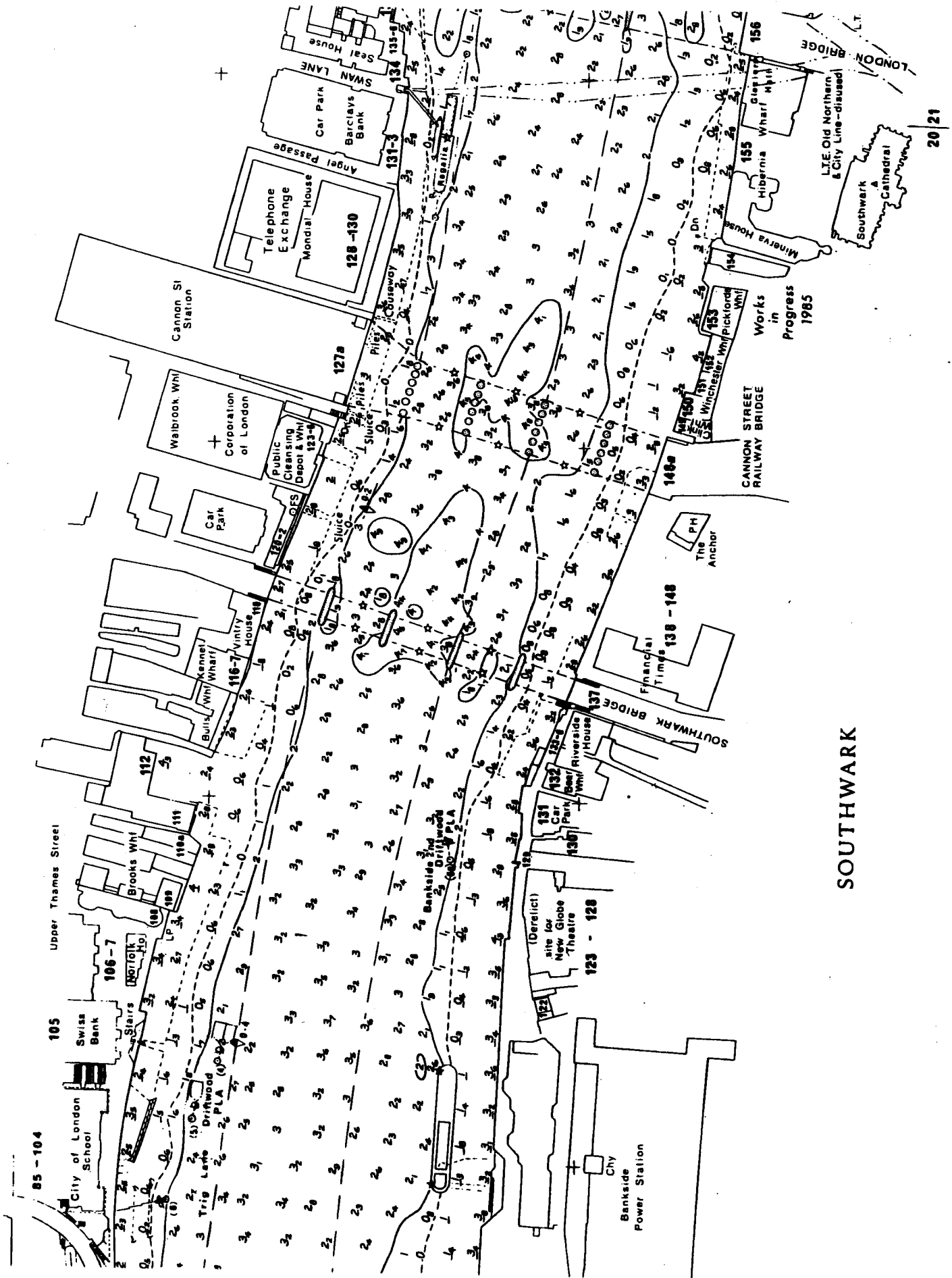
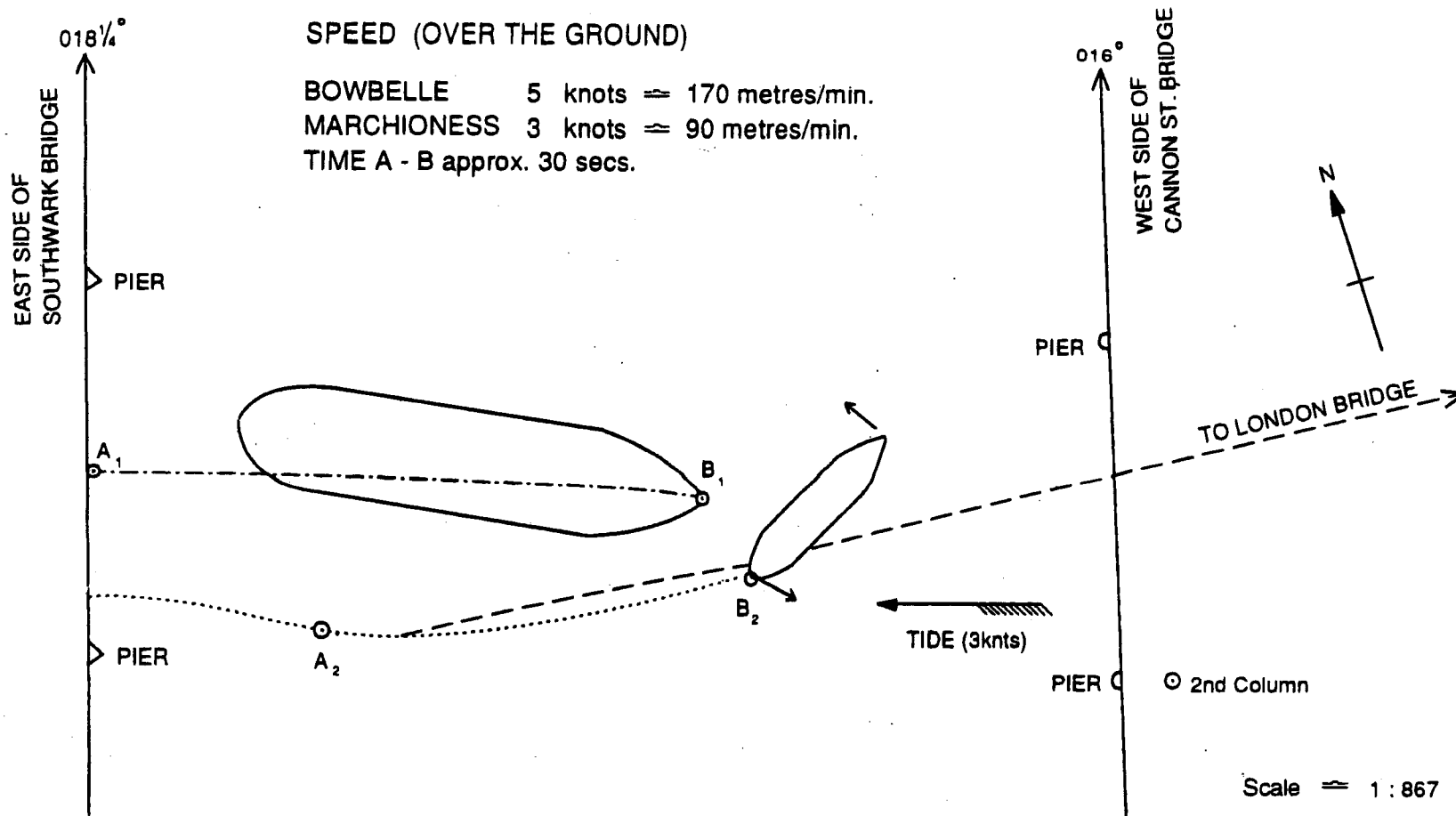


0 100 200 Metres



SOUTHWARK

0 50 100 Metres



At positions 'A', BOWBELLE's bow (A1) is just emerging from Southwark Bridge. MARCHIONESS's stern (A2) is 30 degrees on the bow about 50 metres off. The tracks allow for BOWBELLE passing through the middle of the centre arch, and MARCHIONESS passing close to the southern pier, and getting a little further south probably because of slight over-compensation for tidal eddy off the pier.

