Report on the investigation of the

death of an engineer on board

Fivla

in the Bluemull Sound, Shetland

on 16 July 2000

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Extract from

The Merchant Shipping

(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

BST	British Summer Time
ISM	International Safety Management
m	metre
MAIB	Marine Accident Investigation Branch
Ro-Ro	Roll-on roll-off
UK	United Kingdom

SYNOPSIS

On the morning of Monday 17 July 2000, the MAIB was informed of a fatality on board *Fivla,* a small passenger ro-ro ferry operated by the Shetland Islands Council. Two inspectors were immediately sent to the Shetland Islands, arriving later that day, and an investigation began.

Fivla is 30m in length, and runs between Gutcher on the Isle of Yell, and Belmont on the Isle of Unst in the northern Shetland Islands. The vessel has one car deck which runs her entire length, with a ramp at the aft end and a ramp and bow visor at the forward end.

On Sunday 16 July 2000, the vessel's crew was changed in Gutcher at 1730 BST. At 1755 she returned to Gutcher, having completed one round trip. The engineer was seen standing by the linkspan, talking to the mate and one of the deckhands. Just prior to departure, the mate raised the forward ramp and went to the bridge. The deckhand left the deck at the same time and went to the bridge via the ticket office. The engineer was left on the deck, apparently having just completed greasing the visor and flap. The vessel was carrying no passengers on this passage.

Fivla backed off the berth and the bow visor was closed. She then sailed to Belmont, arriving at 1810. After one of the deckhands had secured the vessel aft (the vessel being berthed stern first in Belmont), he looked forward and saw the engineer apparently leaning over an access hatch on the starboard bow. The deckhand walked forward to the bow to speak to him, but as he approached realised that his colleague had suffered serious head injuries, when the bow visor was lowered. No tools were in the vicinity, and the safety chain fitted between the car deck and the working area was lying on the deck. The engineer was declared dead at 1836 by the local doctor.

The postmortem examination indicated that, in addition to head injuries caused by the visor, the engineer had some cardiac enlargement, a recognised cause of collapse and sudden death. Due to these findings, the unusual location of the engineer when he was found and that he had failed to take evasive action when the visor was being lowered, it is concluded that, although the cause of death is uncertain, in the opinion of the MAIB it appears possible that he had collapsed and died from natural causes before the visor was lowered.

A safety bulletin containing recommendations was issued with respect to operational procedures, and the installation of alarms and emergency stops regarding the operation of the bow visor. A further recommendation is addressed to the Shetland Islands Council to introduce into its safety management system, guidelines and procedures, including training, for the operation of the bow visors throughout its fleet.

PARTICULARS OF *FIVLA* AND ACCIDENT

Vessel details

Name	:	*Fivla* (**Figure 1**)
Registered owner	:	Shetland Islands Council
Port of registry	:	Lerwick
Flag	:	UK
Type	:	Ro-Ro passenger ferry
Built	:	Troon Scotland 1985
Length overall	:	30.0m
Gross tonnage	:	230
Engine power and/or type	:	2 x Kelvin Diesels TASC8 656 Kilowatts
Service speed	:	11.00 knots
Passenger capacity	:	95 (class IV summer)
Crew (max)	:	6
Other relevant info	:	One forward bow thruster, twin screw main engine

Accident details

Time and date	:	1800 BST 16 July 2000
Location of accident	:	Bluemull Sound, Shetland Islands
Persons on board	:	5
Injuries/fatalities	:	1 fatality

Figure 1

Fivla

SECTION 1 - FACTUAL INFORMATION

1.1 Background

Fivla is a small passenger roll-on roll-off (ro-ro) ferry operated by the Shetland Islands Council, and runs between Gutcher on the Isle of Yell and Belmont on the Isle of Unst in the northern Shetland Islands.

She is 30m in length, and has a maximum passenger capacity of 95 when operating in class IV mode in summer. The vessel has twin engines and a bow thruster. She can carry a small number of cars and/or freight vehicles, in addition to foot passengers. She was purpose-built in 1985 in Troon for the Shetlands trade. *Fivla* has a gross tonnage of 230 and a draught of 2.5 metres. She has one car deck which runs her entire length, with a ramp at the aft end and a ramp and bow visor at the forward end.

