Naval or Air Force craft, when it is convenient to do so; otherwise to visually signal the letter 'N' (Negative).

(9) To read the barometer regularly, particularly when in a hurricane zone in season.

(10) To make sure that lookoutmen are safe and that all watchkeepers are relieved on time.

(11) To make sure that suitable decklights are switched on and off at sunset and sunrise. This applies also to the navigation lights.

(12) To ensure that weather-deck doors and openings are closed when not in use.

(13) To ensure that flags are flying freely and that signal halliards are slackened in damp weather.

(14) To check the compass error regularly.

(15) To record in the Deck Logbook: engine movements and revolutions; log distances; wind directions and speeds; air and sea temperatures; barometer readings; weather conditions; courses steered; allowances made for current set or leeway; results of sextant observations; times of passing major navigational marks; names of pilots; details of action in fog or bad visibility; times when holds are ventilated; tank soundings; times when navigation lights are switched on and off; entries of heavy weather, and any soundings made together with the nature of the bottom, if known.

(16) To keep a meteorological logbook where arranged.

(17) To make sure that anchors are clear for use when approaching port.

(18) To frequently observe smoke-detecting apparatus cabinets.

(19) To bear in mind that awnings may be ripped by freshening winds and take action to prevent this.

(20) To ensure that men are clear of the fog-signalling apparatus before the O.O.W. uses it.

(21) To ensure that relieved helmsmen report the course to the O.O.W.

Duties which must take pride of place over others include numbers (1), (2), (3), (6), (11), and (14). It should be noted, however, that the execution of (1) will automatically include duties (4), (7), (10), (12), (13), (19), (20), and (21).

When taking over a watch, the O.O.W. will require to know: the course steered; allowances for leeway and set; the rudder carried, i.e. continuous port or starboard helm; the revolutions; ships or navigational marks in sight; the ship's position; whether sounding gear or radar is in use; whether extra lookouts are posted and where they are situated; details of any sound signals heard; the compass error. He will read and initial the Master's Night Order Book. It is customary to write

the logbook entries for the watch after being relieved, and when the relieving officer has verbally agreed to take over the watch.

B. In Port, Berthed

(1) To ensure that a proper gangway watch is kept; that the gangway is adjusted for tidal range; that no unauthorised persons are allowed aboard and that the Officers' tally board is properly used. This latter indicates which Officers are aboard and which one is on duty.

(2) To ensure that all moorings are properly fitted with rat-guards.

(3) To ensure that decklights are switched on and off at dusk and dawn.

(4) To attend cargo operations, storing of the ship, and the supplying of fresh water to tanks.

(5) To ensure that watchmen are properly relieved and that when men are working overside or aloft their equipment is in a safe condition and that a man is employed to watch for their safety. The vessel should fly the two-flag signal 'RY', which means 'Reduce speed when passing me'.

(6) To frequently observe fire or smoke-detecting apparatus and to carry out fire patrols.

(7) To investigate disciplinary offences.

(8) To prevent smoking in appropriate parts of the ship.

(9) To be responsible for the custody of keys.

(10) To enter into the logbook: weather conditions; details of repair work; number of men employed on repairs; times when cargo is loaded or discharged and which holds are in use; the number of stevedore gangs employed; reasons for stoppages of cargo work; the ventilation of holds; tank soundings; the draught each day; details of heavy lift work; names of gangway watchmen.

(11) To regularly check moorings and fenders.

(12) To carry out sea duties (9), (12), (13), and (19).

C. In Port, at Anchor

(1) To ensure that the anchor lights are burning properly and at equal brilliancy.

(2) To ensure that the anchor ball is displayed by day.

(3) To make the appropriate sound signals in fog or poor visibility.

(4) To take all possible steps to detect a dragging anchor.

(5) To make sure a second anchor is ready for letting go.

(6) To lift the gangway when seas are breaking over it.

(7) To observe all boats arriving at and leaving the ship.

(8) To call the Master instantly should the vessel be in danger.

(9) To record in the logbook: the depth of water at the anchorage; the amount of cable veered; the nature of the bottom; the anchor bearings or transit bearings, i.e. those used to check the vessel's position;

any adjustments to the amount of cable veered; details of boats arriving at and leaving the ship; the arrival draught; any of the entries which are made at sea or when berthed in port and which are appropriate.

(10) To carry out sea duties (1), (4), (8), (9), (10), (11), (12), (13), (14), (16), (18), (19), and (20).

(11) To post extra lookouts in poor visibility, commence a radar watch, and call the Master.

(12) To ensure that the vessel is properly sheered (Chapter 1).

In all cases the O.O.W. should carefully attend to Standing Orders. He should report to the Master when:

(*a*) there is a deterioration of visibility, or
(*b*) the vessel sights certain navigational marks, or
(*c*) there is any unusual sighting of, or failure to sight, navigation marks, or
(*d*) any vessel fails in its duty to give way, or
(*e*) wrecks, unidentified objects, or survivors are observed, or
(*f*) the barometer falls sharply.

DUTIES OF OFFICERS PRIOR TO LEAVING PORT (BERTHED)

The following duties will be shared among the Officers:

(1) To ensure that all hatchways are securely battened down and that booby (hold entrance) hatches are locked. All weather-deck doors should be closed where practical.

(2) All ship's side rails must be properly shipped and secured. Overside nets should be hauled aboard.

(3) Derricks will be stowed and securely lashed in their crutches. The decks are to be cleared of all running rigging.

(4) Standing rigging should be set tight—this applies when it has been cast off to facilitate the swinging out of derricks.

(5) To ensure that a proper exchange of documents has been made between the ship and the dock offices.

(6) All cargo should be securely tommed (shored) to prevent it shifting in a seaway.

(7) A thorough check must be made to ensure that no cargo for that port is being overcarried to the next destination.

(8) The Master will probably require a list to be made enumerating the spaces remaining within cargo compartments, particularly when the vessel is loading. Ideally, a copy of this should be sent to the next loading port.

(9) The draught is to be accurately read on both sides (in case the vessel is listed) and the density of the dock water determined. In some

localities where high temperatures prevail, such as the Persian Gulf, this may be as low as 996 grammes per litre, and a hydrometer suitable for oils will have to be used. The form FRE 13 (Notice of Draught and Freeboard) must be completed, signed by the Master and Chief Officer, and posted in a conspicuous place. The Master will enter the details listed in this form into the Official Logbook.

(10) To ensure that strong rooms and mail rooms are locked.

(11) To carry out a thorough search for stowaways in all parts of the ship, with particular reference to: lifeboats; funnel casings; large ventilators; crew accommodation; empty oil-cargo-tanks; engine-rooms; tunnel-escape trunkways and shaft tunnels (underneath the limbers); storerooms; coils of rope covered with canvas; holds, and the steering flat, etc. Stowaways may use the chain locker.

(12) To ensure that Muster Lists are posted throughout the ship listing the emergency duties of all crew members.

(13) To post a copy of the Crew Agreement (ALC 6) in the crew accommodation.

(14) To ensure that a cabin, if required, is prepared for the Pilot.

(15) Late documents should be prepared ready for landing by means of the pilot cutter.

(16) To make preparations for the compass adjuster, if any.

(17) To obtain the latest weather-forecast chart, if required, and also the latest ice reports, in season.

(18) The whistle lanyards and main radio aerials should be erected.

(19) All necessary flags should be made ready. The Blue Peter (code flag 'P') should preferably be displayed for the final 12 hours.

(20) Telephones should be tested throughout the ship. Those provided by the shore Authorities should be disconnected and taken ashore. This applies to shore supplies of steam, gas, electricity, and water, etc.

(21) A check should be made to ensure that all passengers and crew members are aboard. This will normally be done by the Heads of the departments, who will report to the Chief Officer.

(22) The patent log, if of the towing type, should be made ready for streaming.

(23) The gyro compass should be running for about the final 6–12 hours. The gyro error should be checked and repeaters synchronised with the master compass. Some Masters prefer to adjust the repeaters so that they show no error. All clamps must be released on the master compass.

(24) The navigation bridge should be made ready with particular reference to: binoculars; telescopes; megaphones; chalk for course board; charts; chartwork instruments; sharp pencils; bridge notebook; signalling lamps; compass binnacle covers; azimuth mirrors (these should be tested for error by observing the bearings of an object with

the arrow both up and down); the V.H.F. radio; torches; the chronometers should be checked for error; the radar, echo-sounding machine, engine-room telegraphs, steering-gear, whistles, and loud hailers should be tested; current Notices to Mariners must be obtained.

(25) Ratguards should be brought aboard.

(26) Fenders and gangways should be tended ready for shipping.

(27) All boats and lighters should be cast off. Propeller guards (floating spars, tangential to poop deck) should be shipped.

(28) To attend the moorings if the Engineers wish to test the engines.

When leaving an anchorage, particularly when cargo has been loaded or discharged, duties (23) and (24) may be dispensed with, assuming a proper anchor watch has been kept. Duty (25) will not apply.

DUTIES OF OFFICERS PRIOR TO ARRIVAL IN PORT

(1) Arrange for all necessary flags to be made ready, such as quarantine signals and the ship's signal letters group. The correct courtesy flag should be to hand.

(2) To prepare a list of cargo, together with its volume, carried in unregistered spaces, for declaration to the Customs Officers.

(3) To prepare derricks and cranes ready for immediate commencement of cargo work.

(4) To warn the Engineers at least 1 hour before the engines are to be stopped.

(5) To prepare a gangway and fenders ready for rigging overside.

(6) The patent towing log must be handed (brought aboard).

(7) A pilot ladder must be made ready.

(8) Mooring lines must be prepared for running. Heaving lines should be distributed fore and aft, and the springs should preferably have heaving lines already secured to them.

CONNING THE SHIP; HELM ORDERS

There is no single system of verbal helm orders, and the new seafarer is strongly advised to study the various methods and choose one for his own use, endeavouring to make sure that it will at all times be suitable for the prevailing conditions, e.g. conning among heavy traffic and also in narrow waters, etc., and that it is beyond misinterpretation.

The use of 'Hard a' starboard (or port)' is generally an emergency order when a rapid swing is required, and the order should be given in a calm voice to ensure that a flustered helmsman does not put the wheel over in the wrong direction. This latter action is likely to be a mistake made by any one of us, and may occur particularly when the helmsman is watching the events through the wheelhouse windows, instead of his

instruments. The use of this order, however, may be quite regular and frequent in narrow channels when the ship is proceeding at slow speeds and carrying large rudder correction angles.

All orders to the helmsman must be repeated by him; when he reports a condition such as 'Wheel's amidships, Sir' this must be acknowledged by the O.O.W.

If the O.O.W. wishes to alter the vessel's course from, say, 270 to 330 degrees he may give the order, 'Alter course 60 degrees to starboard', or 'Steer 330 degrees', or else he may choose to control the swing of the ship himself, in which case he will watch the compass and say, 'Twenty degrees starboard wheel'. As the ship commences her swing the O.O.W. may say, 'Ease the wheel' or 'Ease to ten', in which case the wheel is rotated until the indicator shows a less value than 20 degrees, or else 10 degrees. The next order will be ''midships'. When the vessel reaches a heading of about 320 degrees (depending upon the rate of swing) the order will be 'Steady' or 'Meet her!', the wheel being rotated to provide port helm in order to check the swing. This must be done so that the ship stops swinging on a heading of 330 degrees, when the order is given 'Steady as she goes' or 'Steady on 330 degrees'.

This method of conning may be useful when the O.O.W. wishes to alter course to avoid another vessel. If he thinks an alteration of 15 degrees to port is sufficient, he may say simply 'Steer fifteen degrees to port', but if he prefers to swing the ship until a suitable alteration has been achieved, then he may use the sequence, 'Twenty degrees port wheel' . . . 'Ease to five' . . . ''midships' . . . 'Steady' . . . 'Steady as she goes'. The helmsman now reports the ship's heading.

Some Officers and Pilots use the expression 'Port twenty!', etc., but many helmsmen interpret this to mean 'You are to alter course twenty degrees to port' while others understand it to mean 'You are to carry twenty degrees of port wheel'. For this reason there must always be a clear understanding between the conning Officer and the helmsman. Assuming the latter interpretation, the above altering sequence can be changed to, 'Port twenty' . . . 'Port five' . . . ''midships' . . . 'Starboard fifteen' (to steady the swing) . . . ''midships' . . . 'Steady as she goes'.

The expression 'Port five' is used here instead of 'Ease to five'.

When instructing the helmsman to steer a certain course such as 330 degrees, it is always expressed as 'Three, three, Oh'. The helmsman must report courses in a similar manner.

If the O.O.W. wishes to be absolutely precise in his duties he may watch the wheel indicator as he gives an order. This enables him to detect instantly any mistaken helm application. The rudder indicator naturally shows a delayed action compared with that of the wheel, and a mistake is not instantly observed.

Whenever an order is rung on the engine-room telegraphs it will be

answered by the Engineer, and the smaller pointer on the bridge telegraph will align itself with the main control. It is most important that the Officer in charge of the telegraphs should observe this small pointer in order to detect errors.

THE BOW THRUSTER

This device will enable the vessel to be turned within her own length and is an excellent aid to ship-manoeuvring. Whether or not it is fitted to a ship depends very much upon how much use it is likely to see. Orders such as PORT THRUST, or THRUST TO PORT are sometimes grossly misinterpreted to mean THRUST WATER TO PORT, in which case the ship moves to starboard, undoubtedly the opposite required! To avoid any possibility of misunderstanding, I prefer the order BOW TO PORT. Opinion differs as to the thruster's efficiency at forward speed. Above about 4 knots it is unlikely to have any effect.

THE LOGBOOKS

Reference has been made in previous sections to a logbook. By this is meant the Chief Officer's logbook, which is virtually a diary of the ship's activities. The information contained therein is derived from the rough logbook, which is kept by the individual Officers-of-the-watch. The Chief Officer's log is written up daily, and each page is signed by the Chief Officer and witnessed by the Master. Both this book and the rough logbook may be produced in Courts of Law and also during Official Enquiries, such as are held by the Department of Transport (D.o.T.) in the U.K. subsequent to a collision, etc.

For this reason, pages should never be torn out of the book, and any alterations should be made by ruling a single line through the original entry, rewriting it as desired, and initialling the entry. It is preferable to have a witnessing signature. *In no circumstances should an erasure be made.*

At the end of the voyage the Chief Officer's log is often given into the custody of the shipowners while the rough copy is retained aboard for reference purposes. The Owners are then in a position to conduct defences even though the vessel is abroad. In this connection it is of the utmost importance to make a full entry in the logbook relating to all accidents which occur on the ship, no matter who the victim, e.g. visitor, stevedore, other shore employee, or crew member. In many cases the entry has been overlooked, and as many as five years later a claim for damages has been made, the claim relating to illness or incapacitance, etc., alleged to be a direct result of the original accident. Provided a full account, duly witnessed, and where possible signed by the victim, has

been entered into the logbook, the Owners will be able to provide the maximum defence under conditions of litigation.

The Official Logbook (*O.L.B.*) is supplied by the Department of Transport in the United Kingdom when the Crew Agreement have been completed to the satisfaction of the Mercantile Marine Office Superintendent, and before he issues the ship's certificate of outward clearance. It must be delivered to the Superintendent within 48 hours of arrival in the United Kingdom, or when the crew is discharged, whichever is the sooner.

This logbook is kept by the Master, and all entries are signed by him and witnessed by a crew member, usually the Chief Officer. The logbook contains entries relating to:

(1) Births, deaths, and marriages which occur on board.
(2) Wages due to a dead seaman, together with a list of his effects.
(3) Each case of sickness and the remedy used.
(4) A list of crew, with a report on their conduct and character. Also details of their qualifications.
(5) Written warnings, reprimands and statutory deductions. Convictions by a Court of Law.
(6) Details of crew changes and any promotions or disratings which occur.
(7) Beachings, strandings, and collisions.
(8) Orders of a Naval Court.
(9) Details of watertight doors, radio installations, deck line, and loadlines.
(10) Distress calls which resulted in no departure of the ship from her course. Full reasons for not going to the assistance of the distressed persons must be given.
(11) A list of documents within the Master's charge, e.g. Certificate of Registry, Certificate of Freeboard, copy of the crew's Agreement, charter-parties, Manifest, Bill of Health, radio logbook, etc.
(12) Refusal by any crew member to take anti-scorbutics (lime or citrus-fruit juices which are issued free to prevent scurvy).
(13) Wages and effects of any seaman who has been left behind, for any reason, at a previous port of call.
(14) Complaints regarding food and water.
(15) Tonnages of deck cargoes.
(16) The draught, dock allowance, and freeboard on leaving each port; these are copied from form FRE 13.
(17) Occasions on which the ship's life-saving appliances are inspected, including boat drills and fire drills.
(18) Tests of pilot hoists and steering gear.
(19) Inspections of the accommodation.

A copy of the entry should be furnished to a seaman who has been warned or reprimanded, or who has been disrated.

When the vessel has suffered heavy weather, stranded, or been beached, etc., i.e. any occurrence which might lead to damage to the vessel or her cargo, the Master 'notes protest' before a Notary Public within 24 hours of arrival in port. An entry to this effect should be made in the Chief Officer's logbook and also in the Official Logbook.

CHAPTER XIV

THE SAFETY OF NAVIGATION

NOTICES TO MARINERS

These are published for the correction of Admiralty charts, Sailing Directions, Light Lists, and other hydrographic publications, and are issued by the Admiralty for the use of both Royal and Merchant Navies.

For foreign-going vessels, the following Notices are issued:

(*a*) Daily notices to disseminate information of an urgent nature or of major importance.

(*b*) Weekly complete editions of notices, which contain all the information which has become available during the previous week and include any Daily Notices issued during that week.

(*c*) A quarterly edition containing, in a collated form, the hydrographic information published in the weekly complete editions during the previous quarter.

The first issue of the year contains roughly the first twenty notices, which are annual Regulations and on which candidates for D.o.T. examinations are closely questioned. The book also contains notices of a temporary character, preliminary notices in force on 1 January, details of minelaying exercises, territorial and fishing limits, radio navigational warnings, positions of traffic separation schemes, the carriage of nautical publications and details of offshore rigs. This book is known as the Annual Summary.

The Weekly Editions contain six parts:

Part 1 The index
Part 2 Notices to Mariners
Part 3 Navigational warnings
Part 4 Corrections to Sailing Directions
Part 5 Corrections to Admiralty Lists of Lights and Fog Signals.
Part 6 Corrections to Admiralty Lists of Radio Signals.

For home-trade and fishing vessels, daily notices are issued and also a weekly complete edition, but both refer only to the areas traversed by these vessels.

The Notices are issued gratis to Master's of ships, and all Officers should search them thoroughly, making all appropriate corrections to their hydrographic material. Navigational warnings should be initialled by each Officer. The Notices are obtainable at Mercantile Marine Offices throughout the United Kingdom. They may be inspected, and in many cases obtained, at important Commonwealth shipping offices and at important British Consulates. They are also obtainable from Admiralty Chart Agents.

THE AMVER SYSTEM

The Automated Mutual Assistance Rescue System, originated by the United States Coastguard, is a maritime mutual assistance organisation which provides important aid to the development and co-ordination of search and rescue (SAR) efforts in many offshore areas of the world.

Merchant vessels of all nations making offshore voyages are encouraged to send movement reports and periodic position reports to the AMVER centre at Coast Guard New York via selected radio stations. Information from these reports is fed into an electronic computer which supplies dead-reckoning positions for the vessels while they are within the plotting area.

Characteristics of vessels which are valuable for determining SAR capability are also entered into the computer from available sources of information.

The predicted location and SAR characteristics of each vessel known to be within the area of interest are made available upon request to recognised SAR agencies of any nation, or person in distress, for use in an emergency. The predicted locations are disclosed only for reasons connected with maritime safety.

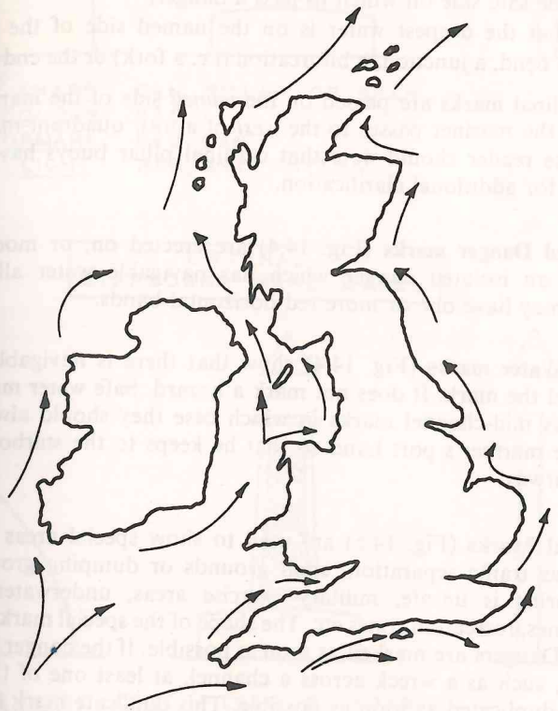
Similar systems are now in operation in Madagascar, Australia, New Zealand and Denmark (Greenland area). All ships are urged to co-operate. AMVER messages are free to the ship.

