Report on the investigation of

the capsize of the fishing vessel

Charisma (OB588)

with the loss of one crew member

Carlingford Lough

30 January 2002

Marine Accident Investigation Branch
First Floor
Carlton House
Carlton Place
Southampton
United Kingdom
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(Accident Reporting and Investigation)

Regulations 1999

The fundamental purpose of investigating an accident under these Regulations is to determine its circumstances and the cause 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.

CONTENTS

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

CPR	-	Cardio-Pulmonary Resuscitation
Disp	-	Displacement in tonnes
FSM	-	Free Surface Moment
GM(fluid)	-	GMT with free surface effect included
GMT	-	Transverse Metacentric Height from centre of gravity in metres
GRP	-	Glass Reinforced Plastic
GTA	-	Group Training Associations
GZ	-	Heel righting lever in metres
KMT	-	Transverse Metacentric Height from keel in metres
LCB	-	Longitudinal Centre of Buoyancy in metres aft of stem
LCG	-	Longitudinal Centre of Gravity in metres aft of stem
LOA	-	Length Overall
MCA	-	Maritime and Coastguard Agency
MGN	-	Marine Guidance Note (MCA publication)
RNLI	-	Royal National Lifeboat Institution
SFIA	-	Sea Fish Industry Authority
VCB	-	Vertical Centre of Buoyancy in metres above baseline
VCG	-	Vertical Centre of Gravity in metres above baseline (Baseline at lowest point of keel)

SYNOPSIS

Charisma, a 9.68m GRP vessel built in 1989, was dredging for mussels in Rostrevor Bay, Carlingford Lough on 30 January 2002. She had a crew of three. The weather was described as ideal for mussel fishing with light winds and a calm sea. A substantial catch of mussels had been caught the previous day and this had been left stacked on deck overnight.

At 1125, the last catch of the day was tipped on to the mussel bench and processing began. Two crewmen were next to the bench, cleaning and raking the mussels into bags. The skipper was tying and stacking the bags slightly further forward.

At 1135, *Charisma* started to list to starboard and very quickly her stern quarter gunwale was submerged. The crew realised that the vessel was about to roll over, but before any corrective action could be carried out, they were scrambling for their lives. The vessel capsized and rolled completely upside down, throwing all the crew members into the water.

One of the crew remained conscious throughout the incident and, once he had surfaced and kicked off his boots, looked quickly for his two colleagues. He saw a lifebuoy and swam to it. Shortly after, he found the skipper unconscious in the water. There was no sign of the third crewman. He held on to the skipper and shouted for help.

Cathy Anne was fishing nearby and came to their assistance. *Cathy Anne'*s crew alerted the coastguard as they proceeded towards the casualties, who were then recovered from the water. *Cathy Anne*'s skipper successfully administered CPR to the unconscious man before continuing the search for the missing crewman. Once help had arrived, *Cathy Anne* headed for Rostrevor pier to land the casualties at the awaiting ambulance. The missing crewman, Mark Spiers, was later recovered from the seabed by divers, and was rushed to hospital, but he never regained consciousness.

Charisma was salvaged by the vessel's insurers and examined by MAIB inspectors, who also conducted an inclining experiment to determine her stability characteristics. It was discovered that the vessel's manual bilge pump had been removed for repair and not been replaced before the accident. A rag and bung were used to seal the open overboard discharge pipe. The bilge alarm had not been tested on the day of the accident and it was not heard at any time during it. The vessel had also been modified significantly in the past, with no estimate of the likely effects this would have on stability or load carrying capacity. An overall poor approach to safety was evident on board *Charisma*.

It is concluded that the ultimate capsize of *Charisma* was caused by the effect of undetected flooding, probably via the manual bilge discharge pipe, in combination with the heavy load of mussel bags on deck.

Letters have also been sent to both owner and skipper of *Charisma* with regard to specific safety issues.

A recommendation is addressed to the MCA with reference to the loading of fishing vessels <15m LOA.

Figures 1 and 2 *Charisma*

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *CHARISMA* AND ACCIDENT

Vessel details

Registered owner	:	Mr J P Trainor, 9 Casement Park, Kittys Road, Kilkeel, Co Down, Northern Ireland, BT34 4EZ
Skipper	:	Mr K Trainor
Port of registry	:	Oban (OB588)
Flag	:	British
Type	:	Fishing vessel (Cygnus 35)
Built	:	Penryn in 1989
Classification society	:	None
Construction	:	GRP
Registered Length	:	9.68m
Gross tonnage	:	15.56
Engine power and/or type	:	100kW
Service speed	:	9.5 knots
Other relevant info	:	Single screw

Accident details

Time and date	:	1135 UTC on 30 January 2002
Location of incident	:	54 5.537' N 006 12.193' W About 650m off shoreline, 830m from Rostrevor pier.
Persons on board	:	Three
Injuries/fatalities	:	One fatality and one serious injury
Damage	:	Vessel capsized and sank (later salvaged)

1.2 NARRATIVE

All times are UTC

On the morning of Wednesday 30 January 2002, *Charisma* and her three crew left Warrenpoint at approximately 0930 for the mussel beds in Rostrevor Bay. *Charisma* had been moored at Warrenpoint overnight with the previous day's catch of mussels, some 200 bags, left stacked on deck.

They arrived at the mussel beds at 0955 and began towing for mussels. Ten tows were carried out in the next 1 hour 30 minutes, which, after processing, equated to roughly 60 further bags of mussels. The bags were stacked flat beside each other in two rows, one port, one starboard, starting at the wheelhouse and working aft **(Figure 3)**. At the time of the accident the bags were stacked six or seven high on both sides, ie about 1.5m from the deck to the top of the bags. The bags were sufficiently high that, when executing a tight turn to come around for another trawl, one bag fell over the side.

At 1125, the last catch of the day was tipped on to the mussel bench **(Figure 4)** and all three crew began processing it. The engine was running, but it was out of gear. At this time, the second crewman was on the starboard side of the bench, the third crewman was forward of the bench and the skipper was slightly further forward tying up full bags. At 1135, *Charisma* started to list and the top of the starboard stern quarter gunwale immersed shortly after. The skipper shouted to the other crew to throw some of the bags on the starboard side overboard and he headed towards the wheelhouse to make a "Mayday" call. The speed of events prevented either action from being carried out. As the vessel listed more rapidly, the bags on the port side fell to starboard and many of those on the starboard side fell overboard, although many bags were also caught by the shelter. Because it was apparent the vessel was capsizing, the second crewman climbed the gallows, the third tried to climb over the bags on the port side, while the skipper moved back to the gap between the shelter and the gallows. *Charisma* capsized and rolled completely upside down.

The second crewman was the only person to remain conscious throughout the incident. He estimated that from the time he started climbing, until he was in the water, took only 30 seconds. Once he had surfaced, he kicked off his boots and tried to spot the others. A lifebuoy came up to the surface; he swam to it and put it round him. As he swam around the boat he found the skipper, floating, but unconscious, so held on to him, keeping his head above water. There was no sign of the third crewman. The second crewman started shouting for help.

Figure 3

An example of mussel bag loading on *Charisma*

Figure 4

Charisma's stern showing mussel bench and hydraulic gear

1.3 RESCUE

Cathy Anne (M368), with two persons on board, was also mussel fishing, less than a quarter of a mile away, when her skipper noticed the starboard list of *Charisma*. At that time, the two vessels were facing away from each other. They realised that *Charisma* and her crew were in trouble, so cut the lines to their dredges and turned to provide assistance. A line became snagged on their vessel in the process, but they broke free. By the time *Cathy Anne* had turned round to head in the right direction, *Charisma* was upside down. *Cathy Anne'*s skipper alerted Belfast Coastguard while heading for the one person he could see in the water. On arrival, he saw 2 people together, one of whom was unconscious. They pulled the unconscious man on board first, and *Cathy Anne'*s skipper administered CPR. After he had successfully resuscitated the casualty, he was placed in the recovery position and the remaining crewman was helped out of the water.

Cathy Anne circled the upturned *Charisma,* looking for the other crew member, but with no success. About 5 to 10 minutes after capsizing, *Charisma* rolled back on to her side, filled with water and then sank, ending roughly upright on the seabed, with the top of the mast above the surface of the water.

Several vessels arrived on the scene shortly after, under the co-ordination of the coastguard. Once an ambulance had arrived at Rostrevor pier, *Cathy Anne* left the area to land the two casualties.

Divers recovered the third crewman from the seabed sometime later. At 1322, an ambulance rushed him to hospital, but he never regained consciousness.

1.4 WEATHER

At the time of the accident conditions were calm with light winds from the south-south-west. The weather was described as “ideal for mussel fishing”. In the next hour after the accident, the tide started to ebb, at which time conditions become more choppy, but not significantly enough to hamper the rescue effort.

1.5 CREW

Charisma had a crew of three.

The skipper, Kevin Trainor, aged 29, had been fishing since he was 15, predominantly on small vessels. He had undertaken pelagic fishing, gill netting, prawn and mussel fishing, as well as potting. He had attended the basic sea survival and fire-fighting and prevention courses. He had always worked out of Kilkeel and Warrenpoint. His father, James Trainor, was the owner of *Charisma* for roughly 5 years. During the first year of ownership, Kevin Trainor crewed for his father. For the next 2 years, Kevin Trainor skippered *Charisma*. He then skippered his own vessel, *Family's Pride*, for roughly a year before selling that vessel and returning to *Charisma*. He had been *Charisma'*s skipper since April 2001.

The second crewman, Kevin Kearney aged 21, had been a fisherman for about 2 to 2½ years and had worked on *Charisma* for 10 months at the time of the accident. He had not attended any of the mandatory courses.

The third crewman, Mark Spiers, aged 23, had worked on *Charisma* for 9 months at the time of the accident. He had been fishing on and off for 2½ years. He had not intended to follow a career as a fisherman, but the pay was relatively good so he kept returning to it. He could not swim. It is believed Mark Spiers had not attended any of the mandatory courses, as there are no records of him having done so.

1.6 FISHING OPERATION

Charisma normally trawled for prawns in the Irish Sea off Kilkeel but occasionally she would dredge for mussels. Before Christmas 2001, *Charisma* had been mussel fishing but without any great success. The next occasion she dredged for mussels was the day before the accident, when the catch was more plentiful.

The process of mussel fishing on *Charisma* began by lowering the two dredges with the hydraulic rams **(Figure 4)**; the dredges were then shot away by paying out the cables from the winch. Roughly 25 fathoms of cable were paid out when fishing in Rostrevor Bay. The dredges were towed along the seabed for about 2 minutes before using the winch to haul in. Once the dredges were on the surface, the hydraulic rams were used to lift the cod ends clear of the bench. The cod ends were untied and the dredge contents then emptied on to the bench. The cod ends were retied ready for the next tow. The catch was cleaned of mud and debris by using the deck hose while raking it about. The clean mussels were then raked forward into three bags which were attached to the forward end of the bench. The dredges were shot away again, once the majority of mussels had been bagged.

When a bag of mussels was full, it was tied off and then stacked on the deck. None were put in the fish hold, as it was too strenuous to get the full bags in and out of the hold. On weighing a selection of mussel bags retrieved from the seabed after the accident, it was found the average mass of a bag of cleaned mussels was 27kg. When the catch was good, it was not unusual to stack bags six or seven high on *Charisma*'s deck.

The catch was normally taken to Greencastle, nearer to the mouth of Carlingford Lough, where the bags were simply dropped over the side on to the beach and then retrieved at low tide by the buyer. If left too late, it was not possible to get to Greencastle after fishing at Rostrevor Bay, hence the reason why the catch might have been kept onboard overnight. However, other skippers in the area did unload their catch daily, and skippers rarely kept their catch on deck overnight.

The day before the accident, *Charisma* and her crew fished for the maximum amount of time on one tide at Rostrevor Bay, about 4 hours and 15 minutes, and had 200 bags of mussels stowed on deck. This figure is derived from the fact that 2 bales of bags had been used, each bale containing 100 bags. This corresponds to 5.4 tonnes of mussels. At the time of capsize, it is estimated that a further 60 bags of mussels had been collected in 1½ hours, and 20 bags-worth was on the mussel bench being processed. A total mussel bag load of 7.5 tonnes was therefore estimated to be onboard.

1.7 THE VESSEL

Charisma was a Cygnus 35 with a standard forward wheelhouse **(Figures 1 & 2)**. Her engine room was immediately beneath the wheelhouse and was accessed via a hatch in the wheelhouse deck. Forward of this was the cabin, and aft, the fish hold. There was also a small forepeak and steering gear space, which were rarely accessed. None of the transverse bulkheads were watertight. The only seepage of sea water known to the skipper was via the stern gland.

Two years before the accident, the owner fitted the gallows, mussel bench and hydraulic rams **(Figure 4)**. The previous gallows had rusted through. The owner was not aware of any official weight capacity for the vessel and, therefore, no particular allowance or calculations were carried out for the addition of this structure on the stern.

On 7 January 2000, the local coastguard carried out a targeted inspection on *Charisma*. Several defects were raised and the skipper was instructed to correct them before sailing. A copy of the deficiency report is included at **Annex 1** showing the outstanding defects.

