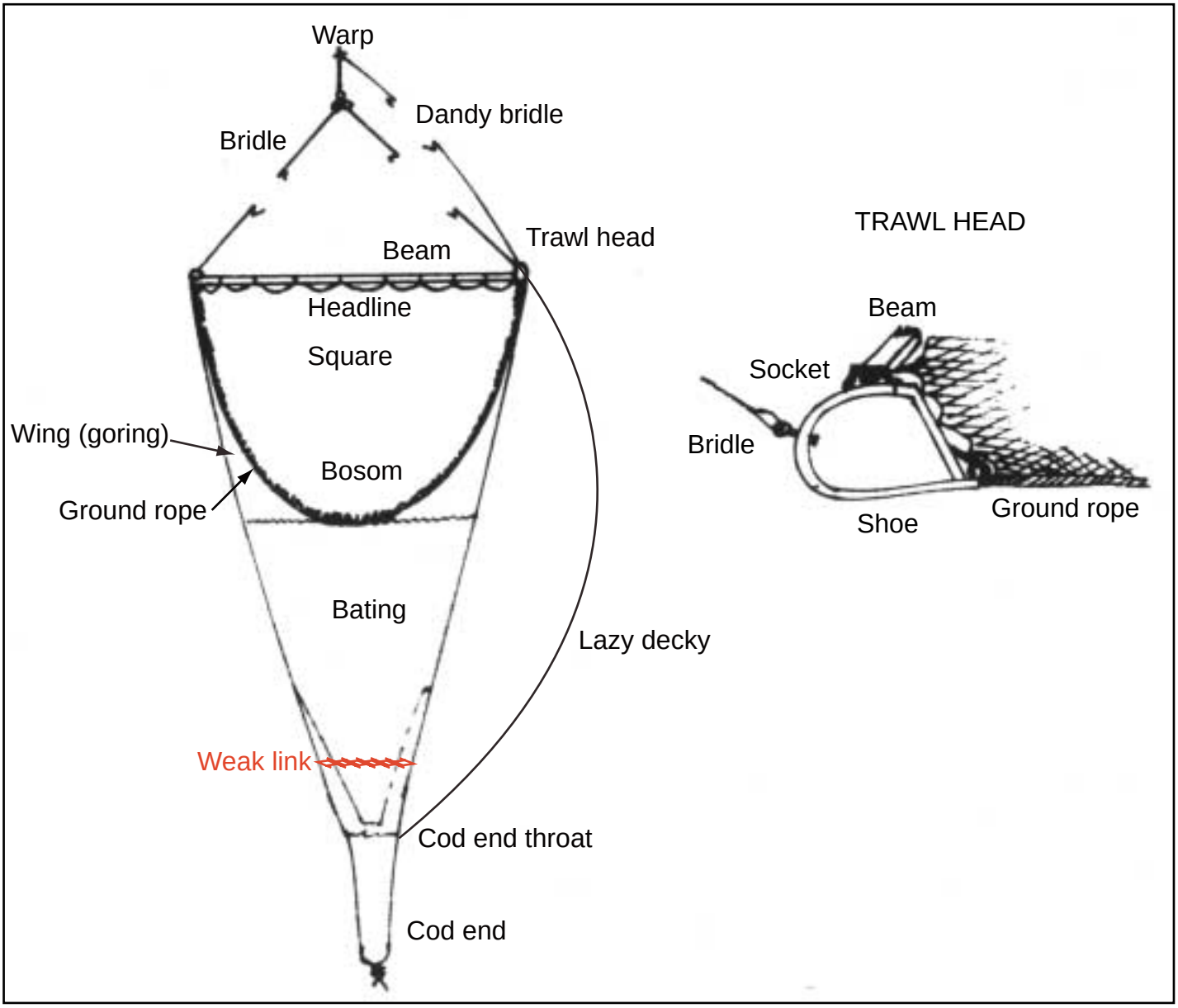
Lever in mid-position; the brake is on.

Lever forward; the winch is in freefall and pays out the wire under gravity.

The inboard control was for the fishing line, which controlled the length of towing wire. The centre control was for topping and lowering the derrick. The outboard control was for the gilson line.

On occasions, before lifting the catch on board, it is necessary for a beam trawler to wash her nets to clear out sand and shells and other fine debris, and also to move the catch to the aft section of the cod end. This is to avoid excess weight while lifting the catch on board, and to save time while sorting the catch. The nets are washed by topping the derricks to about 45° and steaming ahead

Figure 15



Beam trawl

for a period of time, usually about 15 to 20 minutes, but dependent on the composition of the seabed. It was quite common for vessels fishing in the area of the accident to have to wash their nets before lifting the catch onboard.

