Report of an Investigation
of a steering failure and subsequent
collision with Lambeth Bridge of the
Class V passenger vessel

mv Symphony

on the River Thames
on 4 October 1999

MAIB 1/1/74

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

Report No 18/2000

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 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.

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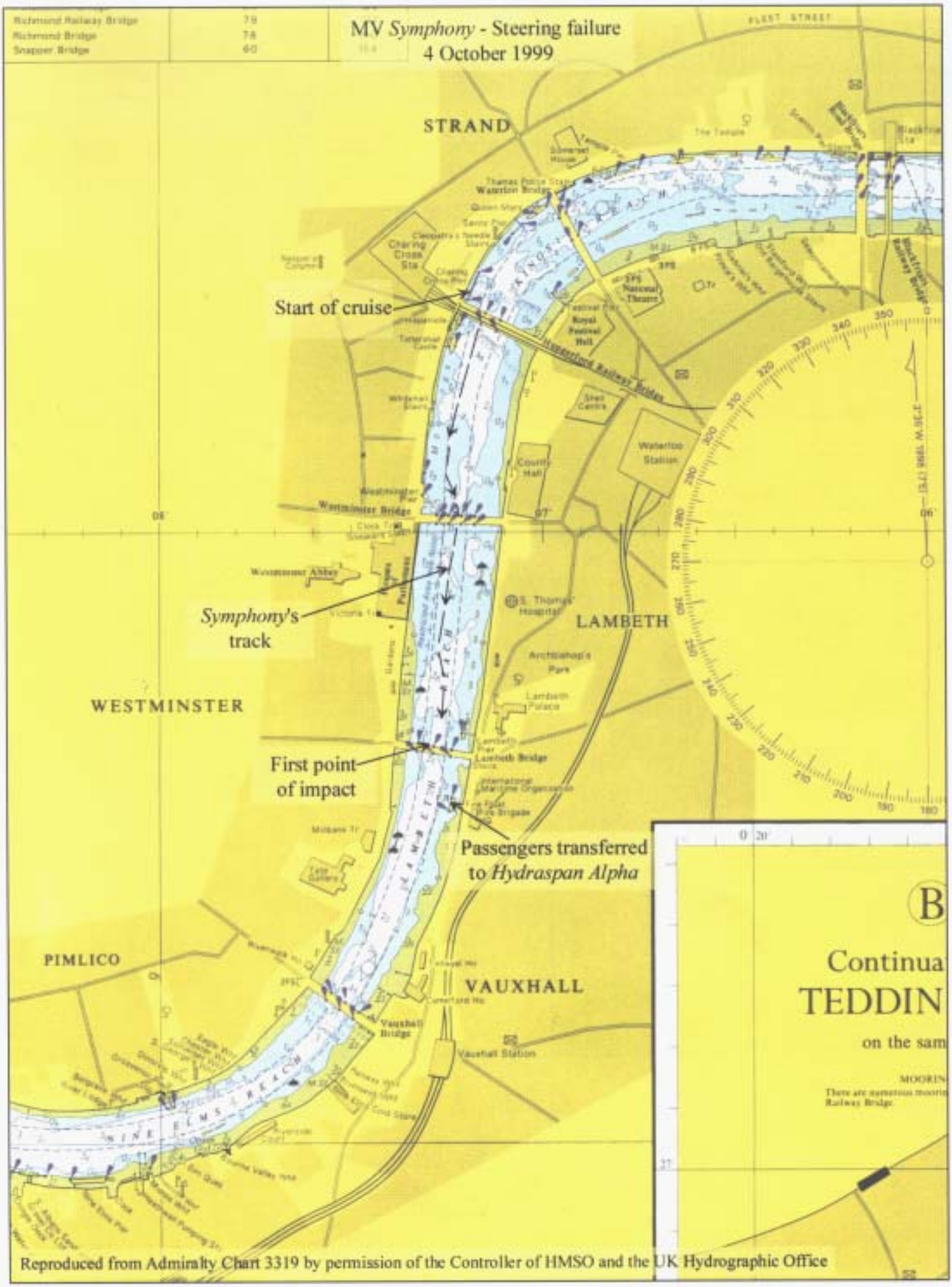

MV *Symphony* - Steering failure
4 October 1999
STRAND
Start of cruise
Symphony's track
First point of impact
Passengers transferred to *Hydraspan Alpha*
WESTMINSTER
LAMBETH
PIMLICO
VAUXHALL
Waterloo Station
Westminster Bridge
Lambeth Bridge
Vauxhall Bridge
Vauxhall Station
Reproduced from Admiralty Chart 3319 by permission of the Controller of HMSO and the UK Hydrographic Office

SYNOPSIS

This accident was notified to the Marine Accident Investigation Branch (MAIB) by the Thames Barrier, Woolwich Control Centre at 2240 on Monday 4 October 1999. The investigation started early the following morning.

The Class V passenger vessel *Symphony* operates with a deck crew of three, plus a catering and entertainment crew of 12. She left her berth at Embankment pier at 2000 on 4 October with 103 passengers on board, for a dinner cruise on the Thames. She was following her normal route upstream to Albert bridge when the collision occurred.

At about 2015, *Symphony* cleared Westminster bridge and was approaching the centre arch of Lambeth bridge. While manoeuvring, the starboard Schottel unit failed to respond to the controls. All indicators on the wheelhouse console, plus those in the engine room, showed normal. The master reduced speed on the starboard unit and went full astern on the port Schottel unit. Despite these efforts, the vessel's forward starboard quarter struck the bridge support. As the flood tide had started to swing the vessel, stern first in an upriver direction, the passengers were moved to the port side in case the collision caused any glass panels on the starboard side to shatter. *Symphony*'s starboard quarter then came into contact with the northern abutment of number two arch of the bridge. As she continued to pass through the arch, the aft starboard side of the wheelhouse made contact with the underside of the arch, damaging the wheelhouse structure and smashing the forward and starboard side windows.

As *Symphony* passed through the arch, the master regained control and navigated the vessel over to the south side of the river, tying up on Lambeth fire brigade pier. Neither passengers nor crew were injured. Port of London Authority (PLA), who had been informed of the incident by the master after the first contact, arranged for a police launch to attend, and advise as to injuries, damage etc until their duty launch could arrive on scene. *Symphony*'s master had arranged for *Hydraspace Alpha,* another of the company's vessels, to attend and at about 2040, she arrived at the pier. There were 92 passengers plus 12 catering crew, who transferred for the trip back to Embankment pier. Eleven passengers chose to leave the vessel at Lambeth and make their own way back to the pier. At about 2100 the PLA launch arrived, followed shortly afterwards by owner's representatives. Following an inspection of the vessel and discussions involving owners and the PLA, the master voluntarily provided a series of breath tests, a number of which proved positive. At 0100, *Symphony* was towed to Gravesend for repairs.

A subsequent investigation confirmed that there had been a steering failure on the starboard Schottel unit. The drive shaft for the feedback potentiometer had sheared, disabling the wheelhouse indicator. Under this condition, although the propulsion unit continued to operate, the lack of any stop signal from the feedback potentiometer caused the steering unit to rotate slowly throughout 360°. With no wheelhouse indicator, the master did not know the steering unit was rotating (or in what direction). The propulsion control and alarm system gave no indication as to what the failure was.

Following the investigation, although the cause of the accident was mechanical failure, the master was dismissed due to the positive breath tests. His alcohol level while in control of a vessel contravened both company and PLA regulations.

Figure 1

Symphony

SECTION 1 - FACTUAL INFORMATION (all times BST)

1.1 PARTICULARS OF VESSEL (Figure 1)

Name	:	*Symphony*
Official No	:	-
Port of Registry	:	London
Gross Tonnage	:	415
Overall Length	:	56.4m
Breadth	:	10.0m
Maximum Draught	:	1.572m
Air Draught	:	5.00m
Year & Country where Built	:	1992 France
Type	:	Passenger vessel max number passengers 400 max crew 15
Main Engines	:	Volvo Penta-TAMD 122A 2 x 267Kw @ 1800rpm
Propulsion/Steering	:	Schottel azimuth units, 2 off
Owners	:	Catamaran Cruisers Embankment Pier Victoria Embankment London WC2N 6NU
Date and Time	:	4 October 1999, about 2015 BST
Place of Incident	:	Lambeth bridge, River Thames
Injuries	:	None
Damage	:	Rubbing strake on starboard quarter, starboard stern, and wheelhouse structure

1.2 BACKGROUND TO VOYAGE

Symphony, a Class V passenger vessel, is one of a pair of vessels designed as cruising restaurants. The main deck is rectangular in shape and can accommodate up to 342 dining passengers, 260 at the forward end, 82 at the aft end. Separating the two areas is the bar, a small dance floor, and the galley area on the port side, amidships. Apart from a small area forward and aft, the entire dining area is fitted with large double-glazed windows giving an uninterrupted view in all directions. The small wheelhouse is above the bar area, with access via a vertical ladder and a trap door.

The vessels operate with a deck crew of three, plus a catering and entertainment crew of 12. Both lunch time and evening cruises are catered for. Each cruise can last between 1 to 2½ hours, depending upon the time of day and the type of cruise required.

The evening cruise starts from Embankment Pier (by Charing Cross station), proceeds upriver to just beyond Albert bridge, turns and goes downriver to Canary Wharf. The vessel then turns and makes its way back upriver to Embankment Pier to complete the cruise.

On the evening of 4 October 1999, there were 103 passengers on board with a full crew of 15.

1.3 NARRATIVE

1.3.1 On the morning of 4 October 1999, *Symphony* was lying alongside the Embankment Pier waiting to be prepared for the evening cruise, no lunch time cruise having been programmed. No machinery was operating, minimum vessel lighting was being provided by shore power. At 1000, the master arrived together with the engineer. The third member of the deck crew, the mate, had called in earlier saying that he was unwell. Once on board, the master and mate started their normal duties; the master checking the lifesaving and fire fighting equipment, while the engineer went below into the engine room to check the condition of the machinery, start the generator, and power up the vessel. On completion, he joined the master on the main deck to assist in the general cleaning of the vessel. Meanwhile, the office had called an off-duty mate and arranged for him to join the vessel later in the day.

Cleaning and general maintenance work continued during the afternoon, with the vessel's catering staff joining to start preparations for the evening meal. At about 1700, the main engines were started. The master then carried out a propulsion test on the Schottel units. This consisted of a functional test on the machinery alarm system and rotating each Schottel unit through 360°. The main engine clutches were engaged and the engine speed run up to about 1000rpm before being reduced to the idling speed of about 600rpm. On satisfactory completion of the test, both Schottel units were turned outboard to keep the vessel close into the pier. The predicted height of tide at London bridge at the departure time of 2000, was 3.39 metres. The actual tide was running 0.54 metres above this. The flood tidal stream (neap tide) was also expected to be about 2.5 to 3.0 knots.

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

BST	-	British Summer Time
CCL	-	Catamaran Cruisers Limited
CCTV	-	Close Circuit Television
H&S	-	Health & Safety
MAIB	-	Marine Accident Investigation Branch
MCA	-	Maritime and Coastguard Agency
MGM%	-	Milligrams per 100 Millilitres
MSA	-	Marine Safety Agency (subsequently becoming the MCA)
NSTC	-	National Sea Training College
PLA	-	Port of London Authority
RIB	-	Rigid Inflatable Boat
SAR	-	Search and Rescue
SRP	-	Schottel Rudder Propeller
TAMD	-	Turbo charger, After cooler, Marine Diesel.
VHF	-	Very High Frequency

1.3.2 On completion of the propulsion test, the mate went ashore and stood at the top of the walkway by the reception desk ready to assist and guide passengers down to *Symphony*. The master stood at the entry gate at the top of the gangway, greeting passengers and passing them over to the maitre d'hotel who showed them to their table. During this period, the engineer was on-hand keeping watch on the machinery and providing a back-up where needed.

By 2000, with 103 passengers on board, and the usual 12 catering staff, the vessel was ready for departure. The vessel's navigational lights were on, the Schottel units continued to run normally, and the PLA passenger record form had been completed. The mate took the completed form to the PLA collection box ashore, while the master made a safety announcement over the public address system to the passengers. He told them where the lifejackets were kept, the positon of the liferafts, signals for evacuation, etc. Following this announcement, the master called Woolwich Radio at about 2004, telling them *Symphony* was leaving on a 2½ hour cruise, inward bound for Albert bridge. Despite a flood tide and high water at London bridge at 2219, the air draught of *Symphony* was sufficient to pass under all bridges on the proposed route.

1.3.3 *Symphony*'s normal route is up to Albert bridge, swing round above the bridge and return downriver so as to arrive at the Houses of Parliament by 2100. The voyage continues downriver to Canary Wharf where the vessel again turns to come back upriver, arriving at Embankment Pier by 2230.

Shortly after 2004, both the forward and stern lines were let go and the master backed the vessel off the berth into the river using both Schottel units. The engineer, having checked that all exit doors were shut, went up into the wheelhouse. The mate remained on the main deck. Once clear of number two arch of Charing Cross bridge, the master went ahead on the starboard Schottel unit. The port unit was declutched and left in the astern position. *Symphony* then moved upriver towards Westminster bridge, keeping to the north side of the river. The starboard Schottel unit was set at half speed. As *Symphony* passed under Westminster bridge, the mate joined the master and engineer in the wheelhouse.

After passing through number three arch of Westminster bridge, the master started to manoeuvre *Symphony* into position to pass through the centre arch of Lambeth bridge. When opposite Lambeth Pier, the master turned the starboard Schottel unit to about the 3 o'clock position to make the vessel come to port. (The indicator in the wheelhouse shows the position of the thrust, not the direction of the vessel.) As the vessel started to respond, he brought the starboard control back to about the 10 o'clock position to correct the swing. Nothing happened, and *Symphony* continued to swing to port. Realising that the Schottel unit was not responding, he moved the starboard control further back. Again nothing happened. The engineer checked the wheelhouse controls and saw that, although the Schottel control was set hard to port, the direction indicator remained in the 3 o'clock position. The clutch indicator confirmed that the port Schottel unit was in neutral, while the starboard Schottel unit was driving ahead, engine still engaged, and running normally. No alarm conditions were showing.

1.3.4 With *Symphony* not responding, the master sent the engineer down to the engine room to check the Schottel drive. The engine room indicator panel showed that both Schottel drive and steering units were operating normally, despite the wheelhouse indicator continuing to

show the starboard unit locked in the 3 o'clock position. In an effort to regain control, the engineer switched electrical power off both units, then on again, before returning to the main deck. The master, realising that he still had no control over the starboard Schottel unit, reduced the engine speed to idling causing the engine to declutch under the auto declutch speed mechanism. The master sent the mate down to the main deck to warn the passengers what was happening and to prepare them for a possible collision. As *Symphony* still had forward motion, the master went full astern on the port Schottel unit in an effort to avoid a collision with the northern abutment of the centre arch of Lambeth bridge.

This manoeuvre failed to prevent *Symphony*'s forward starboard side hitting the bridge. Immediately after the collision, at about 2013, the master contacted Woolwich Radio on channel 14 and told them that he had hit Lambeth bridge and requested assistance from the PLA Harbour Services launch. Radio transmission was very poor, and despite switching channels, the PLA Duty Officer continued to have difficulty in obtaining a clear understanding of the incident details.

With the vessel's forward starboard quarter against the bridge support, the flood tide started to swing the vessel, stern first in an upriver direction. The mate, who was now down on the main deck, instructed the entertainment manager to get the passengers to go to the port side in case the collision caused any glass panels on the starboard side to shatter. At about this time, the engineer arrived back on the main deck on his way back to the wheelhouse. *Symphony*'s starboard quarter then came into contact with the northern abutment of number two arch of the bridge, before passing through the arch. As *Symphony* did so, the aft starboard side of the wheelhouse made contact with the underside of the arch, damaging the structure and smashing the forward and starboard side windows.

1.3.5 As *Symphony* progressed through the arch, the master regained control and managed to navigate the vessel over to the south side of the river towards the Lambeth fire brigade pontoon. Some fire brigade staff, who had heard the noise, as well as cries of assistance from the crew, were on hand to assist in the mooring of the vessel alongside. Thames police had been notified of the incident by Woolwich radio and had dispatched two vessels, a police boat and an inflatable to the scene to assist if necessary.

While the master was concentrating on regaining control and manoeuvring the vessel towards Lambeth fire brigade pontoon, the engineer, who had by then, returned to the wheelhouse, was asked by the master to make an announcement to the passengers. This was done using the public address system, the passengers being asking to remain at their tables while the vessel was manoeuvred alongside Lambeth pontoon.

Once alongside, the master called *Hydraspace Alpha,* another of the company's vessels which was inward bound on a circular cruise, to divert to Lambeth to pick up both passengers and all catering and entertainment staff, and return them to Embankment pier. The starboard Schottel controls were left untouched, with both main engines left running with the Schottel units de-clutched. At about 2030, while waiting the arrival of the vessel, the master arranged for the engineer to call both the company operations manager and the engineer manager to tell them what had happened and what was happening. The police boats arrived at 2038 and were told by the master that there were no injuries to either passengers or crew and that they were waiting for the PLA launch *Ravensbourne* and for *Hydraspace Alpha* to arrive. The latter arrived at the pontoon at about 2040. Under the

direction of *Symphony's* mate, 92 passengers and the 12 catering and entertainment crew were safely transferred through the port forward door. Eleven passengers decided not to travel back by river and left the pontoon to return by road.

1.3.6 At about 2100, after *Hydraspace Alpha* had left, the PLA Harbour Service launch arrived. An informal discussion of the circumstances of the incident then took place while waiting for the arrival of the owner's operations and engineering managers. When the two managers arrived, *Symphony*'s engineer explained what had happened and showed them the position of the controls in the wheelhouse. The engineer manager then operated the starboard Schottel unit but the indicator remained in the 3 o'clock position. The port unit operated normally. No alarm conditions were showing on any of the machinery alarm panels. After carrying out an inspection in the engine room and on deck, the main engines were shut down.

