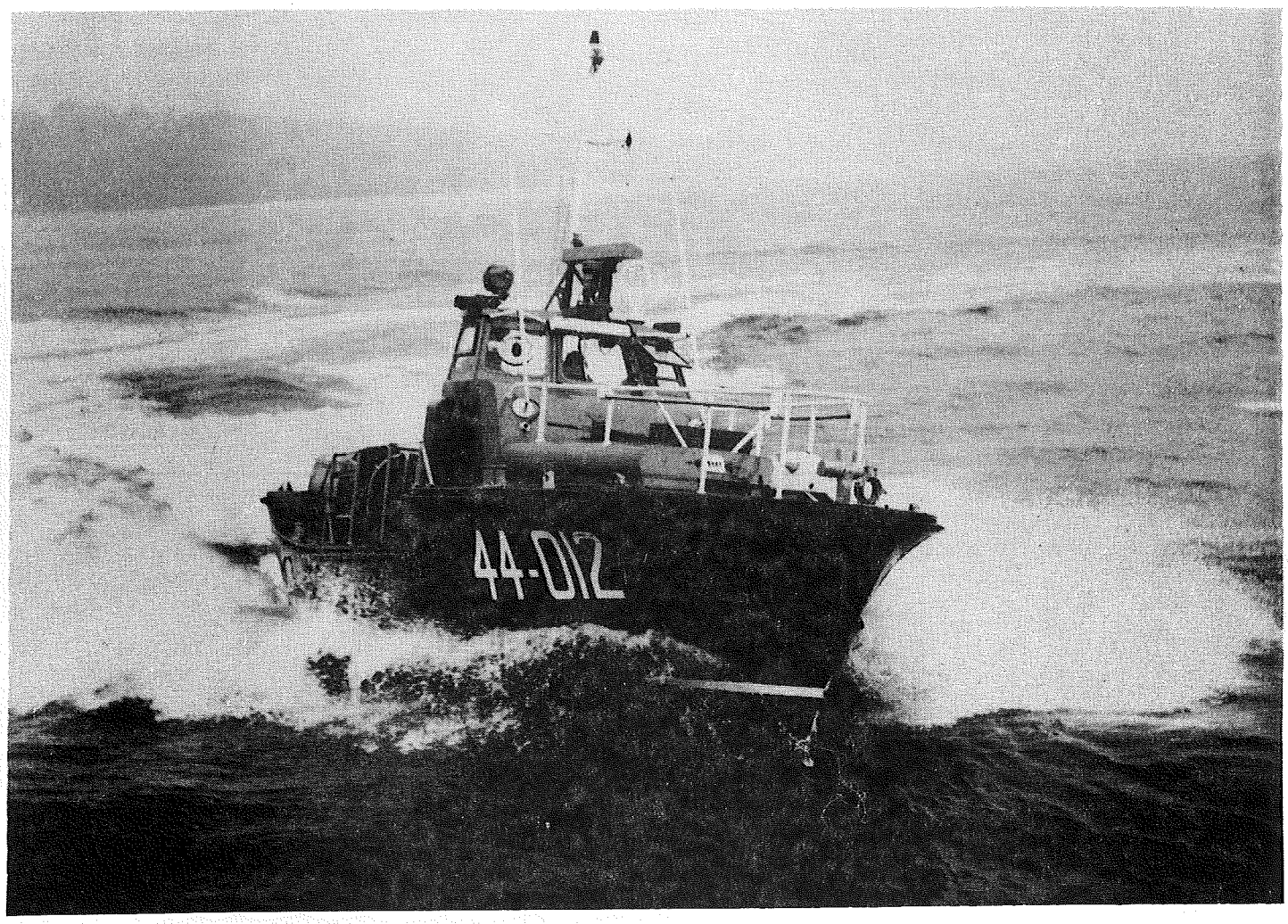
Royal National
Lifeboat
Institution



HANDBOOK
for
WAVENEY CLASS
LIFEBOAT

TRG/16

PREFACE

The first of the RNLI's 44ft. Waveney Class lifeboats was built at the yard of Brooke Marine Limited at the mouth of the river Waveney at Lowestoft, Suffolk. The class name 'Waveney' is in line with the Institution's policy of using names of rivers for lifeboat classes.

The development of the Waveney Class lifeboat since the first one was launched makes it difficult to describe individual boats in detail. Therefore the handbook concentrates mainly on the latest Waveney to be built.

As each lifeboat of the class is withdrawn for Survey the latest modifications, improvements and equipment are incorporated where applicable.

In addition, and in common with other classes of lifeboat, the equipment fit for a particular lifeboat may differ slightly to suit the operational requirement of a particular station.

Details of the up-to-date equipment fit for a lifeboat is supplied in the form of the Machinery, Electrical Parts, Electronic Equipment and Portable Equipment Lists.

IT IS RECOMMENDED THAT ALL STATION PERSONNEL CONCERNED WITH THE OPERATION OF THE LIFEBOAT SHOULD STUDY THIS HANDBOOK AND SIGN IN THE SPACE BELOW THAT THEY HAVE DONE SO.

NAME	SIGNATURE	DATE

/contd.....

NAME	SIGNATURE	DATE

RECORD OF CHANGES

Change Number	Date of Change	Date of Entry	Name	Signature

Note: A number of the design features described and/or illustrated in this handbook are the subject of Patents held by the Royal National Lifeboat Institution.

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1.2 Handbook

1.3 Conversions: Imperial/Metric

1.4 Technical details of Waveney Class Lifeboat.

SECTION 1

I N T R O D U C T I O N

1.1 ORIGIN OF THE WAVENEY CLASS LIFEBOAT

1.1.1 During 1963 the Ninth International Lifeboat Conference was held in Edinburgh. At the conference the United States Coastguard (USCG) presented a paper which described a new kind of lifeboat built of Corten steel with an aluminium superstructure.

1.1.2 A major consideration in the design of this new 44-foot lifeboat was its ability to operate in coastal waters under unusually severe adverse weather and sea conditions. Features intended to provide excellent seaworthiness characteristics were given high priority in the development of the design.

1.1.3 A film accompanying the paper showed that the new lifeboat had excellent sea-keeping qualities, good manoeuvrability and was self-righting.

1.1.4 The RNLI bought one of the new 44-foot lifeboats from the USCG for trials around the coast of Britain and Ireland. Lieut.Commander R.W.Witter, USCG, who was largely responsible for the design of the lifeboat accompanied the one purchased to the U.K.

1.1.5 Extensive trials were completed in December 1964. By this time the new lifeboat had completed 4,500 miles on sea trials in all type of conditions and sea states. As a result the RNLI decided to build its own 44-foot steel lifeboat to the designs willingly supplied by the USCG, and to fit it out to its own requirements.

1.1.6 The new lifeboat was built at Lowestoft and was given the Class name of Waveney. (See Preface).

1.1.7 The first Waveney Class 44-foot lifeboat entered RNLI service in 1967.

1.1.8 The first lifeboats of the Class were fitted with twin Cummings diesel engines but these were later changed to Caterpillar Type 3208's.

1.1.9 Waveney lifeboats built between 1973 and 1975 are fitted with Type GM 8V53 twin diesel engines and those built between 1976 and 1982 are fitted with Caterpillar Type 3208T (turbocharged) twin diesel engines.

1.2 WAVENEY CLASS LIFEBOAT HANDBOOK

1.2.1 Purpose - The purpose of this handbook is to provide Class characteristics and basic operating information for the crew member. The approach presupposes general awareness of small boat seamanship and of RNLI customs and practices. The handbook is not considered a strict guide, particularly as regards operation and handling of the lifeboat at sea, but any departures from it should not be undertaken without good reason.

1.2.2 Scope - This handbook contains the necessary information for safe and efficient operation of the Waveney Class lifeboat. The physical characteristics of the lifeboat, its fittings, and facilities are described in detail. Normal and emergency procedures are spelt out, as are the technical details of this lifeboat.

1.3 AMENDMENTS AND CHANGES

1.3.1 Every effort is made to keep the handbook up-to-date. Items are reviewed during crew training and an ongoing review is obtained from maintenance records and the Return of Service information. However, an error cannot be corrected unless its existence is known. In this regard, it is essential that you do your part. Comments, corrections, suggestions, amendments and additions, and questions regarding this handbook or any phase of Waveney Class lifeboat operating parameters are welcomed. These should be forwarded to Staff Officer Operations (Training Officer), Head Office, Poole. If possible they should be written in such a form that they can be incorporated in the existing framework of the book and should be accompanied by a reasoned explanation of the proposals.

1.4 CONVERSIONS : IMPERIAL/METRIC

1.4.1 It is Government policy to change from Imperial measure to the metric Systeme International d'Unites, commonly known as SI units. Wherever practicable throughout this handbook metric units (enclosed in brackets) follow the Imperial units. Approximate conversions are listed below.

1.4.2

DEPTH	1 Fathom	= 1.830 metre
(metre)	1 metre	= 0.546 fathom
LENGTH	1 foot	= 0.305 metre, 305mm
(metre)	1 metre	= 39.37 inches
PRESSURE	1 psi	= 69 millibars (mb)
(millibar)	1 mb	= 0.0145 psi
MASS	1 lb	= 0.454 kilogrammes(kg)
(kilogram)	1 kg	= 2.205 lbs
VOLUME	1 pint	= 0.571 litres
(litre)	1 litre	= 1.76 pints, 0.22galls
POWER	1 hp	= 0.75 kilowatts(kW)
(kilowatt)	1 kW	= 1.25 hp
TEMPERATURE	°F to °C	°F - 32 x 0.56
(Celsius)	°C to °F	°C x 1.8 + 32

1.5 TECHNICAL DETAILS OF THE WAVENEY LIFEBOAT

1.5.1	Length overall (LOA)	44ft. 1&11/16th.inches. (13.5m)
	Length at waterline	40ft. (12.2m)
	Beam	12ft. 8ins. (3.86m)
	Draught	3ft. 11ins. (1.2m)
	Displacement	18 tons (18.3 tonnes)
	Engines	Twin Cat.3208; GM8V53 or Cat.3208T
	Shaft horse power	Cat.3208NA = 203SHP (152.25kW)
		GM8V53 = 260SHP (195kW)
		Cat.3208T = 250SHP (187.5kW)
	*Maximum speed	Over 15 knots
	Range at full speed	Approx. 167 miles.
	*Cruising speed	13.1 knots (approx).
	Number of Crew	Five
	Engine fuel	Diesel
	Fuel tank capacity	Main tanks: 110 gallons(500 litres) each tank.
		Reserve tank: 75 gallons (340 litres).

* Waveney's with Cat.3208NA engines have lower maximum and cruising speeds.

1.5.2 Other Facts and Figures

Fire detectors operate sirens at 155°F (68.8°C)

Fire extinguisher discharges at 175°F(80°C).

S E C T I O N

T W O

GENERAL DESCRIPTION OF WAVENEY CLASS LIFEBOAT

2.1 Introduction

2.2 Hull Structure

2.3 Hull Compartments

2.4 Main Deck.

2.5 Superstructure

2.6 Mast Structure

2.7 Fire Protection & Fire Fighting Appliances

2.8 Other Equipment, Instruments, Tools & Spares.

SECTION 2.

GENERAL DESCRIPTION OF WAVENEY CLASS LIFEBOAT

2.1 INTRODUCTION

2.1.1 The hull is built in "Cor-ten" corrosion resistant steel. Steel does not give such a good surface finish as wood or GRP, but it has much to commend it. A steel hull can be thinner and the scantlings (standard dimensions for the various parts of the lifeboat's structure) generally smaller than would be possible with either wood or GRP, and as special seatings for fittings do not present such a problem, there is an immediate saving of internal space and often weight.

2.1.2 Also the benefits of steel construction in withstanding the harsh treatment often suffered by a lifeboat in shallows and the comparative ease of repair if damaged far outweigh the features afforded by other materials.

2.1.3 The raised fore deck, raised aft deck and the midships deck together with the superstructure are made of marine grade aluminium to reduce weight and to achieve a low centre of gravity of the lifeboat and thus improve her self-righting capability.

2.1.4 The cabins and engine room are insulated on all exposed structural steel and aluminium surfaces. The insulation acts as a thermal barrier and also affords crew protection in heavy weather. The engine room insulation is sheathed in expanded rigid metal mesh to form an accoustic (sound) barrier. Protective padding is fitted throughout the lifeboat on awkward corners.

2.1.5 All hull, machinery, electrical fittings, appliances, tools, etc., are well secured by a combination of nuts, bolts, drop-nose pins and shockcords to retain them in place should a knockdown or capsize occur.

2.2 HULL STRUCTURE

2.2.1 The hull is framed by a combination of transverse and longitudinal members and is divided into seven watertight compartments.

2.2.2 The seven watertight compartments are, from forward to aft,

Fore Peak/Cable Locker;

Forward Passenger/Survivor Compartment;

Crew/Radio Cabin;

Engine room;

Well Deck Space Compartment;

Survivor/Stretcher Compartment, and

Steering Gear Compartment.

2.2.3 For extra strength and safety against possible grounding damage, a double bottom is provided in the forward half length of the lifeboat. Further protection when beam-on is afforded by a web frame located at the mid-section and extending from keel to cockpit level.

2.2.4 The hull exterior has a deep Vee flared bow. The flare and spray rail protect the deck and wheelhouse from thrown spray when travelling at speed and provides good working space on the foredeck. The flare decreases to the midship section and after sides and ends up in a half round transom stern.

2.2.5 Fixed trim tabs are fitted either side of the centre-line, under the stern, below the waterline, and extending just aft of the twin screws.

2.2.6 Watertight comparments below the lower deck are either void spaces or are filled with expanded poly-urethane foam to provde buoyancy and prevent ingress of water should damage occur.

2.2.7 The twin rudders are streamlined semi-balanced types fabricated from Corten steel shaped plates.

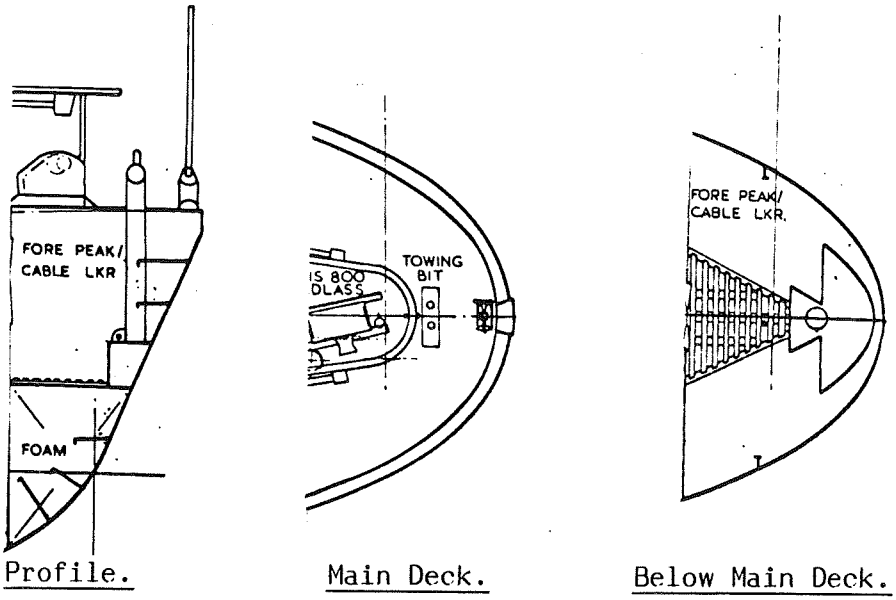
2.2.8

2.3 HULL COMPARTMENTS

2.3.1 Fore Peak/Cable Locker

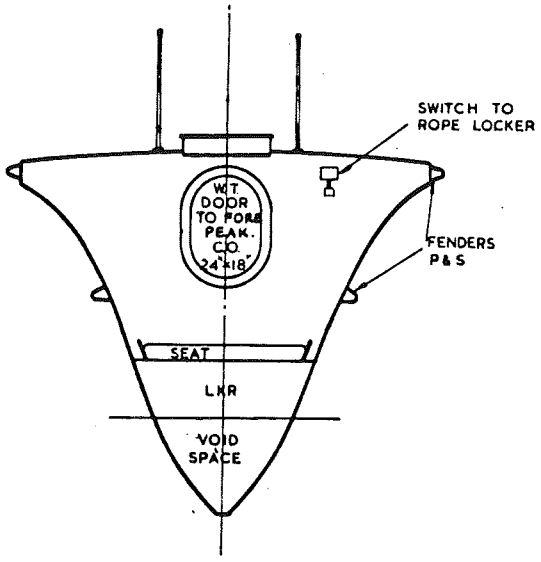
Note: Large scale drawings are provided at the back of this handbook. They can be folded out for study while reading the text.

The space below the the five foot waterline is filled with expanded polyurethane foam.



Profile. Main Deck. Below Main Deck.

a). Entry - access to this compartment is through a watertight door from the forward bulkhead of the Forward Passenger/Survivor compartment.



View looking forward
from inside Survivor/Passenger
Compartment.

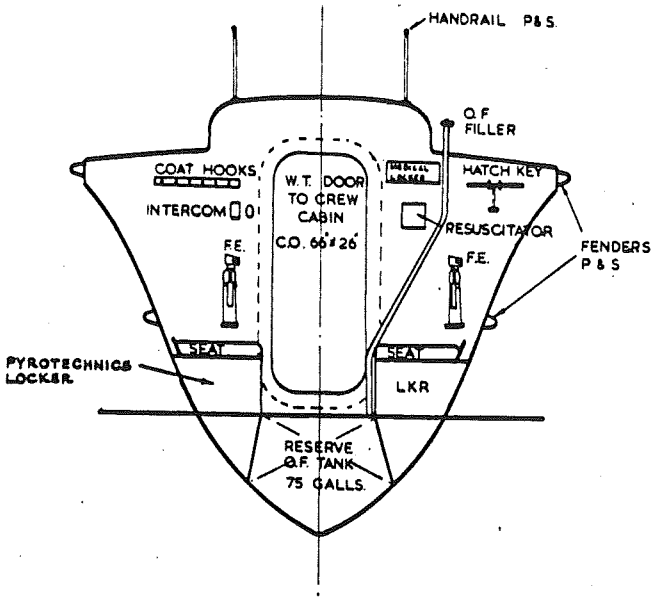
2.3.1
contd..

b). Contents - a sparred wood grating, fitted in two sections for portability covers the deck of this compartment. A steel clench plate with a hole for a shackle pin is fixed to the breast hood or samson post. This is provided to allow the inboard end of the anchor cable to be attached to the lifeboat's structure. A 'Y' shaped two inch wide webbing strap is also fitted. This strap fixes over the stowed cable to prevent tumbling in heavy weather. The anchor cable, 50 fathoms (91.5 metres) in length is a three inch circumference nylon rope complete with chain tailing at the anchor end and a shackle at the inboard end.

c).

2.3.2 Forward Passenger/Survivor Compartment

a). Entry - access to this compartment is via a watertight door from the Crew/Radio Cabin. The reserve fuel tank is situated below this compartment.



Looking Aft from
Passenger/Survivor Compartment.

b). Contents - bench seats are provided on either side for up to six survivors. Each seating position is equipped with a safety harness (seat belt) which when worn correctly is capable of restraining a person even should a knockdown or capsize occur. The after bulkhead bears six coat hooks, a station of the onboard intercom, a first-aid locker and mouth-to-mouth resuscitor. In addition two portable Halon fire extinguishers are fixed in secure stowages that have quick release type of fittings. The hatch key stowed on the port side of the watertight bulkhead is used to open the escape hatch which is situated on the deck-head of this compartment.
Pyrotechnics are stowed beneath the starboard bench seating and beneath the port seating is the Secure Locker containing the Morphine Box, Brandy and the ship's bell.Also stowed on the after bulkhead are the oil fuel tank dip-sticks.
A Breeches buoy is stowed in this compartment.
A coach type heater is fitted on the port side. The heater is fed with hot water from the engine fresh water cooling system.

2.3.2 (b)
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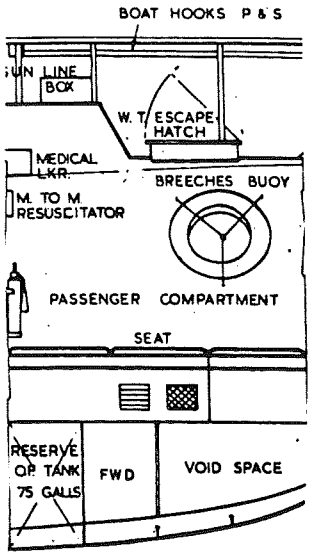
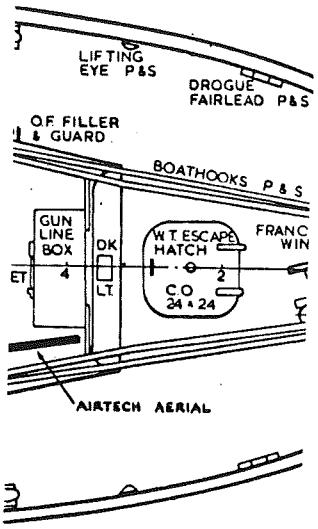
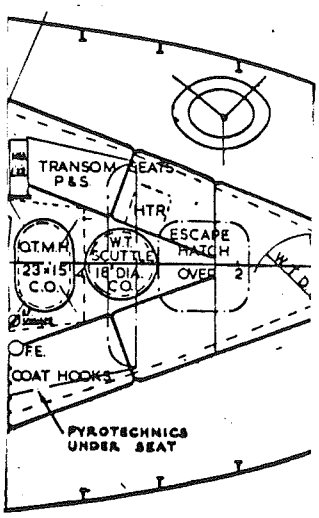
The drawings below give three views of the Passenger/ Survivor Compartment.





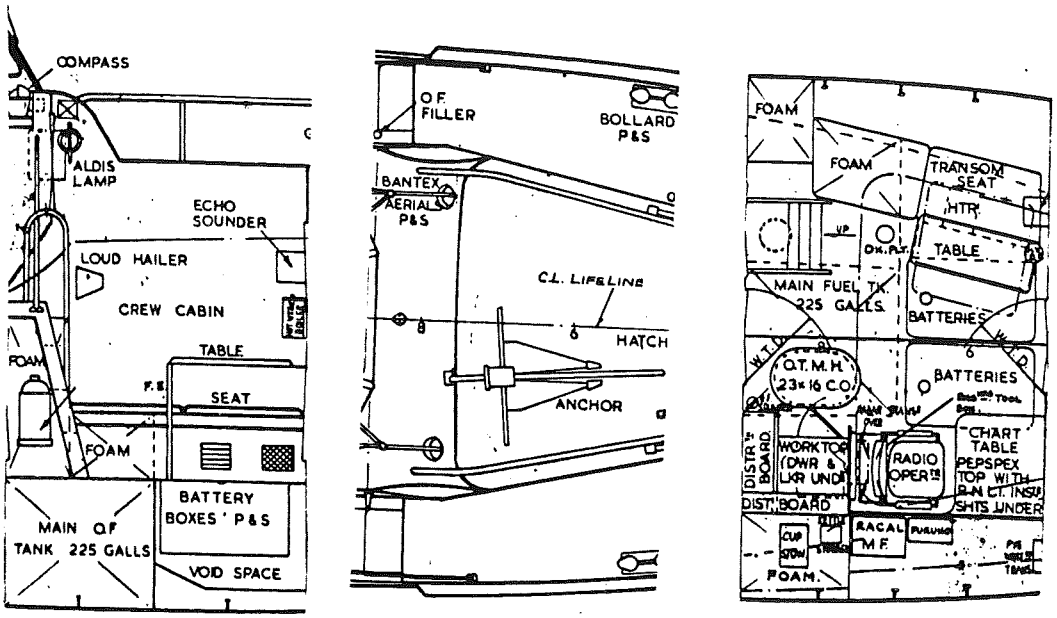


Profile. Main Deck. Below Main Deck.

c). Exit - via the after bulkhead watertight door into the Crew/Radio Cabin or via the escape hatch to the main deck in an emergency.

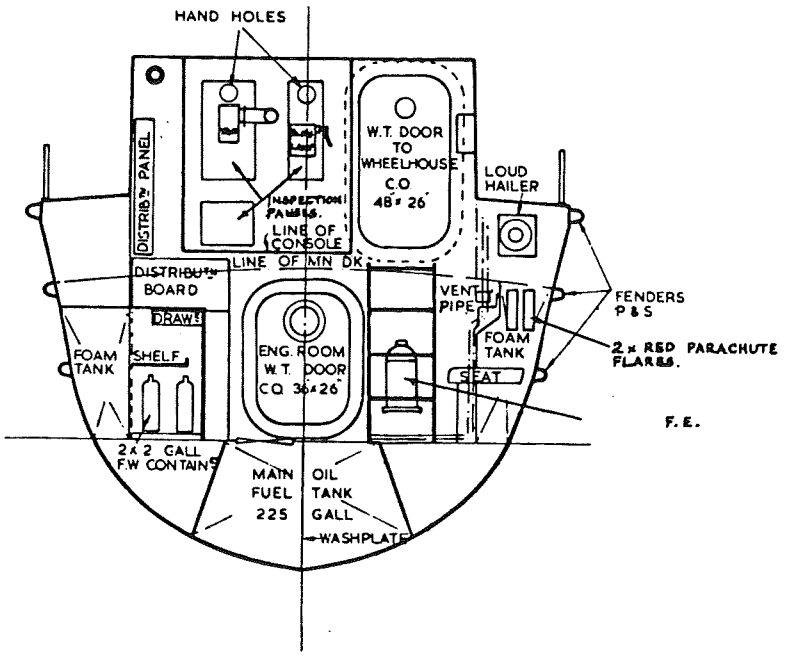
2.3.3 Crew/Radio Cabin

This compartment houses the radio communication outfits, electrical distribution/switchboard, chart table, echo sounder and facilities to provide a hot drink.



Profile. Main Deck. Lower Deck.

a). Entry - normal access is via a watertight door on the port side of the wheelhouse interior. A step ladder complete with hand rail leads down into the after end of the cabin.



Aft Bulkhead.

2.3.3(a)
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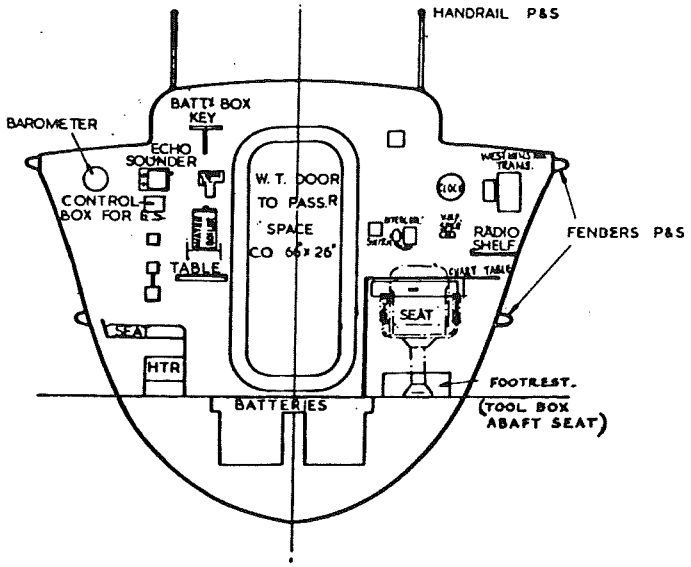
From inside the cabin access is available to the Engine Room via a watertight door on the aft bulkhead, or to the Fwd. Passenger/survivor compartment via a watertight door in the forward bulkhead.



Forward Bulkhead.

b). Contents - bench seats are fitted on the port side. The three seating positions are fitted with safety harnesses (seat belts). Also on the port side is a mess table that is normally covered by a portable (bolt-on) chart table. When the portable chart table is not in use, a secure stowage is provided for it on the starboard screen bulkhead. A fixed chart table covered with a perspex sheet is fixed on the starboard side. The chart table has a hinge-down flap front with a chart stowage under. The radio equipment consists of MF Radiotelephone and MF D/F outfit, a VHF Radiotelephone and a VHF D/F set. The radio operator/chart table seat is fixed and has vertical and fore and aft adjustment and can be rotated and locked in position. The seat is fixed with a safety harness (seat belt) and a foot rest. Aft of the radio operator's seat is situated a dresser unit. This unit provides stowage for cups and ready use provisions and a table top. Underneath the unit is the stowage for the fresh water containers. A domestic hot water boiler is fitted here. Behind and to the side of the dresser unit is fitted the main electrical switch/distribution board. On the port side after bulkhead is the access ladder leading to the wheelhouse via a watertight door. Beneath the ladder is stowed the engine room Secondary fixed fire extinguisher which is piped to discharge into the engine room. Alongside the ladder is a stowage for two RED parachute flares. The outboard spaces either side of the cabin (the wings) are filled c o m p l e t e l y

2.3.3(b)
contd..

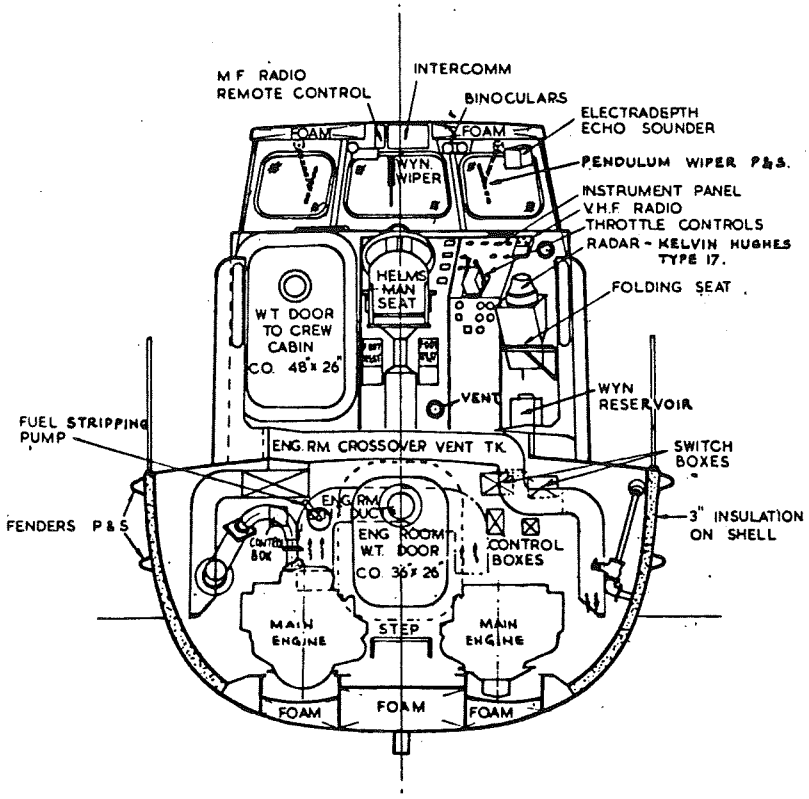
with expanded polyurethane foam. Beneath the cabin floor forward is a secure stowage (in the form of gas tight boxes) for the two banks of batteries. The battery boxes are vented to the engine room. The under-floor section of the after end of the cabin is occupied by the main fuel tank. In later lifeboats of the Class the main fuel tank space is occupied by two fuel tanks, port and starboard. All lifeboats of the Class are scheduled to have this modification completed during their Survey. A cabin heater supplied with hot water from the port main engine fresh water cooling system is fitted below the port side bench seats and an inbuilt electric fan exhausts warm air from the heater into the cabin.

c). Exit - normal exit is via the ladder and water-tight door to the wheelhouse. Emergency exit is via the forward passenger/survivors compartment to the escape hatch built into the deckhead leading to the main deck forward.

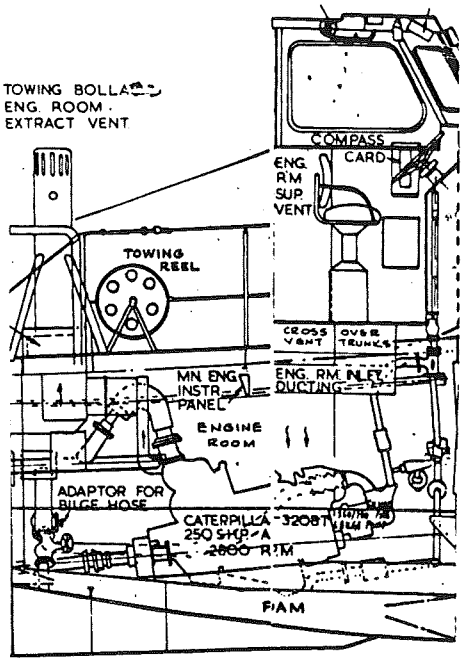
d). Ventilation - an exhaust fan draws air from the compartment with its outlet beneath the helmsman's console in the wheelhouse.

2.3.4 Engine Room

a). Entry - access to the engine room is via a water-tight door on the centreline of the Crew/Radio Cabin after bulkhead.



View Looking Forward In Engine Room.



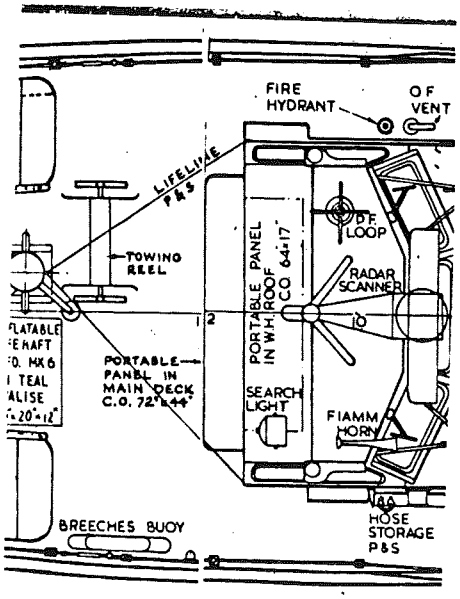
Profile.

b). Contents - this compartment houses the two main engines and the auxiliary generator set. The aux.gen. set is sited starboard side forward of the starboard engine, (later lifeboats of the class have the aux.gen. set at the centre after end of the engine room). Both engines and the aux.gen.set are independent units having their own fresh water cooling system, sea water cooling, fuel, exhaust systems and controls for independent operation. The main engines are controlled from the wheelhouse helmsman's position and the aux.gen.set is controlled locally in the engine room. A belt driven bilge pump with remote operated clutch is driven by each main engine. The remote control for the bilge pump clutches are not entirely successful and have been removed from some lifeboats while a new method is being investigated. An electro-magnetic clutch operated firemain pump is mounted on the forward end of the port engine and is driven by a belt. The pump draws water from its own sea inlet and supplies it under pressure to a deck hydrant on the port side. A three-way cock allows emergency bilge suction to be connected into the system when desired. A bleed-off from this sea inlet also supplies cooling water to the auxiliary generator set.

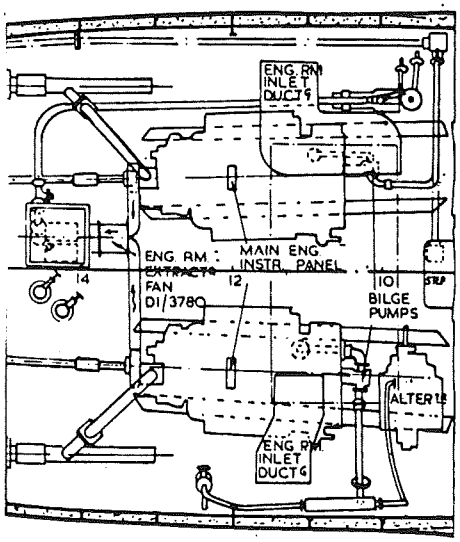
2.3.4(b)
contd..

The engine room Primary fire extinguisher is fitted to the deckhead in this compartment. It is a 15lb. Halon 1301 (BTM) bottle fitted with a temperature sensitive glass phial which will discharge the gas automatically should the temperature in the vicinity reach a critical level. This extinguisher can also be operated by means of a 'fire-pull' situated in the wheelhouse. The Secondary fire extinguisher is fitted in the Crew/Radio Cabin under the access ladder with its discharge outlet on the forward bulkhead of the engine room for discharge into the engine room. This bottle is not automatic, it is connected to another 'fire-pull' in the wheelhouse. Three fire detectors are fitted and located one over each main engine and one over the auxiliary generating set. The fire detectors operate at a temperature rising to 155°F (68.8°C) to give audible and visual warning of a fire in the engine room by means of warning sirens, one in the wheelhouse console and one in the engine room and a fire warning RED light in the wheelhouse console.

c). Ventilation - The main air intakes for the engine room are through two trunks, one port and one starboard mounted on the sides of the wheelhouse. The trunks run down to the deck, across to the opposite side of the lifeboat (the top of the trunks forming the helmsman's platform) down through the deck and terminating low down in the engine room. As the trunks crossover to form the helmsman's platform they are recessed into the engine removal hatches. An extraction fan is fitted aft in the engine room and exhausts via the combined towing bollard and engine room vent.



Main Deck.

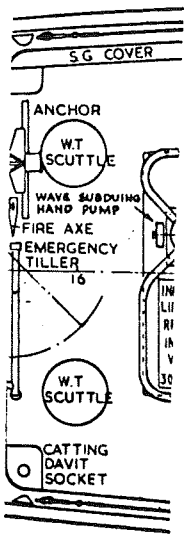


Below Main Deck.

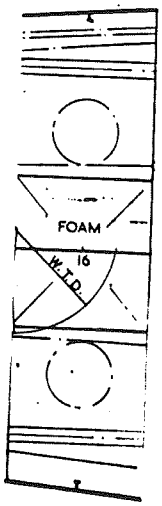
2.3.4
contd..

d). Exit - as for entry. Emergency exit can be made via the Crew/Radio Cabin to the Forward Passenger/ Survivor compartment and the forward escape hatch.

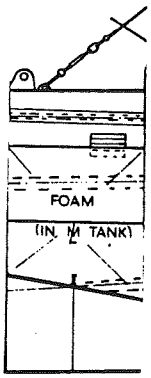
2.3.5 Well Deck or Cockpit Compartment - the void space below the cockpit deck is arranged as three separate tanks with the centre one filled with expanded polyurethane foam. The port and starboard tanks are fitted with clear opening scuttles in the deck. The main engine exhaust pipes run through the side tanks to the after compartments.



Main Deck.



Lower Deck.

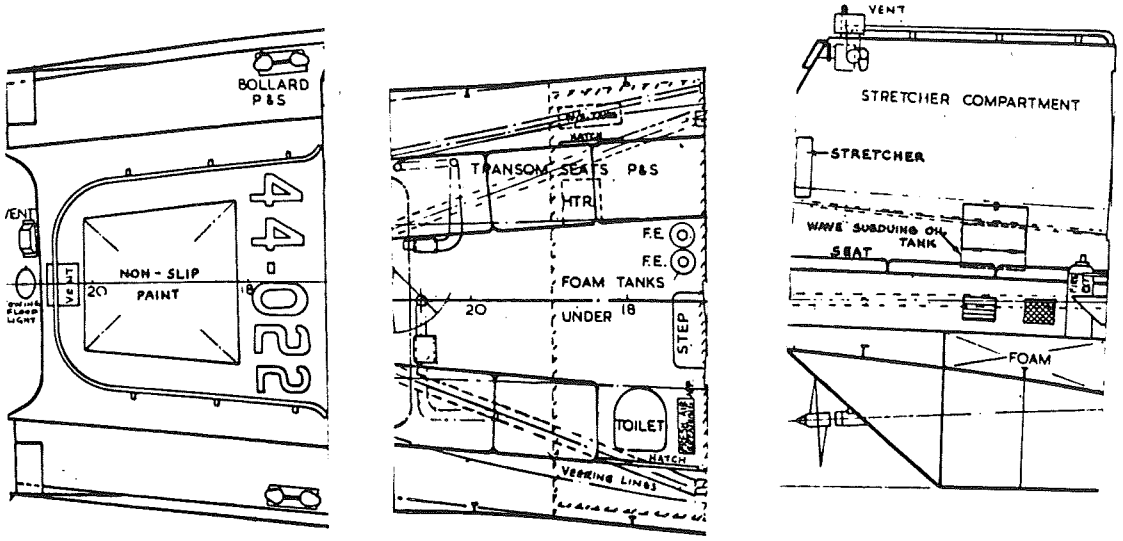


Profile.

The well deck is fitted with a non-return ball valve drain in each corner port and starboard. The valves are fitted below deck level and enclosed in a housing welded to the shell and the deck.

2.3.6 Survivor/Stretcher Compartment

This compartment is often known simply as the 'Aft Cabin'.



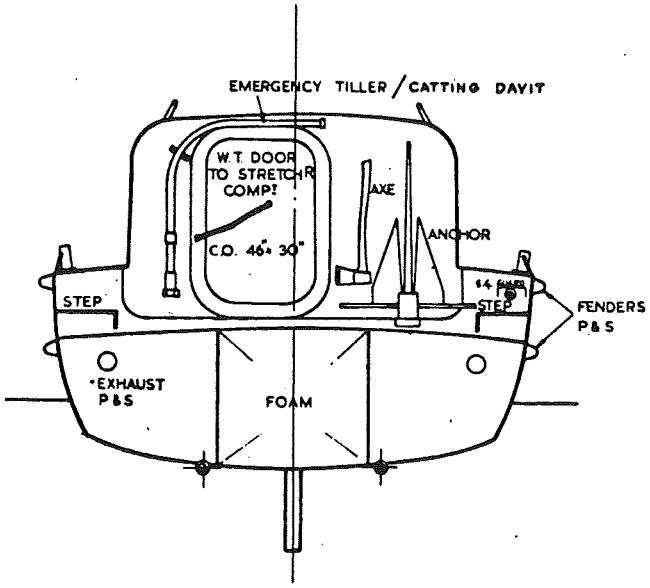
Main Deck. Lower Deck. Profile.

a). Entry - access to this compartment is via a watertight door from the well deck. A step leads down into the compartment.

b). Contents - an eye-plate is located above the access door for use when bringing a stretcher case aboard. Bench seats are fitted either side of the compartment. Three seats on each side are fitted with safety harnesses (seat belts). The starboard seat lockers contain stowages for the line throwing equipment. Fresh Air Breathing Apparatus is stowed in a container on the starboard forward bulkhead. Outboard of the starboard bench seats is a stowage for the veering lines. The stowage is in the form of sparred wood grating bottom with marine plywood front and ends. The front of the stowage is an access flap. Rope trays are fitted in lockers over the bottom longitudinals port and starboard, and a wooden stowage box is fitted to the starboard seat back at the forward end for the anchor catting block. The wave subduing oil tank is fitted on the port side of the compartment. An Elsan Bristol toilet is fitted on the starboard side just inside the access door. A watertight door in the aft bulkhead leads to the Steering Gear Compartment.
The top of the Aft Cabin is covered with 'non-slip' paint to provide a possible position for helicopter winching operations.