Beam trawlers are particularly prone to snagging their gear on the bottom. If only one side is snagged, the leverage may turn a vessel through 90° and give rise to a capsize risk. Similarly, during hauling operations, the weight of the catch is transferred to the top of the derrick, which will lead to a rise in the vessel's centre of gravity and may lead to capsize.

A beam trawler at sea with gear deployed, can behave differently to vessels using other fishing methods. The fishing gear has a damping effect on the roll of the vessel. This damping effect masks the signs that indicate the vessel's stability state.

The MAIB has investigated several accidents involving beam trawlers. These include the loss of *Pescado* in February 1991 with all six crew, when her gear became snagged on the seabed. Also, the loss of *Margaretha Maria* in November 1997 with all four crew, when she capsized and sank, most probably while the derricks were being topped with large weights of shells and sand in the nets.

These investigations revealed that stability of beam trawlers may be substantially reduced by normal operational movement of derrick and fishing gear, and the snagging of gear on the seabed.

As a consequence to these investigations, and studies undertaken with the co-operation of the fishing industry, the MCA published MGN 181 (F). The guidance advises appropriate precautions to be taken when operating beam trawlers, and the stability problems such vessels could have when raising the derricks above the horizontal towing condition.

1.7 EPIRB

To signal a distress, EPIRBs operating on 406MHz give a complete, yet non-continuous coverage of the earth. The non-continuous aspect of the coverage occurs because the polar orbiting satellites can only view a portion of the earth at any given time. Consequently, the system cannot produce distress alerts until the satellite is in a position where it can "see" the distress beacon.

At 2045 on 7 July 2002, a satellite started passing over the area where *Flamingo* was fishing. The final pass over the area was completed at 2058.

The next satellite over the area was SARSAT 4, which acquired a signal at 2224. The EPIRB alert was transmitted at 2232. The EPIRB was manually activated.

SECTION 2 - ANALYSIS

2.1 AIM

The purpose of the analysis is to determine the contributory causes and circumstances of the accident as a basis for making recommendations to prevent similar accidents occurring in the future.

2.2 THE CAPSIZE

Flamingo capsized during the evening of 7 July 2002 and had remained afloat, inverted, for about 15 hours before sinking.

Both derricks were found topped at about 50° from the horizontal and about 45° abaft the beam. The derrick heads were around 8.5 metres above the waterline in that position, and the beams were suspended about 5 metres below the derrick head on each side. The vessel's centre of gravity was raised and her stability reduced when in this condition.

The gilson lines were made fast, under tension, to the bulwarks on each side of the accommodation. The fish hatch lid was also found secured. The main engine was set to about 60% ahead, and all the indications are that the engine was running at the time of the capsize.

The above evidence indicates that *Flamingo* had completed a tow and was in the process of cleaning her nets before bringing her catch on board. This was a quite normal practice for vessels fishing in this area. Because of the depth of water, the position of *Flamingo*'s gear near the surface, and the fact that the inverted hull drifted with the tide throughout, the possibility of her gear being snagged on an obstruction is effectively ruled out.

The examination of her nets in Zeebrugge, found that the starboard net was intact except for a hole of about 1.6 metres in diameter, centred about 4 metres from the cod end. The beam and chains appeared to be undamaged. However, the bottom 6 metres of the port side net was missing. The section of missing net broke away at the "weak link". This link is designed to break first in the event of excess load.

It is highly probable that a substantial quantity of rocks and shells remained in both the starboard and port nets, of similar composition to the small quantity found in the starboard cod end, when the vessel was brought back to Zeebrugge. It is probable, therefore, that the weight of rocks and shells in the port net caused it to come apart at the weak link. The vessel capsized as a result.

When the weak link parted, most of the contents in the port net would be thrown out. Consequently, the vessel would heel immediately to starboard, because of the weight remaining in the starboard net. The weight in either nets is unknown, but it could have been several tonnes. Given that the starboard net held rocks and shells, its weak link was, quite possibly, close to breaking point. It is also apparent that the lazy decky parted, as the bottom section of the net was not found. When this occurred is not known, but it might have been after the vessel sank. A green line under tension was noted to be running across the hull from one side to another when the vessel was floating inverted. This might have been the port side lazy decky.

The engine room batteries and the gear in the forward store, all on the starboard side, indicate the capsize was to starboard. With the evidence available, it is not possible to establish exactly the size of the heel to starboard, when the port net broke. However, the heel was probably substantial, if not leading to an immediate capsize.

The vessel was, almost certainly, in autopilot at the time of the accident. The explanation for the rudder being hard-to-port is thus:

The starboard gear would be close to the surface. Together with the vessel's forward motion, this would cause a "drag" in the water. A pressure differential would be created between the two sides of the vessel. The autopilot would therefore adjust the vessel's heading by compensating for the starboard alteration by putting the rudder to port. This would, initially, be by a few degrees. However, if the vessel failed to respond, more port helm would be put on until the rudder was hard to port, as it was found when the vessel was raised. The rudder would remain over to port until the previously manually inputted heading was re-established.