The internal ferry system is part of Shetland's transport infrastructure, in the same way as roads and footpaths, harbours and airstrips, and other transport services. It links the main islands to the Shetland mainland, the principal point of arrival and departure for the islands as a whole, and it connects the spine road system within the islands. Shetland's ro-ro passenger ferry service provides what has become an almost seamless 18 hours a day "road". For both people and motor vehicles, it is an integral part of the transport system. The Shetland Islands Council operates the ferry service. The inter-island ro-ro passenger fleet comprises eight vessels.

The short trip between Gutcher and Belmont takes between 5 and 10 minutes. Unst is the northern most island in Shetland, and has a population of around 1000. A similar number of people live on Yell.

The certification issued in respect of *Fivla* was valid at the time of the accident, and the vessel was manned in accordance with her Safe Manning Certificate. She had full International Safety Management Code (ISM) certification with a safety management system in place.

1.2 Routine operational procedures

Fivla operated with a crew of five. The master was normally on the bridge at all times. The mate supervised the loading, then went to the bridge once the vessel had sailed. One of the deckhands collected the fares, and then went to the ticket office to register the details of the vehicles and passengers on each trip. The other deckhand normally worked in the galley or elsewhere as required. Throughout the day, the ship's engineer frequently left the engine room to carry out routine planned maintenance.

The ferry ran for 18 hours a day, and was taken out of service between 0000 and 0600.

For the vessel to act in its “ro-ro” mode it usually berthed ‘bow first’ at Gutcher, and ‘stern first’ at Belmont. This enabled vehicles to be driven on and off without their having to reverse. At Belmont only the stern ramp or “flap” was used.

The controls for the ramps at both ends of the vessel were situated locally at the bow and the stern. There were also controls for the remotely operated linkspans which a crew member used as the vessel was berthing. Both terminals ashore were unmanned.

On departure Gutcher *Fivla* was moved astern off the berth with the visor still open **(Figure 2)**. Once clear of the berth, the master activated the pre-recorded safety announcement and closed the visor from the console on the bridge. It normally reached the fully closed position about 2 minutes after sailing. The vessel then proceeded on passage. The master remained alone on the bridge until the mate and/or the deckhand arrived.

Figure 2

Fivla moving astern off the berth in Gutcher

Although the visor was visible from the bridge, it could only be seen by someone standing at the front and looking down. There was no alarm system, and the visor could only be operated from the bridge console. It took approximately 35-40 seconds to close the visor. There were no written operating procedures, but there was a manufacturer's notice on the bridge console by the operating controls **(Figures 3 and 4)**, which instructed the operator to check the area was clear before lowering. The controls consisted of "raise" and "lower" buttons and two lights which indicated if the visor was being raised or lowered. There was an emergency stop button on the bridge console. There were also controls for the hydraulic pumps used to operate the visor. There were no other controls for the bow visor on the vessel.

1.3 The crew

The 48-year old deceased had been working for the Shetland Islands Council on ferries since 1985. He had a valid medical certificate which restricted him to working near UK coastal areas only. He was a highly regarded and experienced employee. He had attended a training course in Fleetwood just prior to the accident, returning home in the early afternoon on the day before. He was well rested. He fully intended to obtain a Class 4 Engineering Certificate of Competency. He was in good spirits on the day of the accident, and talking to the other crew members about the course he had just attended. Apart from the restriction on his medical certificate, he was in apparent good health. He was, however, investigated for pyelonephritis (kidney infection) in August 1998. His family had a history of heart disease. The postmortem indicated he was not under the influence of alcohol and/or drugs.

The 47-year old master had served on board *Fivla* for 15 years at the time of the accident, the last 10 as master. He had a class 5 Deck Officer's Certificate of Competency.

The 35-year old mate had served on *Fivla* for the last 11 years. He, too, had a class 5 Deck Officer's Certificate of Competency.

The deckhand working on deck at the time of the accident was 20 years old, and had worked for the Shetland Islands Council for 10 months. The other deckhand, who was working in the galley, had been with the council for 5 years.

1.4 Environmental conditions

The weather at the time of the accident was fine, sunny and dry with good visibility. The barometer was 1025 millibars and the wind was northerly 10 knots with a slight sea. There was no unusual vessel motion.