The PLA formally interviewed the master in the presence of the owner's operations manager as to the circumstances of the incident, and asked him if he was willing to take a breath test. The master agreed to this and between 2140 and 2230, four tests were conducted. Two of the four proved to be positive. The Thames police remained on hand but were not involved in the breath testing.

At 0100, the tug *Warrior* arrived at Lambeth fire brigade pontoon and at 0135 on the morning of Tuesday 5 October, *Symphony* was towed downriver to Denton Slipway, Gravesend for examination and slipping. The main engines were not used during this passage. The PLA launch *Ravensbourne* accompanied the tug and *Symphony* during the tow to Gravesend.

1.4 CREW PARTICULARS

1.4.1 The master, John Abbotson, a 28 year old UK citizen, obtained his Thames Waterman's Licence in 1991. This certificate, numbered 73331, was issued by The Company of Watermen and Lightermen as agents for the Port of London Authority. This certificate states:

The holder of a full waterman's licence is licensed to work as a waterman in the navigation of passenger boats on all parts of the Thames between the landward limit and Lower Hope Point.

The limits are in fact, Teddington Lock at the inland end, and just short of Thames Haven at the seaward end. He has since added an endorsement for large passenger vessels introduced by the PLA in January 1998 to this licence. This endorsement is required for:

.. the master or mate of any passenger vessel over 40 metres in length, or with a capacity of more than 250 passengers which operates solely between Teddington and Lower Hope Point.

He also had a pilotage exemption certificate for large vessels within the licence bounds (valid up until 12 October 1999) as well as certificates for fire fighting, first-aid, sea survival, and VHF operation.

Before joining Catamaran Cruisers in March 1999, he spent 13 years with C Crawley, a Gravesend shipping company. He worked as an apprentice waterman and lighterman for the first five years. On obtaining his licence, he continued with the company as master on a number of vessels varying in size between 100 and 1000gt, operating on the Thames and the Medway. While in Crawley's employment, he had been master of the *Thames Bubbler* and *Thames Vitality*. Both these vessels were fitted with Aquamaster propulsion units (similar to Schottel units), which show that he was familiar with that type of propulsion and its operation.

He was not known as a heavy drinker and, before this incident, had not given the company any cause for concern. The operations manager considered him to be competent in his job and capable in his dealings with passengers and staff.

1.4.2 The mate, Danny Montila, a 19 year old UK national, joined Catamaran Cruisers in March 1999. He started a five year apprenticeship as a Waterman and Lighterman on 1 July 1997. He attended courses at the National Sea Training Centre (NSTC), Kent, obtaining certificates in first aid, sea survival, and VHF operation in May 1998, and fire fighting in April 1999. He also attended the Grade II PLA course in March 1999, being awarded his provisional waterman's licence in October 1999.

Before joining his present company, he gained general boat operating and handling experience by working on a casual basis with General Port Services, Sargent Brothers, and City Cruisers. All three companies work on the river Thames.

1.4.3 The Driver/Mate (engineer), Kevin Bowden, a British national, 30 years of age and joined Catamaran Cruisers in December 1995. Since then he was employed on all of the company's vessels, as well as assisting as required on various maintenance work carried out on the vessels during the closed season (October - March).

His qualifications include a City & Guilds General Engineering Course 686, Practical Electronics Level 1, and certificates in first-aid, fire fighting, sea survival, and VHF operation obtained from the NSTC. He has also attended the approved MSA Diesel Engine Course and a safe working and management course.

Before joining Catamaran Cruisers, he had worked as a trainee engineer with his father on river craft, as a lift engineer's mate and other casual jobs before becoming an engineer with Thames Luxury charters on mv *Elizabethan*, a 250 person passenger vessel.

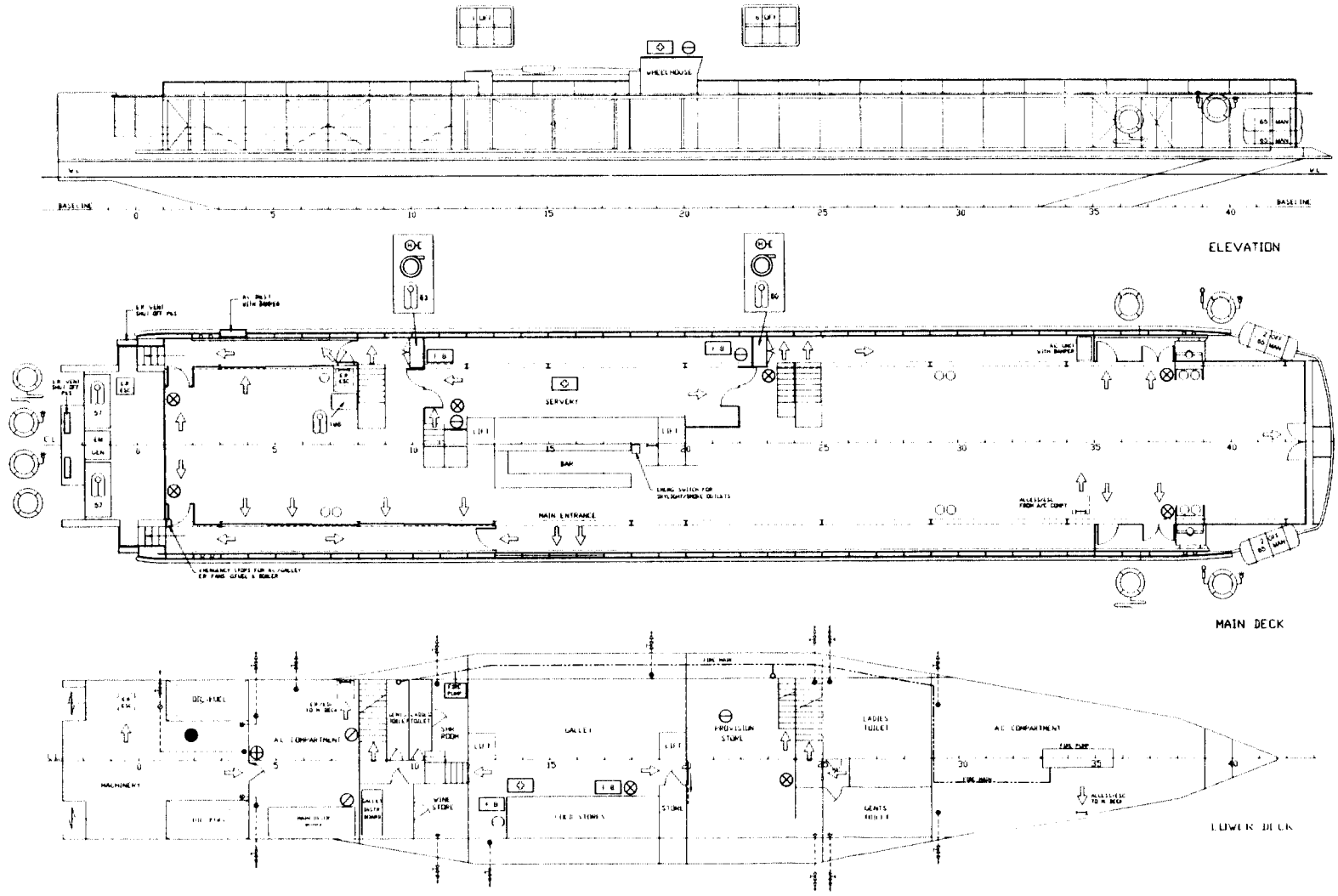
1.5 DESCRIPTION OF VESSEL (Figure 2)

1.5.1 *Symphony* is certified by MCA as a Class V passenger vessel licensed to operate on the River Thames above a line drawn north/south through the eastern extremity of Denton Wharf Pier, Gravesend. She is licensed to carry a maximum of 400 passengers plus crew, with the maximum number of persons on board not to exceed 415.

Symphony is a single deck passenger vessel designed for river cruising, with all passenger seating on the main deck **(Figure 3)**. Apart from a small deck area aft, the main deck is

M.V. SYMPHONY

FIRE & SAFETY PLAN



LIFESAVING APPLIANCES

- 4 OFF 65 MAN OPEN REVERSIBLE LIFERAFT
- 9 OFF 20 MAN BUOYANCY APPARATUS
- 2 OFF LIFEBUOY
- 2 OFF LIFEBUOY WITH LINE
- 2 OFF LIFEBUOY WITH LIGHT
- 2 OFF LIFEBUOY WITH LIGHT AND SMOKE
- 433 OFF LIFEJACKETS IN TOTAL ONBOARD

FIREFIGHTING APPLIANCES

- 9 OFF 9 LTR AFFF FOAM SPRAY EXTINGUISHER
- 5 OFF 2KG CO2 GAS FIRE EXTINGUISHER
- 2 OFF 5KG CO2 GAS FIRE EXTINGUISHER
- 1 OFF 3KG DRY POWDER FIRE EXTINGUISHER
- 1 OFF AUTO RELEASE DRY POWDER FIRE EXTINGUISHER CEILING MOUNTED

FIRE EXTINGUISHERS ARE TO BE COMPLETE WITH SPARE CHARGE

- 4 OFF 1.2Mx1.2M FIRE BLANKET TO BS 6575
- 2 OFF FIRE HYDRANT
- 2 OFF RED LAY FLAT FIRE HOSE 45MM MAXIMUM C/W 2.5" INST GUNMETAL COUPLINGS

2 OFF GUNMETAL JET SPRAY FIRE HOSE NOZZLES C/W 2.5" INST INLET

FIRE PUMP DETAILS

EMER FIRE PUMP (ELECTRIC)
BILGE PUMP (ELECTRIC)
G.S. PUMP (ELECTRIC)

- 3 OFF FIRST AID KIT
- ESCAPE ROUTES

CLASSIFICATION

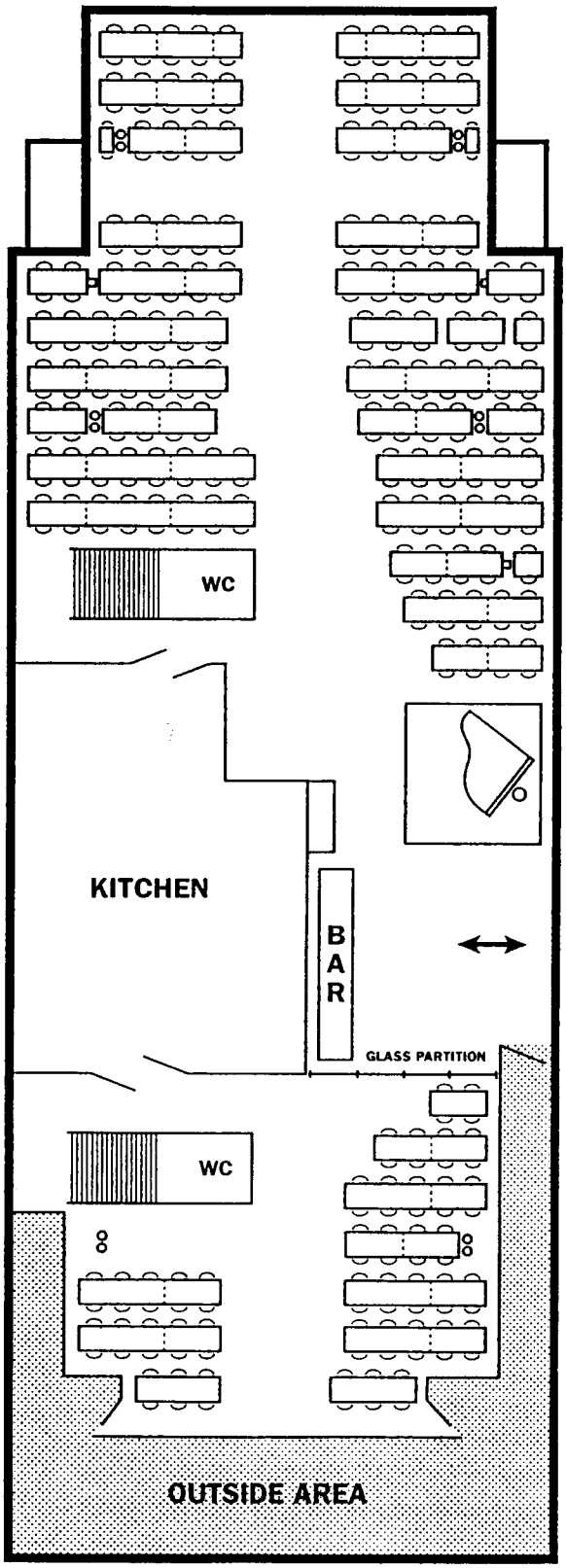
M.S.A. CLASS V, CATEGORY C WATERS - 400 PAX
MAXIMUM SHIPS COMPLEMENT - 433 PERSONS

Figure 2

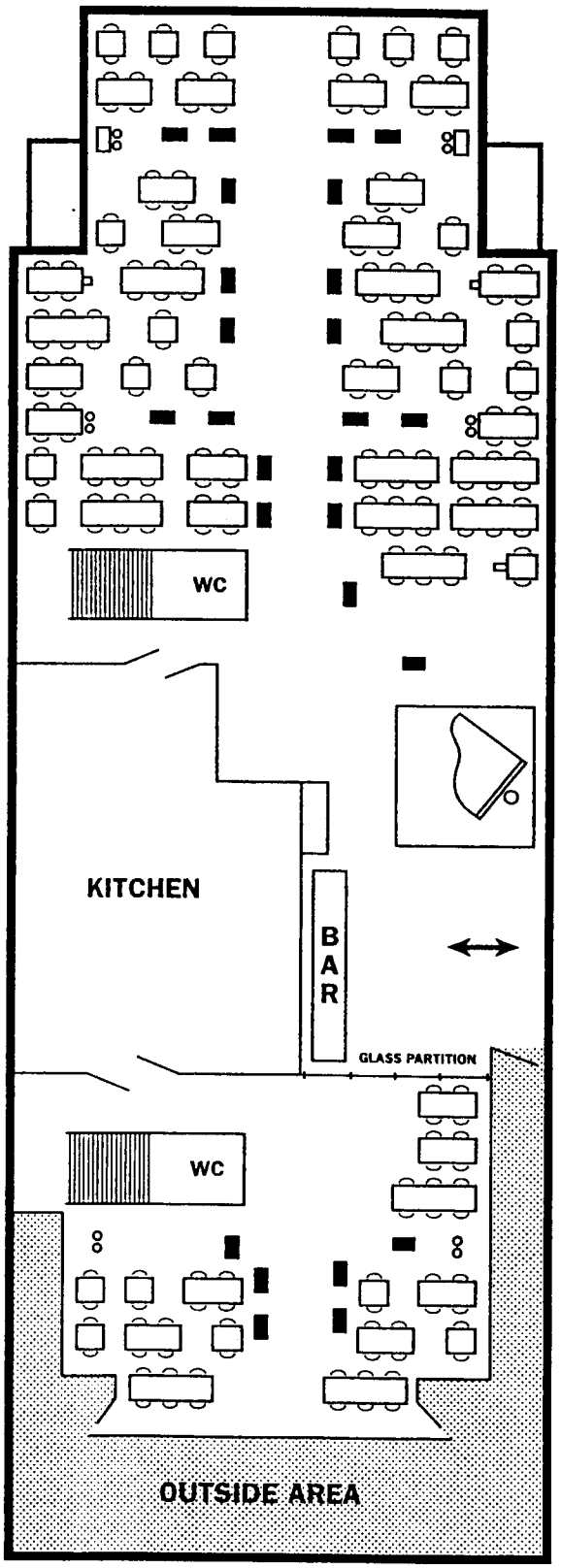
Figure 3

The Symphony

BATEAUX
LONDON



CHARTER



RESTAURANT

totally enclosed by a double-glazed box-like, glass superstructure, supported by a steel framework, giving uninterrupted views all round **(Figure 4)**.

Amidships, the main deck is partially divided by a servery and bar area on the port side, and a small dance or entertainment area on the starboard side.

The wheelhouse is above the bar area with access via a vertical ladder and trapdoor. The top half of the wheelhouse rises clear of the glazed deckhead of the passenger area and gives a clear 360° view. The wheelhouse is fitted with port and starboard Schottel unit controls, main engine controls, navigation and emergency light panels, VHF radio, machinery alarm panels, public address system, remote release for four inflatable liferafts, and two CCTV monitors These two monitors are fed from four cameras, one mounted at deckhead height on the stem looking forward, one each above the port and starboard boarding doors forward (showing the forward quarters), and one mounted aft on the port side at deckhead level showing the stern view. One monitor shows all four views together with a split screen, while the other can be selective on any or all cameras.

A public address system is fitted in the wheelhouse with additional pick-up points forward and aft, plus a radio microphone normally kept amidships at the band position.

1.5.2 The hull, with its shallow draught of 1.6 metres, is constructed of flat steel plates with a chisel type bow section, square box shape middle body, with a square upward sloping aft section ending in a transom stern. The hull is fitted with seven transverse bulkheads, five watertight and two fitted with watertight doors. These bulkheads sub-divide the underdeck space into:

Forward:	Air conditioning machinery & fire pump
	Passenger toilet area
	Provision store
	Galley and cold stores
	Wine store, toilets, galley switchboards
	Air conditioning machinery & main switchboards
Aft:	Engine room

Access between galley and provision areas is through an air operated watertight door, and between air conditioning machinery and the engine room aft, through a manually operated, hinged, watertight door. Each underdeck space is fitted with electrically operated bilge pumps together with an alarm panel in wheelhouse.

At main deck level, a steel backed, timber fender is fitted across the square bow of the superstructure and down both sides of the vessel to the stern. This provides protection to the glazed passenger areas when berthing. Across the stern, the aft section of the main deck rises to form a small open passenger area, as well as providing storage for lifejackets and the 10Kw emergency generator. Set into the deck are four steel, flush mounted hatch covers, giving access to the engine room below. Two steel box sections are fitted right aft, port and starboard, to provide berthing protection for the Schottel units and cover for the engine exhausts. The two Schottel propulsion and steering units are mounted outboard, on the transom stern. Three kedge anchors are fitted, one aft on the centre line, the other two

Figure 4

General view of bow

forward, port and starboard. The forward anchors are secured on to a special frame fitted under the overhanging forward superstructure, close to the bow stem.