Four types of report are in use. The nine-part report used to initiate a plot is sent before or soon after departure; it is virtually a sailing plan. There is also a deviation or delay report which is sent if the sailing plan is changed. A position report can be sent at random intervals to assist the computer (on long voyages). The fourth type of report is made on arrival at the vessel's destination.

THE MARITIME BUOYAGE SYSTEM

The International Association of Lighthouse Authorities (I.A.L.A.) has divided its combined Cardinal and Lateral buoyage system into two regions 'A' and 'B'. Region 'A' uses the following buoys and marks in Europe, Australia, New Zealand, Africa, the Gulf and some Asian countries. Region 'B' is discussed on page 301.

Lateral marks (Fig. 14.2) are used for well-defined channels and show the port and starboard sides of the route to be followed. For example,



CONVENTIONAL DIRECTION OF BUOYAGE IN U.K.

FIGURE 14.1

port hand marks are to be left on the mariner's *port* hand when approaching a harbour, a river estuary or any other waterway from seaward, or when proceeding in the *conventional direction of buoyage*. The latter should, in general, follow a clockwise direction around land masses. The conventional direction of buoyage for the United Kingdom is shown in Fig. 14.1. The reader should note that lateral pillar buoys have coloured pillars.

Cardinal marks (Fig. 14.3) used in conjunction with the cardinal points of the compass, indicate

(*a*) where a mariner can find navigable water,
(*b*) the safe side on which to pass a danger,
(*c*) that the deepest water is on the named side of the mark, and
(*d*) a bend, a junction, a bifurcation (i.e. a fork) or the end of a shoal.

Cardinal marks are passed on the *named* side of the mark, in other words the mariner passes to the *west* of a *west* quadrant mark and so on. The reader should note that cardinal pillar buoys have coloured pillars for additional clarification.

Isolated Danger marks (Fig. 14.4) are erected on, or moored on or above an isolated danger which has navigable water all round it. They may have one or more red horizontal bands.

Safe Water marks (Fig. 14.4) show that there is navigable water all around the mark. It does not mark a hazard. Safe water marks can be used as mid-channel marks in which case they should always be left on the mariner's port hand so that he keeps to the starboard side of the fairway.

Special Marks (Fig. 14.5) are used to show special areas or features such as traffic separation, spoil grounds or dumping grounds where anchoring is unsafe, military exercise areas, underwater cables or pipelines, recreation zones etc. The shape of the special mark is optional. New Dangers are marked as soon as possible. If the danger is especially grave, such as a wreck across a channel, at least one of the marks is to be duplicated as soon as possible. This duplicate mark may carry a racon showing a signal one mile long on a radar display.

The I.A.L.A. consider that double-cone and double-sphere topmarks are features of major daytime importance and should therefore be as large as possible with the maximum separation.

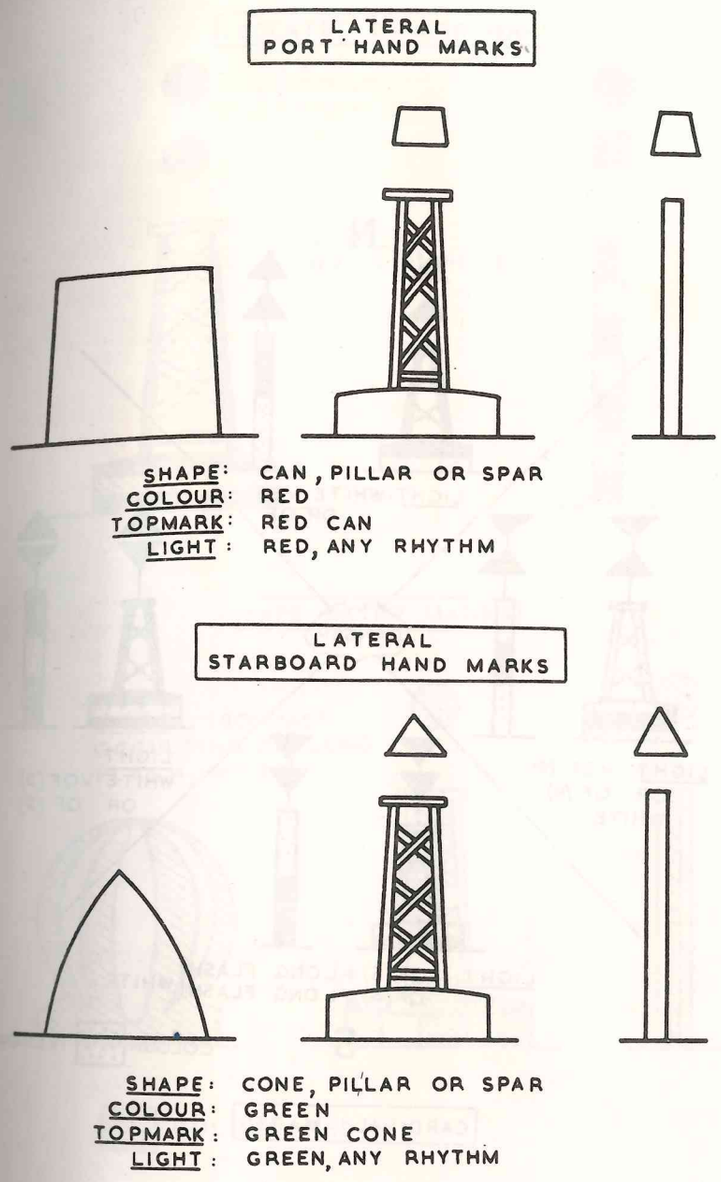
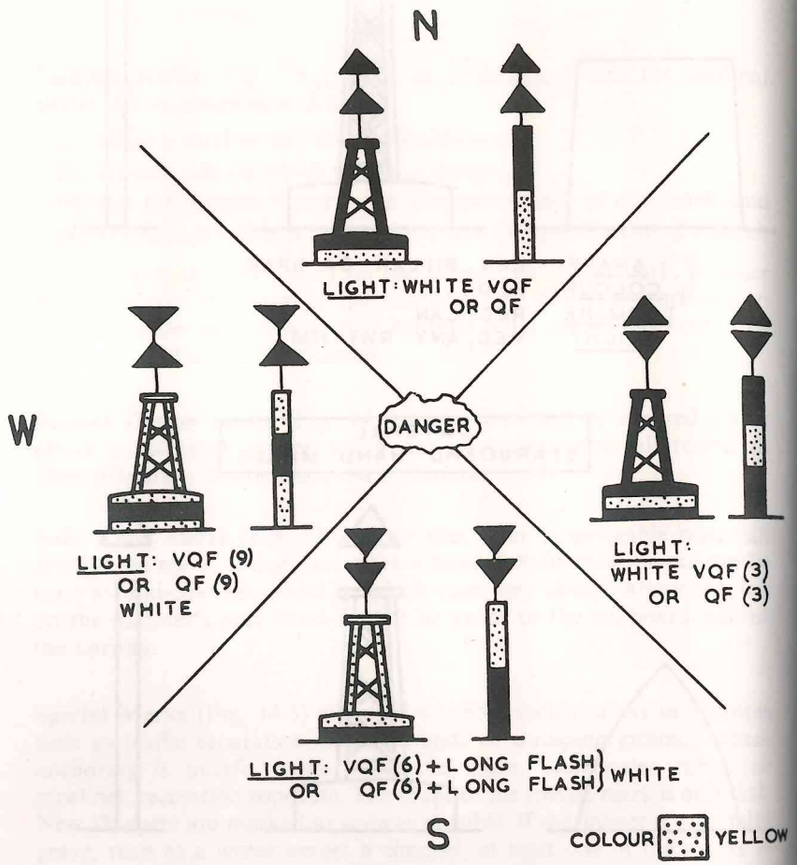


FIGURE 14.2



CARDINAL MARKS

FIGURE 14.3

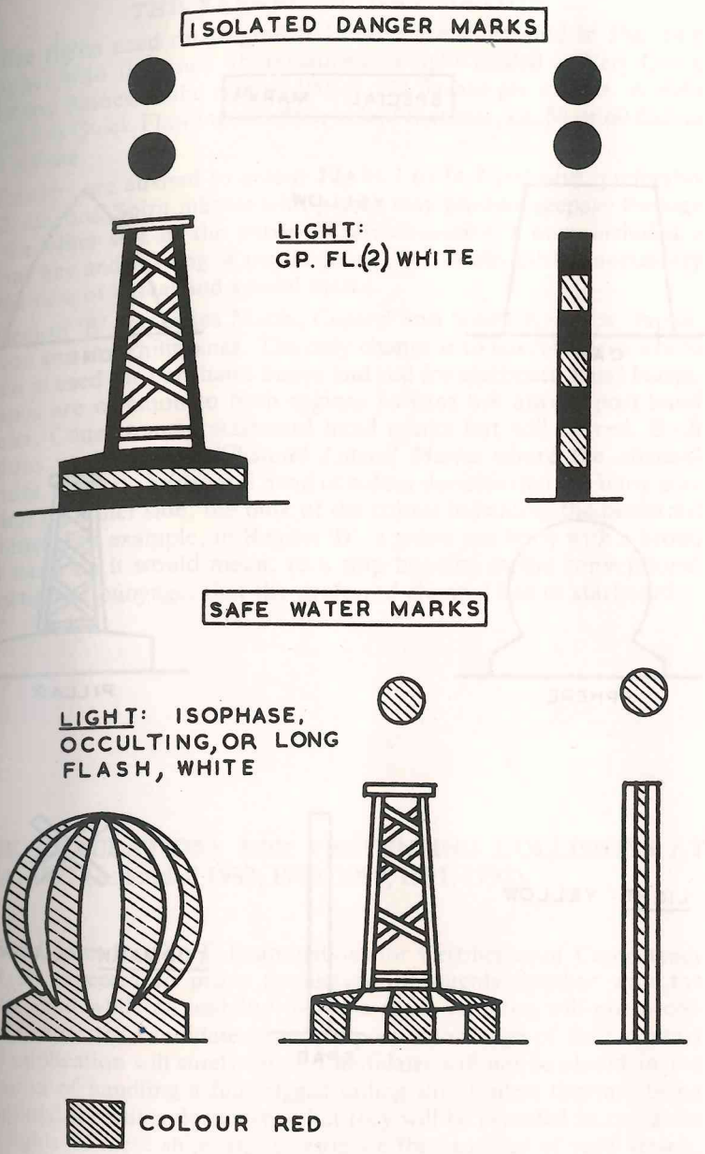


FIGURE 14.4

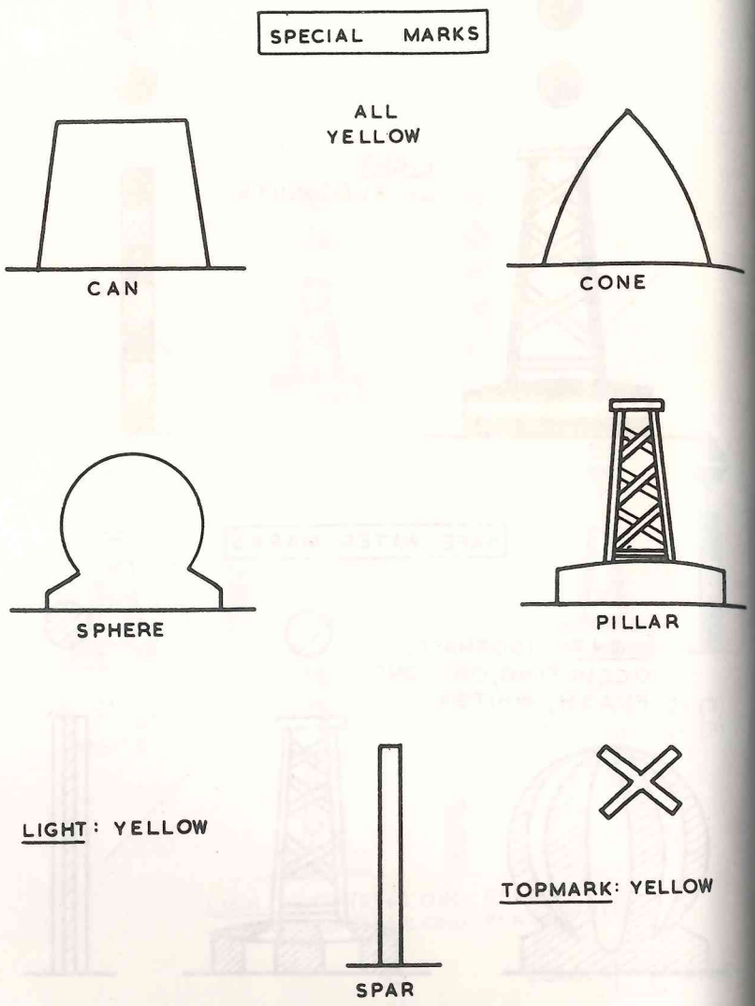


FIGURE 14.5

The lights used on Region 'A' buoys are illustrated in Fig. 14.6 together with the usual abbreviations. A light graded as Very Quick Flashing flashes at the rate of 100 or 120 flashes per minute. A light graded as Quick Flashing will flash at half that rate, i.e. 50 or 60 flashes per minute.

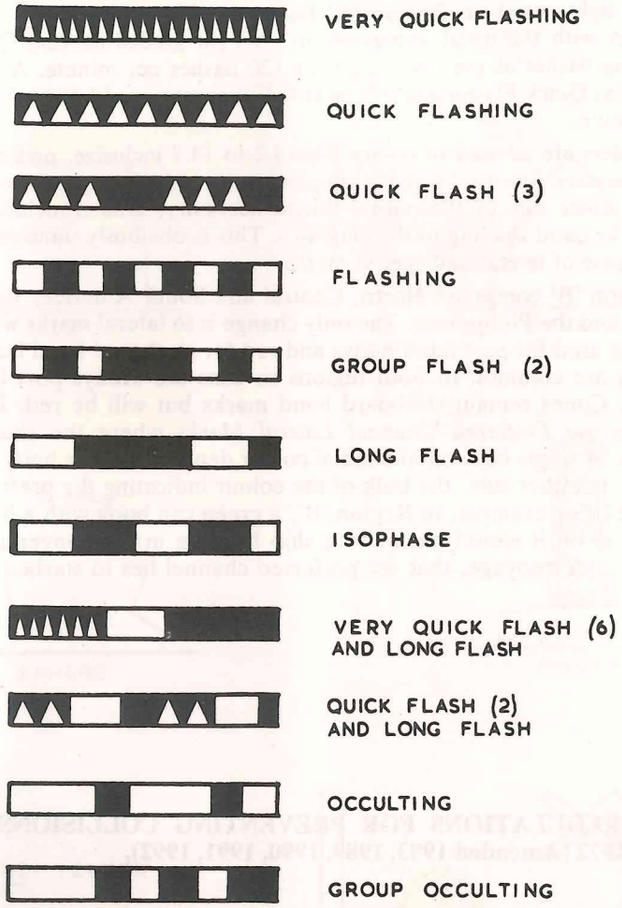
Readers are advised to colour Fig 14.2 to 14.7 inclusive, preferably with crayons. Spirit inks or felt tip pens may produce seepage through to the other side of the paper. Where necessary, I have included a colour key and shading in the diagrams. This is obviously unnecessary in the case of lateral and special marks.

Region 'B' comprises North, Central and South America, Japan, Korea and the Philippines. The only change is to lateral marks where *green* is used for *port* hand buoys and red for starboard hand buoys. Shapes are common to both regions so cans are always port hand marks. Cones remain starboard hand marks but will be red. Both regions use *Preferred Channel Lateral Marks* where the channel divides. A single horizontal band of colour denotes that the buoy may be left on either side, the bulk of the colour indicating the preferred channel. For example, in Region 'B', a green can buoy with a broad red band on it would mean, to a ship heading in the conventional direction of buoyage, that the preferred channel lies to starboard.

THE REGULATIONS FOR PREVENTING COLLISIONS AT SEA, 1972 (Amended 1983, 1989, 1990, 1991, 1992).

Candidates for D.o.T. Examinations for Certificates of Competency will be expected to prove themselves thoroughly familiar with the Rules, and while an inability to recite them verbatim will not necessarily cause the candidate to fail, a poor knowledge of their context and application will surely do so. Candidates will not be placed in the position of handling a fully-rigged sailing ship (unless they are being examined for sail endorsement), but they will be expected to recognise the lights of these ships and to estimate the headings of such vessels.

It is pointless to dwell upon ambiguous wording within the Rules and to demonstrate certain minor instances of faulty wording, for this will



LIGHT CHARACTERISTICS

FIGURE 14.6

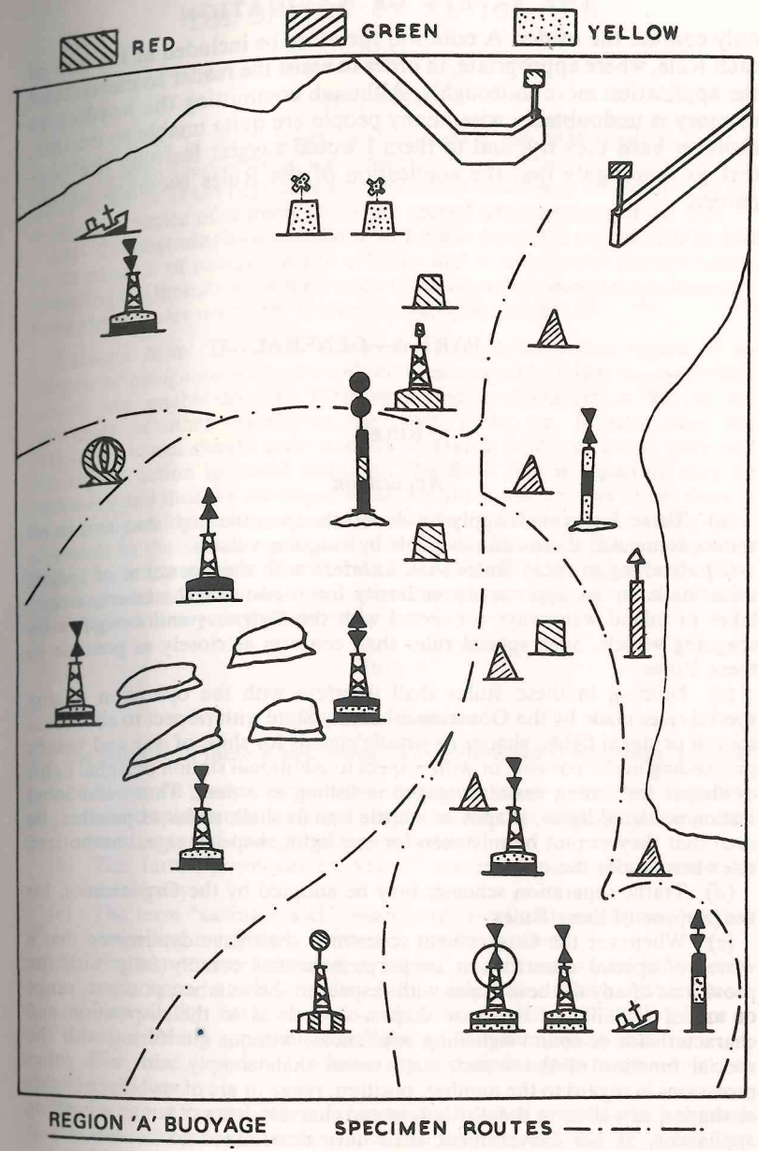


FIGURE 14.7

only confuse the reader. A note will therefore be included at the end of each Rule, where appropriate, in order to assist the reader to understand the application more thoroughly. Although committing the wording to memory is undoubtedly wise, many people are quite unable to do this, however hard they try, and to them I would suggest learning the context so thoroughly that the application of the Rules becomes second nature.

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.

Author's Note: This Rule is extremely important. '*Due regard to all dangers of navigation and collision*' refers among other things to cases where vessels are unable to take their stipulated avoiding action due to the proximity of other vessels, or the coast, reefs, etc. In such cases the privileged vessel should assist matters by taking (and indicating) early and substantial action to avoid collision. The Rule says a departure may be necessary and thus the privileged vessel should assess whether or not there is an onus upon her to keep clear. '*Limitations of the craft*' must surely draw attention to the vessels mentioned in Rules 24, 26 and 27. The inference in Rule 2 is, in my opinion, that literal observance of the Rules is certainly not intended when vessels are encountered which are hampered, disabled or encumbered in any way whatsoever.

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.

Author's Note: Regarding section *(i)*, it has been ruled that to be '*at anchor*', a vessel must be completely held by her anchor. The reader should distinguish carefully between the terms '*under way*' and '*making way*'. A vessel '*under way*' is not necessarily moving.

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.

(*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.

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.

RULE 10

Traffic separation schemes

(*a*) This Rule applies to traffic separation schemes adopted by the Organization:

(*b*) A vessel using a traffic separation scheme shall:

(i) proceed in the appropriate traffic lane in the general direction of traffic flow for that lane;

(ii) so far as practicable keep clear of a traffic separation line or separation zone;

(iii) normally join or leave a traffic lane at the termination of the lane, but when joining or leaving from either side shall do so at as small an angle to the general direction of traffic flow as practicable.

(*c*) A vessel shall so far as practicable avoid crossing traffic lanes, but if

obliged to do so shall cross as nearly as practicable at right angles to the general direction of traffic flow.