1.8 BILGE ALARM AND PUMPS

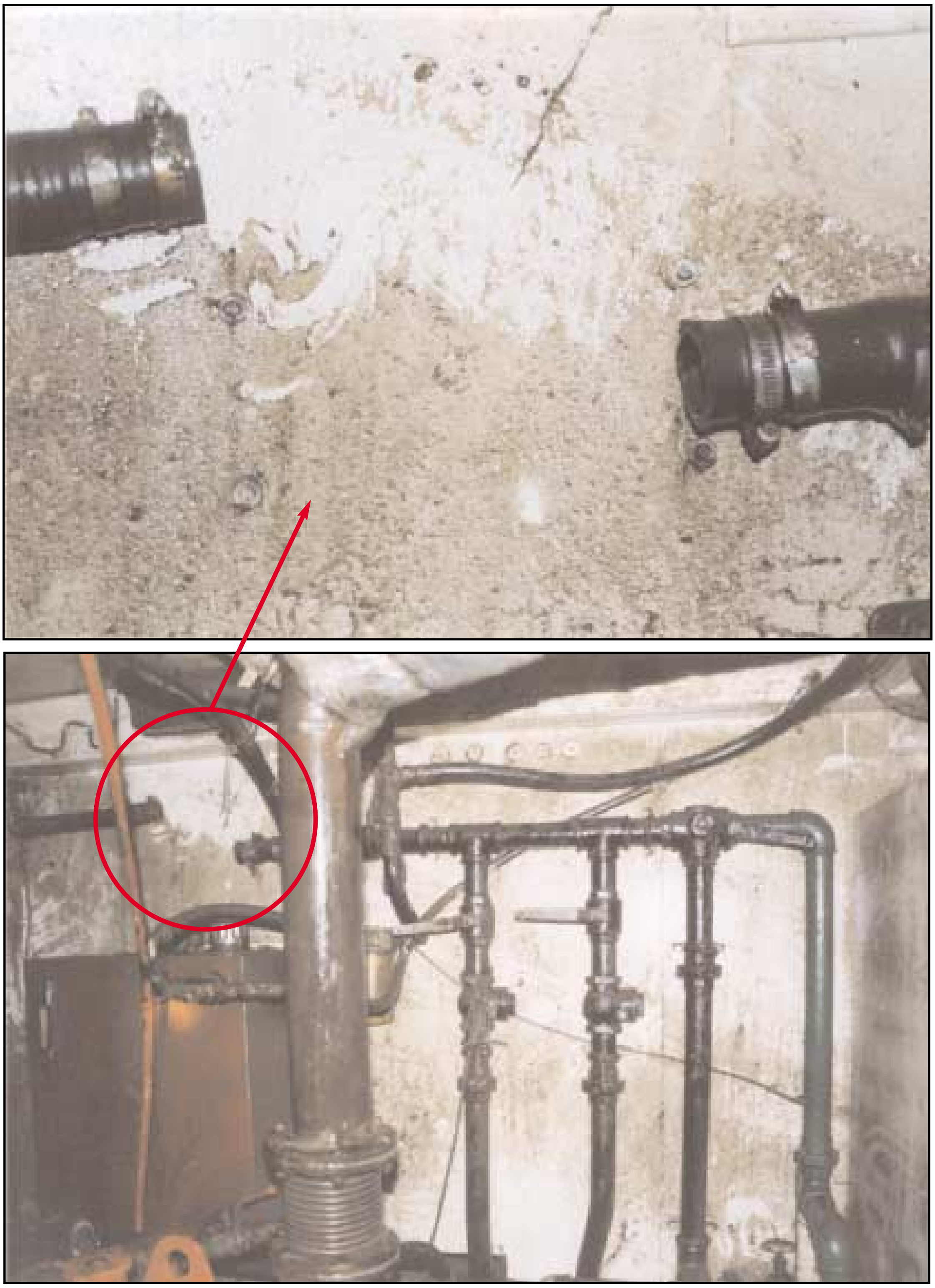
A manually operated bilge pump was fitted on the aft bulkhead of the engine room. However, two days before the accident, the skipper had removed it. He replaced the seals in the pump in an attempt to get it working again, but with no success. A bung wrapped in rag was jammed into the inboard end of the discharge overboard pipe on *Charisma*. The discharge overboard was 0.36m below the deck, 0.8m aft of the wheelhouse.

An automatic electric bilge pump and alarm was fitted in the engine room. The bilge alarm was checked just after Christmas 2001, a month before the accident. The skipper assumed it was fully functional at the time of the accident as he had carried out no check that day or the previous day. No alarm was heard before or during the capsize.

The bilge could also be pumped via the deck wash pump, which was driven off the main engine. This system required someone to switch the system to bilge manually in the engine room.

On closer inspection of the engine room, no trace was found of a bung, although the skipper had stated that a bung and rag had been used to plug the open bilge discharge pipe **(Figure 5)**.

Figure 5



View of aft engine room bulkhead showing location of missing manual bilge pump

1.9 LIFESAVING EQUIPMENT

Three lifejackets were found stowed in a starboard under-bunk locker in the cabin. The lifejackets were effectively jammed in tight. The small locker opening made retrieval of the lifejackets very difficult **(Figure 6)**. After the inspection by the coastguard on 7 January 2000, they had instructed that lights be fitted to the lifejackets to comply with fishing vessel regulations. This had not been done.

Two lifebuoys were also carried on either side of the wheelhouse. One floated to the surface after the capsize, and was used during the rescue.

A set of flares was carried in the wheelhouse. This consisted of four parachute flares, four hand-held flares and two smoke floats. However, the expiry date on them all was December 1992. These were the same as found at the inspection by the coastguard on 7 January 2000, which the skipper had been instructed to replace before departure.

Although not required for fishing vessels under 12m registered length, a liferaft was fitted. The liferaft was stowed in a metal tray positioned on the gallows, 2.4m above the deck. The liferaft was not fitted with a float free device and was designed to be thrown overboard by the crew when required. A tug on the painter would then inflate it. The coastguard had recommended a hydrostatic release unit be fitted to the liferaft after the inspection on 7 January 2000, to improve the chance of it deploying correctly in an emergency.

Figure 6

Stowage of lifejackets as found under cabin bunk

1.10 SAFETY ADVICE FOR FISHERMEN

In April 2001, a *Code of Practice for the Safety of Small Fishing Vessels under 12m registered length* came into force. On 27 March 2001, the MCA sent *Charisma*'s owner a copy of this new code. As part of the code, the skipper/owner is instructed to carry out a risk assessment of their fishing operations. The Code does not stipulate any specific stability requirement for fishing vessels under 12m in length. When interviewed, the skipper was not aware of the *Code of Practice for Fishing Vessels under 12m*, and had not heard of risk assessment.

It is worth highlighting that, in November 2002, a new *Code of Practice for Fishing Vessels between 15m (LOA) and 24m (Registered Length)* comes into force. This has the effect that the *under 12m (Registered Length) Code* will become the *under 15m (LOA) Code*.

1.11 VESSEL SURVEY AND INCLINING TEST

Charisma was successfully salvaged on 15 February 2002 and was taken to Rostrevor pier, where she was pumped dry. MAIB inspectors surveyed her the next day and also carried out an inclining test to enable her stability characteristics at the time of capsize to be determined.

The vessel was in a reasonably clean state considering she had been sitting on the mud in Rostrevor Bay for two weeks. All tanks were full, predominantly with sea water, and the bilge had only a small amount of oily water in it. All cushions and hatch covers were missing. The trawl doors and dredges had been cut away during the salvage operation and were not present for the test. Also, a large section of plywood sheeting, which made up the starboard side shelter, was missing. A significant amount of gear was unloaded on to the dockside, because it was soaking wet. The dry mass of these items was estimated so that it could be added during the stability analysis. The salvage process had damaged the deckhead in the wheelhouse but no items were believed to be missing.

The actual inclining test was conducted at high water with *Charisma*'s bow into the wind to minimise any wind heeling effect. 20kg weights were manhandled across the deck to heel the vessel a small amount, and the deflections recorded. Freeboard measurements were taken at the bow and stern to allow the vessel's draught to be derived. The test was successful, and the resulting displacement and centre of gravity were used as the basis for the stability analysis which followed. **Annex 2** contains a summary of the inclining trial.

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 LOSS OF STABILITY

The best estimate of the mussel load (7.5 tonnes) carried by *Charisma*, and the results of the survey and inclining test, were used to analyse why she capsized. **Annex 3** includes the results of this analysis.

It became clear that loading alone did not cause the capsize. Had this been the case, when the dredges were lifted with their last load, capsize would have occurred when the dredges were hanging in the air, before emptying on to the bench. At this precise time, the vessel was at its least stable, as the vertical centre of gravity of the dredges were acting from their suspension point.

The effect of a large shift of cargo was considered but was then discounted, as a significant number of bags would have had to have toppled over to have caused the vessel to become unstable. There was no evidence from witnesses that this occurred. Capsize as a result of wave action or heeling on a turn were also both discounted because conditions were calm, and the vessel was out of gear, drifting at the time of capsize.

Therefore, by deduction, flooding must have occurred to have caused the capsize of *Charisma*. There may be several causes of the flooding, taking into account the calm conditions on the day of the accident:

- The stern gland leaked.
- Cracks in the hull allowed water into the vessel.
- Hull valves or associated pipework failed.
- The manual bilge discharge outlet bung fell out, or was ineffective.

The first and second explanation can be ruled out as, after the vessel was salvaged, no ingress of floodwater occurred.

With regard to the third option, the hull valves themselves are not believed to have been the cause. This is because after salvage no leakage occurred. However, sea water system pipework might have failed, causing the ingress of floodwater. No obvious physical evidence of pipework damage could be found when the vessel was inspected.

The last option is the most likely cause of flooding. It is highly likely that the bilge discharge was submerged below the waterline on numerous occasions during the latter part of 29 January and on the morning of 30 January (as a result of the large catch on deck). The bilge might have also had some water present at the start of the 2 days, as no checks of the fish hold or engine room were made during this time. Wedging a bung into a 30 to 40mm rubber pipe is a highly unsatisfactory method of maintaining watertight integrity. It is unlikely the bung would have stayed in the pipe. When the vessel was not heavily loaded, the bilge discharge was well clear of the waterline and might not have been considered a great risk to flooding.

It is estimated that approximately 6.5 to 7.0 tonnes of floodwater would have been required to cause capsize. The flooding would have extended throughout the length of the vessel, as there were no watertight bulkheads. The free surface of this extent of water is significant, and was the main reason for the ultimate capsize. The weight of the floodwater alone would not have caused capsize, as its vertical centre of gravity was low in the vessel.

Two measures might have prevented capsize at this stage: loading the mussel bags into the hold, and having an effective bilge alarm and pumping system. Reducing excessive top weight should be normal practice for fishermen. Although the bags of mussels were heavy, not putting any bags in the hold was a major oversight. Bilge alarm and pumping systems are discussed in section 2.4.

The calm weather itself might have also contributed to the accident. The rolling behaviour of a vessel often provides some signs that something might be wrong with regard to stability. In this case, there were no significant early warnings, as the sea was relatively calm. However, the mussel bag which fell over the side as the vessel turned, should have provided some cause for concern.

2.3 STABILITY REQUIREMENTS FOR FISHING VESSELS UNDER 12M

The *Code of Practice for Small Fishing Vessels*[1] came into force on 1 April 2001. It does not stipulate any stability requirement for fishing vessels under 12m registered length. This is left to the owner's/skipper's judgment to assess the risk of capsize in their risk assessment. This can lead to pure reliance on what the vessel has managed to carry in the past as an indicator for the load carrying capacity.

The SFIA produced Construction Standards[2] for new small fishing vessels, to complement the Code[1] in June 2001. As well as construction standards, it also contains recommended stability criteria for fishing vessels under 15m in length (LOA). An alternative approach to the normal GZ curve criteria and inclining

[1] Fishing Vessels (Code of Practice for the Safety of Small Fishing Vessels) Regulations 2001 SI 2001 No. 9

[2] Construction Standards for new fishing vessels less than 15 metres overall length, Sea Fish Industry Authority, June 2001

experiment method is provided. Small fishing vessels have been recommended to have a stability standard applied previously, but there is no such recommendation in place now. The MCA and SFIA were recommended to include minimum standards for stability in their regulations by MAIB Accident Investigation Reports in 1996[3] and 1998[4]. However, at no time has an enforceable standard been applied, mainly because the means to enforce it were limited and there was general opposition to such a standard.

The MCA has Codes of Practice in place covering a wide range of vessel types under 24m in length, for example the *Code of Practice for the Safety of Small Workboats and Pilot Boats*. Basic stability requirements are stipulated in all the codes. Small fishing vessels under 12m registered length are virtually the only exception. From January 1991, when MAIB's database was set up, until, and including, the capsize of *Charisma*, 54 UK fishing vessels under 12m in length have capsized. As a result, 30 people have lost their lives. Satisfying a stability standard might not have helped in all these cases, but the figures demonstrate that capsizing is not a rare occurrence.

Stability criteria provide a factor of safety to ensure vessels will be safe throughout their intended use. By having no standard, fishermen effectively have no safety margin at all, and are relying solely on experience when they go to sea. However, fishermen's experience of stability is usually confined to whether a vessel has a stiff roll motion or not. This is far too crude a measurement to be of any practical use. For this reason, this report recommends that the MCA explores avenues for providing some stability guidance for under 15m LOA fishing vessels in collaboration with the fishing industry.

The replacement of the gallows by the owner, and the subsequent fitting of the mussel bench and hydraulic lifting gear, were significant additions to the vessel. The gallows fitted to *Charisma* were large for the size of vessel. In addition, the mussel bench fitted was of very heavy duty construction and, although probably able to last longer in service, its effect on stability and freeboard was significant. As guidance, the seven page pamphlet '*Safety on the Sea - Capsize Safety for Fishing Vessels*', produced by the RNLI's Sea Safety Liaison Working Group, is an excellent publication, providing useful guidance on fishing vessel stability, and should be essential reading for all fishermen. Some extracts are included at **Annex 4**.

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[3] The Report on the Capsize of the Fishing Vessel *Helen Claire* GY 568 on 12 December 1995, MAIB 01/07/037.

[4] Report of the Inspector's Inquiry into the loss of the Fishing Vessel *Gorah Lass* with three lives on 11 March 1997 off Portreath, North Cornwall, Marine Accident Report 2/98

Although the load of mussels on its own did not capsize *Charisma*, she was overloaded. Even without the flood water, the vessel had virtually no stability margin to cater for snagged lines, heeling while turning, or wind/wave action. Stability margins are applied to ensure that vessels are safe to operate. When these margins are eroded by permanent heavy additions to the vessel, or by overloading, the risk of capsize is considerable. Even the simple action of placing the catch in the hold would have dramatically improved *Charisma*'s stability. Condition 2a superimposed on Condition 2 in Annex 3 clearly demonstrates the improvement, which is solely due to lowering the catch's VCG by 1.5m. Furthermore, a design GZ curve taken from the Cygnus Marine Ltd *Preliminary Stability Book* is also included for comparison. This curve meets the stability criteria that are applied to fishing vessels greater than 15m LOA, which was the recommended standard when the book was produced.