An effect of the rudder being over to port would be to heel the vessel away from the turn. Assuming the rudder overcame the forces of the "drag" of the starboard net, and that it was altering the vessel back to port towards her intended heading, the vessel would heel away from the turn. In this case this would be to starboard. This effect would be to increase further the starboard heel.

It is not known how long it took from the port net parting until the vessel capsized. It could have been immediate, or it is possible the vessel remained with a heavy starboard heel for a short period of time. The vessel might have rolled with the heading alterations and water started to come over the gunwales. The machinery space and the fish hold would then have flooded. The machinery space door, on the starboard side, was secured open and the hinged flap opening into the fish hold from the conveyor belt was also found open. The flooding of these two spaces would have further increased the heel and reduced the vessel's stability. The fact that the rudder had time to move hard-to-port indicates the capsize was probably not immediate.

An immediate capsize is quite feasible because of the large heeling moment generated and equivalent heeling lever, which would be, probably, in excess of the vessel's righting lever. As the weight of the content of the vessel's nets is not known, this cannot be confirmed.

Alternatively, it is possible the vessel did not capsize immediately, but heeled, at an excessive angle, over to starboard, for at least a few seconds, before capsizing. The reasons for this are outlined in the following section.

2.3 ACTIONS OF THE CREW

During the net cleaning operation, which takes up to about 20 minutes, one or more crew members could be expected to be on deck, watching the gear and preparing to lift the catch on board. The wheelhouse should have been manned throughout.

Based on the tension on the fishing lines, and the crew's past experience of the area and, possibly, what they observed visually, they were aware their nets were heavily laden with something other than fish. Although it was a relief crew, with the exception of the deck boy, they were familiar with the vessel and were reasonably experienced.

If the capsize had been immediate when the net parted, those on deck would have been thrown into the water. Those inside the accommodation or wheelhouse would have been trapped inside, and left to try to free themselves from the inverted vessel. Given their sudden immersion in water, and the subsequent cold shock, this would have been far from easy. With the stress of the event they would have found it difficult to find and open exits. However, it would not have been impossible for those inside the vessel to swim free if the vessel had capsized immediately.

Had capsize not been immediate, those on board would have had a limited period to react to the situation. The person in the wheelhouse, when he realised the port net had parted, would have instinctively put the throttle to neutral and, quite possibly, "freefall" the starboard gear into the water. When the vessel was raised, the throttle was found in 60% ahead. This is the normal setting expected when cleaning the nets. However, the only fishing control that was not in the "brake on" position was the starboard gilson line. This was in the "freefall" position. This line was not in use and was found secured to the bulwark.

It is possible that this lever was knocked, during the capsize, by one of the panels found loose in the wheelhouse. It is also possible that the person in the wheelhouse went to put the fishing line into freefall but, as a result of the shock and stress of the accident, moved the wrong lever.

That food was found in the microwave points to the possibility that no-one was in the wheelhouse when the net parted. This possibility is reinforced by the fact that the throttle controls had not been put into neutral. If the capsize had been immediate, however, there would have, most probably, been no time for the person in the wheelhouse to adjust any controls.

There is evidence that the EPIRB was activated manually. This gives credence to the fact that *Flamingo* did not capsize immediately. If a vessel sinks, the EPIRB is released automatically by the HRU and activated automatically. The satellite-receiving signal confirmed the EPIRB was not released automatically. That it was released manually, can be confirmed by a number of facts. The HRU was found to be missing, indicating it had not released, yet the manual release pin was found secured to its mounting. To activate the unit manually, the beacon needs to be removed from its stowage position. It appears, though, that the release unit was torn away, allowing the beacon to be removed. Normally, to detach the EPIRB from its mounting, the securing clamp pin is first removed before the securing clamp can be opened. A person in an emergency situation, knowing he is fighting for his life, could possibly tear the EPIRB from its mountings to activate it, rather than follow the intended procedure to release the beacon. It is possible that in the case of the vessel heeling over slowly, one of the crew could have climbed, or even swum, around to its stowage position to release the EPIRB. During the salvage operation, the first crew member recovered, the engineer, was found close to the EPIRB. He was also wearing oilskins. This indicates that he was working, most likely on deck, at the time of the accident. He might even have been holding on to the EPIRB at one stage.

When the vessel sank, the liferaft surfaced without inflating. The painter was not attached to the weak link of the hydrostatic unit, which was found attached to the vessel. If it had been attached, the liferaft would then have inflated automatically. The painter might have been detached for some time during the voyage, and gone unnoticed by the crew. Alternatively, in an attempt to inflate the liferaft manually before the vessel sank, the crew member who activated the EPIRB, might well have detached the painter from the weak link.