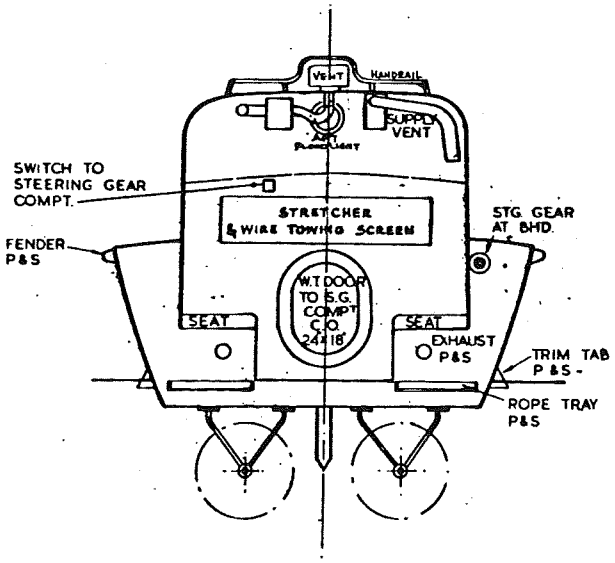
2.3.6
contd.

The drawing below is a view of the Aft Cabin, looking aft from the well deck.



The emergency tiller is also used as the anchor catting davit. One of the two anchors is stowed on the bulkhead as well as the hatchet. On the port side a guard is fitted over the mechanical steerage linkage as it passes aft to the rudders.

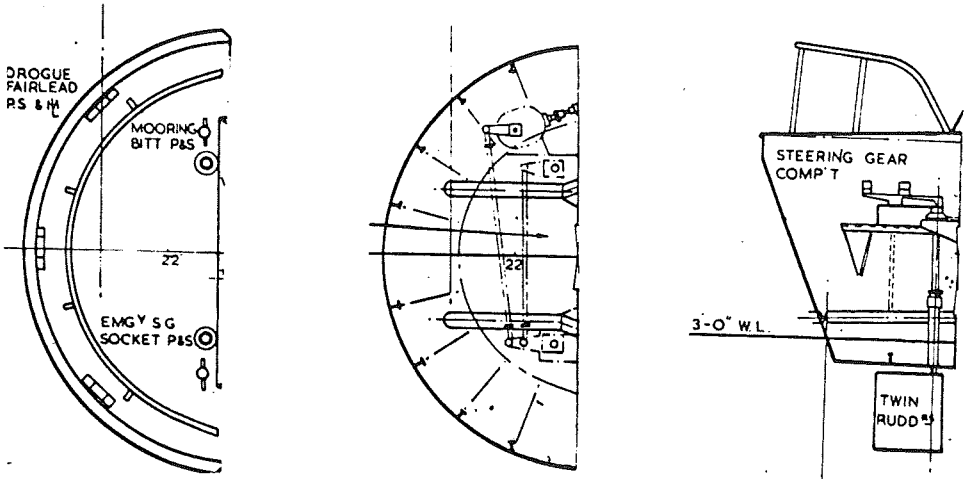
The drawing below is a view from inside the Aft Cabin, looking aft.



The main engine exhaust pipes pass through this compartment, underneath the side bench seats. A coach heater is fitted below the port side bench seats supplied with hot water from the main engine fresh water cooling supply.

c). Ventilation - the cabin is ventilated by means of two air intakes fitted with capsize valves that are mounted port and starboard on the deckhead after end and an air extractor fan.

2.3.7 Steering Gear Compartment - this compartment, often called the 'Tiller Flat' houses the steering gear.



Main Deck. Lower Deck. Profile.

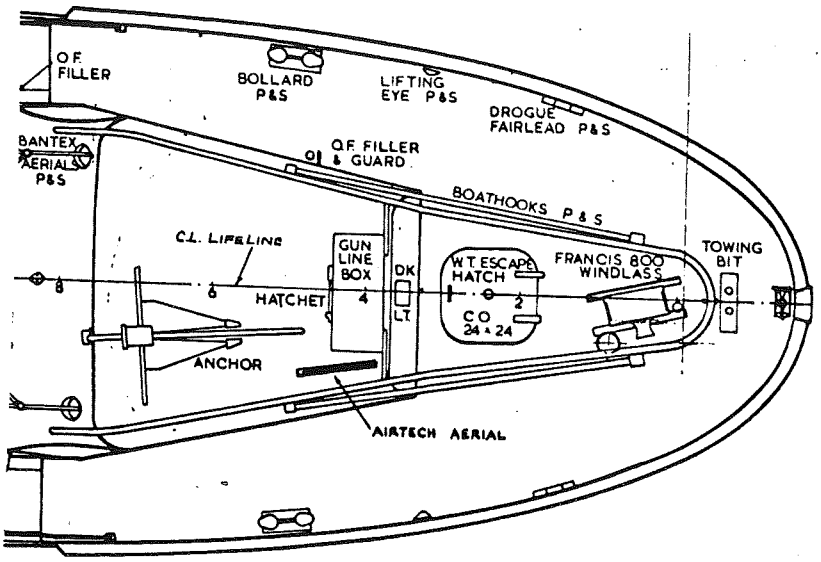
The main deck bears the emergency steering sockets port and starboard.

Access to the compartment is via a watertight door in the aft bulkhead of the Aft Cabin.

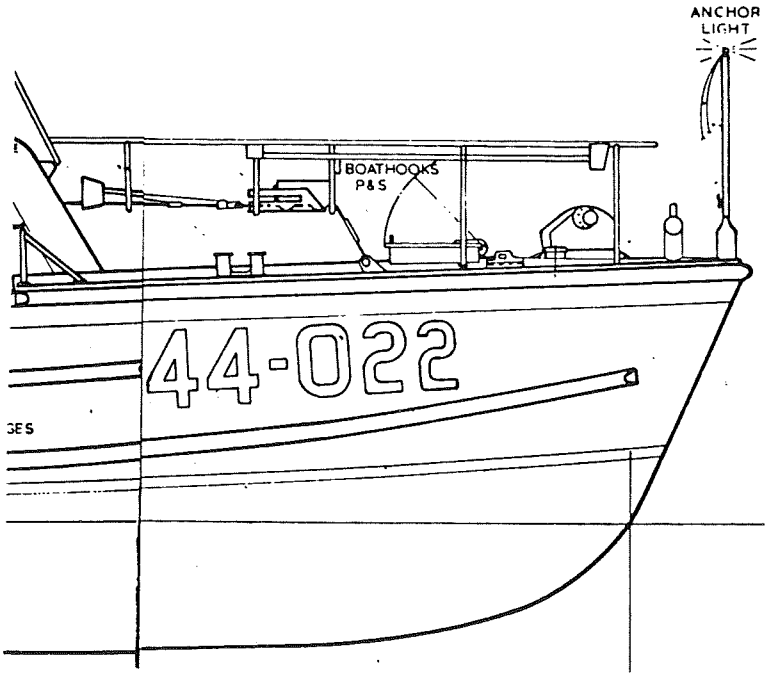
2.4 MAIN DECK

2.4.1 All exposed parts of the deck are covered with a non-slip covering that helps prevent persons skidding when working on deck.

2.4.2 Forward Raised Deck - the fore deck is fitted with a bullring with a bow staff positioned in a socket attached to the top. The staff is fitted with an anchor light, and an eye and cleat for a halyard. The staff is retained in the socket by means of a drop-nose pin.



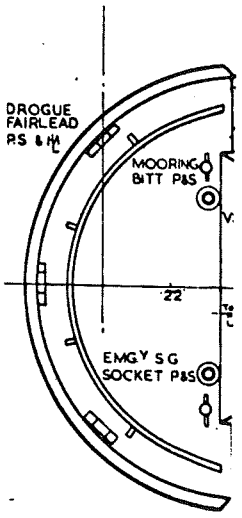
One of the two anchors is stowed on the starboard side of the forward coachroof. Also on the forward coachroof is fitted a stowage box to house the line throwing apparatus when it is used on deck.

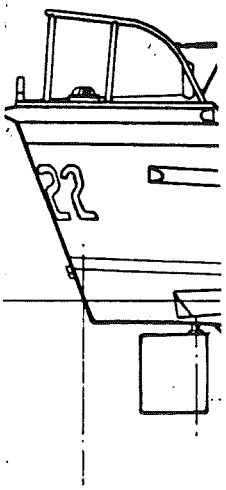


2.4.2
contd..

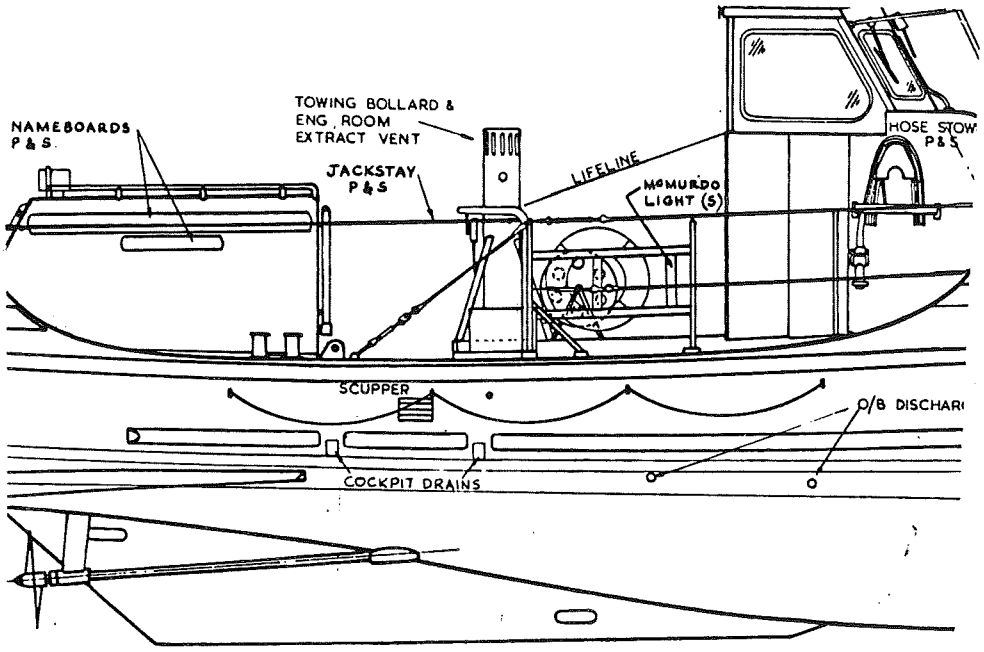
Boathooks are stowed on the guard rails, one to port and one to starboard. The long established practice of painting starboard boathooks **BLUE** and port boathooks **WHITE** is continued on the Waveney. This is one of the few surviving vestiges from the days of pulling/sailing lifeboats when oars were painted blue and white, blue being used for starboard and white for port oars. It is intended that this traditional colour marking will serve to remind us of the strong and brave men of a bygone era. The foredeck is also fitted with a towing bit, an electric windlass, fairleads and mooring bollards. A guard rail surrounds the front end of the coachroof sides. Four lifting plates are fitted two forward and two aft.

2.4.3 <u>After Raised Deck</u> - a guard rail is fitted around the stern. The deck portion bears mooring bits port and starboard, three fairleads and the emergency steering sockets port and starboard.



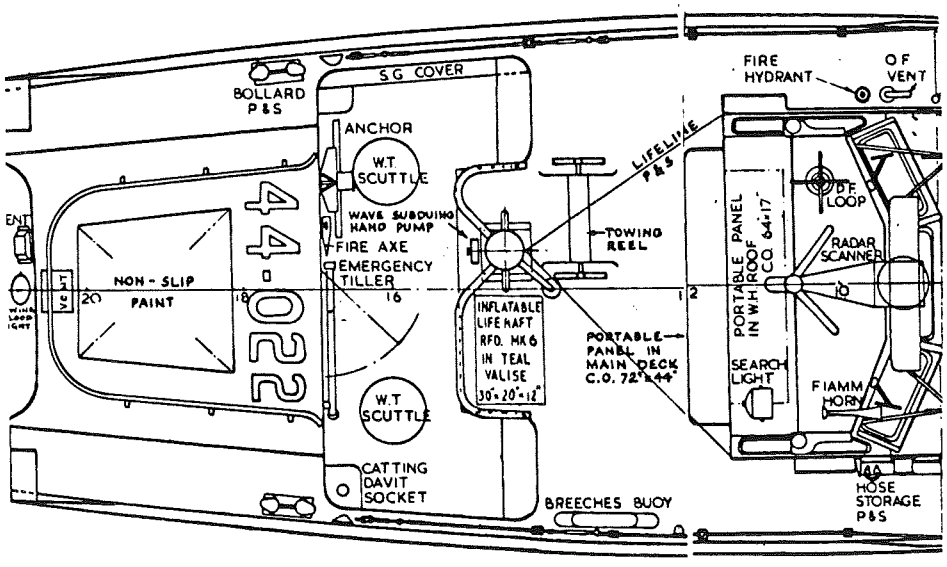


2.4.4 Well Deck (Cockpit) - guard rails are run from the forward end of the superstructure to the forward edge of the well. Grab rails are fitted on top of the aft cabin casing. The fire hydrant stand-pipe is situated on the port side forward close-by the fuel tank vent. Life-lines are fixed from the wheelhouse screen to the towing bollard. Mooring bollards are fitted on the port and starboard sides of the well. The aft lifting eyes are situated just forward of the mooring bollards.



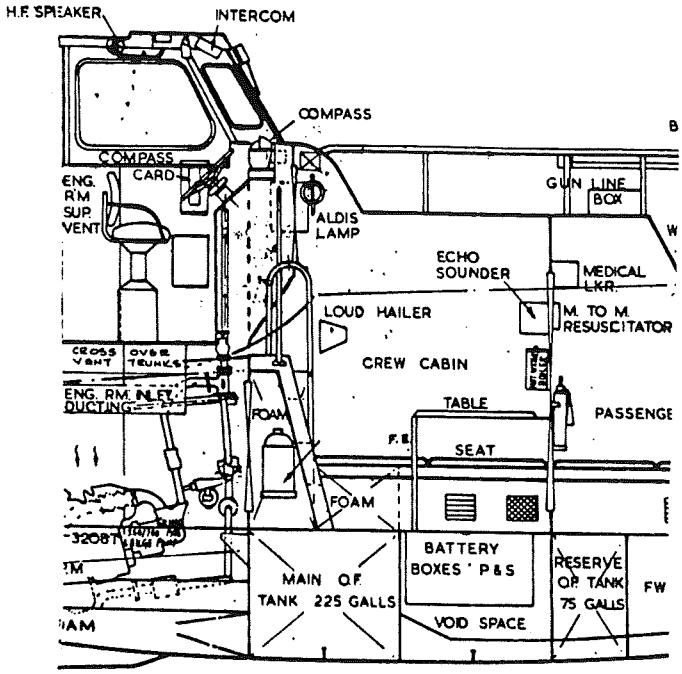
Profile.

The towing bollard on the centreline of the well also serves as the engine room air extraction fan ventilator. A Breeches buoy is stowed on the starboard guard rails, and a inflatable RFD liferaft is stowed on the starboard side of the towing bollard.

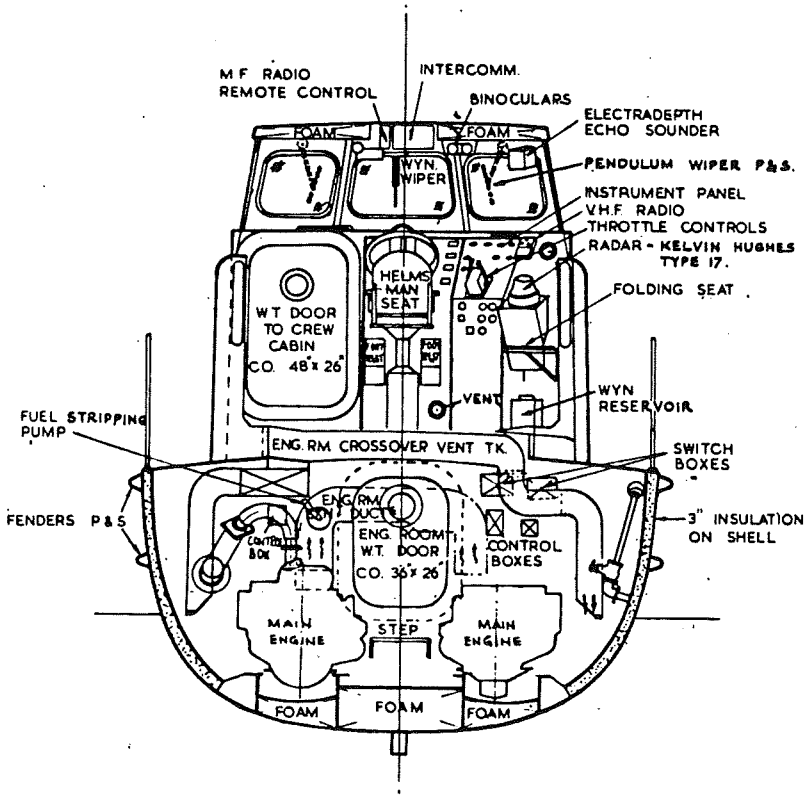


2.5 SUPERSTRUCTURE

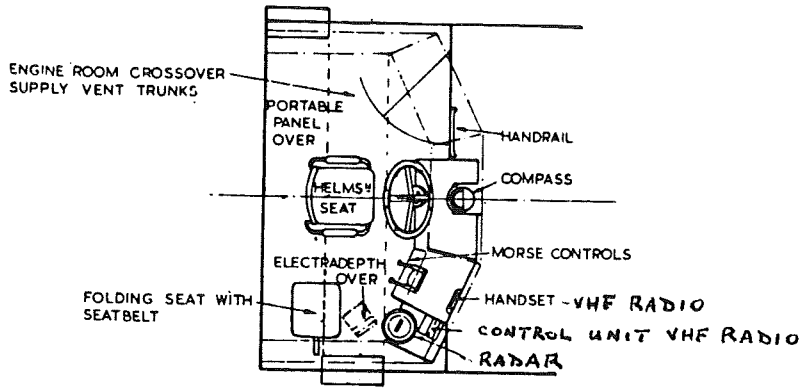
2.5.1 General - the superstructure houses the wheelhouse and the forward raised portion covers the Crew/Radio Cabin and part of the forward Passenger/survivor compartment. The top of the wheelhouse is a buoyancy tank and all fittings to it are made watertight.



2.5.2 Wheelhouse. View Looking Forward - the helmsman's seat is on the centreline with all the controls and instruments on his right-hand side.



2.5.3 Wheelhouse. Plan View - this view shows the layout with the access watertight door to the Crew/Radio Cabin on the port side.



WHEELHOUSE PLAN VIEW

2.5.4 Wheelhouse Screens - plastic screens are fitted over the aft end of the wheelhouse in two halves. The upper section of each screen has a large panel of clear plastic and is attached to the top of the lower section of the screen and to the top of the wheelhouse by nylon turn-buttons and brass eyelets. The sides of the screens have brass eyelets with elastic cords reeved through for fixing to nylon clips on the wheelhouse exterior sides.

2.5.5 Wheelhouse Protective Screen - a further protective screen is fitted at the aft end of the wheelhouse in way of the helmsman's seat for use when towing. The screen is made of black plastic covered wire mesh with aluminium alloy tension bars at top and bottom. The screen is secured to the wheelhouse top by means of bar hooks and to the wheelhouse platform by elastic shock-cords. Terylene cord is reeved through the centre and the sides of the screen.

2.5.6 Wheelhouse Seating - fixed seating is provided for the helmsman. This seat has vertical and fore and aft adjustment and is capable of rotation with three locking positions. A folding seat is fitted on the starboard side of the wheelhouse for the radar operator /navigator, or the Coxswain when on passage to and from a casualty. Each seat is fitted with a safety belt harness for use in foul weather. The harness correctly worn and adjusted is capable of restraining a crew member even should a knock-down or capsize occur.

2.5.7 Helmsman's Position - the Coxswain's or helmsman's position permits single lever control of both main engines (engine revolutions, ahead and astern selection) with his right hand and steering by his left hand.

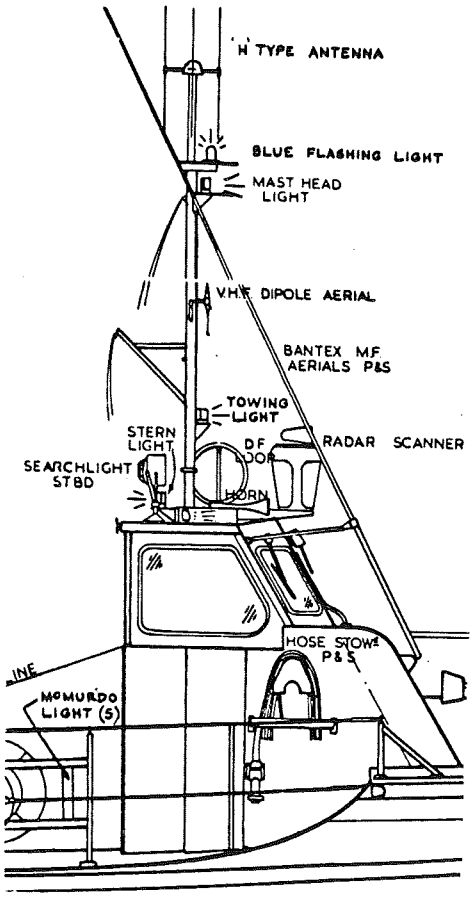
2.5.8 Helmsman's Indicators - the steering compass, rudder angle indicator, watertight door/hatch warning panel and the instrument console are directly in view from this seat.

2.5.9 Helmsman's Console -

2.6 MAST STRUCTURE

2.6.1 Aerials - the 'H' aerial on the top of the mast is the directional aerial for the VHF D/F outfit. The VHF dipole for the VHF Radiotelephone is on the front side of the mast about half-way down its length. The MF whip aerials, port and starboard sides of the superstructure are folding types stayed to the wheelhouse front. The port whip is for the Decca Navigator outfit and the starboard whip is for the MF Radiotelephone. The crossed loop aerial on the top of the wheelhouse is the aerial for the MF Automatic D/F outfit. The Radar aerial is fitted on an extension fitted to the wheelhouse roof.

2.6.2 Lights - the mast bears the blue flashing light, the white masthead steaming light, a towing light and stern light. In addition a searchlight is fitted.



2.7 FIRE PROTECTION SYSTEM & FIRE FIGHTING APPLIANCES

2.7.1 Fixed Fire Extinguishers - the lifeboat is protected by using Halon piped systems in the engine room with automatic and manual discharge facilities.

2.7.2 Portable Fire Extinguishers - also distributed about the lifeboat are portable Halon and Foam fire extinguishers, an engine driven fire main pump and a portable Eductor with suction hose (Jet pump) that can be used to provide water under pressure or suction to a casualty alongside.

2.8 OTHER EQUIPMENT, INSTRUMENTS, TOOLS & SPARES

2.8.1 Survivor Recovery Equipment - stowed onboard are the following items to assist in recovering survivors-

(a) a GRP and a canvas type Breeches buoy;

(b) a Dutch scrambling net;

(c) a Neil Robertson stretcher and sling;

(d) one basket stretcher.

2.8.2 First-Aid and Survivor Care Equipment - a comprehensive first-aid kit and a portable first-aid pouch together with a mouth-to-mouth resuscitor and blankets are provided. A stretcher position is fitted in the aft cabin. Survivor bench seats in the cabins are fitted with safety harness seat belts and three special survivor life-jackets are carried. Facilities exist in the Crew/Radio Cabin to provide a hot drink.

2.8.3 Navigation Equipment - aids to navigation are fitted as follows -

(a) chart table and charts;

(b) pencil compasses, dividers, parallel rulers, time, speed and distance calculator, etc., all in secure stowages;

(c) boat's lead and line;

(d) Two Echo Sounders.

(e) Radar outfit ; (Decca Navigator, some lifeboats).

(f) MF and a VHF Automatic Direction Finders;

(g) Barometer and wall clock;

(h) Magnetic steering compass.

2.8.4 Communication Equipment

(a) Sound - an electric air horn is fitted to allow manoeuvring and warning signals to be made, also a brass bell for use during restricted visibility in accordance with the International Regulations for Preventing Collisions at Sea. A portable loud hailer is carried.

(b) Visual - a set of International Code Flags, two hand signalling flags (red and green) for use during helicopter working, and an Aldis signalling lantern.

(c) Pyrotechnics - see para 2.8.5 below.

(d) Radio - a MF radiotelephone, and a VHF radiotelephone are carried.

(e) Onboard - an internal two-way communication system (intercom) between compartments, deck working areas and the emergency steering position is installed. The main control unit is sited at the helmsman's position.

An improved intercom system has been fitted in the latest lifeboats of the Class. This system has a boom microphone and headset incorporated into protective headgear in the form of an helmet. A further development with the new system has been to provide the Coxswain with the facility to switch his headset from intercom to the VHF radiotelephone.

2.8.5 Pyrotechnics - the following pyrotechnics are carried onboard in secure stowages -

(a) five Speedline line throwing outfits complete with rockets and actuators;

(b) five spare rockets and five spare actuators;

(c) ten illuminating parachute flares (white);

(d) two RED parachute flares;

(e) six hand-held RED flares;

(f) six hand-held GREEN flares.

2.8.6 Anchors, Cordage, etc. - two anchors complete with anchor chain and cable (nylon rope), catting block catband and an anchor messenger rope are carried.

Two heaving lines, one bow line and two veering lines.

A securing rope together with mooring rope sleeves.

Three mooring ropes.

Two tail blocks, four fenders, one grapnel, two boathooks.

2.8.7 Tools - the following on-deck tools are carried-

One one pound hammer.

One 6lb. axe.

Two Marlin spikes.

Two knives.

A set of mechanic's specialist tools necessary for on-board use are carried in the engine room.

SECTION

THREE

PROTECTIVE CLOTHING & GEAR

3.1 Regulations

3.2 RNLI Life-jackets

3.3 Helmets or Bump Hats

3.4 Seat Belts

3.5 Ear Defenders

SECTION 3

PROTECTIVE CLOTHING & GEAR

3.1 REGULATIONS

3.1.1 Protective Clothing and Life-jackets - protective clothing as supplied and life-jackets correctly adjusted must be worn by all crew members whilst at sea.

N.B. Protective clothing may be relaxed at the discretion of the Coxswain in hot weather, however, life-jackets are to be worn AT ALL TIMES.

It is the responsibility of the Coxswain to ensure that this regulation is enforced. Lack of protective clothing, especially for crew members working on the main deck, can result in a serious deterioration of crew capability due to Hypothermia. Suitable warm clothing should be worn beneath the protective outer garments in cold weather and thermal undersuits (optional own purchase through RNLI Depot) are ideal for this purpose.

3.1.2 Helmets or Bump Hats and Seat Belts - these are supplied and should be worn. When at sea in heavy weather or in confused waters the Coxswain should order the protective headgear to be worn, and all crew not required on the upper deck, to be seated and seat belts correctly adjusted and worn.

3.1.3 Safety Lanyards - crew members working on the upper deck in heavy weather should (depending upon the situation) attach their life-jacket safety lanyards to the upper deck jackstay.

3.1.4 Accomodating Survivors - survivors are to be placed in one of the cabins and securely fastened in by means of the seat belts provided on the bench seats or, if the situation warrants it, placed in the stretcher/s and securely fastened in. This measure is essential to the maintenance of the low centre of gravity of the lifeboat and hence its 'righting lever' should a knockdown or capsize occur.

3.1.5 Survivors Life-jackets - the three special survivors life jackets are to be issued to survivors, correctly adjusted, worn and inflated.

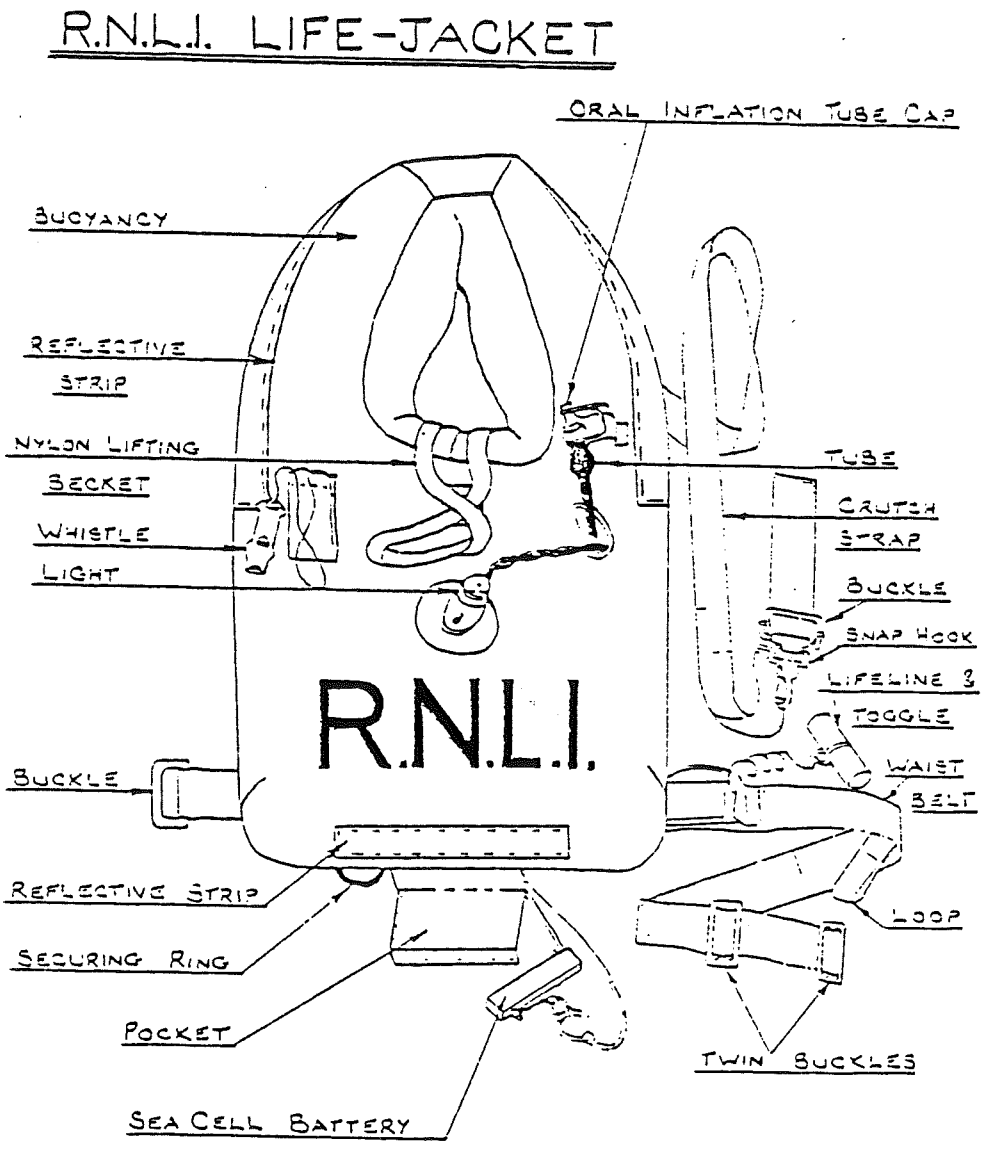
3.2 R N L I LIFE-JACKETS

3.2.1 RNLI life-jackets are manufactured to a very high specification incorporating a number of well proven safety features.

3.2.2 Each crew member is to be fully aware of the correct method of use and the capability of the life-jacket.

3.2.3 RNLI leaflet No.6/833 is well illustrated and designed to assist in the training of crews in the correct use and care of the life-jacket. Ideally, this leaflet should be displayed in a prominent position in the boathouse.

3.2.4 The salient features of the life-jacket are shown labelled in the drawing below.



3.2.5 The purpose of the life-jacket is to provide sufficient buoyancy to keep the wearer afloat until it is possible to fully inflate the life-jacket. When fully inflated by means of the oral inflation tube, the wearer is turned and remains floating head upwards, even if he loses consciousness. To retain this self righting action subsequent to full inflation, the life-jacket must be worn correctly with the waist belt and crutch strap properly secured.

3.2.6 The safety lanyard is fitted under the collar of the life-jacket, around the neck and held in place by means of Velcro strips.

3.2.7 Reflective strips are fitted to both shoulders and to the front of the life-jacket. At night these strips reflect the light from search lights and ease the task of locating a person in the water.

3.2.8 A light is fitted to the front of the life-jacket, operated by a 'sea cell' type of battery that is activated by sea water. It has a detection range of approximately half a mile in ideal conditions and the battery when activated, has an endurance of about 14 hours.

3.2.9 The sea cell is prepared for use at night on the instructions of the Coxswain when he considers conditions on deck warrant this precaution, also, of course, in an 'overboard' situation.

3.2.10 The lifting becket is fitted to assist in lifting and recovery of the wearer from the water.

3.2.11 The whistle is used to attract attention when a rescuer is close-by.

3.2.12 The life-line and toggle is for crew and/or survivors to attach themselves to one another whilst awaiting rescue.

3.2.13 To Don the life-jacket -

i. Ensure :-

(a) waist belt and crutch strap are free,

(b) crutch strap is fed through loop at rear of waist belt,

(c) all other equipment, i.e. light, sea cell, etc., are in good order and properly located.

ii. Place life-jacket over head. Where applicable hood of protective clothing should be pulled over head before life-jacket is put on.

iii. Secure waist belt and tighten.

iv. Secure crutch strap with the open end of hook towards the body and tighten.

3.2.14 The maintenance and care after use is set out in the section on Making Ready For Service, Sect.7.

3.3 HELMETS OR BUMP HATS

3.3.1 Bump hats when properly adjusted, or a helmet of the correct size for the wearer, protects the most vulnerable part of the body. They are strange to wear but constant use soon makes them comfortable and familiar. It is a fact that the majority of 'bumps' suffered at sea are to the head and it is the duty of each crew member to comply with the Safety at Work Act, insofar as it affects the RNLI, by wearing this item of protective headgear.

3.3.2 Trials are constantly being held to find the most suitable protective headgear for use by the RNLI and the latest combined intercom-helmet is the result of development work by the RNLI.

3.3.3 The new type of helmet is made of polycarbonate and a few rules are necessary to obtain the maximum benefit from its use.

(a) When selecting the correct size of helmet remember that for adequate protection the helmet must fit closely and should provide sideways vision. The chin strap must pass under the chin and be securely fastened to maintain tension. On no account must a chin cup be used with this helmet.

(b) Damage - the helmet is so constructed that the energy of a severe blow is absorbed in the partial destruction of the shell and/or the protective padding material. Although damage may not be visible to the eye, any helmet which suffers such impact should therefore be returned to Depot and replaced with a new one.

(c) To maintain the full efficiency of the helmet there must be no alteration to the structure of the helmet or its component parts.

(d) Cleaning - use only soap and water. Chemical or solvents should **NOT** be used. Wipe dry with a clean cloth.

(e) Decoration of the helmet shell. Adhesive decorations may contain harmful solvents and must not be used. Extensive research has clearly shown that most paints, when applied to A.B.S or polycarbonate helmets, can adversely affect the performance of the helmet. You are therefore advised not to paint this helmet.

3.4 SEAT BELTS

3.4.1 Adjusting Seat Belts - once the lifeboat is launched and underway opportunity should be taken to adjust the crew seat belts so that if required they may simply be buckled in place. If the H.M.A. is carried then his seat belt should also be adjusted.

3.4.2 Survivors Seat Belts - when survivors are recovered and are fit enough to sit upright, they should be assisted to their seating positions in one of the cabins and securely fastened into their seat belts.

3.4.3 Purpose of Seat Belts - the use of seat belts by crew and survivors is necessary not only to prevent personal injury but to maintain the low centre of gravity of the lifeboat and its righting lever should a knockdown or capsize occur. If more survivors than available seat belts are rescued they too must be placed in one of the cabins. As uncomfortable as they may be the low centre of gravity of the lifeboat must be maintained at all costs.

3.5 EAR DEFENDERS

3.5.1 Two sets of ear defenders are carried and should be worn by anyone entering the engine room when the engines are running.

SECTION

FOUR

LAUNCHING & SECURING

4.1 Launching on Service

4.2 Launching on Exercise

4.3 Launching for Publicity Purposes

4.4 Reporting Names of Crew

4.5 Radio Watch

4.6 Securing the Lifeboat

4.7 Engine Shut-down Procedure

4.8 Engine Start-up Procedure

4.9 Running Checks

4.10 Slipping Moorings

4.11 Reception of Survivors

4.12 Return of Service.

SECTION 4

LAUNCHING & SECURING

4.1 LAUNCHING ON SERVICE

4.1.1 The Term 'Launching' - used in respect of an afloat lifeboat such as the Waveney, is an out of date term, but, it is a term understood by all SAR authorities to mean "the lifeboat is on its way". Therefore the term is retained for all lifeboats of the RNLI, whether they be slipway, carriage or afloat types.

4.1.2 Authority to Launch - the Coxswain will normally receive the authority to launch from the Station Honorary Secretary (SHS) or a Deputy Launching Authority (DLA). If the Coxswain receives from any other source intimation that lives are in danger at sea, whether distress signals are displayed or not, he must report the fact to the above authority unless, in his opinion, delay would result in danger of loss of life. In such cases he must use his utmost exertions to assemble his crew, launch the lifeboat and proceed to the assistance of the casualty or person in difficulty. If the Coxswain launches the lifeboat on his own authority he must arrange for the SHS or DLA to be given the earliest possible information of the action taken. When there is no likelihood of danger to life the Coxswain must not order the launch of the lifeboat without specific authority from the SHS or DLA.

4.1.3 Availability for Service - it is essential, whenever possible, that the lifeboat should be available for service at all times. The decision to put the lifeboat 'off service' must be made by the SHS after discussion with the Coxswain and Mechanic if appropriate. The lifeboat should always be placed 'off service' i n the following circumstances :

(a) when the hull is holed in a position that affects the sea-keeping ability;

(b) when both propulsion engines are non-operational;

(c) when the steering gear and/or rudder is out of action.

4.1.4 Restricted Service - the lifeboat may remain on 'restricted service' with limitations depending upon the severity of the weather in the following circumstances :

(a) if only one engine is out order;

(b) if the anchor and/or cable is missing;

(c) if the steering system is damaged and steering can be undertaken with the emergency tiller.

4.2 LAUNCHING ON EXERCISE

4.2.1 Frequency of Exercises - every lifeboat must be at sea, with a full crew, at intervals of six weeks. When a lifeboat is launched for service, the next exercise should take place six weeks later. A special exercise will be ordered by the Chief of Operations whenever he considers such a launch advisable. Exercises should preferably take place in rough weather and it is desirable that one exercise in each year should take place at low water. One exercise each year may be a suprise exercise after dark, if the Branch Committee considers it desirable.

4.2.2 Conduct During Exercises - whilst on exercise the lifeboat and all equipment must be used in a seaman-like manner.

4.2.3 Pyrotechnics on Exercise - may only be fired on exercise by permission of the Divisional Inspector of Lifeboats, the Station Honorary Secretary or duty DLA and then only after prior warning has been issued to the HMCG giving time for firing, position, number and description of pyrotechnics to be displayed.

THE FIRING OF DISTRESS SIGNALS FOR EXERCISE PURPOSES IS FORBIDDEN !!

4.3 LAUNCHING FOR PUBLICITY PURPOSES

4.3.1 Requests for Publicity launches should be passed to the headquarters of the RNLI for approval well in advance of the event.

4.3.2 Passengers are not to be taken afloat.

4.3.3 See also RNLI Regulations Sect.2.6 para 2.6.1.13.

4.4 REPORTING NAMES OF CREW

4.4.1 Crew List Afloat - the Coxswain is responsible that the names of individual crew members of all crew and others onboard the lifeboat are known ashore on all occasions of launching on service or exercise. Where possible the crew numbers/names are to be reported to HMCG by radio as soon as possible after launching. See Check Card 6/885.

4.4.2 Enrolled Crew Members Board - a board should be posted in the boathouse/crewroom with the names of **ALL** enrolled crew members. Each crew member is allocated a number from one onwards. A copy of the crew member's name and number is given to HMCG launching station, then when the report is given of the crew list afloat, communications are simplified by sending the abbreviated information.

e.g. "CREW LIST - NUMBERS ONE, THREE, FIVE, SIX, (or the appropriate crew numbers concerned).

Some stations elaborate the crew members board by putting 'cup-hooks' alongside each name and number. A disc is placed on each cup-hook bearing the crew name/number of those afloat.

4.4.3 Telephoning Crew List to HMCG - the crew list is often telephoned to HMCG by the Station Honorary Secretary or senior shore helper while the launch is in progress.

4.5 RADIO WATCH

4.5.1 Distress and Safety Frequencies - whether on service, exercise or trials the lifeboat is to keep radio watch on Channel 16 VHF and 2182kHz MF, unless temporarily working on other channels or frequencies.

4.5.2 Launching Signals - as soon as possible after launch the lifeboat is to call the Coastguard on Channel 16 VHF to establish communications and to obtain a time check. Also to pass the crew list if it has not previously been passed by telephone. Watch should also be set on 2182kHz and contact made with the nearest Coast Radio Station informing them of the radio watch being maintained by the lifeboat. After initial calls the lifeboat is to maintain constant loudspeaker watch on 2182kHz and Channel 16 (or Channel Zero or 67) as required. When on Channel Zero or 67 HMCG will guard Channel 16 for the lifeboat.

4.5.3 Situation Reports - every 30 minutes whilst on service the lifeboat should report its position and intended movements to the Coastguard or other co-ordinating authority.

4.5.4 Interrupted Service - should the lifeboat anchor or take shelter the Coastguard or other co-ordinating authority should be informed with details of the arrangements made for a radio listening watch.

4.5.6 See also the "RNLI Communication Instructions & Radiotelephone Procedures" handbook for full details of the procedures to be used.

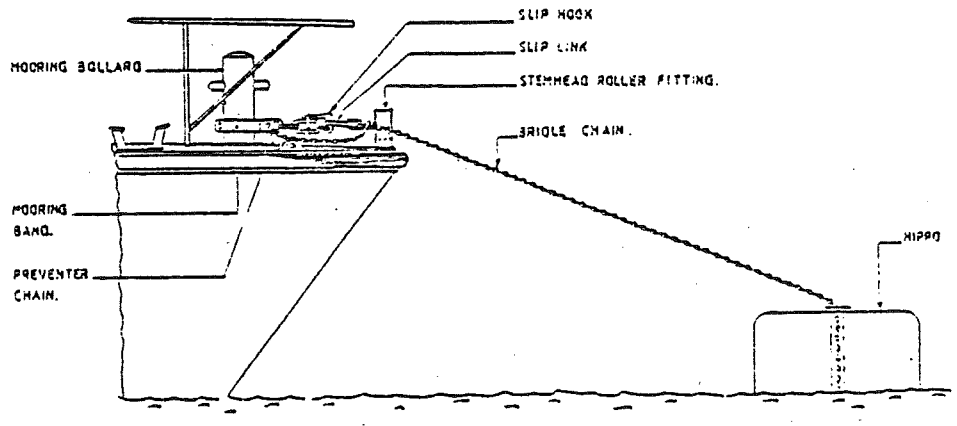
4.6 SECURING THE LIFEBOAT

4.6.1 Preparation - as the lifeboat approaches the mooring buoy the slip hook and preventer chain should be secured to the mooring band ready to receive the slip link of the bridle chain.