Between positions A and B, BOWBELLE alters to starboard to head momentarily for the second column of the south pier of Cannon Street central arch. When that column is ahead, course is altered to port. The track shown represents the estimated track of BOWBELLE's bow. The track for MARCHIONESS shows that of her stern; at A2 she has come to port, either deliberately because she was to the south or inadvertently because of yaw probably caused by the first effects of interaction. She is assumed to have steadied on a course to take her through Cannon Street and London Bridge.

At positions B (approx 30 seconds after A) the distance between BOWBELLE's bow and MARCHIONESS's quarter has reduced to 8 metres. At about this time, the forces of interaction would have taken full control; MARCHIONESS's stern is repelled and bow swung strongly to port. The effect is augmented by the flood tide, and the vessel swings bodily across BOWBELLE's bow.

General view looking downstream showing Southwark, Cannon Street, London and Tower Bridges



Courtesy of the Metropolitan Police

General view looking downstream showing Southwark, Cannon Street, London and Tower Bridges



Courtesy of the Metropolitan Police

BOWBELLE at sea



Courtesy of FotoFlite

BOWBELLE : two views from wheelhouse

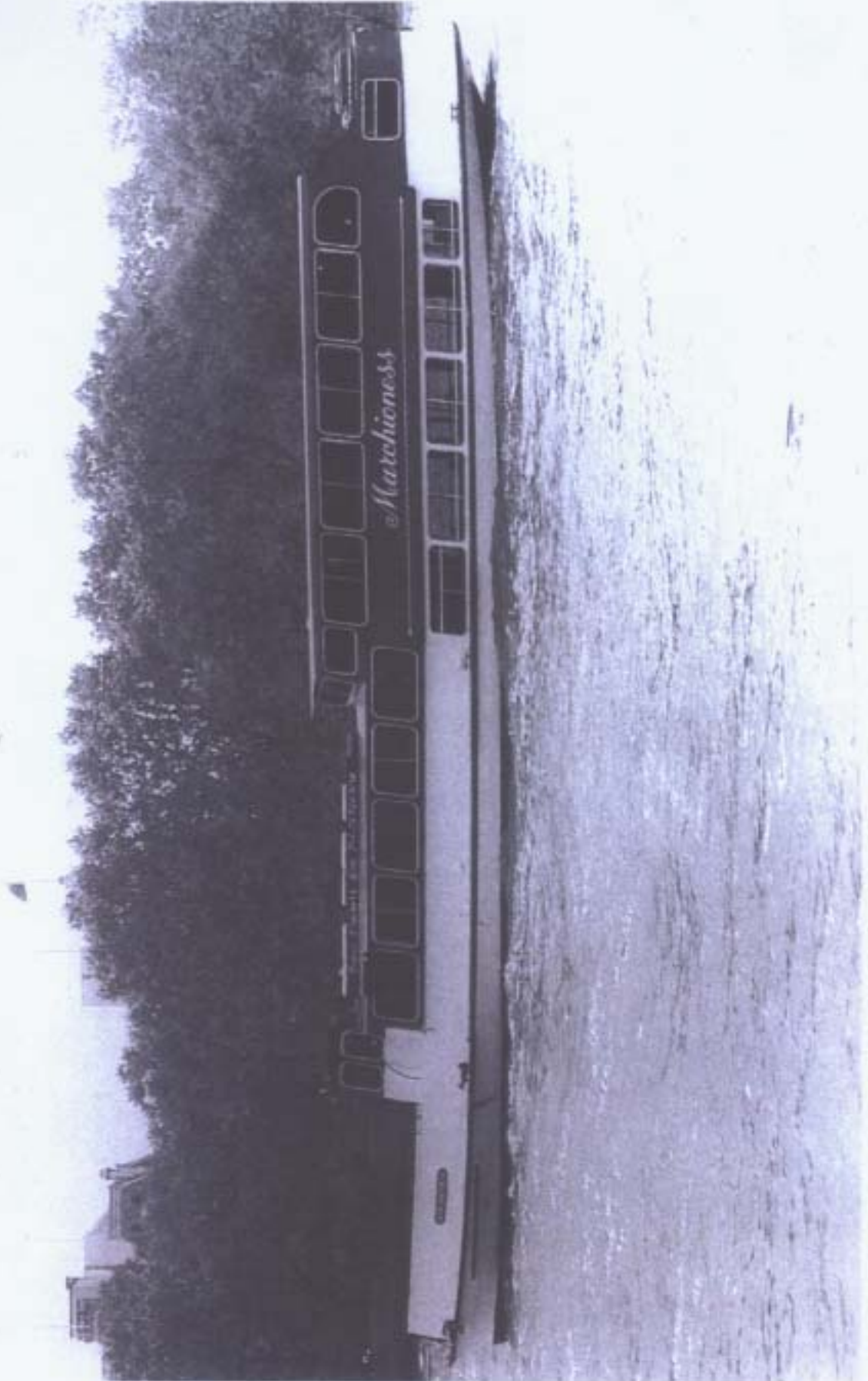


Photograph B



Courtesy of Topham

MARCHIONESS after conversion showing (from forward) wheelhouse, dance deck, upper saloon/bar and lower saloon (below)



Courtesy of The Press Association Ltd

Merchant Shipping Notice M.930.
Interaction between ships

DEPARTMENT
OF TRADE

Merchant Shipping Notice No. **M.930**

INTERACTION BETWEEN SHIPS

Notice to Owners, Masters, Pilots and Tug-Masters

This Notice Supersedes Merchant Shipping Notice No. M.792

1. Since the first Merchant Shipping Notice on this subject was issued in February 1977 there have been further casualties involving British ships where hydrodynamic interaction was a major contributory factor. Three recent casualties involved overtaking situations in relatively narrow channels and in one of these a small coaster quickly capsized after making contact with a larger vessel which was overtaking her. As a result the crew of five men lost their lives (see Appendix 1 para. 1). The Department therefore again draws the attention of those in charge of the handling of ships, particularly in narrow channels, to the hazards arising from this phenomenon between ships when in close proximity to each other.

2. Situations in which hydrodynamic interaction is involved fall into two main categories. The first concerns ships which are attempting to pass one another at very close range. This is usually due to their being confined to a narrow channel. The second concerns ships which are necessarily manoeuvring in very close company for operational reasons. (Appendix 2 summarises conclusions of recent laboratory work on this subject.)

3. In the first category there are two situations—(a) overtaking and (b) the head-on encounter.

(a) **Overtaking.** Interaction is most likely to prove dangerous when two ships are involved in an overtaking manoeuvre. One possible outcome is that the ship being overtaken may take a sheer into the path of the other. Another possibility is that when the ships are abeam of one another the bow of each ship may turn away from the bow of the other causing the respective sterns to swing towards each other. This may also be accompanied by an overall strong attractive force between the two ships due to the reduced pressure between the underwater portion of the hulls. There are other possibilities but the effect of interaction on each ship during the overtaking manoeuvre will depend on a number of factors including the size of one ship relative to the other, the smaller of the two ships feeling the greater effect.

(b) **The head-on encounter.** In this situation interaction is less likely to have a dangerous effect as generally the bows of the two ships will tend to repel each other as they approach. However, this can lead indirectly to a critical situation. In many cases the vessel will already be altering to starboard (assuming that a normal port-to-port passing is intended), when the effect is to increase the swing, probably causing port helm to be applied to check it: if the ship has now approached the edge of the channel and feels bank rejection forward or bank suction aft a marked and possibly uncontrollable port sheer will develop.

4. When ships intend to pass in a narrow channel, whether on the same or opposing courses, it is important that the passing be carried out at a low speed. The speed should be sufficient to maintain control adequately but be well below maximum for the depth of water so that in an emergency extra power is in hand to aid the rudder if necessary. If a reduction in speed is required it should be made in good time before the effects of interaction are felt. A low speed will limit the increase in draught due to squat and limit the sinkage and change of trim caused by interaction itself. It will also prevent the magnification of all interaction effects which arise when one or both ships approach the limiting speed for a channel of particular dimensions. Those in charge of the handling of small ships should appreciate that more action may be required on their part when passing large ships which may be severely limited in the action they can take in a narrow channel. Regardless of the relative size of the ships involved, an overtaking ship should only commence an overtaking manoeuvre after the ship to be overtaken has agreed to the manoeuvre.