(*d*) (i) A vessel shall not use an inshore traffic zone when she can safely use the appropriate traffic lane within the adjacent traffic separation scheme. However, vessels of less than 20 metres in length, sailing vessels and vessels engaged in fishing may use the inshore traffic zone.

(ii) Notwithstanding subparagraph (*d*)(i), a vessel may use an inshore traffic zone when en route to or from a port, offshore installation or structure, pilot station or other place situated within the inshore traffic zone, or to avoid immediate danger.

(*e*) A vessel other than a crossing vessel or a vessel joining or leaving a lane shall not normally enter a separation zone or cross a separation line except:

(i) in cases of emergency to avoid immediate danger;

(ii) to engage in fishing within a separation zone.

(*f*) A vessel navigating in areas near the terminations of traffic separation schemes shall do so with particular caution.

(*g*) A vessel shall so far as practicable avoid anchoring in a traffic separation scheme or in areas near its terminations.

(*h*) A vessel not using a traffic separation scheme shall avoid it by as wide a margin as is practicable.

(*i*) A vessel engaged in fishing shall not impede the passage of any vessel following a traffic lane.

(*j*) A vessel of less than 20 metres in length or a sailing vessel shall not impede the safe passage of a power-driven vessel following a traffic lane.

(*k*) A vessel restricted in her ability to manoeuvre when engaged in an operation for the maintenance of safety of navigation in a traffic separation scheme is exempted from complying with this Rule to the extent necessary to carry out the operation.

(*l*) A vessel restricted in her ability to manoeuvre when engaged in an operation for the laying, servicing or picking up of a submarine cable, within a traffic separation scheme, is exempted from complying with this Rule to the extent necessary to carry out the operation.

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 12

Sailing vessels

(*a*) When two sailing vessels are approaching one another, so as to involve

risk of collision, one of them shall keep out of the way of the other as follows:

(i) when each has the wind on a different side, the vessel which has the wind on the port side shall keep out of the way of the other;

(ii) when both have the wind on the same side, the vessel which is to windward shall keep out of the way of the vessel which is to leeward;

(iii) if a vessel with the wind on the port side sees a vessel to windward and cannot determine with certainty whether the other vessel has the wind on the port or on the starboard side, she shall keep out of the way of the other.

(*b*) For the purposes of this Rule the windward side shall be deemed to be the side opposite to that on which the mainsail is carried or, in the case of a square-rigged vessel, the side opposite to that on which the largest fore-and-aft sail is carried.

Author's Note: A vessel with the wind dead aft has the wind on her *starboard* side for the purpose of this Rule when her mainsail or largest fore-and-aft sail lies to *port*, and vice versa.

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 14

Head-on situation

(*a*) When two power-driven vessels are meeting on reciprocal or nearly reciprocal courses so as to involve risk of collision each shall alter her course to starboard so that each shall pass on the port side of the other.

(*b*) Such a situation shall be deemed to exist when a vessel sees the other ahead or nearly ahead and by night she could see the mast head lights of the other in a line or nearly in a line and/or both sidelights and by day she observes the corresponding aspect of the other vessel.

(*c*) When a vessel is in any doubt as to whether such a situation exists she shall assume that it does exist and act accordingly.

Author's Note: The phrase '*nearly ahead*' may confuse the reader. For this Rule to apply, both vessels must each see the sidelights of the other. If the lights are properly screened, this can only happen when each vessel is within the relative bearing arc of the other extending from two degrees on one bow to two degrees on the other.

Rule 15

Crossing situation

When two power-driven vessels are crossing so as to involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way and shall, if the circumstances of the case admit, avoid crossing ahead of the other vessel.

Author's Note: Vessels are occasionally encountered which do not obey this Rule, usually due to an improper lookout. Once the privileged vessel has ascertained that risk of collision exists, she should sound at least five short and rapid blasts by Rule 34, repeated if necessary and then take action under Rule 17. This is best achieved by altering to starboard *away from the other vessel and without reducing speed.* The degree of any impact will be proportion to the difference between the speeds of the two vessels, in other words the relative approach speed. A vessel which is crossing and overtaking at the same time comes under Rule 13.

Rule 16

Action by give-way vessel

Every vessel which is directed to keep out of the way of another vessel shall, so far as possible, take early and substantial action to keep well clear.

Rule 17

Action by stand-on vessel

(*a*) (i) Where one of two vessels is to keep out of the way the other shall keep her course and speed.

(ii) The latter vessel may however take action to avoid collision by her manoeuvre alone, as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action in compliance with these Rules.

(*b*) When, from any cause, the vessel required to keep her course and spped finds herself so close that collision cannot be avoided by the action of the give-way vessel alone, she shall take such action as will best aid to avoid collision.

(*c*) A power-driven vessel which takes action in a crossing situation in

accordance with sub-paragraph (*a*)(ii) of this Rule to avoid collision with another power-driven vessel shall, if the circumstances of the case admit, not alter course to port for a vessel on her own port side.

(*d*) This Rule does not relieve the give-way vessel of her obligation to keep out of the way.

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.

Author's Note: A controversy has recently arisen over a situation where a Rule 27 vessel (hampered) is overtaking another vessel. It should be noted:

(a) In section (c) above Rule 27 vessels are virtually being excused from giving way to fishing vessels, presumably in view of Rule 3 (f) and (g).
(b) Rule 3 (f) and (g) state that vessels which are hampered are *unable to get out of the way.*
(c) Rule 8 (a) refers to the *observance of good seamanship.*
(d) Rule 2 refers to *departure from the Rules* in cases where dangers of navigation and collision, special circumstances and limitations of craft are involved. It also refers to precautions which may be required by these special circumstances.

If the reader refers to *Marsden's 'Law of Collision at Sea'* he will note:

(1) Literal observance of the Rules is not a defence where ordinary care might have avoided a collision.
(2) If it appears that another vessel is unable to comply with the Rules, the other vessel should watch her closely and *at once take steps to make a collision impossible.*
(3) The words *'Notwithstanding anything contained in the Rules'* were originally introduced into the 1880 Regulations so as to make it clear that Rule 13 superseded Rule 15.
(4) In the case of the Hawthornbank (1904) it was stated that a duty was cast upon a vessel, encountering another showing two red lights, *to keep out of her way.*
(5) The Rules do not apply, and a breach of them may be excused, when a vessel is disabled. *The Law does not require the impossible.*

I can only suggest, in addition to the above, that aircraft carriers working aircraft and travelling at 30 knots, or two vessels re-fuelling and travelling at up to 20 knots can hardly be expected to obey Rule 13. In view of (b), (3) and (4) above, I think that a vessel being overtaken by a Rule 27 vessel has a duty to keep clear. I fail to see why a hampered vessel is privileged when she encounters fishing craft and yet must avoid a perfectly manageable vessel which she happens to be overtaking. An argument against my reasoning has been that overtaking situations involve low relative approach speeds and hampered ships should therefore have time to take avoiding action. This may not be so nowadays with ships travelling at higher speeds.

Section III. Conduct of vessels in restricted visibility

Rule 19

Conduct of vessels in restricted visibility

(*a*) This Rule applies to vessels not in sight of one another when navigating in or near an area of restricted visibility.

(*b*) Every vessel shall proceed at a safe speed adapted to the prevailing circumstances and conditions of restricted visibility. A power driven vessel shall have her engines ready for immediate manoeuvre.

(*c*) Every vessel shall have due regard to the prevailing circumstances and conditions of restricted visibility when complying with the Rules of Section I of this Part.

(*d*) A vessel which detects by radar alone the presence of another vessel shall determine if a close-quarters situation is developing and/or risk of collision exists. If so, she shall take avoiding action in ample time, provided that when such action consists of an alteration of course, so far as possible the following shall be avoided:

(i) an alteration of course to port for a vessel forward of the beam, other than for a vessel being overtaken;

(ii) an alteration of course towards a vessel abeam or abaft the beam.

(*e*) Except where it has been determined that a risk of collision does not exist, every vessel which hears apparently forward of her beam the fog signal of another vessel, or which cannot avoid a close-quarters situation with another vessel forward of her beam, shall reduce her speed to the minimum at which she can be kept on her course. She shall if necessary take all her way off and in any event navigate with extreme caution until danger of collision is over.

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 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.

RULE 24

Towing and pushing

(*a*) A power-driven vessel when towing shall exhibit:

(i) instead of the light prescribed in Rule 23(*a*)(i) or (*a*)(ii), two masthead lights in a vertical line. When the length of the tow, measuring from the stern of the towing vessel to the after end of the tow exceeds 200 metres, three such lights in a vertical line;
(ii) sidelights;
(iii) a sternlight;
(iv) a towing light in a vertical line above the sternlight;
(v) when the length of the tow exceeds 200 metres, a diamond shape where it can best be seen.

(*b*) When a pushing vessel and a vessel being pushed ahead are rigidly connected in a composite unit they shall be regarded as a power-driven vessel and exhibit the lights prescribed in Rule 23.

(*c*) A power-driven vessel when pushing ahead or towing alongside, except in the case of a composite unit, shall exhibit:

(i) instead of the light prescribed in Rule 23(*a*)(i) or (*a*)(ii), two masthead lights in a vertical line;
(ii) sidelights;
(iii) a sternlight.

(*d*) A power-driven vessel to which paragraph (*a*) or (*c*) of this Rule apply shall also comply with Rule 23(*a*)(ii).

(*e*) A vessel or object being towed, other than those mentioned in paragraph (*g*) of this Rule, shall exhibit:

(i) sidelights;
(ii) a sternlight;
(iii) when the length of the tow exceeds 200 metres, a diamond shape where it can best be seen.

(*f*) Provided that any number of vessels being towed alongside or pushed in a group shall be lighted as one vessel:

(i) a vessel being pushed ahead, not being part of a composite unit, shall exhibit at the forward end, sidelights;
(ii) a vessel being towed alongside shall exhibit a sternlight and at the forward end, sidelights.

(*g*) An inconspicuous, partly submerged vessel or object, or combination of such vessels or objects being towed, shall exhibit:

(i) if it is less than 25 metres in breadth, one all-round white light at or near the forward end and one at or near the after end except that dracones need not exhibit a light at or near the forward end;
(ii) if it is 25 metres or more in breadth, two additional all-round white lights at or near the extremities of its breadth;
(iii) if it exceeds 100 metres in length, additional all-round white lights between the lights prescribed in sub-paragraphs (i) and (ii) so that the distance between the lights shall not exceed 100 metres;
(iv) a diamond shape at or near the aftermost extremity of the last vessel or object being towed and if the length of the tow exceeds 200 metres an additional diamond shape where it can best be seen and located as far forward as is practicable.

(*h*) Where from any sufficient cause it is impracticable for a vessel or object being towed to exhibit the lights or shapes prescribed in paragraph (*e*) or (*g*) of this Rule, all possible measures shall be taken to light the vessel or object towed or at least to indicate the presence of such vessel or object.

(*i*) Where from any sufficient cause it is impracticable for a vessel not normally engaged in towing operations to display the lights prescribed in paragraph (*a*) or (*c*) of this Rule, such vessel shall not be required to exhibit those lights when engaged in towing another vessel in distress or otherwise in need of assistance. All possible measures shall be taken to indicate the nature of the relationship between the towing vessel and the vessel being towed as authorized by Rule 36, in particular by illuminating the towline.

Rule 25

Sailing vessels underway and vessels under oars

(*a*) A sailing vessel underway shall exhibit:

(i) sidelights;
(ii) a sternlight.

(*b*) In a sailing vessel of less than 20 metres in length the lights prescribed

in paragraph (*a*) of this Rule may be combined in one lantern carried at or near the top of the mast where it can best be seen.

(*c*) A sailing vessel underway may, in addition to the lights prescribed in paragraph (*a*) of this Rule, exhibit at or near the top of the mast, where they can best be seen, two all-round lights in a vertical line, the upper being red and the lower green, but these lights shall not be exhibited in conjunction with the combined lantern permitted by paragraph (*b*) of this Rule.

(*d*) (i) A sailing vessel of less than 7 metres in length shall, if practicable, exhibit the lights prescribed in paragraph (*a*) or (*b*) of this Rule, but if she does not, she shall have ready at hand an electric torch or lighted lantern showing a white light which shall be exhibited in sufficient time to prevent collision.

(ii) A vessel under oars may exhibit the lights prescribed in this Rule for sailing vessels, but if she does not, she shall have ready at hand an electric torch or lighted lantern showing a white light which shall be exhibited in sufficient time to prevent collision.

(*e*) A vessel proceeding under sail when also being propelled by machinery shall exhibit forward where it can best be seen a conical shape, apex downwards.

Rule 26

Fishing vessels

(*a*) A vessel engaged in fishing, whether underway or at anchor, shall exhibit only the lights and shapes prescribed in this Rule.

(*b*) A vessel when engaged in trawling, by which is meant the dragging through the water of a dredge net or other apparatus used as a fishing appliance, shall exhibit:

(i) two all-round lights in a vertical line, the upper being green and the lower white, or a shape consisting of two cones with their apexes together in a vertical line one above the other; a vessel of less than 20 metres in length may instead of this shape exhibit a basket;
(ii) a masthead light abaft of and higher than the all-round green light; a vessel of less than 50 metres in length shall not be obliged to exhibit such a light but may do so;
(iii) when making way through the water, in addition to the lights prescribed in this paragraph, sidelights and a sternlight.

(*c*) A vessel engaged in fishing, other than trawling, shall exhibit:

(i) two all-round lights in a vertical line, the upper being red and the lower white, or a shape consisting of two cones with apexes together in a vertical line one above the other; a vessel of less than 20 metres in length may instead of this shape exhibit a basket;
(ii) when there is outlying gear extending more than 150 metres horizontally from the vessel, an all-round white light or a cone apex upwards in the direction of the gear;
(iii) when making way through the water, in addition to the lights

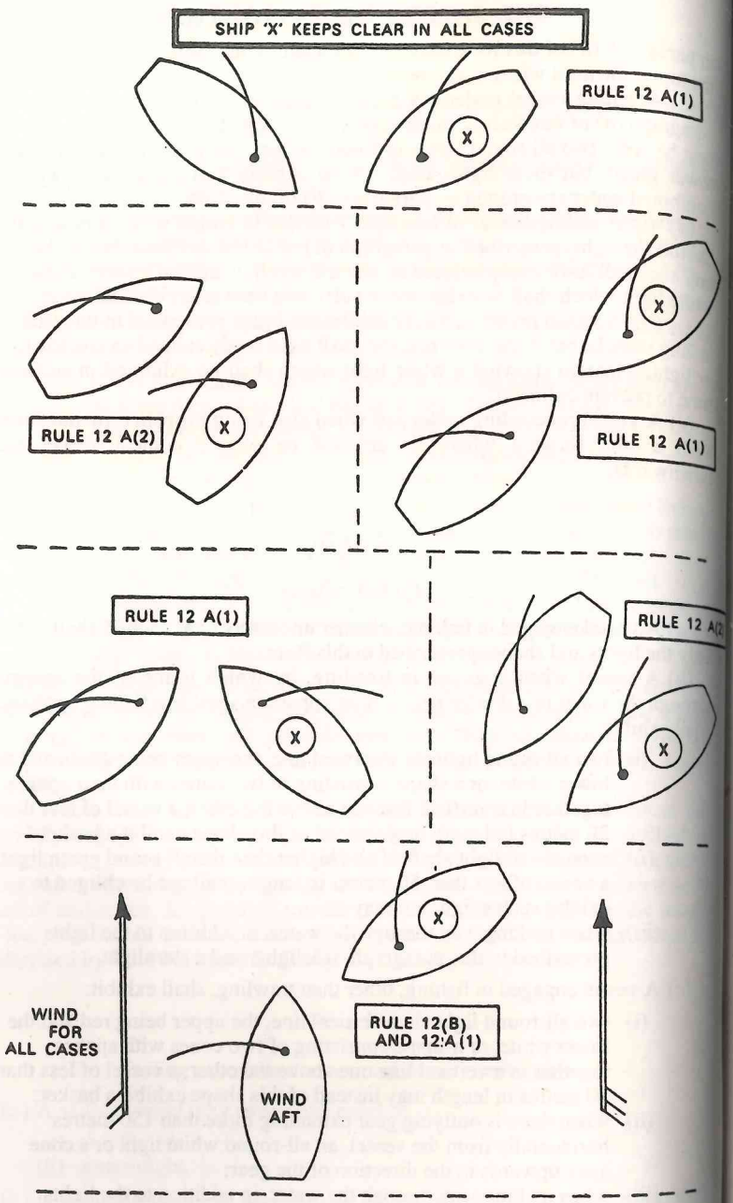


FIGURE 14.8 RULE 12

prescribed in this paragraph, sidelights and a sternlight.

(*d*) A vessel engaged in fishing in close proximity to other vessels engaged in fishing may exhibit the additional signals described in Annex II to these Regulations.

(*e*) A vessel when not engaged in fishing shall not exhibit the lights or shapes prescribed in this Rule, but only those prescribed for a vessel of her length.

Author's Note: At night, vessels fishing at anchor will be indistinguishable from vessels fishing under way, but stopped. As in Rule 27, these craft show their sidelights *only when moving through the water*. Regarding section (c)(ii), the reader should note the similar inverted signal in Rule 25(e). For vessels with their gear fast to a rock etc., see the second Annex to the Rules.

RULE 27

Vessels not under command or restricted in their ability to manoeuvre

(*a*) A vessel not under command shall exhibit:

(i) two all-round red lights in a vertical line where they can best be seen;

(ii) two balls or similar shapes in a vertical line where they can best be seen;

(iii) when making way through the water, in addition to the lights prescribed in this paragraph, sidelights and a sternlight.

(*b*) A vessel restricted in her ability to manoeuvre, except a vessel engaged in mine-clearance operations, shall exhibit:

(i) three all-round lights in a vertical line where they can best be seen. The highest and lowest of these lights shall be red and the middle light shall be white;

(ii) three shapes in a vertical line where they can best be seen. The highest and lowest of these shapes shall be balls and the middle one a diamond;

(iii) when making way through the water, a masthead light or lights, sidelights and a sternlight, in addition to the lights prescribed in sub-paragraph (i);

(iv) when at anchor, in addition to the lights or shapes prescribed in sub-paragraphs (i) and (ii), the light, lights or shape prescribed in Rule 30.

(*c*) A power-driven vessel engaged in a towing operation such as severely restricts the towing vessel and her tow in their ability to deviate from their course shall, in addition to the lights or shapes prescribed in Rule 24(*a*), exhibit the lights or shapes prescribed in sub-paragraphs (*b*)(i) and (ii) of this Rule.

(*d*) A vessel engaged in dredging or underwater operations, when restricted in her ability to manoeuvre, shall exhibit the lights and shapes prescribed in sub-paragraphs (*b*)(i), (ii) and (iii) of this Rule and shall in addition, when an obstruction exists, exhibit:

(i) two all-round red lights or two balls in a vertical line to indicate the side on which the obstruction exists;
(ii) two all-round green lights or two diamonds in a vertical line to indicate the side on which another vessel may pass;
(iii) when at anchor, the lights or shapes prescribed in this paragraph instead of the lights or shape prescribed in Rule 30.

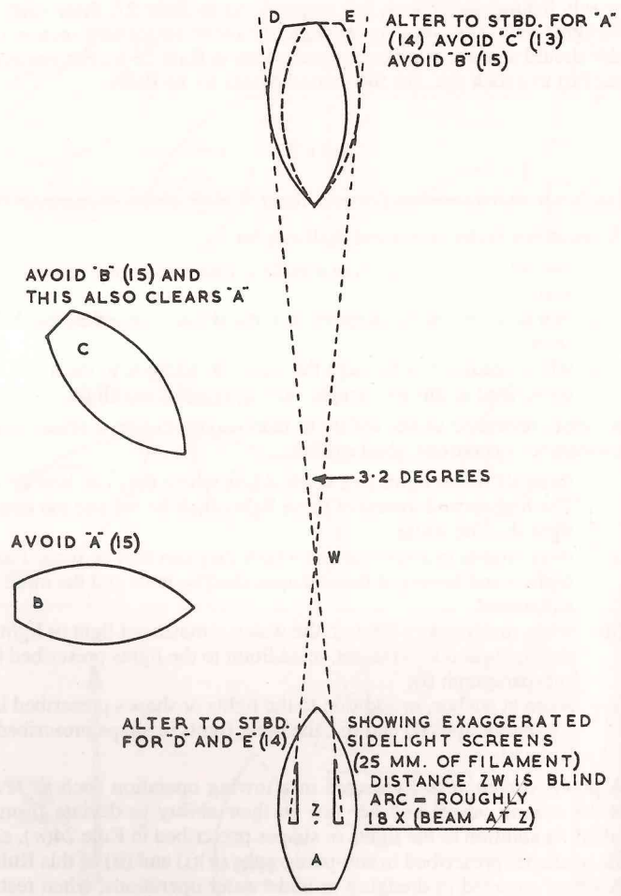


FIGURE 14.9 POWERED SHIPS

(e) Whenever the size of a vessel engaged in diving operations makes it impracticable to exhibit all lights and shapes prescribed in paragraph (d) of this Rule, the following shall be exhibited:

(i) three all-round lights in a vertical line where they can best be seen. The highest and lowest of these lights shall be red and the middle light shall be white;
(ii) a rigid replica of the International Code flag "A" not less than 1 metre in height. Measures shall be taken to ensure its all-round visibility.