The SOLAS emergency radio was found to be missing from its stowage position in the wheelhouse. This is further evidence to indicate that the vessel did not capsize immediately. It is possible one of the crew had the presence of mind to take it. It is also possible that it was lost during the capsize.

It seems that all four crew members were able to get off the vessel either before the capsize, or shortly after. The escape hatch from the cabin was found open. It might have been left open for ventilation or have been opened by escaping crew. If the vessel had capsized immediately, it is likely that one or more persons would have been found on board when the vessel was raised. This, again, suggests the vessel heeled over to an extreme angle for a short period of time before capsizing.

The evidence found during salvage work showed that the working-type lifejackets were not being worn. All were found in the winch room. Five of the six full-type lifejackets were recovered from the raised wreck. The two crew members who were recovered, died from drowning. The bodies found were not wearing lifejackets.

The use of a lifejacket would have provided the crew with buoyancy, giving them more chance of survival. It is possible that the missing lifejacket was taken by a crew member. However, if he was wearing it, it is likely he would have been located.

The rigid raft would also have given a person in the water some buoyancy and, at least, provided something to hold on to. It is unfortunate that its line was caught around the vessel's handrails, and that it was out of reach of those in the water.

2.4 THE RESCUE

The search and rescue was conducted with much effort and every resource available. Falmouth MRCC passed on the EPIRB alert to Thames CG. Falmouth attempted to contact *Flamingo* and, when no reply was received, alerted the lifeboat and other rescue resources at their disposal.

The other Belgian vessels fishing in the vicinity were not aware of their colleagues' plight until they heard the broadcasts from the CG. One of the Belgian fishing vessels discovered the upturned hull. In their rescue attempts, both the Harwich and Walton lifeboats worked throughout the night and into the next day. The Royal Navy divers were flown from the south coast and made a brave attempt to locate anyone still alive and trapped in the inverted hull.

Every effort was made to find any survivors from the vessel.

The ETV, *Anglian Monarch*, made an attempt to tow the vessel and beach her on a sandbank. Unfortunately, while being towed, she sank.

The Belgian wreck recovery vessel, *Norma*, and her team of divers, worked tirelessly over several days, in very testing conditions, to raise the vessel. If they had not done so, it is unlikely the cause of *Flamingo*'s loss would have been established.

The time of the accident is not known for certain. At 2045 on 7 July 2002, a satellite began to pass over the area where *Flamingo* was fishing. The final pass over the area was completed at 2058.

The next satellite over the area was SARSAT 4, which acquired a signal at 2224, the EPIRB alert being transmitted at 2232. The wheelhouse clock was battery operated and was found stopped at 1159 and 9 seconds (12 hour clock).

With the assumption that the clock was set to the correct Belgium time (UTC+2), this would be 2159 UTC. This time corresponds to being between satellite passes, and would not be picked up until SARSAT 4 passed over the area.

Therefore, the capsize is considered to have occurred at around 2200 UTC on 7 July.

2.5 BEAM TRAWLING

This tragic accident again highlights the dangers of fishing, and beam trawling in particular.

Extreme vigilance, awareness and caution should always be shown whenever the gear is out. This is particularly important when the derricks are topped and the vessel's centre of gravity is raised and her stability therefore reduced. This is the critical period when the vessel is most at risk of capsize.

The crew were, most likely, aware that an excessive weight was in their nets. They were also aware of the weak link fitted to the nets, as they had repaired it on occasions in the past when it had parted. With the nets having the weak link, which is designed to allow the net to part and prevent the loss of her gear, vigilance should be displayed whenever it is suspected an excessive weight is in one or both nets. Although the "weak link" is designed to save the gear, its parting might cause the vessel to heel dangerously.

The quick release gear at the end of each derrick is fitted to allow the towing wire to be brought close to the side of the vessel in the event of the gear becoming snagged on the seabed. It would not be expected that the quick release mechanism would be operated without the vessel's gear being snagged on the seabed.

In the circumstances of this particular accident, the hazards involved in washing the nets should be part of a risk assessment. This could reduce the risks of the operation to an acceptable level.

The modifications made to *Flamingo* were not approved by the Belgian authorities. The modifications, in particular the lengthening of the derrick booms, might have reduced her stability from that of her original design.

The engine room bilge alarm was found switched off. A loose wire was discovered in the aft engine room bilge alarm junction box. It is not known how long the bilge alarm had been switched off. However, the most likely reason it was disabled was loose wire, causing irritating intermittent false alarms.

Although not thought to be a contributory factor to the accident, the engine room bilge alarm is an important safety feature on any vessel. Normally, it is the first indicator of flooding in the engine room. If disabled, the loss of an early warning of engine room flooding significantly increases the chance of foundering.