2.4 BILGE ALARM AND PUMPS

As seen in many previous fishing vessel accidents, the bilge alarm appears to have been ineffective as an early warning of flooding. Had the skipper been warned early enough, he could have pumped out any floodwater and perhaps located the cause. A recent study by Banff & Buchan College[5] has demonstrated that fishermen have very poor confidence in bilge alarm systems. It must, however, be remembered that there are examples where bilge alarms have saved lives. If bilge alarms are checked and maintained regularly, they will remain a very important part of fishing vessel safety, as they provide vital early warning that flooding is occurring. As part of the study carried out, the college is developing a reliable/robust bilge alarm in collaboration with the maritime industry. The results, so far, are very promising.

To ensure an effective bilge pumping capability, a series of bilge pumps with different methods of operation is needed. In the case of *Charisma*, the first line of defence was the deck wash pump, which could be switched to bilge suction. This pump required the main engine to be running. To switch from deck wash to bilge suction, someone must enter the engine room and adjust the necessary valves. Early warning of flooding is required for this system to be effective. Its reliability and availability is good, as long as bilge suction pipes and valves are clear of debris, since deck wash systems are regularly in use by crew and any operational problems should be apparent.

The next line of defence available in *Charisma* was the automatic electric bilge pump which was attached to the bilge alarm. Although a relatively low pumping capacity, this system starts without manual intervention and gets a good head start on any flooding. However, to be effective, automatic bilge alarms and pumps must be checked and maintained regularly. It is apparent that this was not the case in this accident. Bilge alarms must be checked daily and before going to sea, and bilge pumping systems must be checked weekly, as recommended in MGN 165 (F), see **Annex 5**.

[5] The Development of a Reliable Bilge Monitor and The Loss of UK Fishing Vessels Through Flooding, by David Cook & Bill West, December 2001, Banff & Buchan College of Further Education

The last line of defence fitted in *Charisma* was the manually operated bilge pump attached to the aft engine room bulkhead. Again, this did not have a high pumping capacity but, in the event of a complete power failure, it provided the only means of pumping out floodwater. Maintenance of this system is required from time to time, and that is precisely what the skipper was doing a few days before the accident. Unfortunately, he was unable to repair the old manual bilge pump and, not considering the lack of manual bilge pumping capability and possible back flooding, did not fit a new one.

2.5 LIFESAVING EQUIPMENT

The lifebuoy assisted greatly in rescuing *Charisma*'s crew after she capsized. The difficulty in swimming fully clothed must never be underestimated. The lifebuoy enabled the second crewman to hold the skipper on the surface. Had the lifebuoy not floated free when it did, there might have been further casualties. However, only one lifebuoy appeared at the time of the accident. It is essential that lifebuoys float free when a vessel sinks, since, as this accident demonstrates, there is no time to unlash them. It is appreciated that there is always the hazard of lifebuoys being lost in heavy weather, but with careful positioning, this risk can be minimised.

Had lifejackets been worn at the time of the accident, it is highly probable that no lives would have been lost. For some time, the MAIB, MCA and RNLI have campaigned for fishermen to wear lifejackets as a matter of course; when they are really needed, the time required to don them is restricted. Additionally, in the case of *Charisma*, several minutes warning were required to extract the lifejackets from the under-bunk locker.

Although advised, but not required for a vessel of this size, *Charisma* was fitted with a liferaft. This is commendable and would have been vital if *Charisma* had sunk offshore with no assistance close at hand. However, it was a manual release liferaft and was intended to be deployed by the crew. It is recommended that if a liferaft is fitted, that it has a float free mechanism, which will release the liferaft automatically if the vessel sinks. If, for example, a rapid capsize incident had occurred out in the Irish Sea, the liferaft would have been useless, as there would have been no time to deploy it. When fitting a liferaft, it is essential to consider the likely scenarios in which it may be used. Limiting its potential use as a lifesaving appliance is extremely short-sighted and a waste of its potential lifesaving capability. It is also essential that the liferaft is serviced regularly to ensure it works when needed.

2.6 ONBOARD SAFETY CULTURE

Many of the issues highlighted in this report have demonstrated a poor approach to safety in the operation of the fishing vessel *Charisma*. Had a better safety culture been adopted on the vessel, the capsize and fatality might have been avoided. Several unsafe working practices have been highlighted by this investigation:

- The manual bilge pump was removed and not replaced
- Coastguard survey defect instructions were ignored
- Awareness of current regulations and vessel stability were lacking
- Safety gear was significantly out of date
- The bilge alarm was not checked before sailing
- The fish hold was not used, nor the catch unloaded on the same day.

It should be apparent that keeping the catch on deck overnight was unnecessary. If the fishing time had been reduced each day, allowing the catch to be landed, an equal or greater quantity of mussels would have been caught and the vessel's risk of capsizing would have reduced. Other fishing vessel skippers in the area unloaded their catch each day.

SECTION 3 - CONCLUSIONS

3.1 CAUSE

The ultimate capsize of *Charisma* was caused by the effect of undetected flooding, probably via the manually operated bilge pump discharge pipe, in combination with the heavy load of mussel bags on deck.

3.2 CONTRIBUTING FACTORS

The manual bilge pump was not replaced after it had been removed. [2.4]

The bilge alarm did not work on the day of the accident. [2.4]

The approach to safety was poor because:

> The bilge alarm was not checked. [2.4]
>
> The fish hold was not used, nor the catch unloaded each day, even though deck load was significant. [2.6]
>
> When the vessel was modified, no stability check was carried out. [2.3]

3.3 FINDINGS

1. The capsize of *Charisma* on 30 January 2002 was not caused solely by the overloading of the vessel with mussel bags. It is concluded that flooding must have also occurred to cause the vessel to become unstable. [2.2]
2. The bilge alarm did not sound before or during the accident. [2.4]
3. The skipper had not checked that the bilge alarm was functioning on the day of the accident or the previous day. [2.4].
4. The manual bilge pump was removed and not replaced. A bung wrapped in rag was jammed in the inboard end of the discharge pipe. [2.2]
5. A lifebuoy was the only piece of lifesaving equipment that was used after *Charisma* had capsized. The crew were not wearing lifejackets. [2.5]
6. There was a poor safety culture adopted in the running of the vessel. [2.6]
7. The skipper was not aware of the fishing regulations appropriate to his vessel and had not heard of risk assessment. [2.3]
8. The catch was not unloaded each day, nor was the fish hold used, which would have been the prudent and safer options with a large catch. [2.6]
9. Modifications to the vessel had reduced the stability safety margin. [2.3]
10. A maximum load carrying capacity for the vessel was not known. [2.3]
11. There are no stability requirements for fishing vessels under 15m LOA. [2.3]

SECTION 4 - ACTION TAKEN

The Chief Inspector has written to Mr J Trainor (fishing vessel owner) and Mr K Trainor (skipper), regarding the following safety issues which have arisen as a result of this investigation:

(a) Compliance with the Code of Practice for the Safety of Small Fishing Vessels;

(b) Attending a one-day safety awareness and risk assessment course;

(c) Bilge alarms;

(d) Lifejackets.

SECTION 5 - RECOMMENDATIONS

The Maritime and Coastguard Agency is recommended to:

In consultation with the fishing industry develop and promulgate guidance for the loading of fishing vessels under 15m LOA.

Marine Accident Investigation Branch
November 2002

ANNEX 1

Report of Inspection and/or Survey 7/1/00

MSF 1603/ REV 0499

mca
Maritime and Coastguard Agency

REPORT OF INSPECTION AND/OR *SURVEY

Of United Kingdom/Dependent Territory/Foreign Vessel*

*Delete as appropriate

2. Name of Ship | CHARISMA | Page .... of ..

5. Call Sign | | 9. Date (dd/mm/yy) | 07/01/00 | MO Copy

10. Place of Inspection/Survey | GB KKL.

15. Nature of Deficiency

#	15. (a) Code	S/I	(b) text	(c) Regulation references	16. Action taken
	0650		REPAINT NAME + No. ON LIFEBUOYS + FIT 18M BUOYANT LINE TO ONE.		17
					17
	0640		REPLACE OUT OF DATE FLARES 3 PARA 2 HAND 1 ORANGE SMOKE		
	0660		FIT LIGHTS TO LIFEJACKETS		17
	0720		FIT LINE TO FIRE BUCKET		17
	1550		REPLACE BULB ON FISHING LIGHT		17
					↑ Rectify before departure

Remarks RECOMMEND SERVICE LIFERAFT AND FIT HYDROSTATIC RELEASE

Name R. NEWELL

Duly authorised surveyor of flag State authority.

Signature [signature]

1 Please specify: S/I = a deficiency with 'S' and inspection deficiencies with 'I'

REPORT TO SURVEYOR - The Master, Skipper or Owner is requested to confirm in writing to the Office indicated at foot of form MSF 1602 by .... (date) that all / item Nos .... of the outstanding requirements listed above have been met and to indicate where and when the vessel will be available for re-inspection/survey *(to be deleted by surveyor if not required)*.

Office use only: Confirmation received on .... Signature ....

ANNEX 2

Inclining Experiment of FV *Charisma* 16/2/02

***CHARISMA* – Inclining test report**

Date: Saturday 16 February 2002

Time: 1315 – 1400 (High tide was at about 1400)

Place: Rostrevor quay, Carlingford Lough, Northern Ireland

Weather: Dry. There was a slight chop on the water at the aft end, but it was calm forward. The wind was from the south west, force 3-4. The vessel was well shielded by the quay with the wind coming from this direction.

Mooring: The starboard side of vessel was alongside the quay. There was one mooring rope forward and one aft, which were kept slack when the pendulums were read.

Those present:		
	Richard Barwick	MAIB (aft pendulum)
	Nicholas Hance	MAIB (fwd pendulum)
	David Carlisle	MCA (on quay)
	Randall Ward	Police (on quay)

Hydrostatics:

Waterline fwd: 2.10m below the underside of the rubbing timber
(measured along the sloping line of the stem)

Waterline aft port: 0.64m below the freeing port
(measured along the sloping line of the transom)
Waterline aft stbd: 0.64m (as above)

Draft fwd: 1.764m (At AP to baseline)

Draft aft: 2.016m (At FP to baseline)

Mean draft: 1.890m (to the baseline (lowest point on the keel))

Trim: 0.252m (by stern)

	MCA hydrometer	MAIB hydrometer
Specific gravity fwd:	1.0090	1.0095
Specific gravity aft:	1.0095	1.0100
Average s.g.	1.0095	

From hydrostatics: Disp. = 26.957t KMT = 2.742m
LCB = 5.979m VCB = 1.407m

Pendulums and inclining weights:

Forward pendulum:

Shift No.	Direction	Deflection
1	P-S	46.5
2	P-S	39
3	S-P	41
4	S-P	43.5
5	S-P	43
6	S-P	41
7	P-S	41
8	P-S	43
	Average:	42.25mm

Pendulum length = 2.2m Tan theta = 0.04225/2.2 = 0.0192

Aft pendulum:

Shift No.	Direction	Deflection
1	P-S	38
2	P-S	36
3	S-P	37.5
4	S-P	36.5
5	S-P	38
6	S-P	39
7	P-S	37.5
8	P-S	38
	Average:	37.5625mm

Pendulum length = 2.07m Tan theta = 0.03756/2.07 = 0.0181

Average tan theta = 0.01865

Weight shifts were all 5 x 20kg moved 3.535m - ie wd = 0.3535tm

GMT = wd / (Disp. x tan theta) = 0.3535/ 26.957 x 0.01865 = 0.703m

VCG(f) = KMT – GMT = 2.742 – 0.703 = 2.039m

Free surface moment for the port fuel tank (only free surface during the test)
FSM = 0.072 tm (from tank calibrations)
VCG(s) = VCG(f) - FSM/Disp. = 2.039 - 0.072/26.957 = 2.036m

LCG = LCB - [(Actual trim/LBP) x (VCG – VCB)]
= 5.979 - [(0.252/10.68) x (2.039–1.407)] = 5.964m

As inclined: Disp. = 26.957t LCG = 5.964m VCG = 2.036m

ANNEX 3

Stability Analysis for FV *Charisma*

***Charisma* Stability Analysis**

The kit removed from *Charisma* at her inclining and missing items have been accounted for by producing a weight on- weight off list.

An average weight for a mussel bag has been derived from a sample of bags recovered from the site of the incident. The bags were weighed complete with mud, and then after cleaning. The weight after cleaning has been used in the analysis, as this represents the condition of the bags as stacked on *Charisma* at the time of the accident. The number of bags of mussels has then been estimated.

The weights on, weights off and mussel bag load were then added to the inclined condition to give the best estimate of the condition that *Charisma* was in at the time of capsize.

A MAST model was derived to allow the stability analysis to be carried out. Downflooding points were measured from the general arrangement drawing. Several conditions were then run using the model:

1. Catch on deck, no flooding, low sea water density,
2. Catch on deck, no flooding, normal sea water density,

2a Catch in hold, no flooding, normal sea water density,

3. Catch on deck, hull flooded 12%, low sea water density,
4. Catch on deck, hull flooded 13%, normal sea water density.

The two sea water densities were used as a result of the very low sea water density found at the inclining. Obviously, the precise sea water density at the time of the accident is unknown, but it will be somewhere between the two readings.

It is readily apparent that the load carried on *Charisma* was not sufficient to cause capsize on its own. Although the GZ curve is not healthy and only has 0.045-0.05m maximum righting lever, in calm conditions the vessel should remain upright. It is roughly estimated that 6.5-7.0 tonnes of floodwater would be required to cause capsize.

The beneficial effect of loading the mussel bags in the hold, instead of on deck, is clearly evident from Condition 2a, which is overlaid on Condition 2's GZ curve. A design curve taken from the Cygnus Marine Ltd *Preliminary Stability Booklet* is also included on the graph for comparison. This curve meets the requirements of the stability criteria applied to >15m LOA fishing vessels.