(f) A vessel engaged in mineclearance operations shall in addition to the lights prescribed for a power-driven vessel in Rule 23 or to the lights or shape prescribed for a vessel at anchor in Rule 30 as appropriate, exhibit three all-round green lights or three balls. One of these lights or shapes shall be exhibited near the foremast head and one at each end of the fore yard. These lights or shapes indicate that it is dangerous for another vessel to approach within 1000 metres of the mineclearance vessel.

(g) Vessels of less than 12 metres in length, except those engaged in diving operations, shall not be required to exhibit the lights and shapes prescribed in this Rule.

(h) The signals prescribed in this Rule are not signals of vessels in distress and requiring assistance. Such signals are contained in Annex IV to these Regulations.

Author's Note: This Rule covers a rare instance when ships switch off sidelights and sternlights though still under way, as in Rule 26 also. *Any other vessel showing sidelights and sternlights may be stopped or moving.*

RULE 28

Vessels constrained by their draught

A vessel constrained by her draught may, in addition to the lights prescribed for power-driven vessels in Rule 23, exhibit where they can best be seen three all-round red lights in a vertical line, or a cylinder.

RULE 29

Pilot vessels

(a) A vessel engaged on pilotage duty shall exhibit:

(i) at or near the masthead, two all-round lights in a vertical line, the upper being white and the lower red;
(ii) when underway, in addition, sidelights and a sternlight;
(iii) when at anchor, in addition to the lights prescribed in sub-paragraph (i), the light, lights or shape prescribed in Rule 30 for vessels at anchor.

(*b*) A pilot vessel when not engaged on pilotage duty shall exhibit the lights or shapes prescribed for a similar vessel of her length.

RULE 30

Anchored vessels and vessels aground

(*a*) A vessel at anchor shall exhibit where it can best be seen:

(i) in the fore part, an all-round white light or one ball;
(ii) at or near the stern and at a lower level than the light prescribed in sub-paragraph (i), an all-round white light.

(*b*) A vessel of less than 50 metres in length may exhibit an all-round white light where it can best be seen instead of the lights prescribed in paragraph (*a*) of this Rule.

(*c*) A vessel at anchor may, and a vessel of 100 metres and more in length shall, also use the available working or equivalent lights to illuminate her decks.

(*d*) A vessel aground shall exhibit the lights prescribed in paragraph (*a*) or (*b*) of this Rule and in addition, where they can best be seen:

(i) two all-round red lights in a vertical line;
(ii) three balls in a vertical line.

(*e*) A vessel of less than 7 metres in length, when at anchor, not in or near a narrow channel, fairway or anchorage, or where other vessels normally navigate, shall not be required to exhibit the lights or shape prescribed in paragraphs (*a*) and (*b*) of this Rule.

(*f*) A vessel of less than 12 metres in length, when aground, shall not be required to exhibit the lights or shapes prescribed in sub-paragraphs (*d*)(i) and (ii) of this Rule.

RULE 31

Seaplanes

Where it is impracticable for a seaplane to exhibit lights and shapes of the characteristics or in the positions prescribed in the Rules of this Part she shall exhibit lights and shapes as closely similar in characteristics and position as is possible.

PART D. SOUND AND LIGHT SIGNALS

RULE 32

Definitions

(*a*) The word "whistle" means any sound signalling appliance capable of producing the prescribed blasts and which complies with the specifications in Annex III to these Regulations.

(*b*) The term "short blast" means a blast of about one second's duration.

(*c*) The term "prolonged blast" means a blast of from four to six seconds' duration.

RULE 33

Equipment for sound signals

(*a*) A vessel of 12 metres or more in length shall be provided with a whistle and a bell and a vessel of 100 metres or more in length shall, in addition, be provided with a gong, the tone and sound of which cannot be confused with that of the bell. The whistle, bell and gong shall comply with the specifications in Annex III to these Regulations. The bell or gong or both may be replaced by other equipment having the same respective sound characteristics, provided that manual sounding of the prescribed signals shall always be possible.

(*b*) A vessel of less than 12 metres in length shall not be obliged to carry the sound signalling appliances prescribed in paragraph (*a*) of this Rule but if she does not, she shall be provided with some other means of making an efficient sound signal.

RULE 34

Manoeuvring and warning signals

(*a*) When vessels are in sight of one another, a power-driven vessel underway, when manoeuvring as authorized or required by these Rules, shall indicate that manoeuvre by the following signals on her whistle:

—one short blast to mean "I am altering my course to starboard";
—two short blasts to mean "I am altering my course to port";
—three short blasts to mean "I am operating astern propulsion".

(*b*) Any vessel may supplement the whistle signals prescribed in paragraph (*a*) of this Rule by light signals, repeated as appropriate, whilst the manoeuvre is being carried out:

(i) these light signals shall have the following significance:
—one flash to mean "I am altering my course to starboard";
—two flashes to mean "I am altering my course to port";
—three flashes to mean "I am operating astern propulsion";
(ii) the duration of each flash shall be about one second, the interval between flashes shall be about one second, and the interval between successive signals shall be not less than ten seconds;
(iii) the light used for this signal shall, if fitted, be an all-round white light, visible at a minimum range of 5 miles, and shall comply with the provisions of Annex I to these Regulations.

(*c*) When in sight of one another in a narrow channel or fairway:

(i) a vessel intending to overtake another shall in compliance with Rule 9(*e*)(i) indicate her intention by the following signals on her whistle;

—two prolonged blasts followed by one short blast to mean "I intend to overtake you on your starboard side";
—two prolonged blasts followed by two short blasts to mean "I intend to overtake you on your port side";

(ii) the vessel about to be overtaken when acting in accordance with Rule 9(*e*)(i) shall indicate her agreement by the following signal on her whistle:

—one prolonged, one short, one prolonged and one short blast, in that order.

(*d*) When vessels in sight of one another are approaching each other and from any cause either vessel fails to understand the intentions or actions of the other, or is in doubt whether sufficient action is being taken by the other to avoid collision, the vessel in doubt shall immediately indicate such doubt by giving at least five short and rapid blasts on the whistle. Such signal may be supplemented by a light signal of at least five short and rapid flashes.

(*e*) A vessel nearing a bend or an area of a channel or fairway where other vessels may be obscured by an intervening obstruction shall sound one prolonged blast. Such signal shall be answered with a prolonged blast by any approaching vessel that may be within hearing around the bend or behind the intervening obstruction.

(*f*) If whistles are fitted on a vessel at a distance apart of more than 100 metres, one whistle only shall be used for giving manoeuvring and warning signals.

RULE 35

Sound signals in restricted visibility

In or near an area of restricted visibility, whether by day or night, the signals prescribed in this Rule shall be used as follows:

(*a*) A power-driven vessel making way through the water shall sound at intervals of not more than 2 minutes one prolonged blast.

(*b*) A power-driven vessel underway but stopped and making no way through the water shall sound at intervals of not more than 2 minutes two prolonged blasts in succession with an interval of about 2 seconds between them.

(*c*) A vessel not under command, a vessel restricted in her ability to manoeuvre, a vessel constrained by her draught, a sailing vessel, a vessel engaged in fishing and a vessel engaged in towing or pushing another vessel shall, instead of the signals prescribed in paragraphs (*a*) or (*b*) of this Rule, sound at intervals of not more than 2 minutes three blasts in succession, namely one prolonged followed by two short blasts.

(*d*) A vessel engaged in fishing, when at anchor, and a vessel restricted in her ability to manoeuvre when carrying out her work at anchor, shall instead of the signals prescribed in paragraph (*g*) of this Rule sound the signal prescribed in paragraph (*c*) of this Rule.

(*e*) A vessel towed or if more than one vessel is towed the last vessel of the tow, if manned, shall at intervals of not more than 2 minutes sound four blasts in succession, namely one prolonged followed by three short blasts. When practicable, this signal shall be made immediately after the signal made by the towing vessel.

(*f*) When a pushing vessel and a vessel being pushed ahead are rigidly connected in a composite unit they shall be regarded as a power-driven vessel and shall give the signals prescribed in paragraphs (*a*) or (*b*) of this Rule.

(*g*) A vessel at anchor shall at intervals of not more than one minute ring the bell rapidly for about 5 seconds. In a vessel of 100 metres or more in length the bell shall be sounded in the forepart of the vessel and immediately after the ringing of the bell the gong shall be sounded rapidly for about 5 seconds in the after part of the vessel. A vessel at anchor may in addition sound three blasts in succession, namely one short, one prolonged and one short blast, to give warning of her position and of the possibility of collision to an approaching vessel.

(*h*) A vessel aground shall give the bell signal and if required the gong signal prescribed in paragraph (*g*) of this Rule and shall, in addition, give three separate and distinct strokes on the bell immediately before and after the rapid ringing of the bell. A vessel aground may in addition sound an appropriate whistle signal.

(*i*) A vessel of less than 12 metres in length shall not be obliged to give the above-mentioned signals but, if she does not, shall make some other efficient sound signal at intervals of not more than 2 minutes.

(*j*) A pilot vessel when engaged on pilotage duty may in addition to the signals prescribed in paragraphs (*a*), (*b*) or (*g*) of this Rule sound an identity signal consisting of four short blasts.

RULE 36

Signals to attract attention

If necessary to attract the attention of another vessel any vessel may make light or sound signals that cannot be mistaken for any signal authorized elsewhere in these Rules, or may direct the beam of her searchlight in the direction of the danger, in such a way as not to embarrass any vessel. Any light to attract the attention of another vessel shall be such that it cannot be mistaken for any aid to navigation. For the purpose of this Rule the use of high intensity intermittent or revolving lights, such as strobe lights, shall be avoided.

RULE 37

Distress signals

When a vessel is in distress and requires assistance she shall use or exhibit the signals described in Annex IV to these Regulations.

PART E. EXEMPTIONS

RULE 38

Exemptions

Any vessel (or class of vessels) provided that she complies with the requirements of the International Regulations for Preventing Collisions at Sea, 1960(a), the keel of which is laid or which is at a corresponding stage of construction before the entry into force of these Regulations may be exempted from compliance therewith as follows:

(*a*) The installation of lights with ranges prescribed in Rule 22, until four years after the date of entry into force of these Regulations.

(*b*) The installation of lights with colour specifications as prescribed in Section 7 of Annex I to these Regulations, until four years after the date of entry into force of these Regulations.

(*c*) The repositioning of lights as a result of conversion from Imperial to metric units and rounding off measurement figures, permanent exemption.

(*d*) (i) The repositioning of masthead lights on vessels of less than 150 metres in length, resulting from the prescriptions of Section 3(*a*) of Annex I to these Regulations, permanent exemption.

(ii) The repositioning of masthead lights on vessels of 150 metres or more in length, resulting from the prescriptions of Section 3(*a*) of Annex I to these Regulations, until nine years after the date of entry into force of these Regulations.

(*e*) The repositioning of masthead lights resulting from the prescriptions of Section 2(*b*) of Annex I to these Regulations, until nine years after the date of entry into force of these Regulations.

(*f*) The repositioning of sidelights resulting from the prescriptions of Sections 2(*g*) and 3(*b*) of Annex I to these Regulations, until nine years after the date of entry into force of these Regulations.

(*g*) The requirements for sound signal appliances prescribed in Annex III to these Regulations, until nine years after the date of entry into force of these Regulations.

(*h*) The repositioning of all-round lights resulting from the prescription of Section 9(*b*) of Annex I to these Regulations, permanent exemption.

The Annexes to the Rules are reproduced later in this chapter.

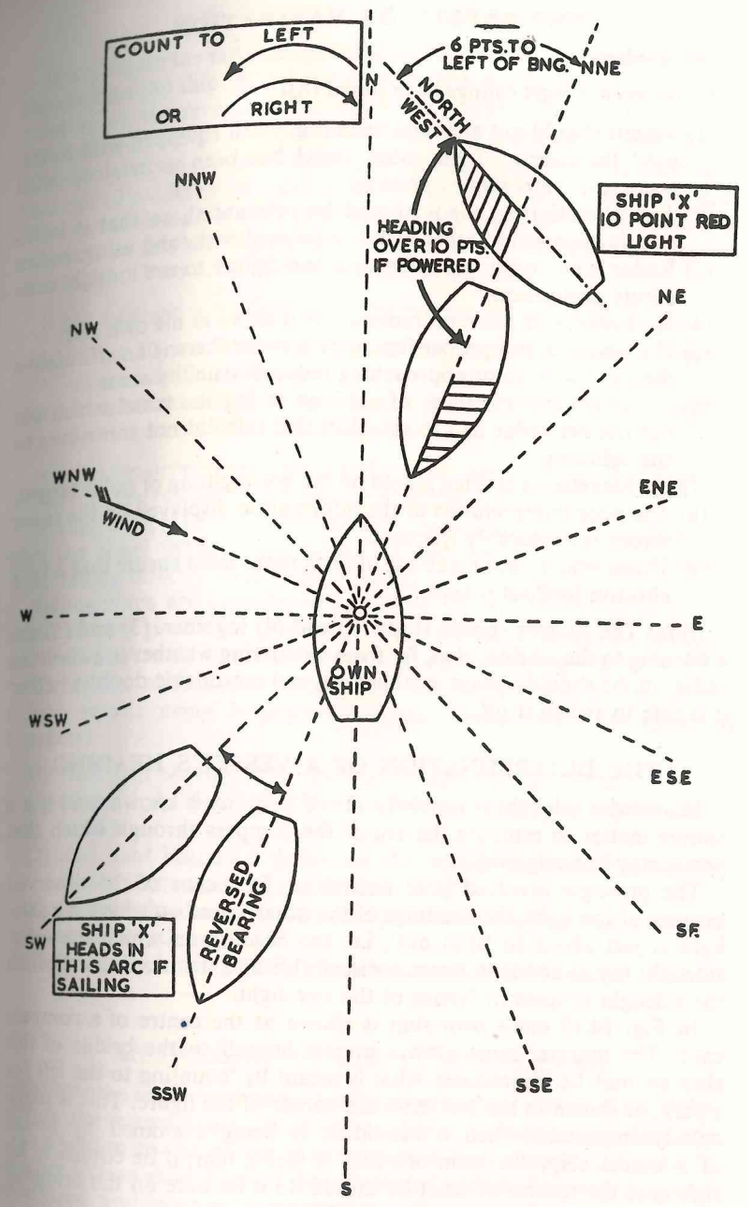


FIGURE 14.10

Court Verdicts

Some recent Court rulings have stated that:

(1) Vessels should not alter course in fog, when equipped with radar, until the course of the other vessel has been ascertained with accuracy, *preferably by plotting*.
(2) Any alteration so made should be substantial, so that it is instantly apparent to other vessels equipped with, and using, radar.
(3) Radar is an additional safeguard, and failure to use it might constitute negligence.
(4) A Master who relies on radar alone does so at his own risk.
(5) If a vessel carries proper functioning radar there is an affirmative duty to use it, in or approaching reduced-visibility areas.
(6) In certain circumstances of collision in fog the vessel which did not use her radar had to establish that this did not contribute to the collision.
(7) Undue reliance is often placed on the non-sighting of radar targets.
(8) The poor *interpretation* of the information displayed on the radar screen is deplorably frequent.
(9) Those who do not make use of their radar must ensure that a very effective lookout is kept.

Note: The student should study (9) and (4) together. (3) and (5) are a warning to the mariner that, far from wondering whether to switch the radar on, he should always establish beyond reasonable doubt whether it is safe to switch it *off*.

THE DETERMINATION OF A VESSEL'S HEADING

Provided a sidelight is visible its arc of visibility is known, and it is a simple matter to estimate the arc of the compass through which that vessel may be navigating.

The principle involved is to determine, by means of the observed bearing of the light, the headings of the other vessel on which the sidelight is just about to 'shut out', i.e. the heading on which the other sidelight is just about to become discernible and the heading on which the sidelight eclipses in favour of the sternlight.

In Fig. 14.10 one's own ship is shown at the centre of a compass card. The mariner must always project himself to the bridge of this ship so that he appreciates what is meant by 'counting to the left (or right)', as shown in the top left-hand corner of the figure. This is particularly important when a candidate is being examined by means of a model ship, the stem of which is facing him; if he counts to his right it is the reverse of what he should do if he were on the bridge of that ship.

In the figure the red sidelight of ship 'X' is shown bearing NNE. If at that instant the ship 'X' is heading directly towards own ship, then it is heading on the reverse of the bearing, i.e. SSW. On this heading the red light is about to shut out in favour of the green light. The red light is visible over an arc of 10 points, so that the ship 'X' could be rotated through 10 points to the right of the reversed bearing before the red light shuts out in favour of the stern light, on a heading of NW. It should be noticed that this heading (NW) is also 6 points to the left of the bearing of the light. Two rules-of-thumb are thus possible:

When a ten-point red light is sighted reverse the bearing (1), and:

(*a*) count 10 points to the right of this reversed bearing to obtain another direction (2); or
(*b*) reverse the bearing (1) and count 6 points to the left of the original bearing to obtain another direction (2).

When a ten-point green light is sighted use rule (*a*) above, but count to the left; or use rule (*b*) above and count to the right.

In each case, (1) and (2) give the extreme headings. It should be noted that the vessel 'X' is sailing *nearly* on the reversed bearing, for if she were sailing directly on it both sidelights would be visible.

Sailing ships are considered to sail no closer than 6 points to the wind in these problems. If ship 'X' were sailing, it would be between SW and SSW only in a WNW wind, as shown in Fig. 14.10.

The reader should now attempt the following examples for power-driven vessels using 10-point sidelights. The answers are given in brackets:

(1) Red light bearing NW. (Between nearly SE and WSW.)
(2) Green light bearing E by S. (Between nearly W by N and S by E.)
(3) Red light bearing 6 points on the port bow; own ship heading north. (Between ESE nearly, and SW.)
(4) Green light abeam to starboard; own ship heading west. (Between nearly south and ENE.)
(5) Red light bearing ENE. (Between nearly WSW and N.)

KNOWLEDGE OF THE COMPASS CARD

By now the reader will undoubtedly have become aware of his ability to 'box' the compass card; he should be able to do it quite automatically.

In addition to the points of the compass card shown in Fig. 14.10, another sixteen exist. Each of these is placed midway between the points illustrated, and its name commences with the name of the nearest cardi-

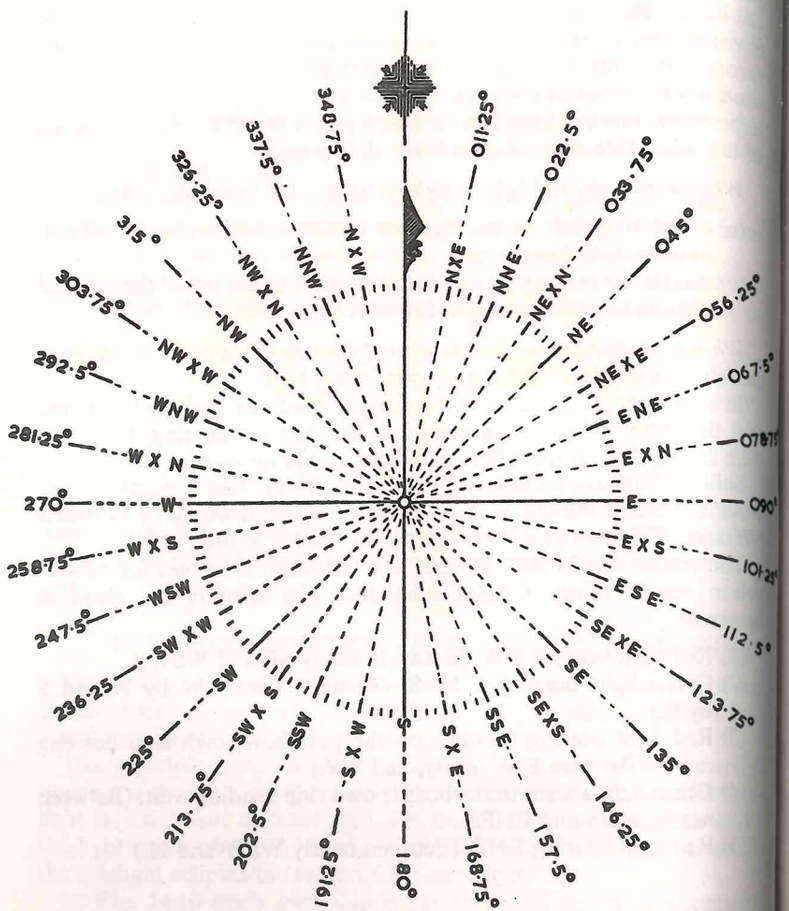


FIGURE 14.10 (A)

COMPASS POINTS IN THREE-FIGURE NOTATION

nal (N, E, S, W) or inter-cardinal point (NE, SE, SW, and NW). The latter part of its name, prefixed with the word 'by', is named after the other nearest cardinal point.

For example, between North and North-north-east, there is a point which will be named after the nearest cardinal point, i.e. NORTH. The second half of its name is that of the other nearest cardinal point, which in this case is EAST.

So, boxing these points from North to East we have: North by East; North-east by North; North-east by East, and East by North.

All the thirty-two points of the card are shown in Fig. 14.10 (*a*). In the same figure is shown the fact that each point of the compass is divided into quarters, known as quarter-points. A point is $11\frac{1}{4}$ degrees.