4.6.2 Picking up the Slip Link - approach the buoy slowly and pick-up the slip link from the top of the buoy with a boat hook.

4.6.3 Securing the Bridle Chain - pull up the bridle chain, passing the slip link end through the stemhead roller and secure the slip link to the slip hook as shown in the drawing below.

4.6.4 Fit the Preventer Chain - between the mooring band and the links on the end of the bridle chain.



4.7 ENGINE SHUT-DOWN PROCEDURE

4.7.1 A definite procedure is to be followed when the lifeboat is secured on the moorings and when it is time to stop both engines.

4.7.2 The Caterpillar 3208T engines are high performance turbo-charged types and as such run at quite high temperatures. Ideally before stopping the engines after use they should be allowed to run at idle speed for a while to allow the raw water (via the heat exchangers) to cool down the fresh water coolant and hence the engines. The worst conditions for the engines would occur if the lifeboat was driven at high speed up to a jetty or moorings and the engines immediately stopped. The ideal procedure is outlined below.

(a) Put both engine controls in NEUTRAL, i.e. remove the load from the engines;

(b) place both throttle controls to about half speed and leave the engines to run for about five minutes. This allows the internal temperature to reduce gradually and prevents loss of jacket water coolant by 'afterboil';

(c) while the engines are running note the readings required to complete the Machinery Record or the Mechanic's Log Sheets;

(d) set the helm amidships;

(e) move both throttle controls to low idle for about 30 seconds;

(f) stop both engines, cancel alarm bell;

(g) switch off the engine room fans;

(h) switch off all electrical services by means of their ON/OFF switches.

NOTE: The circuit breakers on the distribution boards should ideally be left at their ON positions and the electrical load reduced to a minimum by means of the individual ON/OFF switches in readiness for re-starting the engines prior to another launch.

(i) close sea valves and rig riding lights if needed;

(j) switch OFF both battery isolator switches;

(k) commence post recovery checks. See Sect.7.

4.8 ENGINE START-UP PROCEDURE

4.8.1 Assuming that the engines were shut down following the procedure given in Sect.4.7 :

(a) **OPEN THE SEA VALVES!!**

(b) check that the throttle control levers are at the idle (neutral) position;

(c) check that the fresh water levels in the engine header tanks are correct;

(d) check the engine and gear box oil levels;

(e) check that the fuel supply valves are set to NORMAL, i.e. with single main tank, that both engines are set to run off the main tank, and with two main tanks, that the port tank supplies the port engine and the starboard tank supplies the starboard engine.

(f) switch ON both battery isolator switches;

NOTE: When the isolator switches are first switched and before the engines are started, the following warning lights will light-up and the alarm bell will ring - switch OFF the alarm bell and check the warning lights -

Alternator charge warning lights;
Engine oil low pressure lights;
Gearbox oil low pressure lights;

In addition the Watertight door/hatch display will light-up.

(g) Move the throttle control levers to half engine speed (gear shifts in neutral);

(h) start one engine at a time. The Port engine should be started first because the port battery bank supplies both engine starter motors and once the port engine is running its alternator will be supplying electrical current to this battery bank thus ensuring easier starting of the starboard engine.

Press the START button firmly. If the engine fails to start after 20 seconds, release the start button and allow the starter motor to cool for a while before trying again. If the engine fails to start after four attempts, an inspection should be made to determine the cause.

4.8.1
contd..

C A U T I O N

TO PREVENT DAMAGE TO THE STARTER MOTOR AND/OR THE FLYWHEEL GEAR TEETH, DO NOT PRESS THE START BUTTON WHILE THE FLYWHEEL IS TURNING.

(i) as soon as the engine starts, reduce the engine speed to low idle;

(j) do not apply the load to the engine, or increase revolutions, until the oil pressure gauge indicates normal pressure, and the low pressure warning light goes out;

(k) engage forward and increase revolutions slightly to operate the engine at low load. Observe the gauges and check that the warning lights for the engine systems go out as the engine warms up;

(l) start the other engine. Check that the warning lights for this engine also go out as the engine warms up;

(m) switch on the engine room fans;

(n) check the steering function;

(o) carry out the running checks listed in Sect.4.9.

4.8.2 Emergency Starting - if the Start battery does not have sufficient charge to crank the engine, or cranks it very slowly then the Coupling switch may be used. Set the Coupling switch to its ON position, press the engine Start button; release the Start button as soon as the engine starts and return the Coupling switch to its OFF position. If the engine does not start, do not hold the start button depressed longer than 10 seconds, let go momentarily and try again. Do not continue this procedure if the engine does not start at all. Make an inspection to determine the cause, rather than discharge the batteries completely.

4.9 RUNNING CHECKS

4.9.1 (a) Check instrument readings.

(b) Check equipment and controls.

(c) Check aerials.

(d) Check gear stowages.

(e) Check steering gear compartment and fore and aft cabins.

(f) Make a visual check of the engine room - engines, gear boxes, bilges, pipework, sea water supply, sea valves, security of tools, etc.

4.10 SLIPPING MOORINGS

4.10.1 When both engines are running correctly, all gear and equipment stowages checked and the steering function operating, move ahead slowly towards the mooring buoy. Remove the bridle chain end of the preventer chain, and when enough 'slack' is available on the bridle chain, release the slip hook from the slip link. When clear, drop astern and proceed.

4.10.2 Warming-up the Engines - diesel engines are best warmed-up under load. When practical, you should get underway as soon as the checks are carried out. The lifeboat will respond very slowly when placed in gear at idle speed. This is ideal for pulling away from or into a mooring. The lifeboat's speed in reacting to the throttle improves gradually with engine speed. As the revolutions increase it becomes very responsive.

4.10.3 Getting Underway - as the lifeboat moves away, observe how all systems are reacting.

(a) Are the gauges steady and within normal range? A shaking volt or ammeter needle may indicate a loose alternator belt. A falling or steady low oil pressure reading indicates a probable oil leak. A rapidly rising temperature gauge indicator, passing normal limits, may well mean a burned-out impeller or other breakdown in the cooling system.

(b) Is sea water flowing normally out of the exhaust pipes? If not, you may have lost sea suction and face a burn-out of the engine cooling system.

4.10.3
contd..

(c) A pronounced steady vibration, probably with loud noise below, is a likely indication of a bent shaft or damaged propeller.

(d) A shaking rather than a steady tachometer needle indicates misfiring of cylinders, obstruction in the fuel line, or a fault in the tachometer circuit. Any of these symptoms will quickly cause problems if not diagnosed and rectified.

(e) If the electronics equipment begins to flicker on and off, a short in the electrical system- probably caused by damaged wiring - is likely. The cause should be determined and rectified.

Increase speed gradually in steps to allow the engines to warm up thoroughly. Unless absolutely necessary, do avoid using maximum revolutions for at least the first 10 minutes.

4.11 RECEPTION OF SURVIVORS

4.11.1 Procedure for dealing with Survivors - the Institution remains responsible for survivors after they have been brought ashore; and until they have been handed over to another accredited organisation, i.e. the National Health Service, proper private medical care or alternatively, until the Honorary Medical Advisor considers they are fit to leave. The following is designed to give some guidance on the dispersal of survivors.

4.11.2 Sick Survivors - survivors suffering from exposure, shock, sickness or injury should be evacuated to hospital as soon as possible.

4.11.3 Unconscious and Resuscitated Survivors - any survivor who has been unconscious for a short period or has required resuscitation should be evacuated to hospital as soon as possible.

4.11.4 The Shipwrecked Mariners Society - this Society has representatives in most ports and will usually assist with the reception of survivors. During normal working hours the local representatives of the Society can often provide cash and grants for clothing and travel.

4.11.5 Civil Emergency Plans - Station Honorary Secretaries should acquaint themsleves with the local Civil Emergency Plan, which may have to be activated if a large number of survivors are brought ashore.

4.12 RETURN OF SERVICE FORMS

4.12.1 The return of service forms that follow are to remain in this handbook. Books of forms are available on demand and are to be completed and returned on each and every occasion of launching on Service or 'Immediate Readiness'.

RETURN OF SERVICE (CONFIDENTIAL)

R.N.L.I. LIFEBOAT (10 metres and over)

Station .....

L/B name .....

L/B number .....

Date of Service .....

FOR USE IN HEAD OFFICE Assessment (Plain language)				
COMPUTER				
1. Assessment of outcome of mission				
2. Number rescued or landed				
3. Feasibility of other rescue methods				
4. Co-ordination of service				

PLEASE ANSWER ALL QUESTIONS

1. Cause of service *(See Cover note)* .....
2. Type of casualty *(See Cover note)* .....
3. Name of casualty, signal letters, call sign, sail number or other identifying no. and Port of Registry

   .....
4. Name(s) and address(es) of master, and owner of vessel .....

   .....
5. Number of persons on board .....
6. Gross registered tonnage and cargo .....
7. Position of casualty or search datum .....
   (bearing and distance from station)
8. Number of lives considered as rescued by the Lifeboat .....
9. Weather and tidal conditions *(See back cover)*

   (i) At launching position (a) Time of High Water .....

   (b) Weather ..... (c) Visibility .....

   (d) Wind force .....(Beaufort scale)

   (e) Wind direction ..... (f) Sea state .....

   (g) Swell in feet .....

   (ii) At position of casualty (a) Weather ..... (b) Visibility .....

   (c) Wind force .....(Beaufort scale)

   (d) Wind direction ..... (e) Sea state .....

   (f) Swell in feet .....
10. Was the H.M.A., another doctor, nurse, midwife, other medical auxiliary on board?
    (Please circle as appropriate)
11. Was first-aid given? None Ilness Injury Drowning Exposure
    (Please circle as appropriate)
12. Were any drugs administered? If so state which .....
13. Did any crew members enter the water to assist in the service? .....

    If yes, please give names .....

    .....
14. Which SAR Authority co-ordinated the service? .....
    (If C.G. attach Form C.G.15 or forward it when received)
15. Additional assistance None Helicopter
    (Please circle as appropriate)

    Fixed wing aircraft Other vessels Other R.N.L.I. Lifeboat

16. Time *(B.S.T. when applicable)*

(a) First intimation of casualty and from whom received .....

(b) Assembly signal and by whom made .....

(c) Launch from slipway or off beach or leaving mooring .....

(d) Reaching casualty (if applicable) .....

(e) Leaving casualty (if applicable) .....

(f) Return to station upon completion of service .....

(g) Rehousing boat on completion of service ..... or remooring.....

17. Which lifeboat official authorised launch? .....

If launch authorised by other than S.H.S. or D.L.A.

(a) Why was S.H.S. or D.L.A. not contacted? .....

(b) Was S.H.S. or D.L.A. advised service in progress? .....

18. How did the R.N.L.I. craft behave? .....
(Adverse behaviour to be explained under Hon. Sec.'s remarks)

19. Damage or Defects (**IMPORTANT**—Items listed must be telephoned or telexed immediately to Headquarters and/or coast officials.)

(M.M. & R/T Log should accompany each Return of Service)

(a) Hull .....

(b) Machinery .....

(c) Electronics .....

(d) Other equipment .....

20. Estimate value of boats, towed in/property recovered. *(Please circle one).*

None	Less than £100	£101-£1,000
£1,001-£5,000	£5,001-£10,000	£10,001-£100,000
£100,001-£200,000	£200,001-£500,000	over £½ million

21. State amount of payment received as (a) donation to branch funds .....
or (b) to crew, and please give names and addresses of donors .....
.....
.....
.....

22. Will crew claim property salvage? .... or 23. Has any towage fee been received and state amount?.....

24. Number of persons injured during the service. R.N.L.I. personnel ..... Others.....
(In cases of ambulance or medical calls exclude the patients)

25. Number of lives lost. (In cases of ambulance or medical calls include the patient(s), if death occurs before landing) R.N.L.I. personnel..... Others.....

26. What became of (a) Casualty?.....
.....
and (b) Survivors?.....
.....

Please give here a FULL account of the service from the time of receiving the first news until Lifeboat's return to Station
(If more convenient the account may be typewritten on a separate sheet or continued overleaf.)

.....

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REMARKS, etc., by the Honorary Secretary on this Service if warranted

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.....

NAMES OF CREW	RANK	NAMES OF SHORE PERSONNEL *(To be entered alongside rank)*	MEN TO BE PAID *(Delete or add as necessary)*	No. of Men	No. of hours	For HQ use	
						Rate	Total
1.	Coxswain		Crew				
2.	2nd Coxn.		Head Launcher				
3.	M.M.		Shore Attendant				
4.	A.M.M.		Shore Signalman				
5.	Crew		Winchman				
6.	Crew		Asst. Winchman				
7.	Crew		Tractor Driver				
			Asst. Tractor Driver				
			Helper				
			Helper				
			Helper				
			Helper				
Please report reasons for any variation from authorised number of crew and absence of any full-time or retained men.			Helper				

WE HEREBY CERTIFY that this Service was actually performed.

Given under our hands this.....day of ..... 19.....

.....
Coxswain in charge of Lifeboat on this occasion

.....
Honorary Secretary

For HQ use
Passed for paymen

Date .....

Init. .....

Reprint 1983

SECTION FIVE

SEA KEEPING & BOAT HANDLING

5.1 Coxswain's Primary Duty

5.2 Safety of Crew and Lifeboat

5.3 Conduct at Sea

5.4 Speed

5.5 Use of Aids to Navigation

5.6 Running before a sea

5.7 (Spare)

5.8 Operating in Shallow Water

5.9 (Spare)

5.10 Towing

5.11 Going Alongside at Sea & Transferring Survivors

5.12 Picking up a Person from the Water

5.13 Effect of Propellers in Boat Handling

5.14 Use of Warps

5.15 Handling a Headrope when Coming Alongside

5.16 Boat Handling Alongside

5.17 Anchor Work

SECTION 5

SEA KEEPING & BOAT HANDLING

5.1 COXSWAIN'S PRIMARY DUTY

5.1.1 Saving Life - the Coxswain is in command of the lifeboat and must, at all times when on Service, use his utmost endeavours to safeguard and rescue the lives of those in danger. He must not allow considerations of property salvage to influence his actions when lives are in danger.

5.2 SAFETY OF CREW AND LIFEBOAT

5.2.1 Prudent and Efficient Boat Handling - the Coxswain must at all times be aware and show his regard for the safety of his crew and lifeboat. What can be and should be done in an emergency does not necessarily constitute normal good practice. Violent manoeuvres at speed except in the course of performing a rescue or for training purposes should always give way to prudent and efficient boat handling.

5.2.2 Watertight Doors and Hatches - at sea all watertight doors and hatches must be kept closed except for necessary entry and exit. The ability of the lifeboat to right itself after a capsize depends on the hull compartments remaining watertight during capsize. In addition any crew member on the main deck should attach his life line to a jack-stay and those below deck should be seated with the safety harness correctly adjusted and fitted when sea conditions dictate. The Coxswain (or helmsman) and the other person in the wheelhouse should be seated with their safety harnesses correctly adjusted and fitted.

5.2.3 Stowing Equipment and Tools - the self righting capability should also be borne in mind when stowing tools, spares or any other equipment, irrespective of the intrinsic importance or value of the item itself, it must be realised that a piece of equipment dislodged by a capsize can become a projectile capable of damaging whatever or whoever it hits.

5.3 CONDUCT AT SEA

5.3.1 Because the RNLI is a nationally recognised emergency service and its lifeboats are built and tested to the highest standards it is important that they should always be handled in a proper seamanlike manner. Indeed, because of the high regard in which they are held in the eyes of the public, even greater attention must be paid to their handling, navigation and appearance than is usual with ordinary craft, particularly when operating within harbour limits, or the approaches to lifeboat stations, and when operating in the vicinity of other craft or persons.

5.4 SPEED

5.4.1 In displacement type 8 to 9 knot lifeboats with engines of relatively low power, it is usual to proceed at full speed whether on passage or on service, however in modern fast lifeboats, full speed should only be used when required by the operational situation. At all other times (except in restricted waters) the maximum speed should be the cruising speed laid down for the lifeboat on its speed/revolutions curve. There may be a very few occasions when proceeding at speed immediately after launching on service can be justified when life is in imminent danger. In most cases, the difference in time to reach the casualty between proceeding at excessive speed and the slower speed to suit harbour conditions, is marginal. When a lifeboat is on passage, or exercising afloat, there can be no justification for navigating with lack of consideration for others or for exceeding the speed limits.

5.4.2 Traffic Separation Schemes - all lifeboats are required to comply with the Traffic Separation Schemes around the British Isles. The regulations for operating in these areas are contained in Rule 10 of the International Regulations for Preventing Collision at Sea, 1972, and are mandatory for all ships registered in the United Kingdom.

5.5 USE OF AIDS TO NAVIGATION

5.5.1 Navigation Aids - although the Waveney is equipped with modern navigation aids including radar, echo sounders and radio direction finding equipment, it must be remembered that these are **AIDS** to navigation.

5.5.2 Operation of Aids to Navigation - in order that all concerned are familiar with operating procedures and the performance of the equipment in local conditions the Coxswain should always make sure that whenever the lifeboat is at sea that all aids to navigation are operated as a matter of routine and that the position of the lifeboat is kept up to date on a chart.

5.5.3 Projecting Lifeboat's Position - on every occasion when the lifeboat's position is fixed and marked on the chart in use, the estimated position at a convenient interval of time in advance should be projected and plotted.

5.5.4 Interpreting Radar Display - it should be borne in mind that because of the low height of the radar aerial and the rough sea conditions in which the lifeboat must operate, there will frequently be occasions when the display will need to be interpreted with extreme caution. For this reason familiarity with echo patterns in local operating areas from different directions is essential. This should take into account differing sea and tidal conditions encountered.

5.6 RUNNING BEFORE A SEA

5.6.1 Apart from ordinary hazards there are conditions when a lifeboat and/or any other boat may get into serious difficulties unless precautions are taken.

5.6.2 When running before a sea or swell which is liable to break, especially in comparatively shallow water, e.g. on to an open beach, entering a harbour or crossing the bar of an estuary, or, when proceeding in shallow water. It must be borne in mind that with shore and shallow water waves, the water actually moves forward and with great power, unlike deep sea waves when the waveform travels but the water remains practically stationary.

5.6.3 Following Seas - the speed of the lifeboat should be adjusted to that she is proceeding either faster or slower than the waves. The lifeboat will then be easier to control than if she proceeds at the same, or nearly the same speed as the waves.

N.B. Great care is necessary to avoid broaching when proceeding at slower speed than the sea.

5.7 (Spare).

5.8 OPERATING IN SHALLOW WATER

5.8.1 A lifeboat must never be allowed to run broadside on, with the sea on her quarter, near "the first break of the sea", either in moderate weather or in bad weather, since it is then that a sudden and unexpected steep sea appears from nowhere and puts the lifeboat in difficulties, especally when underway at slow speed or when stopped.

5.8.2 When in relatively moderate weather conditions a rogue sea or swell larger than the others may appear rapidly and with little warning. Such seas are more frequently encountered close inshore or inside a surf line but may also be met at a distance offshore where the presence of shallow banks serves to change the regular passage of wave formations.

5.8.3 There are hazards too when closing a headland in heavy weather, where conditions, due to refracted waves, can be more confused than further to seaward.

5.8.4 There may be occasions on service when taking such risk is justified or necessary, but every precaution should be taken to prevent injury to crew members or damage to the lifeboat.

5.9 (Spare)

5.10 TOWING

5.10.1 Before Undertaking a Tow - the Coxswain must satisfy himself that no damage is likely to be caused to the lifeboat or her engines and he should not tow a casualty any longer distance than is necessary to place her in a position of safety. (The above is an extract from the RNLI Regulations Para.2.2.2.12).

5.10.2 Towing in very Rough Weather - this will inevitably hamper the freedom of action of the lifeboat and the Coxswain should bear this in mind when weighing up the best course of action in dealing with a casualty.

5.10.3 Towing by the Lifeboat - is not permitted if any tug or other suitable vessel in the vicinity could be summoned without undue delay (See Sect.5.10.17).

5.10.4 Do Not use a Wire Rope for Towing - a wire rope from another vessel should not be used as this has very little elasticity and could cause damage to the quarter posts of the lifeboat.

5.10.5 Towing Yachts - in towing a yacht of any type, special care is needed in securing the tow on board the casualty. Fore deck cleats are rarely strong enough and masts are often stepped on deck and therefore quite unsuitable. A bridle to a sheet winch either side of the cockpit or even right round the transom, and bowed down at the stem may be the only solution. Great care is needed in towing small yachts; the minimum speed of the lifeboat may well be greater than the safe speed of the casualty. On the other hand, a yacht surfing before a big sea may over run the tow causing damage to the lifeboat, however this danger may be reduced if a satisfactory jury drogue can be streamed by the casualty. Such a drogue will be found almost essential to be streamed from the casualty if it is a yacht which has lost its steering capability and must be towed.

5.10.6 Length of Tow - in the open sea the length of tow should be such that it does not become taut and 'snub' or 'snatch' with a risk of parting or causing damage to either craft. The length of the 'span' should relate to the wave length so that both the lifeboat and the casualty are on the same surfaces of different waves and their movement is harmonised, i.e. in step rather than acting in opposition causing an uneven pull or a tendency for the towed vessel to surf down onto the lifeboat.

5.10.7 Increasing the 'Spring' in a Tow Rope - the 'spring' in a tow rope can be increased by veering a weight into the middle of the span. The best thing is probably heavy coir fenders or an anchor and the object is to see that it always remains in the water, preventing any snatch loading.

5.10.8 Releasing the Tow in an Emergency - a sharp knife, or an axe, must always be to hand to release the tow in an emergency. The tow should be kept under constant observation and the rope cut if necessary. Normally enough slack to take the turns off the bollard can be made available by stopping the engines.

5.10.9 Shortening the Tow - the tow should be shortened when approaching shallow water to avoid snagging on the bottom and when approaching confined waters such as entering a harbour when more control of the towed casualty is required.

5.10.10 Towing Alongside - to tow the casualty alongside the lifeboat, warps must be used. The basic warps are a spring led well aft and a breast rope forward but the lifeboat is able to manoeuvre far better if a back spring and a breastrope aft are added. Do not forget to rig plenty of fenders between the lifeboat and the casualty.

5.10.11 Guarding against Chafe when Towing - when towing another craft chafe must be guarded against. On the lifeboat any part of the tow rope liable to chafe should be parcelled, or otherwise veered at regular intervals to 'freshen the nip'.

5.10.12 Securing the Tow to Casualty - the end of the tow should be passed through a stemhead fairlead or bullring to reduce sheering and onto the bitts or round the mast. If these are structurally light a round turn should be taken and the rope taken further aft and secured taut to a thwart or other strong fitting as back-up. (See also Sect.5.10.5).

5.10.13 Trimming the Casualty when Towing - the distribution of weight in the casualty is important. If the weight is forward then the bow will dig in and cause her to sheer about. Therefore the casualty should have the weight towards the stern but should be lightened overall, if practicable, by taking off some of her crew or passengers.

5.10.14 Towing Speed - the speed of the tow depends on circumstances and conditions. From rest the towing lifeboat goes ahead very slowly to take down the slack and avoid 'snatching'. When the lifeboat has the weight and the casualty begins to move the throttles should be opened gradually until the maximum comfortable speed is reached when it should be steadily maintained.

5.10.15 Communication with Casualty when Towing - if practicable a crew man should be put onboard the casualty, preferably with the hand-held VHF radio, to provide communication between the lifeboat and the casualty.

5.10.16 Towing by Night - at night a light on board the casualty will assist the Coxswain in his task of towing.

5.10.17 RNLI Regulations Regarding Towing - the following extract from the Green Book of Regulations is also relevant:-

Section 2.2.2.11 -

"TOWING BY LIFEBOATS" - lifeboats are permitted to tow other lifeboats, but are not permitted to tow any other vessel unless:

(1) A direct request for a tow is received by the Coxswain of a lifeboat from the Master of a casualty.

(2) A casualty abandoned by her crew might become a danger to navigation.

(3) The best method of saving life is to take a vessel in tow.

5.11 GOING ALONGSIDE AT SEA & TRANSFERRING SURVIVORS

5.11.1 Casualty Larger than Lifeboat

(a) If possible the casualty should be requested to prepare for the lifeboat coming alongside by steaming at manoeuvrable slow speed with the weather 30 to 40° on one bow or the other making a lee and indicating the side and position she wants the lifeboat by rigging fenders.

(b) The lifeboat should then make an approach as if overtaking the casualty by keeping outside her wake until abeam and then keeping station (pacing her) for a few minutes and studying her for dangerous rubbing strakes and other projections. Check what lines if any the casualty intends to pass to the lifeboat and standby to receive them.

(c) Rig fenders on the lifeboat and edge the lifeboat in gradually to the point where the casualty indicates, e.g. jumping ladder, and the lifeboat is moving ahead alongside the casualty at the same speed. If the situation warrants it, it is better to put the forward shoulder of the lifeboat against the casualty and take no lines from her.

(d) If the intention is to lay the lifeboat alongside the casualty, lead the boatrope received through the bullring or an inside bow fairlead and turn up with it. Keep it tended throughout.

(e) The springs, headropes and sternropes should always be long. If they are too short, movement of the lifeboat in a vertical plane will cause a heavy strain upon the ropes and fairleads, cleats and bollards when the weight comes on them with a jerk. Long warps allow free vertical movement. When there is no movement breast ropes will hold the lifeboat close alongside.

(f) When ready to leave the casualty; if the bow of the lifeboat is simply against the casualty, just go astern to clear her. If the lifeboat is close alongside with just a boatrope, release the boatrope and with headway on steer out taking care to keep clear of the bow area as vessel interaction may be experienced causing the lifeboat to be drawn under the casualty's bow.

(g) If the lifeboat is secured alongside the casualty, e.g. for the transfer of a stretcher, then you should single-up to a back spring and forward breast rope and let the wash and back spring take the bow of the lifeboat out before going ahead.

5.11.2 Taking Survivors off a Large Disabled Vessel

(a) This operation depends upon sea conditions and the extent to which the casualty is rolling. The casualty will normally lie beam-on to the weather and thus provide a lee but she may be rolling very heavily and to place the lifeboat alongside under her lee might be dangerous. Also she might be making a lot of leeway so that the lifeboat will be difficult to get clear of her. On the other hand, and for the same reasons, the lifeboat may have difficulties in keeping alongside the casualty on her weather side. The whole operation depends on circumstances and the job to be done. Any doubt and it is best to put the forward shoulder of the lifeboat into her lee quarter.

(b) A breeches buoy transfer should be considered and in all cases a liferaft transfer is a possibility.

(c) Failing these methods when taking off survivors it may be necessary for them to jump into the sea to transfer and this action should always be on a line tended at both ends (except for the last man).

5.11.3 Casualty Smaller than the Lifeboat - if it is necessary to go alongside a disabled smaller craft in heavy seas to take survivors off, then the risk of damage in this situation is to the smaller craft. Damage should be avoided if at all possible, though rescue of the persons onboard is the prime consideration. Since the lifeboat will have more windage it will make more leeway than the smaller craft and should, therefore, be brought alongside close on the weather side. Bow and stern lines should be passed if possible and if necessary to transfer the survivors. The smaller craft and the lifeboat should be kept firmly alongside each other, with plenty of fenders during the transfer. The lifeboat should turn both vessels so that they remain head to sea to minimise rolling. If the seas are heavy the vessels must not be allowed to drift broadside on to the sea. If it is too dangerous to take persons off the disabled craft it should be towed into more sheltered waters.

5.11.4 Transferring a Stretcher Case - if the lifeboat and the casualty cannot be secured firmly alongside each other then danger to the injured person, (immobilised in the Neil Robertson stretcher), of falling into the water should be borne in mind. A heaving line should be secured to the stretcher head ring and tended all the time. The person on the stretcher should be further protected by placing a life-jacket around the stretcher outside and be inflated.

5.12 PICKING UP A PERSON FROM THE WATER

5.12.1 Precautions - the precautions to be observed when picking up a person from the water are as follows:-

(a) don't run him down;

(b) don't chop him up with the propellers;

(c) don't injure him when pulling him over the gunwhale.

5.12.2 Crewman Assisting Survivor in the Water - the greatest care must be taken not to run the person down so that, in some cases, it will be quicker and safer to send a crewman, in a dry suit, on a line to swim to the person and to assist him in the water. In this case the lifeboat should be stopped head to sea abreast the person in the water and a few yards from him. The crewman should jump overboard clear of the lifeboat and propellers when the lifeboat is stopped or almost stopped. The engines may be used to hold the lifeboat in position while the person being hauled in is well clear but must be in neutral when he is alongside and being lifted aboard. The Coxswain must remain at the engine controls and the crew must take care to keep the lifeboat as far as possible on an even keel. If it is necessary to stop the lifeboat beam on to the weather, it must be remembered that the lifeboat will make far more leeway than the person in the water, so should be upwind of him.

5.12.3 Hauling Rescuer and Survivor to Lifeboat - if you have to haul the rescuer and/or survivor back to the lifeboat through surf or breaking seas then care must be taken that the line is not hauled in so quickly that the men in the water are pulled below the surface of the waves unintentionally. The crewman must have the option to remain on the surface or go under the sea as circumstances indicate to him. The lifeboat can be used, with great care, to tow both clear of the surf. When clear, the lifeboat should circle to close as quickly as possible.

5.13 EFFECT OF PROPELLERS IN BOAT HANDLING

5.13.1 Effect of Single Propeller

(a) To understand the effects let us first take a brief look at a single right-hand screw vessel. A single right-hand screw vessel will turn short round better to starboard because when the blades of the propeller are at the bottom of their rotation, i.e. in deeper water than at the top, they meet a greater pressure and therefore a right-hand propeller, which is the normal, "walks" to the right (as seen from aft) when going ahead and to the left (to port) when going astern. This is called the "paddle-wheel" effect.

(b) With the engine going ahead the propeller's thrust is fully imparted to the rudder, which is abaft it, and the paddle wheel effect is almost entirely overcome by the directional thrust of the rudder so that it wouldn't matter which way the vessel turned. However, when the engine is put astern all the thrust goes forward so that, until the vessel gathers sternway, the rudder has no effect and the paddle wheel effect is at its maximum and "walks" the stern markedly to port.

5.13.2 Paddle Wheel Effect - how does the "paddle wheel" effect apply to twin screw lifeboats ? It is normal for the propellers to be outward turning on lifeboats. If the port engine is put astern it will "walk" the stern to starboard and the starboard engine put astern will "walk" it to port. Therefore, with one engine ahead and the other astern the lifeboat will be helped to turn fast by the "paddle wheel" effect. However, the wheel should be put hard over in the direction of the turn to get full directional thrust from the outside propeller and rudder.

5.13.3 Using Paddle Wheel Effect to come Alongside

(a) The paddle wheel effect can be of help when coming alongside. Supposing the intention is to put the lifeboat starboard side to. The bows must be pointed in some 20° slightly abaft the point where they will finally stop. Put the helm to port to swing the bows out and the stern in, stop engines and then go astern on the starboard propeller to take the way off. The starboard propeller's paddle wheel effect (to port) will check the swing of the stern at the same time as stopping the lifeboat so that the lifeboat will finish up stopped and parallel to the quay or other craft.

5.13.3
contd..

(b) For going port side to, use the opposite helm and engine. The only risk in using the inside propeller is when there is a projection or ropes in the water on which it might foul. If the outside propeller is used it will swing the stern in fast - perhaps too fast!

5.14 USE OF WARPS IN BOAT HANDLING

5.14.1 Leaving a Confined Berth

(a) To use mooring ropes to leave a confined berth the lifeboat must first be singled-up to a forward spring and stern breast rope. Then when ready to leave, let go the stern breast and give a touch ahead on the outboard propeller with the steering wheel towards the quay. Have fenders ready on the bow. The stern will swing outwards. Let go the spring and put on opposite wheel to go astern on the inside propeller to get maximum paddle wheel effect before the sternway brings the rudder into action.

(b) It is more difficult to leave a confined berth going ahead as the bows cannot be made to swing out as easily as the rudders swing out the stern. A touch astern on the outboard propeller on a back spring will push the stern hard into the wall so fenders are required on the quarter and corner of the stern if it is not to be damaged. There will be some turning moment to swing the bows out but there will be a necessity to bear the bows off with a boathook.

(c) The bows will have to be held well clear as the rudder cannot be used to swing the bows further out as the stern will swing even more and scrape the quayside as way is gathered.

(d) The steering wheel must be at least amidships until the stern is clear to swing and probably will have to be put towards the quay a few moments later to swing the stern out to clear the craft (or other hazards) ahead. The outer propeller only should be used until the stern is clear of the wall.

5.15 HANDLING A HEADROPE WHEN COMING ALONGSIDE

5.15.1 The bows being pointed in to the quay means that the headrope, rove through the bullring or foremost fairlead, will be put over the shore bollard first. A turn should be taken on the bitts but the rope kept in hand ready to hold on to it or veer freely as required - almost certainly the latter. As the stern is swung in by the rudder the bows need to be able to swing out as the turning point is about one third of the lifeboat's length from forward. If the slack has been taken down and turned up with the headrope the bows cannot swing out so that the stern cannot swing in. Any movement ahead on the shortened and prematurely secured headrope makes it act as a spring and the stern will never come in no matter how much rudder is used, in fact it will go further out. Therefore the headrope must be surged so that the bows can swing out as the stern swings in, allowing the rope to render round the bitts as the weight comes on it and being ready to turn up and secure the moment the order is given by the Coxswain.

Holding the bows in by a short headrope is one of the most common boat handling faults.

5.16 BOAT HANDLING ALONGSIDE

5.16.1 Coming Alongside a Quay: Tidal Stream Running - to come alongside a quay, with a tidal stream running astern of the lifeboat, the approach should be made at an oblique angle (stern in, bows out). A stern rope should be got over first; take down all slack and turn up letting the tide bring the lifeboat in. If space is limited the lifeboat may have to go astern a couple of times parallel to the quay, taking down slack and turning up each time.

5.16.2 Coming Alongside a Quay: Strong Onshore Wind - to come alongside a quay, when there is a strong onshore wind, the lifeboat must be stopped clear of the quay and the engines used to keep the lifeboat parallel to the wall while the wind pushes her in. If the lifeboat is stopped too far clear it may hit the wall hard. If the bows are put in, in the normal way, they may be blown hard against the wall. Have plenty of fenders in hand.

5.16.3 Steering When making Sternway - remember that if the lifeboat is making sternway the steering is less effective because the thrust of the propellers is forward. Only the flow of water past the rudders equal to the speed of the lifeboat has effect. The stern turns the way the rudders are turned, i.e. with port wheel on the stern goes to port. It helps the Coxswain decide upon the required rudder direction if he faces aft.

5.16.4 Rudder Starvation - when the lifeboat is stopped by putting the engines astern most of the steerage is lost because the forward wash from the propellers starves the rudders. The swing should be started before putting the engines astern.

5.17 ANCHOR WORK

5.17.1 Length of Anchor Warp - the length of anchor warp used should be about six times the depth of water so that the anchor is not 'worried' by the lifeboat's movement snatching at it with the risk of dragging. A length of ground chain between the anchor and the warp, lying on the bottom (as fitted), prevents a direct pull coming on the anchor. The chain also prevents chafe against the bottom which might cause a warp to part.

5.17.2 Anchoring - to anchor, prepare the anchor and warp for running; head into the wind or tide whichever is the stronger; stop the lifeboat; let go; get sternway on; bring-to when about two times the depth is out; allow the sternway to dig the flukes in; then veer the remainder of the warp to six times the depth and secure. Watch shoremark transits to see that the anchor is holding. Keep anchor watch in strong winds, tides, etc.

5.17.3 Breaking out a Fouled Anchor - an attempt can be made to break out a fouled anchor as follows. With the anchor warp "up and down" turn up securely on the bitts and give a touch ahead/astern on the engines. If this does not work, pay out more warp to alter the angle of pull. If the anchor remains fouled it should be buoyed so that an attempt can be made to retrieve it at a later time.

5.17.4 Kedging - this is the use of an anchor, laid out in a specific direction, usually from the stern of the lifeboat, for the purpose of holding up in a required position or hauling the lifeboat off a beach or bank.

SECTION SIX

HELICOPTER WORKING

SECTION 6

HELICOPTER WORKING

(See also Check Card 6/867)

6.1 HELICOPTER/LIFEBOAT DRILLS

6.1.1 (a) **N.B.** In order to understand procedures which may be in use with inshore lifeboats whilst the lifeboat is operating in company, instructions for all classes of lifeboat are included in this section.

(b) The following standard procedures are to be used in all exercises involving lifeboats and helicopters.

(c) Wherever possible exercises are to be carried out at regular intervals in open sea conditions.

6.2 HELICOPTER OPERATING LIMITATIONS

6.2.1 When exercises are planned consideration must be given to the following limitations :-

(a) The pilot has only limited vision when a helicopter is hovering over a large lifeboat. Over a 'C' or 'D' class, Atlantic 21' or McLachlan he has no visual contact.

(b) Considerable concentration is required by the helicopter pilot when hovering low over a lifeboat. During winching the pilot must rely on positioning instructions from his winch operator.

(c) Normally height of hover above a lifeboat will be 20 to 25 feet, however, helicopters may require to hover higher than this on certain occasions.

(d) Sea King helicopters have a "High wire" winching capability (RAF 245 ft.; RN 300 ft. wire length) and can operate at night.

6.3 BRIEFING FOR EXERCISES

6.3.1 (a) Exercise briefings are to be arranged between the helicopter Flight Commander and the lifeboat station personnel concerned. It is essential that

personnel participating in an exercise are given detailed instructions. No exercise is to be arranged for the first time unless an Inspector of Lifeboats is present.

(b) The Inspector (or in his absence the Coxswain) is responsible for briefing the crew on exercises involving the winching of personnel. If the Coxswain is not experienced in this task the briefing of the lifeboat crew should be carried out by Service Personnel, together with the Coxswain.

6.4 RESPONSIBILITIES

6.4.1 Coxswain's Responsibility - the Coxswain is responsible for deciding whether conditions are suitable for winching in so far as they affect the lifeboat. The Coxswain should inform the helicopter pilot by radio when it is "clear to start winching". He must also authorise the designated crew member to display the GREEN flag used on Offshore and Intermediate lifeboats.

6.4.2 Helicopter Pilot's Responsibility - the helicopter pilot is responsible for the overall co-ordination of the exercise and will assess the suitability of weather and sea state for helicopter operations. He will not commence winching until cleared to do so by the Coxswain.

6.5 WINCHING

6.5.1 Deciding Winching Method to be used - the Coxswain and the helicopter pilot will decide on the radio before winching takes place the best methods to employ and the courses to steer when due regard can be given to the prevailing wind direction and speed, the direction and height of the sea and swell and the tidal effect. Normally however the methods outlined in the following paragraphs should be utilised.

6.6 "WESSEX" HELICOPTERS

Max Speed: 115 Knots

WESSEX MARK 5

6.6.1 Offshore & Intermediate Lifeboats

NORMAL Procedure

(a) The most important factor is wind direction. The helicopter pilot may drop a smoke float on the sea to obtain an accurate estimate of wind speed and direction. The Coxswain should steer a course of about 30 to 40° to starboard of the wind direction if winching is to take place at the after end of the lifeboat (see drawing Appendix 'A' at the end of this section) or 30 to 40° to port if winching is to be from forward, (see drawing Appendix 'B').

(b) This provides the helicopter pilot with a clear view of the lifeboat enabling him to maintain an accurate position over the lifeboat whilst the helicopter is hovering into wind. The Coxswain should ensure that the lifeboat maintains a steady speed and course.

(c) Generally, if the wind is light, the lifeboat's speed will need to be increased accordingly.

6.6.2 Offshore & Intermediate Lifeboats

DOWNWIND Procedure

When there is a strong wind and heavy sea the lifeboat may present a more stable platform proceeding slowly down-wind with the wind 30 to 40° on the starboard quarter. Winching will then be carried out from forward (see drawing Appendix 'C'). If the wind is over 18 knots this procedure offers a safer method of transferring personnel as a heavy sea or sudden gust of wind from ahead can cause variation in the lifeboat's course and speed.

6.6.3 Offshore & Intermediate Lifeboats

CROSS-WIND Procedure

(a) RAF helicopters do not use the wind to starboard procedure, i.e. as illustrated in Appendix 'B', but use the following procedure instead.

(b) Refer to drawing Appendix 'D'. If necessary a helicopter can winch from a lifeboat with the wind on either the port or starboard beam; in the latter case off the fore-deck.

N.B. - for winching off the fore-deck the lifeboat's speed should be as slow as possible without losing steerage way.

(c) **NOTE:** the diagrams attached as Appendices A,B,C & D illustrate the relative positions of the helicopter and lifeboat as described in the above paragraphs.

6.6.4 Inshore Lifeboats

Atlantic 21', 'C' & 'D' Class

(a) Normally the helicopter will maintain station on the lifeboat. The lifeboat should steer into the wind and maintain sufficient speed for steerage and control.

(b) Throughout the winching operations the helicopter will carry out all necessary positioning manoeuvres unless the pilot requests otherwise. Should the pilot wish the lifeboat to stop, a helicopter crew member will signal by drawing his hand across his throat. Upon receipt of this signal the motor/s should be stopped and raised and the sea anchor deployed. The aerial on these boats constitutes an obstruction for the winchman and should be lowered during winching operations. Adequate radio communication should still be available at close range with the aerial in the lowered position.

(c) The above procedure may be varied at the discretion of the helicopter pilot when the lifeboat would formate on the helicopter as for Sea King helicopters with ILB's, see para. 6.7.3.

6.7 "SEA KING" HELICOPTERS

6.7.1 Offshore & Intermediate Lifeboats

Preferably the Coxswain should set course with the wind 30 to 40° on the port bow and proceed at half speed.If this is impracticable because of the conditions any course and speed can be maintained. In these circumstances the helicopter will probably use the "high line" procedure which is described in the following paragraph.

6.7.2 "High Line" Procedure

This procedure can be used by some Wessex helicopters.

(a) A weighted line is passed by the helicopter to the lifeboat to assist in passing the strop. One crew member should coil it by hand clear of obstructions. This line incorporates a weak link close to the strop, Therefore, it should not be pulled too strongly or it may part. It is advisable that members of the lifeboat crew handling the high-line should wear gloves to avoid rope burns. If the helicopter has to sheer away during winching operations the line should be paid out or, if necessary, let go completely.