Charisma Weights on/off for Capsize Condition

WEIGHTS	Wt(t)	LCG (m)	L Mmt	VCG (m)	VMmt	FS (t.m)
As inclined	26.957	5.964	160.772	2.036	54.884	
Weights off	-3.254	5.129	-16.691	1.939	-6.310	
Weights on	3.393	6.045	20.512	2.396	8.131	0.026
Bags of mussels on deck (280 bags @ 27.056kg)	7.576	5.791	43.873	3.193	24.190	
Totals	**34.672**	**6.013**	**208.466**	**2.333**	**80.895**	**0.026**
(Fluid)				**2.334**		

WEIGHTS ON	Wt (t)	LCG (m)	L Mmt	VCG (m)	V Mmt	FS (t.m)
Stbd fuel tank	0.749	4.165	3.120	1.718	1.287	0.016
Port fuel tank	0.749	4.165	3.120	1.718	1.287	0.016
Dredges hanging from gantry	0.080	10.897	0.872	5.102	0.408	
Trawl doors	0.240	8.839	2.121	2.999	0.720	
Rubber legs	0.060	6.553	0.393	1.067	0.064	
Ballast in fish hold	0.240	5.486	1.317	1.392	0.334	
Liferaft	0.021	8.534	0.179	5.102	0.107	
Crew	0.225	9.175	2.064	3.369	0.758	
Fish boxes in hold (7)	0.028	7.803	0.218	1.143	0.032	
Engine room spares	0.030	2.743	0.082	1.000	0.030	
Lifebuoys	0.008	3.200	0.026	3.658	0.029	
Tools	0.005	2.743	0.014	1.000	0.005	
Fish hatch (112 lbs)	0.051	6.502	0.332	2.743	0.140	
Wheelhouse door	0.020	3.962	0.079	3.719	0.074	
Part of shelter	0.032	4.816	0.154	3.780	0.121	
Wheelhose deckhead	0.010	2.896	0.029	4.694	0.047	
Cabin - cushions and covers	0.010	1.448	0.014	2.591	0.026	
Cabin - spare gear	0.100	1.448	0.145	2.591	0.259	
FW drum (5 galls)	0.025	3.200	0.080	3.079	0.077	
Anchor and chain	0.025	4.191	0.105	2.774	0.069	
Spare dredge in fish hold	0.040	6.553	0.262	1.219	0.049	
Tyres on sides	0.090	6.553	0.590	2.713	0.244	
Flares	0.004	2.651	0.011	3.048	0.012	
Lifejackets	0.003	1.036	0.003	2.286	0.007	
Heater case	0.003	2.286	0.007	2.438	0.007	
Grease gun	0.015	4.785	0.072	0.790	0.012	
Hose	0.010	6.553	0.066	1.219	0.012	
Mussels on the bench	0.500	9.754	4.877	3.780	1.890	
Cod end of prawn net	0.020	8.077	0.162	1.158	0.023	
Totals	**3.393**	**6.045**	**20.512**	**2.396**	**8.131**	**0.032**

All Dimensions in metres

WEIGHTS OFF	Wt(t)	LCG (m)	L Mmt	VCG (m)	VMmt	FS (t.m)
Inclining weights	0.400	6.706	2.682	2.498	0.999	
Weights around aft trough	0.040	8.256	0.330	2.498	0.100	
Weights around fwd trough	0.060	4.362	0.262	2.559	0.154	
Aft trough	0.031	8.500	0.264	2.528	0.078	
Fwd trough	0.031	4.302	0.133	2.589	0.080	
Tools	0.005	8.230	0.041	2.469	0.012	
MAIB inspector 1	0.095	8.230	0.782	3.038	0.289	
MAIB inspector 2	0.075	3.962	0.297	3.160	0.237	
Stbd fuel tank	0.929	4.163	3.867	1.729	1.606	
Port fuel tank	0.762	4.180	3.185	1.661	1.266	
Water tank	0.364	6.472	2.356	1.650	0.601	
Paraffin tank	0.141	3.331	0.470	2.968	0.418	
Rubber legs	0.060	9.449	0.567	2.743	0.165	
Ballast in fish hold	0.240	5.486	1.317	1.036	0.249	
Tyres on stbd side	0.021	6.553	0.138	2.713	0.057	
Totals	**3.254**	**5.129**	**16.691**	**1.939**	**6.310**	**0.000**

Charisma Downflood Points

	LCG	VCG	TCG	
Wheelhouse door (stb edge)	3.972	2.844	0.550	Stbd
Wheelhouse door (port edge)	3.972	2.844	0.000	CL
ER aft vent (fwd corner)	4.464	2.916	2.028	P&S
ER aft vent (aft corner)	4.956	2.868	2.028	P&S
ER fwd vent (fwd corner)	2.520	3.240	1.980	P&S
ER fwd vent (aft corner)	3.120	3.130	2.000	P&S
Bilge overboard	4.740	2.124	2.000	Stbd

Fish Hold Hatch — Heavy steel hatch assumed effectively watertight up to 40 degs

Mussel Bag Weight (kg)

Before	After	Washing
36.35	30.05	
38.05	28.35	
42.75	27.6	
36.15	32.5	
35.2	31.3	
40.15	23.3	
41.75	23.3	
49.15	23.95	
29.05	26.75	
41.1	24.35	Average 27.056
37.25	29.9	
35.75	23.35	
43.35	25.2	
43.75	25.05	
50.2	25.5	
35.2	29.6	
36.8	29.9	
	459.95	

CONDITION 1

DEADWEIGHT TABLE

Vessel....: MFV CHARISMA
Condition.: Catch on deck, no flooding, low sea water density
State.....: HULL INCLUDING WHEELHOUSE
Water SG..: 1.0095
Compliance: Vessel fails requirements in this condition

Longitudinal dimensions about FP AT STEMHEAD (+ve aft, -ve forward)
Vertical dimensions about BASE LINE (USK) (+ve above, -ve below)
Transverse dimensions about centreline (+ve Port, -ve Stbd)

	Deadweight Item	Weight tonnes	LCG metres	Longitudinal moment t.m	TCG metres	Transverse moment t.m	VCG metres	Vertical moment t.m	Free Surface moment t.m
1	Weights Off	-3.254	5.129	-16.690	0.000	0.000	1.939	-6.310	-
2	Weights On	3.393	6.045	20.511	0.000	0.000	2.396	8.130	0.032
3	Mussels 280 bags	7.576	5.791	43.873	0.000	0.000	3.193	24.190	-
	DEADWEIGHT TOTAL	7.715	6.182	47.694	0.000	0.000	3.371	26.010	0.032
	LIGHTSHIP	26.957	5.964	160.772	0.000	0.000	2.036	54.884	-
	DISPLACEMENT	34.672	6.012	208.465	0.000	0.000	2.333	80.895	0.032
	Free Surface Correction (Total Free Surface Moment/Displacement)						0.001		
						VCG fluid	2.334		

CONDITION 1

SAILING STATE

Vessel....: MFV CHARISMA
Condition.: Catch on deck, no flooding, low sea water density
State.....: HULL INCLUDING WHEELHOUSE
Water SG..: 1.0095
Compliance: Vessel fails requirements in this condition

DRAFT SUMMARY (DIMENSIONS IN METRES)	Maximum	Actual
Draft at FP about Base Line..........	-	1.984
Draft midships about Base Line..........	-	2.125
Draft aft about Base Line..........	-	2.267

STABILITY DATA

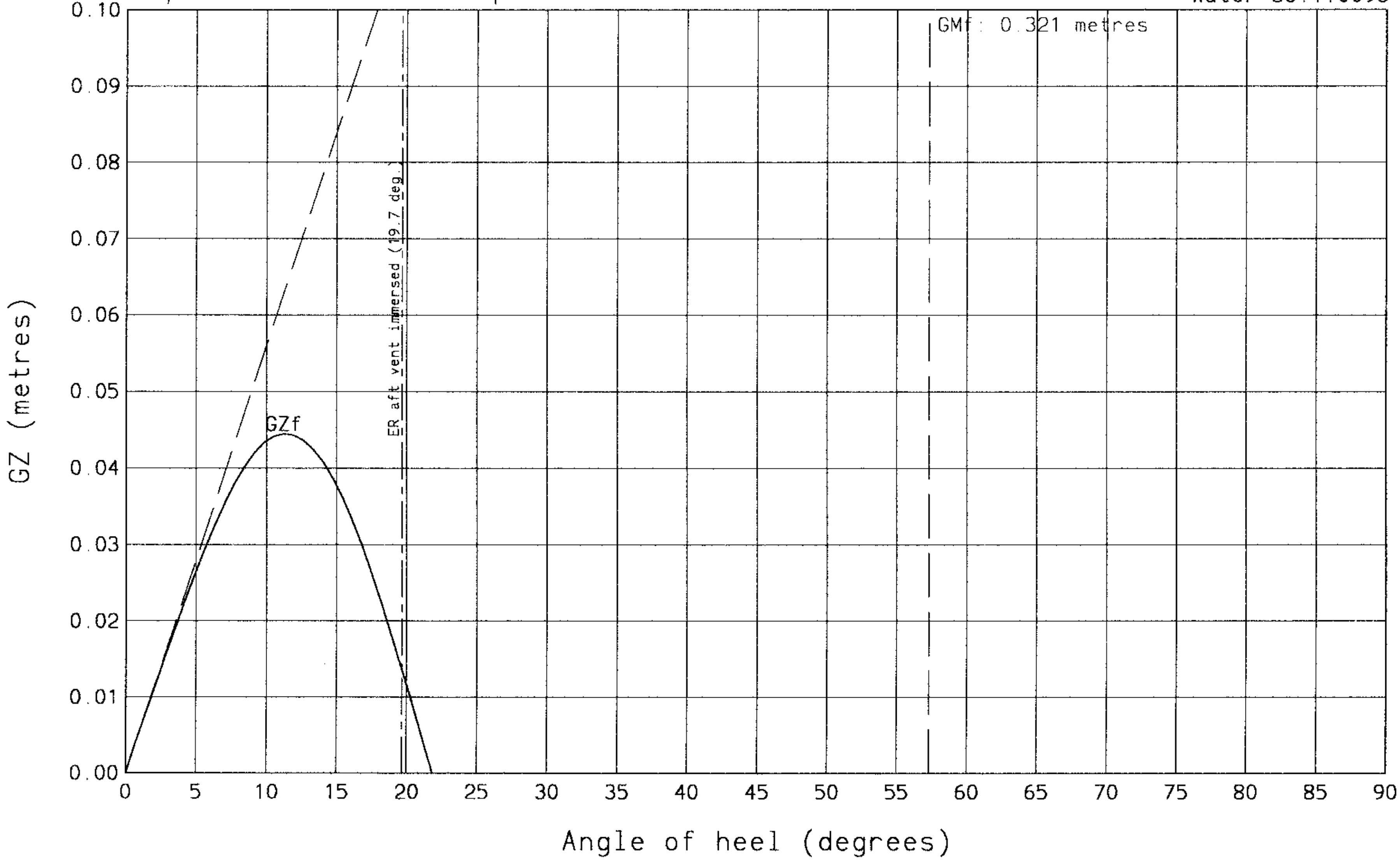
Heel angle degrees	Trim about Base Line metres on LBP	Draft at midships LBP about Base Line	KN metres	KGxSIN(Heel) metres	Righting moment tonne.metres	GZ fluid metres
0	0.280 by stern	2.123	0.000	0.000	0.000	0.000
5	0.274 ''	2.115	0.230	0.203	0.921	0.027
10	0.308 ''	2.093	0.449	0.405	1.511	0.044
15	0.378 ''	2.068	0.642	0.604	1.306	0.038
20	0.467 ''	2.034	0.810	0.798	0.396	0.011
25	0.599 ''	1.996	0.966	0.986	-0.725	-0.021
30	0.750 ''	1.946	1.110	1.167	-1.982	-0.057
35	0.922 ''	1.881	1.245	1.339	-3.267	-0.094
40	1.112 ''	1.801	1.370	1.500	-4.530	-0.131
45	1.318 ''	1.706	1.485	1.650	-5.724	-0.165
50	1.540 ''	1.594	1.592	1.788	-6.780	-0.196
55	1.751 ''	1.469	1.689	1.912	-7.734	-0.223
60	1.959 ''	1.331	1.777	2.021	-8.461	-0.244
65	2.172 ''	1.177	1.861	2.115	-8.818	-0.254
70	2.384 ''	1.015	1.933	2.193	-9.029	-0.260

STABILITY SUMMARY	Minimum	Actual
Angle of immersion of ER aft vent (degrees)..........	-	19.662
Area under GZ curve between 0.00 and 19.66 degrees (metre.radians)..........	0.055	0.010
Area under GZ curve between 0.00 and 19.66 degrees (metre.radians)..........	0.090	0.010
Area under GZ curve between 30.00 and 19.66 degrees (metre.radians)..........	0.030	0.000
Maximum GZ (metres)..........	-	0.044
Angle of heel at which maximum GZ occurs (degrees)..........	30.000	11.209
Maximum GZ between 30 and 90 degrees (metres)..........	0.200	0.000
Positive GZ heel range (degrees)..........	-	19.662
GM solid (metres) (upright)..........	-	0.322
Free Surface correction (metres)..........	-	0.000
GM fluid (metres) (upright)..........	0.350	0.321

GZ PLOT

Condition.: **Catch on deck, no flooding, low sea water density**
State.....: HULL INCLUDING WHEELHOUSE
Compliance: Vessel fails requirements in this condition

Water SG:1.0095



CONDITION 1

DEADWEIGHT TABLE

Vessel....: MFV CHARISMA
Condition.: Catch on deck, no flooding, high sea water density
State.....: HULL INCLUDING WHEELHOUSE
Water SG..: 1.025
Compliance: Vessel fails requirements in this condition

Longitudinal dimensions about FP AT STEMHEAD (+ve aft, -ve forward)
Vertical dimensions about BASE LINE (USK) (+ve above, -ve below)
Transverse dimensions about centreline (+ve Port, -ve Stbd)