The often repeated tragic lesson from this accident highlights the need to wear lifejackets when working on deck. Without them, the chance of survival is severely limited. The main concerns are cold, staying afloat and swallowing water. Various factors determine how long a person can survive in the water; the sea water temperature; whether a lifejacket is worn; and the clothing worn. In this accident, had the crew on deck been wearing lifejackets, even working-type lifejackets, these might have saved them.

The first body was located about 3 hours after the vessel was thought to have capsized. Scientific research and evidence of previous accidents, have shown that a person with light clothing and sufficient buoyancy would have a reasonable chance of surviving for this time on a summer's evening with sea water temperatures of about 14°C.

2.6 WEAK LINK

Use of the "weak link" increases the chances of capsize during the trawling operation. In this case, breakage of the "weak link", as *Flamingo* washed her nets of stones, was the principal reason why the vessel capsized with the loss of four fishermen.

The "weak link" parted under the strain of weight when the starboard trawl was brought virtually to the surface, and "washing of the trawls" had begun.

Flamingo's gear on each side weighed about 3 tonnes and consisted of a beam chain, chain mat and net. The "weak link" consisted of one single band of mesh around the circumference of the trawl, positioned above the cod end. The "weak link" was of smaller diameter line than the net, consisting of 3mm 3-stranded polypropylene, at about 6 metres from the cod end **(see Figure 16)**.

Although the trawl had parted in the intended place in this incident, it had a detrimental effect on the vessel's stability.

The "weak link" is designed to enable heavy weights to be expelled from the trawl without losing the catch, or the trawl. However, as far as safety of the vessel is concerned, the point of the operation at which the "weak link" parts is of paramount importance.

Such a method is designed so that the "weak link" parts when the trawl is on the seabed, or when hauling the trawl off the seabed begins. At this stage, the parting of the "weak link" has minimal effect on the vessel's stability. The weak link will be fail-safe.

With the weak link parted, the weight is expelled from the trawl. The main part of the trawl can then be retrieved back on board along with the cod ends using the "lazy decky", with the catch intact. In this scenario, the "weak link" has had the desired effect; no loss of gear, an easily manageable trawl and no loss of catch **(see Figure 15)**.

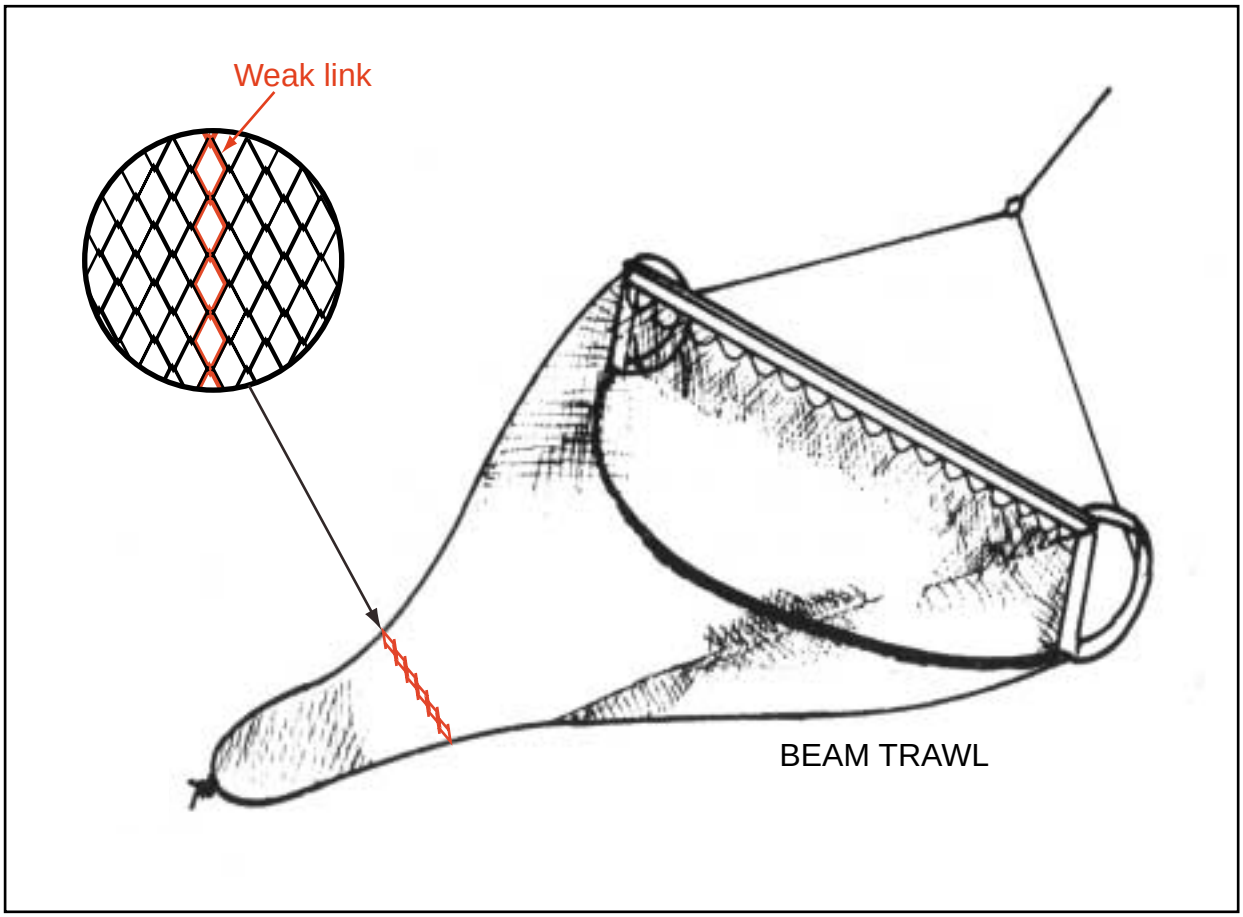
However, the “weak link” can fail dangerously. The problem with such a system arises when the weight causes the weak link to part in only one of the trawls when both are on, or near the sea surface. As highlighted in this case, this has a catastrophic effect on the stability of the vessel if both trawls contained similar excessive weights: a common occurrence with beam trawling when both trawls are deployed alongside each other.