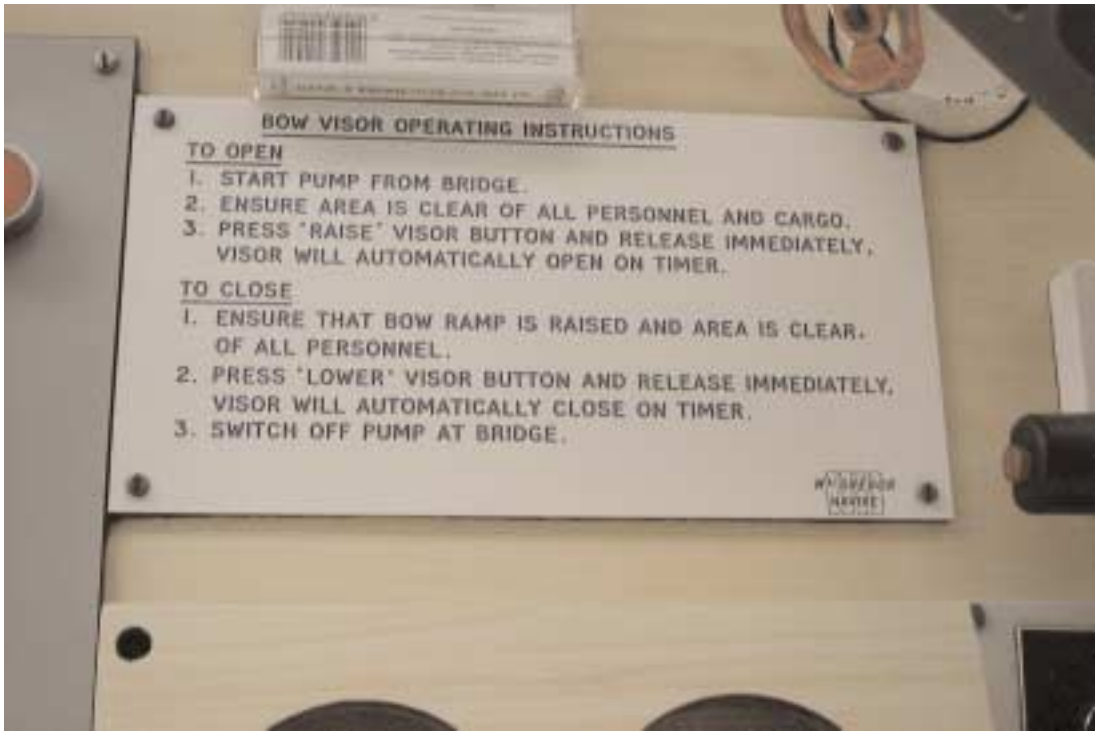
Bow visor control panel

Bow visor operating instructions notice

Figure 3

Fivla - view of wheelhouse

Figure 4



Bow visor operating instructions on bridge console

1.5 Narrative of events

At 1730 BST on Sunday 16 July 2000, *Fivla* changed her crew of five at Gutcher. The previous crew had had a fairly busy day with over 30 trips, carrying over 30 cars and 14 trucks. *Fivla* had also made two trips to Oddsta to provide the timetable service between the nearby island of Fetlar to Yell and Unst.

After a brief handover the crew took over, and the vessel sailed from Gutcher at 1730 with 16 passengers and 6 vehicles on board. At 1745 *Fivla* left Belmont carrying 21 passengers and ten vehicles. At around 1755 the vessel arrived in Gutcher and quickly unloaded. No vehicles or passengers were waiting to be loaded. The mate, deckhand and engineer stood on the linkspan talking. The engineer was holding a grease gun, and was seen greasing the forward flap when the vessel arrived alongside. The master was on the bridge and the other deckhand was cleaning in the galley.

Since taking over the shift at 1730, the engineer had already remarked in the engine room logbook that he had washed down the engine room deck plates and greased the visor pins, rams and hinges on the forward flap.

The conversation between the three crew members was quite normal and the engineer appeared to be in good spirits.

No vehicles or passengers arrived and the vessel prepared to sail at 1800 with just the five crew on board. The three crew who had been on the linkspan came back on board together. The deckhand went to the ticket office to register that there were no passengers, the mate unhooked the vessel, lifted the flap and went up to the bridge. The engineer remained in the fore part of the vessel.