(b) **THIS LINE SHOULD NOT BE SECURED TO ANY PART OF THE LIFEBOAT.**

(c) When several persons have to be winched from the lifeboat the line should be paid out, thus reducing any swinging motion by the wire, but the end should be retained onboard until the last person has been lifted.

(d) At night the lifeboat's searchlight should be manned and shone forward parallel with the sea to provide a reference point for the helicopter pilot.

(e) This method is not used when an ILB is formating on the helicopter although a short line is sometimes carried by the crewman being lowered.

6.7.3 Inshore Lifeboats

McLachlan, Atlantic 21', 'C' & 'D' Class

(a) The helicopter will proceed into the wind at about 8 to 10 knots. At night the helicopter lights will be shone forward to help the Helmsman retain orientation.

6.7.3
contd..

(b) The lifeboat should then be positioned leaving the helicopter to port and at such a distance to avoid the down-draft from the rotors. When the down-draft has been left astern (usually when the helicopter is located about 60° on the lifeboat's port bow), the Helmsman should steer to a position immediately under the helicopter's winch which is to starboard of the fuselage.

(c) Once the Helmsman has positioned the lifeboat to receive the winchman or strop, it is essential that he concentrates on maintaining station under the helicopter winch. In an emergency, if the lifeboat loses power, the sea anchor should be deployed and the helicopter will then do the positioning.

6.8 IDENTIFICATION

At night a helicopter pilot may be able to see several craft and may not easily be able to identify the lifeboat, as the blue flashing light is not always clearly visible until the helicopter is close. In this situation the helicopter pilot will ask for identification and the lifeboat's searchlight should be shone vertically upwards until the helicopter landing lights are flashed in acknowledgement. The searchlight should then be swung down to shine forward. Additionally the Aldis lamp can be shone directly at the helicopter and flashed until positive identification is confirmed.

6.9 HOMING

RAF Sea King helicopters are fitted with a homing device on MF only on 2182kHz. Eventually it is hoped to fit RAF Sea King and Wessex helicopters with homing facilities on VHF Channel Zero and Sixteen.

6.10 PRECAUTIONS & EMERGENCY PROCEDURES DURING WINCHING

6.10.1 "Break Off" in an Emergency - the "break-off" signal by radio and the display of the RED flag by Offshore and Intermediate lifeboats, should be authorised in emergency by the Coxswain. Provided it is safe the helicopter will immediately ascend and move off to a safe distance.

6.10.2 Static Charge - a very heavy static charge can build up in all helicopter winch wires, but this particularly applies to Sea Kings. At **NO TIME** should the helicopter crewman, the strop or the winch wire be touched until they have been earthed either by making contact with the sea or the lifeboat.

6.10.3 To Facilitate Winching

(a) Lifeboat masts may need to be lowered and stowed, although in certain classes of lifeboats, e.g. Barnetts and the larger Watsons, the pilot may find it helpful if the foremast remains raised to provide a reference point while the helicopter is hovering over the stern.

(b) MF whip aerials, where fitted, should normally be folded although experience has shown that this is probably not required in Arun Class lifeboats.

(c) **NOTE:** Lifeboats fitted with slot aerials will be able to maintain VHF communication with the helicopter.

(d) Radar aerials should be stopped and, where applicable, lowered.

(e) If the helicopter crewman is onboard the lifeboat he will be responsible for the winch wire and strop. At all times a crew member should be detailed to hold the strop ensuring that it does not foul the guardrails or other obstruction. Should the hook or strop become fouled the results both for thelifeboat and the helicopter could be disastrous!!

(f) Crew members detailed to assist persons being winched are to stand well clear of the winch cable. They should not remove the strop from the cable, nor must they restrict the free movement of the cable except momentarily when guiding the strop cable clear of obstructions.

(g) There is considerable risk of injuries to the head by crew members working in the winching area and helmets or bump hats **MUST** be worn by all concerned throughout the winching operations.

6.11 COMMUNICATIONS

6.11.1 Establishing Communication with Helicopter - before commencing an exercise, communication is to be established on VHF with the helicopter using the callsign "HELICOPTER" followed by three figures, e.g. HELICOPTER EIGHT ONE TWO. For subsequent calls, but only when no other aircraft are operating in the area, the word HELICOPTER may be omitted from the callsign, e.g. EIGHT ONE TWO.

6.11.2 Communication During Service with Helicopter - during a service communication is to be established on VHF with the helicopter using the callsign "RESCUE HELICOPTER" followed by two figures, e.g. RESCUE HELICOPTER TWO TWO. If no fixed wing aircraft are involved in the service then the callsign can be abbreviated to RESCUE TWO TWO.

6.11.3 Communication Procedures, RN/RAF Helicopters

NOTE: VHF communication procedures vary between the Royal Navy and the Royal Air Force. As a matter of routine Divisional Inspectors will advise lifeboat stations on required callsigns for helicopters operating in their area.

6.11.4 Offshore & Intermediate Lifeboats

(a) Red and Green Flags - if VHF communication cannot be established, an exercise or service can continue at the discretion of both helicopter pilot and the Coxswain using flag signals only. RED and GREEN flags should be held by the designated crew member at the opposite end of the lifeboat from the chosen lifting position. If the helicopter is in the area but the lifeboat is not ready for winching the Coxswain orders "RED FLAG". The designated crew member holds up the Red flag where it is clearly visible and keeps it up (the helicopter pilot may still take up position for winching but will not commence until given the Green Flag). When the Coxswain is ready he orders "GREEN FLAG" the flags are changed and winching commences.

(b) The flag method has the following advantages:-

The helicopter pilot and Coxswain have constant indication of relative wind prior to and during winching.

The Coxswain can warn the helicopter pilot quickly that something is wrong by ordering "RED FLAG".

NOTE:- The flag method should be used during all winching exercises or services.

6.11.5 Radio Communication during Winching - no attempt should be made to talk to the helicopter pilot on the radio during winching operations unless requested to do so. (Except Sea Kings when the second pilot can maintain communications with the lifeboat on a separate channel). The helicopter pilot relies on his winch operator on the helicopter's intercom for positioning instructions.

6.12 LIFTS INVOLVING THE CARRIAGE OF STRETCHERS

6.12.1 The following procedure is to be adopted when a stretcher is supplied by the helicopter:-

(a) The stretcher and a helicopter crew member are transfered to the lifeboat.

(b) The patient (or dummy during exercises) is placed in the stretcher under the helicopter crew members supervision.

(c) The stretcher and helicopter crew member are then winched up to the helicopter together.

6.13 NOTES ON WINCHING

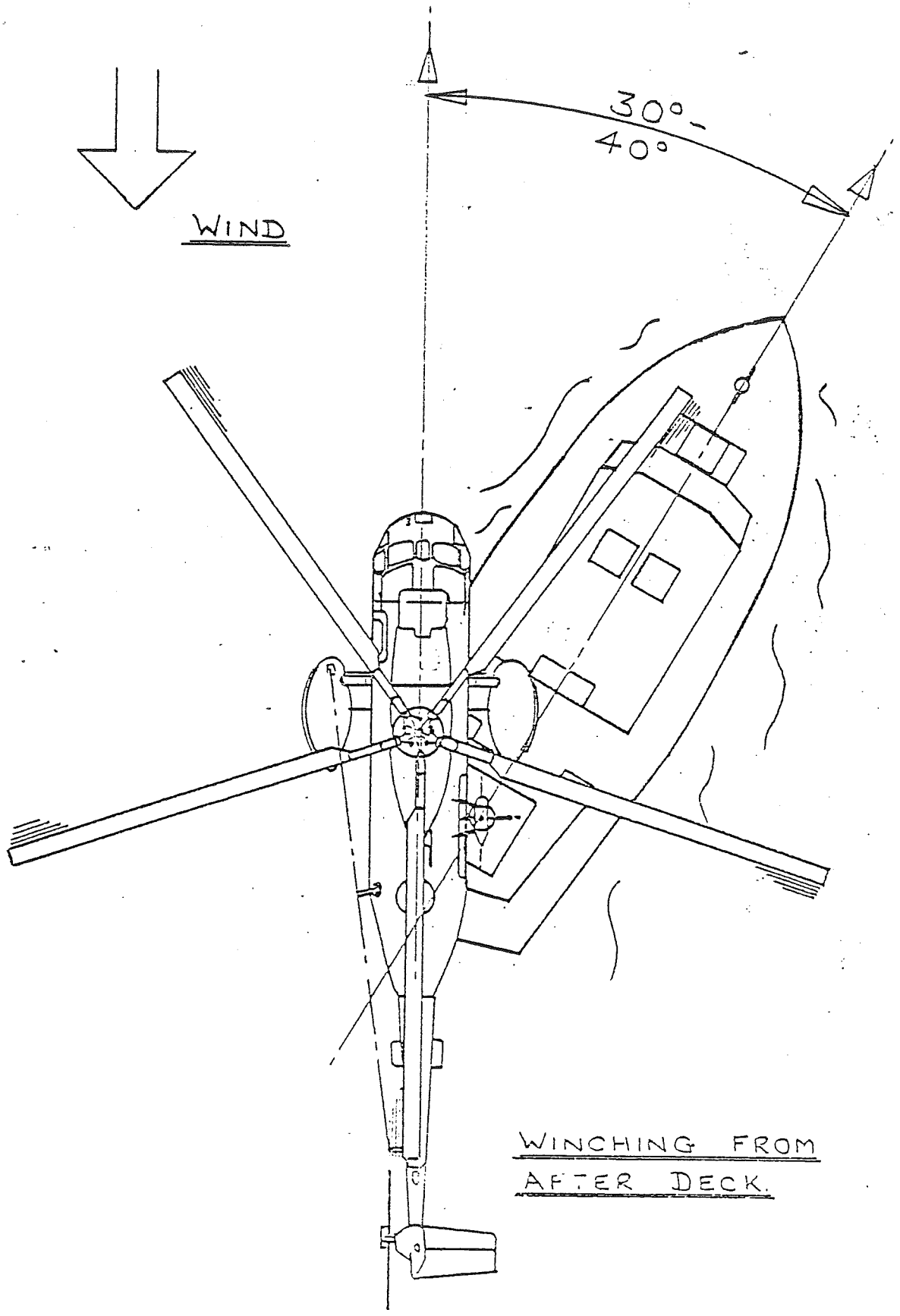
6.13.1 Service Medical Officer - on some occasions a service medical officer may also be carried in the helicopter. In these cases the medical officer would first be transfered to the lifeboat using normal methods to enable him to supervise the handling of the patient. Following the winching of the patient and helicopter crew member back to the helicopter the medical officer would then be winched back into the helicopter in the normal way.

6.13.2 In all stretcher exercises a "dummy" only is to be used, alternatively the stretcher will remain empty.

6.14 WINCHING DIAGRAMS

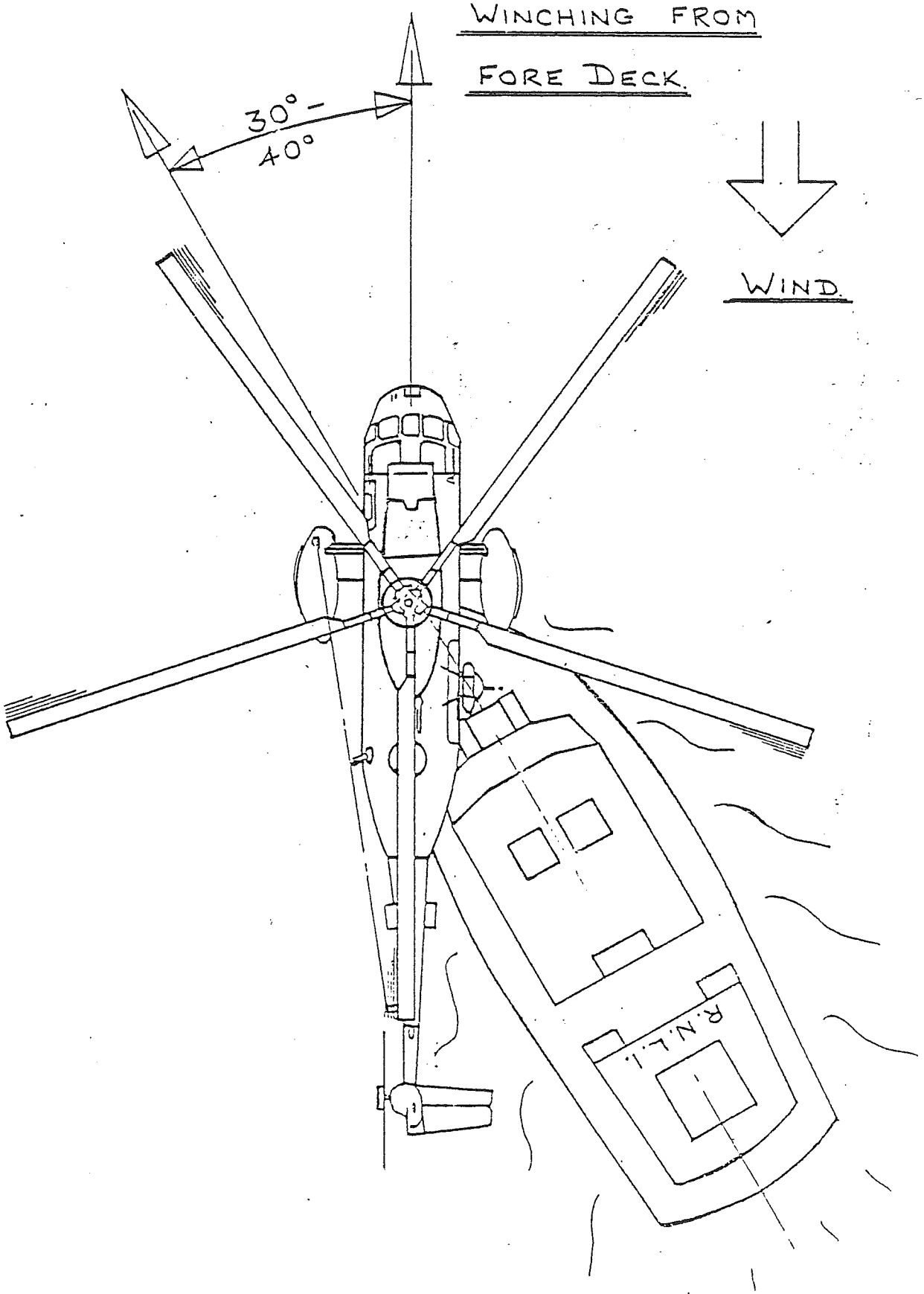
Appendix 'A' - Winching from after deck.
Appendix 'B' - Winching from fore deck.
Appendix 'C' - Winching when wind speed in excess of 18 knots - down wind winching.
Appendix 'D' - Cross wind winching.

APPENDIX "A".



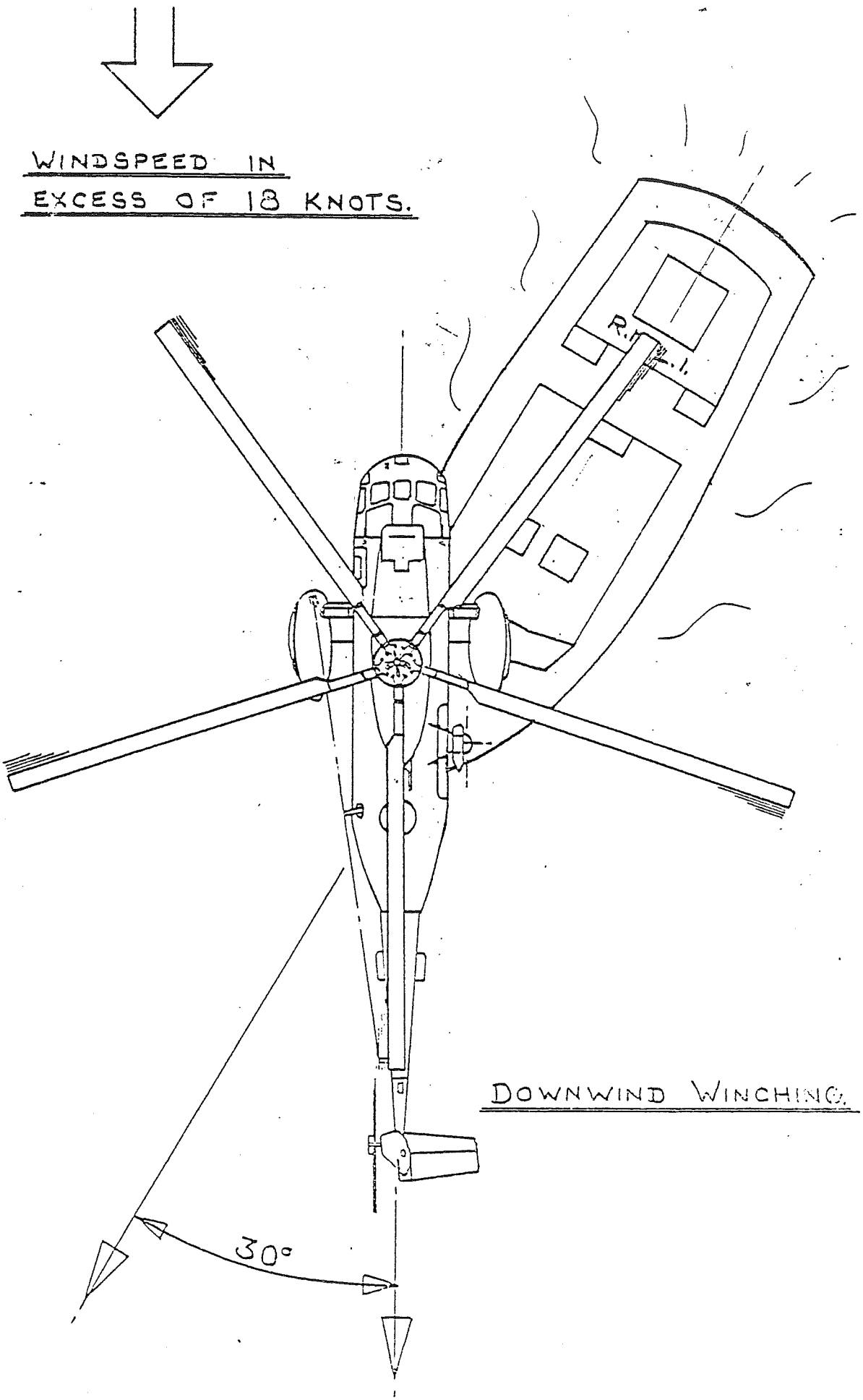
WINCHING FROM AFTER DECK.

APPENDIX "B"



APPENDIX "C."

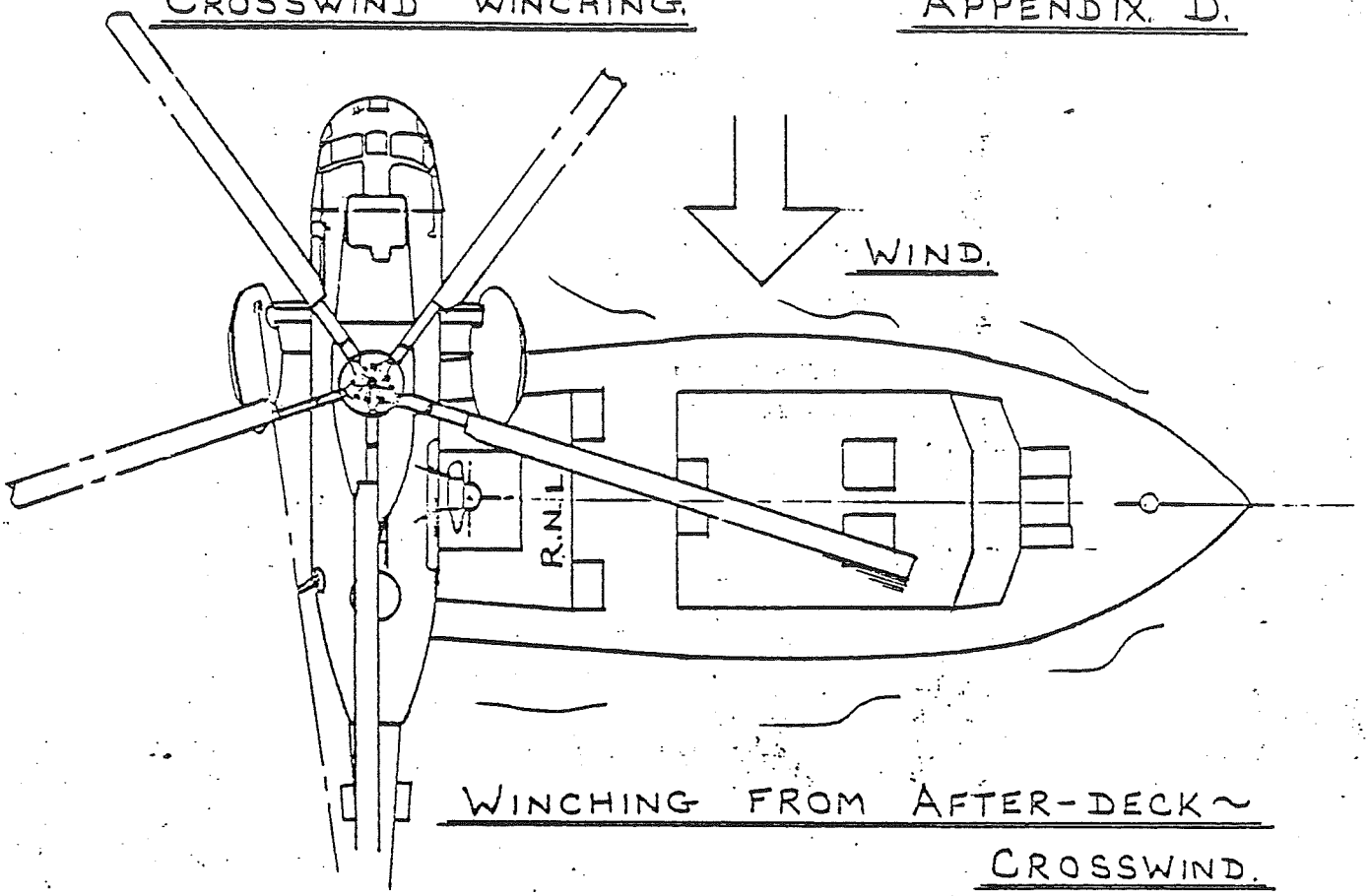
WINDSPEED IN EXCESS OF 18 KNOTS.



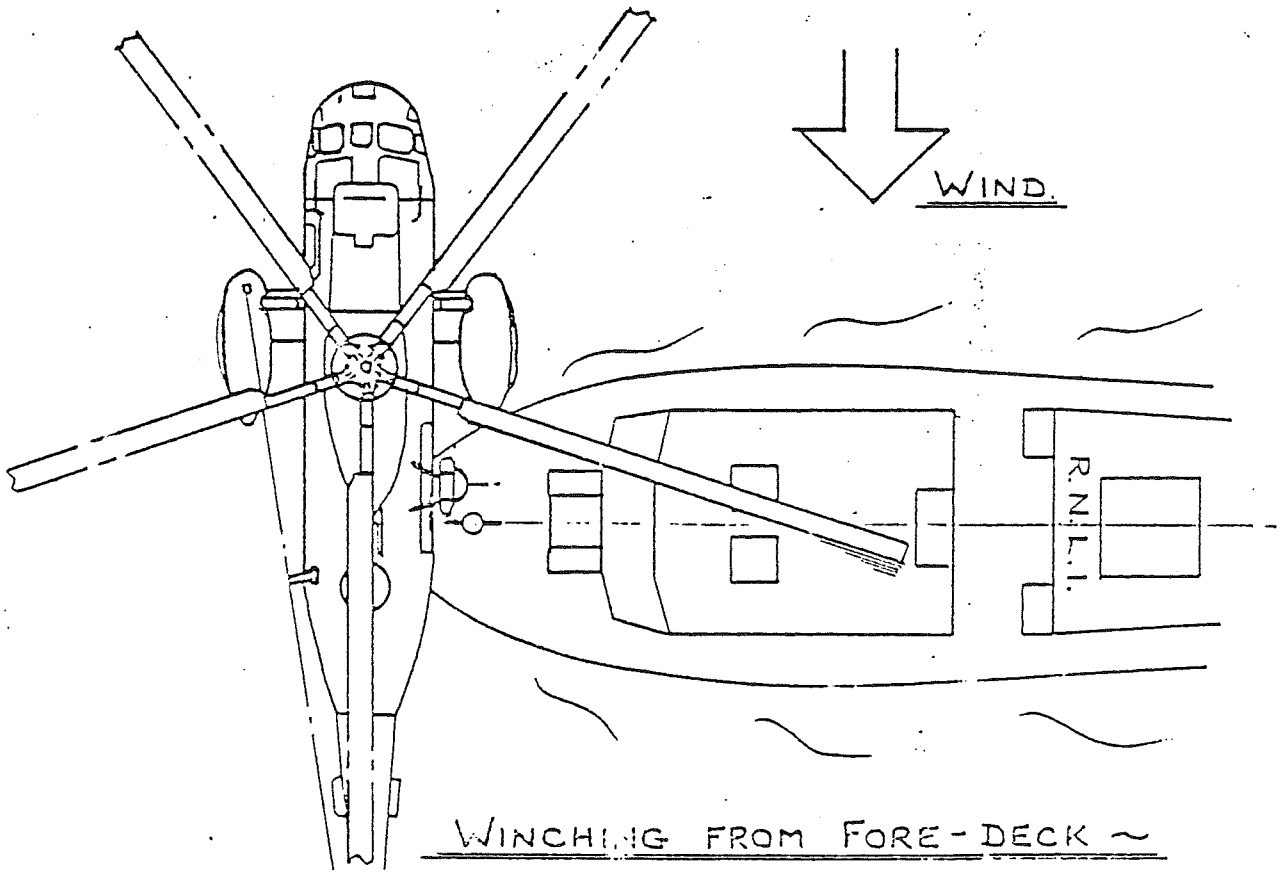
DOWNWIND WINCHING.

CROSSWIND WINCHING.

APPENDIX. "D."



WINCHING FROM AFTER-DECK ~ CROSSWIND.



WINCHING FROM FORE-DECK ~ CROSSWIND.

SECTION SEVEN

MAKING READY FOR SERVICE

SECTION 7

MAKING READY FOR SERVICE

7.1 PREPARATION FOR LAUNCHING

7.1.1 On return from service or exercise the lifeboat must be made ready in all respects for another launch. The Coxswain is responsible that this is done with as little delay as possible.

7.2 OUTLINE REQUIREMENTS

7.2.1 Briefly the object is to -

(a) Report any damage, equipment failures or losses from the prior launch and arrange assistance from the RNLI Coast Staff - hull, engineering or electrical/electronic as necessary, (**N.B.** Contact can be made via the COIR at POOLE H.Q. at any time), otherwise renew, replace or repair damage from within the capabilities of the boat-house/crewroom stores.

(b) Replenish fuel tanks.

(c) Place batteries on charge if necessary.

(d) Check levels and top-up where necessary, of the following - engine lubricating oil, gear box oil, engine fresh water coolant, wave subduing oil tank, windscreen washer fresh water tank, fresh water containers for domestic boiler and ready-use provisions.

(e) Check bilge levels.

(f) Restow cordage and gear.

(g) Replenish stores as neessary.

(h) Clean out all compartments.

(i) Wash down upper superstructure and main deck then dry off while making a visual inspection for wear and/or damage.

(j) Rig riding lights if required.

7.2.1
contd..

(k) When ashore in boathouse/crewroom, wash down life jackets and protective clothing if they have been exposed to salt water, afterwards hanging them up to dry.

7.3 DETAILED REQUIREMENTS

7.3.1 An attempt has been made to list items requiring attention in the order of priority necessary to get the lifeboat ready for the next launch.

7.3.2 With more than one person available, items can be carried out simultaneously, e.g. one person refuelling, another person checking oil levels, etc. The Waveney being an afloat lifeboat it is either moored 'alongside the wall 'or at mooring buoys and each station should work out a procedure to suit their own facilities and number of helpers and practice working together as a team until the most effective method has been devised.

7.3.3 There is a minimum amount of work to be done before the lifeboat can be reported as "Ready for Service", and other work that should ideally be completed before another launch.

7.3.4 Following the description of the work to be carried out a "Check List" has been drawn up for use while completing the jobs. The number alongside each job on the check list refers to the item number in the description of work. The check list bears abbreviated titles for each job described in the description of work.

7.3.5 Spaces have been left on the check list for the insertion of other items that you find require your attention.

7.3.6 The check list follows on from Sect.4.6 Securing the lifeboat, and Sect.4.7 Engine Shut-down Procedure.

7.3.7 The check list is to remain in this handbook. Copies can be made locally or obtained from Poole H.Q.

7.4 **DESCRIPTION OF WORK**

7.4.1 Items 1,2 & 3. Replenish Fuel Oil Tanks

(a) Check the contents of the fuel tanks by means of the dip-sticks, (Replace the sounding terminal caps).

(b) Refuel as necessary. On completion check that the shut-off valves and the changeover valves are set to NORMAL position, i.e. both engines supplied with fuel from the main tank/s.

(c) **REMEMBER** - never leave a fuel tank partly filled otherwise condensation will occur and will contaminate the fuel remaining.

7.4.2 Items 4 & 5 - Check Lubricating Oil Levels

Check the lubricating oil level in both engines with the engines stopped. If the engine has just been stopped, wait a while to allow the oil to drain back to the oil pan. If necessary add the proper grade oil to maintain the correct level on the dipstick.

7.4.3 Items 6 & 7 - Check Gearbox Oil Levels

Check the oil levels in both gear boxes with the engines running at 'tick-over' speed in Neutral. If necessary add the proper grade oil to maintain the correct level on the dipstick.

7.4.4 Items 8 & 9 - Check Coolant Levels

Check the fresh water coolant level in the heat exchanger tanks - **DO THIS WHEN THE ENGINES HAVE COOLED DOWN.** Add fresh water as necessary but do not overfill.

7.4.5 Items 10 & 11 - Check Turbochargers (3208T Engined Waveney).

THIS MUST BE A VISUAL CHECK ONLY. Inspect the mountings, intake and exhaust ducting and connections for leaks. Check the oil inlet and outlet lines for leaks or signs of damage. Any signs of leaks, damage or of noisy operation should be reported to the SHS for the attention of the District Engineer.

7.4.6 (Spare) Item 12.

7.4.7 Item 13. Check Wave Subduing Oil Level

Check the level in the storage tank and top-up as necessary with the correct oil.

7.4.8 Item 14 - Check Windscreen Washer Tank

Check the level and cleanliness of the fresh water in the tank and top-up or clean out and refill as necessary.

7.4.9 Item 15 - Check Fresh Water Containers

The containers should be emptied and refilled with clean fresh water.

7.4.10 (Spare) Item 16

7.4.11 Items 17,18 & 19 - Replenish Provisions, Stow Gear and Clean out.

Replace any items used from the provisions or ready-use stores. Clean out all compartments carefully restowing any items of gear or equipment that are loose.

7.4.12 Items 20 & 21 - Charge Batteries

If the charging rate of the alternators, as observed on the charge ammeters, reduce after a period at sea, then there should be no requirement to charge the batteries. But after a period of idleness at moorings, the requirement may exist. Charging the batteries is covered under Routine Maintenance and are detailed in Sect. 16.7.

7.4.13 Item 22 - Wash down Lifeboat

If the lifeboat is "alongside" and a supply of fresh water is available, the ideal is to wash down the superstructure and main decks with fresh water. If fresh water is not available then sea water should be used. After washing downthe lifeboat should (if conditions permit) be dried off with clean cloths while carrying out a visual inspection for damage or wear.

7.4.14 (Spare) Item 23

7.4.15 Item 24 - Report lifeboat "READY FOR SERVICE"

The lifeboat is now ready for service. The remaining items should be completed as soon as possible.

7.4.16 Item 25 - Check Life-jackets

If they have been exposed to salt water then they must be washed down with fresh water and hung to dry. Check the lifejackets for defects. Check the sea battery has not swollen or split and that the plugs are in place. Check that the light bulb is screwed home and that the dome is tight, (the bulb screw should be greased with silicone grease). Hang the lifejackets up to dry.

7.4.17 Item 26 - Check Helmets/Bump Hats

These should be checked before being hung up or stowed. Check for signs of damage and wear and if wet,wipe dry with a clean cloth.

7.4.18 Item 27 - Check Protective Clothing

Check the clothing for signs of wear and tear before hanging them up. The Zip fasteners should be treated with Beeswax to ensure ease of operation.

POST RECOVERY ACTION CHECK LIST

		Report any defects to the Station Hon.Sec.	Tick when completed						
	1.	Check contents, replenish port fuel tank							
	2.	Check contents, replenish stbd fuel tank							
	3.	Check contents, replenish reserve tank							
	4.	Check lub.oil level, port engine							
	5.	Check lub.oil stbd engine							
	6.	Check port gearbox oil level							
	7.	Check stbd gearbox oil level							
	8.	Check coolant level port engine							
	9.	Check coolant level stbd engine							
	10	Check turbocharger port engine							
	11	Check turbocharger stbd engine							
	12								
	13	Check wave subduing oil level							
	14	Check windscreen washer tank level							
	15	Check fresh water containers							
	16								
	17	Replenish ready-use provisions							
	18	Restow all gear							
	19	Clean out all compartments							
	20	Place port battery on charge							
	21	Place stbd battery on charge							
	22	Wash down lifeboat. Visual inspection							
	23								
	24	**REPORT LIFEBOAT READY FOR SERVICE**							
	25	Check life-jackets. Hang to dry							
	26	Check helmets/bump hats							
	27	Check protective clothing							
		INITIAL BOTTOM OF COLUMN ON COMPLETION							

SECTION

EIGHT

BOATHOUSE EQUIPMENT & STORES

SECTION 8

BOATHOUSE EQUIPMENT & STORES

8.1 THE TERM 'BOATHOUSE'

8.1.1 The shore installation at lifeboat stations with "Afloat" lifeboats vary from station to station, from boathouses no longer used to house the lifeboat, to semi-portable buildings. In each case the installation provides accomodation comprising crew room/office and stores. The term 'boathouse' is retained no matter the actual installation and will be used in this handbook.

8.2 BOATHOUSE COMMUNICATIONS

8.2.1 Telephone - sited in the crew office for general use between Station and other shore authorities, i.e. HMCG, Police, Ambulance and flank lifeboat stations.

8.2.2 Maroons - explosive signals used to call out the lifeboat crew. Two maroons will be fired for emergency call-out. **MAROONS AND OTHER PYROTECHNICS SHOULD BE STORED IN THE MAGAZINES PROVIDED.**

8.2.3 Pagers - paging receivers for crew call-out via HMCG, MRCC/SC's on Channel Zero VHF are in use at Stations where this is found necessary, and the required transmission facilities are available. They have not proved effective at all Stations.

8.3 FUEL

8.3.1 Some Stations have fuel storage tanks sited on a dock side, or jetty, for refuelling the lifeboat, others are able to refuel the lifeboat direct from road tankers, therefore the instructions given here are for guidance only. All diesel fuel oil should be kept in the boathouse fuel storage tanks. After refuelling the lifeboat, the storage tank/s should be refilled as soon as practicable to prevent condensation from contaminating the fuel. Diesel fuel oil should always be clean and free from contamination. To maintain this cleanliness all flexible fuel hoses/pipes and fittings used to fill the storage tanks or the lifeboat fuel tanks, should be stored carefully after use. They should be stored drained of fuel and hung with both open ends downwards to prevent dust entering. Before making any fuel connections, the connectors should be cleaned with a dry, clean, lint-free cloth. The fuel filling funnel with filter, as supplied, should always be used when refuelling.

8.4 PYROTECHNICS

8.4.1 Boathouse Outfit

Ident.No.	Type	Max.	Min.	Life.
6/171	Maroons Brock (Mortar)	24	6	5 yrs.
or 6/747	Maroons hand-held	24	6	3 yrs.

8.4.2 Safety

(a) All who are likely to be in a position to use pyrotechnics are to receive instruction from the Divisional Inspector or his Deputy from time to time, and only those persons so instructed should be allowed to handle pyrotechnics.

(b) The instructions for firing maroons - Poster 6/594A, and the instructions printed on the various flares and rockets must be strictly followed.

(c) **PYROTECHNICS ARE NEVER TO BE PREPARED FOR FIRING IN ENCLOSED SPACES.**

(d) Where more than one pyrotechnic is used, the second or subsequent item should only be prepared after the previous one has been fired.

(e) Brocks maroons are **NOT** to be used when wet as they are liable to swell and split in the mortar.

(f) Faulty, suspect or out of date pyrotechnics are to be weighted and lowered into deep water. They may alternatively be handed over to HMCG for disposal.

8.4.3 Stowage, carriage and Demand - spare flares etc., up to a maximum of six of each type may be stored ashore in the boathouse. All pyrotechnics are to be stowed correctly at all times in the magazine boxes provided, except when withdrawn for use. Orders should be made via the Divisional Inspector or his Deputy.

8.4.4 Sale and Use - the sale of any pyrotechnic is expressly forbidden. On no account are maroons to be used for publicity purposes or at any ceromonies. Use is restricted to operational requirements, on exercise or service only.

8.4.5 Return

(a) On no account are pyrotechnics to be returned to Depot. They should only be transported ashore after receiving instructions from Head Office, the Divisional Inspector or his Deputy, when the method and destination is to be indicated.

(b) Divisional Inspectors and their Deputies may transport items from Station to Station at their own discretion. Hand flares, other than **RED** may be retained and used for exercise purposes outside their effective life span unless they are seen on inspection to be deteriorating. Items should be used strictly in order of age, and should be used for exercise purposes prior to their expiry date, thus ensuring training value from each item, note well that **THIS DOES NOT APPLY TO RED FLARES !!**

8.5 OTHER EQUIPMENT & STORES (BOATHOUSE)

8.5.1 (a) Fire extinguishers; two 8lb. BCF extinguishers, painted Green, for use on electrical fires and one two gallon Foam extinguisher, painted RED or Cream, for oil/spirit fires.

(b) General purpose water hose (fresh water for washing down lifeboat and gear).

(c) First aid box.

(d) Cheshire Wilson mouth-to-mouth resuscitation trainer.

(e) Large and a small house flag.

(f) Coast Officials visiting book.

(g) Green book of RNLI Regulations.

(h) Rosters and notices as necessary.

(i) Life jackets

(j) Helmets or bump hats (may be stored on lifeboat).

(k) Protective clothing.

(l) Battery charger.

(m) The list of equipment and spares to be maintained in the boathouse is contained in the two publications supplied by the RNLI Stores Office. They are the Mechanical Parts List and the Electrical Parts List.

(n) Handbook for Waveney Class lifeboat stations.

8.6 RESPONSIBILITIES

8.6.1 It is the responsibility of the senior person present to ensure that the lifeboat and the boathouse are left secure in all respects. Any unserviceable or missing equipment must be reported immediately to the Station Honorary Secretary or his designated deputy.

8.7 DEMANDS FOR STORES

8.7.1 Divisional Inspectors and appropriate coast officials, at their periodical visits to Stations, will arrange to demand from the Depot all articles required for use at the Station. If any such articles are urgently required in the absence of the Inspector or other appropriate coast official, Station Honorary Secretaries should forward demands to the Depot.

8.8 REPORTS OF DEFECTS & DEFICIENCIES

8.8.1 Defects, deficiencies or damage affecting the Institutions property should be reported to Head Quarters. Such reports should state whether damage or defects have been made good locally.

SECTION NINE

MAINTENANCE, REPAIR & UPKEEP

SECTION 9

MAINTENANCE, REPAIR & UPKEEP

9.1 ROUTINE MAINTENANCE

9.1.1 Need for Routine Maintenance - routine maintenance is an onerous or burdensome task but it is essential that it is carried out correctly and efficiently to keep the lifeboat ready at all times for Service. A great amount of the time spent on routine maintenance work consists of 'visual inspections', cleaning and lubricating. One should be looking for signs of wear and tear, damage or signs of corrosion and the freedom of movement of working parts especially on the deck and superstructure exposed to the elements.

9.1.2 Layout of Check Lists - following the description of work to be carried out and the suggested frequency of each job, a "Check List" has been drawn up for use when carrying out the maintenance. The number alongside each item on the check list refers to the paragraph number in the 'description of work'. The check list bears abbreviated titles to each job, e.g. Item No.1 - Check the contents of the Port Fuel tank - the description of work paragraph No.1 contains detailed information on how to do this particular job.

9.1.3 Spaces have been left for you to list other items requiring attention that are peculiar to your lifeboat, boathouse/ crewroom, moorings and boarding boat.

9.1.4 It is suggested that a few items from the "Monthly" and the "Three Monthly" list be completed with the "Weekly" items on a rota basis so that you will not be faced with a large amount of work at the end of the monthly or three monthly periods.

9.2 RESPONSIBILITY FOR ROUTINE MAINTENANCE CHECKS

9.2.1 The responsibilities are laid down in the Regulations of the RNLI (Green Book). The relevant sections are-

Sect.2.2.2 - Duties of Coxswains & Coxswain/Mechanics;
Sect.2.2.3 - Duties of Full-time & Part time Station personnel;
Sect.2.2.4 - Duties of Station Motor Mechanics.

9.2.2 The above sections dictate who is responsible that the work is done, the next paragraph states 'who does the work'.

9.3 CARRYING OUT THE ROUTINE MAINTENANCE CHECKS

9.3.1 Maintenance work and maintenance checks on the engines, other machinery and the hydraulic and electrical systems is to be carried out by the Station Coxswain/Mechanic, or Station Mechanic.

9.3.2 Many of the routine maintenance checks are better carried out by two persons, e.g. checking operation of watertight door/hatch indicator panel lights, where one person can close or open a door, while the other person checks the indicator lights for correct operation. The 'ideal 'other person' to assist the Mechanic is the assistant Motor Mechanic or one of the Emergency Mechanics. This provides an opportunity to give instruction in the management of the machinery as required by the RNLI Regulations. All other checks of equipment, stores, etc., can be carried out by any crew member under the supervision of the full-time man, as the station organisation permits. All crew members should be encouraged to assist as the information gained will prove invaluable when at sea in difficult conditions.

9.4 SCHEDULE OIL SAMPLING PROGRAMME

9.4.1 The engines of the lifeboat are included in what is known as a "Schedule Oil Sampling Programme" (SOS) which is designed to forecast and minimise failure in engines.

9.4.2 In this programme samples of the engine lubricating oil, taken at intervals determined by the RNLI Engineering Staff and obtained by the Station Mechanic, are analysed to determine the quantity of microscopic wear metals suspended in the oil.

9.4.3 The Station Mechanic is supplied with all the necessary equipment to take the oil samples, including sample suction gun kits, bottles and handy packages for posting the samples to the laboratory.

9.4.4 Before taking the sample the engine must be running at operating temperature when the lubricating oil is well mixed.