The engine room aft contains the two main engine units, Volvo Penta TAMD 122 developing 267Kw at 1800rpm, two Volvo Penta 122 diesel generator sets, each of 285Kw, together with the hydraulic power packs associated with the propulsion system. When in service, both main engines and both generator sets are running. Vessel speed on one Schottel unit is about 6 knots, which increases to about 11 knots when both units are in use.

1.6 DESCRIPTION OF STEERING AND PROPULSION SYSTEM (Figures 5 and 6)

1.6.1 The propulsion and steering units on this vessel are two Schottel azimuth SRP 170 thrusters mounted outboard, on the vessel's transom stern. The thruster unit consists of an upper and lower gearbox connected by a drive shaft contained inside the steering pipe. The upper gearbox is equipped with an input drive shaft connected to a right-angle bevelled drive gear, the output shaft of which passes vertically down to become the input shaft to the lower gearbox. Also fitted in the upper gearbox is an azimuth wheel and worm drive. This worm drive is coupled to an independently driven hydraulic motor. The lower gearbox contains a set of bevelled right angle drive gears, the input being vertically from the upper gearbox, the output coupled to, and driving, the propeller.

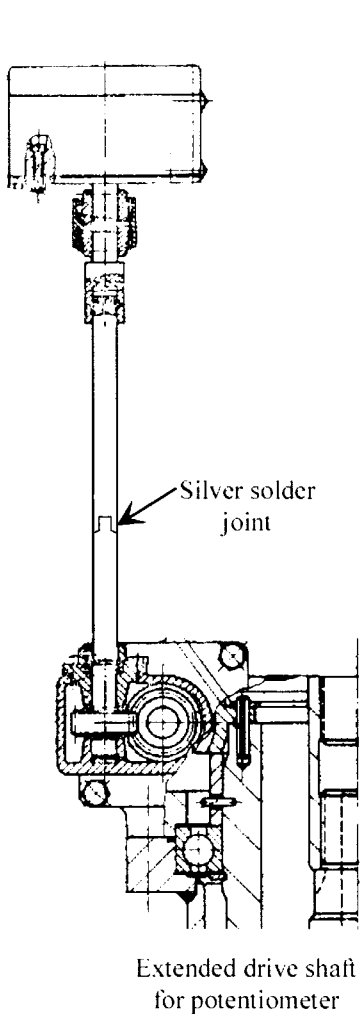
Each Schottel unit is secured to a mounting plate which forms part of the transom stern/aft bulkhead of the engine room. The upper gearbox input shaft is connected to the main engine, via a carden drive shaft and hydraulic clutch. A small oil header tank, high up on the mounting plate, ensures that the oil pressure in the gearboxes and leg assembly is maintained above sea or river water pressure.

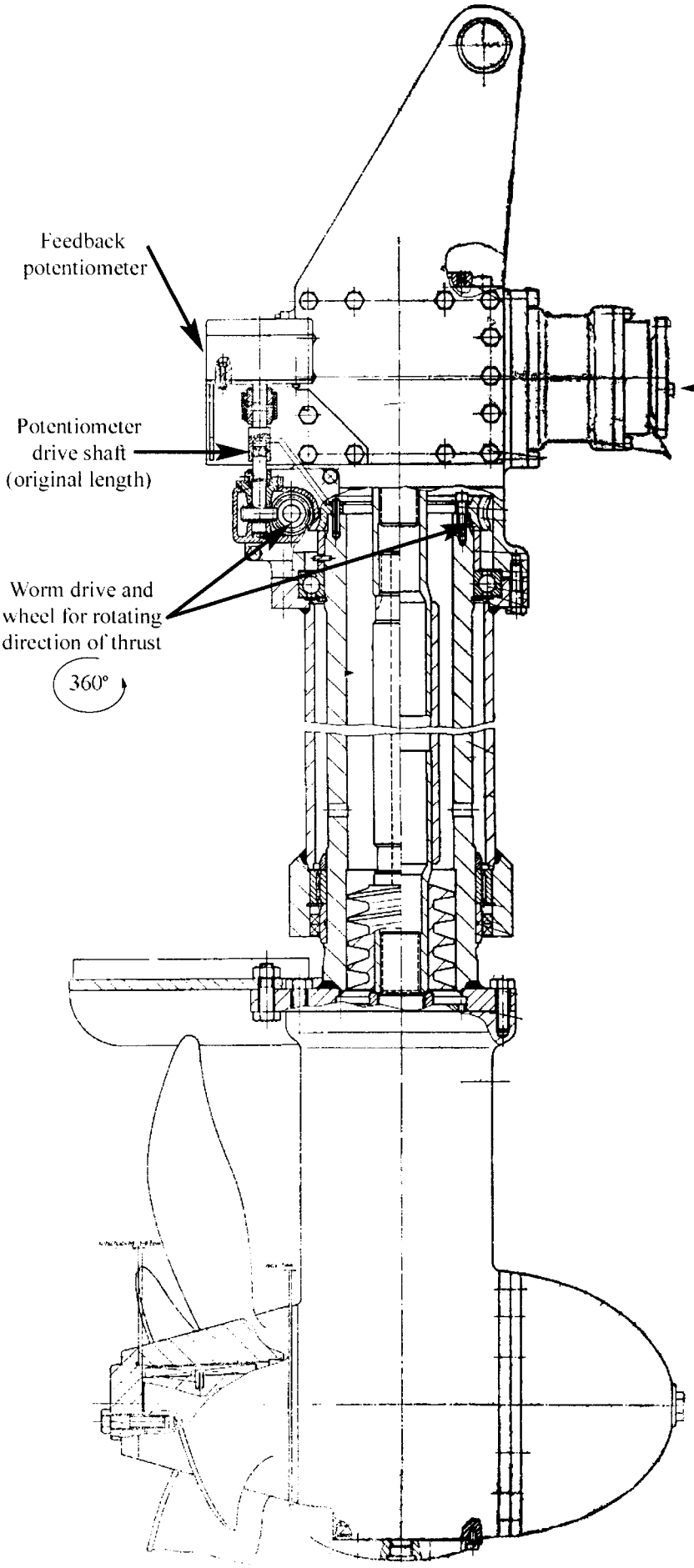
1.6.2 The wheelhouse control system for each Schottel unit consists of an engine/propeller speed control lever and a unit directional control wheel. These controls are mounted as an integral unit on a panel of the console.

The speed control lever is directly connected by a morse cable to the governor of the main engine driving the unit. When the main engine is started, it is run up to its idling speed of about 600rpm. At this speed, the clutch remains disconnected, and the Schottel propeller remains stationary. When the speed control lever is moved forward from the idling position, an increase of engine speed to about 800rpm causes the clutch to engage. This brings the drive train into operation, and the propeller begins to rotate at engine speed. The propeller speed then increases as the engine speed control is advanced.

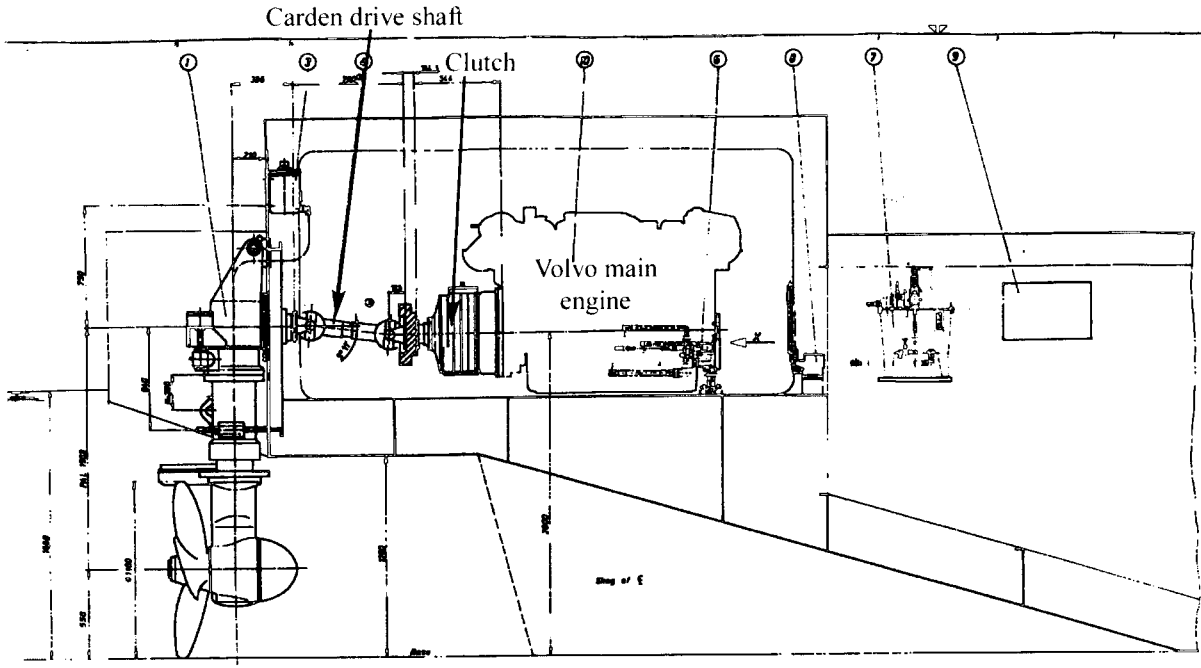
The hydraulic clutch is directly connected to the main engine, with its hydraulic engagement linked to engine speed. Manual de-clutching is also possible locally in the engine room.

1.6.3 The unit directional control wheel is directly connected to an electrical potentiometer fitted on the underside of the panel. Rotary movement of the wheel causes an electrical signal to be sent aft to a solenoid valve controlling the output from a steering hydraulic power pack in the engine room. Movement of that valve allows pressurised oil into the hydraulic motor which is fitted to the azimuth wheel and worm drive on the upper gearbox. This

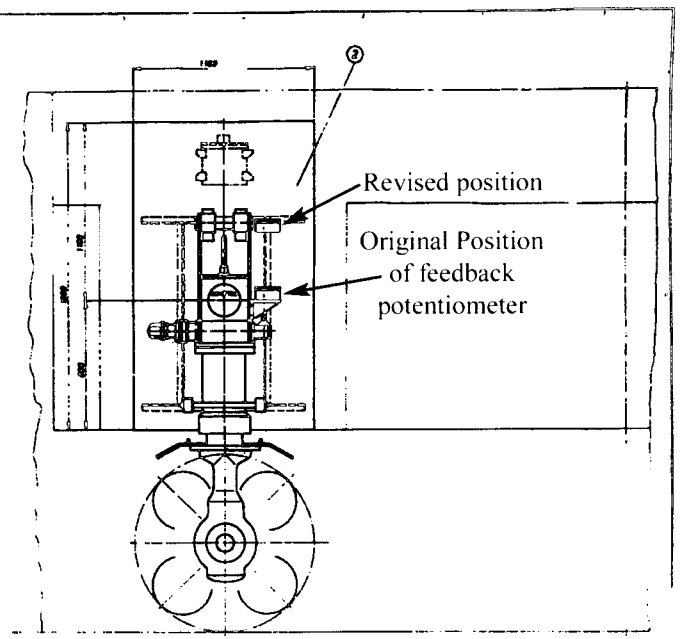




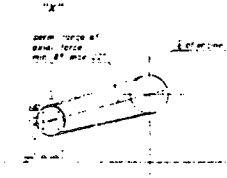
SCHOTTEL UNIT PROPULSION LEG

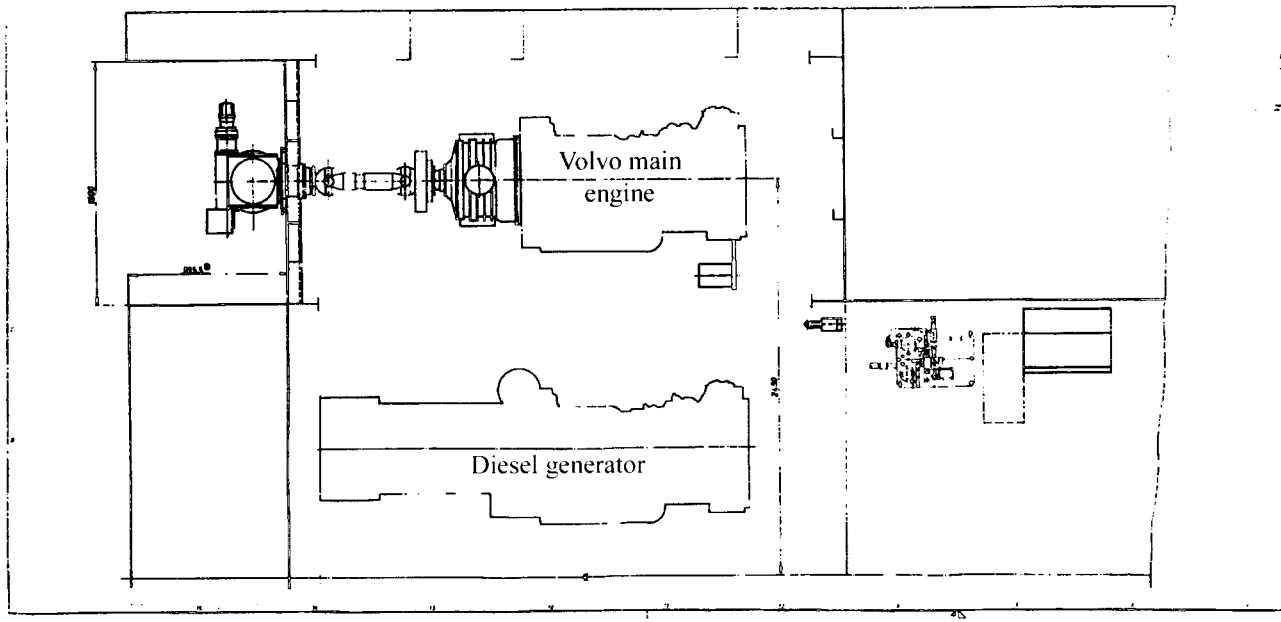


SIDE ELEVATION



STERN VIEW, LOOKING FORWARD





PLAN OF PORT SIDE OF ENGINE ROOM

ENGINE ARRANGEMENTS
SYMPHONY

Figure 6

pressurised oil drives the hydraulic motor, causing the azimuth wheel, together with the leg assembly, to rotate.

As the azimuth wheel rotates, it causes a small shaft, connected to another potentiometer, to generate, and send, an electrical feedback signal to the solenoid valve and wheelhouse position indicator. As the Schottel unit reaches the required operating angle, pressurised oil is shut off and the hydraulic motor stops. The unit will remain in that position until the direction wheel is moved. Any failure of the feedback signal will not only cause the unit to continue to rotate, but the position indicator in the wheelhouse will remain in the original position.

Each Schottel unit has its own hydraulic power pack belt, driven off the main engine shaft.

1.6.4 Electrical power for the Schottel units is provided by the diesel generators through the main switchboard. A back-up 24 volt battery electrical system is linked into the control circuits through an automatic change-over switch.

An alarm panel covering the propulsion, steering and general engineering systems is fitted in the wheelhouse with both aural and visual alarm signals. This alarm panel is fitted with an accept button which silences the aural alarm but leaves the warning light on. This control system has been designed such that alarm signals can only be reset in the engine room. Main engine oil pressure and cooling water temperature gauges are fitted on the console, together with navigation lighting controls and main engine starting controls.

1.6.5 When *Symphony* was transferred from Paris to London, MCA carried out a survey to identify what modifications were necessary to bring the vessel into line with current UK regulations. On completion of these modifications, manoeuvring and operational trials were carried out in the presence of an MCA surveyor, and the appropriate passenger certificate was issued.

With the manoeuvrability of the vessel being a possible factor in the accident, the MAIB arranged for a series of manoeuvring trials to be carried out on the Thames after *Symphony* had been repaired. The object of these trials was to establish the speed of response of the vessel when operated with the starboard Schottel unit only providing both propulsion and steering, compared to using the port Schottel unit only, and also with both Schottel units in operation.

The results were as follows:

Starboard Schottel unit only:

Stopping (with flood)	58 seconds
To rotate unit from astern to ahead	11 seconds
Turning circle, to port 360°	137 seconds
Turning circle, to starboard 360°	137 "
Time to engage port engine clutch and bring into use -	> 2 seconds

Port Schottel unit only:

To rotate unit from astern to ahead	6 seconds
(Remaining tests as for starboard unit.)	

Port & Starboard Schottel units together:

Stopping using both units at full ahead (with flood)	43 seconds
" " " " " " (against flood)	35 "
Turning circle, to port 360°	119 "

Emergency turn, full ahead (starboard), full astern (port) - turned in own length (56.4 metres).

These trials were carried out on Tuesday 30 November between 1230 and 1330, and between Westminster bridge and Rotherhithe. The height of the tide was recorded at 1354 as 0.61metres against a prediction of 1317 and 1.0 metres. Only crew and MAIB inspectors were on board. The trials were satisfactory.

1.7 VESSEL DAMAGE (Figures 7, 8, 9 and 10)

1.7.1 When the vessel was out of control, it collided with Lambeth bridge causing three areas of damage.

The first impact with the bridge caused damage to the starboard forward quarter at about frame 34. It is likely that this contact between the vessel and the bridge occurred when the vessel was still moving ahead and turning to port. This glancing blow was largely absorbed by the steel backed wooden fender and deck edge, but it did cause slight damage to the supporting framework of the glazing, and cracking of the glazing immediately above the impact area. A length of wooden fender, about 2m long, was lost with the steel backing pushed back to the deck edge in a smooth curve. There was no indication of a point of contact. With the main deck in this area overhanging the hull by some 1.5m, the hull was undamaged.