The master backed *Fivla* off the berth and lowered the bow visor. He activated the passenger safety announcement out of habit, despite there being no passengers on board.

The deckhand finished in the ticket office and came up to the bridge for the crossing. The crossing was uneventful and the vessel arrived at Belmont at 1810. The master and mate stayed on the bridge while the deckhand went aft to hook up and lower the aft ramp.

As the deckhand completed lowering the ramp he looked forward and saw the engineer lying across the bow thruster space access hatch on the starboard bow. Initially, he thought the engineer was working and leaning over the hatch, and decided to walk forward to talk to him.

As he approached, it became immediately apparent to him that the engineer was not in fact working, but had been very seriously injured. He was lying over the hatch with his head very close to the bow visor. It was clear he had severe head injuries; the deckhand ran to the bridge to inform the master and mate.

The master ran down on to the fore deck and then back to the bridge to raise the visor by about 30 centimetres, as it was not clear if the engineer's head was trapped under the visor or not.

A small chain was used to segregate the area of the fore deck close to the visor from the rest of the deck. This chain was lying on the deck. The bow thruster space access hatch was normally closed with all four securing "dogs" in place. However, it was noticed that the fore and aft dogs had been released, and only the port and starboard dogs were secure.

The police, local doctor and shore management were immediately informed, and *Fivla* was taken out of service.

At 1836 the engineer was pronounced dead by the local doctor. The vessel was moved to Cullivoe where the police began an investigation. The vessel resumed normal service the next day. The MAIB was informed early the next morning and two inspectors were dispatched to the Shetland Islands, arriving later that evening.

1.6 Postmortem examination report

The postmortem was conducted at Aberdeen Mortuary on 18 July 2000. The following is an extract from the report's conclusion;

From the circumstances of the case as related to us and our autopsy findings we are of the opinion that this man's death should be recorded as due to a head injury sustained in an incident while at work aboard ship. However, it was noted that he also had some cardiac enlargement which is a recognised cause of collapse and, indeed, sudden death. It must be speculated, particularly given the description of the body in situ amongst other circumstantial evidence, that he collapsed and perhaps even died as a result of natural causes, prior to his head being trapped in the bow closure mechanism. The relatively light weight of the lungs would suggest that whatever the proximate cause of death, it had been virtually instantaneous.....

1.7 Safety bulletin

As a result of initial findings while the accident was still under investigation, the MAIB issued Safety Bulletin 3/2000 (see Annex).

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 bow visor operation

It was the practice on *Fivla* and other ferries run by the Shetland Islands Council for the master to lower the bow visor from the bridge after moving the vessel astern and clear of the berth. At this time the master was often the only person on the bridge, while the deckhand collected fares, and the mate made his way from the deck. The master would not have the time to monitor the closing of the visor from start to finish, even with the provision of closed circuit television, without interfering with his shiphandling and navigation duties. To view the fore deck, the master had to stand at the front of the bridge. From all other parts of the bridge the fore deck could not be seen. The mate was often still on the deck when the visor was being lowered, and sometimes waited until it was secure before leaving the deck, especially if passengers were on the deck. The visor was, however, on occasions lowered without any continuous visual monitoring.

No other controls existed for the operation of the bow visor, and therefore it could only be raised or lowered from the bridge. Also, it could only be stopped from the bridge, as this was the location of the one emergency stop. If the mate on deck was monitoring the closing, and realised there could be a potential obstruction, he had to contact the bridge to inform the master to stop the visor, as well as trying to remove the obstruction himself. The provision of, at least, an emergency stop in the local position could allow the mate, or whoever was monitoring from the deck, to stop the operation immediately in the event of possible obstruction.

The council had not given the master and crew any written instructions for operating the bow visor. The only instructions were those provided by the manufacturer in the notice on the bridge console.

The area of the fore deck close to the bow visor was segregated from the car deck by a small safety chain. The chain ran in a fore and aft direction from a post by the windlass to the bulwark adjacent to the ramp, a length of about 4 metres. At the time of the accident, the chain on the starboard side of the fore deck on *Fivla* was connected by a length of nylon line at the forward end, as the original hook or lug had been damaged. The chain could easily be stepped over by an adult, or ducked under by a child, and was no more than a token barrier.

The bow visor had no specific audible or visual alarms to indicate it was being raised or lowered, and there were no closed circuit television monitors covering its area of operation. An appropriate visual and audible alarm would alert both passengers and crew to its operation.