If we box the compass in quarter-points from South to East, we say:

S . . . S ¼ E . . . S ½ E . . . S ¾ E . . . S by E . . . S by E ¼ E . . . S by E ½ E . . . S by E ¾ E . . . SSE . . . SE by S ¾ S . . . SE by S ½ S . . . SE by S ¼ S . . . SE by S . . . SE ¾ S . . . SE ½ S . . . SE ¼ S . . . SE . . . SE ¼ E . . . SE ½ E . . . SE ¾ E . . . SE by E . . . SE by E ¼ E . . . SE by E ½ E . . . SE by E ¾ E . . . ESE . . . E by S ¾ S . . . E by S ½ S . . . E by S ¼ S . . . E by S . . . E ¾ S . . . E ½ S . . . E ¼ S . . . E.

The second, and most popular method of compass reference is by means of the three-figure notation in which the card is divided into 360 degrees, numbered clockwise from North, which is represented by 000°. The points of the compass are shown expressed in this notation in Fig. 14.10 (*a*).

The quadrantal system is generally dying out in favour of three-figure notation. In this system the card is divided into four quadrants, each of 90 degrees, and a course or bearing is expressed as North (or South), so many degrees East (or West), e.g. NORTHEAST is referred to as N 45° E.

THE ANNEXES TO THE COLLISION REGULATIONS

ANNEX I

Positioning and technical details of lights and shapes

1. *Definition*

The term "height above the hull" means height above the uppermost continuous deck. This height shall be measured from the position vertically beneath the location of the light.

2. *Vertical positioning and spacing of lights*

(*a*) On a power-driven vessel of 20 metres or more in length the masthead lights shall be placed as follows:

(i) the forward masthead light, or if only one masthead light is carried, then that light, at a height above the hull of not less than 6 metres, and, if the breadth of the vessel exceeds 6 metres, then at a height above the hull not less than such breadth, so however that the light need not be placed at a greater height above the hull than 12 metres;

(ii) when two masthead lights are carried the after one shall be at least 4·5 metres vertically higher than the forward one.

(*b*) The vertical separation of masthead lights of power-driven vessels shall be such that in all normal conditions of trim the after light will be seen over and separate from the forward light at a distance of 1,000 metres from the stem when viewed from sea level.

(*c*) The masthead light of a power-driven vessel of 12 metres but less than 20 metres in length shall be placed at a height above the gunwale of not less than 2·5 metres.

(*d*) A power-driven vessel of less than 12 metres in length may carry the uppermost light at a height of less than 2·5 metres above the gunwale. When however a masthead light is carried in addition to sidelights and a sternlight, then such masthead light shall be carried at least 1 metre higher than the sidelights.

(*e*) One of the two or three masthead lights prescribed for a power-driven vessel when engaged in towing or pushing another vessel shall be placed in the same position as either the forward masthead light or the after masthead light: provided that, if carried on the aftermast, the lowest after masthead light shall be at least 4·5 metres vertically higher than the forward masthead light.

(*f*) (i) The masthead light or lights prescribed in Rule 23(*a*) shall be so placed as to be above and clear of all other lights and obstructions except as described in sub-paragraph (ii).

(ii) When it is impracticable to carry the all-round lights prescribed by Rule 27(*b*)(i) or Rule 28 below the masthead lights, they may by carried above the after masthead light(s) or vertically in between the forward masthead light(s) and after masthead light(s), provided that in the latter case the requirement of Section 3(*c*) of this Annex shall be complied with.

(*g*) The sidelights of a power-driven vessel shall be placed at a height above the hull not greater than three-quarters of that of the forward masthead light. They shall not be so low as to be interfered with by deck lights.

(*h*) The sidelights, if in a combined lantern and carried on a power-driven vessel of less than 20 metres in length, shall be placed not less than 1 metre below the masthead light.

(*i*) When the Rules prescribe two or three lights to be carried in a vertical line, they shall be spaced as follows:

(i) on a vessel of 20 metres in length or more such lights shall be spaced not less than 2 metres apart, and the lowest of these lights shall, except where a towing light is required, be placed at a height of not less than 4 metres above the hull;

(ii) on a vessel of less than 20 metres in length such lights shall be spaced not less than 1 metre apart and the lowest of these lights shall, except where a towing light is required, be placed at a height of not less than 2 metres above the hull;

(iii) when three lights are carried they shall be equally spaced.

(*j*) The lower of the two all-round lights prescribed for a vessel when engaged in fishing shall be at a height above the sidelights not less than twice the distance between the two vertical lights.

(*k*) The forward anchor light prescribed in Rule 30(*a*)(i), when two are carried, shall not be less than 4·5 metres above the after one. On a vessel of 50 metres or more in length this forward anchor light shall be placed at a height of not less than 6 metres above the hull.

3. *Horizontal positioning and spacing of lights*

(*a*) When two masthead lights are prescribed for a power-driven vessel, the horizontal distance between them shall not be less than one-half of the length of the vessel but need not be more than 100 metres. The forward light shall be placed not more than one-quarter of the length of the vessel from the stem.

(*b*) On a power-driven vessel of 20 metres or more in length the sidelights shall not be placed in front of the forward masthead lights. They shall be placed at or near the side of the vessel.

(*c*) When the lights prescribed in Rule 27(*b*)(i) or Rule 28 are placed vertically between the forward masthead light(s) and the after masthead light(s) these all-round lights shall be placed at a horizontal distance of not less than 2 metres from the fore and aft centreline of the vessel in the athwartship direction.

4. *Details of location of direction-indicating lights for fishing vessels, dredgers and vessels engaged in underwater operations*

(*a*) The light indicating the direction of the outlying gear from a vessel engaged in fishing as prescribed in Rule 26(*c*)(ii) shall be placed at a horizontal distance of not less than 2 metres and not more than 6 metres away from the two all-round red and white lights. This light shall be placed not higher than the all-round white light prescribed in Rule 26(*c*)(i) and not lower than the sidelights.

(*b*) The lights and shapes on a vessel engaged in dredging or underwater operations to indicate the obstructed side and/or the side on which it is safe to pass, as prescribed in Rule 27(*d*)(i) and (ii), shall be placed at the maximum practical horizontal distance, but in no case less than 2 metres, from the lights or shapes prescribed in Rule 27(*b*)(i) and (ii). In no case shall the upper of these lights or shapes be at a greater height than the lower of the three lights or shapes prescribed in Rule 27(*b*)(i) and (ii).

5. *Screens for sidelights*

The sidelights of vessels of 20 metres or more in length shall be fitted with inboard screens painted matt black, and meeting the requirements of Section 9 of this Annex. On vessels of less than 20 metres in length the sidelights, if necessary to meet the requirements of Section 9 of this Annex, shall be fitted with inboard matt black screens. With a combined lantern, using a single vertical filament and a very narrow division between the green and red sections, external screens need not be fitted.

6. *Shapes*

(*a*) Shapes shall be black and of the following sizes:

(i) a ball shall have a diameter of not less than 0·6 metre;

(ii) a cone shall have a base diameter of not less than 0·6 metre and a height equal to its diameter;

(iii) a cylinder shall have a diameter of at least 0·6 metre and a height of twice its diameter;

(iv) a diamond shape shall consist of two cones as defined in (ii) above having a common base.

(*b*) The vertical distance between shapes shall be at least 1·5 metres.

(*c*) In a vessel of less than 20 metres in length shapes of lesser dimensions but commensurate with the size of the vessel may be used and the distance apart may be correspondingly reduced.

7. *Colour specification of lights*

The chromaticity of all navigation lights shall conform to the following standards, which lie within the boundaries of the area of the diagram specified for each colour by the International Commission on Illumination (CIE).

The boundaries of the area for each colour are given by indicating the corner co-ordinates, which are as follows:

(i) *White*

x	0.525	0.525	0.452	0.310	0.310	0.443
y	0.382	0.440	0.440	0.348	0.283	0.382

(ii) *Green*

x	0.028	0.009	0.300	0.203
y	0.385	0.723	0.511	0.356

(iii) *Red*

x	0.680	0.660	0.735	0.721
y	0.320	0.320	0.265	0.259

(iv) *Yellow*

x	0.612	0.618	0.575	0.575
y	0.382	0.382	0.425	0.406

8. *Intensity of lights*

(*a*) The minimum luminous intensity of lights shall be calculated by using the formula:

$$I = 3{\cdot}43 \times 10^6 \times T \times D^2 \times K^{-D}$$

where I is luminous intensity in candelas under service conditions,
T is threshold factor 2×10^{-7} lux,
D is range of visibility (luminous range) of the light in nautical miles,
K is atmospheric transmissivity.

For prescribed lights the value of K shall be 0·8, corresponding to a meteorological visibility of approximately 13 nautical miles.

(*b*) A selection of figures derived from the formula is given in the following table:

Range of visibility (luminous range) of light in nautical miles *D*	*Luminous intensity of light in candelas for* $K = 0{\cdot}8$ *I*
1	0·9
2	4·3
3	12
4	27
5	52
6	94

Note: The maximum luminous intensity of navigation lights should be limited to avoid undue glare. This shall not be achieved by a variable control of the luminous intensity.

9. *Horizontal sectors*

(*a*) (i) In the forward direction, sidelights as fitted on the vessel shall show the minimum required intensities. The intensities shall decrease to reach practical cut-off between 1 degree and 3 degrees outside the prescribed sectors.

(ii) For sternlights and masthead lights and at 22.5 degrees abaft the beam for sidelights, the minimum required intensities shall be maintained over the arc of the horizon up to 5 degrees within the limits of the sectors prescribed in Rule 21. From 5 degrees within the prescribed sectors the intensity may decrease by 50 per cent up to the prescribed limits; it shall decrease steadily to reach practical cut-off at not more than 5 degrees outside the prescribed sectors.

(*b*) All-round lights shall be so located as not to be obscured by masts, topmasts or structures within angular sectors of more than 6 degrees, except anchor lights prescribed in Rule 30, which need not be placed at an impracticable height above the hull.

10. *Vertical sectors*

(*a*) The vertical sectors of electric lights as fitted, with the exception of lights on sailing vessels shall ensure that:

(i) at least the required minimum intensity is maintained at all angles from 5 degrees above to 5 degrees below the horizontal;

(ii) at least 60 per cent of the required minimum intensity is maintained from 7·5 degrees above to 7·5 degrees below the horizontal.

(*b*) In the case of sailing vessels the vertical sectors of electric lights as fitted shall ensure that:

(i) at least the required minimum intensity is maintained at all angles from 5 degrees above to 5 degrees below the horizontal;

(ii) At least 50 per cent of the required minimum intensity is maintained from 25 degrees above to 25 degrees below the horizontal;

(*c*) In the case of lights other than electric these specifications shall be met as closely as possible.

11. *Intensity of non-electric lights*

Non-electric lights shall so far as practicable comply with the minimum intensities, as specified in the Table given in Section 8 of this Annex.

12. *Manoeuvring light*

Notwithstanding the provisions of paragraph 2(*f*) of this Annex the manoeuvring light described in Rule 34(*b*) shall be placed in the same fore and aft vertical plane as the masthead light or lights and, where practicable, at a minimum height of 2 metres vertically above the forward masthead light, provided that it shall be carried not less than 2 metres vertically above or below the after masthead light. On a vessel where only one masthead light is carried the manoeuvring light, if fitted, shall be carried where it can best be seen, not less than 2 metres vertically apart from the masthead light.

13. *Approval*

The construction of lights and shapes and the installation of lights on board the vessel shall be to the satisfaction of the appropriate authority of the State whose flag the vessel is entitled to fly.

ANNEX II

Additional signals for fishing vessels fishing in close proximity

1. *General*

The lights mentioned herein shall, if exhibited in pursuance of Rule 26(*d*), be placed where they can best be seen. They shall be at least 0·9 metre apart but at a lower level than lights prescribed in Rule 26(*b*)(i) and (*c*)(i). The lights shall be visible all round the horizon at a distance of at least 1 mile but at a lesser distance than the lights prescribed by these Rules for fishing vessels.

2. *Signals for trawlers*

(*a*) Vessels when engaged in trawling, whether using demersal or pelagic gear, may exhibit:

(i) when shooting their nets:
two white lights in a vertical line;

(ii) when hauling their nets:
one white light over one red light in a vertical line;

(iii) when the net has come fast upon an obstruction:
two red lights in a vertical line.

(*b*) Each vessel engaged in pair trawling may exhibit:

(i) by night, a searchlight directed forward and in the direction of the other vessel of the pair;

(ii) when shooting or hauling their nets or when their nets have come fast upon an obstruction, the lights prescribed in 2(*a*) above.

3. *Signals for purse seiners*

Vessels engaged in fishing with purse seine gear may exhibit two yellow lights in a vertical line. These lights shall flash alternately every second and with equal light and occultation duration. These lights may be exhibited only when the vessel is hampered by its fishing gear.

ANNEX III

Technical details of sound signal appliances

1. *Whistles*

(*a*) *Frequencies and range of audibility*

The fundamental frequency of the signal shall lie within the range 70–700 Hz.

The range of audibility of the signal from a whistle shall be determined by those frequencies, which may include the fundamental and/or one or more higher frequencies, which lie within the range 180–700 Hz (± 1 per cent) and which provide the sound pressure levels specified in paragraph 1(*c*) below.

(*b*) *Limits of fundamental frequencies*

To ensure a wide variety of whistle characteristics, the fundamental frequency of a whistle shall be between the following limits:

(i) 70–200 Hz, for a vessel 200 metres or more in length;

(ii) 130–350 Hz, for a vessel 75 metres but less than 200 metres in length;

(iii) 250–700 Hz, for a vessel less than 75 metres in length.

(*c*) *Sound signal intensity and range of audibility*

A whistle fitted in a vessel shall provide, in the direction of maximum intensity of the whistle and at a distance of 1 metre from it, a sound pressure level in at least one ⅓rd-octave band within the range of frequencies 180–700 Hz (± 1 per cent) of not less than the appropriate figure given in the table below.

Length of vessel in metres	*1/3rd-octave band level at 1 metre in dB referred to 2 × 10^{-5} N/m^2*	*Audibility range in nautical miles*
200 or more	143	2
75 but less than 200	138	1·5
20 but less than 75	130	1
Less than 20	120	0·5

The range of audibility in the table above is for information and is approximately the range at which a whistle may be heard on its forward axis with 90 per cent probability in conditions of still air on board a vessel having average background noise level at the listening posts (taken to be 68 dB in the octave band centred on 250 Hz and 63 dB in the octave band centred on 500 Hz).

In practice the range at which a whistle may be heard is extremely variable and depends critically on weather conditions; the values given can be regarded as typical but under conditions of strong wind or high ambient noise level at the listening post the range may be much reduced.

(*d*) *Directional properties*

The sound pressure level of a directional whistle shall be not more than 4 dB below the prescribed sound pressure level on the axis at any direction in the horizontal plane within ± 45 degrees of the axis. The sound pressure level at any other direction in the horizontal plane shall be not more than 10 dB below the prescribed sound pressure level on the axis, so that the range in any direction will be at least half the range on the forward axis. The sound pressure level shall be measured in that 1/3rd-octave band which determines the audibility range.

(*e*) *Positioning of whistles*

When a directional whistle is to be used as the only whistle on a vessel, it shall be installed with its maximum intensity directed straight ahead.

A whistle shall be placed as high as practicable on a vessel, in order to reduce interception of the emitted sound by obstructions and also to minimize hearing damage risk to personnel. The sound pressure level of the vessel's own signal at listening posts shall not exceed 110 dB (A) and so far as practicable should not exceed 100 dB (A).

(*f*) *Fitting of more than one whistle*

If whistles are fitted at a distance apart of more than 100 metres, it shall be so arranged that they are not sounded simultaneously.

(*g*) *Combined whistle systems*

If due to the pressure of obstructions the sound field of a single whistle or of one of the whistles referred to in paragraph 1(*f*) above is likely to have a zone of greatly reduced signal level, it is recommended that a combined

whistle system be fitted so as to overcome this reduction. For the purposes of the Rules a combined whistle system is to be regarded as a single whistle. The whistles of a combined system shall be located at a distance apart of not more than 100 metres and arranged to be sounded simultaneously. The frequency of any one whistle shall differ from those of the others by at least 10 Hz.

2. *Bell or gong*

(*a*) *Intensity of signal*

A bell or gong, or other device having similar sound characteristics shall produce a sound pressure level of not less than 110 dB at a distance of 1 metre from it.

(*b*) *Construction*

Bells and gongs shall be made of corrosion-resistant material and designed to give a clear tone. The diameter of the mouth of the bell shall be not less than 300 mm for vessels of 20 metres or more in length, and shall be not less than 200 mm for vessels of 12 metres or more but of less than 20 metres in length.

Where practicable, a power-driven bell striker is recommended to ensure constant force but manual operation shall be possible. The mass of the striker shall be not less than 3 per cent of the mass of the bell.

3. *Approval*

The construction of sound signal appliances, their performance and their installation on board the vessel shall be to the satisfaction of the appropriate authority of the State whose flag the vessel is entitled to fly.

ANNEX IV

Distress signals

1. The following signals, used or exhibited either together or separately, indicate distress and need of assistance:

(*a*) a gun or other explosive signal fired at intervals of about a minute;
(*b*) a continuous sounding with any fog-signalling apparatus;
(*c*) rockets or shells, throwing red stars fired one at a time at short intervals;
(*d*) a signal made by radiotelegraphy or by any other signalling method consisting of the group ···−−−··· (SOS) in the Morse Code;
(*e*) a signal sent by radiotelephony consisting of the spoken word "Mayday ;
(*f*) the International Code Signal of distress indicated by N.C.;
(*g*) a signal consisting of a square flag having above or below it a ball or anything resembling a ball;
(*h*) flames on the vessel (as from a burning tar barrel, oil barrel, etc.);
(*i*) a rocket parachute flare or a hand flare showing a red light;
(*j*) a smoke signal giving off orange-coloured smoke;

(*k*) slowly and repeatedly raising and lowering arms outstretched to each side;
(*l*) the radiotelegraph alarm signal;
(*m*) the radiotelephone alarm signal;
(*n*) signals transmitted by emergency postition-indicating radio beacons;
(*o*) approved signals transmitted by radiocommunications systems.

2. The use or exhibition of any of the foregoing signals except for the purpose of indicating distress and need of assistance and the use of other signals which may be confused with any of the above signals is prohibited.

3. Attention is drawn to the relevant sections of the International code of Signals, the Merchant Ship Search and Rescue Manual and the following signals:

(*a*) a piece of orange-coloured canvas with either a black square and circle or other appropriate symbol (for identification from the air);
(*b*) a dye marker

PILOT LADDERS

The Department of Transport's oral examination in seamanship requires that a candidate shall know how to rig a pilot ladder in a safe and proper manner. Every foreign-going cargo and passenger ship engaged on long international voyages is required to carry a ladder which is used only for the embarkation and disembarkation of pilots, officials or other persons while the vessel is arriving in or leaving port. The ladder must be rigged well clear of overboard discharges, so that each step rests firmly against the ship's side and so that the pilot can gain convenient access to the ship after climbing between 1·5 and 9 m.

The ladder must be a single length, capable of reaching the water from the access point at light draught, with normal trim and zero list. If the pilot has to climb more than 9 m, an accommodation ladder (or similar device) shall be used instead.

The treads of the ladder must be made of hardwood 48 cm long by 11·5 cm deep and 2·5 cm thick, spaced between 30 and 38 cm apart. The steps must be horizontal. The two side-ropes, on each side, are to be of 18-mm manila rope. Two 20-mm manropes are to be fitted to enable the pilot to mount the ladder, together with a safety line if thought fit. Hardwood battens, 2 m long, must be fitted every so often to prevent the ladder from twisting. At night, both the ladder and the point of access are to be properly illuminated. A responsible officer must supervise the ladder when in use.

The Merchant Shipping (Pilot Ladders) Rules 1980, allow substitute materials if the D.o.T. is satisfied that they are of equal strength and suitability.

POLLUTION OF THE SEA BY OIL

In the United Kingdom, this is controlled by the Prevention of Oil Pollution Act 1971 and the Merchant Shipping (Prevention of Oil Pollution) Regulations 1983. Regardless of the amount of legislation, one fact remains indisputable: pollution of the seas can be prevented only by the integrity and diligence of serving Officers.

The main points of the legislation are as follows:

(1) Tankers may discharge cargo oil only outside *special areas*, more than 50 miles from land and at not more than 60 litres per mile. Other ships (and tankers pumping machinery-space bilges) may discharge oil or oily mixtures at least 12 miles from land but only if the oil content is less than 100 ppm. The latter ships may move closer than 12 miles if the oil content does not exceed 15 ppm. In *special areas*, only non-tankers under 400 gross tons may do this.
(2) It is a defence to show that the discharge was due to damage or leak and that all steps were taken to minimise it, or it was discharged for the safety of the ship or life.
(3) The maximum fine on summary conviction for oil-pollution offences is £50,000. The Master, Owner and culprit are liable.
(4) No oil is to be transferred between sunset and sunrise to or from a vessel in a United Kingdom harbour unless 3 to 96 hours notice has been given to the Harbourmaster. (Penalty £400.)
(5) Records are to be kept of ballasting and cleaning of oil tanks, disposal of sludge, discharge of machinery space bilge water, the loading, discharging or transfer of oil cargoes, crude oil washing, discharge of ballast and the discharge of water from slop tanks.
(6) The penalty for failing to keep, or falsifying oil records, is £2,000 on summary conviction.