The second impact occurred when the stern swung under the influence of the flood tide and made contact with the bridge. A rectangular box-shaped section, forming part of the stern structure, was pushed inwards over the bottom half by about 100mm. Although causing local deformation to a footplate and guard-rails at deck level, the starboard Schottel unit was not damaged and remained free to rotate.

The third and last area of damage occurred as the vessel was passing under the bridge. With the vessel well off centre, the wheelhouse struck the curve of the arch causing the upper light structure to be pushed forward by about half a metre and slightly to port. This confirmed that the vessel came out of the bridge stern first and over to the south side of the bridge. The wheelhouse glazing had cracked throughout, with some panes dislodged when the light framing was bent forward. There was no damage to the control console or other equipment mounted on the lower half of the wheelhouse.

Damage to starboard forward quarter caused by first impact

General view of starboard side showing localised
extent of damage to steel and wooden fender

Figure 9

General view of stern - note starboard wing bent inwards causing foot plate to be pushed upwards

Figure 10

Close-up view of damage around around starboard schottel unit

1.8 COMPANY PROFILE

In view of the high profile of passenger craft on the Thames, and the possible impact of this accident on subsequent river operations, Catamaran Cruisers Limited were asked to draw up a company profile for inclusion in the report. Extracts of that profile are given below.

1.8.1 Background

Sodexho Leisure identified London as being a prime location for the operation of river cruises. Initial conversations in 1991 with the PLA led to contacts with the owners of Catamaran Cruisers Ltd (CCL). The Company was then in a very difficult financial situation and was looking for investors. In the same period, the PLA was in the process of issuing, for the first time, long-term licences to operators.

In March 1992, Sodexho acquired a 100% interest in CCL after it was awarded a 10-year sightseeing licence between Charing Cross, Tower bridge and Greenwich. Turnover at that time was about £2 million and CCL had been trading at a loss for 3 years. CCL employed 50 staff and was operating seven vessels with capacities of from 120 to 320 passengers.

Initially CCL's activity was equally split between sightseeing cruises (250,000 passengers per annum generating £1 million turnover) and private functions, with a very small range of low price products open to the public.

1.8.2 Sightseeing

This is a highly seasonal activity with two-thirds of the annual revenue being generated between April and September with a high proportion (up to 65%) of foreign tourists during the summer. Over the years the sightseeing market (2.3 million passengers carried annually on the river in total) had been stable with a limited upward trend.

Since 1992, various contracts were signed with the main attractions by the river (such as Tower bridge, The Thames Barrier, the National Maritime Museum and more recently the Tower of London). In 1993, St Katharine's pier was included in the sightseeing service by private agreement with the pier owners.

New products were introduced (one day passes, joint ticketing arrangements, discount vouchers to other attractions). The operations were reorganised with a strong emphasis on service to customers. All crewmembers had undergone training courses and new standards and procedures have been set.

Since 1992, CCL sightseeing has experienced a sustained growth and more than 450,000 passengers (an 80% increase from 1992) used the service in 1998, with average spend per passenger growing 12% in 3 years.

In 1999 a revolutionary new concept of product was introduced to the Thames. Circular cruises starting and finishing at the same pier offered a 50-minute cruise

encompassing the key tourist sites in London. Offering commentaries in multiple languages within an overall entertainment format, this new product exceeded original targets of 50,000 passengers.

1.8.3 Investment

During 1992 and 1993 CCL invested £1 million in the total refurbishment of its fleet.

In 1993 a further £1.5 million was invested in the construction of the 150-seat restaurant vessel *Symphony* which was to form the basis for the Bateaux London brand.

In 1995 and 1996, two new 350-seat sightseeing vessels of a novel concept, glass walls and sliding glass roof, were introduced for an estimated total outlay of £2.0million as part of a programme of four boats.

In 1997 a new 400-seat, £2million, restaurant vessel, *Symphony*, was brought over from Paris and launched in London, reflecting the continued growth of the restaurant dining market on the Thames. The original 150-seat *Symphony* was transferred to Paris for use on the river Seine.

That same year £450K was invested in the other prime functions vessel, *Naticia*, reflecting the continued strength of the corporate charter market.

During 1998, a £200K commitment to investment in information technology was made.

Also in 1998 the joint investment with the PLA of a £2.6million replacement for Charing Cross pier was completed. Now re-named Embankment Pier, this new pier has revolutionised the way in which facilities are offered to the public, with unrivalled standards of customer service.

In 1999 the third in the series of glass topped 350-seat sightseeing boats was introduced to the Thames.

1.8.4 Restaurant and catered cruises

Prior to Sodexho's acquisition, a demand was identified for high quality regular restaurant type cruises open to the general public. In April 1993, the concept was born. Launched as a separate entity under the brand name Bateaux London (with separate teams, marketing and operations and the set-up of a fully contained catering department), the new restaurant vessel *Symphony* set standards of cuisine, entertainment and service unheard of on the river.

In 1997, the 150 seat *Symphony* was replaced by an even larger and more luxurious craft, also called *Symphony*, with a capacity of 400 passengers.

Since 1993, Bateaux London's original product range has been simplified and completely reviewed towards more exclusive packages, while significant investment

took place on two existing restaurant boats. In 1995, the decision was made to promote all the catered cruises under the Bateaux London brand.

This activity now represents £3.2 million in sales and 56% of the company revenue.

1.8.5 Company organisation

All departments have been reorganised with most people in key positions having been replaced since the acquisition. CCL is now organised in five departments, each department head reporting to the managing director.

The sales and marketing department (12 staff) is organised around market segments with each segment covered by teams. The main focus of activity is in the tour, travel and corporate markets. The department is also responsible for all aspects of public relations, publicity, signage and company literature.

The operations department (31 to 38 staff in the season) is in charge of all cruises, from the recruitment and training of the crews to the safety of, and service provided to, customers on board. Much time has been spent improving the shift set-up, making the operations more flexible and training (the work) in respect of customer care. The maintenance department (5 staff) carries out all the maintenance and engineering work at their purpose-built engineering base.

The food & beverage department (11 kitchen staff and administration, and eight full-time waiting staff increasing to 17 and 18 respectively in the season) was set-up in 1993. All meals are now prepared from fresh produce on the vessels themselves.

The accounts and administration department (4 permanent staff) is fully computerised. It has developed all control and reporting systems and procedures, (with a full set of accounts produced each month).

1.8.6 Quality Programme and Staff Training

Customer surveys are carried out on an on-going basis at both individual and corporate level. A survey of CCL's sightseeing services is carried out over three months in the height of the summer season. Surveys of restaurant customers take place on an on-going basis with principal customers being consulted annually.

The information gathered from these surveys is used in the development of CCL's customer services and staff training. In addition to its training programme at an industry level, in-house training sessions are commissioned on a regular basis. All staff are fully trained for the function they perform.

1.9 COMPANY SAFETY PROCEDURES

1.9.1 Before 1997, Catamaran Cruises Limited operated under a policy of an annual fire and emergency training exercise carried out during the winter period. Fire and safety

equipment checks were carried out on a regular basis, but generally the approach was low-key and did not include active training.

From 1997 onwards, with the appointment of a new managing director, efforts were made to upgrade and improve the company approach to safety. A safety manager was recruited, and work started on analysing both shore and marine safety requirements, together with the production of company safety manuals. Due to a change of personnel, the target date for completion slipped, and it was not until August 1999 that operations and safety manuals were completed and issued. It is the intention of the company that active practice safety drills will be carried out on a regular basis on all vessels.

1.9.2 During the formative period, Catamaran Cruises used the MCA "Safety Management Code for Domestic Passenger Ships" as the basis for its manuals, with its management actively participating in the formation of the draft MCA Code. A copy of that draft code is in **Annex 1**.

Each vessel owned and operated by Catamaran Cruisers Limited carries a logbook on board together with a series of information documents relating to particular sections of the company operations manual, the health and safety policy manual, and a crisis communication guide. All employees are instructed to make themselves familiar with the contents of the manuals and to signify their understanding of them, by signing a card attached to the duty manager's copy.

The operations manual includes an opening introduction which states:

These instructions and procedures are issued on the authority of the Managing Director of the Company. They are for the instruction and guidance of Management, Crew and all other persons involved with the Company.

The current manual was issued in August 1999, and is intended to be a living document ie revisions will be issued as and when necessary. Under section 1.7 *Statutory and Other Official Requirements*, it states:

All laws and Regulations relating to the Service made by the Maritime and Coastguard Agency and Port of London Authority are to be complied with at all times. Copies are available in the Safety Manager's Office.

The standard of safety equipment and safety practice which are to apply on board vessels are to be those of the Maritime and Coastguard Agency unless the Company has specified more stringent requirements.

1.9.3 Given the circumstances of the incident, there are three sub-sections of particular relevance under section 2, *General Instructions*. These are *2.5 Captain's Duties, 2.7 Draft Logbook and Craft Documentation,* and *2.9 Smoking Drinking & Drugs*. Under *2.5, sub-heading Captain's Responsibilities*, it states: *It is the captain's responsibility to ensure the safe navigation of the vessel at all times, and the health, safety and welfare of all passengers and crew on board.*

Under 2.7 *Draft Logbook and Craft Documentation*, it states:

Each vessel will carry a Logbook, which the captain/driver will have completed daily before entering service. The copy sheet MUST be returned to the operations manager in the evening.

The following information will be kept to hand on board:

(i) *Emergency and first aid procedures*
(ii) *Technical instructions*
(iii) *Terms and conditions of carriage (See Appendix H)*
(iv) *Important telephone numbers*
(v) *Accident, incident report form (See Appendix C)*
(vi) *Garbage disposal plan (See Appendix F)*
(1) *Search and rescue plan(See Appendix G)*

When handing over command of a vessel the captain must draw his relief's attention to any defect or abnormalities on board.

Under 2.9, the consumption of alcohol by staff is described as follows:

Staff on duty, or on breaks between shift, may not consume alcohol or unprescribed drugs. Prescribed drugs must not interfere with the ability to carry out normal duties.

Staff must ensure that when on rest days, consumption of alcohol does not impair their ability to work the following day.

The company reserves the right to conduct random alcohol and drug tests.

Your attention is also brought to Port of London river Bylaws 1978 General duties of Masters of vessels Section 9 Drink or Drugs (see appendix D).

A copy of appendix D is in Annex 2.

1.9.4 The company has developed a comprehensive Health and Safety policy manual which is based on the H&S at Work Act 1974, and the Management of Health and Safety at Work Regulations 1992.

The policy manual recognises that the company needs to respond to the British Standards Environmental Code, Port of London Acts and Bylaws, Statutory Instruments, Merchant Shipping Notices and MCA regulations and requirements.

Included in the manual are action scenarios covering manoverboard, fire (deck and machinery spaces), abandon ship, collision or grounding, together with details of the permit system covering electrical and hot work. Guidance on the handling of these events, together with who takes what action are spelt out in detail.

1.9.5 Search and Rescue (SAR) plans have been discussed and developed with the PLA and the plans sent to MCA for approval. These plans are reviewed and updated as required by the appropriate authorities.

1.10 OPERATION AND MAINTENANCE

1.10.1 Before any company vessel enters service, the crew carry out a series of checks and operational tests on the vessel and its equipment. The master concentrates on the presence and condition of the safety equipment, and carries out operational tests on the propulsion, steering and navigational systems, while the driver/mate (engineer) checks out the condition of the machinery and electrical systems. These checks also include equipment in the passenger areas and the galley.

The present method of operating *Symphony* is for both main engines to be running with the starboard Schottel unit clutched in, and in the ahead mode, while the port Schottel unit is de-clutched, and left in the astern mode. Electrical power is supplied by separately driven, diesel generators. This method of using just the starboard Schottel unit for propulsion and control, gives sufficient propulsive power to move the vessel at about 6 knots. The 360° rotational ability of the unit provides a high degree of manoeuvrability. In the case of an emergency, the port main engine can be clutched in immediately, making the port Schottel unit available for either power or steering. The time required to engage the clutch is almost instantaneous.

1.10.2 Maintenance of company vessels is based on a combination of routine daily and weekly checks carried out by the operating crews, and maintenance schedules undertaken by the shore-based maintenance staff.

The daily and weekly maintenance checks are itemised in each vessel's daily log sheet. A copy of a log sheet is in Annex 3. Any defects found during the initial check, together with those developing during the period when the vessel is in service, are entered, together with any action taken. The completed log sheet is handed in daily to the operations manager. Apart from the required checks, the driver/mate is expected to monitor the condition of the machinery, and the machinery space, at regular intervals during their working period. When any defect occurs which the operating crew are unable to deal with, relevant details are entered on a "yellow" card and the card posted on to a maintenance card index in the maintenance area. The duty maintenance engineer subsequently deals with these defects on the basis of their degree of urgency and their effect on the safe operation of the vessel.

1.10.3 The shore-based maintenance team consists of the engineering manager, three qualified engineer fitters, an electrician, and a general engineering assistant. Normally, one of the fitters or the assistant is permanently stationed at Embankment pier, ready to rectify any defects that occur on the vessels during operations. For more serious repairs, the engineering manager is told and the appropriate arrangements made for the repair.

Apart from annual maintenance work carried out while each vessel is slipped, regular overhauls and maintenance work on the main engines and generators is carried out

according to manufacturers' instructions. Generally this work is carried out by the maintenance staff, but it may be contracted out depending upon the work load at the time. Most of the more serious maintenance work is carried out during the closed season of October to March.

1.10.4 Before *Symphony* was transferred from Paris to London in 1997, problems were experienced with the position of the feedback potentiometer. These units had been fitted immediately above the steering worm gear on the Schottel unit, very close to the waterline. They had suffered from the ingress of water and, as a result, had been moved upwards and an extended drive shaft fitted. This modification was designed by the Paris office and fitted on arrival in London.

Since being in service on the Thames, there has been one relatively major incident. This occurred in June 1999 when the starboard Schottel unit started to vibrate badly. Divers were sent down and found damage to the propeller blades. The lower half of the leg was removed, the damage repaired and the unit re-assembled. The vibration was still present during subsequent engine trials. The complete unit was removed and sent to Germany for examination and repair. On return, it was refitted to *Symphony* and, following successful trials, the vessel re-entered service. The cause of the damage is not known.

1.11 LAMBETH FIRE BRIGADE INVOLVEMENT

After the accident on 4 October 1999, when *Symphony* came out from under Lambeth bridge and steering control was re-established, the duty watch on Lambeth fire brigade pontoon heard the crew shouting for assistance. A number of firemen went down to the pontoon and assisted, either by throwing mooring ropes to the vessel, or by retrieving mooring ropes thrown by the crew.

Once the vessel was secured alongside, fire brigade staff offered assistance but it was not required. The fire brigade staff state that initially the crew would not allow any passengers off the craft, but after some discussion, 11 passengers were allowed off and on to the pontoon. Fire brigade staff then escorted them off the pontoon and up to the main road.

As the vessel had not suffered a fire, any apparent serious damage to the vessel or injuries to passengers or crew, fire brigade staff were not formally called upon to assist. No report was therefore made by them.

1.12 THAMES POLICE INVOLVEMENT

1.12.1 Thames police, Wapping, were advised by Woolwich radio at about 2018 on 4 October of the incident and the PLA requested that a police launch attend to investigate. They were asked to provide a presence at the Lambeth until the PLA launch completed its current work and could attend.

Arrangements were put in hand and, by 2028, a police launch and RIB had been instructed and were on their way to the scene. They arrived at Lambeth at about 2038, inspecting the underside of No 2 arch of Lambeth bridge before going alongside. No significant damage to Lambeth bridge other than a few scrape marks, was seen.

Once alongside Lambeth fire pontoon, the damage to *Symphony* was inspected and a brief discussion held with the master over details of the incident. He stated that there were no injuries to either passengers or crew and suggested that the cause of the collision was a steering failure. Shortly after the police arrived, *Hydraspan Alpha* came alongside to take off the passengers and catering staff. Ninety two passengers and 12 staff transferred to the replacement vessel while nine passengers decided to return by road. The three deck crew remained on board.

1.12.2 The police remained on site after arrival of the PLA launch and the owner's operations and engineer managers, and were present during informal discussions. PLA staff carried out the subsequent voluntary breathalyser tests. The police were present, but did not participate. On completion of the interviews and discussions, the police left Lambeth fire pontoon some time after 2300. As the event did not involve injuries or damage to other vessels on the river, police involvement was minimal. Any subsequent action that could be taken remained within the province of the PLA and not the police.

To assist in establishing the sequence of events that led up to the collision, security cameras covering river approaches to the Houses of Parliament, including Lambeth bridge, were checked but, on that particular night, were found to be non-operational for technical reasons.

1.13 PLA INVESTIGATION

1.13.1 The PLA, being the responsible authority for the River Thames carried out its own investigation on two fronts. The first related to the handling of the vessel during, and subsequent to, the accident, while the second related to the mechanical condition and damage suffered by *Symphony*.

At 2013 on Monday 4 October, the master called Woolwich radio on VHF channel 14 requesting transfer to channel 22. This was agreed and, at 2014, *Symphony* reported that she had hit/contacted a bridge. The conversation was very difficult to make out as the signal was breaking up. Woolwich radio understood that the vessel was going alongside Lambeth fire pontoon and asked the master to switch back to channel 14. Further detailed conversation remained difficult due to the breaking up of the transmission.

As a result of this communication difficulty, Woolwich telephoned Thames police Wapping at about 2015, to request the nearest police boat to attend Lambeth fire pontoon and find out what damage had occurred and if there were any injuries. The PLA launch, which at that time was engaged in mooring another large vessel in the Thames, agreed to attend Lambeth fire pontoon once the mooring had been completed. The police agreed and arranged to send a river craft to Lambeth to investigate and report back.

1.13.2 At 2020, PLA launch *Ravensbourne* completed her mooring work and proceeded upriver from Blackwall Point to Lambeth fire pontoon. By 2035, a police launch had arrived on scene and after checking Lambeth bridge, No 2 arch, confirmed that the situation was under control, with no injuries to passengers or crew. At about this time, the *Hydraspace Alpha* arrived at the pontoon and berthed alongside *Symphony*, the passengers and catering staff transferring through the port side bow doors. This transfer was completed by 2055 with *Hydraspace Alpha* leaving for Embankment pier shortly afterwards.