2.3 Activity of the engineer before the accident

The engineer had been greasing the forward bow flap while the vessel was alongside in Gutcher, and had already made a logbook entry to this effect; presumably pre-empting the work he was about to do.

His work began 30 minutes before departure Gutcher, and the engineer was well rested. He had not worked for a few days, having attended a course at Fleetwood and returned to the Shetland Islands the afternoon before. The changeover of the watch was routine, and nothing out of the ordinary had been handed over by the previous engineer. The engineer had already made entries in the engine room logbook including temperatures and pressures of machinery. The greasing was part of *Fivla*'s planned maintenance, and was a perfectly feasible and normal routine for him to be carrying out. It was quite usual for the engineer to leave the engine room to carry out his routine maintenance duties, as he did on this occasion.

The other crew members were, therefore, not surprised to see the engineer on deck with a grease gun. The mate and the deckhand who were talking to him on the linkspan were under the impression that he had completed greasing. An inspection of the greasing points after the accident revealed that they had all been freshly greased.

When the vessel was about to sail from Gutcher, and the mate and the deckhand left the car deck to go to the bridge and ticket office respectively, the engineer often remained on deck for sailing. They would have assumed that he had other maintenance to do, or was just gathering his tools together.

How the engineer ended up in the position in which he was found, is a matter for some conjecture. The grease gun was found on the port bow several metres away. The chain segregating the area of the starboard bow, close to the bow visor, had been broken at the forward end, in way of the nylon line used to secure it. The engineer was known to be a meticulous and careful man, and it is thought unlikely he would have broken the nylon line intentionally. He was much more likely to have unfastened it, and neatly coiled the chain, had he wanted to access the starboard bow area. He could also have simply stepped over the chain.

There is no apparent explanation for why the engineer wanted to go to the starboard bow area. There was nothing mechanical which he would have been checking, and it was unlikely he would have been looking over the bow at

something on the shore or in the water. The bow thruster space access hatch was normally closed with all four securing “dogs” in place. However it was noticed that the fore and aft dogs were released, and only the port and starboard dogs were secure. He was possibly in the process of entering the bow thruster space, but this was normally carried out once every few weeks unless there was a problem. None was experienced at the time, and an inspection was not due. It is possible that he decided “on the spur of the moment” to make an inspection, but this is considered unlikely. It is not known why the two dogs were not secured.

There were no witnesses to the accident.

There is no rational explanation to account for the position in which the engineer was found. He had no obvious reason for being on the starboard side, or for wanting to go below to the bow thruster space. He was found lying over the hatch with his head showing injuries compatible with having been struck by the descending visor. His head was therefore in the visor’s trajectory, and was in that position before it struck. There was no malfunction of the visor, and the hydraulic sounds associated with it closing would have been clearly audible to him had he been conscious. The engineer was sufficiently experienced to have recognised what was happening, and would have known he was in the visor’s way as it closed, had he been fully alert.

It is, therefore, quite possible that the deceased collapsed and died as a result of natural causes, before his head was injured by the bow visor.

2.4 Action taken by Shetland Islands Council since the accident

Since the accident, and also as a result of the MAIB Safety Bulletin 3/2000, the Shetland Islands Council has taken the following action on board *Fivla* and its other vessels:

Installed fixed handrails around the area of the bow by the visor.

Installed audible and visual alarms to indicate the bow visor is being raised/lowered.

Installed emergency stops in a position local to the bow visor.

Issued a memo to all masters on 6 September 2000 regarding operating the bow visor, and instructing masters to develop appropriate operational procedures.

Some vessels in the Shetland Islands Council fleet are awaiting the next refit and dry docking period before the alarms and stops are fitted.

The actions since taken by Shetland Islands Council will contribute towards preventing a similar accident in the future.