5. In the second category, where ships are manoeuvring at close quarters for operational reasons, there is most potential danger when one of the ships is a good deal larger than the other, and this most commonly occurs in normal merchant service operations when a ship is being attended by a tug. A dangerous situation is most likely when the tug, having been steaming alongside the ship, moves ahead to the bow as when preparing to pass or take a tow-line. Due to changes in drag effects, especially in shallow water, the tug has first to exert appreciably more ahead power than she would use in open water to maintain the same speed and this effect is strongest when she is off the shoulder. At that point also hydrodynamic forces tend to deflect the tug's bow away from the ship and attract her stern; but as she draws ahead the reverse occurs, the stern being strongly repulsed, and the increased drag largely disappears. There is thus a strong tendency to develop a sheer towards the ship, and unless the helm, which will have been put towards the ship to counter the previous effect, is very smartly reversed and engine revolutions very quickly reduced the tug may well drive herself under the ship's bow. Further, another effect of interaction arises from the flow around the larger ship acting on the underbody of the smaller vessel causing a consequent decrease in effective stability, and thus increasing the likelihood of capsize if the ships touch. Since it has been found that the strength of hydrodynamic interaction varies approximately as the square of the speed, this sort of manoeuvre should always be carried out at very slow speed. If ships of disparate size are to work in close company at any higher speeds then it is essential that the smaller vessel keeps clear of the hazardous area off the other's bow.

6. It should be noted that in dealing with an interaction situation the control of the ship depends on the rudder which in turn depends on the flow of water round it. The effectiveness of the rudder is therefore reduced if the engine is stopped, and putting the engine astern when a vessel is moving ahead can render the rudder ineffective at a critical time. In many cases a momentary increase of propeller revolutions can materially improve control.

7. Situations involving hydrodynamic interaction between ships vary. In dealing with a particular situation it should be appreciated that when a ship is moving through the water there is a positive pressure field created at the bow, a smaller positive pressure field at the stern and a negative pressure field amidships. The effects of these pressure fields can be significantly increased where the flow of water round the ship is influenced by the boundaries of a narrow or shallow channel and by sudden local constrictions (eg shoals), by the presence of another ship or by an increase in ship speed. An awareness of the nature of the pressure fields round a ship moving through the water and an appreciation of the effect of speed and the importance of rudder action should enable a ship handler to foresee the possibility of an interaction situation arising and to be in a better position to deal with it when it does arise.

1. An example of the first of the two categories illustrates the dangers of an overtaking situation in a narrow channel. This casualty concerns a fully loaded coaster of 500 tons gross which was being overtaken by a larger cargo vessel of about 13,500 tons gross. The channel in the area where the casualty occurred was about 150 metres wide and the lateral distance between the two vessels as the overtaking manoeuvre commenced was about 30 metres. The speeds of the two vessels were initially about 8 and 11 knots respectively. When the stem of the larger vessel was level with the stern of the smaller vessel the speed of the latter vessel was reduced. When the bow of the smaller vessel was level with the midlength point of the larger vessel the bow started to swing towards the larger vessel. The helm of the smaller vessel was put hard to starboard and speed further reduced. The rate of swing to port decreased and the engine was then put to full ahead but a few seconds later the port side of the smaller vessel in way of the break of the foc'sle head contacted the starboard side of the larger vessel. The angle of impact was about 25° and the smaller vessel remained at about this angle to the larger vessel as she first heeled to an angle of about 20° to starboard and shortly afterwards rolled over and capsized, possibly also affected by the large stern wave carried by the larger vessel and which the smaller one entered beam on as she dropped back.

2. The second category is exemplified by a casualty involving a cargo ship of some 1,600 tons gross in ballast and a harbour tug which was to assist her to berth. The mean draughts of the ship and the tug were 3 and 2 metres respectively. The tug was instructed to make fast on the starboard bow as the ship was proceeding inwards, and to do this she first paralleled her course and then gradually drew ahead so that her towing deck was abeam of the ship's forecabin, distant some 6 metres. The speed of the two ships was about 4 knots through the water, the ship steaming at slow speed and the tug, on order to counteract drag, at $\frac{1}{2}$ speed. As the tow line was being passed the tug took a sheer to port and before this could be countered the two vessels touched, the ship's stem striking the tug's port quarter. The impact was no more than a bump but even so the tug took an immediate starboard list, and within seconds capsized. One man was drowned.

APPENDIX 2

1. Extensive laboratory work has been carried out on the combined effect of hydrodynamic interaction and shallow water (ie depth of water less than about twice the draught) and the following conclusions, which accord with practical experience, are among those reached:

- (a) The effects of interaction (and also of bank suction and rejection) are amplified in shallow water.
- (b) The effectiveness of the rudder is reduced in shallow water, and depends very much on adequate propeller speed. The minimum revolutions needed to maintain steerage way may therefore be higher than are required in deep water.
- (c) However, relatively high speeds in very shallow water must be avoided due to the danger of grounding because of squat. An increase in draught of well over 10% has been observed at speeds of about 10 knots, but when speed is reduced squat rapidly diminishes. It has also been found that additional squat due to interaction can occur when two ships are passing each other.
- (d) The transverse thrust of the propeller changes in strength and may even act in the reverse sense to normal.
- (e) Ships may therefore experience quite marked changes in their manoeuvring characteristics as the depth of water under the keel changes. In particular, when the under keel clearance is very small a marked loss of turning ability is likely.

2. Further information is available from the National Maritime Institute, Faggs Road, Feltham, Middlesex, who have made a film entitled "Interaction" in co-operation with the Nautical Institute.

Department of Trade
Marine Division
London WC1V 6LP
April 1980

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Two photographs for consultants report taken on 16/17 September.
Photograph A shows BOWBELLE passing through Tower Bridge,
Photograph B shows the River near Waterloo Bridge



Photograph A



Photograph B

Merchant Shipping Notice M.1264 - Guideline on Navigation Bridge Visibility

DEPARTMENT OF TRANSPORT MERCHANT SHIPPING NOTICE NO. **M.1264**

NAVIGATION BRIDGE VISIBILITY

Notice to Merchant Ship Designers, Builders, Owners and Masters

1. The Maritime Safety Committee of the International Maritime Organisation (IMO), at its Fifty-first Session, approved guidelines on navigation bridge visibility. The Department of Transport recommends that the guidelines, reproduced in the Annex to this Notice, should be followed within the Industry.

2. Scope and Application

2.1 The guidelines have been developed to ensure that ships are designed with adequate visibility from those navigation bridges where bridge watches will be regularly maintained. Builders and designers of ships are urged to use the guidelines during the design process.

2.2 When ships of unusual design cannot comply with the guidelines, arrangements should be such that they provide a level of visibility as near as possible to the level recommended in the guidelines.

2.3 In existing ships, whilst structural alteration or addition of equipment will not be required, the application of paras 1.2 and 1.3 of the Annex is recommended as far as is practicable.

Department of Transport
Marine Directorate
Sunley House
90/93 High Holborn
London WC1V 6LP
January 1987

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ANNEX

GUIDELINES ON NAVIGATION BRIDGE VISIBILITY

1. Field of Vision

1.1 Every effort should be made to place the bridge above all other decked structures, not including funnels, which are on or above the freeboard deck.

1.2 The view of the sea surface from the conning position should not be obscured by more than two ship lengths, or 500 metres, whichever is less, forward of the bow to 10° on either side irrespective of the ship's draught, trim and deck cargo.

1.3 Blind sectors caused by cargo, cargo gear and other obstructions forward of the beam obstructing the view of the sea surface as seen from the conning position, should not exceed 10° each. The total arc of blind sectors should not exceed 20°. The clear sectors between blind sectors should be not less than 5°. However, in the view described in 1.2, each individual blind sector should not exceed 5°.