At about 2055, *Ravensbourne* arrived alongside the fire pontoon. The PLA master boarded *Symphony* and discussed the circumstances of the incident with the master, as well as inspecting the damage to the vessel. At about 2115, the PLA master formally interviewed *Symphony*'s master in the presence of the owner's operations manager. Following this interview, the master was asked if he was willing to take a breath test. This he agreed to. Four tests were carried out with the following results:

- 2140 Positive reading (105 MGM%)
- 2150 Not acceptable as master smoking a cigarette
- 2220 Not acceptable as breath exhale insufficient
- 2230 Positive reading (95 MGM%)

Following these tests and interviews, arrangements were made to tow the vessel downriver to Denton's Slipway for further detailed technical examination. At 0135, the tug *Warrior*, with *Symphony* in tow, and *Ravensbourne*, left Lambeth fire pontoon for Gravesend.

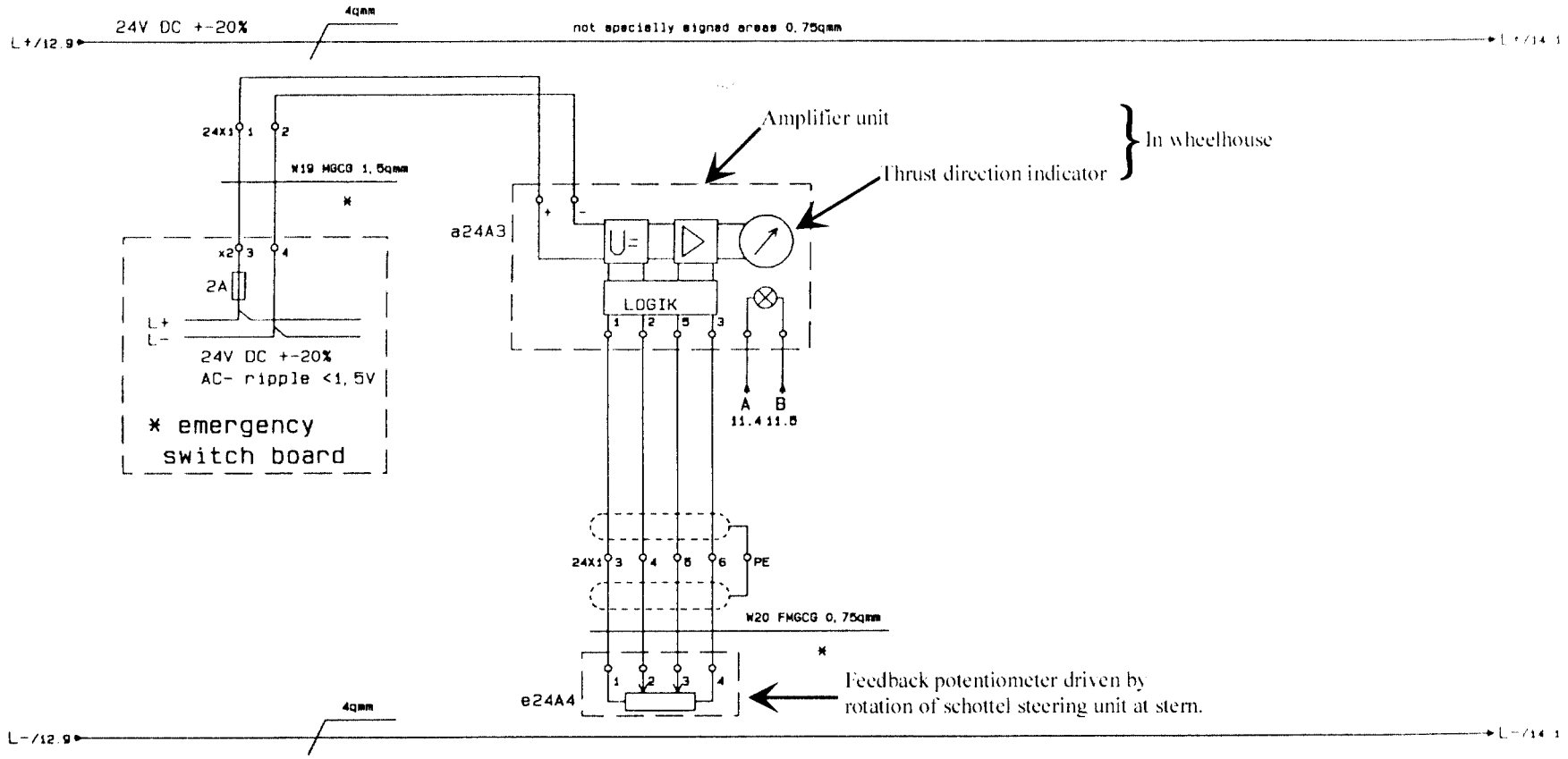
The PLA, under its bylaws, subsequently took a statement under caution from the master with a view to taking further action, subject to the results of a full technical inspection of the vessel.

1.14 JOINT PLA/MAIB TECHNICAL INVESTIGATION

1.14.1 With both PLA and MAIB charged with investigating the circumstances of the accident, it was decided that in the interests of both parties, the inspection, survey and testing of the vessel and its control systems, should be carried out jointly. Under this agreement, a full technical inspection took place over a number of days between 5 and 11 October 1999.

The initial inspection took place while the vessel was moored alongside the jetty at Dentons Slipway, Gravesend on Tuesday 5 October. This inspection confirmed three areas of damage, the starboard bow, the starboard stern, and the wheelhouse. Further discussions and inspections of the machinery spaces and the wheelhouse followed with the PLA engineer recording four areas of concern:

a. The starboard Schottel drive unit appeared to be potentially obstructed from azimuth rotation by deformation of the vertical box section structure and the starboard outboard walkway;



feed line for thrust direction indicator

thrust direction indicator

NB:
As there was no breakage in the electrical feedback circuit, no alarm situation was indicated.

With the drive shaft to the potentiometer broken, and the wheelhouse thrust direction handle moved, the basic electrical balance of the control system could not be restored.

			Datum	31.07.1991	40694	SCHOTTEL	thrust direction indicator	1096274	3
			Bearb.	Menden					
			Gepr.	Schröder				e. - diagram Stbd	
Änderung	Datum	Name	Norm	Keim	Urspr	Ers f	Ers d		

Figure 11

Figure 12

View of wheelhouse showing extent of all round visibility

Figure 13

Damage to wheelhouse structure caused by contact
with underside of bridge while exiting

Figure 14

General view of schottel propulsion units, one driving ahead, one driving astern

Figure 15

View of wheelhouse control console - note schottel direction indicator dial showing unit pointing in direction of between one and two o'clock

Attempts were made to rotate the shaft by hand in order to simulate the mechanical drive. It had been hoped that this would cause movement of the steering control indicator in the wheelhouse, but the indicator failed to respond. It was thought that insufficient rotation speed prevented any change in the indicator position.

A Schottel representative attended for further trials and, with the system fully powered up and controls engaged, the unit started to rotate out of control. No rotation of the feedback drive shaft was seen, confirming that the drive was disconnected. With the system shut down, the feedback drive shaft was rotated by hand at a faster rate than previously. This time, the steering position indicator in the wheelhouse responded.

1.14.4 The feedback drive mechanism was then opened up, and it was found that the lower end of the shaft had separated from the extended drive shaft because a silver soldered spigot joint had fractured. No taper or split pin locking device had been fitted. Originally, both the drive mechanism and the potentiometer were in close proximity with the short stub drive shaft secured, direct to a similar stub shaft driving the feedback potentiometer, by means of a spigot joint and a split or taper pin.

As problems had been experienced previously with the potentiometer being so close to the waterline of the vessel, a decision had been made to extend the drive shaft and move the potentiometer upwards away from the waterline. The new extended shaft, when installed, was not fitted with any split or taper pin but relied solely on a silver soldered joint. The original coupling design concept using pins was therefore ignored. This modification was not a Schottel decision, but one undertaken by Bateaux Parisienne, the parent company of Catamaran Cruises.

The mechanical survey and inspection confirmed that the vessel suffered a loss of steering control on the starboard Schottel unit as a result of the failure of the feedback drive shaft. This loss of control and the resultant directional instability caused *Symphony* to make a series of low speed contacts with Lambeth bridge.

1.15 THE EFFECTS OF ALCOHOL AND PERMITTED LEVELS

1.15.1 Notwithstanding the fact that the accident was caused by a mechanical failure within the steering system, the master volunteered to give a breath test, which proved positive. Two readings, taken about an hour after the event, were 105 MGM% at 2140, and 95 MGM% at 2230.

The master had been drinking socially during the evening before the accident (Sunday) and went to sleep at about 0100 early on the Monday morning. He had about seven hours sleep before reporting for duty at 1000 later on the Monday morning. This was his scheduled start time

The Catamaran Cruisers Ltd's position is as stated in its operations manual; no drinking on duty, between split duties or to a level on their off days such that it would affect their ability to work the following day. No fixed "dry time" between consuming alcohol and starting work is given. The first two points could be monitored, but the latter is more difficult to assess. There is, and has to be, given the nature of the job

and the level of responsibility, trust between management and the employee. The company had agreed with the work force the right to carry out random breath tests, but usage of that right would, most probably, be limited to immediately after an accident.

Some training in using the breath test equipment kept at the Embankment offices has been carried out, but the company is aware that correct usage and calibration are critical in their use. Following this incident, the company is reviewing the quality of the instrument, its regular calibration, and the correct procedures to be followed in its use.

1.15.2 Although the company includes a statement on alcohol in its management operations manual, no limit is quoted. It does however, refer employees to the Port of London River Bylaws 1978 (as amended), Part II, General Duties of Masters of Vessels, Section 9. Drink or Drugs. Sub-section (2) states;

The master of a vessel shall not navigate, attempt to navigate or be in charge of a vessel after consuming so much alcohol that the proportion of it in his breath when tested in accordance with paragraph (5) below records a reading of 35 micrograms of alcohol or more in 100 millilitres of breath.

The current normal road legislation limit is set at 80mg (80 MGM%) per 100ml of blood. This is equivalent to 35mg in 100ml of breath.

The 1994 research study undertaken for MCA identified the most common acceptable level as 40mg, this being that recommended for the oil industry. The study also stated that a level of 20mg, likely to be applied in the aircraft industry, is effectively a ban. It allows for the effect of certain foods and permitted drugs on the body's metabolism. This level is the accepted standard on vessels operating as "dry" ships.

1.15.3 The whole question of the extent of alcohol usage aboard ships was addressed in the 1994 Marine Safety Agency (MSA) research project. The project covered a considerably wider area than that involved in this particular case, but the findings are still valid. A copy of the section headed *Main Issues and Recommendations* is in Annex 4.

In the context of this case, Conclusion 7 is particularly relevant;

Should legislation be enacted, authorisation for alcohol and relevant drug testing needs to be given to local police constabularies in the event of a shipping casualty or accident. This would enable a separation to be maintained between procedures under the criminal law and the internal disciplinary procedures of organisations. It would also allow a reasonable start to be made on assessing the magnitude of the alcohol and drug problem in shipping.

We found a high degree of unanimity on the question of who might be empowered to test, were legislation to be introduced. In terms of who might have the authority to test in the event of legislation involving breath, urine or blood testing, uniformed police officers were considered the most acceptable but with the caveat that such officers

would need to be trained in shipboard procedures. The coastguard were also mentioned as likely to be acceptable to the industry. However, the coastguard themselves were not consulted as to their view. One area of potential difficulty which will have to be resolved concerns how testing procedure might be carried out away from port.

Although the thrust relates to shipping generally, these views could also be relevant to river traffic and inshore craft on navigable waterways.

1.16 PASSENGER RESPONSE

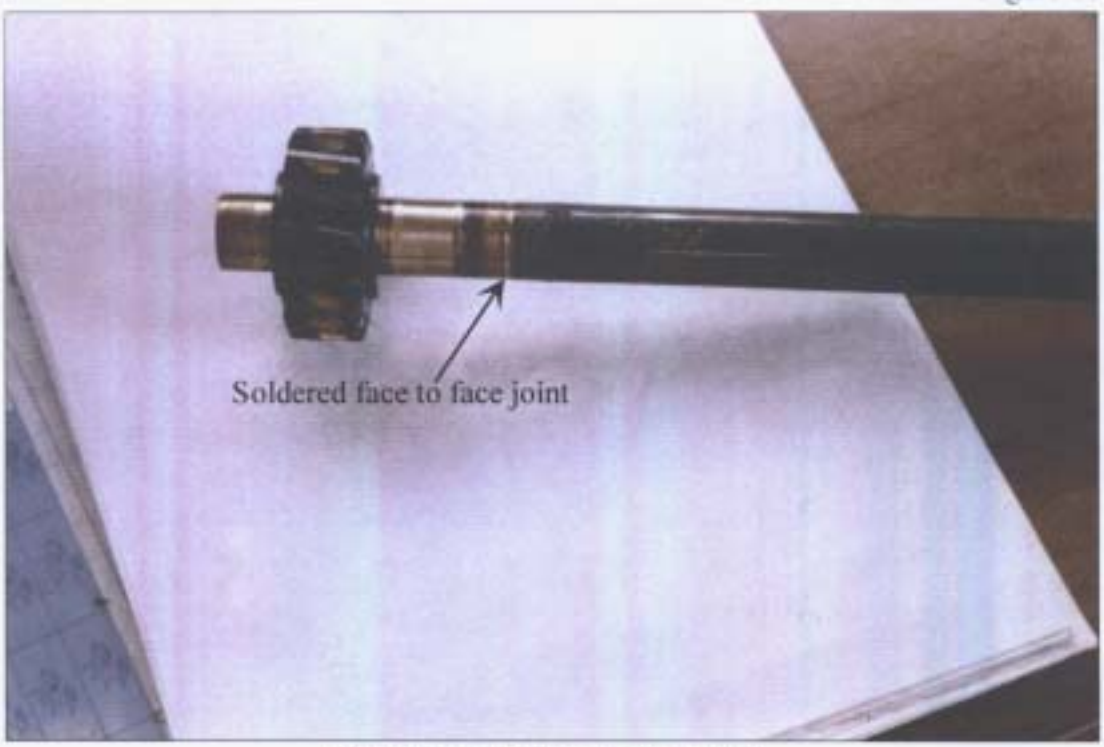
1.16.1 Following the incident, a list of passengers on board at the time, and their contact addresses was obtained from owners. The majority of the passengers were in overseas tour groups and had booked through agencies, but four parties gave addresses in the London area. These four were sent letters inviting them to comment on the incident, with particular reference to the actions of the crew during and after the collision. None replied.

Two other group contacts in London were telephoned and asked if they had received any comment from their Japanese clients as to the response of the crew to the emergency. One contact said that apart from annoyance that the voyage had not been completed, they had not commented on the incident. The other contact said that although the master and crew had handled the incident and the transfer of the passengers to the relieving vessel well, they felt that information about the collision and the actions to be taken was a little slow in being broadcast on board. Nevertheless, their main complaint related to the lack of passenger care once they arrived back at Embankment pier. No arrangements had been made to assist them to return to their hotels.

1.16.2 Although the list of passengers received from the owners gave contact points, it was not broken down into individuals. This system complies with regulations, but it does have a weakness since in the event of a loss of a vessel, the age, gender or nationality of individual passengers will take time to identify.

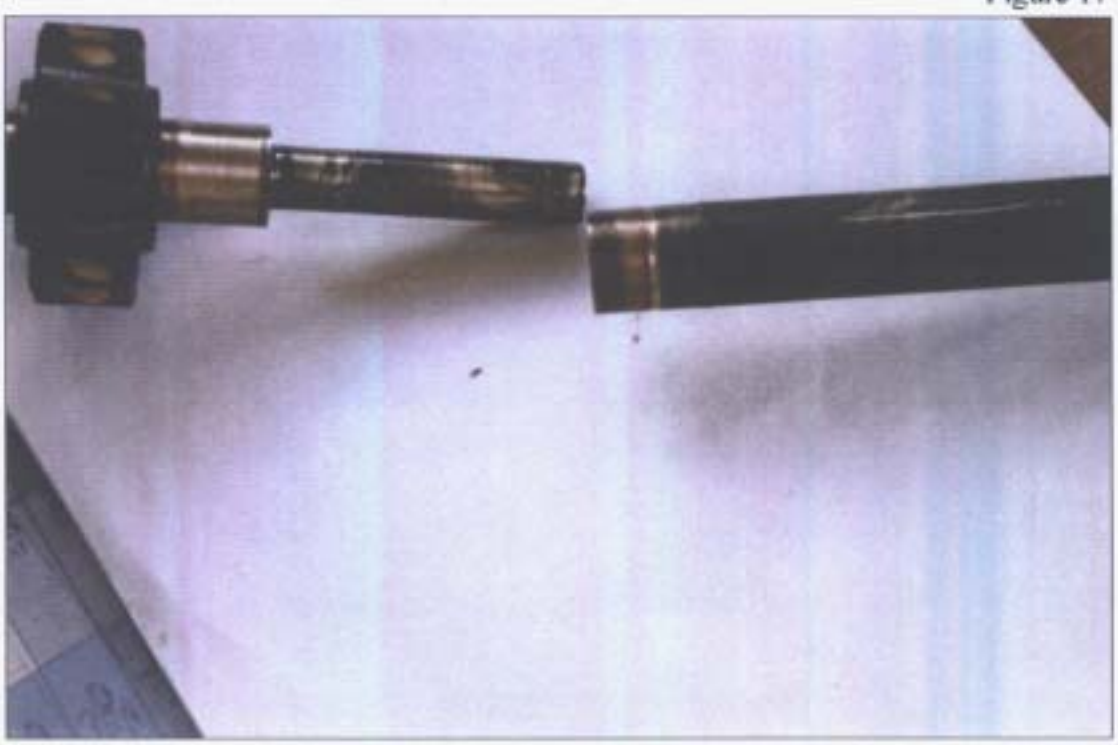
Currently tour groups do not supply details of their clients when booking. With foreign nationals forming the greater part of block bookings, collecting personal details in the generally confused nature of the aftermath of an incident, is both difficult and time consuming. Language and national attitudes to authority add to the difficulties.