A special area includes the Mediterranean Sea area, the Black Sea and the Baltic Sea area. All ships within 200 miles of the UK, all UK ships within 200 miles of land, all UK tankers fully or partly laden and all UK ships of 10,000 gross tons and over must report oil discharges to the coastal State which is considered to be most at risk. All oil tankers of 150 gross tons or more and other ships of 400 gross tons or more are issued with an International Oil Pollution Prevention Certificate valid for 5 years. There is an annual survey of the ship. Oil record books are to be kept for three years from the date of the last entry.

Since both Masters and Owners are liable to fines under this

legislation, it is vital that students obtain copies of the Regulations and study them very carefully. The law now provides for the actual defaulter to be included in the penalties.

MERCHANT SHIPPING NOTICES

From time to time, the Department of Transport in the U.K. issues Notices dealing with aspects of general safety aboard merchant ships, often based upon recent accidents and disasters. The notices are obtainable at Shipping Offices and are issued gratis to Masters.

The following section contains references to the more important 'M' Notices, relating to the work of this chapter. The notices have a great value provided they are produced as soon as possible after the event to which they relate. While it is fairly safe for a student to assume that, if there is a particular danger, there must be an 'M' notice about it, he should consult the full list of issues before presenting himself for examination.

Firefighting on Ships in Port

Fire fighting and prevention on board ships under construction is the builder's responsibility. It is the responsibility of the owners while the ship is under repair. When firefighting may endanger a ship's stability (i.e. flooding of the vessel) and a decision has to be made whether firefighting should cease, the decision of the Harbourmaster, or other Port Officer, is final, after consultation with interested parties. The Master, or Duty Officer, is not however relieved of his duty to inform the Fire Brigade Officer if he considers that dangerous circumstances are developing.

Emergency Medical Outfits

A fire on a tanker destroyed the amidships accommodation together with the medical outfit. It is recommended that tankers should carry a spare medical kit, aft, and preferably in the vicinity of the engine-room.

Carriage of Air-dried Wood Pulp

Tests show that free expansion of wetted wood pulp can lead to a 50% increase in bale depth. Extreme care should be taken to see that this cargo is protected from the admission of water. Severe rupturing of compartment boundaries is otherwise likely to occur.

Direction-finding Apparatus

Serious errors have arisen in the use of this device owing to the proximity of domestic aerials to the D.F. loop. Domestic receivers in the vessel should either be connected to a communal aerial or have aerials rising no higher than the base of the loop, or at least 15 m from the base of the loop, measured horizontally. Random aerials can also affect R.T., W.T. equipment and radio-aids to navigation.

Prevention of Heat Illness

The health of officers on watch is of prime importance. Heatstroke can be very sudden and is always dangerous. It is due to a disturbance in the part of the brain which regulates body temperatures. It is characterised by a cessation of sweating, a burning dry skin, followed by delirium and unconsciousness. Cooling of the body becomes an urgent matter.

Heat exhaustion is less dramatic but may lead to collapse if neglected. Symptoms are fatigue, headache, nausea and faintness. It is caused by an inadequate intake of salt and water.

Heat illnesses may be prevented by drinking at least 4·5 litres of water per day in small but frequent quantities, taking extra salt, avoiding exposure to the sun around midday, and avoiding heavy meals and alcohol in the middle of the day. The body should be kept cool and well washed. Excessive consumption of alcohol under these conditions can lead to heatstroke and death.

Portable Radio Equipment

This must be regularly tested every 7 days and maintained in an efficient condition ready for instant use. One or more persons should be detailed on the Muster List to place the equipment in a lifeboat in an emergency.

Radio Telephone Procedure

This apparatus is required to have three cards displayed nearby. On vessels where the carriage of R.T. is not mandatory, the cards should still be carried if the equipment is fitted.

Card No. 1 explains the procedure for transmitting a distress call

e.g. 'MAYDAY MAYDAY MAYDAY. NONSUCH NONSUCH NONSUCH. MAYDAY NONSUCH.
POSITION 54 25 NORTH 016 33 WEST
I AM ON FIRE AND REQUIRE IMMEDIATE ASSISTANCE.
OVER.'

(Where 'NONSUCH' is the name of the ship.)

Card No. 2 explains that the word 'MAYDAY' implies grave and imminent danger and a request for assistance. The word 'PAN' indicates a message of urgency and 'SECURITE' (pronounced SAY-CURITAY) preludes a navigational or meteorological warning.

Card No. 3 gives the phonetic alphabet and explains how to use R.T. for International Code signals when a language difficulty exists. This type of message uses the word 'INTERCO' to mean that International Code follows.

e.g. 'MAYDAY MAYDAY MAYDAY. NONSUCH NONSUCH NONSUCH. MAYDAY NONSUCH.
INTERCO.
ALFA (A) NADAZERO (O) UNAONE (1) PANTAFIVE (5)
USHANT ROMEO (R) KARTEFOUR (4) NADAZERO (O)
DELTA X-RAY (DX)'

which means

Vessel NONSUCH requires immediate assistance. Position bearing 015 TRUE from USHANT, range 40 miles. I am sinking.

Lifeboat Launching Crews

These crews should include no more than two persons when launching a boat carried on a red-banded launching device.

Direction-finding an SOS Call

When not in use the D.F. set should be kept tuned to one of the international distress frequencies. This will enable rapid bearing location of the call. A suitable method is to link an automatic D.F. with the auto-alarm. In this way, while the radio officer is off watch, not only does the auto-alarm signal trigger off the warning bells but a direction is automatically taken.

Vessels Carrying Dangerous Goods

These vessels when under way at night in the open sea should not carry a red light visible all round the horizon. This light will constitute

a breach of the Collision Regulations unless the vessel is leaking flammable spirit and is in distress with rockets likely to be fired towards her.

Magnetic Compasses

These can be seriously affected if portable radios, exposure meters, hand microphones or telephone handsets are placed within a distance of 4 m.

Polyurethane and other Organic Foams

These are highly dangerous when exposed to fire or other intense heat. Flames may spread at more than 30 m per minute. Temperatures of 1000°C may be generated together with large amounts of highly toxic gas and smoke.

Synthetic Mooring Lines

This type of material gives no audible warning when the breaking stress is approached. On parting, there is considerable recoil which can cause serious accidents. Surging and rendering these ropes around bitts or drums can cause the turns to fuse together and create binding. Only synthetic stoppers should be used on synthetic ropes. It is desirable that only one type of material should be used for mooring ropes in a particular ship. To expect the crew to handle alternately ropes of differing characteristics is to invite accidents.

THE NAVIGATIONAL WATCH

Several Merchant Shipping Notices have been published, following IMCO Resolutions, concerning safe navigation watchkeeping.

The basic recommendations are:

(1) The composition of the watch shall take into account the weather conditions, visibility, whether it is day or night, navigational hazards, use and condition of navigation equipment, automatic steering.
(2) Watchkeeping is not to be impaired by fatigue. The first watch of a voyage especially, shall be rested and fit.
(3) The Officer in charge of the watch shall not undertake duties which will interfere with safe navigation.
(4) At all times, there shall be an efficient and unimpaired visual and listening lookout. Ideally, the helmsman shall not also act as the lookout. By day, the Officer of the watch may act as the sole visual lookout but only after careful consideration of prevailing circumstances.

(5) The presence of a pilot shall not relieve the Master (or Officer in charge) of his duties and obligations regarding the safety of the ship.

(6) The Officer of the Watch shall under no circumstances leave the bridge until properly relieved. A proper lookout must be maintained during a visit to a separate chartroom. Such visits are to be brief.

(7) When the Officer is acting as sole lookout, he must not hesitate to summon assistance to the bridge if he needs it and such assistance is to be immediately available.

(8) The Officer should not hesitate to use engines and sound signalling apparatus.

(9) The Officer of the watch is responsible for the safe navigation of the ship **even when the Master is on the bridge, until the Master informs him that he has assumed full responsibility and this is mutually understood.**

(10) The automatic steering should be tested in manual at least once a watch. Manual steering should be adopted well before a close-quarters situation develops.

THE INTERNATIONAL CODE OF SIGNALS

It is beyond the size of this book to discuss flag signalling methods, and the reader is referred to the *International Code of Signals 1969 (Revised)*, where he will find the full procedure clearly discussed. At the same time he should thoroughly familiarise himself with the layout and use of this important book.

The flags themselves are included in Fig. 14.11 for reference purposes only; again, the reader is advised to colour them himself after carefully studying the colour key. The following are the meanings of the flags when used singly. The same meanings apply when used by any other method of signalling.

A I have a diver down; keep well clear at slow speed.
*B I am taking in, or discharging, or carrying, dangerous goods.
C Yes (affirmative, or 'The significance of the previous group should be read in the affirmative').
*D Keep clear of me; I am manœuvring with difficulty.
*E I am altering my course to starboard.
F I am disabled; communicate with me.
G I require a pilot. (When made by fishing vessels operating in close proximity on the fishing grounds it means 'I am hauling nets'.)

*H I have a pilot on board.
*I I am altering my course to port.
J Keep well clear of me. I am on fire and have dangerous cargo on board, or I am leaking dangerous cargo.
K I wish to communicate with you.
L You should stop your vessel instantly.
M My vessel is stopped and making no way through the water.
N No (negative, or 'The significance of the previous group should be read in the negative'). This signal may be given only visually or by sound. For voice or radio transmission the signal should be 'NO'.
O Man overboard.
P (In harbour) All persons should report on board as the vessel is about to proceed to sea. (At sea may be used by fishing vessels to mean 'My nets have come fast upon an obstruction'.)
Q My vessel is 'healthy' and I request free pratique.
R (No meaning given.)
*S My engines are going astern.
*T Keep clear of me; I am engaged in pair trawling.
U You are running into danger.
V I require assistance.
W I require medical assistance.
X Stop carrying out your intentions and watch for my signals.
Y I am dragging my anchor.
Z I require a tug (or, as in 'G' above, 'I am shooting nets').

Signals marked with an asterisk (*) may be made only by sound signalling according to Rules 34 and 35 of the Collision Regulations.

The code pennant is hoisted close-up to the halliard block to indicate that a flag message is understood. If it is kept at the dip, i.e. flying below the halliard block, it indicates that the message is not yet interpreted. The pennant is also used to indicate a decimal point.

Names in the text of a signal are to be spelt out using the alphabetical flags, preceded if necessary by the group 'YZ', meaning 'The words which follow are in plain language'.

Single-letter signals are usually of an urgent nature.

Two-letter signals are used for the general section.

Three-letter hoists begin with the letter 'M' and indicate medical signals.

Four-letter hoists will indicate signal letters of ships.

Latitude is expressed by four numerals preceded by 'L'. The first two indicate the degrees and the final two, the minutes. The letters 'N' or 'S' may follow if needed.

'L 3740 S' means Latitude 37°40′ South

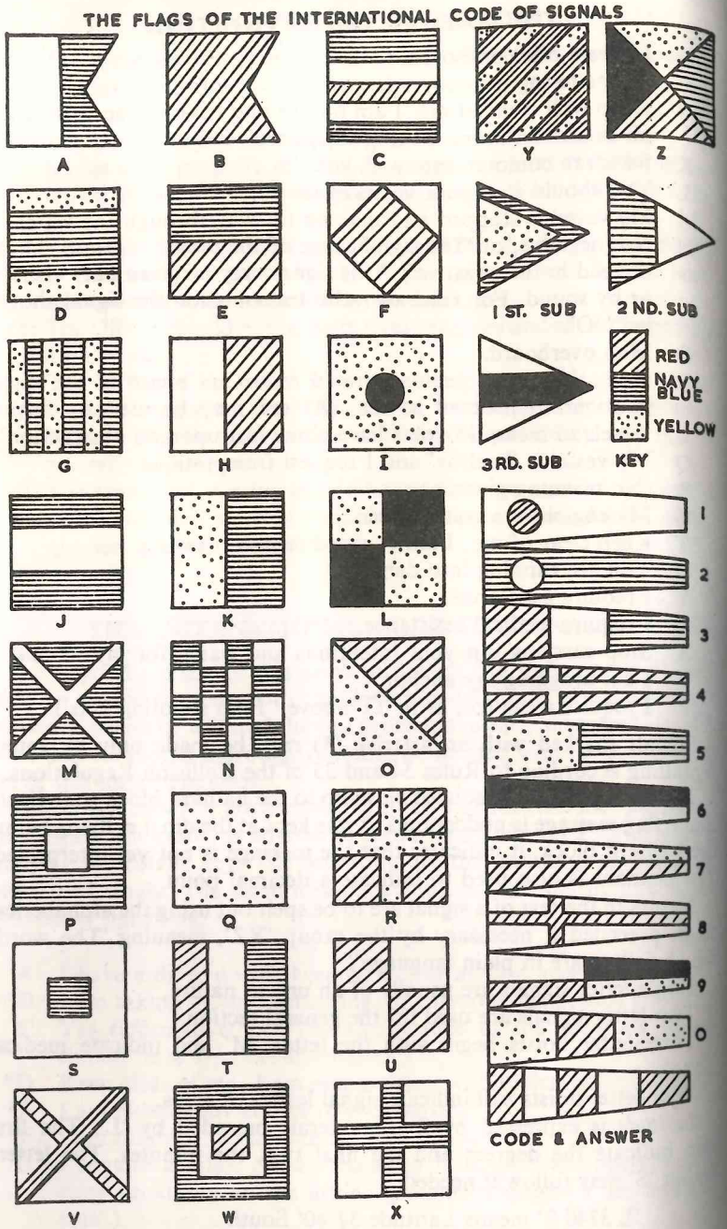


FIGURE 14.11

Longitude is expressed by four, or five, numerals preceded by the letter 'G'. When the longitude exceeds 99°, no confusion will normally arise if the figure indicating hundreds of degrees is omitted. In cases where confusion may occur, it should be used. The letters 'E' or 'W' may be used if necessary, thus

'G 13925 E' means Longitude 139°25' East

Course is indicated by three numerals denoting degrees from 000 to 359, preferably preceded by the letter 'C'.

Speed in knots is indicated by numerals preceded by 'S'. The letter 'V' is used for kilometres per hour.

'C 240 S 18' means Course 240° Speed 18 knots.

Azimuth or bearing is expressed similarly to course, preferably preceded by 'A'. Bearings and courses are true unless otherwise stated in the context.

Distance is indicated in nautical miles by one or more numerals, preferably preceded by 'R'.

Date may be signalled by two, four or six numerals preceded by 'D'. The first two denote the day of the month. The next two indicate the month of the year and the final two the year itself.

'D 180763' indicates 18 July 1963.
'D 18' alone, indicates the 18th of the current month.

Time is denoted by the use of the 24-hour clock. Four numerals are used preceded by 'T' (local time) or 'Z' (G.M.T.). A time of 2359 is followed a minute later not by 2400 but by 0000.

The flag set of 40 contains three substitutes, used to repeat a flag in a group. Thus the group 'MMB' is sent as 'M', First substitute, 'B'. The group MBM would be sent as M, B, First substitute. The group number '1100' is sent as '1', First substitute, '0', Third substitute. But the group 'T 1100' would be sent in the same way, prefixed by 'T'. The prefix letter is not included when substitutes are made. Thus 'G 2444' would appear as 'G, 2, 4', Second substitute, Third substitute.

Sound signalling is a slow process. Its misuse may create serious confusion at sea and its use in fog should be kept to a minimum. Signals other than the single letters should be made only in extreme emergency and never in busy waters. The signals should be made slowly and clearly. If they are repeated, it should be at long intervals.

Flags Flown by British Merchant Ships

Section 74 of the Merchant Shipping Act 1894 states:

(1) A ship belonging to a British subject shall hoist the proper national colours—

(*a*) On a signal being made to her by one of Her Majesty's ships, (including any vessel under the command of an officer of Her Majesty's Navy on full pay), and

(*b*) on entering or leaving any foreign port, and

(*c*) if of 50 tons *gross* tonnage or upwards, on entering or leaving any British port.

(2) If default is made on board any such ship in complying with this section the Master of the ship shall for each offence be liable to a fine on summary conviction.

THE KNOWLEDGE OF THE OFFICER OF THE WATCH

The section which now follows is a comprehensive list of questions and answers relating to efficient watchkeeping. It cannot be stressed too much that these answers should come automatically to every Officer on watch, for in many cases lives may be at stake. A candidate for a D.o.T. certificate is likely to be questioned very closely in a similar fashion.

A space will be left after each answer so that from time to time the reader can insert any amendments which may be made by the Authorities. It is most important that the answers be kept up to date.

The letter 'M' will indicate that the information is promulgated by D.o.T. Notices, 'N.M.' will refer to Notices to Mariners, and 'S.R.' to Statutory Rules and Orders.

The questions are intended to cover work which has not already been dealt with in previous text, but a few may arise which refer to past reading, in order to emphasise an important point.

1. What is a Larsen trawl and what lights are shown by vessels thus fishing? (M).

It is a trawl towed between two trawlers; each vessel carries normal trawling lights, but a searchlight may be shone from each vessel towards the other.

Amendment

2. What is the visibility of sidelights carried on a 12·0 m sailing ship?

Two miles; the reduced range is permitted only on sailing ships of less than 12·0 m. (Rule 22.)

Amendment

3. A 50 m power-driven coaster runs aground. What signal must she show?

Anchor lights and two all-round red lights vertically disposed (Rule 30) and three balls in a vertical line.

Amendment

4. What signal is shown by a seaplane aground?

As far as possible, the signal mentioned in Question 3 above, and three balls by day (Rules 30, 31.)

Amendment

5. A pillar buoy is sighted in the North Sea coloured black over yellow. Topmark: two black cones points upwards. What action should be taken?

Pass to the north of this buoy. It is a north quadrant cardinal mark, system 'A'.

Amendment

6. What is an examination port? (N.M.)

It is a British or Commonwealth port where an Examination Service exists for the purpose of examining vessels desiring to enter the port or locality. It is often carried out in conjunction with Admiralty control or closure of the port.

Amendment

7. A serious emergency exists in a port. What signals are displayed? (N.M.)

Three flashing red lights, vertically disposed in or near the port approach. All ships are to stop or divert according to instructions.

Amendment

8. What signals are used to indicate that vessels shall not proceed in a port? (N.M.)

Three fixed or slow-occulting red lights, vertically disposed in or near the port approach.

Amendment

9. What action should be taken if a port displays three fixed or slow-occulting green lights, vertically disposed? (N.M.)

I may proceed but a one-way traffic system is in operation. If the lower light is white, a two-way traffic system is in force.

Amendment

10. A fishing vessel is exhibiting two yellow lights, vertically disposed, and flashing alternately. What does this mean?

The vessel is fishing with Seine nets. These are likely to cover one square mile. (2nd Annex to Rules.)

Amendment

11. Describe ODAS buoys. (N.M.)

These are Ocean Data Acquisition System buoys, collecting and recording ocean data. They are coloured in yellow and have a light which is usually a group flashing yellow.

Amendment

12. What is the meaning of a port signal consisting of three lights vertically disposed in the order green, white, green? (N.M.)

Ships may proceed only if they have specific orders to do so. A yellow light shown to the upper left of the signal means that ships can proceed as long as they do not use the main channel.

Amendment

13. What day signal may be shown by vessels engaged in pair trawling?

International Code flag 'T' flown at the foremast.

Amendment

14. What actions are not permitted within an Examination anchorage? (N.M.)

To lower any boat; to communicate with the shore or other ships; to move the ship; to work cables, or to allow any person or thing to leave the ship. These actions are allowed only if they will prevent an accident or if the permission of the Examining Officer has been obtained.

Amendment

15. A fishing vessel displays two white lights, visible all round the horizon, vertically disposed, in addition to normal fishing lights. What does this indicate?

'I am shooting nets'. (2nd Annex to Rules.)

Amendment

16. Which vessels switch off their sidelights when stopped but under way?

Vessels not under command, vessels engaged in fishing and vessels restricted in their ability to manœuvre, except vessels clearing mines or towing.

Amendment

17. What lights are displayed by oil rigs? (N.M.)

Normally, an all-round white light visible for 10 miles. Also a red light at each 'corner' visible for 2 miles. All lights flash Morse 'U' every 15 seconds.

Amendment

18. In which direction do long nets lie by day, from a fishing vessel?

From the double cone (or basket) towards the single cone. (Rule 26.)

Amendment

19. What is the day signal for a trawler?

Two black cones, in a vertical line, points together. If under 20 m in length, she may show a basket instead. (Rule 26.)

Amendment

20. What is a telegraph buoy?

It is a yellow Special Mark buoy and shows a submarine cable in an area where anchoring is not permitted.

Amendment

21. What fog signal is made by an oil rig? (N.M.)

Normally, a sound signal consisting of Morse 'U' every 30 seconds.

Amendment

22. What shapes are shown by a vessel servicing a buoy, by day, when also at anchor?

The three shapes prescribed in Rule 27, namely a ball, a diamond, and another ball, vertically disposed at least 1·5 m apart where they can best be seen. Also the anchor ball mentioned in Rule 30.