1.4 The height of the lower edge of the front windows above the deck should be kept as low as possible. In no case should the lower edge present an obstruction to the forward view as described in these guidelines.

1.5 The upper edge of the front windows should allow a forward view of the horizon, for a person with an eye height of 1800 mm, at the conning position when the ship is pitching in heaving seas.

1.6 The horizontal field of vision from the conning position should extend over an arc from more than 22.5° abaft the beam on one side, through forward, to more than 22.5° abaft the beam on the other side.

1.7 From each bridge wing the field of vision should extend over an arc from at least 45° on the opposite bow through dead ahead and then aft to 180° from dead ahead.

1.8 From the main steering position the field of vision should extend over an arc from dead ahead to at least 60° on each side.

1.9 The ship's side should be visible from the bridge wing.

2. Windows

2.1 Framing between windows should be kept to a minimum and not be installed immediately forward of any work station.

2.2 To help avoid reflections, the bridge front windows should be inclined from the vertical plane top out, at an angle of not less than 10° and not more than 25°.

2.3 Polarized and tinted windows should not be fitted.

2.4 A clear view through at least two of the front windows and, depending on the bridge configuration, an additional number of clear view windows, should be provided at all times regardless of weather conditions.

Previous Incidents -
 Bowtrader / Hurlingham,
 Bowbelle / Pride of Greenwich,
 Shell Distributor / New Southern Belle,
 Tahiti / Greycliffe

BOWTRADER/HURLINGHAM

Collision at Tower Bridge in the early hours of 18 October 1981.

Both vessels heading down river and stemming a flood tide. BOWTRADER was overtaking but (a) misjudged the distance off and (b) lost sight of the other vessel, being trimmed by the stern and having a restricted view from the wheelhouse. HURLINGHAM did not realise the dredger was close and altered to port across her bow. Salient factors were inadequate look-out in both vessels, a major contributory factor being the restricted view from both their wheelhouses. HURLINGHAM (constructed like MARCHIONESS) had no view aft because of the superstructure. Damage was only slight, though several passengers suffered minor injuries.

BOWBELLE/PRIDE OF GREENWICH SHELL DISTRIBUTOR/NEW SOUTHERN BELLE

- Two incidents on successive days (8 and 9 June 1983).

BOWBELLE and PRIDE OF GREENWICH were both proceeding down river against the flood tide, late in the evening. The master was on watch on BOWBELLE assisted by the second mate on the fo'c'sle, this arrangement being adopted owing to the very bad view ahead from the bridge, particularly when light. In PRIDE OF GREENWICH, the mate was on watch with the engineer in the wheelhouse with him. Visibility aft from this vessel's wheelhouse, by night, is virtually non-existent. The launch was seen from BOWBELLE some distance ahead, apparently clear, but as the vessels closed she was lost to view from the bridge and the second mate's warning of her proximity, though in time to allow BOWBELLE to reduce her speed, could not prevent collision; impact was, however, light and no great harm was done.

SHELL DISTRIBUTOR (a small tanker) was bound up stream on the flood tide and NEW SOUTHERN BELLE was also heading up stream, though almost stopped as she intended to berth at Lambeth Pier. The tanker, seeing the passenger vessel ahead, tried to find out by VHF what her intentions were but received no reply; she also sounded a whistle signal but the band was playing on the NEW SOUTHERN BELLE and the signal was not heard. Nor was the tanker seen, NEW SOUTHERN BELLE'S vision aft being, it seems, as bad as that from PRIDE OF GREENWICH. With the tide aft SHELL DISTRIBUTOR could not take all way off and moreover had to maintain some ahead power on the engine to assist in negotiating the bridge which was close ahead. Thus when NEW SOUTHERN BELLE commenced her swing off the pier her quarter came in contact with the tanker's bow and following this she also struck the bridge. Again, fortunately, both impacts were light and there were no injuries to personnel, though minor damage was sustained.

TAHITI/GREYCLIFFE

A collision in Sydney Harbour on 3 November 1927.

TAHITI, a ship of 7898 gross tons, outward bound from Sydney, was overtaking the ferry GREYCLIFFE and saw her in good time, but did not apprehend danger until too late. The Inquiry found TAHITI to blame, but regarding GREYCLIFFE said in its report that: "The Master of the GREYCLIFFE was clearly totally ignorant.....of the proximity of the TAHITI.....it (is) urgently incumbent on the proper authorities to.....impress.....upon the masters of all vessels

navigating the harbour the obligation of keeping an effective look-out astern as well as ahead and abeam, and as a first and important step in that direction the owners of vessels should be compelled, in all cases where adequate structural facilities for enabling such a look-out to be kept do not already exist on these vessels, to provide them without loss of time.”

As a result of the collision, GREYCLIFFE sank with the loss of 40 lives.

SCHEDULE 1

INTERNATIONAL REGULATIONS FOR PREVENTING
COLLISIONS AT SEA, 1972

(as amended by Resolution A464(XII))

PART A. GENERAL

RULE 1

Application

(a) These Rules shall apply to all vessels upon the high seas and in all waters connected therewith navigable by seagoing vessels.

(b) Nothing in these Rules shall interfere with the operation of special rules made by an appropriate authority for roadsteads, harbours, rivers, lakes or inland waterways connected with the high seas and navigable by seagoing vessels. Such special rules shall conform as closely as possible to these Rules.

(c) Nothing in these Rules shall interfere with the operation of any special rules made by the Government of any State with respect to additional station or signal lights, shapes or whistle signals for ships of war and vessels proceeding under convoy, or with respect to additional station or signal lights or shapes for fishing vessels engaged in fishing as a fleet. These additional station or signal lights, shapes or whistle signals shall, so far as possible, be such that they cannot be mistaken for any light, shape or signal authorized elsewhere under these Rules.

(d) Traffic separation schemes may be adopted by the Organization for the purpose of these Rules.

(e) Whenever the Government concerned shall have determined that a vessel of special construction or purpose cannot comply fully with the provisions of any of these Rules with respect to the number, position, range or arc of visibility of lights or shapes, as well as to the disposition and characteristics of sound-signalling appliances, without interfering with the special function of the vessel, such vessel shall comply with such other provisions in regard to the number, position, range or arc of visibility of lights or shapes, as well as to the disposition and characteristics of sound-signalling appliances, as her Government shall have determined to be the closest possible compliance with these Rules in respect of that vessel.

RULE 2

Responsibility

(a) Nothing in these Rules shall exonerate any vessel, or the owner, master or crew thereof, from the consequences of any neglect to comply with these Rules or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

(b) In construing and complying with these Rules due regard shall be had to all dangers of navigation and collision and to any special circumstances, including the limitations of the vessels involved, which may make a departure from these Rules necessary to avoid immediate danger.

* The regulations have been amended since the accident. The amendments include amplification of Rule 3(h) and 8(f). See Annex 12C.

RULE 3

General definitions

For the purpose of these Rules, except where the context otherwise requires:

- (a) The word "vessel" includes every description of water craft, including non-displacement craft and seaplanes, used or capable of being used as a means of transportation on water.
- (b) The term "power-driven vessel" means any vessel propelled by machinery.
- (c) The term "sailing vessel" means any vessel under sail provided that propelling machinery, if fitted, is not being used.
- (d) The term "vessel engaged in fishing" means any vessel fishing with nets, lines, trawls or other fishing apparatus which restrict manoeuvrability, but does not include a vessel fishing with trolling lines or other fishing apparatus which do not restrict manoeuvrability.
- (e) The word "seaplane" includes any aircraft designed to manoeuvre on the water.
- (f) The term "vessel not under command" means a vessel which through some exceptional circumstance is unable to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel.
- (g) The term "vessel restricted in her ability to manoeuvre" means a vessel which from the nature of her work is restricted in her ability to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel. The term "vessels restricted in their ability to manoeuvre" shall include but not be limited to:
 - (i) a vessel engaged in laying, servicing or picking up a navigation mark, submarine cable or pipeline;
 - (ii) a vessel engaged in dredging, surveying or underwater operations;
 - (iii) a vessel engaged in replenishment or transferring persons, provisions or cargo while underway;
 - (iv) a vessel engaged in the launching or recovery of aircraft;
 - (v) a vessel engaged in mineclearance operations;
 - (vi) a vessel engaged in a towing operation such as severely restricts the towing vessel and her tow in their ability to deviate from their course.
- (h) The term "vessel constrained by her draught" means a power-driven vessel which because of her draught in relation to the available depth of water is severely restricted in her ability to deviate from the course she is following.
- (i) The word "underway" means that a vessel is not at anchor, or made fast to the shore, or aground.
- (j) The words "length" and "breadth" of a vessel mean her length overall and greatest breadth.
- (k) Vessels shall be deemed to be in sight of one another only when one can be observed visually from the other.
- (l) The term "restricted visibility" means any condition in which visibility is restricted by fog, mist, falling snow, heavy rainstorms, sandstorms or any other similar causes.