9.4.5 Once the laboratory gets the samples, they are analysed quickly. If there are any critical readings, immediate notification is given. If the readings are normal, a report is sent indicating that the engine is operating within established requirements.

9.4.6 The method used to measure the concentration on the wear particles is known as "Atomic Absorption Spectrophotometry" which is an extremely precise method.

9.4.7 The spectrophotometer operates on the principle that atoms of each element will absorb light only of a specific wavelength. The instrument is set to emit and detect light of the wavelengths of each of the elements tested:

Copper (chemical symbol Cu),
Aluminium (Al),
Iron (Fe),
Silicon (Si),
Lead (Pb),
Sodium (Na),
Molybdenum (Mo),
Antifreeze (A.F.), and
Fuel.

9.4.8 The spectrophotometer is calibrated using standard solutions which contain a known concentration of the element being tested for. This comparison technique guarantees that the results from any atomic absorption spectrophotometer will be repeatable an any other unit.

9.4.9 Each of the five elements normally checked serves as an indicator for different parts of the engine. For example:

IRON (Fe) generally indicates oil pump wear, shaft wear and liner wear;

ALUMINIUM (Al) indicates piston or bearing wear;

SILICON (Si) levels are used as a measure of dirt entry.

The detection of excessive amounts of these elements in the oil sample indicates an impending failure.

9.4.10 Schedule oil sampling cannot detect fatigue failure.

9.4.11 All oil samples may also be checked for water, fuel dilution and anti-freeze. A positive finding in any of these tests calls for a check on the engine systems to discover the problem..

9.4.12 A typical laboratory report is shown below -

LEVERTON CATERPILLAR

LABORATORY REPORT

SOS

R. N. L. I.
WEST QUAY ROAD,
POOLE,
DORSET BH15 1HZ.
ATTN: MR. D. NOYCE

MODEL 6V91TI | SERIAL NO. [redacted]
COMPARTMENT TRANS/PORT | PLANT No.
WINDSOR CONSTR. SERVICE | DESPATCH | POST

LAB NO.	DATE TAKEN	DATE REC.	QTY. ADDED	S/M HOURS	OIL HOURS	Cu PPM	Fe PPM	Cr PPM	Al PPM	Si PPM	PB	MO	MG	NA	A/F	FUEL	H2O
THESE ARE YOUR CURRENT RESULTS																	
026	131284	171284	0	0	21	51	48	0	0	33	14	N	N	6	N	N	N
BELOW ARE YOUR PREVIOUS RESULTS																	
032	161184	191184	0	0	197	91	79	1	3	82	22	N		6	N	N	N
015	210984	240984	0	144	35	33	46	0	2	55	15			7	N	N	N
012	100984	110984	0	103	34	40	79	2	5	89	15			17	N	N	N
031	140884	160884	0	92	92	28	53	1	3	52	17			18	N	N	TR

COMMENTS AND RECOMMENDATIONS

ALL READINGS ARE ACCEPTABLE

9.4.13 A continuing programme of oil sampling is important for best results. This permits charts to be constructed that quickly spot and suggest remedies for any significant increases in wear particle concentration. The abbreviation PPM stands for Parts Per Million.

9.4.14 Lubricating oil, oil filter, fuel strainer and filter changes and coolant filter changes will be determined by the RNLI Engineering Staff using the information contained in the 'SOS' reports. The District Engineer will inform the Station Mechanic when the changes are required.

9.5 Spare

9.6 Spare

9.7 DESCRIPTION OF WORK

9.7.1 Items 1,2 & 3 as per Sect.7.4.1.

9.7.2 Items 4 & 5 as per Sect. 7.4.2

9.7.3 Items 6 & 7 as per Sect.7.4.3.

9.7.4 Items 8 & 9 as per Sect. 7.4.4.

9.7.6 Items 10 & 11 - Check PTO Belts.

Check the drive belts on each engine for signs of wear and for correct tension.

9.7.7 Item 12. Check fuel lines and valves.

Check lines and valves for cleanliness and signs of fuel leaks; finally check that the valves are set to NORMAL. See Sect.11.3.

9.7.8 Items 13 & 14 Fixed fire extinghishers.

Check the security, cleanliness and the pressure gauge readings of the contents, of the engine room fixed extinguishers.

9.7.9 Item 15 Check wave subduing tank oil level.

As per Sect.7.4.7.

9.7.10 Items 21 to 30 Inclusive _

As per instructions from District Engineer.

9.7.11 Steering Gear - inspection and maintenance as in Sect. 12.

9.7.12 The remainder of the items are self expanatory and require no further information.

SECTION

TEN

TRAINING

10.1 On Job Training

10.2 Liaison with HMCG

10.3 Training Records

10.4 Formal Training Courses

10.5 New Offshore & Intermediate Lifeboats

10.6 Radar Course - MTU

10.7 Radio Course - MTU

10.8 Navigation Course - MTU

10.9 NAVRADSAR Courses - College

10.10 Miscellaneous Courses

10.11 Course Certificates

SECTION 10

TRAINING

10.1 ON JOB TRAINING

10.1.1 Training is provided by the Divisional Inspector (or his Deputy), and by the District Engineer on each of their inspection and exercise visits. Every effort should be made to have as many crew members in attendance at training ashore as is possible and that crews are rotated to allow for training as required afloat.

10.1.2 Any problems requiring specific training attention should be mentioned to the Divisional Inspector, his Deputy or the District Engineer during their visits.

10.1.3 Every opportunity should be taken during routine exercise launches to practice all drills and procedures in various weather conditions and differing locations.

10.2 LIAISON WITH HMCG

10.2.1 Good liaison with HMCG is essential and prior warning should be given the MRCC/MRSC in good time to allow them to make the best use of the exercise time available.

10.3 TRAINING RECORDS

10.3.1 Training Log - it is advisable to keep a training log showing hours exercised, persons involved and which drills and procedures were practised.

10.3.2 Crew Members Qualifications/Experience - a record of which crew members are qualified or are experienced in specific things should be kept also, e.g. Radar, First-aid, Radio, liferaft, fire fighting, etc.

10.4 FORMAL TRAINING COURSES

10.4.1 These are held in a variety of subjects at lifeboat stations, Poole Headquarters of the Institution, Cowes Inshore Lifeboat base and other locations as necessary.

10.5 NEW OFFSHORE & INTERMEDIATE CLASS LIFEBOATS

10.5.1 All lifeboat stations receiving new lifeboats will be required to send the crew for training to Poole Headquarters prior to the boat making an extended passage to station. The course is of five days duration followed by a passage to station which will include a night passage. Where possible, the Mechanic should have attended at least the forty hour trial of the lifeboat during the week prior to the course, and if considered necessary, the Coxswain should attend during this period.

10.5.2 Aim : To train lifeboat crew members to a level which will allow them to man and operate a _____ Class lifeboat on service.

10.5.3 Course Objectives - To provide training to enable crew members to :-

(a) Understand the lifeboat's construction, capabilities and limitations.

(b) Be able to operate all the lifeboat's equipment efficiently.

(c) Be able to operate the lifeboat under various sea conditions likely to be encountered on service by day and by night.

(d) Be able to navigate safely.

(e) Be familiar with helicopter operating procedures.

10.5.4 **N.B.** This course will also be attended by the Divisional Inspector and the District Engineer.

10.6 RADAR COURSES- MOBILE TRAINING UNIT

10.6.1 Aim - To train crew members to a level which will enable them to operate the lifeboat's radar set efficiently.

10.6.2 Objectives - To provide training to enable crew members to :-

(a) Operate the user controls of an RNLI lifeboat radar installation so as to obtain the optimum results under the prevailing conditions of weather and sea state.

(b) To interpret the ship's head-up, unstabilised relative display, provided by the radar as an aid to :-

i. Collision avoidance.
ii. Casualty detection.
iii. Coastwise navigation.

10.6.3 Mobile Training Unit - training is given in a Mobile Training Unit (MTU) which is fitted with a computer operated radar simulator. Courses are of five days duration spread over a five week (approximate) period.

10.6.4 Course Preparation - students should prepare themselves by ensuring that they are familiar with the "Rule of the Road" and "Buoyage System". To this end, self-teaching "Programmed Learning" books are available for issue to stations prior to the course, as required by the Divisional Inspector or his deputy. These books will be on loan only and should be returned on completion.

10.7 RADIO COURSES- MOBILE TRAINING UNIT

10.7.1 Training is given in a mobile training unit which is fitted with MF and VHF training facilities for a number of students (usually six). Courses are of five days duration spread over a five week (approximate) period.

10.7.2 Aim - To train crew members to a level which will enable them to operate the MF and VHF radios correctly.

10.7.3 Objectives - To provide training to enable crew members to communicate by voice on RNLI, HMCG and International Maritime Mobile and Aeronautical frequencies and channels from an Offshore, Intermediate or Inshore lifeboat at sea, during all services, exercises, trials and passages between ports.

10.8 NAVIGATION COURSES-MOBILE TRAINING UNIT

10.8.1 The courses in "Basic Navigation" are run on an 'as convenient' basis in the radio caravan. Times are arranged to suit crew members and the Instructor and are finalised by the Instructor locally after the arrival of the radio caravan (MTU) at station.

10.9 NAVIGATION/RADAR/SEARCH & RESCUE (NAVRADSAR COURSES) COLLEGE.

10.9.1 These courses are arranged by Divisional Inspectors with local colleges after consultation with Headquarters (Staff Officer Operations - Training Officer) in order to fulfill specific needs that cannot adequately be covered in the short term by the radar MTU training syllabus. Courses consist of basic navigation, radar simulator training, and search and rescue techniques using both navigation and radar.

10.10 MISCELLANEOUS COURSES

10.10.1 A number of short, usually one day, courses are from time to time available either locally or at Colleges or helicopter stations. Any Divisional Inspector or his Deputy who may be made aware of Courses which would be useful to crew members should after satisfying themselves of the suitability of the course content, etc., inform Headquarters (Staff Officer Operations-Training Officer) of the arrangements made and subsequently the results.

10.11 COURSE CERTIFICATES

10.11.1 Certificates are available from Headquarters for awarding to crew members suitably qualified after attendance at any of the above courses. Recommendations for the award of certificates should be forwarded to Headquarters (Staff Officer Operations - Training Officer) for necessary action.

10.11.2 **N.B.** Course Instructors in MTU's will automatically forward recommendations upon completion of the courses run in the MTU's. It is of importance that Divisional Inspectors and the deputies appraise Headquarters (Staff Officer Operations - Training Officer) of any specific training requirements they may have and the priorities as they see them.

ROUTINE MAINTENANCE

CHECK LISTS.

STATION _____

O.N._____

a). Insert your crew number against item checked.

b). Encircle crew number if item defective.

c). Report defect in Station Log and to the SHS/DLA for onward transmission to the DE or DI.

Frequency Abbreviations

W - Weekly

M - Monthly

3M - Three-monthly

DE - as determined by District Engineer.

ROUTINE MAINTENANCE CHECK LISTS.

	1	Check contents Port fuel tank	W							
	2	Check contents Stbd fuel tank	W							
	3	Check contents Reserve fuel tank	W							
	4	Check Lub.oil level port engine	W							
	5	Check Lub.oil stbd engine	W							
	6	Check oil level Port gearbox	W							
	7	Check oil level Stbd gearbox	W							
	8	Check coolant level Port engine	W							
	9	Check coolant level Stbd engine	W							
	10	Check PTO drive belts port engine	W							
	11	Check PTO drive belts stbd engine	W							
	12	Check fuel lines and changeover valves	W							
	13	Check pressure Primary fire bottle	W							
	14	Check pressure Secondary fire bottle	W							
	15	Check level wave subduing oil tank	W							
	16									
	17									
	18									
	19									
	20									
	21	Change Lub.oil port engine	DE							
	22	Change Lub.oil stbd engine	DE							
	23	Clean crankcase breather port engine	DE							
	24	Clean crankcase breather stbd engine	DE							
	25	Change Lub.oil filter port engine	DE							
	26	Change Lub.oil filter stbd engine	DE							
	27	Change fuel filter/strainer port engine	DE							
	28	Change fuel filter/strainer stbd engine	DE							
	29	Check weight of fire extinguishers	DE							
	30	Check watertight integrity of compts.	DE							

SECTION

ELEVEN

ENGINES

SECTION 11

ENGINES

11.1 PROPULSION ENGINES

11.1.1 Engine Types - Waveney Class lifeboats from Operational number 44-001 to 44-007 inclusive are fitted with Caterpillar Type 3208NA twin diesel marine engines; 44-008 to 44-015 are fitted with GM 8V53 twin diesel engines and 44-016 to 44-022 are fitted with Cat.3208T twin diesel engines.

11.1.2 Engine Type Numbers - on the Caterpillar engines the letters NA following the engine type number indicate that the engine is a Naturally Aspirated type and the letter 'T' indicates that the engine is a Turbocharged type.

11.1.3 Propeller Rotation - each engine gearbox combination is arranged to give left-hand (port) and right-hand (starboard engine) rotation , i.e. outward rotation of the twin propellers.

11.1.4 Gearboxes - in all cases both engines are fitted with a Twin Disc MG 506 reverse/reduction hydraulically operated gearbox. The reduction ratio differs with the engine type, e.g. the reduction ratio used with the Cat.3208T, MG506 combination is 2.50:1.00.

11.1.5 Engine Systems - the engines incorporate four basic systems which direct the flow of fuel, air, lubricating oil and engine coolant. Following the brief specifications below, descriptions of the arrangements in the Waveney to supply the necessary fuel, air, lubricating oil and engine coolant will be given.

11.1.6 Operator's Manual - full details of the engines will be found in the appropriate Engine Operators Manual.

11.2 ENGINE SPECIFICATIONS

11.2.1 Cat. 3208NA

Type	Four stroke, naturally aspirated
Number of cylinders	- Eight
Bore	4.5 ins. (114mm)
Stroke	5.0 ins. 127mm)
Displacement	636 cubic ins. (10.4 litres)

11.2.1
contd..

Engine oil pressure	35 to 70 psi
Engine water temp.	170 to 195°F (77.3 to 91.3°C)
Shaft Horse Power	203 SHP (1252.25kW) at 2,800 rpm
Idling speed	650 rpm.

11.2.2 GM 8V53

Type	Four stroke, naturally aspirated
No. of cylinders	Eight
Bore	3.87 ins. (mm)
Stroke	4.5ins. (mm)
Displacement	424 cubic ins. (litres)
Shaft Horse Power	260 SHP at 2800 rpm

11.2.3 Cat.3208T

Type	Four stroke Turbocharged
No. of cylinders	Eight
Bore	4.5ins (114 mm)
Stroke	5.0ins (127mm)
Displacement	636 cubic ins. (10.4 litres)
Shaft Horse Power	250 SHP at 2800 rpm

11.3 FUEL SUPPLY ARRANGEMENTS

11.3.1 Fuel System - the fuel system consists of the following equipment :-

(a) Engine driven fuel lift pump.

(b) Primary fuel filter/water separator.

(c) Secondary fuel filters having replaceable filter elements mounted on the inboard side of each engine.

(d) Sleeve metering fuel injection equipment.

(e) Engine mounted priming pump.

(f) Water trap.

11.3.2 Fuel Tanks - originally each Waveney was fited with one large main tank and a reserve tank, the main tank having a remote fuel guage fitted. All have now been modified to have two smaller main tanks and a reserve tank. In some cases an extra filler pipe has been fitted and on some a changeover valve is fitted that allows the two main tanks to filled from the port side filler pipe. Most of the remote fuel gauges have been removed the tanks being sounded by dip-sticks. Thus the diesel fuel for the main engines is stored in three built-in steel tanks. The two main tanks, each with a capacity of approx. 110 gallons (500 litres) are built into the structure below the Crew/Radio Cabin. The reserve tank, with a capacity of approx. 75 gallons (340 litres) is built into the lifeboat structure below the Forward Survivor Cabin. The three tanks give a fuel capacity of approximately 300 gallons (1340 litres).

11.3.3 Filler Connections - most lifeboats of the Class have one filler connection on the port side for the main tanks and one for the reserve tank, but a few have one filler connection either side of the superstructure to fill the main tanks in addition to the filler for the reserve tank.

11.3.4 Vents - each tank has its own filler, vent, sounding, feed, stripping and return connections. The reserve tank vent is connected to the vents from the main tanks and extended through the deck in a swan neck fitting sited above the deck filler connection.

11.3.5 Gravity Valve - a gravity operated valve is fitted into the main vent terminal to prevent loss of fuel or water ingress in the event of a knockdown or possible capsize.

11.3.6 Tank Contents - fuel tight connections are fitted on top of each tank and sited to allow dipsticks to be used for checking fuel remaining.

11.3.7 Spare.

11.3.8 Fuel Supply Changeover Valves - normally the port engine is supplied with fuel from the port main fuel tank and the starboard engine from the starboard main fuel tank. By use of interconnecting valves, numerous engine/tank combinations are available. The surplus fuel from the injectors **MUST** be returned to the tank from which it was drawn.

11.3.9 Fuel Changeover Sequence - when changing an engine's fuel supply /return from one tank to another, great care must be taken to ensure that the Supply (or Suction) valve **AND** the Return valve for the new tank are opened **BEFORE** the Supply and Return valves for the tank in use are closed or shut-off. If the supply of fuel is shut-off before the new tank's supply valve is opened, fuel starvation can result; this could cause an engine to stall. If the return valve to the new tank is not opened then the fuel from the injectors will be returned to the previously used tank.

11.3.10 Normal Fuel Supply Condition - on return from sea and after re-fuelling the valves must always be returned to the NORMAL position, i.e. port tank supplying the port engine and the starboard tank supplying the starboard engine.

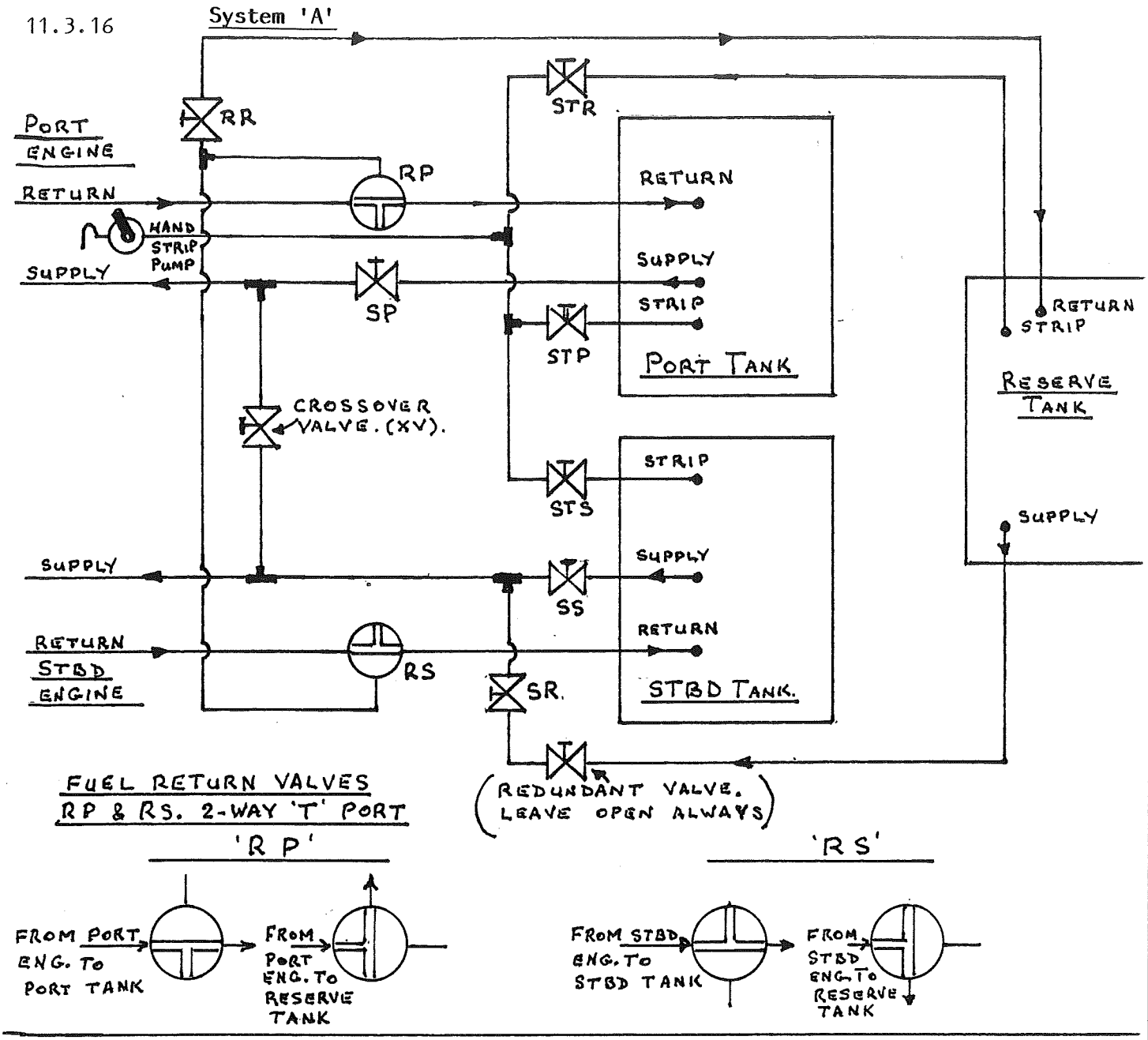
11.3.11 Fuel Valve Systems - during the period when the single main fuel tank of the Waveneys were changed to two main tanks, port and starboard, a number of differently designed changeover systems evolved. The two systems mostly used are shown in the following paragraphs, but it is essential that you physically check the fuel changeover system on your lifeboat to determine the system in use.

11.3.12 Fuel Changeover System 'A' - the theoretical diagram is shown on the next page. Ideally this diagram should be studied while looking at the physical layout on the lifeboat. The fuel changeover valves are situated on the forward bulkhead of the engine room, generally just below the level of the walkway or gangway.

11.3.13 "T" Port Changeover Valves - these are used to return fuel to the tank in use, e.g. valve 'RP' can be used to return excess fuel from the port engine to the port tank or to the reserve tank. The different positions of both valves are shown below the circuit diagram. Study these in conjunction with the main drawing.

11.3.14 Fuel ON/OFF Valves - the remaining valves, i.e. RR,XV,SP,RS, STR,STP,STS,SS and SR are simple ON/OFF types. The operating lever is turned Clockwise for OFF or closed, and anti-clockwise for ON. Easily remembered by "Clockwise 'C' for closed".

11.3.15 Fuel Valve Facilities - both engines are normally supplied with fuel from their respective tanks, or both engines can be supplied with fuel from the reserve tank.



The three Supply (or Suction) line valves are shown on the drawing as -

SP	Supply from Port Tank
SS	Supply from Stbd Tank.
SP	Supply from Reserve Tank.

The three Return line valves are shown on the drawing as-

RP	Return from Port engine.
RS	Return from Stbd engine.
RR	Return to Reserve tank from either the Port or Starboard engines.

11.3.16
contd..

The stripping valves -

STR	**Strip Reserve Tank**
STP	**Strip Port Tank**
STS	**Strip Stbd Tank**

- are kept closed until required for "Stripping" the fuel from the tank or tanks, or when 'drawing-off' fuel for visual examination, or to provide fuel for the Auxiliary Generator Set.

The Crossover or Interchange valve (marked XV on the drawing) allows fuel to be used from any of the tanks.

When refering to the ON/OFF valves, the letter 'C' is used to indicate closed, and the letter 'O' to indicate Open.

11.3.17 Fuel Valve Arrangements

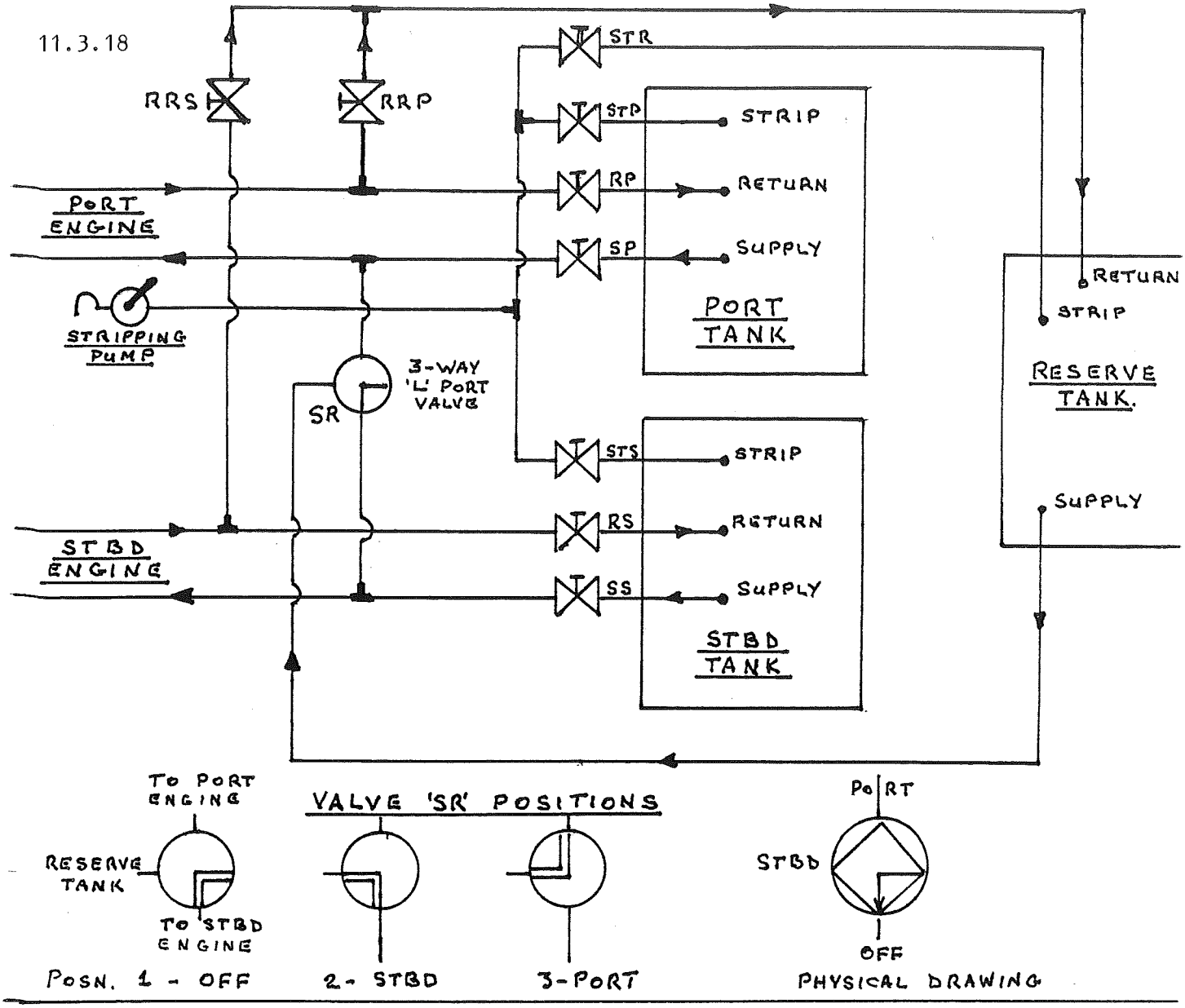
1. NORMAL - Port engine supply from port tank and Stbd engine supplied by starboard tank. Stripping valves closed.

Valves	SP	SS	SR	XV	RR	RP
Position	O	O	C	C		

2. Both Engines Supplied from Port Tank (Stripping valves closed.

Valves	SP	SS	SR	XV	RR	RP	RS
Position	O	C	C	O	C		

11.3.18



11.3.19 Fuel Changeover System 'B' - the facilities provided by this system differ from those provided by system 'A'. In addition to the NORMAL condition, the options are, Port engine supplied by the port tank with the Stbd engine supplied by the Reserve tank or Port engine supplied from the Reserve tank with Starboard engine supplied by the starboard tank. It is not possible to run both engines off any one tank.

11.3.20 Fuel Valve Arrangements

1. NORMAL - Port engine supplied by port tank and Stbd engine supplied by starboard tank. Stripping valves closed.

Valves -	SP	SS	SR	RP	RS	RRS	RRP
Position	O	O	OFF	O	O	C	C

2. Port Engine from Reserve Tank & Starboard Engine from Starboard Tank. (Stripping valves closed).

Valves -	SP	SS	SR	RP	RS	RRS	RRP
Position -	C	0	Port	C	0	C	0

3. Port Engine from Port Tank & Starboard Engine from Reserve Tank. Stripping valves closed.

Valves -	SP	SS	SR	RP	RS	RRS	RRP
Position -	0	C	Stbd.	0	C	0	C

4. Stripping - open the stripping valve for appropriate tank, i.e. to strip, or draw-off fuel from the Port tank, Open valve STP, close STS and STR, then operate the semi-rotary hand pump.

11.3.21 Use of Reserve Tank - the majority of services will be completed without the need to use the fuel from the reserve tank. It is important to maintain a supply of fresh diesel in the reserve tank, therefore the fuel should be used whenever the opportunity occurs, e.g. during exercise launches.

THE IMPORTANCE OF USING THE DIESEL FROM THE RESERVE TANK AS A MATTER OF ROUTINE, CANNOT BE OVERESTIMATED.

11.3.22 Contamination of Fuel - on return to moorings the fuel tanks should be filled with fresh clean fuel and then kept full otherwise partially filled tanks collect moisture, which contaminates the fuel remaining. If there is any doubt about the condition of the diesel fuel in the reserve tank, or either main tank, a sample should be drawn off through the stripping pump. The sample should be visually exained for signs of contamination.

11.3.23 Fuel Priming Pumps and Filters - each main engine is fitted with a fuel priming pump and a secondary fuel filter. In addition to the engine mounted fuel filter a combined fuel filter and water separator, is fitted in the fuel suction (or supply) line of each engine.

11.3.24 Engine Out of Fuel - the problem of restarting a diesel engine after it has run out of fuel stems from the fact that after the fuel is exhausted from the fuel tank, fuel is pumped from the primary fuel strainer and sometimes partially removed from the secondary fuel filter before the fuel supply becomes insufficient to sustain engine firing. Consequently, these components must be refilled with fuel and the fuel pipes rid of air in order for the system to provide adequate fuel for the injectors. When an engine has run out of fuel, there is a definite procedure to follow for restarting the engine. This procedure is known by the Mechanic although the problem is most easily overcome by prevention.

11.3.25 Transferring Fuel to Auxiliary Generator Tank - fuel for the Auxiliary Generator Set diesel engine may be obtained from any tank by use of the valves and the stripping pump.

11.3.26 Stripping Fuel Tanks - all three tanks can be stripped (emptied) by means of the stripping pump, and operation of the appropriate valves.

11.4 AIR SUPPLY ARRANGEMENTS

11.4.1 Fresh Air Supply - for the main engines is taken from the engine room atmosphere.

11.4.2 Main Air Intakes - the air supply to the engine room is through two trunks, one port and one starboard mounted either side of the wheelhouse with their inlets inside the wheelhouse at near deck level. The trunks run upwards, from a 'U' bend then run down again to deck level, across to the opposite side of the lifeboat, down through the deck and terminate in the engine room bilge space. The top of the trunks form the helmsman's platform and the trunks are recessed into the hatches giving access for the removal of the engines.

11.4.3 Air Extraction Fan - Waveney's Operational Number 44-001 to 44-015 inclusive have an extractor fan fitted to the starboard engine room vent trunking, and with the end flap closed it reverses the air flow to remove warm air from the engine room. When in harbour, this vent fan is only to be used when the engines are 'off-load'. On Waveney's 44-016 to 44-022 inclusive, the engine room extraction fan exhausts through the slots in the upper end of the towing bitt located on the main deck forward of the well or cockpit.

11.4.4 Fire Covers - each engine air intake, inside the wheelhouse has an hinged fire flap fitted.

11.5 LUBRICATING OIL SYSTEM

11.5.1 The lubricating oil system is self contained in each engine and the gear boxes have independent systems.

11.5.2 The following items are fitted to each engine/gearbox combination :-

(a) Engine driven pump.
(b) Full flow filters.
(c) Engine oil cooler.
(d) Gearbox oil cooler.
(e) Front sump oil pan.
(f) Inboard manded oil filters and dipsticks.

11.5.3 Sump Pump - one sump pump is fitted and by use of cocks can be used to tempty either tghe engine or the gearbox sumps.

11.5.4 Oil Pressure Alarms - in the event of a loss of lubricating oil pressure on either or both engines an alarm bell will ring in the wheelhouse and a RED indicator light or lights will light-up on the helmsman's console. An alarm cancel switch is fitted on the console to cancel the alarm bell when first switching on the electrical isolator switches (engines stopped) and when the engines are being stopped. When the engines are stopped, the lub. oil pressure drops and the alarm bell will sound and the warning lights will light-up, The alarm cancel switch is biased (spring loaded) to the ON position; depressing the switch cancels the alarm bell and when the switch is released the alarm circuit is made active once more; the warning light/s RED remain on until the oil pressure rises once more when the engines are re-started.

11.5.5 Oil Pressure Gauges - lubricating oil pressure gauges for each engine and each gearbox are mounted on an engine instrument panel and on the wheelhouse console. The engine and gearbox oil pressures are stamped on an engine mounted tally. You can determine what is 'normal' operating range by observing the gauges over a period of time. The cause of any sudden or significant change in the readings should be determined and corrected.

11.6 CRANKCASE BREATHER SYSTEM

11.6.1 Each engine is fitted with twin positive crankcase vents. Each pair are piped together and led to a collector tank sited under the engine room ventilation extractor fan. The outlets from the collector tanks are piped to stub pipe connections on the ventilation trunking on the delivery side of the extractor fan.

11.7 ENGINE COOLING SYSTEM

11.7.1 Description - to dissipate the heat generated each engine has its own closed fresh water cooling system, using integrally mounted circulating pump, header tank, thermostatic control and heat exchanger. The heat exchanger is cooled by sea water.

11.7.2 Heat Exchanger - in the heat exchanger cooling system, the fresh water is drawn by the water pump from the heat exchanger and is forced through the engine and to the thermostatic housings. A bypass tube from the thermostat housing to the inlet side of the water pump permits circulation of the cooling water through the engine whilst the thermostats are closed. The thermostats maintain a normal engine operating temperature of 170 to 196°F (77.3 to 92°C). When the thermostat is open, the coolant can flow through the heat exchanger and then, after being cooled, to the engine fresh water pump for recirculation.

11.7.3 Sea (Raw) Water Cooling - cooling of the engine fresh water coolant is by sea water. Each engine circuit is independent, having its own sea inlet and strainer. The sea water is circulated through the heater exchanger by the sea water pump for injection into the engine exhaust system and eventual discharge overboard with the exhaust gases.

11.7.4 Stern Tube Bearing Lubrication - a bleed from each engine sea water discharge is fed to its respective stern tube bearing for positive lubrication of the cutless rubber bearing. Provision is made to provide sea water lubrication of both stern tube bearings from one engine in an emergency, i.e. one engine stopped at sea. The cross connection between the port and starboard bleeds is fitted with an isolating valve. If one engine is stopped at sea, for any reason, and its propeller left trailing, then opening of the isolation valve ensures that the sea water lubrication of this propeller bearing will be maintained by the engine that is running.

11.7.5 Sea Inlet Valves - each sea inlet valve is of the full bore gate valve type with a two-inch bore. On top of each valve is attached a strainer assembly. The top of each valve is above the waterline and readily accessible for inspection and removal of the perforated strainer for cleaning.

11.7.6 Water Jacket Protection - to protect the engine cooling water jacket from electrolytic action, zinc rods are fitted that extend into the raw water passages.

11.7.7 Cooling Water Temperature Alarm - visual and audible warning of high cooling water temperature on both engines is provided. The alarm bell will sound in the wheelhouse and RED indicator light/s will light-up on the helmsman's console. The alarm cancel switch can be used to switch off the alarm bell, but the RED warning light/s will remain on until the temperature lowers.

11.7.8 Cabin Heaters - provision is made on each engine for the supply of hot water, from the closed fresh water system, to Smiths type coach heaters. The port engine supplies two heaters, one in the Crew/Radio Cabin and one in the Survivors cabin forward. The starboard engine supplies the heater in the Aft/Stretcher Cabin. By using the heater electric circulating fan, warm air is ducted over the inside of the heater.

11.8 EXHAUST SYSTEM

11.8.1 Each engine exhausts independently through the lifeboat's transom.

11.8.2 The exhaust system is specially designed to allow sea water from the engine cooling system to be injected into the exhaust gas stream and the resultant mixture of cooled gases and sea water to be conveyed via stainless steel pipes to the transom fittings. The discharged sea water cools the exhaust and muffles engine noise before passing overboard through the exhaust pipes.

11.8.3 Exhaust Transom Fittings - the transom fittings have hinged flaps fitted on their outlet ends. The outlets are angled so as to close the opening when the engine is not running. A limit stop is fitted to each flap to prevent it being held wide open when running astern; this prevents sea water being rammed into the exhaust pipework and causing an engine stall.

11.8.4 Dry sections of the exhaust pipework are lagged with heat insulating material.

11.9 ENGINE TRANSMISSION

11.9.1 Gearboxes - each main propulsion engine is fitted with a flange mounted hydraulically operated twin disc gearbox type MG 506. The gear boxes are oil cooled and lubricated. Adequate lubrication is maintained under trailing conditions.

11.9.2 Engaging and Changing Gear - to engage gear allow the engine to run long enough for oil pressure to be indicated on the pressure gauges, then move the throttle control lever to the low idle speed position (neutral). Engage gear by moving the control lever in the desired direction.

N.B. When engaging engines from neutral, there will be a pause before the propellers commence turning.

ALLOW A SLIGHT PAUSE BEFORE INCREASING ENGINE SPEED TO ALLOW THE CLUTCH TO BECOME FULLY ENGAGED.

To change gear a slight pause should be made in neutral before moving to the new gear. Move to the new gear - **P A U S E** - then increase engine speed. **DO NOT SHIFT ACROSS NEUTRAL POSITION WITHOUT A FEW SECONDS DELAY.**

Rapid gear shifting does not allow the selector valve in the gearbox to empty properly. The shift would go directly from high pressure in the one direction to high pressure in the other direction with resultant shock to gearbox and engine.

11.10 PROPELLER SHAFTING & STERN GEAR

11.10.1 Transmission - engine power is transmitted via gearboxes, flexible couplings and solid shafts to the four bladed propellers.

11.10.2 Shaft Bearings - each propeller shaft is supported by two Cutless rubber bearings, one in the "A" bracket and the other in the aft end of the stern tube. A bleed off from the main engine sea water cooling system provides positive water lubrication for the stern tube bearing.

11.10.3 Trailing Propeller Shaft - see Sect.11.7.4.

11.11 MAIN ENGINE CONTROLS

11.11.1 Starting and Stopping Facilities - both main engines can be started and stopped electrically -

At the wheelhouse console;

In the engine room.

11.11.2 Controls - single lever operation controlling engine speed and ahead/astern selection is employed for each engine and remotely controlled from the helmsman's position in the wheelhouse. Twin control heads are used.

11.11.3 Shut-down to Idle Solenoids - the engine speed attachment of each engine incorporates a mercury switch operated solenoid that reduces the engine speed to low idle in the event of a knockdown or capsize. When the solenoids operate RED warning lights light-up on the helmsman's console. The lights are situated above the capsize cancel switches, and it is imperative -

THAT THE TWIN SINGLE LEVER CONTROLS ARE RETURNED TO THE NEUTRAL POSITION BEFORE OPERATING THE CANCEL SWITCHES!!

- a notice to this effect is fitted adjacent to the warning lights and the cancel switches.

11.11.4 Engine Mounted Instruments - each engine has an instrument panel bearing engine oil pressure, water temperature and gearbox oil pressure gauges. In addition a service unit meter, engine Start and Stop push button switches and an engine isolation switch is fitted.

11.12 PIPEWORK COLOUR CODES

11.12.1 All pipework on the lifeboat is painted in accordance with the colour code shown below.

S Y S T E M	COLOUR/BSI No.
Sea water inlet to engine, fire pump, etc.	GREEN 995
Overboard discharges	BLUE 1190
Fresh water	YELLOW 109
Lubricating oil	LIGHT BROWN E160
Fuel oil	BROWN 063
Hydraulic oil	ORANGE
Fire main. Discharge from pump	RED
Bilge suctions & drain to bilge	BLACK

11.12.2 A tally plate (A1/2516) is fitted in a prominent position in the lifeboat.

11.12.3 The above colour code is being adopted for all new construction lifeboats and the existing lifeboats are to be painted in accordance with this code at the next survey.

11.13 AUXILIARY GENERATOR SET

11.13.1 Introduction - the auxiliary generator set has its own independent systems and is in no way interconnected to any of the main engine systems. On Waveney's 44-001 to 44-015 inclusive the set is installed in the forward end of the engine room and on 44-016 to 44-022 it is installed at the centre aft end of the engine room.

11.13.2 Prime Mover - this is a Petter, single cylinder sea-water cooled, diesel type AC1W, producing 6 BHP at 3,000 rpm. The engine can be started electrically or by hand.

11.13.3 Alternator - the associated alternator is a CAV type that produces 24 volts, 60 amperes at 3,000 rpm.

1.13.4 Cooling - the engine is cooled by sea water, the engine driven pump drawing water from the firemain sea inlet and strainer via an isolating valve through the engine and into the exhaust pipe for eventual discharge overboard. A silencer is fitted in the exhaust line prior to the sea water injection point.

11.13.5 Fuel - the fuel tank mounted on the set is complete with feed, vent and filling connections. Some sets are fitted with a separately mounted tank holding approximately 4.5 gallons, other tanks hold approximately 9 pints only. The engine is fitted with its own fuel lift pump, filter,etc

11.13.6 Exhaust - the diesel engine exhausts at the boatside. A short length of flexible stainless steel exhaust tubing with flanged ends connects the exhaust outlet on the engine to a mild steel pipe that rises to a point where discharged cooling sea water from the engine is injected. All dry sections of the exhaust are lagged with heat resistant material.

11.13.7 Lubricting Oil - the engine operates on the wet sump principle and all items are self contained on the engine.

11.13.8 Controls - the engine is electrically or hand started and has a stop/run lever mounted on the engine. Engine speed is controlled locally at the engine.

11.13.9 Automatic Shut-down - a watchkeeping panel usually mounted at the main electrical distribution board or adjacent to the generator set. This will automatically shut down the engine should either a too high water cooling temperature or a too low oil pressure occur. The panel bears low oil pressure, hight water temperature, charge and high charge RED warning lights together with a GREEN "ACCEPT FAULT" warning light.

