Report of the Inspection of an unnamed dory which sank on

Loch Awe

with the loss of three lives on 29 May 1999

Extract from

The Merchant Shipping

(Accident Reporting and Investigation)

Regulations 1994

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

CONTENTS

GLOSSARY OF ABBREVIATIONS

MRSC	Maritime Rescue Sub-Centre
GRP	Glass Reinforced Plastic
m	metres
MCA	Maritime and Coastguard Agency
MAIB	Marine Accident Investigation Branch
SBBNF	Ship and Boat Builders National Federation

TERMS

Dory	A small flat bottomed boat

Figure 1

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SYNOPSIS

At about 1345 on 29 May 1999 an unnamed dory was swamped by a large wave while underway on Loch Awe. The MAIB received the first telex on the incident from MRSC Oban at 1538 on 29 May 1999; further telexes were received as the situation developed. The MAIB does not normally investigate accidents to small unregistered boats, and hence no action was taken immediately after the notification from MRSC Oban.

Oban Police are investigating the accident for the Procurator Fiscal. The Police asked the MAIB to inspect the dory, as they believed the experience of the Branch would help their enquiry. The MAIB agreed to the request and the dory was inspected on 23 June 1999. The case was handled by Richard Barwick (Inspector).

The dory was built at least 15 years ago. The main hull was a GRP moulding; another GRP moulding was laid inside the main hull to form the deck. The two mouldings were joined around their edges, and then these edges were covered with a rubbing strip. The space between the two mouldings was a void. The void could be drained through a plug hole at the transom. In a new (or undamaged) dory very little water would accumulate in the void, but the keel on this dory had been damaged at some stage, probably by contacting underwater rocks. This damage allowed water to enter the void, which reduced the buoyancy and freeboard.

Prior to the accident the dory had been on the loch for a few hours; also it had been raining during the day. This resulted in a substantial amount of water entering the void. The crew might not have been aware of this, because the void is completely enclosed. This accident has highlighted the danger of this type of construction.

The situation was made worse because the dory was overloaded; it was designed to seat four, but six were on board.

The weather at the time of the accident was severe.

The low freeboard of the dory was caused by flooding and overloading. This made it prone to swamping in heavy weather. When swamping occurred there was insufficient integral buoyancy to keep the dory on the surface.

SECTION 1

FACTUAL INFORMATION

1.1 PARTICULARS OF DORY AND INCIDENT

Name	:	Unnamed
Type	:	CJR dory
Owner	:	Allan Pennell 10 Cherrybank, Airdrie, Scotland
Built	:	Approx early 1980's
Manufacturer	:	CJR Marine Woodrolfe Road Tollesbury Maldon Essex (The company is no longer in business)
Material of construction	:	GRP

Dimensions as measured by MAIB :

Length overall	:	4.34m
Breadth	:	1.65m
Depth	:	0.80m
Position of accident	:	Near Ardanaiseig on Loch Awe in Scotland **(Figure 1)**
Time and date	:	About 1345 on 29 May 1999
Injuries	:	Three persons lost their lives when the dory was swamped.

Some general views of the dory are shown in **(Figure 2)**.

Figure 2

1.2 HISTORY

The dory was a CJR dory built by CJR Marine of Tollesbury, Essex. The company went out of business in the early 1980's and it is believed that the dory was at least 15 years old at the time of the accident.

1.3 CONSTRUCTION

The main hull of this dory was a GRP moulding; another GRP moulding was laid inside the main hull to form the deck. The two mouldings were joined around their edges, and then these edges were covered with a rubbing strip. Between the two mouldings was a void, which could be referred to as a double bottom. The void could be drained through a plug hole at the transom **(Figure 3)**. The keel on this dory had been damaged **(Figure 4)** and was no longer watertight. There were two holes in the deck at the aft end of the dory **(Figure 5)**. A second plug hole was fitted in the transom (just above the one for the void) for draining the deck **(Figure 6)**.

The power control of the outboard motor was originally attached to the starboard side of the dory immediately adjacent to the steering wheel, but was removed, leaving four holes in the inner moulding **(Figure 7)**. Therefore the power setting could only be altered at the outboard motor position, hence the person steering could not control the power.

At the time this dory was built there was a voluntary code for manufacturers. This document was titled '*Code of recommended practices for boats up to 20 feet in length*' and was produced by The Ship and Boat Builders National Federation (SBBNF). The code recommended that boats were able to remain afloat and upright after swamping.

The manufacturer's brochure for the CJR dory is at **(Figure 8)**. It should be noted that a foam filled hull was an option that could be fitted at the owner's request, for an additional cost. In this case foam was not fitted.

1.4 BACKGROUND

The owner of the dory arrived in the area on the day before the accident. The dory was removed from its trailer and put on Loch Awe mid-morning on Friday 28 May 1999. The dory was used for fishing on the Friday. The dory was put back on its trailer and removed from the water; it was reported that when the drain plug to the void was removed, some water flowed out.