Amendment

23. What is a minehunter? (N.M.)

A small naval vessel locating mines with sonar devices or magnetic-anomaly detecting gear. Her lights are prescribed in Rule 27(*f*). Small vessels may operate nearby showing the lights prescribed in Rule 23 (*c*) or Rule 25(*d*)(ii). 'A' may be signalled by flag or flashing when divers are down.

Amendment

24. What signal is used to indicate that a vessel, at night, has not yet received free pratique to a port? (Int. Code of Signals.)

A red light over a white light, visible all round the horizon, 2·00 m apart, hoisted where they can best be seen.

Amendment

25. On which side of vessel will a disabled aircraft usually ditch? (M).

On her starboard side; this is due to the fact that the Captain of the aircraft usually sits on the port side. A lee should be made, therefore, on the starboard side.

Amendment

26. When a vessel finds herself in a firing practice area, what action should she take? (N.M.)

She should maintain her course and speed; if this is not possible due to the exigencies of navigation, she should clear the area as quickly as possible. All persons on board should take cover.

Amendment

27. What information is promulgated by Notices to Mariners with regard to aircraft carriers? (N.M.)

Their movements are uncertain and they must usually turn into the wind if aircraft are taking off or landing. Furthermore, Mariners are warned that by night aircraft carriers have their steaming lights placed permanently off the centre line of the ship. Alternative positions for their side lights:

(i) on either side of the hull,

(ii) on either side of the island structure, in which case the port bow light may be as much as 30 m from the port side of the ship.

100 ft

Certain aircraft carriers exhibit anchor lights as follows: four *white* lights located in the following manner:

5 ft In the forward part of the vessel at a distance of not more than 1·5 m below the flight deck, two lights in the same horizontal plane, one on the port side and one on the starboard side.

15 ft In the after part of the vessel at a height of not less than 4·5 m lower than the forward lights, two lights in the same horizontal plane, one on the port side and one on the starboard side.

Each light visible over an arc of at least 180 degrees. The forward lights visible over a minimum arc from 1 point on the opposite bow to 1 point from right astern on their own side, and the after lights from 1 point on the opposite quarter to 1 point from right ahead on their own side. (See also Rule 27(*b*).)

Amendment

28. What signal is exhibited by a submarine escort vessel? (N.M.)

The International Code group 'NE 2'. These vessels should be given a wide berth; if this is not possible, they should be approached at slow speed, until warning is received of the danger zone. A good lookout should be kept for submarines.

Amendment

29. How do submarines indicate their positions? (N.M.)

Either by their periscope, or in deeper water, by towing a red and white, or red and yellow float astern of them at the surface. A smoke candle may also be released, giving off a large quantity of smoke.

Amendment

30. What signals are used to indicate that a submarine is about to surface? (N.M.)

One red pyrotechnic light or smoke, repeated as often as necessary to indicate 'Keep clear. I am carrying out an emergency surfacing procedure. Do not stop propellers. Ships are to clear the area immediately and stand by to render assistance.' Two yellow pyrotechnic lights, or two white or yellow smokes, three minutes apart to indicate 'Keep clear. My position is as indicated. I intend to carry out surfacing procedure. Do not stop propellers. Ships are to clear the immediate vicinity.' It must not be inferred that submarines exercise only in the company of escort vessels.

Amendment

31. How may a sunken submarine indicate its plight? (N.M.)

By releasing an indicator buoy, yellow or white smoke and flame candles, or by pumping out air or oil.

Amendment

32. What action should the vessel take on sighting the buoy or any of these signals? (N.M.)

Inform the Navy, Coastguard, or Police; stand by downstream to pick up any escaping men; tap on the ship's side below the waterline, run the echo sounder, or explode small charges at least ¼ mile away, to warn the crew of the submarine that help is at hand.

Amendment

33. Describe the buoy. (N.M.)

It is of a highly visible orange colour, floats at a freeboard of 15 cm, has a white light flashing twice a second, visible to the naked eye in clear darkness for 1·75 miles. The light will flash for some 40 hours. There are cat's-eye reflectors around the upper surface, together with a whip aerial. (See Chapter VI.)

6 in

Amendment

34. What signals are displayed by vessels replenishing with fuel at sea?

British and Allied Warships in conjunction with auxiliaries frequently exercise Replenishment-at-Sea. While doing so the two or more ships taking part are connected by jackstays and hoses. They display the signals prescribed by Rule 27(*b*) of the International Regulations for Preventing Collisions at Sea, 1972.

Mariners are warned that while carrying out these exercises the ships are severely restricted both in manœuvrability and speed, and it is the duty of other vessels to keep well clear in accordance with Rule 3(*g*) of the above Regulations.

Amendment

35. Are there any peculiarities with regard to the navigation lights of submarines? (N.M.)

Submarines when at anchor, or moored to a buoy, may show a white light visible all round the horizon, from the conning tower. This is shown in addition to anchor lights prescribed in Rule 30.

Hitherto the navigation lights of submarines have been exhibited from the conning tower, which is near the centre of the vessel. The steaming light, bow lights, and overtaking light have been necessarily low down and closely spaced, with the result that they give no indication of the submarine's length nor of her exact course or change of course. Consequently they may be mistaken for the lights of a very much smaller vessel of the coaster type.

Special arrangements have now been made to fit H.M. Submarines with a second steaming light. The forward steaming light is placed on a special fitting in the fore part of the vessel between 0·3 and 2 m above the hull. The main steaming light is fitted on the conning tower or fin. In submarines where the forward steaming light is appreciably less than 2 m above the hull, and may in consequence be lower than the coloured side lights, the overall arrangement of lights as seen from other vessels may appear unusual. In addition, the vertical separation in some cases is less than 4·5 m.

1 and 6 ft

6 ft

15 ft

The overtaking light is placed on a special fitting near the stern of the vessel, but may be at a height considerably less than that of the side lights.

Some submarines carry a quick-flashing amber light 2 m above the steaming light, when on the surface at night.

6 ft

36. What lights are carried by a seaplane engaged in towing?

The same as prescribed for other vessels in Rule 24. But see Rule 31 for special dispensation.

Amendment

37. What lights are carried by a seaplane not under command?

She may carry the lights prescribed in Rule 27. She shows the sidelights only when she is moving.

Amendment

38. An aircraft fires white pyrotechnic lights or flashes its navigation lights. What does this mean? (N.M.)

The aircraft wishes to attract the attention of surface shipping.

Amendment

39. A tug is towing three vessels, the length of the tow being 180 m. How many white masthead lights are shown?

500 ft

Only two to indicate the fact that she is towing. (Rule 24.) She shall also show the light required by Rule 23(*a*)(ii).

Amendment

40. A light vessel signals the letter 'K' in Morse to a vessel. What does this mean? (Int. Code of Signals.)

She has something to communicate.

Amendment

41. If she hoists the two-flag signal 'NG', what does this mean?

'You are in a dangerous position'.

Amendment

42. What is the fog-signal for a minesweeper?

A long blast, followed by two short blasts, on the whistle, at intervals of not more than 2 minutes. She is unable to get out of the way. (Rules 27 and 35.)

Amendment

43. What signal is made by a sailing vessel before reaching a bend in a river?

One prolonged blast as prescribed in Rule 34(*e*).

Amendment

44. An aircraft flies over the vessel at sea, in open and unfrequented waters. What action should be taken? (N.M.)

Entries should be made in the logbook regarding the time, date, weather conditions, identification marks of aircraft, type of aircraft, its course, and estimated height.

Amendment

45. What are the limits of helicopter air–sea rescue? (M).

They will not operate at night, in reduced visibility, in winds over 45 knots, and their range is governed by their fuel capacity.

Amendment

46. What is a dracone? (N.M.)

200 ft / 200 yds

A tubular casing of nylon fabric and synthetic rubber, about 60 m long, used for the transportation of oil fuels and spirits. It is towed by a tug on a towline roughly 200 m in length. The dracone is almost submerged, since it floats at a draught commensurate with the specific

gravity of the casing and the liquid. It shows one all-round white light at or near the after end. If more than 25 m in breadth, it shows two extra all-round white lights at or near the extremities of its breadth. By day it shows a black diamond at each end, but see Rule 24(*g*)(iii) and (iv).

Amendment

47. What is a safe water mark?

A red and white buoy used to show that there is navigable water all around it.

Amendment

48. How should the O.O.W. indicate that he is unable to reply to signals received from warships or aircraft?

Signal 'N' in the Morse code or hoist flag 'N'.

Amendment

49. How may a pilot be summoned by day or by night?

Local signals should be used according to the Sailing Directions. The International Code flag 'G' may be flown. Morse 'G' may be made by any signalling method. Where language difficulties exist on R.T., the words 'INTERCO GOLF' may be used.

Amendment

50. When aground, 3 white star rockets are fired ashore. What does this mean? (M).

'You are seen: help will be given as soon as possible.'

Amendment

51. Approaching a disabled tanker in mist, you hear 'GU' sounded on the whistle. What does this mean? (M).

'It is not safe to fire a rocket.'

Amendment

52. A disabled tanker is flying flag B. By night it shows a red light at the masthead. What does this mean? (M).

'The vessel is leaking flammable liquid; it is dangerous to fire a rocket.'

Amendment

53. What is a range safety craft? (N.M.)

A vessel which patrols up to 8 miles away from a firing-area centre.

Amendment

54. What information is promulgated in Notices to Mariners with regard to these areas? (N.M.)

Firing and bombing practices, and defence exercises, take place in a number of areas off the coasts of British Commonwealth and Colonial Territories as well as in foreign waters.

In future, and in view of the responsibility of range authorities to avoid accidents, limits of practice areas will not as a rule be shown on charts and descriptions of areas will not appear in the Sailing Directions. Such range beacons, lights, and marking buoys as may be of assistance to the Mariner, or targets which might be a danger to navigation, will, however, be shown on charts and, when appropriate, mentioned in Sailing Directions.

Lights will be mentioned in the Admiralty List of Lights.

The principal types of practices carried out are:

(*a*) *Bombing Practice from Aircraft*

Warning signals usually shown.

(*b*) *Air to Air, and Air to Sea, or Ground Firing*

The former is carried out by aircraft at a large white or red sleeve, a winged target, or flag towed by another aircraft moving on a steady course. The latter is carried out from aircraft at towed or stationary targets on sea or land, the firing taking place to seaward in the case of those on land.

As a general rule, warning signals are shown when the targets are stationary, but not when towed targets are used.

All marine craft operating as range safety craft, target towers or control launches for wireless controlled targets will display, for identification purposes, while in or in the vicinity of the danger area, the following markings:

(1) a large red flag at the masthead;

(2) a painted canvas strip, 2 m × 1 m, with red and white chequers in 0·3 m squares, on the fore deck or cabin roof. 6 ft × 3 ft 1-ft

Anti-aircraft Firing

This may be from A.A. guns or machine guns at a target towed by aircraft as in (*b*) above, a pilotless target aircraft, or at balloons or kites. Practice may take place from shore batteries or ships.

Warning signals as a rule are shown from shore batteries. Ships fly a red flag.

Firing from Shore Batteries or Ships at Sea at Fixed or Floating Targets

Warning signals usually shown as above.

At Remote-controlled Craft

These craft are 21 m in length and carry 'not under control' shapes and lights, which are prescribed in Rule 27(a). Exercises consisting of surface firing by ships, practice bombing, air to sea firing and rocket firing will be carried out against these craft or targets towed by them. 68 ft

A control craft will keep visual and radar watch up to approximately 8 miles, and there will be cover from the air over a much greater range to ensure that other shipping will not be endangered.

Warning signals, when given, usually consist of red flags by day and *red fixed* or *red flashing* lights at night. The absence of any such signal cannot, however, be accepted as evidence that a practice area does not exist. Warning signals are shown from shortly before practice commences until it ceases.

Ships and aircraft carrying out night exercises may illuminate with bright *red* or *orange* flares.

Amendment

55. A man on a yacht is slowly moving his arms up and down. What does this mean?

It is a signal of distress. (4th Annex to Rules.)

Amendment

56. What shapes are shown by a vessel navigating stern-foremost? (M).

2 ft 8 ft 6 ft

Only when fitted with a bow rudder a vessel will show two black balls, each 0·6 m in diameter on a cross-yard 2·5 m apart and 2 m above the funnel top. The signal is shown aft.

Amendment

57. An aircraft fires a red flare. What does this mean? (N.M.)

The aircraft is threatened by grave and imminent danger and requires immediate assistance.

Amendment

58. An aircraft fires green flares every 10 to 15 minutes. What does this indicate? (N.M.)

The aircraft is searching for survivors. The signal should be answered by the survivors with the use of statutory distress signals—probably red hand flares or rockets.

Amendment

59. If a fishing vessel shows a white light over a red light, visible all round the horizon while fishing, in addition to her normal fishing lights, what does this mean? (2nd Annex to Rules.)

She is hauling her nets.

Amendment

60. A vessel of 100m or more is at anchor. What lights are shown?

Two anchor lights together with all available working lights to illuminate her decks. (Rule 30.)

Amendment

61. What signals are shown by deep-draught vessels?

The International Regulations for Preventing Collisions at Sea 1972 (Rule 28) suggests the following signals. In some ports they may be compulsory.

By day: A black cylinder where it can best be seen, measuring 0·6 m in diameter and 1·2 m high.

By night: Three red lights shown where they can best be seen. The lights should be equidistantly spaced, 2 m apart and visible all round the horizon for a distance of at least three miles.

The signals have already been adopted in many ports and may, in some areas, be applicable to vessels over a certain deadweight tonnage, or over a certain length, or over a certain draught. The signals do not absolve the vessels showing them from complying with the Regulations for Prevention of Collision at Sea, but if they are in any doubt as to whether another vessel is giving them sufficient searoom, they may give at least five short and rapid blasts under Rule 34. Other vessels, not showing such signals, should endeavour to keep clear and may indicate their intentions by making the manoeuvring signals prescribed in Rule 34.

Amendment

62. What may be indicated at sea when two all-round white lights are sighted, separated by a horizontal distance which greatly exceeds the vertical distance?

(i) A vessel at anchor of any length.
(ii) An aircraft at anchor of any length.
(iii) A power-driven vessel of any length, hull down, i.e. with sidelights not visible.
(iv) An aircraft carrier at anchor. (See Question 27.)

Amendment

63. What signal is displayed by a light-vessel which is out of position? (M).

The characteristic light is not shown, any daymark is struck, and the fog signal is not made. By day, she shows a large black ball at each end of the vessel and also the two-flag code group 'LO'. By night, she will display a red light, visible all round the horizon, at each end, together with a red flare and a white flare, shown amidships simultaneously every 15 minutes. If the use of flares is not possible, red and white lights may be displayed for about a minute at a time.

Amendment

64. If the light on a light-vessel is out of order, what signal is shown? (M).

6 ft Only her riding light, which is exhibited about 2 m above the rail, on the forestay.

Amendment

65. At what speed would you navigate with caution?

At a speed commensurate with steerage way, or even stopped.

Amendment

66. What regulations apply to pilot ladders? (S.R.)

They must be capable of being used either side; they are only to be used for pilots' access. They are to have wide treads of adequate depth; a manrope each side of the ladder 20 mm in diameter; to be of adequate length and strength and to have anti-twisters fitted to them.

Amendment

67. What is the meaning of the International Code group 'ZW'?

'I require the Port Medical Officer'.

Amendment

68. What precautions would you take when approaching squadrons, convoys, aircraft carriers under way or at anchor, and other warships at sea? (N.M.)

Adopt early measures to keep out of the way.

Amendment

69. How far do some fishing gears extend, e.g. drift nets and Seine nets? (M), (N.M.)

Drift nets extend up to 2 miles from the craft. Seine nets may cover 1 square mile.

Amendment

70. You cannot avoid crossing nets. What action will you take? (M).

Stop engines and proceed across the nets with all speed. The propellers must be stopped revolving.

Amendment

71. Would you anchor near submarine cables? (N.M.)

No; if, however, I did this by accident, and fouled such a cable on my anchor, I would never cut the cable, which may be carrying high voltages. The anchor should be slipped if the cable cannot be cleared in the normal way. I would report to the shore Authorities.

Amendment

72. What provisions are made with regard to using radar in wartime or other emergency? (N.M.)

It must be used at sea only when imperative. In harbour or at anchor it should never be used except in the interests of safe navigation and when permitted to do so by the Naval Authorities.

Amendment

73. What precautions must you take regarding light-vessels? (M).

Always give them a very wide berth. Never 'home' on their radio direction-finding transmissions, as a collision may occur either with them or with other ships doing the same thing.

Amendment

74. What are sandwaves and seiches?

Sandwaves are sediment formations on the seabed in the form of waves. They occur in shallow seas where the water movement is relatively fast, the waves lying at right angles to the direction of flow. In the North Sea wavelengths of 300 metres have been found with heights, measured from crest to trough, of up to 13 metres. A *seiche* is an oscillation in water level usually caused by abrupt changes of wind or pressure. A feature of harbours and bays, it may last only a few minutes.

Amendment

75. How many magnetic compasses must be carried on board ship? (S.R.)

At least two are recommended for Class 7 ships. Class 1 ships must carry at least three.

Amendment

76. What are the meanings of the International Code groups 'QQ' and 'ZV'?

'QQ' indicates 'I require health clearance'. 'ZV' indicates 'I believe I have been in an infected area during the last thirty days.'

Amendment

77. What is an EPIRB? (M)

It is an Emergency Position Indicating Radio Beacon and is a useful aid to Search and Rescue services. It transmits on aero

frequencies such as 243 and 121·5 MHz and has an effective range of up to 100 miles.

Amendment

78. What is a watch buoy?

A red can-buoy moored close to a light-vessel. It has the name of the lightship painted on it in white letters. Its purpose is to provide a mark so that the lightship can check its position.

Amendment

79. Under what circumstances may the W/T auto-alarm signal be activated? (N.M.)

(i) to warn that an S.O.S. message is about to be transmitted.

(ii) To warn that an urgent cyclone warning is to be transmitted from a coast radio station.

(iii) When a person has fallen overboard, to summon more help than can be obtained through an urgency message.

80. A buoy light is sighted in the Irish Sea. It is white, quick-flashing with nine flashes in a cycle. What action should be taken?

Pass to the west of this buoy. Nine flashes (i.e. nine o'clock) indicates that it is a west quadrant buoy.

Amendment

81. An isophase red buoy light is sighted in the English Channel. What action should be taken?

It is a port hand lateral mark to be left to port when following the conventional direction of buoyage.

Amendment

82. What is a schooner?

This is a vessel which may have from two to six masts, and she will be fore-and-aft rigged on all masts. A topsail schooner, however, will have her fore topmast rigged with square sails.

83. A buoy light is sighted in the North Sea, group flashing two, white. What action should be taken?

Pass either side. It is marking an isolated danger.

Amendment

84. Distinguish between a ketch and a yawl.

These are small sailing craft, each having a mainsail and a mizzen sail, with or without jibsails. The mizzen sail of the ketch is often the larger of the two mizzens, and the mizzen-mast is stepped forward of the rudder post. The mizzen-mast of the yawl is stepped much farther aft and the sail projects over the stern.

85. What information is promulgated with regard to Hovercraft? (N.M.)

These craft may be found operating anywhere on the United Kingdom coasts, where they will show a quick-flashing amber light visible all round the horizon for a distance of at least 5 miles, between sunset and sunrise. In poor conditions the light may be exhibited in daytime also.

At present these craft can proceed either fully waterborne, or partially airborne but with their keels or sidewalls remaining in the water, or fully airborne a few cm above water level.

In the first two cases they will behave similarly to shallow-draught vessels, but in the last case they are capable of speeds in excess of 80 knots over both land and sea, and are susceptible to wind drift. They can go astern, and can stop extremely quickly by simply alighting upon the water.

In general, they will keep clear of all vessels and avoid impeding their navigation. In circumstances where risk of collision exists they shall go at a moderate speed and behave as though they were power-driven vessels. Because of their noise level, they may not emit sound signals, neither may they hear those which are emitted by other vessels.

Amendment

CHAPTER XV

LIFTING GEAR

GENERAL

EVERY component of a lifting apparatus has an ultimate stress at which it will fracture and a safe stress at which it can normally be used. This latter is called the *safe working load* (S.W.L.). Every component has this S.W.L. stamped or painted upon it—in the case of wire or chain it is either stamped on a durable tablet attached to the material or else a notice is posted in a conspicuous place in the working vicinity where employees can refer to the safe working loads of all ropes, wires, and chains in use.

The ratio of ultimate stress to safe working load is called the *factor of safety*, and is usually between four and eight. For example, in the case of wire rope it is five, for fibre rope it is six, and again five for chains.

When assembling a lifting apparatus, every part is vital and must be adequately strong; a weak part may cause a disaster, and an over-strong part adds unnecessary weight.

Most gear is tested officially to find its ultimate stress, and also *proved* at a licensed Proving House to a load which will not produce weakness or injury to the part.

Gear should be proved at regular intervals after being put into initial use, to test for strength deterioration. After continuous use the metal may become brittle and fracture. This is expedited by ill-use. Before this state of affairs exists, the metal should be *annealed*, i.e. heated to a temperature depending upon the metal, say 600°–650° C, and then allowed to cool very slowly. This process removes the brittleness and restores the original grain to the metal. Many metal objects when loaded to beyond half their ultimate strength suffer a permanent *set* or distortion. In this case the *elastic limit* has been exceeded. Later as the load is increased the *yield point* will be reached, and at this stage *constriction* begins.