N.B. The above features allow unattended operation of the generator set **while someone is onboard the lifeboat, B U T - THE PRIME MOVER IS A DIESEL ENGINE AND SHOULD NOT BE STOPPED BY ALLOWING IT TO RUN OUT OF FUEL.**

11.13.11 Purpose of the Auxiliary Generator - it can be used in either of the following modes :-

(a) Battery Charging - used when the lifeboat is secured at moorings or alongside with the main engines closed down. Two rates of charge are available known as the 'High' rate and 'Normal rate'. The 'High' rate is only available when both Port (Start) and Starboard (Load) battery isolator switches are in the 'OFF' position. With the isolator switches 'OFF' an additional resistor fitted into the alternator control equipment is brought into the circuit which raises the charge voltage from 27.5 volts to 29.5 volts to provide a higher rate of charge. If either of the isolator switches are switched 'ON' the resistor is taken out of circuit to provide the normal boat load charging voltage of 27.5 volts. It should be noted that the Starboard (Load) isolator switch must be switched ON to energise the auxiliary generator starter motor circuit. Once the engine is running the Starboard (Load) isolator must be switched to OFF together with the Port (Start) isolator and the Coupling switch to obtain the 'High' charge rate. In this mode the voltmeter adjacent to the set indicates 29.5 volts, and the Starboard (Load) batteries will be receiving a 'HIGH' charge rate. If the Port(Start) batteries require charging the Coupling switch must be switched 'ON'. In this condition both banks of batteries will receive a 'High' charge. It is not possible to charge the Port(Start) batteries on their own.

(b) Emergency Feed into the Boatload - in this mode the battery isolator switches will be 'ON' and the resistor mentioned in (a) above will be taken out of circuit to provide the normal boat load charging voltage of 27.5 volts. This mode is primarily for use when the lifeboat is at sea with the starboard engine shut-down and there is a requirement to provide emergency feed into the boatload batteries. See also Sect.11.14. But, in the event of the Port engine being shut-down, the starboard engine still running, and there is a need to provide emergency feed into the Port(Start) batteries (which also supply the electronics equipment See Sect.11.14.2(a)(3), then the output of the aux.gen. can be applied to the Port(Start) battery, in addition to the Starboard(Load) battery, by switching the Coupling switch 'ON'. In either case, the output of the remaining engine driven alternator is capable of supplying all electrical demands.

11.13.12 Starting the Aux.Gen.Set

(a) Check that the Aux.Gen.Set Isolator switch is 'OFF' and switch the Starboard (Load) Isolator switch to its ON position.

(b) Open the Firemain sea inlet valve and the valve to the Aux.Gen.Set sea water cooling system (See Sect.11.13.4).

(c) Open the Aux.Gen.Set exhaust valve. This valve is normally kept closed to prevent the ingress of water when the generator is not in use.

(d) Check the lubricating oil and diesel fuel levels.

(e) Using the dipstick suction rubber, or an oil can, inject a small quantity of lubricating oil into the aperture at the top of the cylinder head.

(f) Switch ON the Generator switch on the Instrument (Alarm) panel.

(g) Start the engine by pressing the STARTER button.

(h) When the engine is running evenly, switch OFF the Starboard (Load) isolator switch to obtain the 'HIGH' rate of charge.

(i) Switch ON the Aux.Gen.Set isolator to apply the load and check that the voltmeter is reading 29.5 Volts and that the 'High' charge rate RED light is glowing on the watchkeeping panel.

(j) Check that the GREEN "Accept Fault" warning light is glowing on the Alarm Panel.

(k) Check that the Battery box ventilation fan is running.

For hand starting, follow steps (a) to (f) inclusive, then -

- Check that the fuel shut-off lever is in the RUN position;

- Engage the starting handle;

- lift the decromprssion lever and crank engine;

- release the decompression lever and continue to crank the engine until it starts;

- when the engine is running evenly carry out steps from (h) above.

11.13.13 Shutting Down the Aux.Generator Engine

(a) Remove the 'load' from the generator by switching OFF the Aux.Gen.Set isolator.

(b) Allow the engine to run for about five minutes to allow the sea water coolant to reduce the heat level.

(c) Place the switch on the Alarm panel to OFF.

(d) Close the exhaust valve, the sea inlet feed valve and the Firemain sea inlet valve.

(e) Refill the Aux.Gen.Set diesel fuel tank to prevent condensation contaminating the remaining fuel.

(f) Finally, switch the starboard (Load) isolator OFF.

11.14 MAIN ENGINE SHUT DOWN AT SEA

11.14.1 Facilities Provided by Main Engines - besides generating the propulsion power to drive the propellers, and hence the lifeboat, each main engine provides other facilities via power take-off points (PTO's). The facilities are bilge pumps, firemain pump, sea water circulation pumps that besides cooling the engines also cool the exhaust systems and lubricate the propeller tailshaft bearings situated in the shaft logs. In addition each engine drives an alternator that charges or maintains the charge on the banks of batteries and supplies the electrical load of the lifeboat. The engine fresh water cooling system also supplies the hot water to the cabin heaters . If one engine has to be shut-down whilst at sea the other engine's systems are capable of providing most of these facilities by means of switches, isolating and changeover valves. All the capabilities have been mentioned in the text and are summarised in the following paragraphs for convenience.

11.14.2 Port Engine Facilities

(a) PTO's - (1) Bilge pump with suction in the engine room.

(2) Firemain pump which is used for emergency suction as well as its primary function.

(3) Alternator which provides electrical power to the port (Starter) battery. The port starter battery provides the "Starting" current for both main engines, for the alarm circuits, door/hatch warning system, and the electronics equipment, i.e. radio's, D/F's, Radar, Echo sounders and the intercom.

(b) Sea Water Pump - engine cooling and lubrication of the port stern shaft bearing.

(c) Fresh Water Cooling Pump - hot water to the fore Survivors cabin and the Crew/Radio Cabin.

11.14.3 Starboard Engine Facilities

(a) PTO's - (1) Bilge pump with suction in the engine room.

(2) Alternator which provides electrical power to the starboard (boatload) battery. This battery provides electric power to all the circuits in the

11.14.3
contd..

lifeboat except those listed in Sect. 11.14.2 for the Start battery.

(b) Sea Water Pump - engine cooling and lubrication of the starboard propeller stern bearing.

(c) Fresh Water Cooling Pump - hot water to the heater in the aft cabin.

11.14.4 Port Engine Shut-down - if the port engine has to be shut-down while at sea :-

(a) The bilge pump facility normally provided by this engine driven pump, can be maintained by using the starboard engine driven bilge pump.

(b) The firemain pump facility is out of action while the port engine is shut down.

(c) The port alternator no longer provides electric power for the port (Start) battery. If it is expected that the engine will be shut down for a lengthy period the Coupling switch may be put to its ON position and the electric power from the starboard alternator shared between the banks of batteries. Each engine driven alternator provides sufficient output to charge both banks of batteries nevertheless, the Coupling switch should only be used if the port ammeters show a discharge.

(d) The sea water lubrication of the port shaft log can be maintained by use of the sea water system changeover/ isolation valve.

(e) The hot water normally supplied to the fore Survivors cabin and to the Crew/Radio cabin will cease to circulate and will eventually cool down.

11.14.5 Starboard Engine Shut-down - if the starboard engine has to be shut-down while at sea.

(a) The bilge pump facility normally provided by this engine driven pump can be maintained by use of the port engine driven bilge pump. In addition the emergency bilge suction provided by the firemain pump system is available.

(b) The alternator no longer provides electric power to the starboard (Boatload) battery. If there is a heavy electric load on the batteries, i.e. at night with all lights, searchlight, fans, etc., running, the batteries will discharge. To maintain the charge on the boatload battery,

11.14.5
contd..

the Coupling switch can be switched ON to share the output from the port engine driven alternator, but if the starboard discharge ammeter still shows a discharge under these conditions, the Coupling switch should be switched OFF and the Auxiliary Generator Set brought into use to provide emergency charging current to the boatload batteries as in Sect. 11.13.11 (b).

(c) The sea water lubrication of the starboard shaft stern bearing can be maintained by use of the sea water changeover /isolation valve.

(d) The hot water normally supplied to the aft cabin heater will cease to circulate and eventually cool down.

SECTION

TWELVE

STEERING SYSTEM

SECTION 12

STEERING SYSTEM

12.1 MANUAL STEERING GEAR

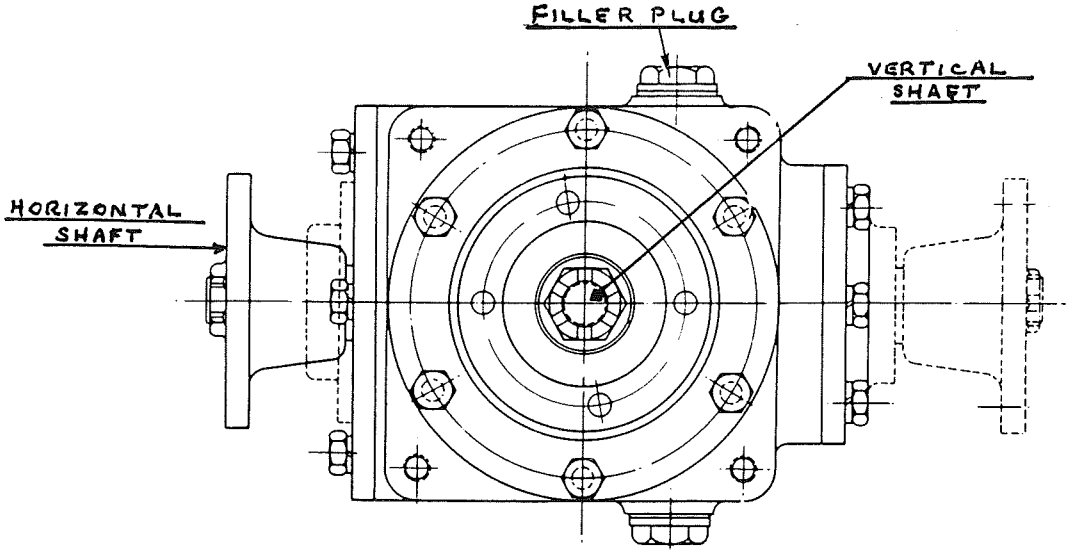
12.1.1 The lifeboat is fitted with Mathway Marine manual steering gear type L/S. The mechanical system incorporates the use of a steering bowl with helm indicator, right angle bevel boxes, and an aft end reduction gear box which is connected to the linked twin rudders (tiller arm) by means of a ball jointed drag link. The system is connected together by means of universally jointed shafts. Where a shaft passes through a bulkhead, a bulkhead bearing is used which incorporates a self-aligning bearing.

12.1.2 Emergency Steering - an emergency tiller which serves also as a fixed anchor catting davit, is provided for use in the event of a steering gear failure. The emergency tiller is stowed on the forward side of the aft cabin forward bulkhead in the well deck. The tiller fits over the squared ends of either rudder stock via holes in the after deck and steering is then carried out from that position.

12.1.3 Lubrication and Maintenance

(a) Steering bowl - on installation the Steering Bowl is filled with oil to the level of the wheel shaft. The filler plug is accessible by removing the bowl lid which exposes the plug in the pointer carrier plate. After filling, providing the oil seals are working properly the oil should remain in the container indefinitely. The oil level is normally checked during Survey.

(b) Bevel box - the Bevel boxes are filled with SAE 30 oil.

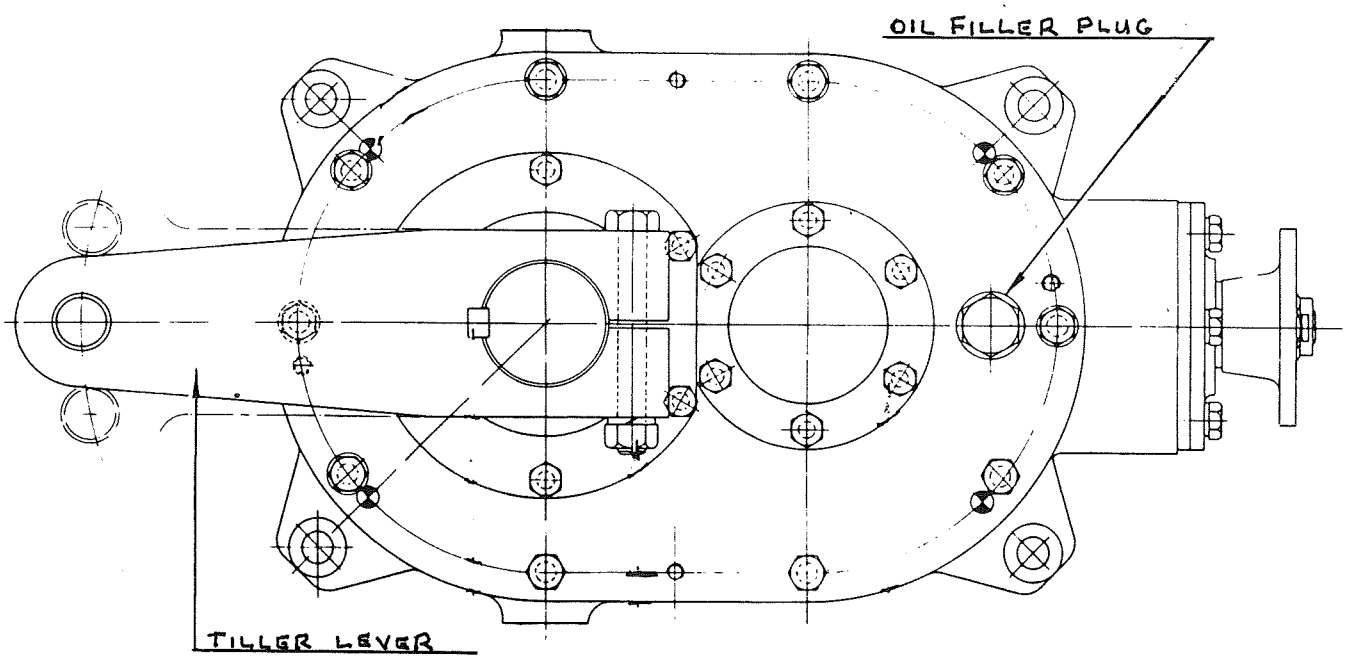


BEVEL BOX

These also require limited attention providing the oil seals are doing their work properly.

12.1.3
contd..

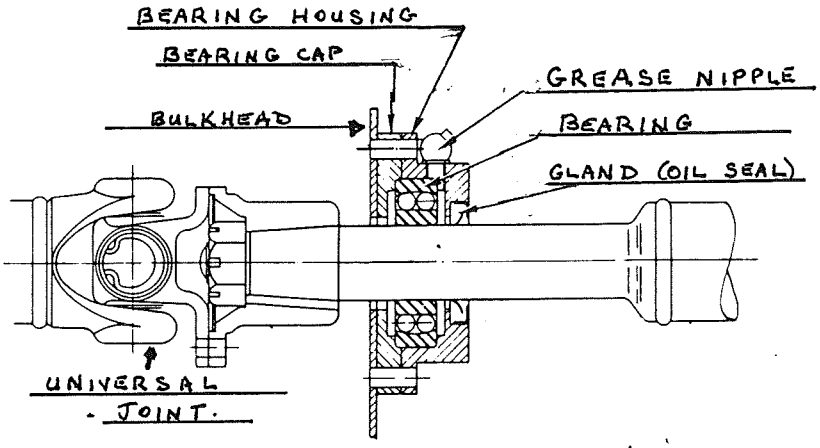
(c) Aft End Reduction Gear Box - this is filled with SAE 30 oil and should be checked once every six months and topped-up as necessary.



AFT END REDUCTION GEARBOX RATIO 2:1

It also applies, if the oil seals are operating properly the oil level should remain constant.

(d) Bulkhead Bearings - the bulkhead bearings and the Universal joints are loaded with soft grease.



BULKHEAD BEARING 'LS'

These should be checked every six months and given a 'shot' with a grease gun as required. Where the steering shaft and bulkhead bearings enter and leave the starboard side of the cockpit (well deck) they are particularly prone to the effects of the weather. The protective covers should be removed and the steering shafts and fittings examined for corrosion; be greased and then sprayed with WD40 or FOSPRO before replacing the covers.

12.1.3
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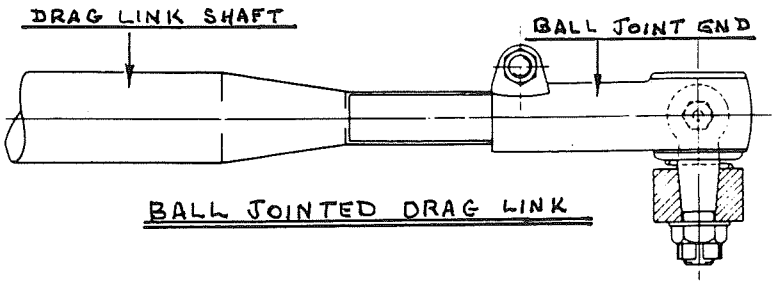
(e) Ball Jointed Drag Link - The ball joint is loaded with grease.



This should be checked every six months and given a 'shot' with a grease gun as required.

(f) The steering system has proven to be extremely reliable and after the initial installation, no maintenance is required other than that listed above and a visual inspection to ascertain that all oil seals are leak free. No adjustment is required providing the steering gear has not been damaged. Any suspected faults should be reported via the Station Honorary Secretary to the District Engineer.

Fore Peak/Cable Locker

	1	Check interior; security of anchor cable	W						
		Forward Passenger/Survivor Compartment							
	1	Check seat belts	W						
	2	Check first-aid locker	W						
	3	Check stowage mouth-to-mouth resuscitor	W						
	4	Check stowage of fire extinguishers	W						
	5	Check the operation of the escape hatch	W						
	6	Check the Pyrotechnic stowage	W						
	7	Check coach heater for leaks	W						
		Crew/Radio Cabin							
	1	Check the dist/switchboard for cleanliness	W						
	2	Check seat belts	W						
	3	Check dresser unit stowages	W						
	4	Check fire extinguisher stowage	W						
	5	Check RED parachute flares stowage	W						
	6	Check coach heater for leaks	W						
		Survivor/Stretcher Compartment (Aft cabin)							
	1	Check seat belts	W						
	2	Check line throwing equipment stowage	W						
	3	Check FABA equipment stowage	W						
	4	Check the veering line stowages	W						
	5	Check rope trays, and anchor catting block	W						
	6	Check wave subduing oil tank	W						
	7	Check Elsan toilet	W						
	Check coach heater for leaks		W						

Steering Gear Compartment

	1	Check compartment, cleanliness	W						
		Main Deck							
	1	Check bow staff,lubrication of fittings	W						
	2	Check fore anchor stowage	W						
	3	Check windlass	W						
	4	Check guard rails, stanchions and life line fittings	W						
	5	Check life raft stowage	W						
	6	Check wheelhouse screens; fixings	W						
	7	Check seat belts, helmsman and lookout	W						
	8	Check folding mechanism of Whip aerials	W						
		Alarms							
	1	Check capsize circuit test sw. port	W						
	2	Check capsize circuit test sw. stbd	W						
	3	Check port eng. coolant test switch	W						
	4	Check stbd eng. coolant test switch	W						
	5	Check fire bottle test switches	W						
	6	Check fire alarm test switch	W						
		Boathouse							
	1	Check pyrotechnics	W						
	2	Check fuel storage tanks	W						
	3	Check stores and equipment	W						
	4	Check protective clothing	W						
	5	Check life-jackets	W						
	6	Check boarding boat	W						

MONTHLY CHECKS

	1	Check strum boxes and bilges	M						
	2	Check fire pump sea inlet	M						
	3	Check all W/T doors/Hatches;grease	M						
	4	Remove anchor cable,gratings,check	M						
	5	Check guard rails; grease fittings	M						
	6	Check life-lines; grease turnbuckles	M						
	7	Remove anchors, check, re-stow	M						
	8	Check for earth leakage; electrics	M						
	9	Check S.G. mechanical linkages;grease	M						
		THREE MONTHLY CHECKS							
		(Preferably when 'at sea'.							
	1	Check operation of fire main	3M						
	2	Check operation of windlass	3M						
	3	Check emergency steering	3M						
	4	Check operation of bilge pumps	3M						
	5	Check engine capsize units	3M						
	6	Check compass	3M						
	7								

SECTION

THIRTEEN

FIRE PROTECTION & FIRE FIGHTING

13.1 Fire Protection System

13.2 Spare

13.3 Halon 1301 BTM (Bromotrifluoromethane)

13.4 Fire in the Engine Room

13.5 Spare

13.6 Portable Hand Extinguishers

13.7 BCF (Bromochlorodifluoromethane)

13.8 Foam

13.9 Water

13.10 Fresh Air Breathing Apparatus

13.11 Spare

13.12 Casualties on Fire

13.13 Pumping out a Casualty Alongside

SECTION 13

FIRE PROTECTION & FIRE FIGHTING

13.1 FIRE PROTECTION SYSTEM

13.1.1 Lifeboat Protection in General - the lifeboat is protected by using a Halon (BTM) piped system in the engine room, with automatic and manual release facilities. Also distributed about the lifeboat are portable BCF and Foam extinguishers. A firemain pump with deck hydrant is also fitted.

13.1.2 Engine Room Fire Protection - the engine room is protected by two fixed 15lb. Halon 1301 (BTM) extinguisher bottles fitted with mechanically operated remote control systems in the form of 'fire-pulls ' situated on the helmsman's console. One of the extinguishers (the Primary) is fitted in the engine room and in addition to the 'fire-pull' operated valve has a temperature sensitive glass phial which will automatically discharge the extinguisher should the temperature in its vicinity reach a level of 175°F (80°C). The other extinguisher (the Secondary) is fitted in the Crew/Radio Cabin with its discharge outlet piped to a nozzle on the engine room forward bulkhead for discharge into the E/room; this extinguisher does not have the facility to discharge automatically. Each extinguisher is fitted with a contents pressure gauge and a pressure switch.

13.1.3 Pressure Switches - each pressure switch is wired to operate the alarm bell and its respective warning light in the wheelhouse to indicate that one or both of the fixed extinguishers have discharged or suffered leakage.

13.1.4 Fire Detectors - three fire detectors mounted under the deckhead in the engine room, one over each main engine and one over the Auxiliary Generator Set, will actuate fire warning sirens mounted in the engine room and the wheelhouse if the temperature in their vicinity reaches 155°F (68.8°C). It should be noted that the temperature at which the fire detectors will operate is lower than the temperature at which the engine room Primary extinguisher automatically discharges. Therefore the sequence of events, in the case of a fire in the engine room will be :-

At a temperature of 155°F - **Sirens sound.**

At a temperature of 175°F - **Primary ext. discharges.**

13.1.5 Correct Use of Fire-Pulls - the fact that the fire sirens sound **BEFORE** the Primary fixed extinguisher discharges automatically should be remembered. There is no need to remember the temperatures at which each event occurs. If the fire sirens sound and it is determined that a fire exists in the engine room, the Primary extinguisher could be operated manually by means of the fire-pull rather than wait for it to discharge automatically. This action leaves the Secondary extinguisher as a reserve or back-up if and when it is required; whereas if the Secondary extinguisher is discharged by means of its fire-pull, (before the Primary extinguisher) then there is a liklehood that the Primary extinguisher will be discharged automatically by a rise in temperature too. This would result in no reserve being available, but see Sect.13.4 also.

13.2 Spare

13.3 HALON 1301 BTM (BROMOTRIFLUOROMETHANE)

13.3.1 Stored as a liquified gas Halon 1301 BTM is a very efficient fire fighting medium and for a given space, less is required to kill a fire than would be the case with CO2 or BCF (Bromo chlorodifluoromethane). BTM type fixed and portable extinguishers are gradually replacing all BCF types as they become due for renewal. Though Halon 1301 is an inert gas compound at normal temperatures, there have been reported cases of minor side effects after exposure to the gas (headaches and nausea).

W A R N I N G !!

ALL SPACES SHOULD BE VENTED WELL AFTER DISCHARGE OF THE HALON. IF THIS IS NOT PRACTICABLE OR IN THE CASE OF AN EMERGENCY, THE BREATHING APPARATUS SHOULD BE WORN BY A PERSON ENTERING THE AFFECTED COMPARTMENT.

As a portable extinguisher, Halon is a good general purpose unit and will successfully deal with any type of fire outbreak on the lifeboat. It can be used externally to 'snuff-out' a small fire at close range but the gas blanket will be blown away and re-ignition is a possibility. It is most effective when used in still air conditions and for this reason, all compartment fans should be stopped and ventilation blocked off.

W A R N I N G !!

BTM AND BCF BEING PRESSURISED GAS CAN CAUSE FREEZE 'BURNS' WHEN RELEASED. CARE SHOULD BE TAKEN NOT TO TOUCH THE EXPANSION HORN ON PORTABLE APPLIANCES.

13.4 FIRE IN THE ENGINE ROOM

13.4.1 The procedure outlined below should be followed strictly.

(a) Evacuate all persons from the engine room and close all doors.

(b) Stop the main engines (and the auxiliary generator if running).

(c) Stop the engine room exhaust ventilation fan.

(d) Fit air inlet and exhaust ventilation terminal fire covers.

(e) Release the Primary extinguisher gas by means of its fire-pull if the extinguisher has not already automatically discharged. (Check the RED fire warning lights on the wheelhouse console).

(f) When the fire is extinguished and **before** entering the engine room, a period of ventilation is required.

(g) Open the engine room doors.

(h) Remove the air inlet and exhaust ventilation terminal covers.

(i) Run the engine room exhaust ventilation fan.

W A R N I N G !!

IT IS IMPERATIVE THAT THE ENGINES ARE STOPPED BEFORE THE VENTS ARE BLANKED OFF AND THE VENTILATION FAN IS STOPPED - AND IT IS IMPERATIVE THAT THE ENGINES ARE NOT RE-STARTED UNTIL THE FIRE FLAPS ARE REMOVED OR OPENED AND THE VENTILATION FAN IS RUNNING.

13.6 Spare

13.7 BCF (BROMOCHLORODIFLUOROMETHANE)

13.7.1 Stored as a liquified gas, it is gradually being replaced by Halon 1301 (BTM). See Sect. 13.2.1. Everything said in Sect.13.2.1 about BTM applies to BCF and this includes the WARNINGS.

13.8 F O A M

13.8.1 The two portable foam extinguishers are primarily intended for use on fuel or oil fires and should never be used on or near electrical equipment. The foam should not be directed at the base of a fire but played against a vertical surface, such as an engine block or bulkhead. The foam will then run off and form a blanket over the burning liquid, sealing off air from the fire. A slight cooling effect is also provided by the foam and this, together with the blanketing effect, will prevent further ignition. For this reason the foam layer should be left unbroken until all surfaces have cooled. In extreme cases foam may be used on textile fires but it does not penetrate as well as water and therefore has less cooling effect.

13.9 W A T E R

13.9.1 A 2.5 inch firemain pump is driven by a power take-off on the port main engine. This pump takes suction from its own sea inlet and supplies water under pressure to a deck hydrant mounted within a recess on the port side of the superstructure. Between the sea inlet and the pump is a three-way cock which allows emergency bilge suction to be connected into the system. See Sect.14. A portable suction hose complete with an Eductor (Jet pump) provides a bilge pumping facility on a casualty lying alongside when this is necessary to save life.

13.9.2 **W A R N I N G !!**

THE PRESSURISED SEA WATER SYSTEM IS PROVIDED AS A BACK-UP TO THE OTHER FIRE PROTECTION SYSTEMS AND SHOULD NOT BE REQUIRED FOR ONBOARD USE EXCEPT IN DIRE EMERGENCY. APART FROM THE POSSIBLE SERIOUS DAMAGE TO MACHINERY AND ELECTRICAL GEAR (WHICH CAN BE AVOIDED BY USING BTM OR BCF GAS) THERE IS THE THREAT OF LOST STABILITY DUE TO A BUILD UP OF 'FREE SURFACE' EFFECT ON THE WATER USED.

By using the protection from a fog nozzle spray 'umbrella' lifeboat crew may be able to effect a rescue from a burning casualty, but the firemain pump is not designed for, (and except for saving life) should not be used as a means of salvaging a vessel.

13.10 FRESH AIR BREATHING APPARATUS (FABA)

13.10.1 This is a short distance breathing apparatus, in which fresh air is drawn up the hose by the wearer's own inspiratory effort. It can be used up to a maximum distance of 30 feet. (9 metres).

13.10.2 The complete FABA equipment is stored in a fibreglass carrying storage case. The lid of the storage case carries full instructions for use of the equipment. The apparatus comprises a full facemask with built-in speech diaphragm, rubber breathing tube and lightweight connections, a waist belt, 30 ft. (9 metres) rubber/canvas wire reinforced hose with fittings and strainer, a life-line and heat resistant gloves.

13.10.3 The instructions modified for use on the lifeboat are as follows :-

(a) Remove life-jacket and helmet or bump hat.

(b) Buckle on FABA belt ensuring the connector is on the left of body.

(c) Connect black rubber breathing tube to the top of belt connector.

(d) Connect facemask to other end of black rubber tube.

(e) Hang facemask around neck by means of neckstrap.

(f) Keep free end of supply air hose (end fitted with strainer) in a fresh air zone, with another crewman as attendant.

(g) Fit facemask by placing thumbs inside head harness straps, place chin into chin cup and draw facemask onto face.

(h) Tighten lower side straps first, then top side straps and finally top strap. A correct seal can be obtained without overtightening straps.

(i) Ensure life-line is secured to belt and free end is run out.

13.10.4 Signals FROM Wearer of Apparatus via Life-line

One pull - more fresh air

Two pulls - slack-off life-line

Three pulls - help me out immediately.

13.10.5 TO Wearer of Apparatus

Three pulls - come out immediately.

13.10.6 Facemask - Servicing after use

Remove mask from apparatus. Inspect for damage and replace parts as necessary. Wash thoroughly in clean running water and then shake to remove excess water. Allow to dry away from sunlight and direct heat. Polish visor with clean lint free cloth and replace guard on the outer surface. Pack facemask in its plastic bag and stow in the FABA carrying box.

13.11 Spare

13.12 CASUALTIES ON FIRE

13.12.1 As stated in Sect.13.9 the firemain pump is only to be used to fight fires aboard another vessel in exceptional circumstances when life is in danger and this is the only means of saving life. If a casualty on fire has to be dealt with then it should be approached with care.

13.12.2 On reaching the casualty the Coxswain's actions will very largely be dictated by the circumstances prevailing however, the broad basis is likely to involve :-

(a) Approach from windward.

(b) Make use of the lifeboat's own fire fighting equipment to keep the lifeboat cooled down, dislodge sparks, etc.

(c) Beware of poisonous or asphyxiating fumes from the casualty.

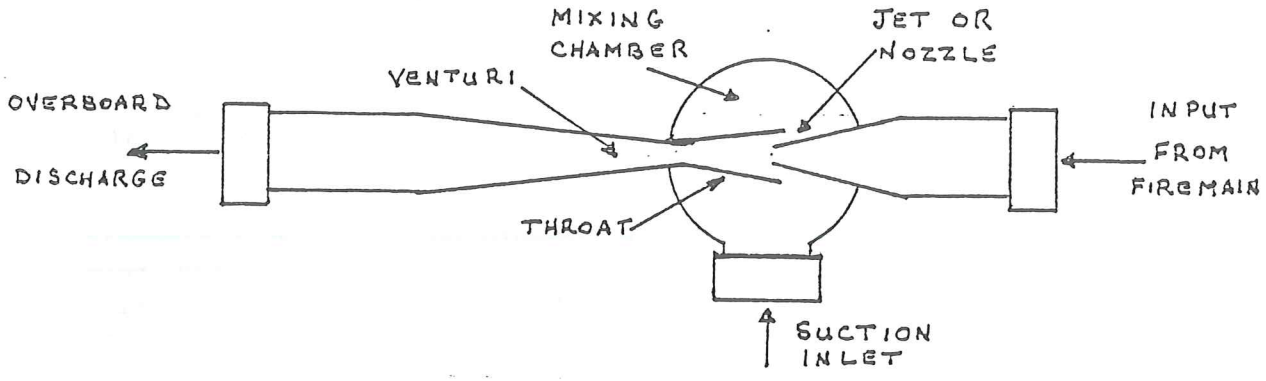
(d) Prepare the onboard firemain and the portable fire extinguishers so that they are readily available for use if required.

(e) Be prepared to receive survivors suffering from burns.

13.13 PUMPING OUT A CASUALTY ALONGSIDE

13.13.1 The firemain pump/suction unit can be used with a portable Eductor to pump out a casualty alongside the lifeboat.

13.13.2 Eductor - externally the portable Eductor resembles a 'T' pipe fitting with a 10 ft. length of suction hose fixed to the upright of the 'T'. Its interior is more complex however. The Eductor, sometimes known as a Jet Pump, works by pumping a small volume of water through jet into a Venturi chamber. This chamber by reducing the water flow, creates a vacuum that will draw water in through any lower pressure opening. The stronger force of water pushed into the jet the stronger the pumping force acting on the suction input. A theoretical drawing of an eductor is shown below.



13.13.3 Thus the water is delivered from the firemain pump through a hose to the jet of the Eductor. With the reduction of pressure that takes place at this point, the water it is intended to remove is forced by atmospheric pressure to rise in the suction hose until it is caught up in the jet stream and passed to the discharge side of the Eductor, from which it is delivered through hose to an overboard discharge point.

13.13.4 The Eductor is normally suspended above the water, hanging on the hoses, and the quantity of water lifted will vary with the height of the Eductor above the water and the height of the discharge point in relation to the Eductor. If the discharge outlet is **BELOW** the centreline of the Eductor, i.e. the end of the discharge hose, the action of the Eductor becomes siphonic. With the end of the discharge hose **ABOVE** the Eductor the output is reduced quite appreciably, and it is therefore important to keep the discharge outlet as low as possible in relation the the Eductor.

13.13.5 To Rig the Eductor

(a) If the casualty is lower than the freeboard of the lifeboat and the water to be pumped out is close-by then the Eductor may be connected directly to the firemain standpipe. When connected in this way it takes a while longer to prime the pump (See (f) below). Otherwise connect the inlet of the Eductor to the firemain outlet with a length of hose sufficient to reach the flooded area that requires pumping.

(b) Check that the 10ft. length of suction hose together with its strainer is securely fixed to the suction inlet of the Eductor and then place the strainer end of the suction hose into the water in the flooded area.

(c) Connect another length of hose to the discharge side of the Eductor and run its end overboard so that the discharge point (end of discharge hose) is **LOWER** than the Eductor.

(d) Check that the firemain sea inlet is open and the Auxiliary Generator Set inlet closed. Engage the firemain clutch (port engine forward take-off).

(e) Adjust the port engine revolutions to give a firemain pressure reading of just below 75 psi. If the revs are too high a relief valve in the firemain line will operate above 75psi to discharge the excess water overboard thus maintaining a pressure of 75psi. But the aim should be to maintain a pressure at no lower than 70 psi. This pressure gives maximum suction on the Eductor. The engine speed must not exceed the RPM stated on the tally on the Helmsman's console.

(f) Lower the Eductor complete with its connecting hoses into the water in the flooded area. This action, i.e."dunking" the Eductor, will prime the pump by removing air quickly from the suction hose.

(g) Check the Eductor discharge hose to be sure it is running full, then elevate the Eductor and its hoses just above the water in the flooded area.

(h) Once again check the Eductor discharge hose is running full, if not, the Eductor is not pumping out, an obstruction of the line is the most likely cause.

W A R N I N G !!

ANY KINK OR OBSTRUCTION IN THE DISCHARGE HOSE WILL CAUSE THE EDUCTOR TO PUMP WATER INTO THE FLOODED AREA RATHER THAN OUT OF IT.

SECTION

FOURTEEN

OTHER ONBOARD SYSTEMS

14.1 Bilge System

14.2 Wave Subduing System

14.3 Windscreen Wash/wipe Demisting System

14.4 Intercom System.

SECTION 14

OTHER ONBOARD SYSTEMS

14.1 BILGE SYSTEM

14.1.1 Bilge Pumps

Each main engine drives via Vee belts a bilge pump fitted with a remote controlled clutch. The suction for each pump is taken to a strum box placed in the lowest part of the engine room, on its respective side. The strum boxes are easily accessible for cleaning. The pump discharge is piped to the side of the lifeboat. The clutches of the bilge pumps are remotely controlled by mechanical 'pulls' behind or nearby the access ladder from the wheelhouse to the Crew/Radio Cabin.

14.1.2 **THE ENGINE REVOLUTIONS SHOULD NOT EXCEED 1,000 WHEN THE CLUTCHES OF THE PUMPS ARE ENGAGED AND CARE SHOULD BE TAKEN TO ENSURE THAT THE PUMPS DO NOT RUN DRY.**

14.1.3 Emergency Additional Bilge Capacity - for emergency use an additional bilge capacity can be made available by use of the firemain system pump. A suction hose is connected to the three-way changeover cock fitted on the port side of the engine room, the firemain sea inlet cock must be closed and the firemain pump clutched in by hand locally.

14.2 WAVE SUBDUING SYSTEM

14.2.1 Wave Subduing Oil - the oil used in this sytem is special mineral oil without any additives to allow it to be used without causing any type of pollution generally associated with fuel oil spills.

14.2.2 Storage Tank - a small stainless steel tank is located behind the port wing bulkhead of the after cabin. A non return valve is fitted in the suction line near the storage tank and a shut-off valve is fitted adjacent to the pump, also in the suction line.

14.2.3 Oil Pump - a hand operated semi-rotary pump, situated on deck , is used to draw oil from the storage tank. The oil is delivered to jets sited port and starboard under the fenders about a metre aft of amidships. Each pump line has a relief valve fitted.

14.3 WINDSCREEN WASH/WIPE, DEMISTING SYSTEM

14.3.1 Washer - the system is comprised of a one gallon fresh water storage tank and an electric pump unit situated on the console side below the radar display unit.. Water is drawn from the storage tank by the pump and delivered under pressure to spray pipes mounted externally over the top of the forward facing wheelhouse windows.

14.3.2 Wipers - A straight-line wiper is fitted on the wheelhouse centre window and a clear view screen complete with heater on the starboard window. Later lifeboats have three straight-line wipers on the forward facing windows.

14.4 INTERCOM SYSTEM

14.4.1 Intercom Layout - an internal two-way communication system between compartments, main deck working areas and the wheelhouse helmsman's position is installed. A local loudspeaker is fitted on top of the helmsman's console close to the forward facing windows.
The sub-stations of the system are located :-

Forward Survivors compartment.
Crew/Radio Cabin.

Aft Stretcher Cabin.
Fore deck (via plug and socket).
Aft Deck (via plug and socket).

14.4.2 Improved Intercom System - an improved intercom system has been fitted to some Waveney's. This system has a boom microphone and headset built into protective headgear in the form of an helmet. A further development has been to provide the Coxswain with the facility to switch his headset from 'intercom' to the VHF transceiver. The advantage of the new system is the much improved communication between crew members working on the main deck and crew members in the wheelhouse.

S E C T I O N

F I F T E E N

RADIO COMMUNICATION EQUIPMENT & NAVAIDS

(COMNAVAIDS)

SECTION 15

RADIO COMMUNICATION EQUIPMENT & NAVAIDS

(COMNAVAIDS)

15.1 INTRODUCTION

15.1.1 Radio communication equipment and navigational aids are constantly being overtaken by technology. Manufacturers make changes and bring out new 'lines', and although attempts are constantly being made to standardise RNLI equipment it proves very difficult to do so when manufacturers cease making certain types and introduce newer types.

15.1.2 Equipment Handbooks - - the handbooks for the particular equipment fit on your lifeboat, together with the operating instructions are supplied with the lifeboat. The handbooks should be studied in conjunction with the information given in this Section, and the handbooks should be kept in a safe place for later reference.

15.2 M.F. RADIOTELEPHONE

15.2.1 General Description of Outfit - a Falkland radiotelephone, otherwise known as the RACAL TRA 950, is fitted in the Crew/Radio Cabin. The aerial for this outfit is an 18ft. Bantex whip. The aerial is a folding type.

15.2.2 The Falkland II and Falkland marine radiotelephone equipments are 120 watt (nominal) peak-envelope power transmitter-receivers for shipborne installation.

15.2.3 Channels Available - provision is made for reception and transmission in either the single sideband mode or the A.M. Mode. Single or two-frequency simplex communication is provided by 11 transmitter channels and 23 receiver channels for Falkland II or 16 receiver channels for the Falkland. The distress frequency of 2182kHz is included in the transmitter and the receiver channels. Each channel is crystal controlled and separate crystals are used for reception and transmission.

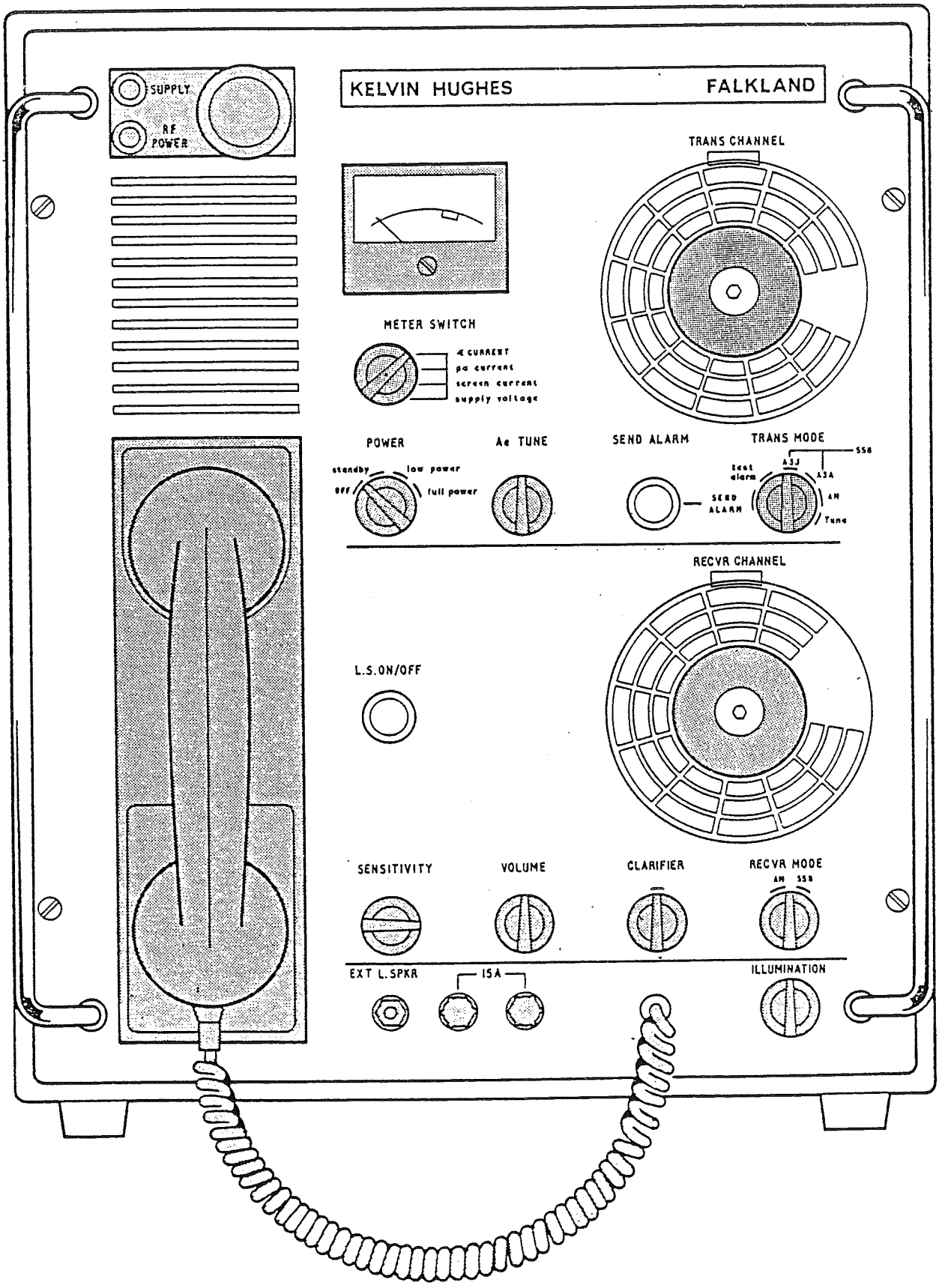
15.2.4 **Note:** Since the introduction of this MF outfit the "Mode of Emission" designators have been changed by International agreement. The 'old' and 'new' designators are shown below.