Use of the weak link method is predominant in the Netherlands and Belgium. These countries are major operators of beam trawlers and, historically, they export beam trawling methods and vessels to the UK.

Consequently, although the use of the weak link is not commonly used in the UK fishing industry, there is a strong possibility that it could be used in the future.

With this in mind, operators of beam trawlers are reminded of the inherent dangers of the “weak link” design.

Figure 16



Beam trawl

SECTION 3 - CONCLUSIONS

3.1 CAUSE AND CONTRIBUTING FACTORS

3.1.1 The cause

The cause of the accident was the parting of the portside net which led to an unrecoverable heel to starboard and a capsize. [2.2]

3.1.2 Contributing factors

1. The “weak link” on the portside net parted because of the excessive weight of stones and shells it contained. [2.2]

2. The starboard net had, most probably, a similar quantity of shells and stones close to the breaking strain of the “weak link”. [2.2]

3. The derricks were topped during cleaning of the nets before bringing the catch on board. This raised the vessel’s centre of gravity. [2.2,2.5]

3.2 OTHER FINDINGS

1. The evidence indicates that *Flamingo* had completed a tow and was in the process of cleaning her nets before bringing her catch onboard. [2.2]

2. There are indications that the vessel might not have capsized immediately, but remained with a large angle of heel for a short period of time. [2.2,2.3]

3. The vessel would have sheared to starboard because of the drag of the starboard net, the autopilot would have compensated for this by putting the rudder to port. If the vessel had started to turn to port, she would have heeled further over to starboard. [2.2]

4. The throttle control was found at 60% ahead, an expected setting for the net cleaning operation. [2.3]

5. The EPIRB was activated manually and the liferaft painter might have been released manually. [2.3]

7. The machinery space door, on the starboard side, was secured open, and the hinged flap opening into the fish hold was also found open. The flooding of these two spaces would have further increased the heel and reduced the vessel's stability. [2.2]

8. The modifications made to the vessel were not approved by the Belgian authorities. These modifications, in particular the lengthening of the derrick booms, might have reduced her stability from that of the original design. [2.5]

9. The working-type lifejackets were not being used at the time of the accident. The two crew members who were recovered were not wearing lifejackets. [2.3,2.5]

SECTION 4 - RECOMMENDATIONS

The United Kingdom Maritime and Coastguard Agency, the Ministère des Communications et de L'infrastructure, Belgium and the Transportation Safety Board, Netherlands, respectively, are recommended to:

1. Advise operators and skippers of beam trawlers of the inherent dangers of the design of the "weak link" connecting the cod end to the trawl net.

Additionally, **Ministère des Communications et de L'infrastructure, Belgium** and **the Transportation Safety Board, Netherlands,** as the UK Maritime and Coastguard Agency already does, are recommended to:

2. Bring to the notice of operators and skippers of fishing vessels engaged in twin beam trawling:

   (i) Specific advice on the associated risks to stability when operating.

   (ii) The importance of wearing lifejackets when working on the deck of fishing vessels.

Marine Accident Investigation Branch
June 2003

ANNEX 1

MGN 181(F) Fishing Vessels: the Hazards Associated with Trawling, Including Beam Trawling and Scallop Dredging

MARINE GUIDANCE NOTE

MGN 181 (F)

Maritime and Coastguard Agency

Fishing Vessels: The Hazards Associated with Trawling, Including Beam Trawling and Scallop Dredging

Notice to Owners, Operators, Skippers, Crews, Managers, Gear Fitters and Designers.