The dory was put back in the water on Saturday 29 May 1999, just prior to the fishing trip which started at about 1030. The party headed for Port Sonachan where they fished with rods for about 25 minutes; then they headed for Tervine. When they rounded the headland at Ardanaiseig and motored towards Tervine, they stayed close to the shore on their port side. When they got past

Figure 3

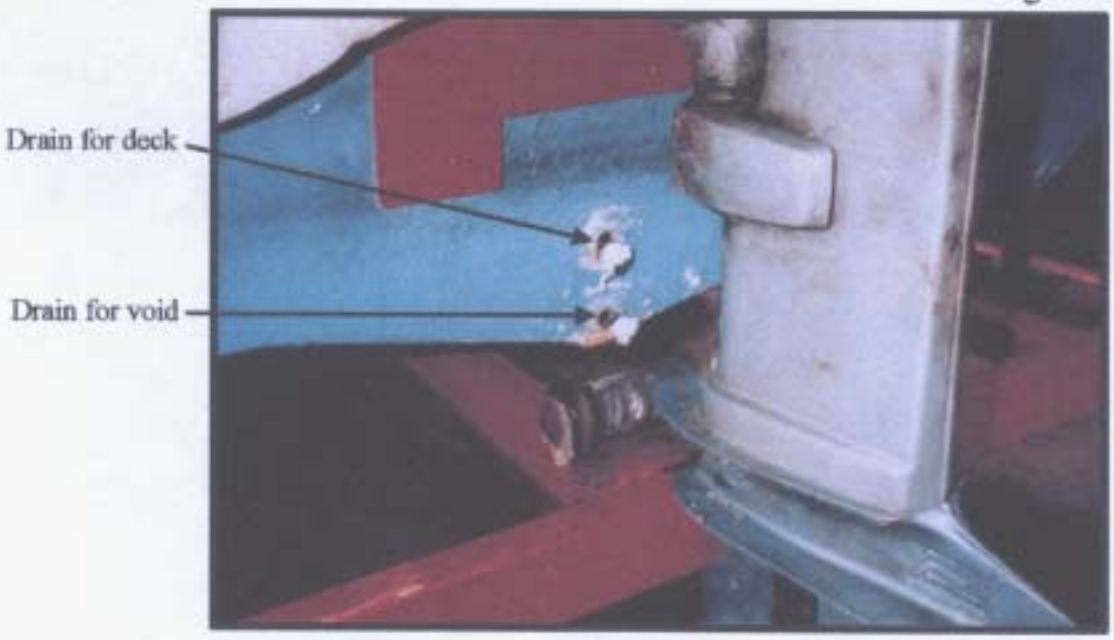


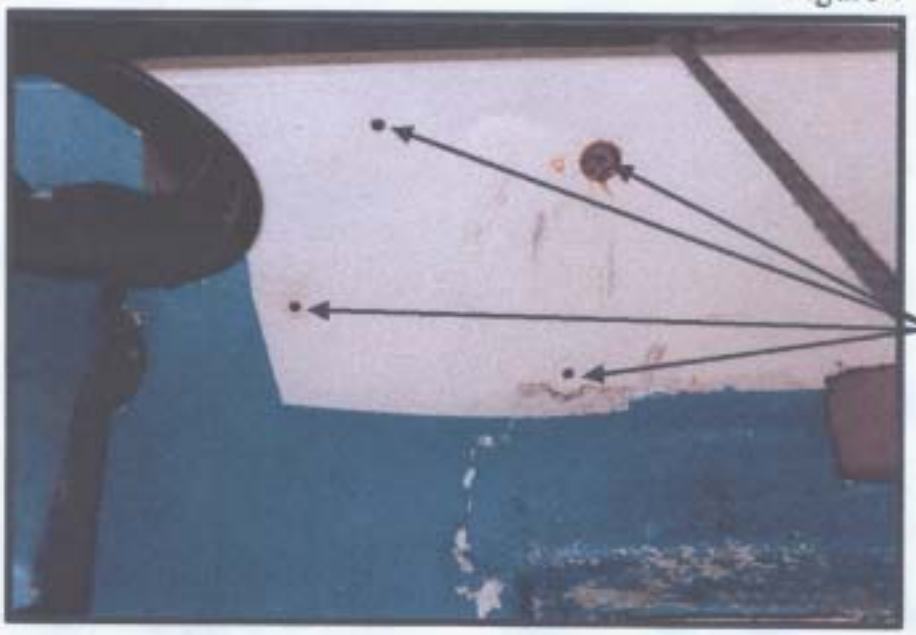
Figure 4

Figure 5

Figure 6

Looking from inside the boat

Figure 7

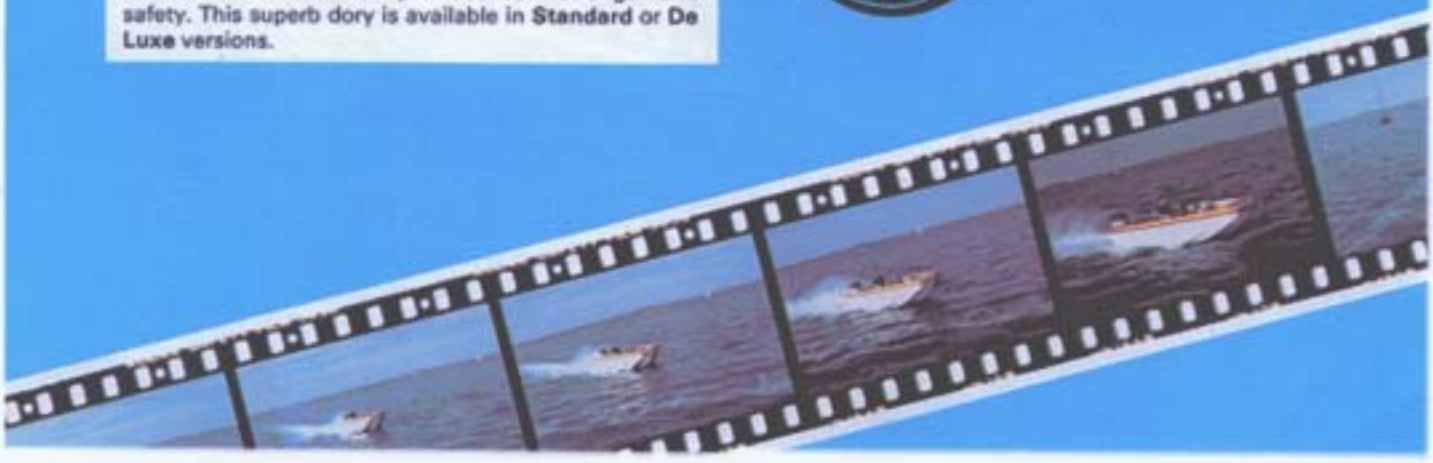


CJR MARINE

The highly successful triple hull of the CJR Fourteen has been used to form the basis of the exciting **CJR DORY**. Scientifically designed, the triple hull is widely acknowledged for extreme stability at high speeds and ease of planing, thus making it ideal for towing a skier. As with