Figure 16



Potentiometer drive shaft as fitted

Figure 17



Potentiometer drive shaft showing extension shaft and absence of taper pin

SECTION 2 - ANALYSIS

2.1 STEERING FAILURE (Figures 16 and 17)

2.1.1 The two technical investigations which took place at Dentons Slipway, Gravesend, between 5 and 11 October 1999 confirmed that the cause of the steering failure was the fracturing of a silver solder joint on the drive shaft of the starboard steering feedback potentiometer.

The lack of a feedback control signal to the wheelhouse, did not only prevent the master knowing the position, and hence direction, of the engine thrust, but also caused the unit to continue to rotate as it was unable to sense a stop signal.

Without the control signal, the thrust direction indicator fitted in the wheelhouse console, remained in the position it had taken up following the previous wheel movement.

The panel indicators showing engine performance, availability of electrical power, and the condition of control systems in both wheelhouse and engine space showed that the entire system was normal.

2.1.2 Under these conditions, and with no visual or audible indicators available to the master as to what the problem was, an immediate corrective response was not possible. The fractured drive shaft was not visible either from the deck or when standing on the transverse access tread aft of the Schottel unit. Only a close examination of the joint and manual manipulation of the shaft could identify the problem.

The decision to raise the position of the potentiometer further up the transom stern was sound, but using silver solder to secure the extension piece to the original stub shaft was not. The original shaft had been secured using a split or taper pin. This securing method should have been retained.

2.2 CREW REACTION

2.2.1 The reaction of the master when confronted with an apparent loss of steering control was to check immediately the console instrumentation. This showed that the propulsion and steering system was operating normally. As expected, the master repeated the steering movement, but this time increasing the amount of turn. Again with no response. At that point, the vessel was still going ahead, nominally at about 6 knots, although with the steering lost, forward movement was probably erratic due to the rotation of the starboard Schottel unit.

With *Symphony* still moving upstream under the combined response of the starboard Schottel unit and a strong tidal stream of around 2 to 3 knots, the master sent the driver/engineer down to the engine room to check what was happening. With the vessel approaching Lambeth bridge, he then throttled back the starboard Schottel unit and applied stern thrust using the port Schottel unit. Although these moves slowed the vessel down, they did not prevent it striking the bridge.

Arguably, at the onset of the steering problem, the vessel should have been brought to a stop by de-clutching the starboard unit and putting the port unit to full astern. Alternatively, by attempting to regain steering control by de-clutching the starboard unit and moving the port unit from the astern to the ahead position. The decision not to take either of these actions was influenced by the control panel instruments continuing to show that all systems were operating normally. A loss of steering, combined with all instruments reading normal, is not a situation that had been met before, nor was a predictable emergency situation.

It is possible, that the thought uppermost in the master's mind, was to continue apparently as normal, to avoid alarming the passengers.

It must also be accepted that with the master providing a positive breath test some 1-1½ hours later, it is likely that the effect of alcohol had an influence on his ability to make decisions, and the speed at which they were made.

As well as the alcohol effect, the loss of steering, the proximity of Lambeth bridge, the effect of the tidal stream, and the lack of any indication of mechanical or electrical system failure, were all significant factors in the subsequent collision. Given this combination of factors, it is highly likely that a collision would have occurred no matter what action had been taken.

Once alongside the pontoon, the master organised the safe and rapid transfer of his passengers to another of the company's vessels. It is to his credit that, despite a degree of unrest and mild panic among some passengers, the evacuation was carried out without incident.

2.2.2 The driver/engineer's response was correct. He checked the main engine and Schottel units control panel in the engine space. All recorded normal readings. With no obvious defect showing, he attempted to re-set the control system by switching the electrical power off and on. The broken potentiometer drive shaft was not obvious; it could not be seen from inside the vessel and there were no indications internally to identify the problem.

The mate provided the communication link between the master and the entertainment manager. Although the master was in a position to broadcast an announcement to the passengers from the wheelhouse, he was pre-occupied with regaining control of the steering and trying to avoid contact with Lambeth bridge. Using the mate, therefore, to tell the entertainment's manager, was probably the best way of handling the situation.

The company operations manual states that all passenger names and addresses should be taken following a grounding or collision. With up to 400 passengers, the majority of which appear to have booked through overseas agents, this requirement is difficult to fulfil. In this case, although only 103 passengers were aboard, only four were direct and local bookings. Their names and addresses were taken. The remaining 99, all of whom were in parties booked through agents abroad, referred enquires back to their agents.

2.3 OWNER'S RESPONSE

2.3.1 The owner's immediate response was in accordance with the stated company policy. Both the engineering and operations managers were notified immediately of the accident, and attended the vessel at Lambeth fire pontoon.

On arrival, they were briefed by the master and mate, as well as the PLA harbour master who was also on board at that time. Following these preliminary discussions and the breathalisation of the master, they carried out the following actions:

- the master was suspended pending further investigation
- the extent of the damage was assessed
- the controls were tested to confirm the steering failure allegation
- arrangements were made to tow the vessel off the berth for repairs.

2.3.2 The day after the accident, the master was interviewed by the company lawyers and the managing director, regarding the circumstances of the incident and his explanation for the positive reading when breath tested by the PLA. It was agreed that no decision would be made until the preliminary examination of the steering system had been completed. Although the company were told subsequently that a steering failure had occurred, the master was dismissed for being on duty with a blood alcohol level higher than that permitted under both company and PLA regulations. This decision was reached before the PLA had made any decision as to prosecution under its bylaws.

2.3.3 After the incident, the company introduced further staff safety meetings to re-emphasise divisions of responsibility. The master was confirmed as being in overall command, with specific responsibility for boat preparations, the safe boarding and disembarkation of passengers, navigation and all safety issues. The boat manager was responsible for all entertainment on board, passenger care and catering. In the event of an emergency affecting the vessel or her passengers and crew, the boat manager would take instructions from the master or his deputy.

Although these lines of responsibility were nominally in place at the time of the accident, this was the first time the system had been tested.

Following the MAIB investigation, the company also tightened up the defect and reporting system, and included a more rigorous safety equipment check. It also contracted a consultant safety company, Safety Solutions, to carry out a further detailed examination of the vessel and to produce a safety audit.

2.4 PLA RESPONSE AND ACTIONS

2.4.1 The response of Woolwich Radio to the accident was prompt and efficient. Despite difficulties with the radio transmission, probably due to the vessel's position close to, or under, Lambeth bridge, the position of the vessel was confirmed and arrangements made within minutes for a police boat to attend. Once the extent of the damage and

the action of the master in regard to his passengers was known, the scale of the accident and the level of response required was judged correctly by the duty officers. Thereafter, the situation was monitored until the duty harbourmaster's launch arrived alongside.

Standard procedure was followed with the master being subjected to a breath test, once owner's representatives were on board. The preliminary discussion and tests were conducted in an orderly and friendly manner without any adverse comment by any party. There was complete co-operation between all concerned.

The joint technical investigation carried out with the MAIB was thorough, and involved both the actual cause of the steering failure and the general condition of the vessel.

2.4.2 The collision was due to a steering failure and not as a result of the master being under the influence of alcohol. However, the bylaws were clearly broken, since the level of alcohol recorded in the breath test was over 35 micrograms of alcohol in 100 millilitres of breath.

The MAIB was told, at the time of writing this report, that consideration was being given to discussing the actions of the master in a board of inquiry set up under the Port of London watermen and lightermen bylaws 1992. The outcome of that inquiry will not be known for some months.

2.5 GENERAL OBSERVATIONS

2.5.1 During the investigation, a number of points came to the MAIB inspector's attention:

a. As stated earlier, group bookings by agencies of foreign nationals make life difficult for the crew when a list of passengers is required. If, as part of the booking process, agencies were required to supply a detailed list of their clients, this would satisfy company requirements and reduce the risk of false information being passed to the rescue service in the event of an accident. The agency contact would be sufficient for the address, but name, age and gender should cover the requirements.

b. The involvement of certain catering and entertainment staff in formal safety training would greatly increase the general safety of passengers. In the event of an accident, four crew trying to oversee and guide up to 400 passengers, while also attempting to deal with the cause of the accident is a cause for concern. Bateaux London have now undertaken to send a number of regular catering and entertainment staff to the National Sea Training College for safety training. Other operators on the Thames should be encouraged to follow Bateaux's lead.

c. Among the documentation relating to defect reporting on *Symphony*, was a note on fire extinguishers found in the used condition during one of the safety officer's inspections. This note confirmed that the safety inspection system was working, but what was not obvious, was why the extinguishers were empty in the first place. Whatever the reason, it is vital that fire extinguishers are refilled/renewed immediately,

and not left until the next safety inspection. Failure to do so, could lead to a fire quickly getting out of control and result in death and injury to passengers and/or crew.

d. As noted in the joint PLA/MAIB inspection of the vessel after the incident, the condition of the engine room was poor. Increasing lighting levels, together with a regular inspection and cleaning rota, will make defects and leaks much easier to spot.

e. (Based on declarations, and what we have been told in discussions with crew members.) It has become the accepted practice while cruising, for all three members of the deck/engine crew to congregate in or by the wheelhouse once the vessel is clear of her berth and all systems have been proved to be operating correctly. This practice has the potential for creating an accident. The wheelhouse can accommodate two people, but a third makes movement difficult and restricts the master's visibility. On *Symphony*, a chair was stationed to the rear of, but outside, the wheelhouse suggesting that the second or third person sat there regularly.

While appreciating the deck crew need to stay clear of the passenger areas while the catering staff are working, the wheelhouse is a control space designed for one person. If a second person is required to be present on a regular basis, or if it is a designated stand-by position, then the management needs to make proper provision for that second person.

2.5.2 Although a number of points regarding the maintenance and operation of *Symphony* have been highlighted, the company has been, and is in the process of, raising standards in all areas. Co-operation with the investigator by both company and individuals was good, with a free exchange of views from all sides.

SECTION 3 - CONCLUSIONS

3.1 FINDINGS

3.1.1 *Symphony* was correctly registered, licensed, and manned by an experienced and qualified crew.
[Ref: 1.5.1, 1.4.]

3.1.2 The master held a full waterman's licence issued in 1991 with an endorsement issued in 1998 enabling him to be master on a vessel carrying more than 250 passengers. He also had certificates for fire fighting, first-aid, sea survival, and VHF operation.
[Ref: 1.4.1.]

3.1.3 *Symphony* operates with both main engines running. The starboard Schottel unit clutched in, and in the ahead mode, with the port Schottel unit de-clutched and left in the astern mode. This method allows the vessel to make 6 knots while the 360° rotational ability of the unit provides a high degree of manoeuvrability. In an emergency, the port unit can be engaged almost instantaneously.
[Ref: 1.10.1.]

3.1.4 Steering trials carried out by MAIB using single and double units were satisfactory.
[Ref: 1.6.5.]

3.1.5 Catamaran Cruisers based its operating, safety and maintenance manuals and procedures on the MCA "Safety Management Code for Domestic Passenger Ships" and the PLA Bylaws.
[Ref: 1.9.2.]

3.1.6 The use of the breathalyser by the PLA harbour master is standard PLA procedure following an accident.
[Ref: 1.13.2. & 2.4.1.]

3.1.7 At the onset of the steering problem, the vessel should have been brought to a stop by de-clutching the starboard unit and putting the port unit in full astern. Alternatively, by attempting to regain steering control by de-clutching the starboard unit and moving the port unit from the astern to the ahead position.
[Ref: 2.2.1.]

3.1.8 The master followed standard procedure correctly by informing Woolwich Radio immediately after the first contact with Lambeth bridge, and stated both position and his intentions.
[Ref: 1.3.4.]

3.1.9 The response of passenger groups to the accident was not conclusive but was critical of passenger care **after** they had been returned to Embankment pier.
[Ref: 1.16.1.]

3.1.10 Access difficulties combined with low lighting levels, had resulted in the accumulation of an oil and dust film throughout the aft machinery space.
[Ref: 1.14.2.]

3.1.11 With foreign nationals forming the greater part of block bookings, collecting personal details in the generally confused nature of the aftermath of an accident, is both difficult and time consuming. Language and national attitudes to authority add to the difficulties.
[Ref: 1.16.2.]

3.2 CAUSE

The vessel suffered a loss of steering control on the starboard Schottel unit as a result of the failure of the feedback drive shaft. This loss of control and the resultant directional instability caused *Symphony* to make a series of low speed contacts with Lambeth bridge.

3.3 CONTRIBUTORY FACTORS

1. Loss of a feedback signal from the Schottel unit to the unit directional control system, not only caused the unit to continue to rotate, but also caused the wheelhouse indicator to remain fixed in its original position.
[Ref: 1.6.1, 1.6.2, 1.6.3, & 2.1.1.]

2. Examination of the feedback drive shaft of the starboard Schottel unit confirmed that the soldered connection between the original shaft and the extension had sheared.
[Ref: 1.14.4.]

3. With no visual or audible indicators of the problem available to the master, immediate corrective response was not possible.
[Ref: 2.1.2.]

4. The loss of steering, combined with all instruments reading normal, is not a predictable emergency situation. The proximity of Lambeth bridge, the effect of the tidal stream and the confused signals as to the condition of the vessel were all significant factors in the accident.
[Ref: 2.2.1.]

5. The alcohol content identified in the positive breath test made by *Symphony*'s master some 1-1½ hours after the event, is likely to have influenced both the decisions and the speed at which they were taken.
[Ref: 2.2.1.]

6. The new extended potentiometer drive shaft was not fitted with either a split or tapered pin but relied solely on a silver soldered joint.
[Ref: 1.10.5 & 1.14.4.]

7. The decision to raise the position of the potentiometer further up the transom stern was sound, but using silver solder to secure the extension piece to the original stub shaft was not. The original shaft had been secured using a split or taper pin. This securing method should have been retained.
[Ref: 2.1.2.]

SECTION 4 - RECOMMENDATIONS

Catamaran Cruisers Ltd is recommended to:

1. Ensure that the extended potentiometer drive shaft of both Schottel units fitted to *Symphony*, and any other similar installations within its fleet, follow the original design concept of pinning or as recommended by the unit manufacturer.

2. Develop through its sales and marketing department, a system whereby agencies, when booking, supply a detailed list of their clients, identifying name, age, and gender or such details as the SAR document requires.

3. Consider increasing lighting levels in *Symphony*'s engine room and putting a more rigorous inspection and cleaning regime in place.

4. Issue instructions restricting the presence to only two people in the wheelhouse when *Symphony* is operating commercially.

The Port of London Authority & The Maritime and Coastguard Agency jointly are recommended to:

5. Encourage other companies owning or operating Class V passenger vessels to follow Catamaran Cruisers lead in sending regular catering and entertainment staff to the National Sea Training College, or another similar establishment, for safety training.

GLOSSARY OF TERMS

Abutment	-	a pier on which a bridge arch rests.
Air draught	-	maximum distance between uppermost point of vessel and waterline.
Azimuth thruster	-	a thruster that can rotate through 360°, fixed or retractable.
Fender	-	any material or fitting used for protection of a floating body by chafing or collision.
Morse cable	-	type of flexible cable moving freely inside an outer protective cover.
Neap tide	-	Period of highest low water and lowest high water, ie minimum tidal range.
Quarter	-	arc between ships bow or stern, and side body.
Transom stern	-	Stern consisting of a flat almost vertical thwartship plate.
Slipway	-	inclined bed of masonry, sloping towards water on which vessels are built or pulled on to for repair.
Slipping	-	act of placing a vessel on a slipway.
Woolwich Radio	-	PLA navigation control centre.

ANNEX 1

1. Safety Management Code for Domestic Passenger Ships

SAFETY MANAGEMENT CODE for DOMESTIC PASSENGER SHIPS

Domestic Passenger Ships Steering Group

Introduction

1 General;

2 Safety and Environmental Policy;

3 Responsibilities of the Master;

4 Personnel and Training;

5 Onboard Procedures;

6 Preparation for Emergencies;

7 Reporting of Accidents;

8 Maintenance of Boat and Equipment;

9 Certification and Review.

Introduction

1 The purpose of developing a safety management code is to establish a common standard for the safe operation of passenger ships employed in the domestic trade.

2 It is recognised that no two operations are the same, and that vessels vary in size and are employed under a wide range of different locations and conditions. For these reasons, this code is based on general principles and objectives, and expressed in such terms that it can be applied to a wide variety of ships.

1 General

1 Definitions

1.1 Company means the owner, operator, manager or charterer who has assumed the responsibility for operation of the ship from the owner.

1.2 Ship includes every description of vessel used in navigation, and can include a narrow boat;

1.3 Shore base is the establishment ashore which has been designated as the place where the passenger and crew numbers, route and destination of the ship and any other information relevant in the event of an emergency, has been lodged.

Objectives

1.4 Safety management shall be applied to every passenger ship in domestic trade;

1.5 The objectives of safety management are to ensure a simple and cost effective means of:-

.1 ensuring safety on board;
.2 preventing human injury and loss of life;
.3 protecting the environment;
.4 complying with applicable rules and byelaws.

1.6 Each operator should develop and implement safe practices which include the following:

.1 a safety and environmental protection policy;
.2 procedures to ensure safe operation of ships in compliance with relevant rules;
.3 lines of communication between personnel, ashore and afloat;
.4 procedures for reporting accidents;
.5 procedures for responding to emergency situations;

2 Safety and Environmental Protection Policy

The operator should ensure that the policy is implemented, and that responsibilities of all personnel are understood. There should be a designated link between the ship and the shore base, to ensure that in the event of an emergency there is immediate communication with the emergency services (see interpretations).