	Deadweight Item	Weight tonnes	LCG metres	Longitudinal moment t.m	TCG metres	Transverse moment t.m	VCG metres	Vertical moment t.m	Free Surface moment t.m
1	Weights Off	-3.254	5.129	-16.690	0.000	0.000	1.939	-6.310	-
2	Weights On	3.393	6.045	20.511	0.000	0.000	2.396	8.130	0.032
3	Mussels 280 bags	7.576	5.791	43.873	0.000	0.000	3.193	24.190	-
	DEADWEIGHT TOTAL	7.715	6.182	47.694	0.000	0.000	3.371	26.010	0.032
	LIGHTSHIP	26.957	5.964	160.772	0.000	0.000	2.036	54.884	-
	DISPLACEMENT	34.672	6.012	208.465	0.000	0.000	2.333	80.895	0.032
	Free Surface Correction (Total Free Surface Moment/Displacement)						0.001		
						VCG fluid	2.334		

SAILING STATE

CONDITION 2

Vessel....: MFV CHARISMA
Condition.: Catch on deck, no flooding, high sea water density
State.....: HULL INCLUDING WHEELHOUSE
Water SG..: 1.025
Compliance: Vessel fails requirements in this condition

DRAFT SUMMARY (DIMENSIONS IN METRES)	Maximum	Actual
Draft at FP about Base Line	-	1.968
Draft midships about Base Line	-	2.109
Draft aft about Base Line	-	2.251

STABILITY DATA

Heel angle degrees	Trim about Base Line metres on LBP	Draft at midships LBP about Base Line	KN metres	KGxSIN(Heel) metres	Righting moment tonne.metres	GZ fluid metres
0	0.280 by stern	2.107	0.000	0.000	0.000	0.000
5	0.273 ''	2.099	0.231	0.203	0.950	0.027
10	0.304 ''	2.076	0.452	0.405	1.611	0.046
15	0.369 ''	2.049	0.648	0.604	1.528	0.044
20	0.465 ''	2.017	0.820	0.798	0.747	0.022
25	0.578 ''	1.974	0.974	0.986	-0.426	-0.012
30	0.724 ''	1.922	1.119	1.167	-1.679	-0.048
35	0.889 ''	1.857	1.253	1.339	-2.973	-0.086
40	1.071 ''	1.776	1.378	1.500	-4.254	-0.123
45	1.269 ''	1.679	1.493	1.650	-5.475	-0.158
50	1.485 ''	1.567	1.599	1.788	-6.560	-0.189
55	1.695 ''	1.441	1.694	1.912	-7.544	-0.218
60	1.899 ''	1.303	1.782	2.021	-8.310	-0.240
65	2.111 ''	1.149	1.864	2.115	-8.718	-0.251
70	2.317 ''	0.986	1.936	2.193	-8.930	-0.258

STABILITY SUMMARY	Minimum	Actual
Angle of immersion of ER aft vent (degrees)	-	20.079
Area under GZ curve between 0.00 and 20.08 degrees (metre.radians)	0.055	0.012
Area under GZ curve between 0.00 and 20.08 degrees (metre.radians)	0.090	0.012
Area under GZ curve between 30.00 and 20.08 degrees (metre.radians)	0.030	0.000
Maximum GZ (metres)	-	0.048
Angle of heel at which maximum GZ occurs (degrees)	30.000	11.938
Maximum GZ between 30 and 90 degrees (metres)	0.200	0.000
Positive GZ heel range (degrees)	-	20.079
GM solid (metres) (upright)	-	0.329
Free Surface correction (metres)	-	0.000
GM fluid (metres) (upright)	0.350	0.328

CONDITION 2a

DEADWEIGHT TABLE

Vessel....: MFV CHARISMA
Condition.: Catch in hold, no flooding, high sea water density
State.....: HULL INCLUDING WHEELHOUSE
Water SG..: 1.025
Compliance: Vessel fails requirements in this condition

Longitudinal dimensions about FP AT STEMHEAD (+ve aft, -ve forward)
Vertical dimensions about BASE LINE (USK) (+ve above, -ve below)
Transverse dimensions about centreline (+ve Port, -ve Stbd)

	Deadweight Item	Weight tonnes	LCG metres	Longitudinal moment t.m	TCG metres	Transverse moment t.m	VCG metres	Vertical moment t.m	Free Surface moment t.m
1	Weights Off	-3.254	5.129	-16.690	0.000	0.000	1.939	-6.310	-
2	Weights On	3.393	6.045	20.511	0.000	0.000	2.396	8.130	0.032
3	Fishroom	7.576	6.800	51.517	0.000	0.000	1.700	12.879	-
	DEADWEIGHT TOTAL	7.715	7.173	55.338	0.000	0.000	1.905	14.699	0.032
	LIGHTSHIP	26.957	5.964	160.772	0.000	0.000	2.036	54.884	-
	DISPLACEMENT	34.672	6.233	216.109	0.000	0.000	2.007	69.584	0.032
	Free Surface Correction (Total Free Surface Moment/Displacement)						0.001		
						VCG fluid	2.008		

CONDITION 2a

SAILING STATE

Vessel....: MFV CHARISMA
Condition.: Catch in hold, no flooding, high sea water density
State.....: HULL INCLUDING WHEELHOUSE
Water SG..: 1.025
Compliance: Vessel fails requirements in this condition

DRAFT SUMMARY (DIMENSIONS IN METRES)	Maximum	Actual
Draft at FP about Base Line	-	1.745
Draft midships about Base Line	-	2.072
Draft aft about Base Line	-	2.398

STABILITY DATA

Heel angle degrees	Trim about Base Line metres on LBP	Draft at midships LBP about Base Line	KN metres	KGxSIN(Heel) metres	Righting moment tonne.metres	GZ fluid metres
0	0.645 by stern	2.067	0.000	0.000	0.000	0.000
5	0.644 ''	2.062	0.227	0.175	1.812	0.052
10	0.724 ''	2.047	0.434	0.349	2.973	0.086
15	0.844 ''	2.026	0.620	0.520	3.496	0.101
20	0.993 ''	1.999	0.788	0.687	3.515	0.101
25	1.156 ''	1.964	0.940	0.849	3.181	0.092
30	1.329 ''	1.918	1.081	1.004	2.657	0.077
35	1.516 ''	1.858	1.211	1.152	2.064	0.060
40	1.714 ''	1.783	1.332	1.291	1.452	0.042
45	1.921 ''	1.692	1.445	1.420	0.875	0.025
50	2.138 ''	1.584	1.549	1.538	0.392	0.011
55	2.343 ''	1.463	1.644	1.645	-0.011	-0.000

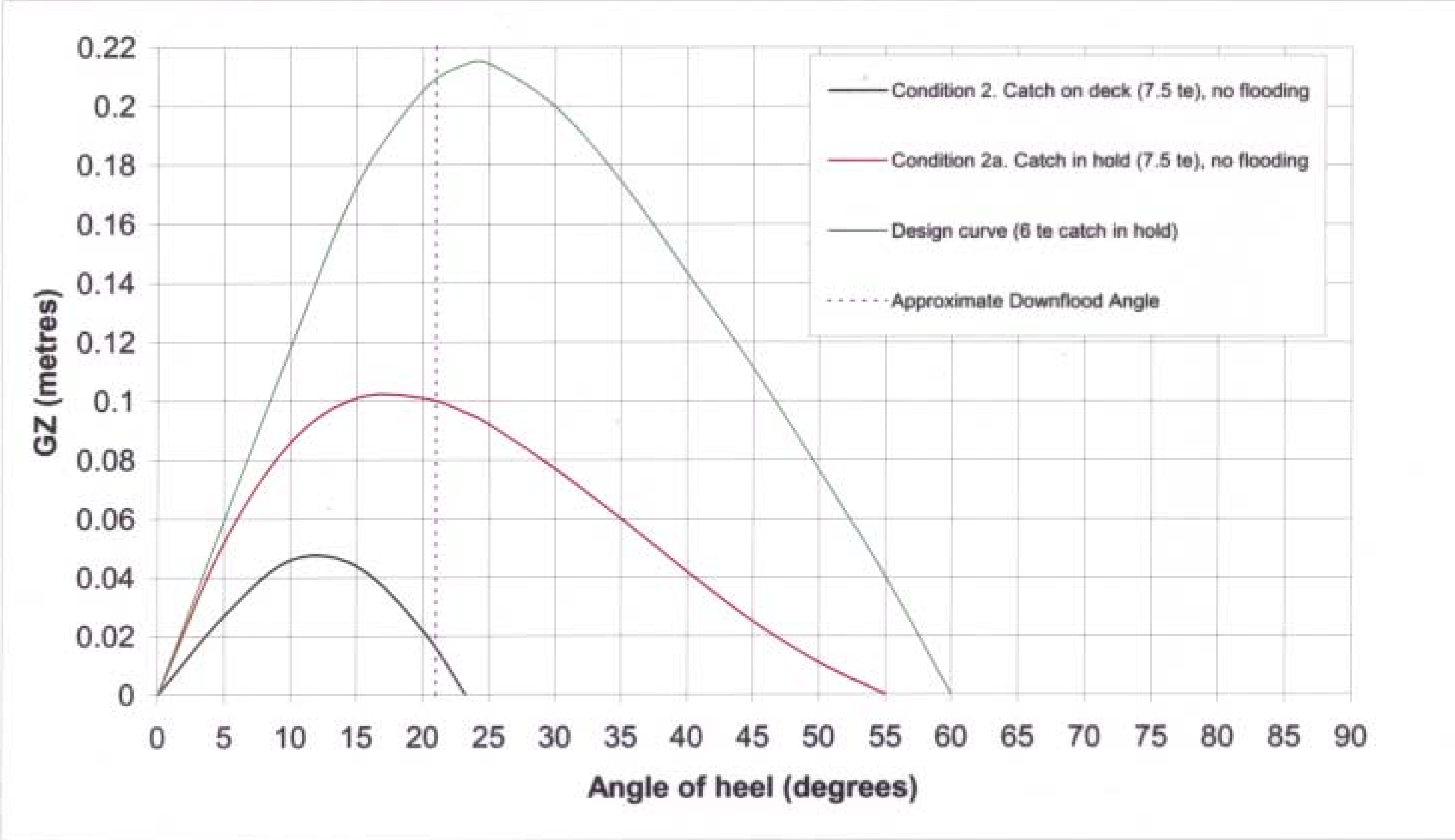
STABILITY SUMMARY	Minimum	Actual
Angle of immersion of ER aft vent (degrees)	-	20.673
Area under GZ curve between 0.00 and 20.67 degrees (metre.radians)	0.055	0.027
Area under GZ curve between 0.00 and 20.67 degrees (metre.radians)	0.090	0.027
Area under GZ curve between 30.00 and 20.67 degrees (metre.radians)	0.030	0.000
Maximum GZ (metres)	-	0.102
Angle of heel at which maximum GZ occurs (degrees)	25.000	17.774
Maximum GZ between 25 and 90 degrees (metres)	0.200	0.000
Positive GZ heel range (degrees)	-	20.673
GM solid (metres) (upright)	-	0.647
Free Surface correction (metres)	-	0.000
GM fluid (metres) (upright)	0.350	0.646

GZ PLOT

MFV CHARISMA

Condition: 2, 2a and Design Curve from Cygnus Marine Preliminary Stability Information Book
State: HULL INCLUDING WHEELHOUSE
Compliance: Only design curve meets requirements

Water SG: 1.025



CONDITION 3

DEADWEIGHT TABLE

Vessel....: MFV CHARISMA
Condition.: Catch on deck, hull flooded 12%, low sea water density
State.....: HULL INCLUDING WHEELHOUSE
Water SG..: 1.0095
Compliance: Vessel fails requirements in this condition

Longitudinal dimensions about FP AT STEMHEAD (+ve aft, -ve forward)
Vertical dimensions about BASE LINE (USK) (+ve above, -ve below)
Transverse dimensions about centreline (+ve Port, -ve Stbd)

	Deadweight Item	Weight tonnes	LCG metres	Longitudinal moment t.m	TCG metres	Transverse moment t.m	VCG metres	Vertical moment t.m	Free Surface moment t.m
1	Weights Off	-3.254	5.129	-16.690	0.000	0.000	1.939	-6.310	-
2	Weights On	3.393	6.045	20.511	0.000	0.000	2.396	8.130	0.032
3	Mussels 280 bags	7.576	5.791	43.873	0.000	0.000	3.193	24.190	-
4	HULL AS COMPT	6.473	5.288	34.229	0.000	0.000	0.905	5.858	13.291
	DEADWEIGHT TOTAL	14.188	5.774	81.923	0.000	0.000	2.246	31.868	13.323
	LIGHTSHIP	26.957	5.964	160.772	0.000	0.000	2.036	54.884	-
	DISPLACEMENT	41.145	5.899	242.694	0.000	0.000	2.108	86.753	13.323
	Free Surface Correction (Total Free Surface Moment/Displacement)						0.324		
						VCG fluid	2.432		

CONDITION 3

SAILING STATE

Vessel....: MFV CHARISMA
Condition.: Catch on deck, hull flooded 12%, low sea water density
State.....: HULL INCLUDING WHEELHOUSE
Water SG..: 1.0095
Compliance: Vessel fails requirements in this condition

DRAFT SUMMARY (DIMENSIONS IN METRES)	Maximum	Actual
Draft at FP about Base Line	-	2.297
Draft midships about Base Line	-	2.334
Draft aft about Base Line	-	2.371

STABILITY DATA

Heel angle degrees	Trim about Base Line metres on LBP	Draft at midships LBP about Base Line	KN metres	KGxSIN(Heel) metres	Righting moment tonne.metres	GZ fluid metres
0	0.073 by stern	2.334	0.000	0.000	0.000	0.000
5	0.074 ''	2.333	0.215	0.212	0.138	0.003
10	0.158 ''	2.337	0.403	0.422	-0.799	-0.019
15	0.291 ''	2.339	0.575	0.630	-2.243	-0.055
20	0.453 ''	2.324	0.737	0.832	-3.891	-0.095
25	0.654 ''	2.300	0.898	1.028	-5.348	-0.130
30	0.884 ''	2.262	1.051	1.216	-6.797	-0.165
35	1.141 ''	2.208	1.197	1.395	-8.152	-0.198
40	1.426 ''	2.138	1.333	1.563	-9.462	-0.230
45	1.720 ''	2.052	1.461	1.720	-10.668	-0.259
50	2.007 ''	1.947	1.582	1.863	-11.552	-0.281
55	2.283 ''	1.822	1.698	1.992	-12.095	-0.294