all CJR craft the CJR DORY is manufactured in top grade GRP and meticulous attention is paid to quality at all stages of manufacture. *The double skinned foam filled hull* provides both strength and safety. This superb dory is available in **Standard** or **De Luxe** versions.

C J R

Dory



CJR
Dory

Standard Dory is complete with:–
Bonded Hull and Deck, Deck Fittings (Cleats and Fairleads), Fendering, Bow Eye, Steering, Edge Trim (Round locker edges etc.), Carpeting, Cushioned Lids to stowage compartments forming helmsman and passenger seats.

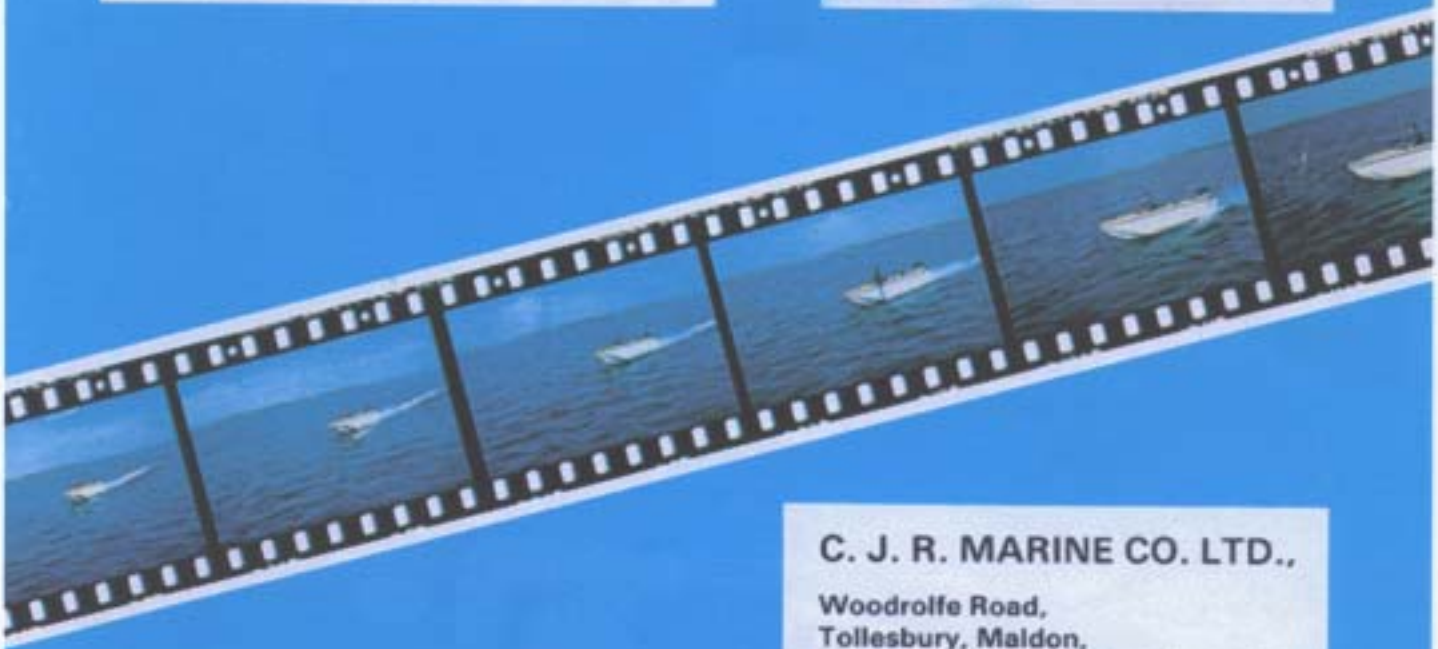
De Luxe Dory has all the equipment listed for Standard version *PLUS* Stainless Steel Pulpit, Stainless Steel Handrails, De Luxe Fold Down Seats (replacing Cushioned Lids), Front Cushion, Padded Side Trim and Locker Flaps.

Optional Extras:–
Ski Pole, Boarding Ladders, Helmsman's Screen.