PART B. STEERING AND SAILING RULES

Section I. Conduct of vessels in any condition of visibility

RULE 4

Application

Rules in this Section apply in any condition of visibility.

RULE 5

Look-out

Every vessel shall at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision.

RULE 6

Safe speed

Every vessel shall at all times proceed at a safe speed so that she can take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions.

In determining a safe speed the following factors shall be among those taken into account:

- (a) By all vessels:
 - (i) the state of visibility;
 - (ii) the traffic density including concentrations of fishing vessels or any other vessels;
 - (iii) the manoeuvrability of the vessel with special reference to stopping distance and turning ability in the prevailing conditions;
 - (iv) at night the presence of background light such as from shore lights or from back scatter of her own lights;
 - (v) the state of wind, sea and current, and the proximity of navigational hazards;
 - (vi) the draught in relation to the available depth of water.
- (b) Additionally, by vessels with operational radar:
 - (i) the characteristics, efficiency and limitations of the radar equipment;
 - (ii) any constraints imposed by the radar range scale in use;
 - (iii) the effect on radar detection of the sea state, weather and other sources of interference;
 - (iv) the possibility that small vessels, ice and other floating objects may not be detected by radar at an adequate range;
 - (v) the number, location and movement of vessels detected by radar;
 - (vi) the more exact assessment of the visibility that may be possible when radar is used to determine the range of vessels or other objects in the vicinity.

RULE 7

Risk of collision

(a) Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. If there is any doubt such risk shall be deemed to exist.

(b) Proper use shall be made of radar equipment if fitted and operational, including long-range scanning to obtain early warning of risk of collision and radar plotting or equivalent systematic observation of detected objects.

(c) Assumptions shall not be made on the basis of scanty information, especially scanty radar information.

- (d) In determining if risk of collision exists the following considerations shall be among those taken into account:
- (i) such risk shall be deemed to exist if the compass bearing of an approaching vessel does not appreciably change;
 - (ii) such risk may sometimes exist even when an appreciable bearing change is evident, particularly when approaching a very large vessel or a tow or when approaching a vessel at close range.

RULE 8

Action to avoid collision

(a) Any action taken to avoid collision shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship.

(b) Any alteration of course and/or speed to avoid collision shall, if the circumstances of the case admit, be large enough to be readily apparent to another vessel observing visually or by radar; a succession of small alterations of course and/or speed should be avoided.

(c) If there is sufficient sea room, alteration of course alone may be the most effective action to avoid a close-quarters situation provided that it is made in good time, is substantial and does not result in another close-quarters situation.

(d) Action taken to avoid collision with another vessel shall be such as to result in passing at a safe distance. The effectiveness of the action shall be carefully checked until the other vessel is finally past and clear.

(e) If necessary to avoid collision or allow more time to assess the situation, a vessel shall slacken her speed or take all way off by stopping or reversing her means of propulsion.

RULE 9

Narrow channels

(a) A vessel proceeding along the course of a narrow channel or fairway shall keep as near to the outer limit of the channel or fairway which lies on her starboard side as is safe and practicable.

(b) A vessel of less than 20 metres in length or a sailing vessel shall not impede the passage of a vessel which can safely navigate only within a narrow channel or fairway.

(c) A vessel engaged in fishing shall not impede the passage of any other vessel navigating within a narrow channel or fairway.

(d) A vessel shall not cross a narrow channel or fairway if such crossing impedes the passage of a vessel which can safely navigate only within such channel or fairway. The latter vessel may use the sound signal prescribed in Rule 34(d) if in doubt as to the intention of the crossing vessel.

(e) (i) In a narrow channel or fairway when overtaking can take place only if the vessel to be overtaken has to take action to permit safe passing, the vessel intending to overtake shall indicate her intention by sounding the appropriate signal prescribed in Rule 34(c)(i). The vessel to be overtaken shall, if in agreement, sound the appropriate signal prescribed in Rule 34(c)(ii) and take steps to permit safe passing. If in doubt she may sound the signals prescribed in Rule 34(d).

(ii) This Rule does not relieve the overtaking vessel of her obligation under Rule 13.

(f) A vessel nearing a bend or an area of a narrow channel or fairway where other vessels may be obscured by an intervening obstruction shall navigate with particular alertness and caution and shall sound the appropriate signal prescribed in Rule 34(e).

(g) Any vessel shall, if the circumstances of the case admit, avoid anchoring in a narrow channel.

Section II. Conduct of vessels in sight of one another

RULE 11

Application

Rules in this Section apply to vessels in sight of one another.

RULE 13

Overtaking

(a) Notwithstanding anything contained in the Rules of Part B, Sections I and II any vessel overtaking any other shall keep out of the way of the vessel being overtaken.

(b) A vessel shall be deemed to be overtaking when coming up with another vessel from a direction more than 22.5 degrees abaft her beam, that is, in such a position with reference to the vessel she is overtaking, that at night she would be able to see only the sternlight of that vessel but neither of her sidelights.

(c) When a vessel is in any doubt as to whether she is overtaking another, she shall assume that this is the case and act accordingly.

(d) Any subsequent alteration of the bearing between the two vessels shall not make the overtaking vessel a crossing vessel within the meaning of these Rules or relieve her of the duty of keeping clear of the overtaken vessel until she is finally past and clear.

Rule 18

Responsibilities between Vessels

Except where Rules 9, 10 and 13 otherwise require:

- (a) A power-driven vessel underway shall keep out of the way of:
 - (i) a vessel not under command;
 - (ii) a vessel restricted in her ability to manoeuvre;
 - (iii) a vessel engaged in fishing;
 - (iv) a sailing vessel.
- (b) A sailing vessel underway shall keep out of the way of:
 - (i) a vessel not under command;
 - (ii) a vessel restricted in her ability to manoeuvre;
 - (iii) a vessel engaged in fishing.
- (c) A vessel engaged in fishing when underway shall, so far as possible, keep out of the way of:
 - (i) a vessel not under command;
 - (ii) a vessel restricted in her ability to manoeuvre.
- (d)
 - (i) Any vessel other than a vessel not under command or a vessel restricted in her ability to manoeuvre shall, if the circumstances of the case admit, avoid impeding the safe passage of a vessel constrained by her draught, exhibiting the signals in Rule 28.
 - (ii) A vessel constrained by her draught shall navigate with particular caution having full regard to her special condition.
- (e) A seaplane on the water shall, in general, keep well clear of all vessels and avoid impeding their navigation. In circumstances, however, where risk of collision exists, she shall comply with the Rules of this Part.

PART C. LIGHTS AND SHAPES

RULE 20

Application

- (a) Rules in this Part shall be complied with in all weathers.
- (b) The Rules concerning lights shall be complied with from sunset to sunrise, and during such times no other lights shall be exhibited, except such lights as cannot be mistaken for the lights specified in these Rules or do not impair their visibility or distinctive character, or interfere with the keeping of a proper look-out.
- (c) The lights prescribed by these Rules shall, if carried, also be exhibited from sunrise to sunset in restricted visibility and may be exhibited in all other circumstances when it is deemed necessary.
- (d) The Rules concerning shapes shall be complied with by day.
- (e) The lights and shapes specified in these Rules shall comply with the provisions of Annex I to these Regulations.