3 Responsibilities

The Master's responsibility should be laid down so that there is no misunderstanding. He has the authority to make decisions regarding the safety of the vessel and persons on board, and assistance shall be available at all times.

4 Personnel and Training

4.1 The operator shall ensure that all persons employed in the operation of the vessels have received appropriate training for the duties they are required to fulfil. They should have an understanding of the relevant rules. Masters should hold the appropriate certification.

4.2 Proper instruction in their duties shall be received by personnel before the first occasion of sailing on the vessel as a designated crew member, and as necessary thereafter. This instruction should be recorded.

5 Onboard Procedures

There should be procedures in place for key shipboard operations with regard to safety; the tasks involved in these procedures should be assigned to designated personnel.

6 Preparation for Emergencies

Potential emergency situations should be identified, and exercises carried out to respond to these emergencies.
- Where appropriate, these exercises should involve the personnel ashore.
- The exercises should be recorded.

7 Reporting of Accidents

All accidents and near accidents should be reported to the operator, who should implement corrective action, with the aim of improving safety. In addition, the Master should inform the Marine Accident Investigation Branch (MAIB).

8 Maintenance of the Vessel and Equipment

The operator should inspect each ship at frequent intervals to ensure that it is properly maintained and operated in accordance with the relevant rules. Deficiencies should be corrected, and records of inspections kept.

9 Certification and Review

(It is still to be decided/confirmed whether this would form part of the annual survey for Passenger Certificate)

.1 Following verification that the vessel is being operated in accordance with the code, each vessel shall be issued with a certificate.

.2 The operation of the safety management system should be reviewed at intervals not exceeding three (3) years.

The foregoing has been amended following the meeting of the working group on 26 January 1999, and again on 12 March 1999 to take into consideration initial comments from the working group.

It is now tabled at the meeting of the DPSSG on 16 March 1999 for discussion. Comments should be forwarded, in the first instance to:-

Principal Surveyor,
Technical Consistency Branch,
MCA,
"Spring Place",
105 Commercial Road,
Southampton,
SO15 1EG

2. Catamaran Cruisers Ltd, Operations Manual, Appendix "D"

APPENDIX D

DRINK OR DRUGS

(1) The master of a vessel shall not navigate the vessel when unfit by reason of drink or drugs to do so

(2) The master of a vessel shall not navigate, attempt to navigate or be in charge of a vessel after consuming so much alcohol that the proportion of it in his breath when tested in accordance with paragraph (5) below records a reading of 35 microgrammes of alcohol or more in 100 millilitres of breath.

(3) If the harbourmaster has reasonable cause to suspect that the master has drugs or alcohol in his body, which may impair his fitness to navigate, he may direct the vessel to proceed to a designated berth or mooring or, if already on a berth or mooring, to remain in that position.

(4) The harbourmaster may permit a vessel to proceed notwithstanding that the master is suspected of being unfit to navigate through drink or drugs, if the Harbourmaster considers that satisfactory arrangements have been made to replace the said master and to ensure safe navigation.

(5) A vessel directed under paragraph (3) above shall remain in the position designated until such time as either a substitute master is on board and takes command of the vessel or master suspected of having alcohol in his body submits to a breath test on equipment provided by the harbourmaster and approved by the Secretary of State for the purpose of the Road Traffic Act 1988 and the said breath test indicates a reading of less than 35 microgrammes of alcohol of 100 millilitres of breath.

(6) It is an offence for the master of a vessel to fail to comply with a direction made under paragraph (3) above.

3. Sample Log Sheet

CATAMARAN CRUISERS LTD
Captains Log

Vessel Sym

Date 3 Nov 98

Crew
Capt. JH
Engr. DB
Mate. MA

1.0 Test the satisfactory operation of:-

	Correct	Defective
1.1 Navigation Lights		
Mast		
Port		
Std		
Stern		
Indicator Panel		
N.U.C. Lights		
1.2 Whistle and Bell		
1.3 Public Address system		
1.4 V.H.F Radio		
1.5 Emergency Lighting		
1.6 Main Steering		
1.7 Emergency Steering (weekly)		
1.8 Main Fire Pump		
1.9 Hand Fire Pump		
1.0 Bilge System		
1.11 Bilge Indicator Panel		
1.12 Fuel Shut off remote (weekly)		
1.13 All Ventilation shut off (weekly)		
1.14 Gas Detector test button (weekly)	N/A	
1.15 Day Glow stern Light is working		
1.16 Noise level cut off tested		
1.17		
1.18		

2.0 Check Condition, Number and Stowage of:-

	Correct	Defective
2.1 Life-rafts		
2.2 Lifebuoys		
2.3 Lifebuoy Lights		
2.4 Fire Extinguishers		
2.5 Sand Box and Scoop		
2.6 Fire Hose and Nozzle		
2.7 Shapes		
2.8 Buoyancy Aids		
2.9 Open Revisable Life-rafts		
2.10		
2.11		

3.0 Confirm that:-

	Correct	Defective
3.1 Emergency Signs are in place		
3.2 Emergency Exits are clear		
3.3 Emergency Exits are Operable		
3.4 All Crews have Emergency Exit Keys if required		
3.5 All Emergency Key Boxes have a Key		
3.6 Complete First Aid Kits are onboard		
3.7 Man overboard ladder is onboard		
3.8 Boat Hook is onboard		
3.9 All Crew are familiar with Emergency procedures		
3.10 V.H.F procedures are in Wheelhouse		
3.11 Visibility Astern is clear		
3.12		
3.13		

4.0 Engineers have Checked:-

	Correct	Defective
4.1 All Raw water filters have been Cleaned		
4.2 All oil levels have been checked and topped up		
4.3 All Water levels have been checked		
4.4 Oil leaks, water and fuel leaks		
4.5 All bilges have been checked for oil and water levels		
4.6 Fuel Level has been checked		
4.7 All Wheelhouse controls are switched on		
4.8 All engines are tested before getting underway		
4.9 Water drains for fuel tanks are checked		
4.11		
4.12		

Notes:

a. It is a requirement of the MSA to fill out this Document.
b. Satisfactory items to be confirmed with a tick in corresponding box.
c. All items have been checked and defects recorded.
d. Defects affecting the validity of the P.C. are rectified.
e. Copy to be retained onboard and original handed to office Daily.

Captains Comments

VHF Not Transmitting properly had to use handset

This is to certify that all the above items have been completed to my satisfaction

Captains signature

Log Sheet Number

Please keep this Document Legible

CATAMARAN CRUISERS LTD
Engineers Log

Vessel Sym

Date 3 Nov 98

Fuel Taken Approx

Fresh Water Yes

Running Hours

Port Main Engine	75068
Stbd Main Engine	75446
Port/No1 Generator	
Stbd/No 2 Generator	

Oil Consumption

Port Main Engine	ltrs
Stbd Main Engine	ltrs
Port/No1 Generator	ltrs
Stbd /No 2 Generator	ltrs

Coolant Temperature (after one hour)

Port Main Engine	80
Stbd Main Engine	80
Port/No1 Generator	
Stbd/No 2 Generator	

Oil Pressures (normal running temperature)

Port Main Engine	60 PSI
Stbd Main Engine	60 PSI
Port/No1 Generator	
Stbd/No 2 Generator	

1.0 Start up Procedure

1.1 Check previous days Log for any reported defects and oil consumption figures	✓
1.2 Turn on 24v Lighting in Engine Room	✓
1.3 Check Generator Raw water filter is clear	✓
1.4 Check Generator oil level (top up if the level is on / or below 75% full (do not over fill)	✓
1.5 Check and Top-up Generator fresh water (50% Antifreeze and 50% water)	✓
1.6 Turn on battery isolator and start engine	✓
1.7 Check Generator overboard water, and check for oil, water and fuel leaks	✓
1.8 Turn off 24v Lighting (if not on Emergency system)	✓
1.9 Perform checks 1.3 to 1.5, to other Generator, so as ready to run	✓
1.10 Check Main Engine Raw water filter	✓
1.11 Check Main Engine oil level (top up if the level is on / or below 75% full(do not over fill)	✓
1.12 Check and Top-up Main Engine fresh water (50% Antifreeze and 50% water)	✓
1.13 Check Gearbox oil level (do not over fill)	✓
1.14 Turn on battery isolator and start engine	✓
1.15 Check Main Engine overboard water, and check for oil, water and fuel leaks	✓
1.16 Check stern gland and grease if type or turn on lubricators	✓
1.17	
1.18	
1.20	

2.0 In Service Checks

2.1 A regular should be made of the Temperature and Oil pressure of all engir	✓
2.2 Check bilge alarm system is not showing water in any void space	✓
2.3 Visual check should be made to the Engine Room at regular intervals	✓
2.4 Check overboard water from all engines at regular intervals	✓
2.5 Record any problems on the log sheet	✓
2.6	
2.7	
2.8	

3.0 Shut Down Procedure

3.1 Confirm with Captain that Main Engine is no longer required	✓
3.2 Stop Main Engine	✓
3.3 Isolate Main Engine Batteries	✓
3.4 Check stern gland and grease if type or turn off lubricators	✓
3.5 Check bilge level is low and not rising	✓
3.6 Turn on 24v lighting (if not Emergency system)	✓
3.7 Shut down Generator engine	✓
3.8 When all is shut down and quiet, listen for water leaks	✓
3.9 Turn off 24v lighting	✓
3.10 Ensure vessel is fully secured and night, along with Crew members	✓
3.11 Place Log Sheet in Main Office	✓
3.12	
3.13	

Maintenance, Repairs and Reports.

ENGINES and GENERATOR Checked OK

This is to certify that all the above items have been completed to my satisfaction

Engineers signature

Log Sheet Number

Please keep this Document Legible

ANNEX 4

4. Extract from the 1994 MSA Report "Alcohol & drug abuse aboard ships"

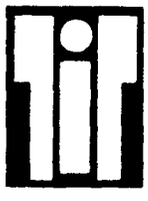
(2)

FINAL REPORT, 11 August 1994

MARINE SAFETY AGENCY RESEARCH PROJECT #346

ALCOHOL AND DRUG ABUSE ABOARD SHIPS

Dr. Hilary Standing, Dr. Jean Neumann, and Mark Stein



The Tavistock
Institute of
Human Relations

5. MAIN ISSUES AND RECOMMENDATIONS

In this final section, we briefly summarise the key themes which have emerged from this research, reconsider our original hypotheses and offer our conclusions and recommendations.

In this research we have sought to address the three broad issues of magnitude, policies and practices for dealing with alcohol and drug misuse and the response of some key stakeholders to the prospect of national legislation. In our examination of the problem of magnitude, the point was made that existing data sources cannot give a "true" picture of the extent of the problem but that a lot can be learned from examining perceptions and anecdotal evidence, and that extrapolations from wider societal trends can provide useful general indicators. Overall, a picture of considerable diversity emerged, and this diversity needs to be taken into account in moving forward through legislation or other means. At the same time, a consistent and significant narrative was told throughout the industry which pinpointed a long term decline in the problem of alcohol misuse. This decline was connected to structural changes in the merchant shipping (and to some degree the fishing) industry.

Alongside this, it was pointed out that the industry as a whole is currently divided into self-regulating and non self-regulating segments as far as formal policies to deal with alcohol and drug misuse are concerned. A major motivation for introducing D and A policies has been public pressure stemming from some highly visible disasters at sea. Oil companies and ferry operators have been at the forefront of self-regulation. A further division exists between those companies which have random testing as a key element of their policies and those which do not. There are widely different views on the acceptability and utility of random testing as a method of controlling misuse.

Random testing aside, there is a high degree of acceptance among seafarers, at least in the self-regulating part, of the necessity for formal policies in relation to misuse. Legislation would thus not cause major problems for this part, provided it is not substantially at variance with existing practices. In particular, post accident (or incident) and "for cause" testing appears to be well accepted. Outside the self-regulating part of the shipping industries, there are likely to be varying degrees of hostility to any form of legislation, particularly where it implies additional costs to the organisation or companies concerned.

In reflecting on this account, two related issues seem to recur as key themes. One is the wider context within which concerns about safety may be set and its link to pressures for formal policies and legislative action in relation to alcohol and drug misuse. The other is the question of trust and how compliance is most appropriately assured. The decline in alcohol misuse has been linked consistently by our respondents to wider commercial pressures which have had the effect, among other things, of greatly reducing manning levels on ships. As a consequence, it is no longer tenable for small crews to "carry" someone incapacitated by alcohol or other substances. Thus, pressures from outside the industry have been reinforced by pressures from within to recognise alcohol misuse as a safety issue for crews themselves.

The second issue, of trust, surfaces particularly in debates about the nature and extent of testing. One of the notable features of the shipping industry seems to have been the historical absence of a culture which discourages alcohol misuse in particular and impairment through substance abuse in general. In this, it may be contrasted with civil aviation, where a strong safety culture discouraging even minor misuse has operated without the framework of national legislation. It is perhaps paradoxical that the beginnings of the development of such a culture

within merchant shipping should coincide with very much stronger formal controls in parts of the industry.

Random testing is currently the strongest response to what appears to be a still pervasive lack of trust within the industry as a consequence partly of the failure to foster a sufficiently health and safety conscious culture in shipping. As was pointed out in section 3, random testing is not the most effective means of picking up those misusing alcohol and drugs. Its value perhaps is more that of a "signifier" to the wider society that something is being done.

The dilemma associated with a "signifier" response is that it can increase the problem of trust, by creating dependency upon external control measures and by encouraging those so minded to find ways of "beating the system". This, in turn, provokes the need to find ever more sophisticated control measures to overcome the determined system beater or the hardened misuser; measures which bear equally upon those who respect the limits. It will be important, if any legislative framework is proposed, to avoid setting in motion this kind of dynamic, and this will require particular attention to the question of how any "due diligence" requirement might be framed.

5.1 The conceptual framework and hypotheses revisited

Our initial conceptual framework postulated a series of boundaries between the individual and the organisation, and the organisation and society, each of which would raise sensitive psychological, social or political issues requiring attention from the point of view of any legislative action.

Hypothesis: There are some forms of testing that are acceptable to seafarers because they offer adequate protection from danger without, at the same time, invading personal privacy.

The boundary between the individual and society raised questions particularly about the balance between the public and private in the lives of seafarers. To what extent is it reasonable and acceptable for seafarers' rights as private citizens to be overridden by their obligations as public employees and, specifically, to be required to submit to monitoring and control practices which are of an invasive nature?

Associated with this boundary, it was hypothesised that there are some forms of testing that are acceptable to seafarers because they offer adequate protection from danger without invading personal privacy. What do existing policies and practices in the industry tell us about this sensitive boundary and what constitutes an acceptable balance? There are three particular aspects of D and A policies which involve boundary issues of this kind. These are the type of test involved, the form in which the test is carried out and the person empowered to perform the test on the individual.

As has been pointed out, the major difference within current D and A policies relates to the use of random, or unannounced testing. All, or the great majority, carry out at minimum post-accident and "for cause" testing. Random testing is mainly associated with oil tankers. Our first stage interviews led us to suspect that it would be more unpopular with seafarers than other types of D and A testing. *Random testing is not more invasive in form than any other type of testing, but it invades social and personal space in a much more direct way.* Only a brief warning is given and it tends to be carried out on the whole crew, thus potentially

involving off-duty employees as well. There are also some specific issues about trust which are taken up in the next section.

Generally, the finding was that *random testing is much more unpopular outside the companies which use it than within them.* We interviewed seafarers in two companies which have introduced it and found a reasonable measure of acceptance or at least resignation. However, there were some caveats which mainly concerned the initial response to the policy, its mode of introduction and the question of who should be subject to it. A Master told us:

> "Initially I was incensed by the policy. They introduced it far too late and without enough backing. Now I find it useful to wave at someone and say 'if you can't abide by it you'll have to go'."

Another officer said:

> "You had to accept it or you'd be out of a job. There was some resentment about it . After all there had been no bother and the ship is your home. People just drink a couple of beers. Someone in an office doesn't get pulled out of their house to get tested, but it's a good thing for the hard core drinkers."

While a rating commented:

> "It's no problem for me. Ninety nine per cent of the people just signed it. It didn't affect me at all."

In the company where a critical positions policy operated, an officer said:

> "There's a modicum of resentment that ratings are not included. After all, if he's drunk he can turn the wrong valve and that can have very serious consequences. When it first came in there was resentment... The resentment was really from a professional point of view..... Can't you trust me not to open a can of beer?"

These comments exemplify a number of recurring themes. *First, the greater the educational effort which preceded the introduction of the policy the less the hostility to it. Policies linked to programmes emphasising the health and safety aspects of drug and alcohol misuse gave employees the opportunity to buy into a more positive message to offset the negative message about trust.* Again, however, there are financial costs associated with this which put smaller companies at a disadvantage. Our impression is that such companies have had to sell random testing to their employees as being a reluctant commercial necessity and that employees have, by and large, accepted this as such, recognising that their jobs are at stake. This acceptance is exemplified by the rating quoted above.

Second, however carefully it is introduced, random testing does incur resentment in the beginning. One company did lose a small number of staff who considered it a breach of civil rights. For senior officers resentment particularly relates to questions of trust and being policed in a way which casts doubt on professional integrity. For other staff, the breaching of the already limited private space at sea implied by a random test is an issue. In practice, we found that most such tests took place in port during the daytime when most staff were on duty anyway. *The invasiveness is more in the ever present possibility than in the actual circumstances in which it is carried out.*

Third, the decision in at least one company to distinguish critical from non-critical safety positions has evoked some controversy. It may be noted that none of the companies bound to random testing by a charter party clause has chosen to make this distinction among their own staff, believing it to be divisive. This is despite the fact that such a policy would be cheaper to implement. Paradoxically, *this decision by sub-contractors of the big oil companies to not differentiate amongst their personnel has contributed to a more general sense in the industry that random testing will inexorably become the norm.* There is a concern not to discriminate among employees by treating them differently and this has led one company to extend random testing to its dry cargo fleet, although it is not under any contractual obligation to do so.