Specifications:–

Length	14' 0" 4.30m
Beam	5' 8" 1.74m
Weight (approx.)	500 lbs. 223 kg.
Engine	Up to 70 hp longshaft

CJR Marine Co. Ltd., reserves the right to alter specification and prices without prior notice.



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Tervine, they crossed to the other side. After spending a while in this area they decided to head back to the campsite. It was raining a good deal of the time during the trip.

For the journey back, the disposition of the people in the dory was as shown in **(Figure 9)**. The approximate track of the dory is shown on **(Figure 10)**. It was reported that the dory rounded the headland at Ardanaiseig at about 1345, where they encountered a large wave which broke over the forward end of the dory. The force of the wave was such that the person seated forward on the starboard side was knocked back over the steering wheel. The shipping of this wave pushed the bow down leading to the dory turning over. The engine screamed as the propeller came out of the water. The dory stayed on the surface (upside down) for a short while before sinking by the stern.

1.5 MAIB's INSPECTION

The dory was recovered from the loch after the sinking and was taken to a garage close to Oban Police Station; it was inspected here, and in the water, on 23 June 1999.

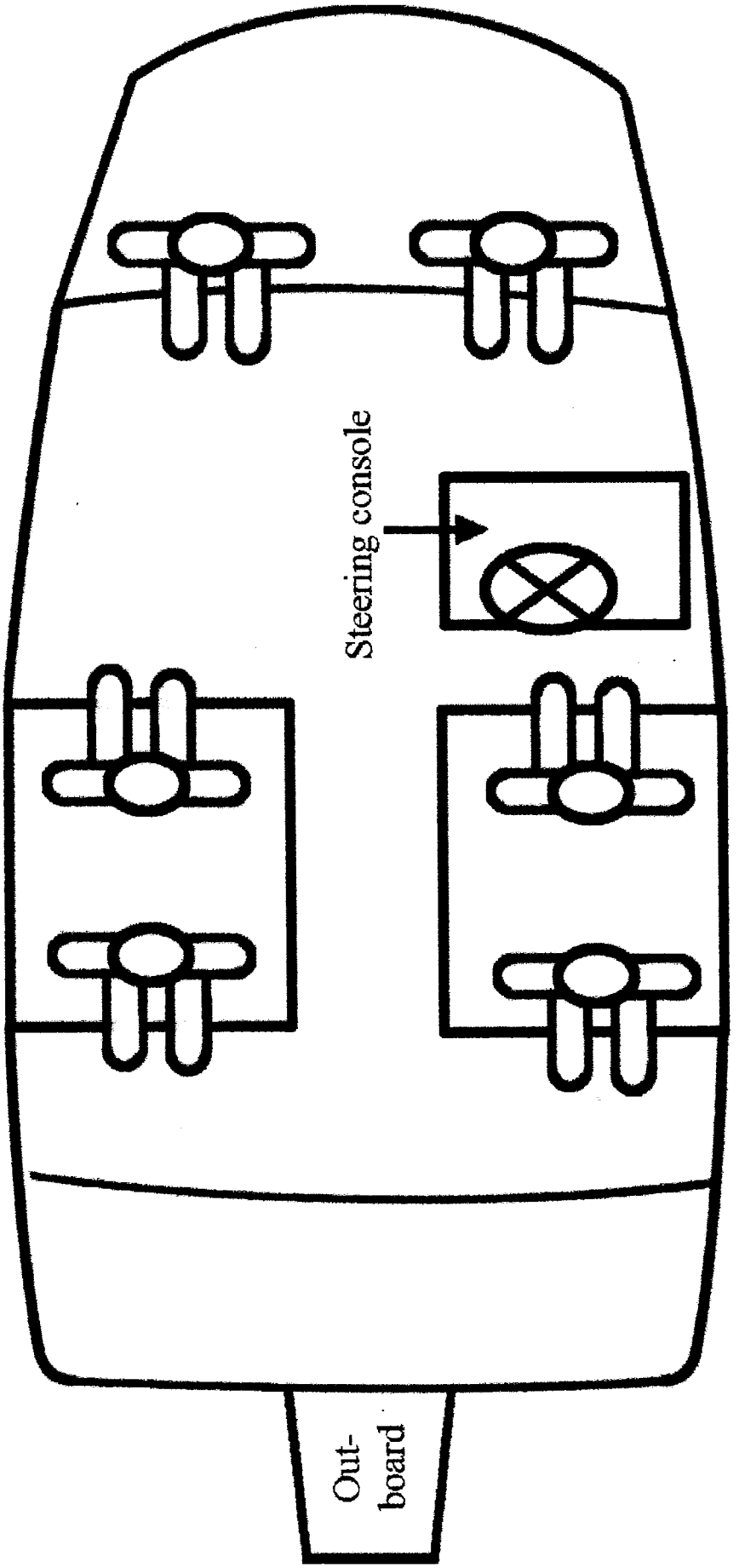
For the inspection afloat the dory was launched off its trailer at a beach near Oban. The dory was loaded with the engine and six adults to represent as closely as possible her condition prior to the accident **(Figure 11)**. It was recognised that the dory was inspected in sea water, whereas the accident occurred in fresh water, but this was not considered to be significant (a boat displaces about 2.5% more fresh water than salt water). It was also recognised that one of the crew in the accident was a child. These two weight discrepancies would tend to cancel each other out.