RULE 21

Definitions

- (a) "Masthead light" means a white light placed over the fore and aft centreline of the vessel showing an unbroken light over an arc of the horizon of 225 degrees and so fixed as to show the light from right ahead to 22.5 degrees abaft the beam on either side of the vessel.
- (b) "Sidelights" means a green light on the starboard side and a red light on the port side each showing an unbroken light over an arc of the horizon of 112.5 degrees and so fixed as to show the light from the right ahead to 22.5 degrees abaft the beam on its respective side. In a vessel of less than 20 metres in length the sidelights may be combined in one lantern carried on the fore and aft centreline of the vessel.
- (c) "Sternlight" means a white light placed as nearly as practicable at the stern showing an unbroken light over an arc of the horizon of 135 degrees and so fixed as to show the light 67.5 degrees from right aft on each side of the vessel.
- (d) "Towing light" means a yellow light having the same characteristics as the "sternlight" defined in paragraph (c) of this Rule.
- (e) "All-round light" means a light showing an unbroken light over an arc of the horizon of 360 degrees.
- (f) "Flashing light" means a light flashing at regular intervals at a frequency of 120 flashes or more per minute.

RULE 22

Visibility of lights

The lights prescribed in these Rules shall have an intensity as specified in Section 8 of Annex I to these Regulations so as to be visible at the following minimum ranges:

- (a) In vessels of 50 metres or more in length:
 - a masthead light, 6 miles;
 - a sidelight, 3 miles;
 - a sternlight, 3 miles;
 - a towing light, 3 miles;
 - a white, red, green or yellow all-round light, 3 miles.
- (b) In vessels of 12 metres or more in length but less than 50 metres in length:
 - a masthead light, 5 miles; except that where the length of the vessel is less than 20 metres, 3 miles;

- a sidelight, 2 miles;
- a sternlight, 2 miles;
- a towing light, 2 miles;
- a white, red, green or yellow all-round light, 2 miles.

(c) In vessels of less than 12 metres in length:

- a masthead light, 2 miles;
- a sidelight, 1 mile;
- a sternlight, 2 miles;
- a towing light, 2 miles;
- a white, red, green or yellow all-round light, 2 miles.

(d) In inconspicuous, partly submerged vessels or objects being towed:

- a white all-round light, 3 miles.

RULE 23

Power-driven vessels underway

(a) A power-driven vessel underway shall exhibit:

- (i) a masthead light forward;
- (ii) a second masthead light abaft of and higher than the forward one; except that a vessel of less than 50 metres in length shall not be obliged to exhibit such light but may do so;
- (iii) sidelights;
- (iv) a sternlight.

(b) An air-cushion vessel when operating in the non-displacement mode shall, in addition to the lights prescribed in paragraph (a) of this Rule, exhibit an all-round flashing yellow light.

- (c) (i) A power-driven vessel of less than 12 metres in length may in lieu of the lights prescribed in paragraph (a) of this Rule exhibit an all-round white light and sidelights;
- (ii) a power-driven vessel of less than 7 metres in length whose maximum speed does not exceed 7 knots may in lieu of the lights prescribed in paragraph (a) of this Rule exhibit an all-round white light and shall, if practicable, also exhibit sidelights;
- (iii) the masthead light or all-round white light on a power-driven vessel of less than 12 metres in length may be displaced from the fore and aft centreline of the vessel if centreline fitting is not practicable, provided that the sidelights are combined in one lantern which shall be carried on the fore and aft centreline of the vessel or located as nearly as practicable in the same fore and aft line as the masthead light or the all-round white light.

Port of London Authority

Extracts from the Port of London River Bylaws

PART IV STEERING AND SAILING

Obligation of master

14. It shall be the duty of the master of a vessel to comply with the requirements of –

- (a) this Part of these byelaws;
- (b) Part B of the International Rules as modified by byelaw 15 of these byelaws.

Modification of the International Rules

15. Notwithstanding Part B of the International Rules –

- (a) a vessel shall not cross or enter a fairway so as to obstruct another vessel proceeding along the fairway;
- (b) when a power-driven vessel operating as a ferry is crossing the river, she shall keep out of the way of a vessel proceeding along the river;
- (c) a power-driven vessel shall not proceed abreast of another power-driven vessel except for the purposes of overtaking that other vessel;
- (d) a vessel in a fairway above Tilburyness shall not overtake a vessel which is herself overtaking another vessel.

Note – For further provisions about overtaking, see Rules 9(e) and 13 on pages 9 and 11.

Additions to the International Rules

16. The steering and sailing rules in the following byelaws 17 to 19 shall be additional to and shall not derogate from the International Rules as modified by these byelaws.

Vessels navigating against the tide and turning about

17. (1) A power-driven vessel navigating against the tide shall when approaching or passing under a bridge, or when approaching or rounding a bend in the river, ease her speed and prepare to stop to avoid risk of collision with another vessel that is navigating with the tide.

Note – Rules 9(f) and 34(e) on pages 9 and 23 may also apply.

(2) A power-driven vessel intending to turn about shall before commencing to do so ensure that the river is sufficiently clear for the manoeuvre not to impede any other vessel.

Vessels above Cherry Garden Pier

19. (1) Above Cherry Garden Pier –

- (a) a vessel of less than 40 metres in length, and
- (b) a sailing vessel

shall not impede the passage of –

- (i) a vessel of 40 metres or more in length, or
- (ii) a vessel engaged in towing.

(2) Above Westminster Bridge, and in addition to their obligations under paragraph (1) above –

- (a) a vessel of less than 20 metres in length, and
- (b) a sailing vessel

shall not impede the passage of a vessel of 20 metres or more in length.

(3) Notwithstanding that a vessel has priority under paragraph (1) or (2) above, she shall when navigating against the tide comply with byelaw 17(1) above.

Note – Byelaw 4 of the Port of London River (Amendment) Byelaws 1987 substituted this byelaw for the original byelaw 19, as from 17th February 1988.

PART V LIGHTS AND SHAPES

Obligations of master

20. It shall be the duty of the master of a vessel to comply with the requirements of –

- (a) this Part of these byelaws unless otherwise stated;
- (b) Part C of the International Rules as relaxed and as modified by byelaws 21 and 22 of these byelaws.

Relaxation of the International Rules

21. Notwithstanding Part C of and Annex I to the International Rules –

- (a) on a power-driven vessel of 20 metres but less than 50 metres in length the forward masthead light, or if only one masthead light is carried then that light, need not be placed at a greater height above the hull than 3.5 metres;
- (b) on a power-driven vessel that ordinarily navigates both above and below London Bridge the masthead light or lights may, when the vessel is navigating above Cherry Garden Pier, be placed at any convenient height above the hull.

Extracts from Amended Collision Regulations.
Rules 3 and 8, in force 19 November 1989