STABILITY SUMMARY	Minimum	Actual
Angle of immersion of ER aft vent (degrees)	-	13.185
Area under GZ curve between 0.00 and 13.19 degrees (metre.radians)	0.055	0.000
Area under GZ curve between 0.00 and 13.19 degrees (metre.radians)	0.090	0.000
Area under GZ curve between 30.00 and 13.19 degrees (metre.radians)	0.030	0.000
Maximum GZ (metres)	-	0.005
Angle of heel at which maximum GZ occurs (degrees)	30.000	3.141
Maximum GZ between 30 and 90 degrees (metres)	0.200	0.000
Positive GZ heel range (degrees)	-	6.234
GM solid (metres) (upright)	-	0.429
Free Surface correction (metres)	-	0.324
GM fluid (metres) (upright)	0.350	0.105

CONDITION 4

DEADWEIGHT TABLE

Vessel....: MFV CHARISMA
Condition.: Catch on deck, hull flooded 13%, high sea water density
State.....: HULL INCLUDING WHEELHOUSE
Water SG..: 1.025
Compliance: Vessel fails requirements in this condition

Longitudinal dimensions about FP AT STEMHEAD (+ve aft, -ve forward)
Vertical dimensions about BASE LINE (USK) (+ve above, -ve below)
Transverse dimensions about centreline (+ve Port, -ve Stbd)

	Deadweight Item	Weight tonnes	LCG metres	Longitudinal moment t.m	TCG metres	Transverse moment t.m	VCG metres	Vertical moment t.m	Free Surface moment t.m
1	Weights Off	-3.254	5.129	-16.690	0.000	0.000	1.939	-6.310	-
2	Weights On	3.393	6.045	20.511	0.000	0.000	2.396	8.130	0.032
3	Mussels 280 bags	7.576	5.791	43.873	0.000	0.000	3.193	24.190	-
4	HULL AS COMPT	7.117	5.306	37.763	0.000	0.000	0.926	6.590	14.513
	DEADWEIGHT TOTAL	14.832	5.762	85.456	0.000	0.000	2.198	32.601	14.545
	LIGHTSHIP	26.957	5.964	160.772	0.000	0.000	2.036	54.884	-
	DISPLACEMENT	41.789	5.892	246.228	0.000	0.000	2.093	87.485	14.545
	Free Surface Correction (Total Free Surface Moment/Displacement)						0.348		
						VCG fluid	2.442		

CONDITION 4

SAILING STATE

Vessel....: MFV CHARISMA
Condition.: Catch on deck, hull flooded 13%, high sea water density
State.....: HULL INCLUDING WHEELHOUSE
Water SG..: 1.025
Compliance: Vessel fails requirements in this condition

DRAFT SUMMARY (DIMENSIONS IN METRES)	Maximum	Actual
Draft at FP about Base Line	-	2.306
Draft midships about Base Line	-	2.335
Draft aft about Base Line	-	2.364

STABILITY DATA

Heel angle degrees	Trim about Base Line metres on LBP	Draft at midships LBP about Base Line	KN metres	KGxSIN(Heel) metres	Righting moment tonne.metres	GZ fluid metres
0	0.057 by stern	2.334	0.000	0.000	0.000	0.000
5	0.058 ''	2.333	0.215	0.213	0.110	0.003
10	0.141 ''	2.338	0.402	0.424	-0.906	-0.022
15	0.273 ''	2.340	0.576	0.632	-2.340	-0.056
20	0.434 ''	2.324	0.739	0.835	-4.016	-0.096
25	0.633 ''	2.300	0.900	1.032	-5.493	-0.131
30	0.862 ''	2.261	1.055	1.221	-6.945	-0.166
35	1.118 ''	2.207	1.202	1.400	-8.293	-0.198
40	1.401 ''	2.137	1.340	1.569	-9.590	-0.229
45	1.694 ''	2.050	1.469	1.726	-10.777	-0.258
50	1.982 ''	1.946	1.592	1.870	-11.642	-0.279
55	2.258 ''	1.821	1.709	2.000	-12.171	-0.291

STABILITY SUMMARY	Minimum	Actual
Angle of immersion of ER aft vent (degrees)	-	13.166
Area under GZ curve between 0.00 and 13.17 degrees (metre.radians)	0.055	0.000
Area under GZ curve between 0.00 and 13.17 degrees (metre.radians)	0.090	0.000
Area under GZ curve between 30.00 and 13.17 degrees (metre.radians)	0.030	0.000
Maximum GZ (metres)	-	0.005
Angle of heel at which maximum GZ occurs (degrees)	30.000	2.990
Maximum GZ between 30 and 90 degrees (metres)	0.200	0.000
Positive GZ heel range (degrees)	-	5.923
GM solid (metres) (upright)	-	0.449
Free Surface correction (metres)	-	0.348
GM fluid (metres) (upright)	0.350	0.101

ANNEX 4

‘Capsize Safety for Fishing Vessels’ pamphlet

CAPSIZE SAFETY FOR
FISHING VESSELS

FISHING VESSEL REGISTRATION FORM - DETAILS INSIDE

SAFETY ON THE SEA

WHO WE ARE: WHAT WE DO:

BMIF
British Marine Industries Federation
Meadlake Place, Thorpe Lea Road
Egham, Surrey
TW20 8HE
Tel: 01784 473377

We are the trade federation for the UK marine industry. Our primary objective is to represent members' interests. We are equally committed to ensuring that the growth of boating and water-based leisure is achieved through a harmonious relationship with the environment.

MCA
The Maritime and Coastguard Agency
Spring Place,
105 Commercial Road
Southampton, Hampshire
SO15 1EG
Tel: 023 8032 9100

We are the Government body responsible for:

- developing, promoting and enforcing high standards of maritime safety
- minimising the risk of pollution of the marine environment from ships and, where pollution occurs, minimising the impact on UK interests
- minimising the loss of life amongst seafarers and coastal users
- responding to maritime emergencies, 24 hours a day.

RLSS (UK)
The Royal Life Saving Society UK
River House, High Street
Broom, Warwickshire
B50 4HN
Tel: 01789 773994
Registered Charity No. 279782

Our aim is to prevent loss of life through drowning and asphyxiation, and we are the principal provider of lifeguard training throughout the UK.

RNLI
Royal National Lifeboat Institution
West Quay Road
Poole, Dorset
BH15 1HZ
Tel: 01202 663174
Registered Charity No. 209603

We exist to preserve life from disaster at sea. This is achieved by providing a fleet of lifeboats, with 24 hour cover, and crewed by well-trained volunteers. In addition, we work with other national organisations to promote sea safety. We are funded entirely by voluntary contributions.

RYA
Royal Yachting Association
RYA House
Romsey Road
Eastleigh, Hampshire SO50 9YA
Tel: 023 8062 7400

We are the governing body representing sailing, windsurfing and motorboating in the UK. We offer a wide range of benefits and advice plus full training courses for all types of recreational craft.

FOREWORD

This booklet has been produced by the RNLI's Sea Safety Liaison Working Group which has representation from the following organisations and agencies:-

British Marine Industries Federation (BMIF)
Maritime and Coastguard Agency (MCA)
Royal Life Saving Society UK (RLSS UK)
Royal National Lifeboat Institution (RNLI)
Royal Yachting Association (RYA)

In addition the booklet has been approved by:-

National Federation of Fishermen's Organisations (NFFO)
Scottish Fishermen's Federation (SFF)
Northern Ireland Fishermen's Federation (NIFF)
Sea Fish Industry Authority (SEAFISH)

The purpose of this booklet is to provide useful guidelines on preventing capsize.

In 1998, 26 fishermen died in fishing vessel accidents. Twelve died as a direct result, or as a consequence, of their vessel capsizing. Make sure you know what to do to prevent the capsize of your vessel – and make sure you do it.

If you would like any advice or more information please contact the **MCA** on **023 8032 9100**

Further copies of this booklet are available from any of the organisations/agencies mentioned above. See back page for addresses and telephone numbers.

The Fishing Vessel Safety Trends Initiative (FVSTI) – a joint project between MCA and the fishing industry organisations to promote safety on fishing vessels – aims to reduce the number of accidents and deaths in the industry. The RNLI's Sea Safety Liaison Working Group supports FVSTI "Safe Fishing" campaign:

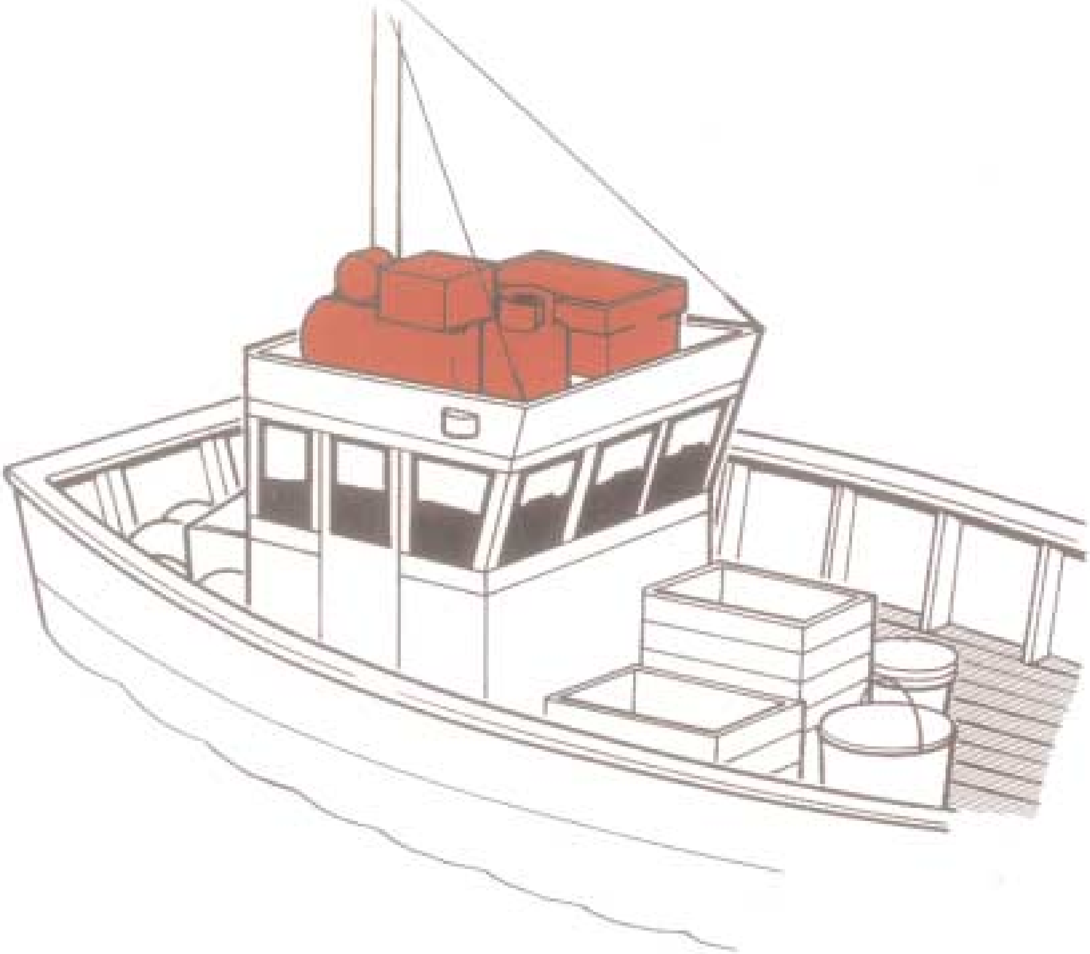
SAFE FISHING - keeps you fishing, keeps you alive

ACTIONS IN PORT

- It is important to ensure that the vessel is in as near an upright position as practicable prior to departure.

REDUCING TOP HAMPER

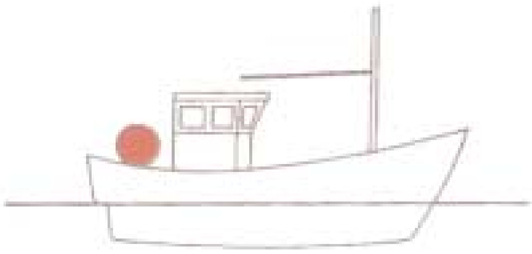
- It is important to identify any items fitted or stowed above the main deck or thwart level, which are unnecessary and therefore can be removed ashore. Anything which cannot be removed should, if possible, be stowed somewhere lower.



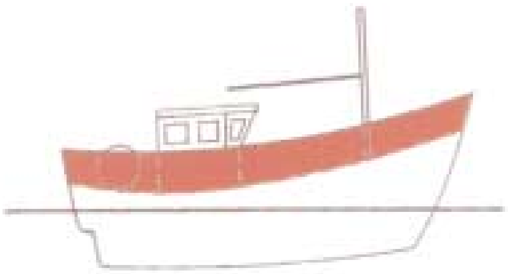
Removing top hamper ashore has two benefits. The first is to increase freeboard, thus helping to protect against shipping water and increasing the range of positive stability. Secondly it lowers the centre of gravity, increasing both upright statical stability, and its positive range. This is particularly important for open boats.

VESSEL MODIFICATIONS

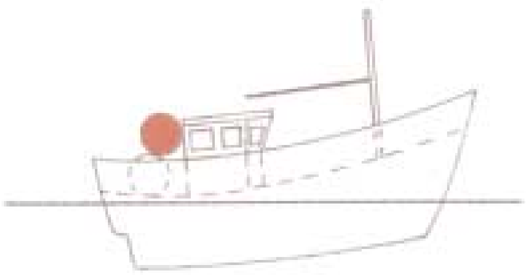
- **DON'T** change a vessel's structure, machinery or fishing gear without first seeking expert advice on the effect on stability.



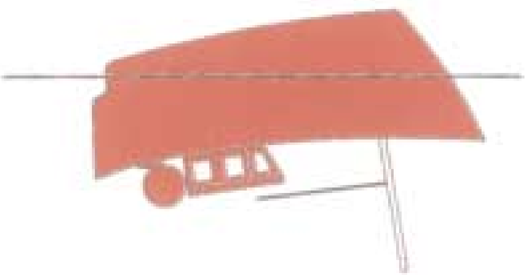
The modifications might include the fitting of a net drum,



or a full length shelter,



then in addition perhaps moving the net drum or adding another.