The freeboards were measured in four places from the centre of the rubbing strip down to the water level. The measurements were as follows:

Forward port corner	0.24m
Forward starboard corner	0.24m
Aft starboard corner	0.46m
Aft port corner	0.46m

The test lasted about 20 minutes, after which the dory was put back on its trailer and pulled out of the water. When the drain plug to the void was removed a substantial amount of water flowed out.

Figure 9



(not to scale)

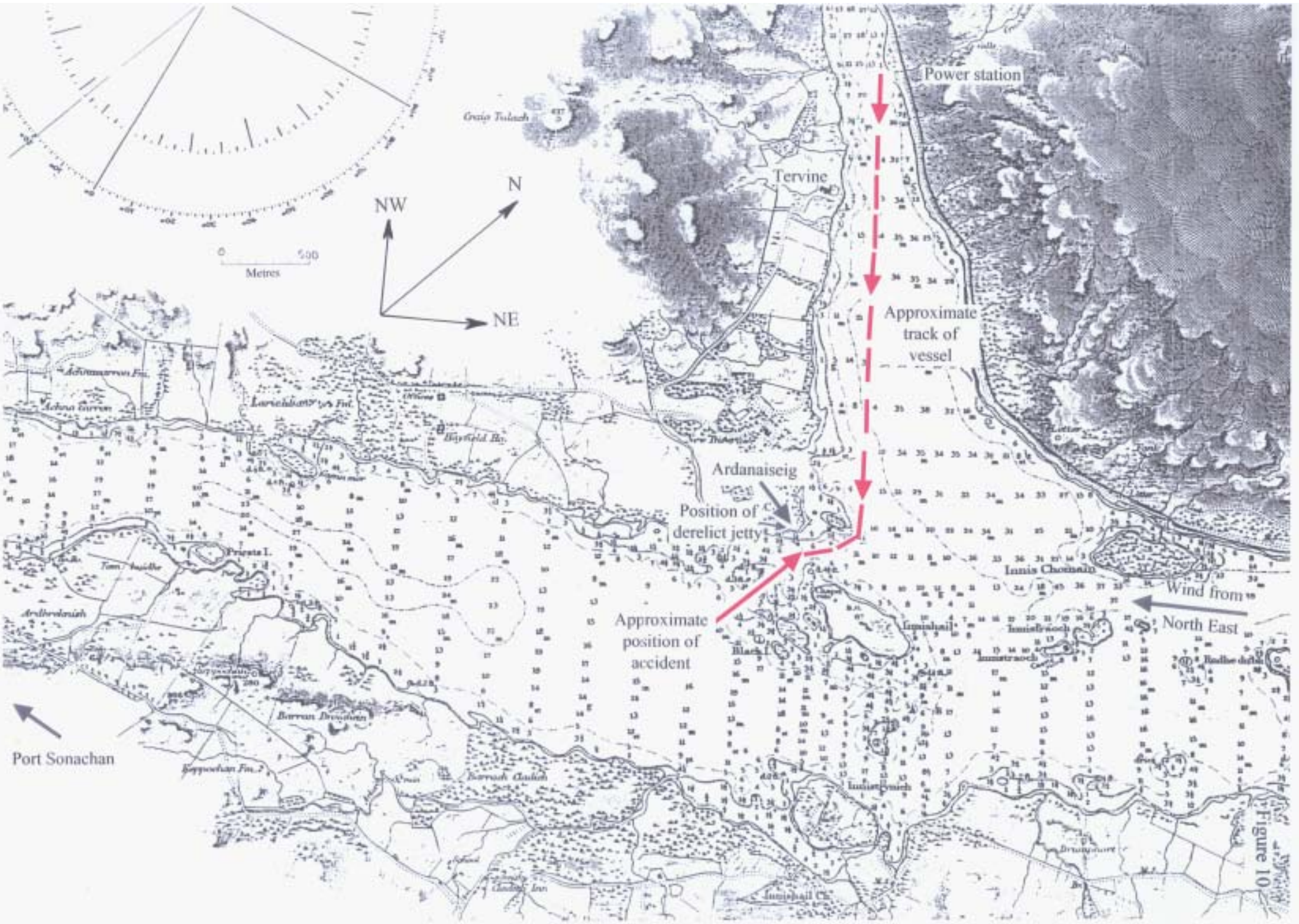
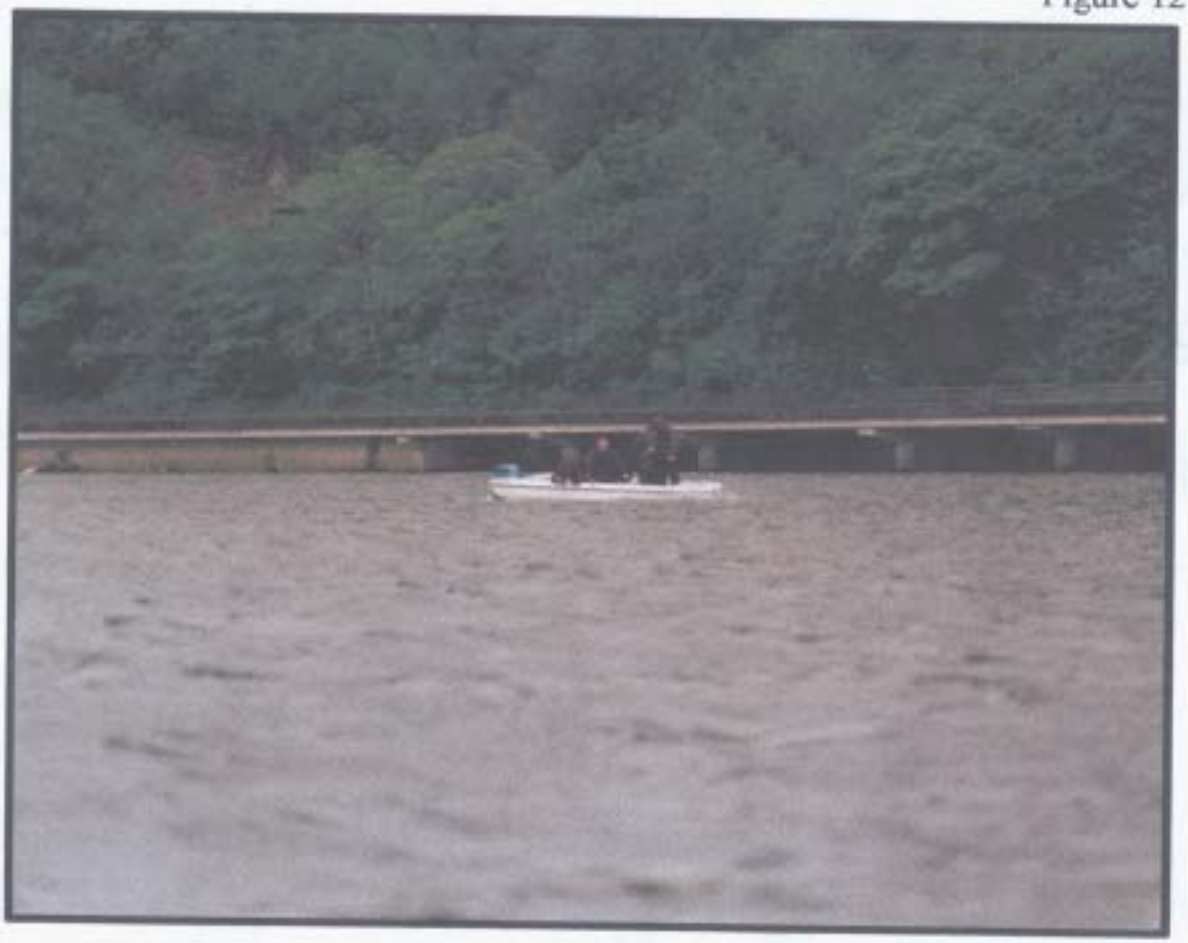