OLD	NEW	MODE OF EMISSION
A3	A3E	Amplitude Modulation. Double Sideband.
A3H	H3E	Single Sideband (SSB) Full Carrier
A3A	R3E	Single Sideband (SSB) Reduced Carrier
A3J	J3E	Single Sideband (SSB) Suppressed Carrier.

In the instructions that follow the new designator will follow the old and be enclosed in brackets, e.g. A3H(H3E) is known as compatible A.M. and can be received on a receiver designed to receive A.M. or SSB.

As can be seen on the drawing that follows, some earlier sets are marked with the old emission designators.

15.2.5 RACAL TRA 950. FALKLAND RADIOTELEPHONE.



15.2.6 Controls - clearly identified front panel controls provide simple operation of the transmitter-receiver. The channel switches are illuminated; the intensity of illumination can be adjusted or switched off by use of a front panel control. A meter mounted on the front panel together with an associated switch, provides indication of aerial current, power amplifier current, screen current and supply (battery) voltage.

15.2.7 Radiotelephony Alarm Signal - a built-in radiotelephone alarm signal generating device is incorporated in the transmitter.

15.2.8 Loudspeaker and Handset - a built-in loudspeaker with an ON/OFF switch and a standard handset are mounted on the front panel. Operation of the handset press-to-talk switch automatically mutes (cuts-off) the loudspeaker and the MF D/F receiver loudspeaker when it is in use.

15.2.9 Frequency Range - the frequency range of the transmitter-receiver is from 1.6 MHz controlled by the crystals inserted.

15.2.10 Operating Instructions

(a) Receiver

(1) Switch the outfit ON by setting the POWER switch to STANDBY or to either FULL POWER or LOW POWER if the transmitter is to be used.

(2) Set the RECVR.MODE switch to A.M. for A3H(A3E) or to SSB for A3A(R3E) and A3J(J3E).

(3) Select the required channel on the RCVR CHANNEL switch. When the switch is set to the D I S T R E S S CHANNEL 2182 kHz, A3H(H3E) is automatically selected irrespective of the position of the R C V R . M O D E switch.

(4) Adjust the VOLUME control to the level required for the headphone or the loudspeaker.

(5) The SENSITIVITY control is normally set to maximum, but may be reduced in conditions of high background noise on the signal.

(6) When receiving in SSB modes, adjust the CLARIFIER control very carefully for optimum speech clarity.

(7) The loudspeaker may be switched ON or OFF at the L.S. ON/OFF switch, but remember, whether on service, exercise or trials the lifeboat is to keep radio watch on 2182 kHz MF, unless temporarily working on other channels or frequencies.

(8) The illumination may be varied or switched off at the ILLUMINATION control.

(b) Transmitter

Note: The transmitter-receiver automatically reverts to the receive condition when the press-to-talk button is released or at the end of SEND ALARM period (45 seconds). The only exception is when the TRANS.MODE switch is in the TUNE position, in which case the transmitter continuously radiates (transmits) tone and carrier frequency at full power.

(1) Switch on the transmitter-receiver at the POWER switch to either LOW POWER or FULL POWER.

Note: - when the transmitter is switched on from the OFF position, **ONE MINUTE** should be allowed for the valve heaters to warm-up. When the transmitter is switched from the STANDY position of the switch, **12 SECONDS** should be allowed for the warming-up of the valve heaters. The only valves in the equipment are the power amplifier valves and unless the heaters are allowed to warm-up as indicated above, they will soon fail to operate.

(2) When the LOW POWER position of the POWER switch is selected, the transmitter delivers 10 to 15 watts into the aerial.

(3) When the FULL POWER position of the POWER switch is selected, the transmitter delivers a minimum of 100 watts into the aerial.

(4) The METER SWITCH is always left in the AE CURRENT position for normal operating. When any other position is selected, the meter should indicate within the green band on the meter dial.

(5) Select the required channel on the TRANS.CHANNEL switch.

(6) For normal operation, set the TRANS.MODE switch to TUNE, and then adjust the AE TUNE control for maximum aerial current on the meter. Do this as rapidly as possible after listening to make sure that the channel is clear, otherwise you will cause interference to other stations.

(7) Set the TRANS.MODE switch to the mode of transmission desired. A3E(J3E) is normally used for SSB transmissions unless A3A(R3E) is requested by the coast radio station. When the TRANS.CHANNEL switch is set to the DISTRESS channel, A3H(H3E) and full power is automatically selected irrespective of the positions of the TRANS.MODE and POWER switches.

(c) Automatic Alarm Signal - the radiotelephone alarm signal consists of two audio frequency tones (one of 2200 and the other of 1300 Hz) transmitted alternately giving a distinctive warbling sound, which can be distinguished by ear through heavy interference.

It must be used ONLY -

To announce that a distress call or message is about to follow.

By a Coast Station to announce the transmission of an urgent cyclone warning.

To announce the loss of a person or persons overboard when the assistance of other ships is required and cannot be obtained satisfactorily by the use of the Urgency signal.

By emergency position indicating radio beacons (EPIRP's).

By a ship sending a MAYDAY RELAY message.

(1) To test the alarm circuit, set the TRANS.MODE switch to TEST ALARM and press the red button. The alarm tones can be heard on the loudspeaker and handset phone, BUT NO TRANSMISSION IS MADE. The alarm will sound for 45 seconds and then cancel: it may be cancelled earlier by the selection of another mode on the TRANS.MODE switch. An incoming call on the receiver will over-ride this test.

(2) In between the TEST ALARM and SEND ALARM positions on the TRANS.MODE switch, a blank position is provided to prevent accidental selection of the SEND ALARM position.

(3) To transmit the alarm signal, select the DISTRESS frequency (2182 kHz) on the TRANS.CHANNEL switch and press the red SEND ALARM button. The alarm signal will be transmitted on full power for 45 seconds and will be heard on the handset phone but not on the loudspeaker. Set the RECVR.CHANNEL switch to the DISTRESS frequency. The send alarm can be sent on any other channel if necessary to attract attention. See the RNLI Communication Instructions & Radiotelephone Procedures Handbook for full details.

15.2.10
contd..

Note: With the TRANS.CHANNEL switch set to CHANNEL A (Distress frequency 2182 kHz) and no AE TUNE control adjustment, the set is guaranteed to give a minimum of 40 watts output. If the operator has time to adjust the AE TUNE control for maximum AE CURRENT he can obtain maximum power output.

(4) When the alarm signal cancels, the press-to-talk switch on the handset may be used to transmit voice in the normal way.

Note: The selection of the DISTRESS CHANNEL A automatically provides A3H(H3E) irrespective of the positions of the RECVR. and TRANS.MODE switches.

(5) If it is required to repeat the alarm transmission, it is only necessary to press the red SEND ALARM button again. Alternatively, transmission of the alarm signal may be cancelled by the selection of another mode on the TRANS.MODE switch.

15.3 FM/VHF RADIOTELEPHONE

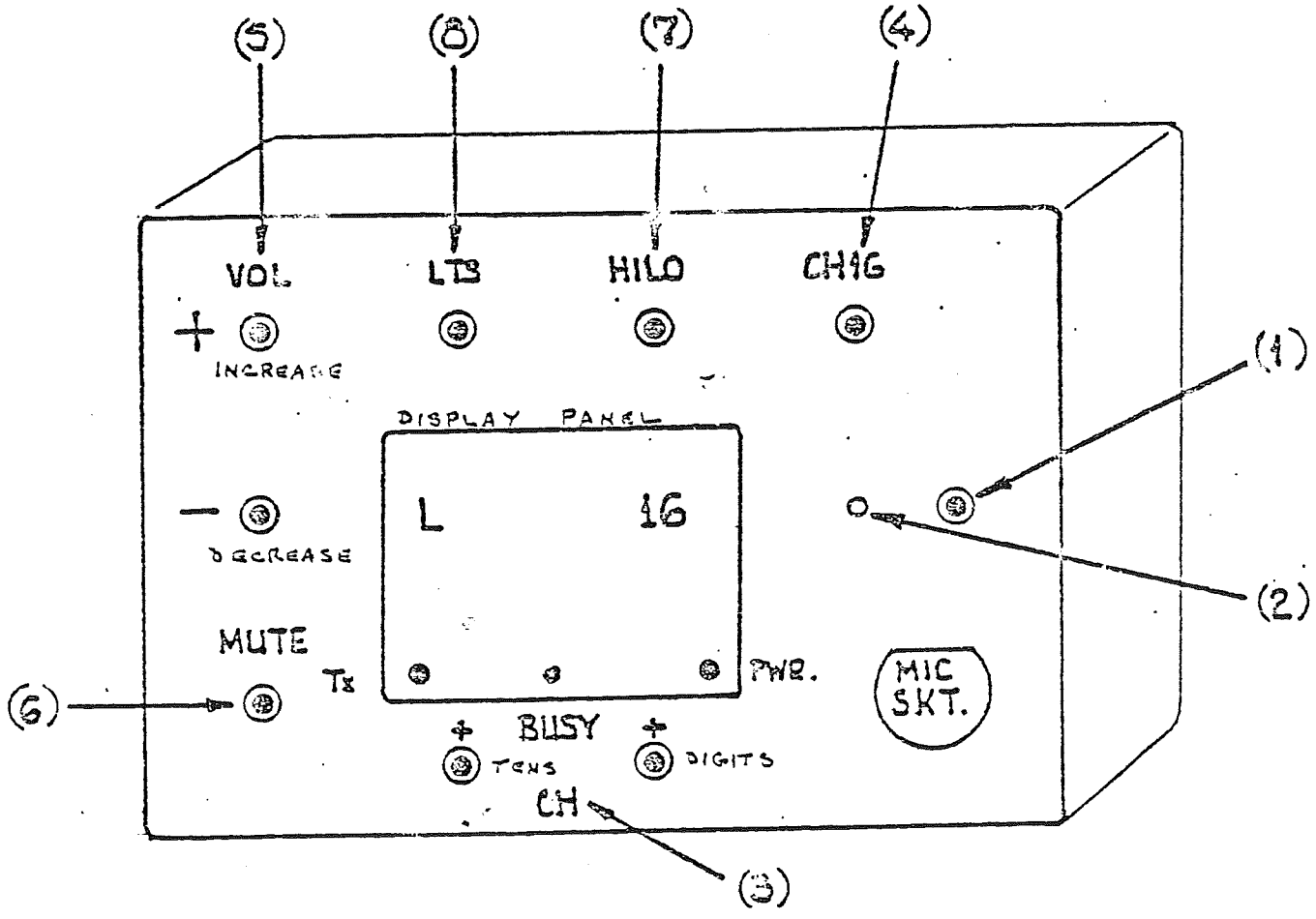
15.3.1 A Pye FM 914 Series, or alternative FM/VHF radiotelephone with a remote unit and a power unit is fitted. The main FM/VHF dipole is mounted on the mast and the emergency VHF slot aerial is mounted on the fore cabin casing with an emergency aerial changeover switch fitted in the wheelhouse above the helmsman's position.

15.3.2 General Description - the FM 914 is described as being a system oriented, computer controlled, frequency synthesised VHF radiotelephone designed for mobile use. It is a compact rugged unit, using the latest technology and with the RNLI designed watertight control box, suitable for lifeboat use. The frequency synthesiser is programmed to give the following channels -

1 to 28 inclusive,
31,37 and 50,
60 to 74 inclusive, and
100 (Channel Zero).

If other channels are introduced at a later date these too can be programmed into the unit.

15.3.3 Operating Instructions - all user controls are fitted on the watertight control box as shown below.



15.3.3
contd..

The paragraph numbers used below correspond with the numbers used on the drawing.

(1) Power ON/OFF

Switches power on or off. The power indicator lamp situated in the bottom right hand corner of the display panel, glows when the unit is ON. The brilliance of all the indicator lights is automatically controlled by a photo-electric cell labelled as (2), to suit the ambient lighting conditions.

(3) Channel Selection

Selects digits (right) and Tens (left) individually (always increasing).

(4) Channel 16

Automatic selection of Channel 16. Previous channel must be selected in the normal manner.

(5) Volume Control

Increase or decrease to desired level. The control must be adjusted when the unit is switched ON.

(6) Mute (Squelch)

Switches the Mute (Squelch) on or off.

(7) Hi Lo

Selects 1 or 25 watts output on transmit. When using 1 watt (Lo) a letter 'L' is shown on the left-hand side of the display, and 'H' when 25 watts (Hi) power is selected. The unit reverts to 25 watts (Hi) on changing channel.

(8) Lts (Lights)

Panel lights on or off.

15.4 AM/VHF RADIOTELEPHONE

15.4.1 For operational reasons a limited number of lifeboats are required to be fitted with an AM/VHF radiotelephone. The type will be a M293 unit unless equipment is transferred from another lifeboat. The unit will be installed in the radio area and an additional AM/VHF dipole aerial will be mounted on the mast.

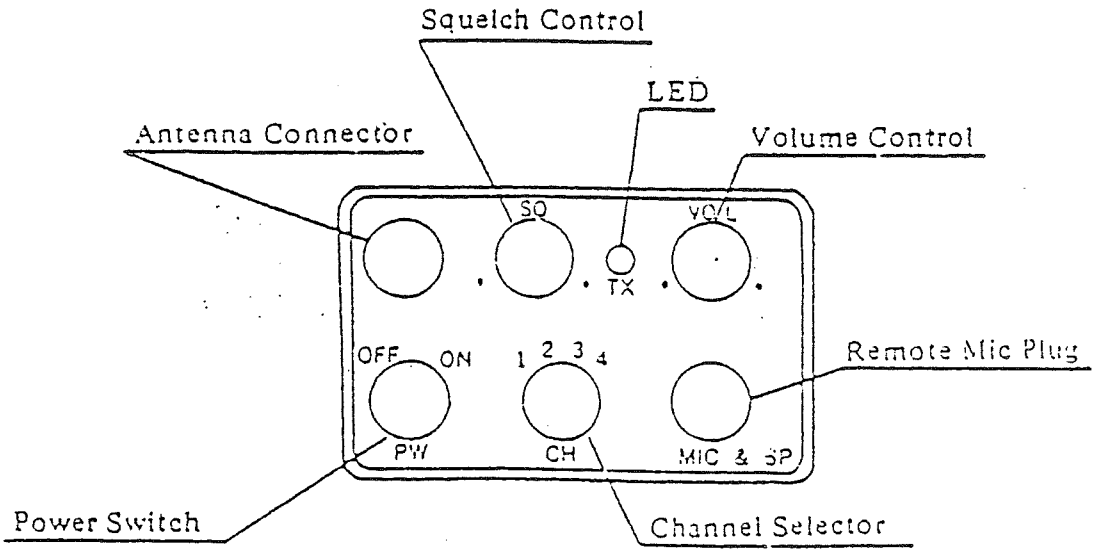
15.5 FM/VHF HAND-HELD RADIOTELEPHONE

15.5.1 A Cody FC 900 hand-held portable VHF radiotelephone is carried onboard. This set is the second VHF FM/VHF radio and is carried as a spare VHF unit and may be used with its own internal stub aerial or the emergency slot aerial.

15.5.2 It is essential that portable or hand-held radios receive proper care and attention to ensure that they are fully effective when required for use. Following prolonged exposure to the elements it should be removed from its leather case and both case and set wiped with fresh water and treated to prevent corrosion. FOSPRO or WD40 should be applied to the controls, but see Sect.15.5.8.

15.5.3 The portable radio is allocated by serial number to a particular lifeboat and should not be exchanged locally when the lifeboat is relieved.

15.5.4 Operating Controls and Switches - the drawing below shows the controls and switches.



15.5.5 Receiving - with aerial and speaker/microphone connected-

(1) Turn the SQUELCH control fully anti-clockwise.

(2) Turn the VOLUME control to about mid-position.

(3) Set the POWER switch to ON.

(4) Adjust the volume control to a comfortable level of noise on a quiet channel.

(5) Turn the squelch control clockwise until the background noise just cuts off. DO NOT GO BEYOND CUT-OFF POINT AS THIS WILL REDUCE THE SENSITIVITY OF THE RECEIVER.

(6) Select the desired channel.

15.5.6 Transmitting - hold the speaker/microphone one or two inches from the mouth, press the push-to-talk switch firmly and keep it depressed during transmission. Distortion will occur if you have the microphone too close to the mouth or you speak too loudly.

15.5.7 Precautions

(a) Transmitting without the aerial connected can damage the output circuits.

(b) The portable should not be used, especially on the main deck, when the main VHF outfit is transmitting otherwise there is a possibility of the portable receive section being damaged by the RF power from the main VHF aerial.

(c) The internal loudspeaker of this unit contains a magnet, therefore it should be stowed and kept well away from the steering compass.

15.5.8 Corrosion Prevention

Frequent exposure to salt water and rain demands that the portable be regularly cleaned and water-proofed in order to prevent corrosion damage. Before the portable is sent out to the coast, the following water-proofing procedures are followed.

15.5.9 Waterproofing

(a) The bases of the ON/OFF switch and the channel change switch are greased with silicone grease between the switch and the case. Also, the Allen key holes are filled with grease.

(b) The holes on the squelch and volume control knob covers are blocked with silicone grease to stop the ingress of salt water around the bases of the knobs.

(c) A small amount of silicone grease is smeared on the mic/spkr connection and WD40 or FOSPRO is sprayed on the aerial connection.

(d) A 'blob' of silicone grease is smeared on the small Phillips screw on the base of the set.

(e) WD40 or FOSPRO is sprayed on the triangular clip on the carrying case.

(f) The whole of the top of the set is sprayed lightly with WD40 and wiped off with a 'J' cloth or a clean dry cloth.

15.5.10 Maintenance

Station maintenance of the portable is essential and you will need :-

A tube of silicone grease (or a jar of vaseline will do just as well). Ident No.C/723.

A can of WD40 or FOSPRO. Ident No. C/696.

15.5.11 If you use the portable at sea and any amount of salt water gets on the set, you should :-

(a) Remove the mic/spkr and the aerial.

(b) Remove the set from the carrying case.

(c) Wash the set in a sink or bowl filled with fresh lukewarm water.

(d) Dry the exterior of the set thoroughly with clean dry cloths.

(e) Re-waterproof as in Sect.15.4.9.

(f) Ensure the carrying case is dry before you put the set back, especially the sponge pad on the inside of the case.

15.6 M.F. AUTOMATIC DIRECTION FINDING UNIT

15.6.1 A Furuno Type FD-171 automatic MF direction finder complete with fixed crossed loop D/F aerial is fitted. The receiver/ indicator unit is mounted in the Crew/Radio Cabin and the crossed loops are mounted on a projection to the wheelhouse roof.

15.6.2 Purpose of M.F. D/F Unit - the MF direction finder is the oldest of the electronic navigational aids and is fitted to all Offshore lifeboats of the RNLI. The radio direction finder operates with an aerial having directional properties. This may be either a rotating loop type of aerial as fitted in the older lifeboats, or fixed crossed loops as fitted with this automatic unit.

15.6.3 Radio beacons for navigational purposes transmit in the frequency band 285 to 315 kHz. A bearing is taken of them, either manually or automatically, using the aerial's directional properties. The useful range of Navigational radio beacons is up to approximately 200 nautical miles (370km) and they are sited to give a world-wide coverage.

15.6.4 Radio direction finders are also increasingly operating at the international distress frequency of 2182 kHz, giving ships the ability to 'home' on vessels in distress. Ships emergency life-boats, life-rafts and Emergency Position Indicating Radio Beacons (EPIRB's) are being fitted with automatic radio distress equipment that radiate both on the marine and aircraft distress frequencies as soon as they are launched or thrown overboard, to enable D/F bearings to be taken of them.

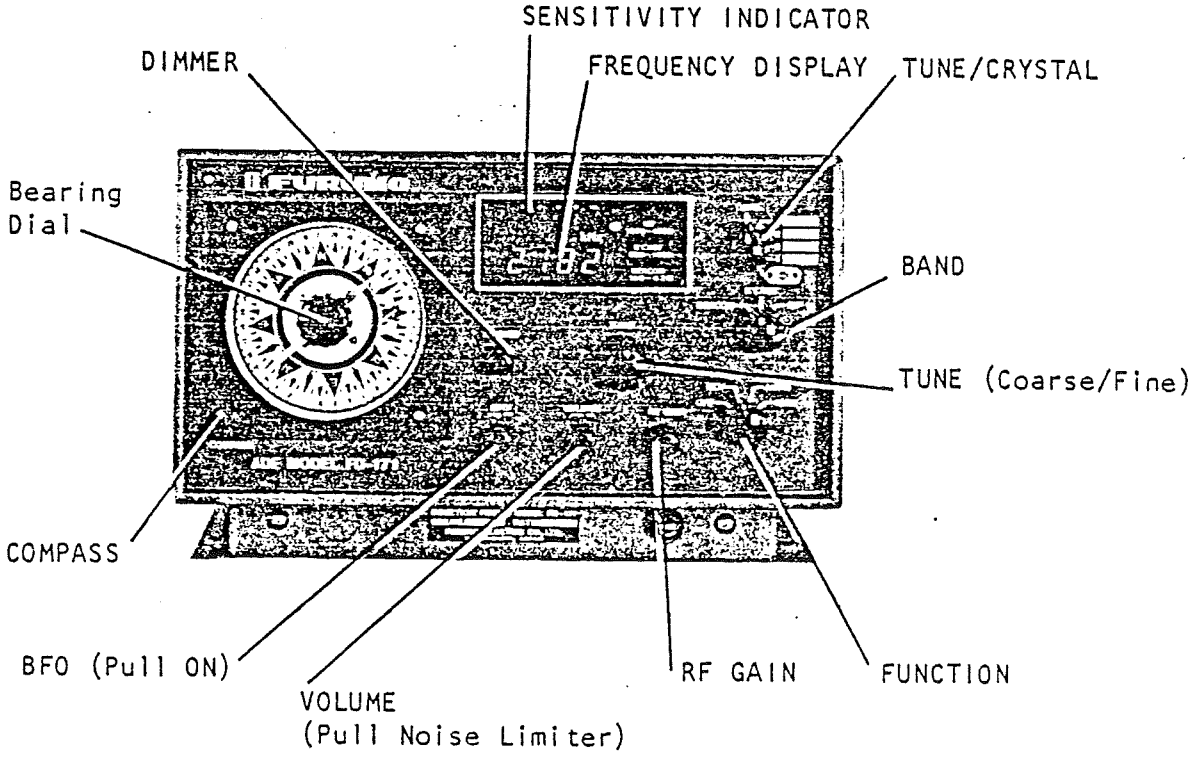
15.6.5 The lifeboat Coxswain can make use of the D/F unit in conjunction with fixed radio beacons for navigation when out of sight of land, or when visibility deteriorates, but the main use of the D/F unit will be to 'home' on to vessels in distress, or to locate life-rafts, ships life-boats, or emergency position indicating radio beacons using automatic distress transmitters on 2182 kHz.

15.6.6 Brief Specification of FD-171

Frequency range	Beacon band 190 - 420 kHz BC band 550 - 1600 kHz MF band 1600 - 4500 kHz.
Tuning	Five crystal controlled channels plus continuous tuning.
Readout	Digital readout in 1 kHz steps.
Modes of Reception	A1A (CW Morse) H2A (MCW Morse) Beacons A3E (AM Voice) H3E (SSB full carrier) R3E (SSb reduced carrier) J3E (SSB suppressed carrier).
Aerial System	Belloni-Tosi fixed loops. No vertical sense aerial.

15.6.7 Operating Controls and switches

All operating controls and switches are situated on the front panel of the receiver indicator unit as shown in the photograph below.



15.6.8 Function Selector - this switch has four positions, OFF, RCV (receive), AUTO (automatic) and MANUAL.

OFF	Power is switched off.
RCV	This position is selected when the unit is used as a monitor receiver.
AUTO	Automatic direction finder.
MAN	This position is used when the incoming signal is too weak to operate the unit in Auto.

15.6.9 Band Switch - this switch is used to select the desired band, i.e. Beacon, Broadcast or MF.

15.6.10 Tune/Crystal Switch - when this switch is set at TUNE position a desired station can be selected by the Band Selector and the Tuning controls (Coarse and Fine). Crystals can be fitted to the receiver in the five crystal positions. To receive on a crystal controlled channel, the correct crystal channel is chosen and the receiver tuned roughly to the crystal frequency by means of the Band Selector and the tuning controls.

15.6.11 Tuning Control - used to tune-in to a desired frequency. The outer control is for coarse tuning, i.e. fast rate, and the inner control for fine tuning. The frequency is read by the frequency display and correct tuning is where most of the Sensitivity Light Emitting Diodes (LED's) light-up.

15.6.12 RF Gain Control - this is usually set at maximum (fully clockwise) position. If the received signal is too strong, the RF Gain should be adjusted so that 5 to 7 LED's light-up.

15.6.13 Volume Control - this control adjusts the output of the loudspeaker. The knob can be pulled to bring in a noise limiter if necessary, but this should not be used unless essential because it makes the receiver less sensitive.

15.6.14 BFO Control - this control is used for the reception of CW (Morse) signals A1A and for Single Sideband reception. The knob should be pulled out and carefully turned to make the SSB signals intelligible, but it is not always successful in resolving SSB. The switch should be pressed in to turn the BFO off when receiving Beacons and Amplitude Modulated (AM) signals.

15.6.15 Bearing Dial - for use when using manual direction finding. The function selector is set to MAN and the bearing dial turned to the position that gives minimum output from the loudspeaker or the minimum number of LED's on the sensitivity indicator. In the MAN mode there is a 180° ambiguity of the pointer. To determine the correct bearing the function selector should be turned to AUTO (once the minimum has been found) and the pointer should automatically turn to the correct bearing.

15.6.16 Compass Knob - the bearing scale can be rotated with this knob. Usually "0" if the bearing scale is placed just under the "Bow" mark at the top of the bearing scale and bearings are given as relative to the lifeboat's bow. If a Magnetic bearing is required the bearing scale should be turned to correspond with the magnetic heading of the lifeboat.

15.6.17 Dimmer Knob - adjusts the illumination of the frequency display and the bearing scale.

15.6.18 Using the Unit as a Monitor Receiver

(a) Turn the FUNCTION SELECTOR switch to RCV position.

(b) Set the BAND SELECTOR switch to the desired band, i.e. Beacon, Broadcast or MF.

(c) **NOTE:** If the main MF Transmitter (Radiotelephone) is in use the FD-171 will be 'Muted' each time the press-to-talk switch on the transmitter is used. Units are inter-linked so as to protect the FD-171 circuits when it is tuned to the same frequency as the MF transmitter.

(d) Set the TUNE/CRYSTAL switch to the TUNE position. If crystals are fitted the correct crytal position should be selected.

(e) Turn the TUNING CONTROLS (Coarse and Fine) to tune in the desired station or frequency.

(f) Adjust the RF and VOLUME controls so that the received signal is at the correct level from the loudspeaker. Ideally the RF GAIN control should be at its maximum clockwise position and the loudspeaker output controlled with the VOLUME control only.

(g) Operate the BFO control as necessary for the class of emmission in use.

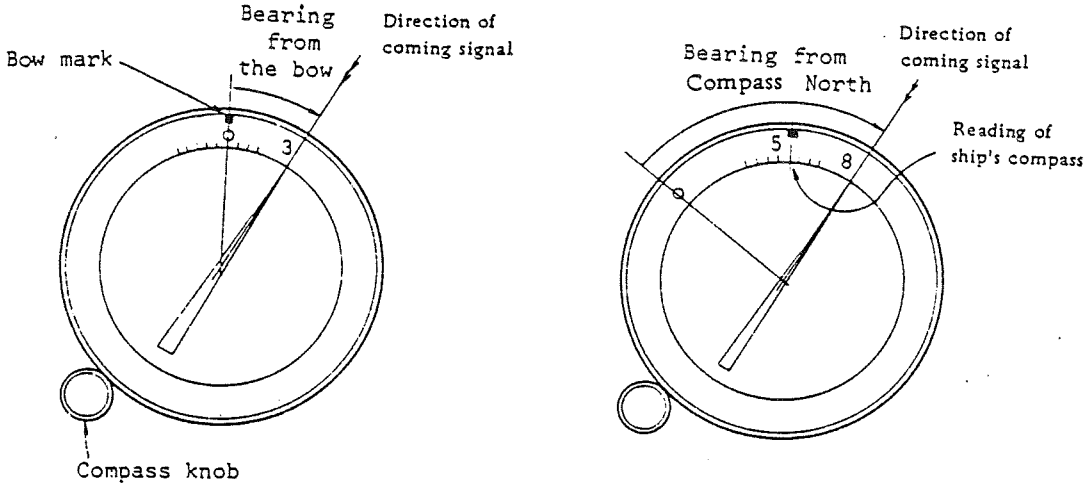
15.6.19 Using the Unit for Direction Finding

(a) Tune the receiver as in Sect.15.6.18 above.

(b) Set the FUNCTION SELECTOR switch to AUTO position.

(c) Adjust the RF GAIN control to reduce the vibration of the BEARING DIAL POINTER to a minimum.

(d) Check that the "0" of the bearing scale is under the BOW mark. Read the relative bearing from the bearing scale. True as opposed to relative bearings can be given by setting the bearing scale to the lifeboat's magnetic heading. Both methods are shown in the drawing below.



(e) Check that the correct bearing, as opposed to the reciprocal bearing, has been chosen by the automatic 'sensing' circuits, by rotating the BEARING DIAL to either direction slightly by hand and releasing. The correct bearing is indicated by the pointer automatically returning quickly to the original position.

(f) If the incoming signal is not strong enough to operate the pointer in the AUTO mode, then the FUNCTION SELECTOR should be switched to the MAN position and the Bearing Indicator turned carefully by hand until the minimum number of LED's in the SENSITIVITY INDICATOR are lit-up, this position should coincide with a minimum output from the loudspeaker. In the MANUAL position there will be two minimum points 180° apart; one minimum is the correct bearing, the other the reciprocal bearing. The correct bearing is most often determined by plotting the bearing line on the chart in use alongside the position and course of the lifeboat. The correct bearing then is easily determined.

15.6.20 Homing

Homing is most easily carried out by steering the lifeboat in such a way that the bearing pointer (pointing towards the transmitting station, generally a casualty or EPIRB) is kept pointing towards the bow mark. If the lifeboat is homing to a casualty then bearings can only be obtained when the casualty is actually transmitting, therefore the lifeboat has to ask the casualty to transmit for direction finding purposes.

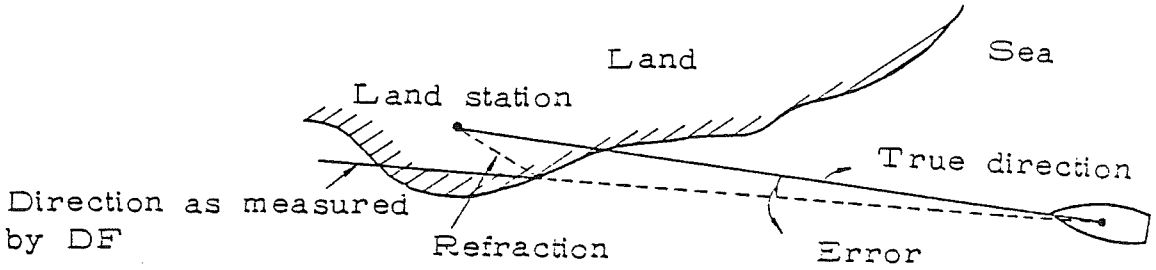
W A R N I N G !!

IN USING FIXED RADIOBEACONS FOR HOMING PURPOSES IN THICK WEATHER, IT MUST BE REMEMBERED THAT UNLESS SOME POSITIVE MEANS OF CHECKING THE "DISTANCE OFF" IS AVAILABLE, THE LIFEBOAT IS LIABLE TO STAND INTO DANGER BY HOLDING ON TOO LONG. PLOT ALL BEARINGS ON THE CHART TO ENSURE THAT THERE ARE NO INTERVENING NAVIGATIONAL HAZARDS.

15.6.21 MF D/F Errors

There are three main types of error that cannot be ignored in MF direction finding. They are Coastal error caused by refraction (bending) of the radio wave; Night error caused by reflection of the radio wave from the ionosphere at night, and Quadrantal error caused by metal on the lifeboat. Aircraft error is also explained as this might be applicable to lifeboat MF operating.

15.6.22 Coastal Error - if the path of the signals from a transmitter crosses the coast obliquely (at an angle) an error will be found in the D/F bearing. This error may possibly be as high as 5 or 10°. The reason for this is that the velocity of the radio wave depends to some extent on the conductivity of the surface over which it is passing, being greater over good conductors such as the sea, than over poorer ones such as dry land. This causes bending or refraction of the radio wave. As a result of this refraction, the radio signals, instead of passing in a straight line, are received at a false angle, and the effect is known as coastal refraction. If a casualty is transmitting beyond a piece of land jutting out into the sea then you should treat any D/F bearings as suspect of coastal error.



15.6.23 Night Error - at low frequencies, e.g. Beacon band 190 to 420 kHz, the radio wave is made-up mainly of a ground wave that travels along the surface of the earth, but as the frequency increases up to the MF band the radio wave becomes more complex and is comprised of both a ground wave portion and a sky wave portion. Only the ground wave can give accurate results in direction finding equipment that uses a loop aerial. During the hours of daylight the sky wave portion of the MF radio wave is absorbed in the ionosphere but when darkness falls the sky wave portion is reflected back to earth and arrives at the D/F loop from angles different to that of the ground wave portion. When this occurs any bearings taken of an MF transmitter at distances above more than about 50 miles, become variable in direction and are thus unreliable. This effect is known as "Night Effect" and is particularly prevalent at 2182kHz. Generally the lifeboat knows the approximate "distance off" of a casualty and if this is about 50 miles, and it is a night time service, and the bearings taken vary a great deal, then night effect should be suspected. The effect will disappear as the distance off becomes less.

15.6.24 Quadrantal Error - this error is caused by the radio waves being reflected from metal close to the loop aerial on the lifeboat, i.e. mast, stays, life-lines, aerials, etc.) onto the loop aerial. Unlike the compass, which is affected by ferrous metals only, e.g. iron, the D/F loop is affected by reflections from any type of metal ferrous and non-ferrous. The error in the bearing is known as "Quadrantal Error" because it is usually at maximum values in directions at 45° to the fore-and-aft line of the vessel, i.e. at mid-points of the quadrants. In merchant ships and warships the quadrantal error is often quite large, and is also variable due to the shifting of steel derricks, etc., and most of these vessels require a correction curve rather like the compass deviation card. When the D/F set is installed on a lifeboat it is calibrated and the quadrantal error curve plotted. Steps are taken to ensure that the error is so small that it is negligible compared to the other errors introduced by the lifeboat's "liveliness" at sea. Quadrantal error can therefore be ignored when using the FD-171 on the lifeboat.

15.6.25 Aircraft Error - if a shore station or a ship (lifeboat) takes a bearing of a transmission from an aircraft (some helicopters may be fitted with 2182 kHz transmitters) the bearing taken will not be that of the aircraft. The error, known as "Aeroplane Effect" is due to pick-up by the horiz-ontal planes of the loop aerial and may amount to a few miles. The effect is identifiable by a blurring of the minimums.

15.6.26 Emergency Position Indicating Radiobeacons (EPIRB's)

The essential purpose of the EPIRB signals is to determine the position of survivors during search and rescue operations. The signals indicate that one or more persons are in distress, may no longer be onboard a ship or aircraft, and that receiving facilities may not be available.

There are two types of EPIRB in current use,

(1) Type L, low power radiobeacon, and

(2) Type H, high power radiobeacon.

Both types automatically start their transmission as soon as they are released from their stowage positions.

The signal transmitted by the radiobeacons on 2182kHz may be either one of the two types that are authorised.

(a) A signal consisting of a keyed emmission modulated by a tone of 1300 Hz, and having a ratio of the period of emmission to the period of silence equal to or greater than one, and an emmission duration between one and five seconds. i.e. a series of dashes for up to five seconds then a pause and repetition of the dashes.

The modulating frequency of 1300 Hz is within the audio frequency range, i.e. within the range of human hearing, and this permits the signal to be heard on a receiver tuned to 2182kHz and set to receive AM signals (BFO OFF) .

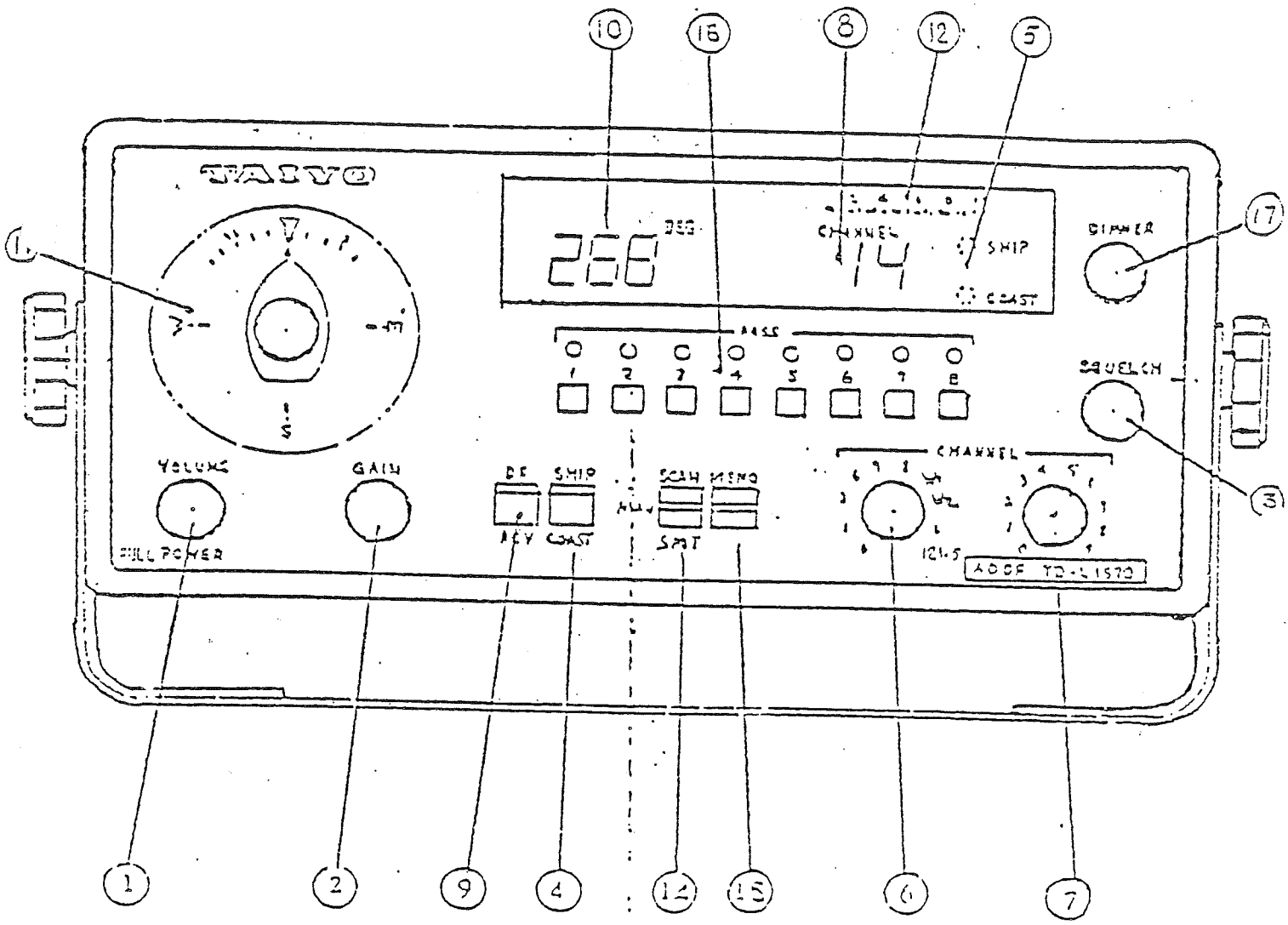
(b) The radiotelephone alarm signal, which is a signal that consists of two audio frequency tones transmitted alternately, giving a distinctive warbling sound, which can be distinguished by ear through heavy interference; followed by the Morse code letter 'B' (-...) and or the callsign of the ship to which the radiobeacon belongs transmitted in the Morse code.

The low power radiobeacons transmit either one of the two signals continuously. The high power radiobeacons transmit either one of the two signals for between 30 and 50 seconds followed by a period of silence between 30 and 60 seconds. The signal may also be interrupted for speech transmissions. The high power type transmits automatically on 2182 kHz and on 121.5 MHz (Aeronautical Distress Channel VHF) or 243 MHz UHF.

15.7 VHF AUTOMATIC DIRECTION-FINDING UNIT

15.7.1 A Simrad TD-L 1520 automatic VHF direction finding receiver unit comprising an indicating receiver and an Adcock aerial is fitted. The aerial is fitted on top of the mast. The VHF D/F unit is interconnected to the main VHF radiotelephone so that it is muted when the main unit is transmitting.

15.7.2 Operating Switches and Controls



Switches and Controls -

1. ON/OFF and Volume.
2. Gain control
3. Squelch control
4. Select Ship or Coast
5. Ship or Coast ind. lights
6. Channel select (Tens)
7. Channel select (Units)
8. Channel select number display
9. DF or receive switch
10. Bearing indicator
11. Azimuth/Compass display
12. Signal strength indicator
14. Scan/Spot switch
15. Memo
16. Channel select button
17. Dimmer.