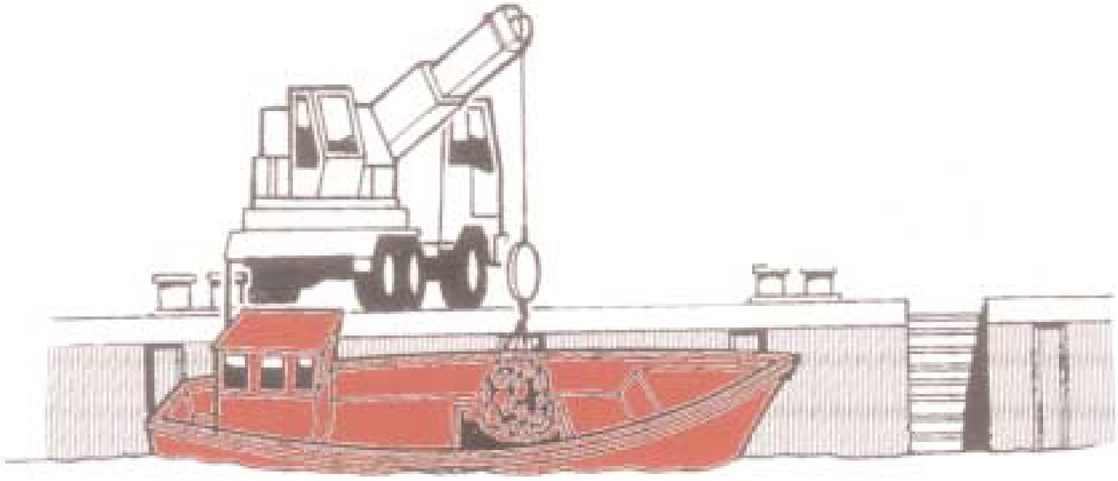
If you do any of these or other modifications without consulting a technical expert, then the latest modification **might be the last one you ever make!**

FITTING AND REMOVING BALLAST

- Never fit any ballast to a vessel (in an attempt to improve statical stability) **without professional advice from a fully qualified naval architect.** One effect of adding ballast is to reduce freeboard. Its effect on stability is therefore uncertain without proper investigation.

"Never fit ballast without professional advice"

- Never remove any ballast in an attempt to improve the rolling behaviour of a stiff vessel (that is a boat with high initial stability and therefore a short roll period), without the express professional advice of a fully qualified naval architect.
- Easy rolling can lead to the shipping of water with a possible risk of swamping. This can be reduced by fitting or increasing the size of the bilge keels (rolling chocks), but take special care with their attachment to the hull.



"Never remove ballast without professional advice"

ACTIONS AT SEA

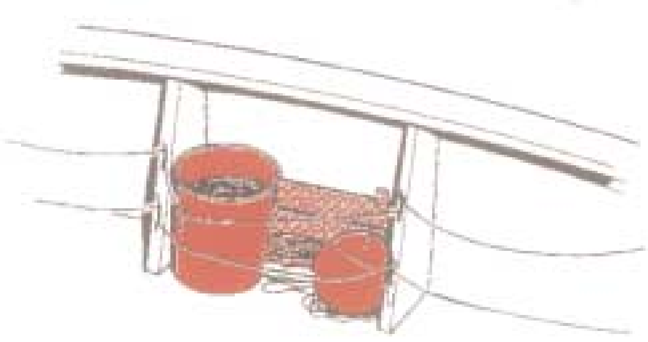
WEATHERTIGHT INTEGRITY

- Especially during bad weather or when undertaking fishing operations, care should be taken to maintain weathertight integrity.
- It is important to close and secure hatch covers, companionways and even keep wheelhouse doors and windows closed whenever there is a risk of accidental flooding. Engine room hatches should never be left open for ventilation and any hatches required to be opened for access should be closed as soon as practicable. However, proper ventilators for engine room and accommodation spaces should normally remain open, but be readily closeable in an emergency.



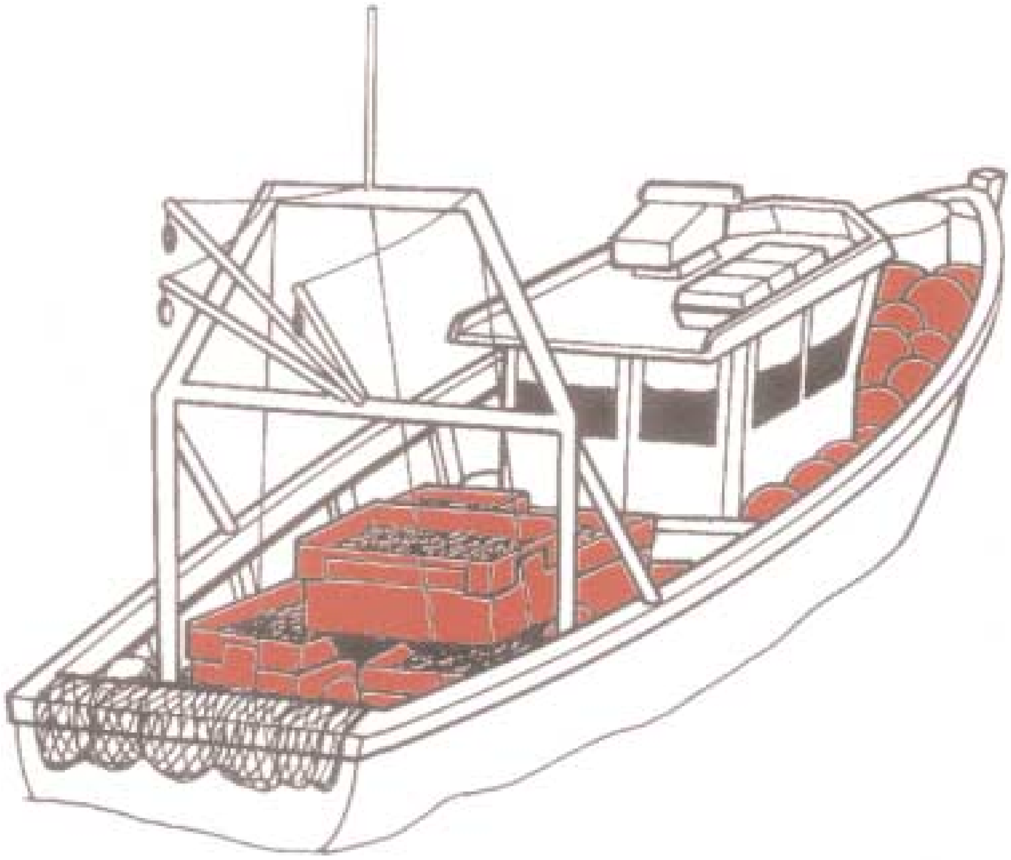
FREEING PORTS

- Freeing ports on decked vessels should be of adequate dimensions and correctly positioned so that they drain any water from the deck quickly and effectively. If fitted with flaps or slides, these should be regularly maintained, lubricated and secured open at sea, if appropriate.
- Care should be taken to ensure that freeing ports are not obstructed by fishing gear, catch, etc., and that deck pound arrangements do not have the potential to trap water on deck.



STOWAGE

- As little equipment as possible should be stowed at any time on deck or in any other high location, i.e. in deckhouses, forecastles, etc.
- Where practicable, on decked boats, spare fishing gear, fuel, water, ice and boxes should be securely stowed below deck. As should the catch, as soon as possible after hauling it on board.

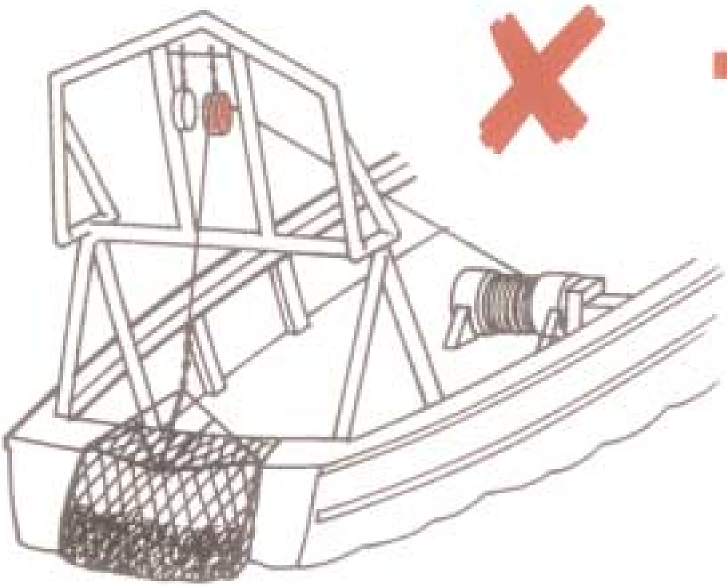


- Particular care should be taken to ensure that such stowages cannot shift as a result of vessel motion.

VESSEL OPERATION

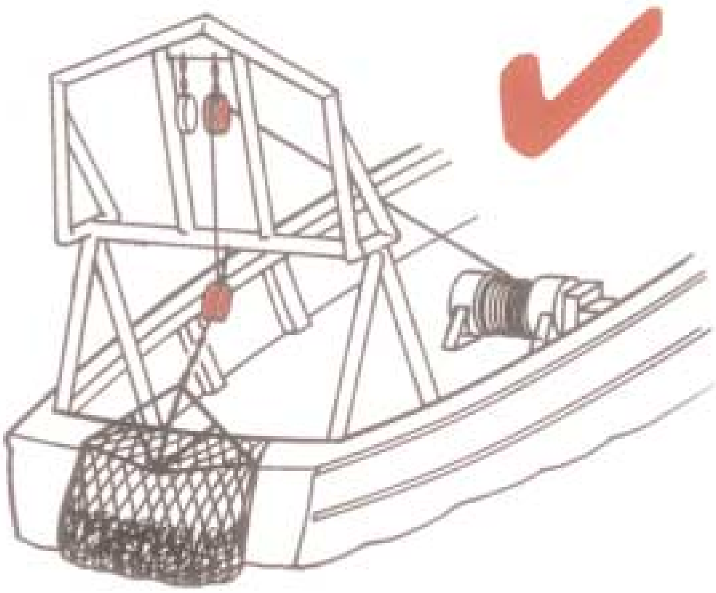
- It is advisable to avoid operating a vessel with a list.

SUSPENSION POINTS



- When working with gear such as trawls or dredges, towing blocks are best arranged as low as possible and near to the centreline.

- If your vessel is not fitted with a suitable towing point lower down, you should consider having one fitted.



- Do not lift pots (creels), nets, cod ends, etc. from unnecessarily high points, as any suspended load acts from the point of suspension.

SNAGGED FISHING GEAR

- If towed gear becomes fast on the seabed or any other obstruction - reduce engine power immediately.
- Contact Coastguard whenever you come fast on the seabed so that they can keep in regular contact with you – if no response is received, Coastguard will initiate enquiries to establish the safety of the vessel.
- If possible, handle heavy lifts, such as those generated by fastened fishing gear, near the vessel's centreline at bow or stern.
- Do not shorten up to fastened gear unless the vessel is equipped to immediately release or sever the trawl warp should the vessel appear to be capsizing. The risk of capsize increases dramatically as the warp is hauled in to the point at which it is straight up and down.
- Before attempting to recover fastened fishing gear ensure that all weathertight doors and hatches are closed and each member of the crew has put on their lifejacket.
- Remember that **the lives of the crew and the vessel are always more valuable than fishing gear or lost time.** If in any doubt, run off or cut away fastened gear, buoy off and return later with assistance for retrieval.

MCA Locations

The Maritime and Coastguard Agency
Spring Place, 105 Commercial Road,
Southampton SO15 1EG

Tel 023 8032 9100
www.shipping.detr.gov.uk/mca/mcahom e.htm

MCA Training Centre
Steamer Point, Highcliffe, Christchurch,
Dorset BH23 4JQ Tel 01425 277621

Registry of Shipping and Seamen
Unit 12, Cheviot Close, Parc Ty Glas
Llanishen, Cardiff CF4 5JA
Tel 01222 747333

The EPIRB Register
Pendennis Point, Castle Drive, Falmouth,
Cornwall TR11 4WZ
Tel 01326 211569

SOUTHERN REGION

HM COASTGUARD

Dover MRCC, Langdon Battery, Swingate,
Dover, Kent CT15 5NA
Tel 01304 210008

Solent MRSC, 44a Marine Parade West
Lee-on-Solent, Hampshire PO13 9WR Tel
023 9255 2100

Portland MRSC, Custom House Quay,
Weymouth, Dorset DT4 8BE
Tel 01305 760439

Brixham MRSC, Kings Quay, Brixham,
Devon TQ5 9TW Tel 01803 882704

Falmouth MRCC, Pendennis Point, Castle
Drive, Falmouth, Cornwall TR11 4WZ
Tel 01326 317575

MARINE OFFICES

Regional Office

Spring Place, 105 Commercial Road,
Southampton, Hampshire SO15 1EG
Tel 01703 329329

Regional Sub-Offices

Orpington, Central Court, 1B Knoll Rise,
Orpington, Kent BR6 0JA
Tel 01689 890400

Falmouth, Imperial Buildings, Bar Road,
Falmouth, Cornwall TR11 4NW
Tel 01326 312761

Plymouth, Phoenix House, Notte Street
Plymouth, Devon PL1 2HF
Tel 01752 266211

SCOTLAND AND NORTHERN IRELAND REGION

HM COASTGUARD

Clyde MRCC, Navy Buildings, Eldon
Street, Greenock PA16 7QY
Tel 01475 729988

Stornoway MRSC, Battery Point
Stornoway, Isle of Lewis HS2 2RT
Tel 01851 702013

Oban MRSC, Boswell House, Argyll
Square, Oban PA34 4BD
Tel 01631 563720

Belfast MRSC, Bregenz House, Quay
Street, Bangor, Co. Down BT20 5ED
Tel 02891 463933