Power station
Tervine
Approximate track of vessel
Ardanaiseig
Position of derelict jetty
Approximate position of accident
Innis Chonnaill
Wind from
North East
Port Sonachan
N
NW
NE
0
500
Metres

Figure 10

Figure 11

Figure 12



1.6 FREEBOARD

The dory was photographed on 29 July 1999, just prior to the accident **(Figure 12)**, by a member of the public on another boat. The road on the north side of the loch can be seen in the background. The chine on the side of the dory is only visible at the aft end.

1.7 WEATHER CONDITIONS

The weather conditions were severe when the accident occurred. The crew of another boat in the area at the time has commented that the conditions were the worst that they had seen on the loch, and photographs were taken as a record **(Figure 13)**.

The wind was from the north-east, and hence the dory was running down-wind at the time of the accident.

1.8 CURRENT CONSTRUCTION METHODS

Dories of this type are now required to have robust integral buoyancy, such that they will not sink when swamped ie dories constructed currently, for sale in the UK, have to be provided with this safety feature. The integral buoyancy can be provided by sealed air tanks which have to be pressure tested, or by foam injection.

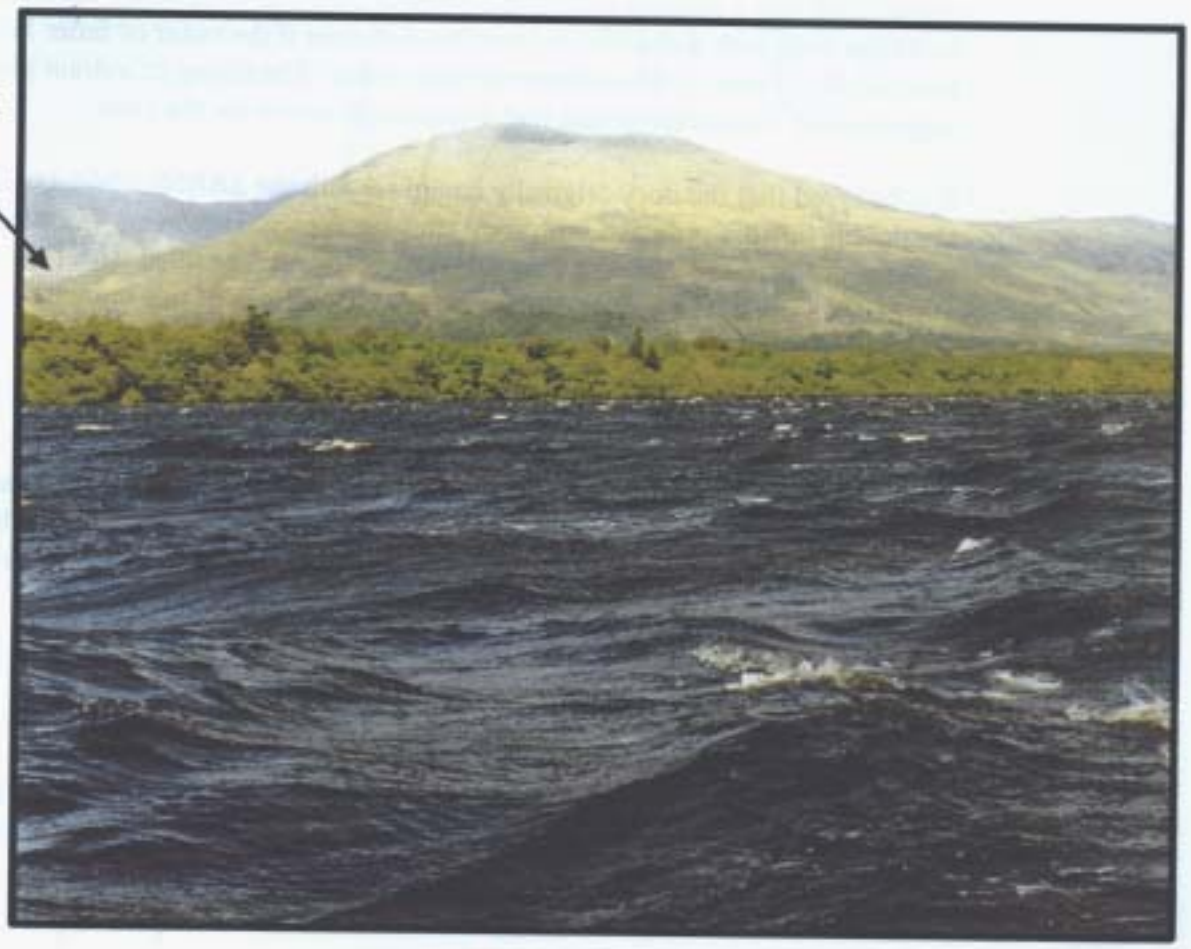
1.9 SAFETY EQUIPMENT AND SAFETY INFORMATION

Pleasure vessels of this size, operating on Loch Awe, were not required to carry any safety equipment at the time of the accident.

Various booklets are available from the MCA on boat safety. The most relevant publication for this case is titled, '*Safety Guidelines For Recreational Boat Users*'; amongst other advice the document states "*Lifejackets ..... should be provided for everyone on board*". No lifejackets were on the dory at the time of the inspection.

Figure 13


Inishail
Island
Ardanaiseig


Cruachan Dam
(north of the
power station)

SECTION 2

ANALYSIS

2.1 CONSTRUCTION

The keel damage and the holes in the deck allowed water to enter the void, which reduced the buoyancy and freeboard of the dory. The dory had been on the loch for a few hours, during which time it had been raining, and it is believed that a substantial amount of water had entered the void by the time the accident occurred. The crew might not have been aware of this, because the void is enclosed. The low freeboard at the time **(Figure 12)** supports this conclusion.

It is evident that this had been a problem earlier in the life of the dory as the damage on the keel at the forward end had been patched, although this patch had been damaged as well at some stage. When the dory was inspected by the MAIB, it was evident that water had been dripping from two places further aft on the keel indicating that the keel was damaged there as well. Better quality GRP dories are constructed with a wood keel grafted on to the hull **(Figure 14)**, which protects the bottom of the dory and prevents water ingress into the void.

In order to restrict the flooding of the void, better dory designs have the void sub-divided into a number of sealed compartments. An even better solution is to fill the void with a closed cell foam, so that even if the outer or inner hull is penetrated, no part of the void can fill with water. The fitting of a drain plug suggests that it was recognised that water might penetrate the void.

It is believed that the dory originally complied with the SBBNF code, because the double bottom provided buoyancy after swamping. However, this integral buoyancy was not robust; the void was not sub-divided or filled with foam, so any penetration of the hull or deck could lead to the loss of this buoyancy.