This notice supersedes Merchant Shipping Notice: M1657

Summary

This note:

- Provides guidance on the safe operation of fishing vessels engaged in trawling.
- Provides specific guidance on the safe operation of fishing vessels engaged in twin beam trawling, including scallop dredging with derricks or booms. Some of the risks identified for beam trawlers may also be applicable for other fishing vessels or fishing techniques that have similar characteristics.

1. THE DANGERS OF TRAWLING

1.1 The nature of trawling, especially beam trawling can result in serious accidents due to a combination of human error, failure of equipment, snagging and loss of stability.

1.2 This notice provides general advice on safety matters related to the operation of fishing vessels. It is the responsibility of the owner and skipper to ensure that all of the procedures used are suitable for the vessel and its mode of fishing.

2. BEFORE GOING TO SEA…

Know the vessel

2.1 The skipper should ensure that only persons fully experienced in handling the vessel and competent in the fishing method are on watch. All watchkeepers and engineers should be aware of conditions that would reduce the stability reserve of the vessel including the use of fuel, stowage of fish and entrapped water when scuppers are restricted by debris or gear.

2.2 All crewmembers should be made aware of emergency procedures, including the closing of weathertight doors and hatches which are needed to maintain the stability of the vessel. They should be made aware of the location and correct operation of all safety related equipment on board the vessel.

3. WHILST AT SEA…

3.1 Loose gear should be restrained or secured. In particular, beams, nets, trawl doors and attached chains should always be securely lashed when not in use, even in fine weather. This safe working practice also helps prevent gear being unexpectedly washed overboard or subject to movement that could result in injury to crew or the blockage of scuppers and freeing ports.

3.2 Weathertight doors and hatches should be kept closed at sea. This reduces the number of vital tasks necessary in the event of an emergency. They should not be left open to assist ventilation. Inadequate ventilation should be rectified by improvements to the

ventilation system. If possible, openings for winches or winch wires should be well above the deepest load waterline.

4. WHEN SHOOTING AND RECOVERING GEAR…

4.1 Crew working on deck should be aware of the dangers of equipment failure and the simple precautions to avoid injury. These include not stepping within the bight of a rope and keeping away from working machinery unless directly involved in its operation.

4.2 Sudden rolling of the vessel followed by a heavy list will arise when hauling or towing equipment fails or a load is lost from one side. This may happen with the clearing of sand, stone or weed from a fouled trawl that is clear of the seabed. It is particularly important to follow the precautions given in paragraph 3.

4.3 Methods of restraining the net prior to release should not cause crew members to become fouled in bights of lifting ropes which are too stout to be made up on cleats. Sharp course alterations should be avoided whilst lifting the cod end.

4.4 On vessels where the winch controls are on deck, care should be taken to ensure good communications are maintained between the skipper and the winch operator, especially if the skipper has only a restricted view of the winch operator. This is particularly important on smaller vessels with powerful winches where there may be less time to react to a dangerous situation. If problems occur the load should be lowered as quickly and safely as possible to the deck or onto the seabed.

4.5 Be aware of the additional risk from use of dog-clutch type winches. Dog-clutch winches should always be unclutched when fishing.

5. WHEN RECOVERING FOULED OR FASTENED GEAR

5.1 Recovery of fouled gear can impose extra loads on wires and machinery, particularly in adverse weather conditions. Failure of either may result in excessive rolling or a dangerous list to the vessel.

5.2 Unusual or potentially dangerous operations should always be carried out under the supervision of the skipper.

5.3 There should be an emergency means for the speedy release of snagged gear.

6. ADDITIONAL CONSIDERATIONS FOR BEAM TRAWLING

6.1 A recent study undertaken with the co-operation of the fishing industry has emphasised the particular risks of beam trawling. Appropriate precautions should be taken to ensure safe fishing. The study emphasised a number of other important safety issues.

6.2 Even with the additional uplift for stability, the existing stability criteria for beam trawlers may not be adequate when recovering fishing gear with the derricks raised above the horizontal towing condition.

6.3 No beam trawler should be operated without experienced crew in charge of the vessel and in control of the winch.

6.4 All winch operators should be fully trained and experienced.

6.5 The skipper's understanding of how the stability is affected during fishing operations can be enhanced by the ready availability, in the wheelhouse, of simplified stability information.

6.6 A beam trawler at sea with gear deployed, can behave differently to vessels using other fishing methods. The fishing gear has a damping effect on the roll of the vessel. This damping effect masks the signs that indicate the vessel's stability state. The person in charge needs to understand the effect of damping to undertake beam trawling safely.

Risk Assessment

6.7 A thorough safety risk assessment should be carried out before fishing operations are commenced. Guidance on carrying out risk assessment is contained in MGN20 (M+F). The following points are relevant to the particular risks associated with beam trawlers:

- Crew fully trained and experienced in beam trawler methods and familiar with the vessel and its operation.

- Bridge control of winches to include warp and topping lift as well as control of the engines.