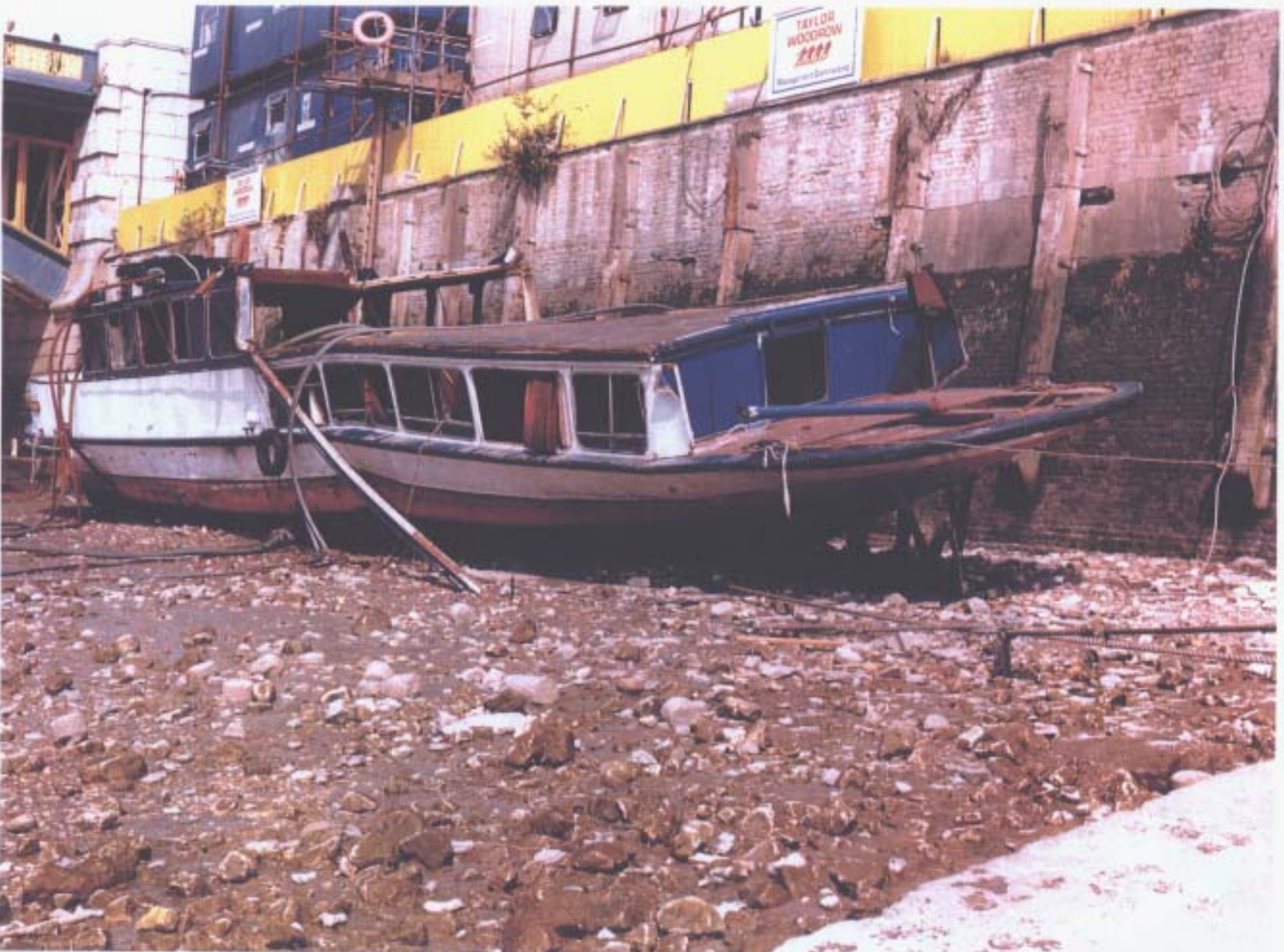
RULE 3
(f to l)

- (f) The term "vessel not under command" means a vessel which through some exceptional circumstance is unable to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel.
- (g) The term "vessel restricted in her ability to manoeuvre" means a vessel which from the nature of her work is restricted in her ability to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel. The term "vessels restricted in their ability to manoeuvre" shall include but not be limited to:
 - (i) a vessel engaged in laying, servicing or picking up a navigation mark, submarine cable or pipeline;
 - (ii) a vessel engaged in dredging, surveying or underwater operations;
 - (iii) a vessel engaged in replenishment or transferring persons, provisions or cargo while underway;
 - (iv) a vessel engaged in the launching or recovery of aircraft;
 - (v) a vessel engaged in mineclearance operations;
 - (vi) a vessel engaged in a towing operation such as severely restricts the towing vessel and her tow in their ability to deviate from their course.
- (h) The term "vessel constrained by her draught" means a power-driven vessel which, because of her draught in relation to the available depth and width of navigable water, is severely restricted in her ability to deviate from the course she is following.
- (i) The word "underway" means that a vessel is not at anchor, or made fast to the shore, or aground.
- (j) The words "length" and "breadth" of a vessel mean her length overall and greatest breadth.
- (k) Vessels shall be deemed to be in sight of one another only when one can be observed visually from the other.
- (l) The term "restricted visibility" means any condition in which visibility is restricted by fog, mist, falling snow, heavy rainstorms, sandstorms or any other similar causes.

RULE 8
(a to f)

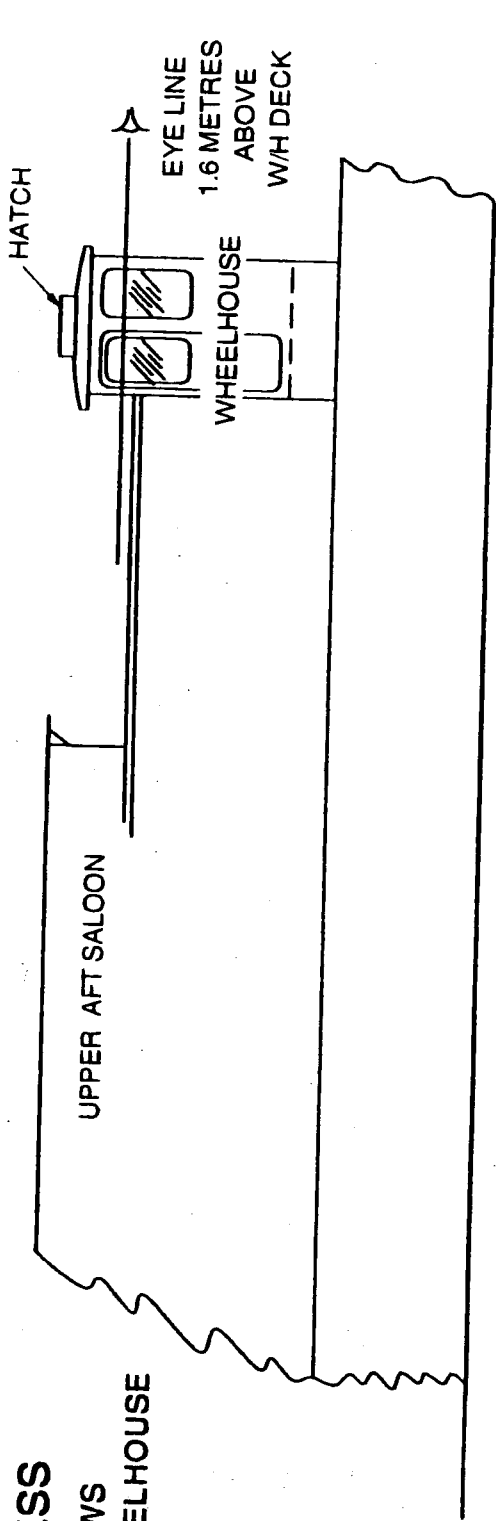
Action to avoid collision

- (a) Any action taken to avoid collision shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship.
- (b) Any alteration of course and/or speed to avoid collision shall, if the circumstances of the case admit, be large enough to be readily apparent to another vessel observing visually or by radar; a succession of small alterations of course and/or speed should be avoided.
- (c) If there is sufficient sea room, alteration of course alone may be the most effective action to avoid a close-quarters situation provided that it is made in good time, is substantial and does not result in another close-quarters situation.
- (d) Action taken to avoid collision with another vessel shall be such as to result in passing at a safe distance. The effectiveness of the action shall be carefully checked until the other vessel is finally past and clear.
- (e) If necessary to avoid collision or allow more time to assess the situation, a vessel shall slacken her speed or take all way off by stopping or reversing her means of propulsion.
- (f)
 - (i) A vessel which, by any of these Rules, is required not to impede the passage or safe passage of another vessel shall, when required by the circumstances of the case, take early action to allow sufficient sea room for the safe passage of the other vessel.
 - (ii) A vessel required not to impede the passage or safe passage of another vessel is not relieved of this obligation if approaching the other vessel so as to involve risk of collision and shall, when taking action, have full regard to the action which may be required by the Rules of this part.
 - (iii) A vessel the passage of which is not to be impeded remains fully obliged to comply with the Rules of this part when the two vessels are approaching one another so as to involve risk of collision.