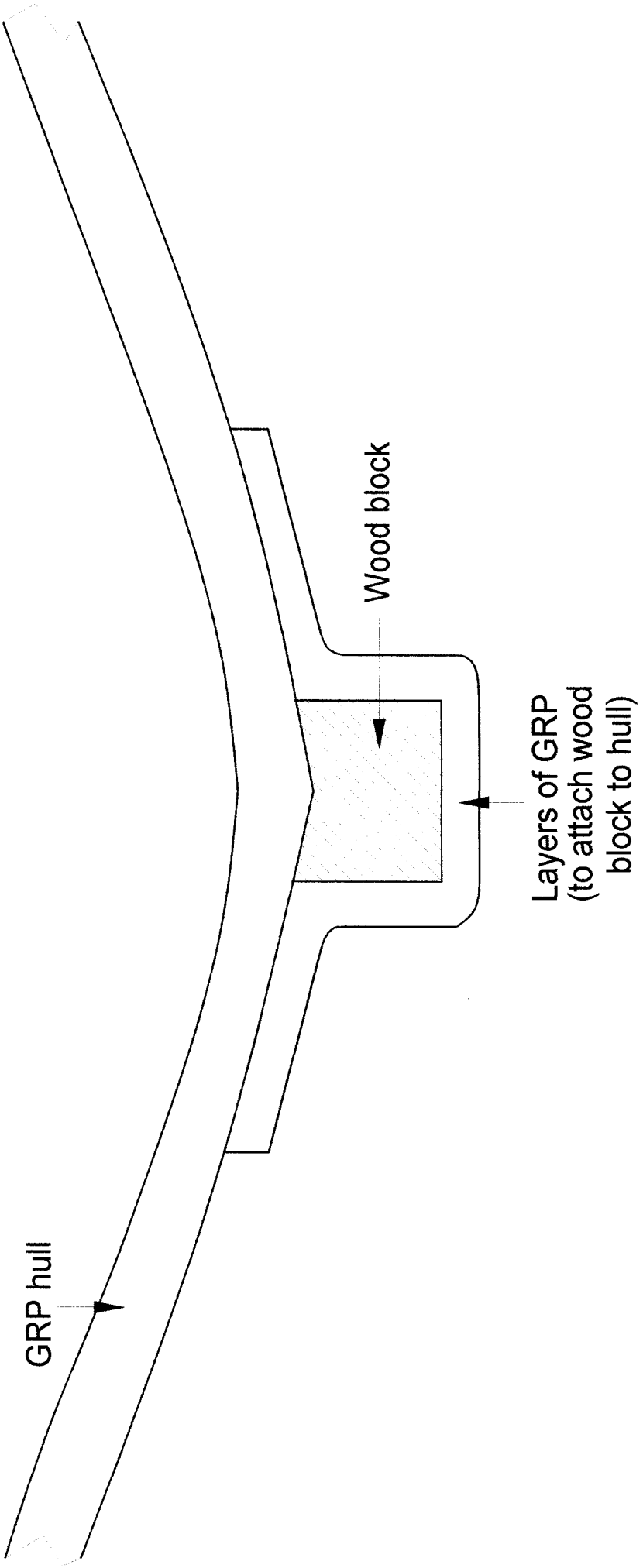
2.2 CONTROLLABILITY

It would have been better had the engine power been controlled at the steering position; the helmsman would then have had better control of the dory. The steering and the power control being in two separate places might have been a factor in the loss.

2.3 FREEBOARD

When the dory was tested by the MAIB **(Figure 11)**, the void was initially dry, however, a freeboard of only 0.24m at the forward end is not considered to be satisfactory for prevailing sea conditions. Two persons seated forward

Figure 14


GRP hull
Wood block
Layers of GRP
(to attach wood
block to hull)

overload this dory. Even if the hull had been watertight, the dory could carry only four adults safely.

Just prior to the accident the dory looked very low in the water **(Figure 12)**. The low freeboard was caused by the overloading and the flooding of the void.

2.4 WEATHER CONDITIONS

The route followed by this dory was particularly hazardous, because, while it was in the north-west leg of the loch, the wind picked up from the north-east causing large waves in the main part of the loch. While the dory was in the relatively sheltered part of the loch, the danger was not obvious. As soon as it rounded the headland at Ardanaiseig, on the way back to the campsite, large waves were met; these formed, because the fetch was greater here.

The crew who took the photographs of the waves **(Figure 13)** passed through the area of the accident, but it was too rough to use a camera there, so photographs were taken to the south-east of Ardanaiseig on the way back to Ardbrecknish. The waves in the main part of the loch were breaking in the area of the accident due to the shallow water. These steep sided waves are particularly dangerous to dories with low freeboard.

2.5 SEAWORTHINESS

The damage to the keel made this dory unseaworthy. However, because the progressive flooding of the void was not readily apparent to the crew, they might not have known about the hazard.

This accident has highlighted the potential danger of dories constructed in this way ie if the outer GRP moulding becomes damaged the dory can slowly fill with water without the crew being aware, this is because the inner GRP moulding conceals the progressive flooding. The problem is worse when more people are on board, because the greater loading forces the keel further down in the water, leading to a greater pressure and an increase in leakage. Although the freeboard of the dory was dangerously low at the time of the accident, the crew might still have been able to return to the campsite had they not been caught in some of the worst weather known on the loch.

It is considered that the dory could only safely carry four adults, and these should have been seated aft of the steering console. The two additional persons seated forward, overloaded the dory, and caused a low freeboard at the forward end. This low freeboard was made worse by the progressive flooding of the void. The low freeboard forward made the dory prone to swamping over the bow; additionally, the flooding of the void meant that after the dory was swamped there was no buoyancy to keep it afloat.

The unseaworthiness caused by the damage to the keel was made worse by the two holes in the deck **(Figure 5)**, which would allow rain water to drain into the void. The holes may have been drilled to mount a ski pole for towing a water skier, with this item being removed at a later date. The upper plug hole in the transom was intended to drain the deck **(Figure 3)**, but water would probably have run into the void through the two drill holes in preference to the proper drain.

2.6 SAFETY EQUIPMENT

Although there was no requirement to carry any safety equipment, each member of the crew should have worn a lifejacket or some form of buoyancy aid.

SECTION 3

CONCLUSIONS

3.1 FINDINGS

1. The weather was severe when the accident occurred. [1.7, 2.4]

2. The dory's void (double bottom) filled with water, which reduced the freeboard and the integral buoyancy. [2.1]

3. The dory was overloaded which further reduced the freeboard. [2.3]

4. The dory was not in a seaworthy condition, because of the flooding of the void, and the overloading. The low freeboard meant that the dory was prone to swamping in heavy weather, and when it was swamped there was no integral buoyancy to keep it afloat. [2.5]