Aberdeen MRCC, Marine House, Blaikies
Quay, Aberdeen AB1 2PB
Tel 01224 592334

Shetland MRSC, The Knab, Knab Road,
Lerwick, Shetland ZE1 0AX
Tel 01595 692976

Pentland MRSC, Cromwell Road,
Kirkwall, Orkney KW15 1LN
Tel 01856 873268

Forth MRSC, Fifeness, Crail, Fife KY10
3XN Tel 01333 450666

MARINE OFFICES

Regional Office, Blaikies Quay, Aberdeen
AB11 5EZ Tel 01224 574122

Regional Sub-Offices

Glasgow, 4000 Academy Park, Gower
Street, Glasgow G51 1TR
Tel 0141 427 9400

Belfast, Customs House, Queens Square
Belfast BT1 3ET Tel 01232 562962

Edinburgh, 1 John's Place, Leith,
Edinburgh EH6 7EL
Tel 0131 554 5488

Shetland, The Port Administration Building,
Sella Ness Graven, Mossbank, Shetland
ZE2 9QR

Tel 01806 242090

WESTERN REGION

HM COASTGUARD

Swansea MRCC, Tutt Head, Mumbles,
Swansea SA3 4EX Tel 01792
366534

Liverpool MRSC, Hall Road West,
Crosby, Liverpool L23 8SY Tel 0151
931 3341

Holyhead MRSC, Prince of Wales Road,
Anglesey, Gwynedd LL65 1ET
Tel 01407 762051

Milford Haven MRSC, Gorsewood
Drive, Hakin, Milford Haven SA73 3ER
Tel 01646 690909

MARINE OFFICES

Liverpool, 2nd Floor, Graeme House,
Derby Square, Liverpool, Merseyside L52
2SQ Tel 0151 471 1142

Cardiff, Oxford House, The Hayes,
Cardiff, South Glamorgan CF1 2TD
Tel 01222 229556

Milford Haven, The Old Smoke House,
The Docks, Milford Haven SA73 3AA
Tel 01646 693272

EASTERN REGION

HM COASTGUARD

Yarmouth MRCC, Haven-bridge House,
5th Floor, Gt Yarmouth NR30 1BR
Tel 01493 851338

Tyne Tees MRSC, Priory Grounds,
Tynemouth, Tyne & Wear NE30 4DA
Tel 0191 2572691

Humber MRSC, Lime Kiln Lane,
Bridlington, North Humberside
YO15 2LX Tel 01262 672317

Thames MRSC, East Terrace, Walton-on-Naze, Essex CO14 8PY
Tel 01255 675518

MARINE OFFICES

Regional Office, Crosskill House, Mill
Lane, Beverley, Humberside HU17 9JB
Tel 01482 866606

Regional Sub-Offices

Newcastle-upon-Tyne, Government
Buildings, Broadway West, Gosforth,

Newcastle-upon-Tyne NE3 2JL
Tel 0191 285 7171 Ext 0236

Middlesbrough, 12-16 Woodlands
Road, Middlesbrough, Cleveland
TS1 3BE Tel 01642 246034

Yarmouth, 5th Floor, Yarmouth House,
Yarmouth Way, Gt. Yarmouth, Norfolk,
NR30 2QZ Tel 01493 330433

THE MARITIME AND COASTGUARD AGENCY INCLUDING COASTGUARD MARITIME CO-ORDINATION CENTRES

Key to map

- Maritime Rescue Co-ordination Centre (Region) MRCC
- Maritime Rescue Sub Centre (District) MRSC
- Surveyors Regional Office
- Surveyors Sub Office
- Registry of Shipping & Seamen
- MPCU Aerial Spraying and Remote Sensing Aircraft
- Helicopter
- Tug
- MPCU Equipment Stockpile
- District Boundary
- Regional Boundary

How to join the Fishing Vessel Safety Register - it's free and could help save your life.

Instructions for completing the Fishing vessels safety registration form

Filling in the attached form is not compulsory to obtain assistance from HM Coastguard;

Therefore, you may complete as much or as little as you like.

Obviously, the more information we hold on the craft, the easier it will be for us to give assistance, and enable her to assist others. It will also make it easier for search and rescue services to rule out false alarms caused by accidental activation of automatic distress alerting equipment she or others may be carrying. Further assistance for completing this form may be obtained from your nearest MRSC/MRCC (see page opposite)

COMPLETE THE ENCLOSED QUESTIONNAIRE IN INK AND SEND IT TO THE NEAREST COASTGUARD RESCUE CENTRE.

ADDITIONAL INFORMATION

Advice on the information detailed in this booklet and on the requirements of current safety legislation, recommended safety provisions and training is available from your MCA Regional Offices or from MCA Headquarters.

MCA Headquarters

Spring Place, 105 Commercial Road, Southampton, Hampshire, SO15 1EG
Tel: 023 8032 9100 Fax: 023 8032 9161

Addresses and contact numbers for SFIA and the Fishing Federations.

NFFO Offices
Marsden Road, Fish Docks
Grimsby DN31 3SG
Tel: 01472 352141
Fax: 01472 242486

SEAFISH
Headquarters
18 Logie Mill
Logie Green Road
Edinburgh EH7 4HG
Tel: 0131 558 3331
Fax: 0131 558 1442

SFF
14 Regent Quay
Aberdeen AB11 5AE
Tel: 01224 582583
Fax: 01224 574958

SEAFISH
Technology, Training &
Standard Divisions
St. Andrew's Dock
Hull HU3 4OE
Tel: 01482 327837
Fax: 01482 223310

NIFF
1 Coastguard Cottages
The Harbour Portavogie
Co. Down BT22 1BA
Tel: 012477 71946
Fax: 012477 71696

In An Emergency Dial 999 And Ask For COASTGUARD

COMPLETE THE ENCLOSED QUESTIONNAIRE IN INK AND SEND IT TO THE NEAREST COASTGUARD RESCUE CENTRE.

IF YOU ARE WORRIED ABOUT THE SAFETY OF THIS CRAFT, PLEASE CONTACT COASTGUARD BY DIALLING 999, OR BY TELEPHONING YOUR NEAREST COASTGUARD RESCUE CENTRE.

ANNEX 5

MGN 165 (F) Fishing Vessels: The Risk of Flooding

MARINE GUIDANCE NOTE

MGN 165 (F)

Fishing Vessels: The Risk of Flooding

Notice to Owners, Builders, Employers, Skippers and Crews of Fishing Vessels.

This Notice replaces Marine Guidance Note No. MGN 49 (F).

Summary

This notice:

1. provides guidance on bilge systems, during construction and operation, to help reduce the number of vessels and lives lost as a result of flooding; and

2. recommends owners and skippers to consider using additional or alternative equipment, such as salvage pumps, propeller shaft-mounted pumps and secondary bilge alarms, to reduce the risk of catastrophic flooding.

1. INTRODUCTION

MAIB investigations into fishing vessel losses continue to show flooding as the primary cause. In 1999, 18 (out of a total of 33) vessels were lost for this reason.

Flooding is preventable, but if not prevented, in most cases can be controlled. If discovered early, leaking pipes can be isolated and the flooding controlled by pumping out the affected space. Flooding can be rapid and late discovery leaves no time to treat the cause. An <u>efficient bilge alarm can be critical in providing early warning of flooding.</u>

No alarm or pumping system, however efficient, is fully reliable on its own. Good practice requires regular checks and function tests of bilge alarms and pumps, together with regular checks of hull and pipework to prevent potential leaks or failures developing.

2. ARE THE PUMPS ON YOUR VESSEL ADEQUATE?

Statutory requirements provide for a minimum capacity for pumping bilges. There is no guarantee that the statutory minimum is adequate for dealing with serious hull or pipework failure. Alternative supplementary means of pumping bilges are available, such as salvage pumps and propeller-shaft mounted pumps. Use of such equipment is highly recommended.

3. CONSIDER CARRYING MORE EQUIPMENT THAN THE REGULATIONS REQUIRE

A range of bilge pumps and alarms are available. To help reduce the consequences of flooding, in addition to statutory requirements, <u>consider one or more of the following options</u> :-

- Install an efficient bilge alarm in the fish hold and any other compartment below the waterline.

- Fit secondary bilge alarms, positioned at a higher level to the main bilge alarm. This will reinforce the main alarm.

- Fit secondary bilge alarms, fed from a separate supply, that incorporate an alarm visible from outside the vessel (e.g. an orange "strobe" light).

- When available, fit electronic bilge level monitoring systems in addition to conventional "float switch" alarms.

- Fit "circuit healthy" indicators on bilge alarm circuits to ensure that the alarm system is working correctly (similar idea to navigation light failure alarms).

- Fit a propeller-shaft mounted pump; this type of pump runs continuously on the main propeller shaft and automatically attempts to pump out the engine room space in the event of flooding.

- Install "submersible" pumps, which continue to operate whilst submerged in water.

- Where practical, fit remotely operated clutches to engage engine driven bilge pumps.

- Carry a portable salvage pump. Extremely positive feedback has been received from Skippers who have sailed with this type of pump, which may "double-up" as a fire-fighting pump in a "dead ship" situation. However, a recent investigation attributed the death of one crew member to such a salvage pump. Unfortunately, he received fatal carbon monoxide poisoning whilst operating the pump inside the engine room.

<u>Such pumps should be:-</u>

i) Used in a well-ventilated space, preferably on deck, where the exhaust fumes will be released to outside the vessel.

ii) Permanently rigged, or readily available, with direct attachment to permanent suction lines (to prevent the need for hoses to be fed through open hatches/doors).

iii) Given due consideration concerning the storage of fuel, particularly petrol driven versions (i.e. adequate ventilation provided, fit for purpose storage canisters and away from sources of ignition).

4. PREVENTATIVE MEASURES – DURING CONSTRUCTION AND REFITS

Bulkheads/Openings

- Ensure that the main bulkheads are as watertight as practicable, to prevent (or at least delay) a flood from spreading to other compartments.

- DO NOT make additional penetrations through main bulkheads unless absolutely necessary.

- Clearly label ("TO BE KEPT CLOSED AT SEA") all doors which contribute to the watertight integrity of the vessel.

Sea Valves/Pipework

- Try to keep the number of sea inlet valves to a minimum.

- Valves and fittings should be manufactured from a suitable* material.

- Avoid unnecessary bends in sea water pipework.

- Position sea valves where they can be easily and quickly closed. Fit extended spindles if necessary, to ensure that sea intake valves can be closed without having to remove floor plates.

- Fit clear labels to identify sea valves.

- DO NOT fit flexible sections of piping in seawater lines unless designed and fitted to withstand vibration. Such sections should be made from reinforced neoprene rubber and secured with stainless steel clips (at least two at each end). The date of manufacture should be clearly marked to identify renewal dates in accordance with the manufacturers' instructions (typically every 5 years).

* "Suitable" means a ductile and corrosion resistant material e.g. bronze, gunmetal, stainless steel, alpha-brasses (containing 70% copper or more and effectively inhibited from de-zincification).

Bilge Alarms

- Position floats or level sensors to bilge alarm systems in accessible positions but where they cannot be damaged and low enough to provide early warning of flooding.

Bilge Valves/Strainers

- Fit bilge valves so they can easily be reached in an emergency.
- Fit clear labels to identify bilge valves.
- Fit and position all bilge strainers (mud boxes) in the engine room, so they can be cleaned easily.
- Fit grids over the fish hold slush well or some other form of coarse strainer.
- Fit a bilge isolating valve in the engine room for the fish hold, to allow cleaning of the strainer even if the hold is flooded.

Bilge Lines

- Avoid unnecessary bends in bilge lines, keeping them straight and direct.

Refits

- Inspect the outer hull closely each time the vessel is slipped, paying close attention to any signs of wastage, damage, caulking and fastenings.
- Inspect sea water pipework closely each time vessel is slipped, paying close attention to bends, "sumps" (e.g. the bottom of sea strainer boxes) and those pipes which are not easily accessible.
- If in doubt about the condition of the sea water pipework, have an ultrasonic inspection carried out and renew those pipes found to be wasted by more than 25-30% of the original wall thickness.

5. REDUCING THE RISK – DURING OPERATION

- Always investigate immediately the cause of high bilge alarms.
- Ensure all watertight and weathertight doors are closed when not in use.
- Regularly (at least weekly) test the bilge pumps and bilge system.
- Test bilge alarms daily.
- Regularly (at least monthly) open and close all bilge and sea water valves, to ensure they don't "seize".
- Keep sea water valves closed when not in use.
- Permanently repair any leaking sea water pipe as soon as possible. Do not rely on temporary repairs and find out if the other sea water pipes are in a similar condition and require renewal.
- Ensure crew members are familiar with sea water side valves and bilge systems. As a reminder, keep a plan at the engine room entrance, identifying the position of sea inlet valves.
- Regularly (several times a day) check compartments not fitted with bilge alarms.
- Regularly (at least weekly) clean bilge. strainers
- Keep the engine room and fish hold free of rubbish, which could choke the bilge system.
- Check sea valves (including overboard non-return valves) whenever the vessel is slipped.

6. EFFECTIVE USE OF THE BILGE PUMPING SYSTEM

- Close the sea suction after any priming of bilge pumps.
- Stop the bilge pump when pumping bilges is finished.
- Close all bilge valves when not in use.

7. WHAT TO DO IN AN EMERGENCY

- Immediately try to find the cause of the flooding and shut the right sea valve. If in doubt, close all sea valves until the flooding stops.
- Start pumping the bilge as soon as possible.
- Do not concentrate on other matters, such as recovering the fishing gear. Deal with the flooding first.

8. PREVENTION AT ANCHOR OR IN HARBOUR

- Close all sea suction valves.
- Avoid "squeezing" wooden vessels in harbour, whenever practicable. This can damage the caulking and lead to a sprung plank.

9. FURTHER NOTES

1. Statutory requirements for fishing vessels of 12 metres in length and over are detailed in the Fishing Vessels (Safety Provisions) Rules 1975 as amended [currently under review]. New vessels 24 metres in length and over now need to comply with EC Directive 97/70/EC, in accordance with the Torremolinos Protocol.
2. This notice is considered relevant to all types of fishing vessels, regardless of size.

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 9478
Fax: 023 8032 9173

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

Tel: 023 8032 9297
Fax: 023 8032 9298

File Numbers: MS 007_025_008
MS 088_001_0456

July 2001

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