Safe loads should not be exceeded except where provided for under the Docks Regulations and in an emergency, such as the use of ground-tackle for ungrounding a vessel. This will restrict such overloading to isolated occasions, which may do no damage. The possibility of permanent distortion should be accepted, however.

BLOCKS AND PURCHASES

A purchase is said to be *used to advantage* when the effort or pull is being applied in the same direction as the achieved movement of the load. For example, if a weight were being hauled down a deck in an aft direction and the men on the fall were also pulling in an aft direction, then the purchase is used to advantage. Also there will be more parts of rope at the moving block than at the standing block.

A purchase is conversely *used to disadvantage* when the effort is being applied in the opposite direction to the achieved movement of the load, i.e. a forward pull to cause a weight to move aft. Also there will be more parts of rope at the standing block than at the moving block.

Now imagine a purchase suspended vertically, used to advantage and hoisting a weight W. The pull P is therefore also acting upwards, and the stress on the shackle securing the top or standing block must be $W - P$.

If the purchase is being used to disadvantage the pull P will be acting downwards in order to lift the weight, and the stress on the same top shackle becomes $W + P$.

Similarly, when a purchase is used to disadvantage the stresses in the fall when lowering or hoisting a given weight will be greater than when the purchase is used to advantage. This must be borne in mind when considering the S.W.L. of a purchase.

Within the purchase, each part of the fall bears a different proportion of the total load. When hoisting, the maximum stress is on the hauling part and the minimum on the standing part. When lowering, the reverse is true.

Blocks are usually stronger than their designed falls, hence the S.W.L. of a purchase is usually that of the fall.

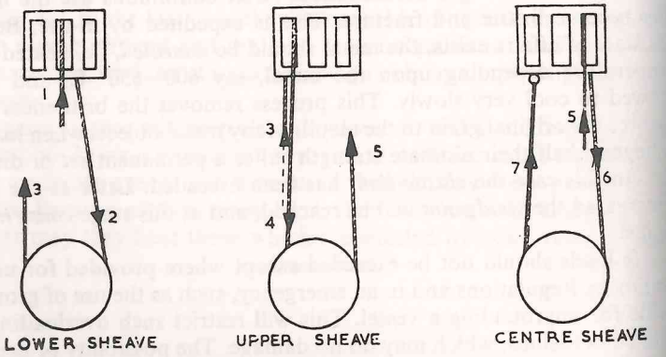


FIGURE 15.1

When a fall is under load the blocks tend to spin and produce turns in the purchase. One turn can increase the stress required (to continue lifting) by four-tenths. A long handspike placed through the parts of the fall close up to the standing block will prevent this, provided the ends of the handspike are stopped off at a nearby point.

A three-fold purchase can be prevented from twisting by reeving it as shown in Fig. 15.1—in addition, the hauling part coming away from the centre sheave prevents the block from canting.

MECHANICAL ADVANTAGE AND FRICTION

A purchase is a machine whereby a load or resistance can be overcome by means of an effort or applied force.

The mechanical advantage of any machine is found from the ratio

$$\frac{\text{load}}{\text{applied force}} \quad \text{or} \quad \frac{\text{resistance}}{\text{effort}}$$

The mechanical advantage of a machine is normally determined experimentally because it is only in this way that the frictional forces can be found.

Purchases are subject to friction, the amount depending upon the relative sizes of sheave and fall, the number of sheaves, and whether hoisting or lowering. For practical purposes, the total amount of friction within a purchase is assumed to be one-tenth (of the lifted weight) per sheave. In the case of heavy-derrick purchases, the amount of friction must be kept to a minimum. The design of these blocks is such that the friction is assumed to be one-twentieth of the lifted weight per sheave. The British Standards Institution adopts a figure of 2–6% of the load for each sheave depending upon the block type.

When heaving on the hauling part of a purchase, both the weight lifted and the friction have to be overcome.

VELOCITY RATIO

When a purchase is used to move a weight, the fall is hove through a greater distance than the weight, within a given period. The ratio of the larger distance to the smaller distance is the Velocity Ratio.

$$\text{V.R.} = \frac{\text{Velocity of effort}}{\text{Velocity of load}} = \frac{\text{Distance effort moves}}{\text{Distance load moves}}$$

In Figure 15.2 several purchases are illustrated together with the common names. Each name is followed by a number. This number represents the velocity ratio when using the purchase to advantage. In the single whip there is a velocity ratio of one. The double whip has a

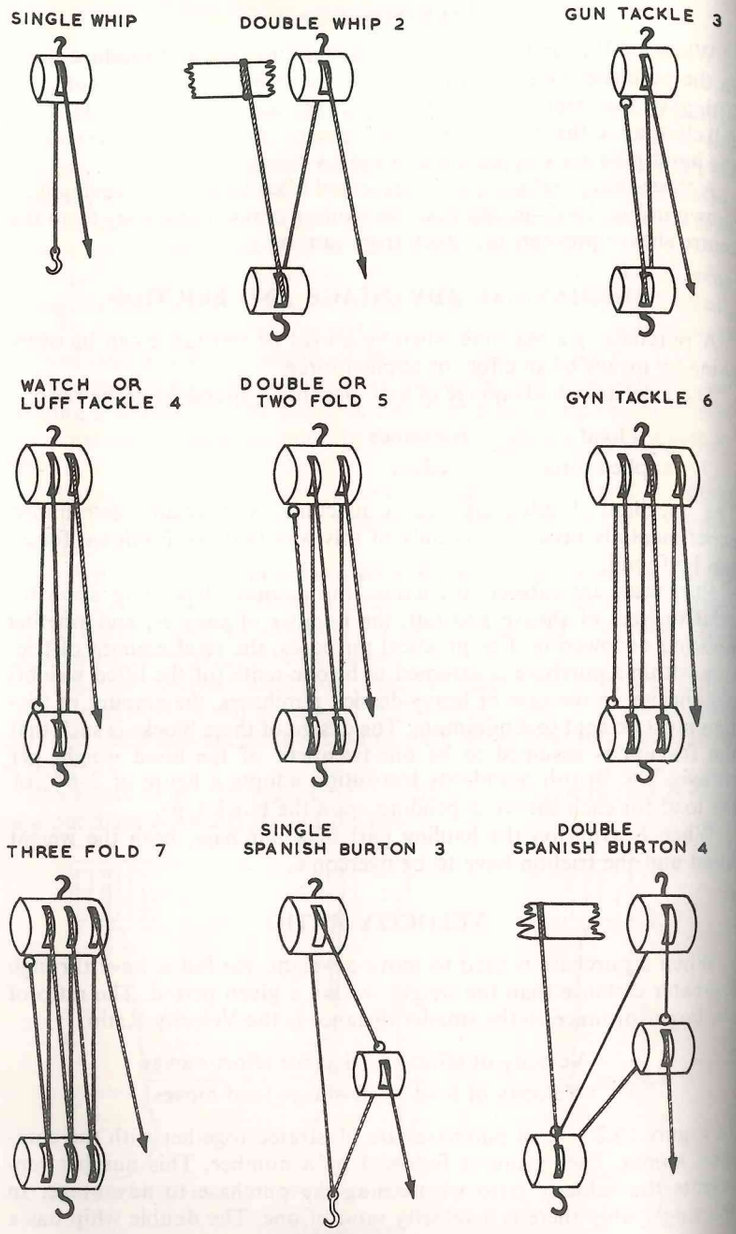


FIGURE 15.2

velocity ratio of two and there is only one way of using this whip. With the exception of these, and the Spanish Burtons, the velocity ratio will be reduced by one when the purchase is used to disadvantage.

It can be seen from the diagram that if a two-fold purchase is used to advantage to move a weight through 1 m, five parts of rope will each shorten by 1 m, so that 5 m of fall must be hove in, giving a velocity ratio of 5. If used to disadvantage, four parts of rope will shorten by 1 m, 4 m of fall will be hove in and the velocity ratio becomes 4.

EFFICIENCY

All machines have an efficiency, usually expressed as a percentage. Efficiency is the ratio of useful work done on the weight, to the work applied by the effort.

$$\text{Efficiency} = \left(\frac{\text{Useful work done on weight}}{\text{Work applied by effort}} \times 100\right)\%$$

An efficiency of 100% will indicate that the machine is frictionless, because work done in overcoming friction is not useful work. Friction always exists and the efficiency is therefore always less than 100%.

In a perfect machine, the work done on the load would be equal to the work done by the effort. Let E be the effort, W the load, De the distance through which the effort moves and Dw the distance through which the load moves. Then in a perfect machine,

Work done by effort = Work done on load

or, $$E \times De = W \times Dw$$

so that, $$\frac{De}{Dw} = \frac{W}{E}$$

or, $$V.R. = M.A.$$

In practice, there is an extra resistance to overcome in the form of friction, the weight of the pulleys and the weight of the fall. Call this quantity R and again use the principle of work,

$$E \times De = (W + R) \times Dw$$

so, $$E \times V.R. = (W + R)$$

or, $$E = \frac{(W + R)}{V.R.}$$

If we now substitute for R, ten per cent of the load for every sheave and call the number of sheaves n, we get

$$E = \frac{W + \frac{nW}{10}}{V.R.}$$

When a purchase is used to advantage $V.R. = (n + 1)$
When a purchase is used to disadvantage $V.R. = n$

The seaman, before putting a purchase into use, may use this expression to determine the approximate stress on the hauling part of the fall. The allowance for friction of 10% errs on the safe side.

Let us suppose that we are lifting 6 kg using a two-fold purchase used to disadvantage, with a V.R. of 4. Allowing 10% for friction, friction becomes 40% of 6 kg or 2·4 kg.

Total load to overcome is $6 + 2{\cdot}4 = 8{\cdot}4$ kg.

The applied effort is thus $\frac{8{\cdot}4}{4} = 2{\cdot}1$ kg.

In this case we need 2·1 kg to lift 6 kg and the Mechanical Advantage is therefore roughly 3.

Suppose the load now moves through 1 m.
Useful work done on load is 6 kg m.
The effort, of 2·1 kg, will have to move through 4 metres with a velocity ratio of 4.
So the work done by the effort is $2{\cdot}1 \times 4 = 8{\cdot}4$ kg m.

So the efficiency is $\frac{6}{8{\cdot}4} \times 100\% = 71{\cdot}4\%$,

This machine is therefore only about seven-tenths efficient owing to the fact that some of our effort is used in overcoming the 2·4 kg of friction. This is not useful work.
It should be noted also that

$$\text{Efficiency} = \frac{\text{Mechanical advantage}}{\text{Velocity Ratio}} \times 100\%.$$

PRACTICAL POINTS

ton ton tons

The seaman often refers to a derrick or block as being a '5-tonne block' or a 'five-tonne derrick'. By this he means that the derrick or block has a S.W.L. of 5 tonnes and is not to be used for lifting weights greater than 5 tonnes.

A single-sheave block is proved to a proof load of four times its S.W.L. This S.W.L. must be stamped on it, together with the maker's name or trade mark, and the number of the block. If the S.W.L. is 5 tonnes and the block is used to lift a weight of 5 tonnes then the stress on the top eye of the block will slightly exceed 10 tonnes. The design of the eye in this block will be such that it has a S.W.L. in excess of 10 tonnes. A 10-tonne shackle would be used for securing the block.

tons tons tons tons

Under the Docks Regulations a single-sheave block may be used to lift *twice* its normal S.W.L. provided the weight is attached directly *to the block* and is not attached to a rope passing around the sheave, i.e. the weight is attached to the eye of the block. For example, if a gun tackle is used to lift 5 tonnes, then the top block will be a 5-tonne block, but the lower one will be a 2½-tonne block and the weight will be either attached to the eye of the lower block or else attached to a hook which is integral with the block.

ton tons ton

A multiple-sheave block will have an eye designed to withstand its S.W.L. together with the maximum stress liable to be applied to the hauling part. A 15-tonne purchase using multiple blocks will have two 15-tonne S.W.L. blocks.

ton ton

Generally speaking, the size of wire rope to be used with a cargo-lifting block has a diameter which is one-fifteenth of the sheave diameter, i.e. with a 30 cm sheave a 20 mm wire rope will be used. For derricks of more than 15 tonnes S.W.L. the size of wire rope should be one-eighteenth of the sheave diameter in order to prolong rope life.

12-in 0·8-in tons

Care of Blocks (Various types are illustrated in Plates 5 and 6)

Frequently check the swivel head for free movement by hand. Grease its shank and bearing. Examine the side plates for distortion or buckling; if they are buckled and the runner jams between the plates and the sheave, lives may be lost. Sheaves should turn freely when rotated by hand; examine them for cracks and bush-wear. The grooves must be frequently checked for wear, which will quickly ruin a new wire runner. Check that axle pins are secure and cannot work adrift. Carry out regular and adequate lubrication. It is better to oil the block surfaces rather than to use paint, which may clog oil holes, obliterate marks, and hide defects. Check wooden blocks for decay and splitting. Blocks should never be thrown on to the deck.

Weight of Purchases

A fully rove purchase complete with shackles, weighs approximately as follows:

¼ tonne: three-fold with 25-cm sheaves or a gun tackle with 42-cm sheaves.

ton 10-in 17-in

ton 12-in 18-in ½ tonne: four-fold with 30-cm sheaves or a double luff with 45-cm sheaves.
ton 16-in 1 tonne: five-fold with 40-cm sheaves.
tons 18-in 1½ tonne: six-fold with 45 cm sheaves.

Guys

A guy purchase including shackles and pennants, should have a S.W.L. as follows:

ton ton A 3-tonne S.W.L. Derrick should have 2-tonne S.W.L. guys.
ton ton A 5-tonne S.W.L. Derrick should have 3-tonne S.W.L. guys.
ton ton A 10–15-tonne S.W.L. Derrick should have 4-tonne S.W.L. guys.
ton A 16-tonne and over S.W.L. Derrick should have guys with S.W.L.'s
ton equal to 25% of the derrick's S.W.L., e.g. a 60-tonne S.W.L.
ton derrick should have 15-tonne guys.

Care of Ropes

Examine all ropes regularly and frequently for chafe, cutting, internal wear, deterioration of fibres, dryness (in a wire rope), and opening of the lay or *long-jawing*. All sheave grooves must be free from roughness and not deepened by wear. The grooves should be at least as wide as the diameter of the rope.

The diameter of sheaves should be at least five to six times the *diameter* of fibre ropes. Ropes, whether of fibre or wire, should not be used for pulling at an angle to the direction of load lift so that the ropes chafe on the block side-plates. Keep fibre ropes in store away from damp or heat. Hang them up if possible. Encourage good ventilation. Rope-rot often commences internally and is difficult to detect. Dry any wet ropes naturally and not with artificial heat. If ropes cannot be hung up, stow them on gratings. If they are to lie in store for long periods make sure there are no rats present, since they will use the rope fibres for their nests. Wire ropes must be condemned if the total visible number of broken wires (in any length of eight diameters) exceeds 10% of the total number of wires.

This last comment provides a good opportunity to discuss those parts of the *Docks Regulations* (1934) which relate to lifting gear and components.

Annealing of Wrought Iron which Has Become Brittle

This has already been referred to in a previous section. So far as the Regulations are concerned, the heating should be done within a furnace and not in a blacksmith's fire, which may cause uneven heating. The temperature of annealing (650° C) should be maintained for 30–60 minutes.

Chains, rings, hooks, shackles, and swivels *in general use* are to be annealed at least once every six months if of 12 mm and under in size. The period is twelve months for larger gear. Both periods may be doubled for gear which is used solely on hand-operated lifting machines. (A recommended practice is to halve all the periods in the case of gear which is being subjected to severe treatment.) ½-in

The above requirements are subject to the following exemptions:

Chains, rings, hooks, shackles, and swivels made of steel.

Pitched chains (i.e. chains used on gear wheels).

Rings, hooks, shackles, and swivels which are permanently attached to pitched chains, pulley blocks, or weighing devices.

Screw-threaded parts or specially hardened gear such as ball bearings.

Bordeaux connections (a device resembling a fattened thimble used for joining chain to wire. The wire is spliced round the groove while the chain passes through the thimble centre.).

These items of gear are exempted from annealing on the condition that they are thoroughly examined at least once a year.

Tests and Examinations

When test gear has been subjected to its specified proof load it must be thoroughly examined before being put into use. This, which must be done by a competent person, will enable detection of defects which have been brought to light by the proof load. Pulley blocks should be dismantled during this examination.

Blocks, chains (other than those permanently attached to a derrick), rings, hooks, shackles, and swivels should be tested before putting them into use and also after any repair. They shall also be examined each time before use, unless this has already been done within the preceding three months.

Wire rope is to be tested by breaking a sample—this ultimate stress must reach a required standard. It must be examined at least once every three months, but *every* month if any wire has broken. Wire rope is to be declared unfit if in any length of eight diameters the total number of visible broken wires exceeds 10% of the number of wires in the rope. (E.g., consider wire rope with a diameter of 24 mm. Suppose it is a six-stranded rope with 24 wires in each strand. The total number of wires is thus 144. Hence if in any length of roughly 19 cm the total number of visible broken wires exceeds 14, then the wire is condemned unfit.) The wire is also declared unfit for use if the corrosion, wear, etc., is considered excessive by the person inspecting.

Proof Loads

Chains, rings, hooks, shackles, swivels are proved to twice the S.W.L.
Single-sheave pulley blocks are proved to four times the S.W.L.
tons Multiple blocks up to 20 tonnes S.W.L. are proved to twice the S.W.L.
tons Multiple blocks 21–40 tonnes S.W.L. are proved to the S.W.L. plus
tons 20 tonnes.
tons Multiple blocks over 40 tonnes S.W.L. are proved to one and a half times the S.W.L.
Pitched chains, their blocks and all permanently attached gear operated by hand are proved to one and a half times the S.W.L.

Derricks and all permanent attachments relating to the derrick such as mast lugs and deck eyebolts are to be inspected every year and thoroughly examined at least once every four years.

All other lifting machinery (cranes, winches, and hoists) is to be thoroughly examined at least every year.

A thorough examination is done visually, and may include hammer-testing and dismantling. Derricks, winches, and cranes—completely rigged for use—are tested before initial use and also after repair. (It is the practice among some owners to test also at regular intervals, e.g. every four years. Under the Regulations, if a derrick never needs repair only one initial test is required in its life.)

Proof Loads

tons S.W.L. up to 20 tonnes—gear is proved to the S.W.L. plus 25%.
tons tons S.W.L. 20 to 50 tonnes—gear is proved to the S.W.L. plus 5 tonnes.
tons S.W.L. over 50 tonnes—gear is proved to the S.W.L. plus 10%.

The load is applied either by hoisting movable weights, or by using a hydraulic or spring balance. The angle which the derrick makes with the horizontal during the test is to be stated in the test certificate. If movable weights are used the derrick is swung as far as possible in both directions while under load. If the balance is used the pull should be made at the limits of derrick swing. (This method has the disadvantage in that the derrick is not *swung* under load and that the mast, rigging, and other gear is not tested under working conditions.)

Before the test, all blocks and shackles, etc., are tested as laid down previously, and the derrick is then fully rigged. It will usually be tested while at its lowest working position—say 45 degrees to the horizontal.

After test, a final examination of all the gear is made and test certificates are issued for all components as required under the Regulations.

When testing heavy derricks the proof load is great, and the balance should be anchored ashore to a strongpoint so as to avoid deck damage. A suitable moving weight would be a loaded barge, using a test clock

attached to the lower purchase block to indicate the load. Great attention should be paid to examining the gooseneck after test.

Sometimes, in the case of hydraulic cranes, the available pressure will not cope with the specified proof load. In this case the maximum possible load will suffice.

Fibre Ropes require no test certificate. They should not, however, be used unless they are of suitable quality and free from defect.

Wire Splices are to have at least three tucks with whole strands followed by two tucks with halved strands.

Notice of S.W.L.

All lifting tackle, including derricks, must have its S.W.L. permanently and clearly marked upon it. In the case of chains it is either stamped upon a metal tab attached to the chain or else it is stamped, more usually, on the links. For wires, either a metal tab is used as before or else a notice is conspicuously posted showing sizes of wire and their S.W.L.s.

Exceeding S.W.L.

No gear is to be loaded beyond its S.W.L. except a crane, which can be overloaded as approved by the person in charge. It is done only in exceptional cases, and a record of the overload must be kept. The permission of the owner must first be obtained in writing. (With regard to this, remember that if a single-sheave pulley block has the weight directly attached to the block instead of to a rope passing around the sheave the actual load upon the block shall be considered as one-half of the actual load.)

The Register

Certificates of test, annealing, and all reports of inspections and examinations are to be entered in the Register before the gear concerned is put into use. The Register is to be kept on the vessel.

It is a buff-coloured book called 'Form 99', measuring 31 cm × 16 cm and is entitled on the front cover 'Register of Machinery, Chains, etc., and Wire ropes'. Entered on the front cover is the vessel's name, port of registry, and the owner's name and address. The book is often called simply the 'Chain Register'. 12½ in 6½ in

The inside front cover and page 1 contain instructions regarding examinations and annealing.

Part 1. Pages 2, 4, 6, are for entries concerning four yearly examinations.
Pages 3, 5, 7, are for entries concerning annual inspections.
Part 2. Pages 8–13 are for entries concerning annual thorough examinations of cranes, winches, and hoists and accessory gear, other than derricks.