Finally - and this relates to the introduction of D and A policies generally, rather than random testing per se - the comment of the Master above is a reminder that different positionalities are involved. Masters are responsible for shipboard discipline. *All those we spoke to welcomed the fact that a clear policy, sometimes with associated powers to test, made it less likely that they would be accused of abusing their discretion.*

Overall, it appears that random testing is opposed much more outside those companies which already use it. Opposition to it is not position specific but was expressed to us equally by managers, trade union representatives and others associated with merchant shipping. The experience of the companies which have introduced it suggests that it can be made acceptable, or at least tolerated, particularly if it is introduced via a larger educational programme. There may, however, be other costs associated with extending random testing through the industry and this question will be taken up in the next section.

We did not find the same reservations about or hostility to post incident or accident, "for cause", medical or pre-employment forms of testing. In the case of post incident or "for cause" testing, most policies do seem to have been successful in presenting these as opportunities for people to clear themselves of suspicion. Obligatory medical screening is part of seafaring life and those who fail a pre-employment test do not enter the industry anyway. Among those we interviewed at all levels in merchant shipping, there was a recognition that the safety needs of the industry require some formal means of monitoring and control in relation to alcohol and drug misuse.

The two forms of testing actually used are the breathalyser (two types are in use) and urinalysis. They may be used in tandem or separately. *Urine testing is arguably a more invasive procedure than breath testing.* The process of testing is designed to ensure both that no adulteration of the sample can occur and that there is no chance of confusion between samples. This inevitably involves a degree of invasion, as - for example - pockets have to be emptied beforehand and the temperature of the urine has to be checked immediately afterwards. No-one who was interviewed expressed a view suggesting that it is a violation of a personal boundary. However, the very awkwardness surrounding the topic means that it is difficult to form a judgement. The tendency to joke about it (unlike with the breathalyser) suggested that it may be the focus of some unresolved feelings about personal boundaries.

Testing may be carried out by a variety of personnel. However, while breathalyser testing is quite commonly done by ships' officers (where breathalysers are carried on board), it is much less common for urine testing to be done by anyone other than health personnel from within the company or from an externally contracted company. The exceptions seem to be some deep sea fleets, where it is impractical to send such personnel. Some companies do train or are planning to train senior officers in urinalysis, however.

There are mixed views about the acceptability of giving senior officers the power to carry out testing themselves. At one end, a view was expressed that such testing violates trust between the Master and the rest of the crew (where on-board testing can be carried out, senior engineers are empowered to test Masters in the event of an accident or a suspicion of impairment). The most forcible expression of this view came from a source within the fishing industry who predicted that if breathalysers were put on vessels "the crew would throw them overboard".

However, inability to perform duties because of alcohol or drug misuse has always been an offence against the Merchant Navy's Code of Conduct but decisions as to what constituted impairment would be at the Master's discretion. *The introduction of either on-board breathalyser testing or testing by an external company has given all parties an objective measure which goes some way to answer the concern about fear of arbitrariness in a Master's judgement.* Certainly, the Masters interviewed for this research welcomed (sometimes retrospectively) the clearer guidelines given by D and A policies and the possibility of a more objective measurement of impairment.

The question of what constitutes an acceptable balance between seafarers' rights as private citizens and their obligations as public employees probably has several answers, depending on context. Where random testing is already in place, those subject to it appear to find it acceptable enough, although there are differences in the degree to which it is considered desirable. It is also the case that crews of ships which sail in American coastal waters are accustomed to much stronger legislative controls in relation to drug and alcohol testing. Other types of testing do not excite the same controversy within those companies which have D and A policies, but which do not carry out random testing. *At least in the self-regulating sector, it seems that post-accident and "for cause" testing are acceptable to everyone as striking a reasonable balance between rights and obligations.*

Where no policies are in place, such as in the fishing industry, it appears likely that the introduction of any kind of formal testing, whether voluntary or through legislation, will encounter greater hostility. *It will require the fostering of a more appropriate climate about the safety implications of alcohol and drugs within the currently non self-regulating sectors to create the conditions for acceptability of any kind of formal testing.* Our findings also exemplify a wider problem in any debate about legislative action. Several respondents referred to the problem of the "hardcore" or determined drinker/drug user. The question is how far legislation could or should go in attempting to encompass the hardcore at the expense of the right of the majority not to be subject to (for them) an unnecessarily invasive set of controls. This question is considered further in the next section.

Hypothesis: Some shipping companies (mostly large ones with a good safety record) already have a variety of practices for monitoring and controlling alcohol and drug use which include both formal and informal testing.

Our second level boundary concerned the interface between the control practices employed within the organisation and the wider factors which determine or influence the kind of policies which companies put in place. It was hypothesised that some companies, mostly the larger ones with good safety records, already have a variety of practices in place for monitoring and controlling alcohol and drug misuse, and that these practices are both formal and informal. Our research shows that this is clearly the case. Further, there are also likely to be examples of formal and informal practices among smaller UK shipping companies, although we are not in a position to give an estimate of numbers. *Informal practices to control drinking in*

particular have operated in the more safety conscious part of the industry probably for two decades and before the introduction of any formal policies. The move to concentrate drinking in a central bar is an early example of this. Peer pressure is another important way in which a changed "culture" in relation to alcohol and drug misuse becomes disseminated in a context where health and safety awareness work has already been carried out.

Formal practices have been shown to be directly related to wider public concerns about safety in the shipping industry, particularly following a number of well publicised disasters. Acceptance by employees in the self-regulating parts of the industry of the need for formal controls seems to have been won at least partly on the basis of commercial necessity. Companies chartering to the oil industry, for example, have little choice. *What is also clear is that a large part of the shipping sector remains unregulated* and, for the present, apparently not touched by these kinds of pressures. This is particularly the case in fishing and leisure. However, the picture is unlikely to remain static. The possible tightening of Port State Controls and the introduction of the new IMO Safety Management Code may place greater obligations on ship owners. Pressures may also come from insurers, under pressure themselves to cut losses from maritime business.

Hypothesis: Critical issues for the companies are likely to relate to the direct and indirect costs of any legislation and to avoidance of situations where the Master has to act as a legal agent.

Hypothesis: There are some important outstanding issues on the boundaries between the shipping industry and "society" which concern particularly who has authority to test and the jurisdiction of that legislation.

Our third level boundary is that between the shipping industry and "society". We hypothesised that there are some important outstanding issues at this boundary which concern who has the authority to test and the jurisdiction of any legislation. We also hypothesised that companies would want to avoid situations where the Master is required to act as a legal agent.

The question of whether Masters and other senior officers could be authorised and required to carry out testing in the event of an accident at sea, for possible use in a criminal prosecution, was raised a number of times and provoked concern. As has been pointed out, the use of breathalysers on board ships is becoming more common in the self-regulating part of the industry. Its advantage is that it gives both Masters and crews a more objective measure of impairment. At the same time, it has the advantage, from the company's point of view, of providing evidence which is more likely to be accepted should a dismissal case go to industrial tribunal. To that extent, the Master could be said to be already acting as a quasi-legal agent in relation to an institution of the state.

However, there is a difference between an industrial tribunal - which is a civil body arbitrating on matters concerning employee-employer relations - and the criminal law. It is unlikely that any of the key interests involved would accept such a direct role for senior officers. *For officers and their representative organisations, it would be important to keep issues of shipboard discipline separate from procedures relating to the criminal law because of concerns about trust.* For companies, on-board testing raises complex legal issues about procedures as well as concerns about the cost implications. These are considered below.

A further issue, which will require clarification, concerns the interface between the jurisdiction of merchant shipping legislation and of the ports authorities, particularly the

need to ensure that there are no major discrepancies between port byelaws and legislation for shipping. Port representatives themselves are likely to favour national legislation for alcohol and drug misuse, bringing all ports under the same legislative framework.

Finally, and also associated with the boundary between the industry and society, it was hypothesised that the critical issues for companies would relate to the direct and indirect costs to them of any legislation. In considering this hypothesis in the light of the interviews, it is important to think of costs in a broader sense than financial costs, although these are undoubtedly an issue, particularly for smaller companies. Discussions with companies and other organisations suggest that the following kinds of cost may be entailed:

- time and goodwill;
- industrial relations; and,
- financial and legal.

A complaint heard across the industry concerns the volume of regulations already in place within both merchant shipping and fishing and the amount of administrative and seafarers' time which regulation incurs. We are not concerned here with whether this complaint is accurate (although the legislation is certainly cumbersome), but rather with the implications of this perception for any legislative intention in relation to alcohol and drug misuse. *Our data suggest that the spectrum of views on further legislation within the commercial shipping industry itself ranges from hostility to resigned acceptance.* Hostility is most likely to come from the fishing industry (sample comments were "there is a massive bureaucracy - we want to see less, not more", "we have enough on our plate already"). Smaller companies are also likely to view the prospect negatively, if not with outright hostility, but this is also tied to the question of financial costs. Larger companies, and notably the transnationals, are the least hostile to the concept of legislation in this area, and this is clearly linked to the fact that they already have comprehensive policies in place.

A major concern for the self-regulating part of the merchant shipping industry is the possibility that any legislation that is introduced will be substantially weaker than the policies which are already being operated. This particularly relates to the question of what BAC limit might be set. The great majority of self-regulating companies set limits of 40mg or below and would not be prepared to accept legislation which, in their terms, would undermine their position from an industrial relations point of view. One fear is that a higher criminal limit would make it more difficult to dismiss an employee who drank over the company sanctioned limit. Another fear, as a representative of a ferry company put it is that "it would encourage people to feel safer and to drink up to the higher limit". *It was a generally expressed view that the existing limit of 80mg set in the Road Traffic Act reflects what was historically acceptable when the legislation was introduced and that it should not be used as a baseline for the shipping industry.*

The extent to which legislation will incur financial costs for organisations will vary partly depending on whether they already have policies in place. Where these exist and are comprehensive, the direct financial costs may be negligible as it is highly unlikely that any legislation would be proposed which would be more stringent than current "best practice" in the industry. *The most likely source of additional cost would be if the legislation were to include "due diligence", or the obligation of the employer to ensure that employees are fit for duty.* Most existing D and A policies lay down rules or guidelines on the length of time during which drinking should not take place before duty, but the onus tends to be on the employee to follow these rules. There is at present no legal obligation on the employer to check that

employees have done so. Taken together with a related concern of employers that they could be laid open to legal claims if an employee were found to be over the BAC criminal limit, the most likely outcome would be to increase pressure on companies to introduce breathalysers on all ships so as to ensure that they are acting with legal "due diligence". Breathalysers would be a substantial additional cost for smaller companies in particular. The machinery also requires regular calibration and staff have to be trained in its use.

5.2 Conclusions and recommendations

Conclusion 1:

> *There is ambivalence within the industry towards the prospect of legislation on drug and alcohol misuse. Shipowners' representatives are generally of the opinion that no legislation is required. This is at least partly a response to what they see as an excess of regulation in the industry. Shipping company managers themselves and other employees are on the whole neither enthusiastic nor hostile. Others involved with the industry, such as the regulatory bodies are generally more committed to legislation.*

The Chamber of Shipping and representatives of fishermens' organisations made it clear that they do not wish to see legislation. It is likely that legislation would also be unpopular with the leisure industry. These organisations would prefer to see a voluntary code of practice which gives emphasis to prevention through educational programmes for ships' crews.

Conclusion 2:

> *Consideration could sensibly be given to developing guidelines or legislation in conjunction with the International Maritime Organisation's Safety Management Code, and initiating some form of audit, to be undertaken by the MSA or other appropriate body.*

A number of our respondents mentioned the Safety Management Code as potentially an important development in improving safety practices within the maritime industry. At the same time, the introduction of new legislation or guidelines should be monitored and evaluated in order to assess their effectiveness and impact. An audit could be used with the aim of helping companies review and improve their D and A practices, as opposed to monitoring compliance.

Conclusion 3:

> *Were legislation to be enacted for the marine industry, it could usefully be comprised of two elements: a definition of "due diligence" and a technically defined level of impairment for alcohol which is legally enforceable.*

Our research suggests that the concept of "due diligence" and the specification for BAC would provide the most acceptable basis for regulation. The self-regulating part of commercial shipping would find these acceptable as they already have policies in place which contain these elements. At the same time, they provide a realistic basis for developing good practice in the non self-regulating parts of the industry.

Conclusion 4:

> *"Due diligence" within the commercial marine industries could be defined minimally as having three elements: a drug and alcohol abuse policy which is linked to becoming or retaining the right to be employed by that particular company; an organisational culture which discourages impairment at work; and the capacity for an authorised person to test "for cause" and post-incident.*

Those companies within the other managed transport sectors which are widely considered exemplars of "best practice" tend to interpret "due diligence" as comprising a variety of organisational practices, including random testing. The degree to which random testing has been effective in decreasing drug and alcohol abuse, particularly of the type that can contribute to casualties and accidents, cannot be determined from the experiences of these and other companies. It is likely that "due diligence" could be demonstrated by ways other than random testing; to our knowledge this has not been tested legally. Although the majority of people included in this research were negative about detailed specifications being spelled out in legislation, there is concern that any legislation might prove to be the "thin end of the wedge" in terms of pushing companies into random testing. It is recommended that guidelines be developed, using existing models of best practice, to assist companies and organisations in developing their own policies.

Conclusion 5:

> *If legislation is enacted, "best practice" companies within the commercial sector request that blood alcohol levels not be established at a level below those they are currently operating. However, an argument could be made that the non-commercial, private operator in the marine leisure sector more closely matches the private driver on the highways, and could be subjected to the same blood alcohol limits.*

Shipping companies which already have their own policies in place have argued strongly that any proposed legislation should not set a BAC limit higher than that which is considered existing best practice. For those companies following OCIMF guidelines, this is 40mg. For ferry companies, this is 20mg. At the same time, if legislation is to encompass leisure boating, where alcohol frequently plays an important social role, and where little attempt has been made to develop a culture of safety in relation to its misuse, it is probably not realistic to set a limit equivalent to best practice in commercial shipping; nor, arguably, are the risks quite so great.

Conclusion 6:

> *If legislation were to be enacted, the UK commercial shipping companies would welcome any drug and alcohol related legislation or guidelines being applied to all ships in UK territorial waters, although it seems unrealistic to attempt to apply UK legislation to UK ships when they are beyond the bounds of national waters. At the same time, consideration needs to be given to the interfaces with ports and harbours.*

On the question of territorial jurisdiction, there is a unanimous view that if legislation is put into place, it should cover all shipping in British territorial waters. The current framework of Port State Control was suggested by a number of respondents as providing an appropriate territorial basis for alcohol and drug legislation. There would be resistance within the industry generally to any legislation which did not include foreign flag ships within its remit (in any

case, many British registered companies already flag out their ships). Similarly, there would be resistance within the merchant shipping industry to the exclusion of any other category of vessel from legislation. It is unclear whether UK legislation could be extended to include UK ships in international waters but it seems likely that the more appropriate approach would be to work to strengthen international conventions.

Conclusion 7:

> *Should legislation be enacted, authorisation for alcohol and relevant drug testing needs to be given to local police constabularies in the event of a shipping casualty or accident. This would enable a separation to be maintained between procedures under the criminal law and the internal disciplinary procedures of organisations. It would also allow a reasonable start to be made on assessing the magnitude of the alcohol and drug problem in shipping.*

We found a high degree of unanimity on the question of who might be empowered to test, were legislation to be introduced. In terms of who might have the authority to test in the event of legislation involving breath, urine or blood testing, uniformed police officers were considered the most acceptable but with the caveat that such officers would need to be trained in shipboard procedures. The Coastguard were also mentioned as likely to be acceptable to the industry. However, the Coastguard themselves were not consulted as to their view. One area of potential difficulty which will have to be resolved concerns how any testing procedure might be carried out away from port.

Conclusion 8:

> *Coordination and consistency across the following regulatory organisations would help companies greatly in implementing any guidelines or legislation: IMO, MSA, HSE, Ports Authorities, and the EC.*

A further issue, which will require clarification, concerns the interface between the jurisdiction of merchant shipping legislation and of the ports authorities, particularly the need to ensure that there are no major discrepancies between port byelaws and legislation for shipping. Port representatives themselves are likely to favour national legislation for alcohol and drug misuse, bringing all ports under the same legislative framework. It will be important to work closely with the interface organisations, as well as the international bodies, in producing consistent regulations and guidelines.

Conclusion 9:

> *As smaller shipping companies, including those within the fishing industry, have less managerial and financial resources at their disposal, assistance in developing and implementing drug and alcohol policies - appropriate to their size of operation - could enhance the likelihood of compliance with any legislation or guidelines which might emerge.*

In order to be acceptable to and effective across the whole of the shipping industry it will be important for the MSA to consider ways of enabling the non self-regulating part of shipping to develop its own policies and practices in this area. If legislation were to be passed, it would mean that companies which do not have their own D and A policy will need to develop one. The fishing industry would particularly require support in this area, as much of the industry

consists of owner operators and small crews who are not "employees" in the conventional sense. Small shipping companies, fishing and leisure users would require support to develop guidelines and educative material. It is recommended that MSA takes the lead in linking up those voluntary bodies and professional associations (e.g. the RNLI, the RYA, the Chamber of Shipping) which would be in the best position to work with these sections of the industry.

Conclusion 10:

> *Those aspects of commercial pressures within the shipping industry which might contribute to substance misuse need to be investigated directly in terms of their health and safety implications: for example, manning levels and charterers' deadlines can result in work schedules and stress on the job which can encourage an employee to turn to illegal, controlled or prescription drugs to cope.*

Although there is general agreement that the problem of alcohol misuse has lessened as a consequence of some of the commercial pressures within the industry, our research (and previous experience in the shipping industry) suggests that minimum manning levels and tight schedules place considerable pressure on smaller crews. The impairment, for instance, of a crew member through illness may well encourage the misuse of prescription or non-prescription drugs to enable work to continue. Similarly, the possible use of amphetamines and substances which have a stimulant effect to maintain wakefulness might be worth further investigation in this context.