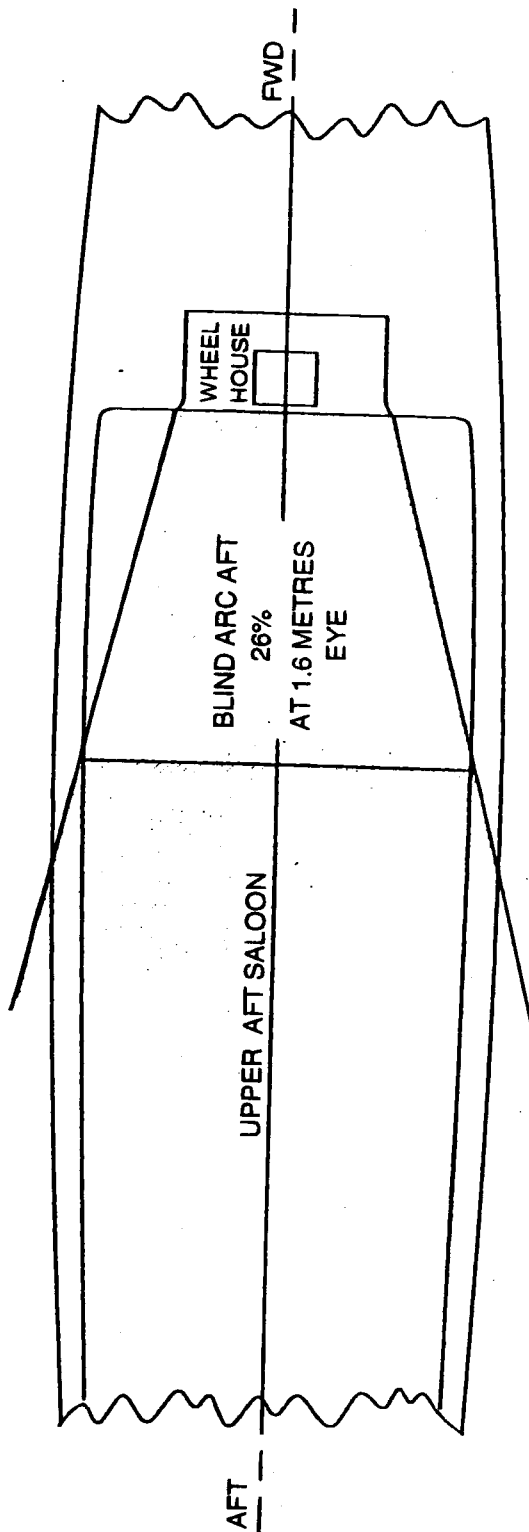


MARCHIONESS
DRAWING SHOWS
VISIBILITY FROM WHEELHOUSE

NOT TO SCALE



ELEVATION



PLAN

APPENDIX

Alternative Text

Regulation 9(4) and (5) of the Merchant Shipping (Accident Investigation) Regulations 1989 provide that any person whose reputation is likely to be adversely affected by the Report shall have the opportunity to comment on that part of the Report before it is submitted to the Secretary of State. If, following representations, passages in the Report remain in issue that person can provide an alternative text for the part in issue which must be included with the Report as an appendix.

Tidal Cruises Limited have exercised their rights in this respect with regard to Section 17.9 of the Report, and have submitted the following alternative text.

17.9 Tidal Cruises Limited

The rather "hands off" method of management adopted by Tidal Cruises Limited will be apparent from Section 5.2. It is not intended to criticise them for it: Thames Watermen are a notably independent body of men and an attempt to exercise close control from a desk ashore would probably lead to more problems than it would solve. They should, however, take steps to ensure that in future the same crew should not undertake two successive night cruises; see Section 9.8.

However, the firm must also be looked at as having been responsible for the re-design of MARCHIONESS when she was substantially altered leading to the poor view aft (see Annex 14). This, like the poor view ahead from the BOWBELLE, substantially contributed to the accident. At first sight it is particularly surprising that the two partners in Tidal Cruises Limited should permit such a design since both are experienced Watermen, but the difficulties it would bring were not fully recognised either by them, or by the DTI who approved the design. Both they and the DTI considered the difficulties would be overcome by Skippers; it is tragic that they have been proved wrong.

The Department of Transport have also exercised their rights in this respect. The Department's Marine Directorate accepts that in the light of the MARCHIONESS/BOWBELLE collision further consideration needs to be given to the questions of visibility from the bridge and efficient look-out on vessels using waterways such as the Thames. However, it considers that the final two paragraphs of Section 17.11 make generalisations about design and about an alleged malaise which are not justified by the facts and submits that the following text replace the paragraphs in question.

17.11 The Department of Transport

All this raises the question whether the Department ought to have permitted vessels with limited visibility from the bridge such as the MARCHIONESS or the BOWBELLE to operate on the Thames. The design of a vessel needs to take into account its intended function, and this may require reasonable and practicable solutions to be considered. With passenger launches such as the MARCHIONESS, the problem of astern visibility was considered by the Department at considerable length. After a number of collisions at night on the Thames in the early 1980's, a list of passenger launches with unsatisfactory visibility from the wheelhouse was drawn up. These problems (and others) were discussed with the Thames Passenger Services Federation and others in September 1982 when measures to improve astern visibility were agreed. A further meeting was held on 1 May 1984 to confirm and consolidate the earlier discussions, and this was attended by the Port of London Authority,

Metropolitan Police (Thames Division), The Company of Watermen and Lightermen, The Thames Passenger Services Federation and 42 Skippers and Crew members of Thames Passenger vessels. The arrangements as they applied to the MARCHIONESS were considered and approved by the Department in October 1984. The incidents also led to discussion of the problems of visibility from the bridges of vessels such as the BOWBELLE. At a meeting in October 1982, British Dredging stated they had made recent operational improvements with the use of on board VHF sets to communicate between fore-castle and wheelhouse. Since the measures were put into effect there were no further reported incidents until the MARCHIONESS/BOWBELLE collision.

In a separate development the Department participated in the development of internationally agreed guidelines for sea going ships for the visibility from navigation bridges. These guidelines were intended to apply to new ships but existing ships were expected to meet the new criteria wherever it was practical to do so. The design of the bridge on the BOWBELLE had to be such as to permit the vessel to reach berths above the Tower Bridge and consequently to pass under fixed height bridge arches. The design followed a practice that had been in use for many years by the East Coast Collier fleet which served the London Power Stations – the so called “flat-irons”. The problem is not confined to the Thames: the basic concept of the “flat-irons” has led in the few years to the development of a “Rhine barge” type sea going vessel with hydraulically elevated wheelhouses. Nor is the existence of blind sectors over the bow confined to vessels with low height wheelhouses as evidenced by container vessels with containers stacked forward of the bridge.

Whatever the design of bridge it is the responsibility of the Master to comply with the International Regulations for Preventing Collisions at Sea and to keep a proper look-out. It is the Master's and Owner's responsibility to set up an operational regime suited to the design which ensures compliance with the Regulations. The operational requirements are crucial in coming to any conclusions about the adequacy of bridge design. In the light of the MARCHIONESS/BOWBELLE collision it is clear that the Department needs to give further attention to both bridge design and look-out arrangements to further assist the task of those navigating these types of vessels.

GLOSSARY

AGGREGATE SUCTION DREDGER	A vessel which reclaims aggregate from the sea bed
AIR DRAUGHT	The distance measured from the waterline to the highest point of a vessel
BUOYANT APPARATUS	A form of raft
CABLE	One-tenth of a nautical mile (about 600 feet)
CLASS V VESSEL	A small passenger vessel operating in sheltered waters
CLASS VIII VESSEL	A non-passenger vessel operating in the coastal and short sea trade
dBA	A measure of sound level
GM) GZ)	Measures of a vessel's tendency to return to the upright, when heeled
INTERACTION	See Annex 8
KNOTS	Nautical miles per hour
MERCHANT SHIPPING NOTICES (M NOTICES)	Notices by Department of Transport to the Shipping Industry, identified by the letter M and a number
MILE	Nautical mile, about 1.15 land miles
PLA	Port of London Authority
RANGE OF TIDE	Difference in height between high and low water
SPEED OVER GROUND	The actual speed as measured against a fixed mark
SPEED THROUGH WATER	The speed which would be recorded with reference to a mark floating freely and therefore moving with the water through which the ship is travelling
THAMES NAVIGATION SERVICE (TNS)	The PLA's navigation information service, broad-casting (for the upper river) through Woolwich Radio
WOOLWICH RADIO	See Thames Navigation Service