SECTION 3 - CONCLUSIONS

3.1 Findings

1. *Fivla* was correctly manned and had full valid certification at the time of the accident. [1.1]

2. The accident was discovered after the vessel had completed berthing in Belmont at 1810 on 16 July 2000. [1.5]

3. The deceased was last seen alive upon departure from Gutcher at 1800. [1.5]

4. The deceased had a restricted medical certificate and his family had a history of heart problems. [1.3]

5. The deceased was known to have been working in the bow area while the vessel was alongside in Gutcher. [1.5]

6. The position the deceased was found in, with his head in a position to be struck by the bow visor, was very unusual and unlikely to be due to any normal movement or operation. [2.3]

7. The only segregation of the bow area close to the visor was by a small safety chain. [1.5]

8. There were no passengers or vehicles on this trip. [1.5]

9. The bow visor had no specific alarm system, and could only be operated and stopped from the bridge console. [1.2,2.2]

10. The visor was normally closed by the master on the bridge after the vessel had cleared the berth. [1.2]

11. There had been occasions when the visor had been raised and lowered without any visual monitoring. [2.2]

12. No written instructions for the operation of the bow visor were provided except for the manufacturer’s notice on the bridge console. [2.2]

13. The postmortem examination indicated cardiac enlargement, a recognised cause of collapse, and that no attempt at evasive action had been made by the deceased. [1.6]

14. The actions since taken by Shetland Islands Council will contribute towards preventing a similar accident in the future. [2.4]

3.2 Cause

Due to the postmortem examination findings, the unusual location of the engineer when he was found and also that he failed to take evasive action when the visor was being lowered, it is concluded that, although the cause of death is uncertain, in the opinion of the MAIB it appears possible that the deceased had collapsed and died from natural causes, prior to the visor being lowered.

SECTION 4 - RECOMMENDATIONS

In addition to the actions already taken [2.4], **The Shetland Islands Council** is recommended to:

1. Introduce into its safety management system, guidelines and procedures, including training, for the operation of bow visors, throughout its fleet.

Marine Accident Investigation Branch
April 2001

MAIB SAFETY BULLETIN 3/2000

Small passenger ro-ro vessels

Bow visor opening/closing procedures

August 2000

MAIB SAFETY BULLETIN 3/2000

This document, containing Safety Recommendations, has been produced for marine safety purposes only on the basis of information available to date.

The Merchant Shipping (Accident Reporting and Investigation) Regulations 1999 provide for the Chief Inspector of Marine Accidents to make recommendations at any time during the course of an investigation if, in his opinion, it is necessary or desirable to do so.

The Marine Accident Investigation Branch (MAIB) is carrying out an investigation into the fatal accident of a crew member on board the ro-ro ferry *Fivla* on 16 July 2000. A report will be published.

J S Lang

Rear Admiral

Chief Inspector of Marine Accidents

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INTERNET ADDRESS FOR DETR PRESS NOTICES:

http://www.coi.gov.uk/coi/depts/GTE/GTE.html

Background

The *Fivla* is a small passenger ro-ro ferry operated by the Shetland Islands Council plying between the Islands of Yell and Unst. She has a crew of five.

Fivla has a bow visor which is raised immediately prior to berthing, and lowered just after leaving the berth for the short passage across Bluemull Sound.

Shortly after berthing recently one of the crew noticed the engineer lying over a hatch at the bow and just inboard of the bow visor. Unaware there was a problem he went to talk to his colleague and discovered he had suffered a head injury which he assumed had been caused by the bow visor as it was being lowered.

An investigation is underway to establish what might have happened but there is nothing to indicate the engineer was working in the area when the accident occurred. There were, for instance, no tools in his vicinity. The safety chain fitted between the car deck and the working area was, however, lying on the deck.

The visor is visible from the bridge but only by someone standing at the bridge front. It does not have an alarm system and can only be operated from the wheelhouse console. It takes approximately 35-40 seconds to close. There are no written instructions regarding the visor operating procedures but there is a manufacturer's notice on the wheelhouse console which instructs the operator to check the area is clear before lowering it. The instructions make no mention of monitoring the area while the visor is being lowered.

The precise cause of the accident is still being investigated.

Safety Recommendations

Although the safety chain has been replaced with a more substantial safety barrier, the Shetland Islands Council is recommended to introduce the following measures on *Fivla* and similar vessels:

Ensure that someone visually monitors the visor at all times while it is being raised or lowered.

Provide an emergency stop for immediate use by whoever is monitoring the visor movement, if the monitoring is made from a location away from the wheelhouse.

Consider installing visual and audible alarms to indicate the raising/lowering of bow visors.

Operators of other small ro-ro ferries are recommended to note the above and take whatever measures they judge necessary to prevent something similar happening.