- Bridge control or a suitable method for the release or lowering of the derrick head block. This will enable controlled lowering of the point of suspension of the load from the head of the derrick down to the shoulder block. This results in a consequent benefit to stability if the gear picks up abnormal loads.

- Warp-tension monitoring equipment.

- Sounding equipment that can reduce the possibility of the trawl picking up excess loads of sand and shells.

- Past experience of safe working with gear of similar sizes and weight.

- Particular care when working on fishing grounds where the features of the sea bed are not known.

- Past experience of safe working with a vessel whose structure, weight distribution and stability characteristics are substantially unchanged.

- Avoiding the use of systems with dog-clutch winches. These winches often take considerable time to de-clutch and re-clutch preventing a rapid response to sudden load changes. Operators should be aware of these additional risks. Dog-clutch winches should be unclutched when trawling.

What the owner should do

6.8 Owners should note that possession of approved stability is no guarantee of satisfactory stability for all possible vessel operations. An assessment of safety for beam trawling should be based on three principles:

History – Generally a beam trawler will continue to operate safely if it has a history of safe operation and its operating profile remains substantially unchanged. This includes factors such as the vessel's characteristics, its gear, the fishing grounds, its crew and the worst weather conditions in which the vessel operates.

Stability – On vessels newly acquired, or after structural alterations, or before working with a new arrangement of fishing gear, or on new vessels, an appraisal should be made of the vessel's stability during fishing operations. Such information should supplement relevant "conditions" of loading already identified in the approved stability book. For normal fishing operations the worst case is generally shown to b when the vessel is recovering her gear.

Control – Control generally means control o winches in addition to engines. A skipper's ability to respond and the speed of response is enhance by full and immediate control of these separate controls.

General Operations

6.9 Every effort should be made to avoid ar excessive list by ensuring uneven loads ar kept to a minimum during the gear recovery.

6.10 Hauling snagged gear should ideally be carried out from as low as possible and clos to the vessel's side and not from the end o the derrick.

6.11 Generally, when gear is stuck fast on a obstruction such as a rock or wreck, th vessel is stopped and hauled over th obstruction. The gear on the free side can b raised and suspended in the water with the derrick at the horizontal, this weight acts as a counterbalance. All crew members should be advised when gear recovery operation commence and are completed. During recovery, they be on deck with their lifejackets.

6.12 Great care should be exercised during adverse weather conditions or where there is a significant swell or tidal current. These conditions can impose a sudden increase i the loads on the vessel.

6.13 Vessels sometimes pick up excess loads sand, shells, weed or man-made debris from the seabed. Without warp-tension monitoring equipment it can be difficult to detect exces loads on the gear. Subtle indications ma come from extra strain on the winch, change in vessel handling or steering or from increased engine exhaust temperatures.

6.14 Experienced skippers apply a range o methods to clear fouled gear of debris whilst avoiding the hazards of raising the load clear of the seabed. Raising loads of this sort ca seriously effect the stability of the vessel especially if the load is suspended from the end of derricks when they are raised abov

the horizontal away from the vessel's centreline. Vessels become less stable as the centre of gravity is raised. This can cause it to capsize. When heavy loads are evenly balanced on each side of the vessel a sudden failure of the gear can cause a loss of stability and possible capsize. If there is doubt about the ability of the vessel to raise a load safely, don't do it.

6.15 If snagged gear cannot be freed without hazarding the vessel, the safe course of action is to release the gear, mark it with a buoy and leave it until conditions improve or a more capable vessel can recover it.

6.16 It is vital that all weathertight doors and hatches are closed and freeing ports are checked free and clear, before the recovery operation takes place. Unless this is done it is possible for water to become trapped on deck if the vessel heels suddenly. This would lead to rapid down-flooding through the doors and hatches which the crew would not have time to prevent.

6.17 All those involved in the catching operation should understand their role and be familiar with the equipment in use.

Experience and Training

6.18 It is essential that all crew members are aware of the particular risks of beam trawling. Special training by experienced beam trawler fishermen is necessary, and they should have time to become accustomed to the work and equipment before a full period of fishing is undertaken.

Stability Information

6.19 It is recommended that fishing gear weight, beam and derrick length should be recorded in all future revisions of beam trawler stability information. Changes in the gear can significantly will affect the vessel's stability which may not be fully appreciated.

Any enquiries relating to the content of this MGN should be addressed to:

Fishing Vessel Safety Branch
The Maritime and Coastguard Agency
Spring Place
105 Commercial Road
SOUTHAMPTON
SO15 1EG

Tel: 023 8032 9177
Fax: 023 8032 9161

General enquiries relating to the supply or availability of MSNs, MGNs, MINs or on other subjects should be addressed to the Maritime Information Centre at the above address, or

Tel: 023 8032 9297
Fax: 023 8032 9298

April 2001

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