15.7.3 Switching ON

1. DF-RCV switch to RCV
2. GAIN control set fully clockwise
3. SQUELCH control set fully anti-clockwise
4. POWER-VOLUME control pull OUT and turn clockwise to desired level of background noise.
5. SQUELCH control. Turn clockwise until background noise just cuts off. DO NOT GO BEYOND CUT-OFF POINT AS THIS WILL REDUCE THE SENSITIVITY OF THE RECEIVER.

15.7.4 Scanning Operation

6. SCAN-MANU-SPOT switch set to MANU
7. SHIP-COAST switch set to SHIP
8. CHANNEL switch. Select required channel. Left-hand knob - Tens, right-hand knob - Units. The channel number will be displayed.
9. SCANNING position press button 1 so that it stays in.
10. MEMO switch. Press Memo switch and release. The selected channel is now on button 1. Press button 1 again so that it stays out.
11. Repeat steps 8,9 and 10 for each of the remaining 7 buttons in turn until button 8 has been set.
12. SCAN-MANU-SPOT switch set to SCAN. Scanning starts and an LED is lit as each channel is passed or stops to receive a signal. If any channel(s) is/are not wanted, press the appropriate button once so that the button stays IN. The channel(s) will be passed when scanning restarts. To reinstate a channel press the appropriate button so that it stays out.

TO SELECT ONE CHANNEL FROM THOSE BEING SCANNED

13. SCAN-MANU-SPOT switch set to SPOT then press the appropriate button for the channel required - scanning stops. Channel number will be displayed.

TO SELECT A CHANNEL NOT ON THE SCANNING RECEIVER

14. SCAN-MANU-SPOT switch set to MANU
15. SHIP-COAST switch set to SHIP or COAST as required. Note: Coast Radio Station working channels are Duplex, i.e. have two frequencies.
16. CHANNEL switch set to the required channel. Channel number will be displayed.

TO SELECT INTERNATIONAL AIR DISTRESS CHANNEL 121.5 MHz)

17. SCAN-MANU-SPOT switch set to MANU
18. CHANNEL switch set left-hand knob to position 121.5. The number 48 will be displayed. N.B. F.W1 and W2 are NOT in use in UK waters at present.

15.7.5 Direction Finding

19. If using the main VHF radio the unit will be 'muted' when the press-to-talk switch is made. If there is any sign of 'feed-back' then turn the volume control (VHF D/F) fully anticlockwise. DO NOT ADJUST THE GAIN CONTROL.

20. D/F REC switch set to DF. As each station is received the bearing will automatically be shown digitally on the bearing display and an LED will light up on the azimuth display.

21. BEARING DISPLAY - the digital display will ALWAYS show RELATIVE BEARING.

WARNING!! - When taking bearings of a shore station first ascertain the position of the AERIAL being used by the shore station - it could be remote from that station.

15.8 ECHO SOUNDER - RECORDING TYPE

15.8.1 A Kelvin Hughes type MS 356A recording echo sounder is installed in the Crew/Radio Cabin. The transducer is fitted under the hull.

15.8.2 General Description

The echo sounder measures the vertical distance from its transducer to the sea bed by sending out high frequency sound waves. The reflected sound waves are converted to electrical pulses on return to the transducer and are then recorded on a chart with a calibrated depth scale. On the recording chart strong and moderately strong echoes are recorded as dark black marks. Weaker echoes are recorded as grey tone marks. Each echo returned and recorded has its own special characteristics, depending on the physical make-up of the reflecting object whether it is a fish, weeds, hard or soft bottom. With practice you can tell what the bottom conditions are for generally very hard or sloping bottom gives a dark black mark, a firm rocky bottom gives a dark grey mark, soft, silty bottom gives a light grey mark, and fish give narrow smudges at the depth they are swimming.

15.8.3 Depth Ranges

Depth ranges are indicated on the transparent depth range scale inside the front panel window. A six position switch is used to select any of the six depth ranges.

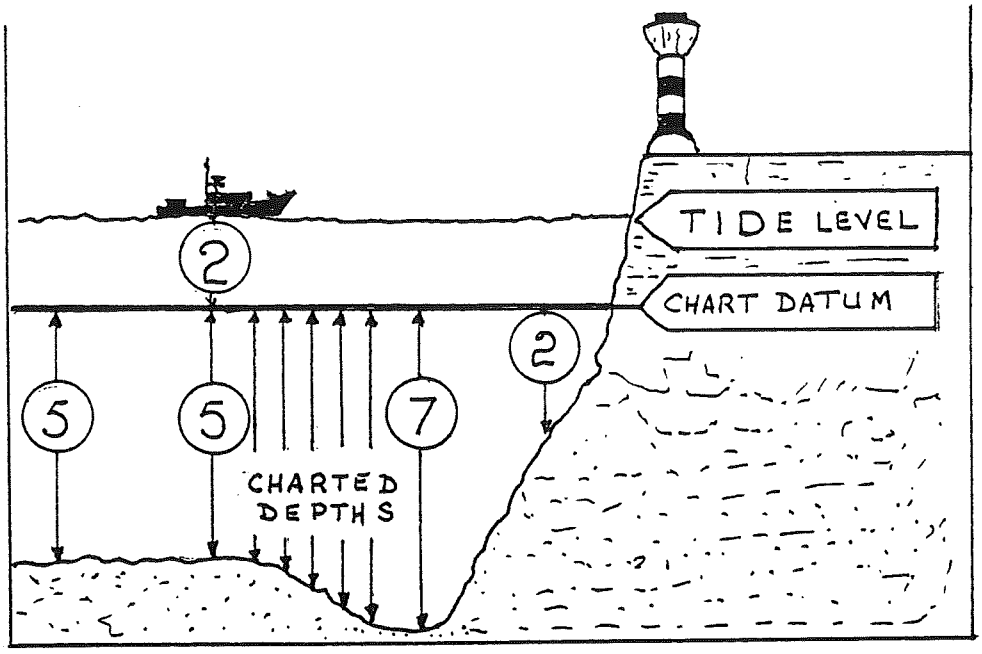
Range No.	Depth (feet)	Depth (metres)
1	0-12	0-3.66
2	0-30	0-9.15
3	0-60	0-18.3
4	0-120	0-36.6
5	0-300	0-91.5
6	0-600	0-183.0

The depth indicated is from the transducer to the sea bed or other intermediate object recorded.

15.8.4 Interpreting the Depth Scale

(a) The depth indicated by the echo sounder is from the transducer (bottom of hull) to the sea bed (or other intermediate object). Suppose the lifeboat is moving along a track plotted on the chart and the charted depth at that position is shown to be 5 metres and suppose the depth shown on the echo sounder is 7 metres. This seems to be in error because the two figures do not tally. The reason for this is shown in the next drawing.

15.8.4
contd..



(b) The drawing is a section (side-on) view of what the sea bed would look like directly below the lifeboat's track. You can see that the Charted Depths are measured from the sea bed to **CHART DATUM.** Notice also that the **TIDE LEVEL** is measured from Chart Datum to the actual level of the sea. Thus the 7 metres depth shown on the echo sounder may now be regarded as a combination of the height above (2 metres) and the depth below (5 metres) Chart Datum.

(c) When you studied navigation and especially tides, you found out that because of the movement of the sun and the moon that the levels of the sea varied from day to day. Spring High Water (HW) levels were higher than they were at Neaps. Spring Low Water (LW) levels were also lower than Neap LW levels. There are occasions when the tidal levels rise far more than they do at any other normal time; they could be described as reaching 'astronomical' levels. On such instances we get what are referred to as the Highest Astronomical Tides. At the other end of the scale there occur what is called the **LOWEST ATRONOMICAL TIDE,** and this is the lowest level to which the tide will fall under any combination of astronomical conditions and where average weather conditions prevail. A note of caution here - the Lowest Astronomical Tide (LAT) is not the lowest level which the tide may ever reach because storm surges may occasionally make the level fall even lower. However, the LAT will not occur every year so the tide level will very rarely fall below it.

15.8.4
contd..

(d) In the drawing on the last page the L.A.T. level is drawn. This level we may now regard as a level of reference and give it its common name of ***CHART DATUM.** This sounds a little complicated but it isn't really. All it means is that all the levels concerning tides are referred to Chart Datum (CD).

(e) * The established levels of datums at Standard Ports vary widely. However, L.A.T. is now accepted as the level to which datum is being adjusted.

15.8.5 MS 356A Operator Controls

(a) Four controls for normal operation are located on the front panel. They are :-

1. Combined GAIN and POWER ON/OFF
2. DEPTH range switch
3. WHITE LINE control
4. CLEAN ECHO switch.

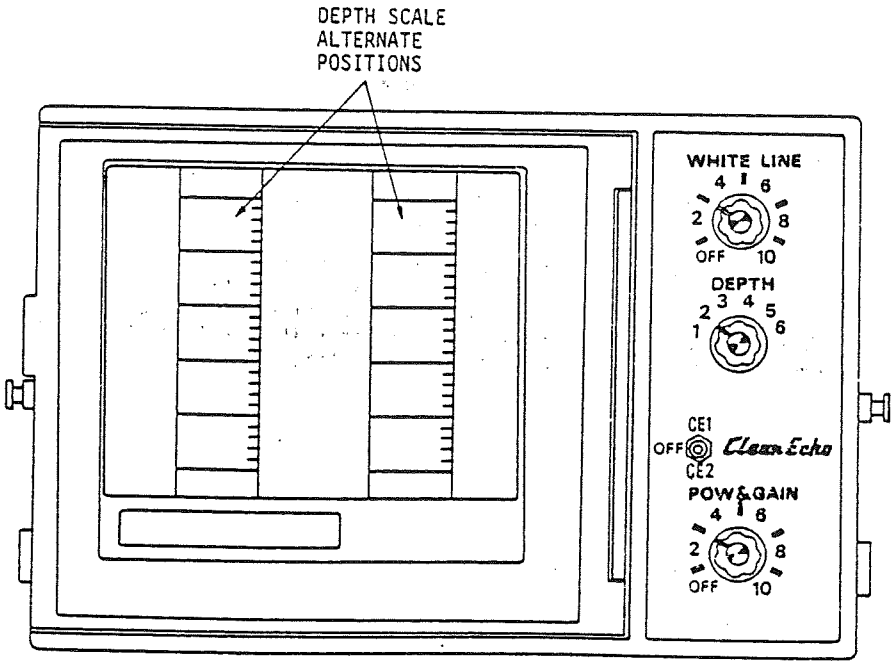
(b) In addition, three controls are located behind the front panel plastic window below the paper chart.

1. PAPER SPEED
2. MARK
3. LAMP switch.

(c) **NOTE:** The White Line control and the Clean Echo switch have been disconnected internally as they are not required for lifeboat operations. The White Line feature is primarily intended for use by fishermen and its use when in shallow water show the sea bed echoes merging with the transmission line (i.e. false depth recording), while the Clean Echo switch affects the ability to determine the seabed or bottom characteristics.

15.8.6 Calibrated Depth Scale

A calibrated depth scale is located behind the clear plastic window of the echo sounder. The depth scale can be positioned to either side for the operators convenience.

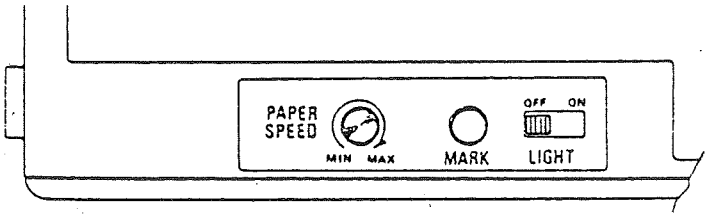


15.8.7 POW & GAIN control

This a variable control combined with the Power ON/OFF switch. Clockwise rotation of the control switches the power ON. The gain control is used to adjust the sensitivity of the unit to suit the depth recording conditions. Clockwise rotation, 1 to 10, increases the sensitivity. The optimum setting for the gain control will vary depending on many factors and experience. The water depth and other local conditions will also influence the setting of the gain control.

15.8.8 Depth Range Switch - selects the depth range required.

15.8.9 Controls Behind the Front Panel -



(a) Paper Speed - this is a variable control used to adjust the speed of the recording paper chart. In the anti-clockwise position, the paper speed is approximately 5/16 inches per minute. Clockwise rotation of the control increases the paper speed to a maximum of 2 1/2 inches per minute. At the fully anti-clockwise position, i.e. 5/16 inches per minute the chart roll which is 50 feet long, will last approximately 32 hours; in the fully clockwise position, i.e. 2 1/2 inches per minute, the chart roll will last approximately 4 hours. For normal depth recording the chart paper speed should be kept low and if special features of the sea bed (bottom) are being sought out then the speed should be increased.

(b) Mark - this is a push-button switch used to produce a continuous black line, from top to bottom of the chart. The mark is used to mark the chart when it is wished to note a special event such as the lifeboat's position, location of shoals, etc. The switch is also useful to check the operation of the stylus. Operation of the switch should produce a continuous black line without any interruption. The proper stylus adjustment is when the stylus touches the paper with the least pressure that will give a continuous solid line.

(c) Light - this is a two position switch used to switch on the illumination for night time viewing.

15.8.10 Operating the Echo Sounder

(a) Check that the chart recording paper is correctly loaded.

(b) Turn the GAIN control clockwise to apply power to the unit.

(c) Set the DEPTH switch to a position that is about twice the depth of water that the lifeboat is over at the time of switch-on. This should produce a recording showing the sea bed or bottom and a second echo below it.

15.8.10
contd..

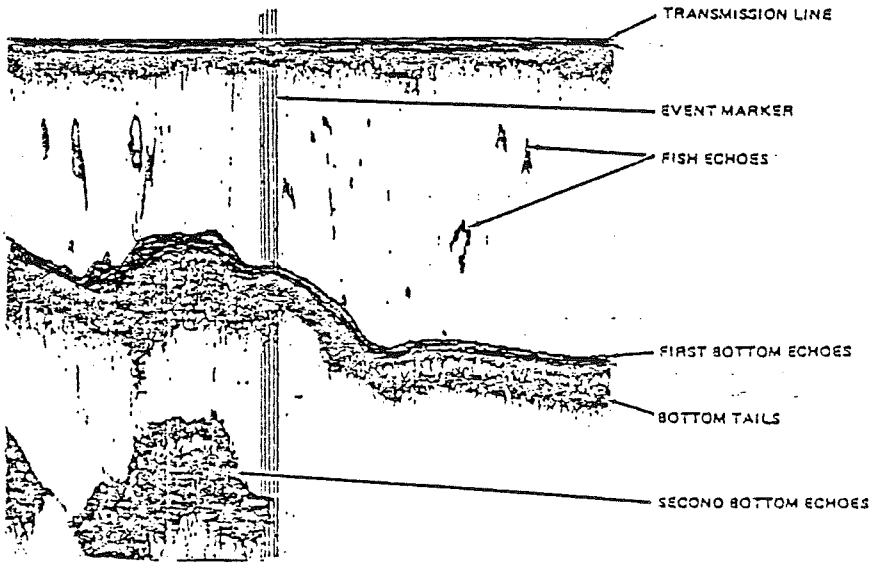
(d) Adjust the GAIN control to produce a black recorded image of the first bottom echoes and a light recorded image of the second bottom echoes, then set the DEPTH switch to the correct depth range so that only the first bottom echoes are shown on the recorder. This is the correct setting for the GAIN control.

(e) Further adjustment of the GAIN and DEPTH controls is a matter of experience and will depend on the depth of water and other local conditions.

(f) Adjust the SPEED control for the desired paper feed speed.

(g) Operate the event MARKER by pressing the MARK pushbutton switch. Use this control at any time to test the operation of the recording stylus or to note some particular event on the chart.

15.8.11 A typical chart recording is shown below.



15.8.12 Changing the Chart Roll

(1) Read through the instructions and study the drawings below before changing the chart roll.

(2) Switch the unit OFF.

(3) Open the front panel by pulling gently on the panel release latch on the left side of the unit. The panel is hinged on the right side.

(4) Rotate the stylus belt downward to position the recording stylus at the bottom and rear of the transport carriage. This action prevents damage to the stylus.

(5) Hold the paper transport cartridge with one hand so that it will not fall out when the transport carriage latch is released.

(6) Press firmly on the paper transport latch to release the paper transport carriage. Remove the transport cartridge from the unit.

(7) Loosen the screw at the bottom of the depth scale and remove the depth scale from the cartridge.

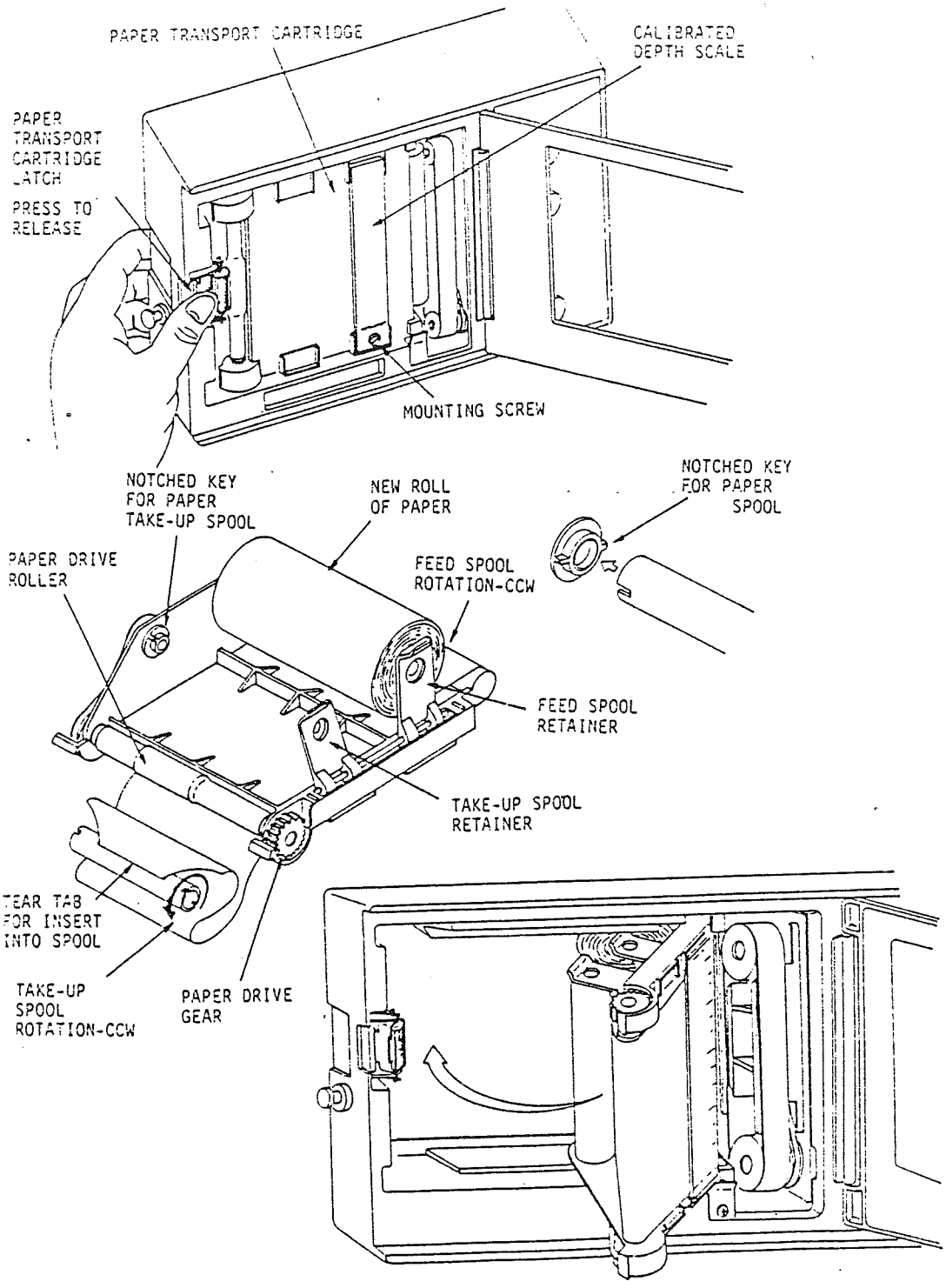
(8) Lift the paper take up spool retainer and remove the used recording paper roll. Remove the plastic take-up spool from the used paper roll and retain it for use on the next roll of paper. Lay the used chart paper aside. Remove any used chart paper scraps from the slot in the plastic spool.

(9) Cleaning the unit: carbon dust from the recording paper will accumulate throughout the unit, on the viewing window and on the mechanical parts. The carbon dust is abrasive and will absorb and retain moisture. The electric parts are well protected, but the remainder of the unit must be kept clean. Clean and remove all carbon dust deposits from the inside and the outside of the unit - at regular intervals, at the least, before each replacement of the recording chart roll.

(10) Use a soft bristle brush to clean away the dust. Clean the clear plastic viewing window with a soft cloth wrung out in a mild detergent solution. Rinse off with clear water. Do not remove the carbon dust with a dry cloth as this will cause scratching and, eventually, degradation of the viewing window.

(11) Fitting new chart roll: lift the paper feed spool retainer and remove the used paper spool. Lay the used paper spool aside.

15.8.12
contd..


PAPER TRANSPORT CARTRIDGE
CALIBRATED DEPTH SCALE
PAPER TRANSPORT CARTRIDGE LATCH
PRESS TO RELEASE
MOUNTING SCREW
NOTCHED KEY FOR PAPER TAKE-UP SPOOL
NEW ROLL OF PAPER
NOTCHED KEY FOR PAPER SPOOL
PAPER DRIVE ROLLER
FEED SPOOL ROTATION-CCW
FEED SPOOL RETAINER
TAKE-UP SPOOL RETAINER
TEAR TAB FOR INSERT INTO SPOOL
TAKE-UP SPOOL ROTATION-CCW
PAPER DRIVE GEAR

(12) Open new roll of recording paper and unwrap the loose end approximately 12 inches. Position the roll of paper so that the direction of feed from the new roll will be anti-clockwise as shown in the drawing.

(13) **NOTE:** The recording paper roll must be loaded correctly. One side of the recording paper is coated with an electrically activated substance that permits the stylus to mark (or burn) the recordings onto the paper. Install the recording paper with the electrically coated surface facing the front of the recorder. Otherwise, the depth marks will not be recorded on the paper.

(14) Install the new roll of paper by mounting it between the paper feed notch key and the feed spool retainer. Be sure the paper spool notch is engaged into the notch key and that the paper will unroll anti-clockwise as shown on the drawing.

(15) Prepare the loose end of the chart paper for insertion into the slot of the paper take-up spool by tearing off approximately one inch from each corner, so that a 1/2 inch paper tab is formed which will be small enough to fit into the slot.

(16) Insert the tab into the paper take-up spool, rotate spool anti-clockwise and wrap approximately two turns of paper onto the spool.

(17) Install the paper take-up spool by mounting it between the paper take-up notch key and the take-up spool retainer. Be sure that the spool notch is engaged into the notch key.

(18) Remove all of the slack from the chart paper by reverse winding it back onto the new roll of paper.

(19) Replace the depth scale and tighten the screw.

(20) Position the paper transport cartridge in the recorder unit by inserting it from left to right at a small angle until it is properly seated near the stylus belt. When it is properly seated, press firmly on the left side of the cartridge until it snaps into place. If any slack remains in the chart paper, remove the slack.

(21) Rotate the stylus belt slowly several times in the direction of the arrow, to be sure that the stylus does not snag on the recording paper.

(22) Close the front panel securely.

15.8.12
contd..

(23) Turn the POWER/GAIN control ON and operate the unit. Press the MARK switch to verify that the stylus is making contact across the entire face of the paper. If the mark switch does not draw a continuous line across the paper, check to be sure that the recording paper is not installed the wrong way round. The paper must be installed with the coated surface facing the front of the unit.

(24) If the Mark switch produces an intermittent black line on the paper, the stylus may not be making contact with the paper, and it may need adjustment. (See Sect. 16.10.13 below.).

(25) Adjust the depth scale inside the front panel so that the zero (0) depth line coincides with the transmission mark on the recording paper.

15.8.13 Stylus Adjustment

(a) In normal operation, the stylus life will be approximately 150 hours to 200 hours. Replacement is required when recording marks become intermittent or otherwise erratic.

(b) Operate the unit and press the MARK switch and observe the recording marks. This should produce a continuous black line from top to bottom on the chart, with no interruptions or skip. If this does not happen, the stylus should be replaced, but first check that the recording paper is not wrinkled or warped, causing skip. Next, using a tweezers or long nose pliers, very carefully bend the stylus a small amount. The lightest pressure on the paper that will produce a black continuous mark is the proper adjustment. Retest the unit with the MARK switch. If the stylus still does not give a continuous mark then report the fault to the Station Honorary Secretary for onward transmission to the RNLI Electronics Engineering Staff.

15.9 ECHO SOUNDER - INDICATING TYPE

15.9.1 A Seafarer '5' indicating echo sounder is fitted in view of the Helmsman in the wheelhouse. The transducer is fitted on the hull.

15.9.2 General Description - the depth is displayed on a circular dial by a brilliant yellow Light Emitting Diode (LED) on two range scales. Ranges are 0-20 metres (0-60 feet) and 0-120 metres (0-60 fathoms). In addition the instrument is fitted with a depth alarm (audible and visual) which operates up to 30 metres (16 fathoms).

15.9.3 Operation - turn the GAIN control to the ON position. A yellow LED will flash at "0" on the dial. Select shallow water range and turn the GAIN control in a clockwise direction until a second (echo) indication appears on the dial. This indicates the depth of water beneath the face of the transducer.

If the GAIN control is advanced more than is necessary, multiple echoes of the true depth will appear. This setting is too high and should be reduced until only the first echo is visible. This will improve clarity of reading.

The performance of all echo sounders depends on the nature of the sea bed. For instance, a hard, rocky or firm sand sea bed will reflect back ultra-sound waves extremely well. The return echo from a sea bed of this type will be shown as a firm flash on the dial at the appropriate depth.

On the other hand, deep mud or large amounts of kelp will give a weaker reflection and produce a wider, more indeterminate flash. With practice it is therefore possible to ascertain not only the actual depth, but also the type of sea bed.

15.10 RADAR OUTFIT

15.10.1 The radar system fitted to the Waveney Class Lifeboat is the Kelvin-Hughes type which is now obsolete. Trials are being conducted with a number of Radar outfits to seek a suitable replacement. One of the modern 'Bright Track' radars is the most promissing so far. When the trials are completed, it is intended to replace all Kelvin-Hughes radar outfits. The procedures given below are common for all types of radar.

15.10.2 Switch ON Procedure

The function of the controls and switches is described in the equipment handbook. The following procedure is general to all radar outfits. The object of this procedure is to obtain a good navigational picture so that the radar set can be used to the best of its ability as an aid to navigation and anti-collision, under the prevailing conditions of weather and sea state. This and the following procedures are those taught on the RNLI Radar Observer's Course.

(1) Check all controls are switched OFF or turned down to a minimum, especially BRILLIANCE, GAIN, ANTI-CLUTTER SEA and ANTI-CLUTTER RAIN.

(2) Switch on the RANGE to a short range, say 3 miles.

(3) Check that the scanner is in its operational position.

(4) Request permission of the Coxswain to switch the scanner ON.

(5) Switch on the STANDBY/TRANSMIT switch to TRANSMIT.

(6) Adjust the BRILLIANCE control until the rotating trace is just barely visible.

(7) Turn the RANGE RINGS on. Check the number and spacing of the rings to ensure that they are correct for the range scale selected.

(8) Switch the RANGE RINGS off.

(9) Align the HEADING MARKER to the lifeboat's head-up position, i.e. 0° or 12-o-clock.

(10) Turn up the GAIN control until a lightly speckled background is just visible. Remember 3 to 4 minutes warm-up time from switch-on.

(11) Adjust the TUNING control for the best picture.

(12) Adjust the ANTI-CLUTTER controls for optimum results.

(13) Constantly re-assess the GAIN, TUNING and the ANTI-CLUTTER controls.

15.10.3 Procedure for Changing Range

(1) Switch OFF the RANGE RINGS and turn down the GAIN, ANTI-CLUTTER and BRILLIANCE controls to their minimum.
NOTE: The range rings, if left on, will make difficult the adjustment of the brilliance and gain settings on the new scale. The gain, if left on, will make difficult the adjustment of the brilliance setting on the new scale. The brilliance setting may be less on the new scale and if left on will cause an excess of 'paint' on the radar screen resulting in a delay before the picture can be re-established.

(2) Select the new range required by turning the control quickly and deliberately from one range scale to the next.

(3) Turn up the BRILLIANCE control until the trace is just barely visible.

(4) Turn the range rings on. Check the number and spacing of rings are correct for the scale selected.

(5) Turn up the GAIN control until a lightly speckled background is just visible.

(6) Adjust the TUNING control for best picture.

(7) Adjust the ANTI-CLUTTER SEA control until just a little clutter is left on the screen. Set the ANTI-CLUTTER RAIN control if necessary. Once again, constant re-assessment of the Anti-clutter controls is necessary.

15.10.4 Procedure for Shutting Down

(1) Select a short range, say 3 miles, in order to be ready for emergency use.

(2) Except for the STANDBY/TRANSMIT and RADAR ON/OFF switches turn all controls off or down to a minimum. Of particular importance are the BRILLIANCE, GAIN and ANTI-CLUTTER controls.

(3) Turn the STANDBY/TRANSMIT switch to STANDBY.

(4) Turn the RADAR ON/OFF switch to OFF.

SECTION

SIXTEEN

ELECTRICAL SYSTEM

SECTION 16

ELECTRICAL SYSTEM

16.1 INTRODUCTION

16.1.1 The electrical system is a 24 volt direct current (DC) two-wire insulated return system with double-pole circuit breaker switches and/or fuses in a number of warning circuits affording protection. The circuit is wired throughout in accordance with the Lloyds Register of Shipping for good marine practice. Two banks of batteries provide a reserve of power and are charged by main engine driven alternators, an auxiliary generator or from an external 24 volt DC supply.

16.1.2 **N.B.** Any wiring diagrams or drawings shown in this Section are for instructional purposes only. The complete Schematic Wiring Diagram is shown on drawings held by the RNLI Coast Staff.

16.2 BATTERIES

16.2.1 **W A R N I N G !!**

ALL LEAD ACID BATTERIES GENERATE HYDROGEN GAS WHICH IS HIGHLY FLAMMABLE. IF IGNITED BY A SPARK OR FLAME, THE GAS MAY EXPLODE, CAUSING SPRAYING OF ACID, FRAGMENTATION OF THE BATTERY, AND POSSIBLE SEVERE PERSONAL INJURIES. WEAR SAFETY GLASSES WHEN WORKING NEAR BATTERIES. IN CASE OF CONTACT WITH ACID, FLUSH IMMEDIATELY WITH FRESH WATER. DO NOT USE MATCHES, LIGHTERS OR OTHER NAKED FLAMES NEAR THE BATTERIES.

16.2.2 Battery Banks - the heart of the electrical system is made up of eight in numbr 6-volt 260 ampere hour lead-acid batteries. The batteries are fitted in two separate banks of four batteries. Each bank is connected in series to provide 24 volts at 260 ampere hours from each bank. Both banks of batteries are sited below the deck of the Crew/Radio Cabin, either side of the centreline. The batteries are installed securely in aluminium ventilated battery boxes fitted with gas tight lids. Ventilation is by means of an electric exhaust fan with its outlet, piped to the engine room atmosphere. One battery bank is primarily for main engine starting purposes and is therefore known as the "Start" battery, the other bank

16.2.2
contd..

is used to supply the major portion of the lifeboat electrical load and is known as the "Load" battery. The Start battery also supplies the following circuits, alarm panels, door/hatch warning system, electronics equipment.

16.3 BATTERY ISOLATOR SWITCHES

16.3.1 Port & Starboard Isolators - each battery bank is connected to the electrical distribution board, situated in the Crew/Radio Cabin, via a double pole isolating switch, i.e. port and starboard isolators.

16.3.2 Coupling Switch - a similar switch is provided to couple the outputs of both battery banks for emergency engine starting and cross charging of the batteries when required. The 'coupling' switch places both battery banks in parallel; in this connection the output voltage remains at 24 volts but the battery capacity is the sum of both banks, i.e. almost doubled.

16.3.3 Auxiliary Generator Set Isolator Switch - another isolator switch is sited on the aux.gen. set panel that provides power for 'Starting' the engine and the watchkeeping panel.

16.3.4 Isolator Switch Details - the switches are rotary action, heavy duty double-pole cut-off switches rated at 200 amperes continuous, and intermittent current, i.e. starter load, up to 1200 amperes.

16.3.5 Isolator Switch Operation - the control lever is simply turned clockwise to switch ON, but to switch OFF, the control lever must be lifted or pulled outwards then turned anti-clockwise to the OFF position. This feature prevents accidental switch-off.

16.4 ALTERNATORS

16.4.1 Alternator Output - when the main engines are running, electrical power is produced by two CAV alternators with built-in rectifiers that provide up to 140 amperes at 24 volts DC from each alternator.

16.4.2 Drive Belts - each main engine drives an alternator by means of 'Vee' belts. The 'V' belts must always be correctly tensioned and in good repair for the alternators to produce their rated output. It requires up to 10 H.P. to drive each alternator on full load.

16.4.3 One Alternator Failed - the output of any one alternator is capable of supplying the lifeboat electrical load should the other alternator be out of action for any reason.

16.4.4 Alternator Charge Warning Lights

(a) The charge warning lights provide indication of failure of the alternator output which may be the result of an engine stopping, drive belts breaking, or alternator breakdown. The charge warning lights are sited next to each of the charge ammeters, port and starboard on the wheelhouse console. When the battery isolator switches are "switched on", and before the main engines are started, both alternator charge warning lights will light-up and remain lit until the engines are started and running.

(b) With a heavy electrical load, e.g. at night and with the main engines at idling speed, the charge warning lights are liable to flash on and off; revving' the engines will stop the lights flashing; this is perfectly normal operation.

(c) The charge ammeter readings will depend upon the state of charge of the batteries and the load applied, i.e. number of lights, fans, etc; the discharge ammeter readings will depend upon the circuit current being drawn for the various electrical devices connected to it.

(d) An alternator charge warning light for the aux.gen.set is provided nearby the appropriate charge ammeter.

16.5 CIRCUIT BREAKERS

16.5.1 The circuit breaker switches employed on the electrical distribution board act like fuses in an electrical circuit. If a circuit breaker, when switched on, carries a current above the rated figure stated on it, the circuit breaker 'trips' to the OFF position and breaks the circuit thus cutting off the flow of current to the circuit it controls.

16.5.2 The advantage of the circuit breaker over a fuse is the fact, that when the fault that caused the excess current to flow, is removed, the circuit breaker can be reset simply by switching it to its ON position once more.

16.5.3 Circuit breakers should normally be left in their ON positions and the electrical services, e.g. lights, fans, etc., be switched ON and OFF by means of their individual control ON/OFF switches.

16.6 BATTERY BOX VENTILATION FAN

16.6.1 **W A R N I N G !!**

WHEN THE BATTERIES ARE BEING CHARGED THEY GENERATE A SMALL AMOUNT OF HYDROGEN GAS WHICH IS HIGHLY FLAMMABLE. THEREFORE WHENEVER THE MAIN ENGINES ARE RUNNING, THE AUX.GEN.SET IS RUNNING OR A SHORE BATTERY CHARGER IS CONNECTED TO THE BATTERIES, IT IS ESSENTIAL THAT THE BATTERY BOX VENTILATION FAN IS RUNNING.

16.6.2 Operation of Battery Box Fan

(a) With Main Engines Running - the battery box ventilation fan is wired direct from the 24 volt bus bar in the switch/distribution board. This means that the fan is switched ON as soon as one of the electrical isolator switches (either port or starboard) are switched ON. This ensures that when the main engines are started and the engine driven alternators produce an output sufficient to charge the batteries that the ventilation fan will be running.

(b) With Auxiliary Generator Set Running - the starboard isolator switch and the Aux.Gen.Set isolator switch have to be switched ON to power the Aux.Gen., thus the battery box fan is operating whenever the Aux.Gen.Set is in use.

(c) When Charging from an External Source - in this mode, the battery box ventilation fan is to be switched ON by making the main starboard isolator switch.

16.6.3 Battery Box Fan Overide Switch - there will be occasions when either of the electrical isolators will have to be switched ON without the engines running, thus no battery charging taking place, when it will not be necessary to run the battery box fan, e.g. laying at moorings when one or other of the electrical services is required. For this eventuality an overide switch assembly is fitted to allow the ventilation fan to be switched OFF. This switch is mounted in the engine room.
A RED indictor light on the unit lights-up when the overide switch is used to switch off the fan. The indictor light gives warning that the overide switch must be OFF before starting either of the main engines, the auxiliary generator set or charging the batteries from an external source.

16.6.4 **W A R N I N G !!**

UNDER NO CIRCUMSTANCES IS THE FAN TO BE SWITCHED OFF WHEN EITHER OR BOTH MAIN ENGINES ARE RUNNING, THE AUXILIARY GENERATOR SET IS RUNNING OR WHEN AN EXTERNAL BATTERY CHARGER IS CONNECTED TO THE LIFEBOAT.

16.7 BATTERY CHARGING

16.7.1 Charging Temperature - for best results, batteries should be charged while the electrolyte and plates are at room temperature (55 to 86°F or 13 to 30°C). A battery that is extremely cold may not accept current for several hours after starting the charge. This fact must be remembered especially during the winter months.

16.7.2 Charger Socket - a three-pin socket (third pin to ensure correct polarity of the mating plug) is fitted on the wheelhouse console for shore battery charger connection. The battery charger output must not exceed 30 amperes at 24 volts D.C.

16.7.3 Battery Charging with Aux.Gen.Set. - see Sect.11.13.11 for full details.

16.8 DISTRIBUTION OF ELECTRICAL SUPPLY

16.8.1 Switchboard - the main switchboard for the electrical system is supplied via the battery isolator switches. From the switchboard the electric supply is fed via breaker switches to all services.

16.9 COLOUR CODE FOR WIRING

16.9.1 The colour code for wiring thoughout the system is :-

POSITIVE or + - RED

NEGATIVE or - - BLACK

GROUND - GREEN & YELLOW or GREEN.

16.10 ANTI-ELECTRO-CHEMICAL CORROSION

16.10.1 A sacrificial anti-corrosion anode assembly is fitted to the hull of the lifeboat. Erosion or disintegration of the anode indicates that it is performing its function correctly. The anode assembly is generally inspected and/or replaced during Survey.

16.11 EARTH LEAKAGE INDICATION UNIT

16.11.1 Electrical System - the electrical system is a two-wire insulated return system, i.e. no part of the metal superstructure, mast, hull, decks, machinery or metal cased instruments is used as a return system. All metal work on the lifeboat is electrically bonded to the earth plate assembly.

16.11.2 Maintenance of Insulation - to ensure that the electrical insulation remains in good repair an earth leakage indicator unit is fitted on the main electrical distribution board.

16.11.3 Testing for Earth Leakage - the test switches on the earth leakage unit are three-way types, i.e. centre position OFF; left-hand position PORT and right-hand position STARBOARD. To test for possible earth leakage (breakdown of insulation to any of the metalwork on the lifeboat) proceed as follows :-

(a) The battery isolator switches and the Aux.Gen.Set isolator switch should be switched ON.

(b) All circuit breakers on the distribution board should be switched ON.

(c) The earth leakage unit test switches should be switched to the port position and the indicator lights on the unit carefully watched; both lights should light-up with equal brilliance ; any difference in the brilliance indicate that there is a 'leak' or insulation breakdown to the metalwork of the lifeboat, on the main wiring system.

(d) Place the test switches to the starboard position and carefully check the indicator lights as in (c) above.

(e) The faulty circuit may be traced by observing the leakage unit lights while each circuit breaker in turn is put to its OFF position until the lights glow with equal brilliance.

(f) For a complete check all the control switches on the wheelhouse console should be switched ON, but this check could best be carried out whilst at sea on exercise with the main engines running and all electrical facilities in use or switched ON.

16.12 POLICE & RIDING LIGHTS

16.12.1 Circuits - the riding light sockets and the police/access lights are fed with power from a supply direct from the live side of the starboard isolation switch. This means that the circuits are 'live' irrespective of the position ON or OFF, of the battery isolation switches.

16.12.2 Riding Lights

(a) Two riding lights, for use when the lifeboat is lying at moorings or at anchor, are carried onboard. One light is a McMurdo automatic riding light and the other is a Simpson Lawrence type, each complete with 25 foot of two-core cable and two pin, odd pin waterproof plugs.

(b) The control switch for the socket is fitted on the wheelhouse console.

(c) The McMurdo automatic riding light can be plugged in and switched ON in daylight but will not light up until darkness or overcast skies occur. When the sky clears or daylight arrives the light will switch itself OFF.

16.12.3 Police/Access Lights - the police/access lights provide illumination when boarding the lifeboat in darkness. One light is fitted in the wheelhouse and the other is fitted over the electrical distribution/switchboard in the Crew/Radio cabin.

16.13 CAPSIZE CONTROL & INDICATION

16.13.1 Engine Shut-down to Idle Solenoids - in the event of a knockdown or capsize mercury switches operate the port and starboard main engine shut-down to idle solenoids. This action prevents the propellers 'racing' when the lifeboat is inverted, reduces the air intake required by the engines and with the exhaust still 'blowing' with the engines at idle speed, prevents water entering via the exhaust pipes.

16.13.2 Gravity Valves - also on capsize, gravity valves in the air vents of the fuel tanks (two per tank) operate to prevent the ingress of water (returning to their normal positions on righting).

16.13.3 Radar Scanner Cut-out - a unit containing a mercury switch is included in the electric supply to the radar. The unit is fitted low down in the engine room. On knockdown or capsize, the mercury switch 'shorts' out the supply and the radar circuit breaker 'drops out' stopping the rotation of the radar scanner.

16.13.4 Start-up Procedure after Knockdown or Capsize

(a) After righting definite procedures have to be followed to get the main engines off idle speed and to restart the radar.

(b) The main engine capsize system provides indication of the operation of the port and/or starboard engine 'shut-down to idle' solenoids by means of RED indictor lights one port and one starboard.

(c) The mercury switches are mounted in a capsize control box which is sited on the engine room bulkhead clos to the centreline and very low down. The units on Waveney's 44-008 to 44-015 have an indicator light to show when the solenoid 'hold on' coil is energised. The RED capsize indicator lights and the capsize cancel (or reset) switches are sited on the wheelhouse console, close by the twin single lever engine controls.

(d) After a capsize, and when the Coxswain decides it is correct to do so, both main engine throttle controls are returned to their 'idle' (neutral) positions and the capsize cancel switches are depressed to release the engine shut-down-to-idle solenoids.

16.13.5 Capsize Unit Test Switches - a capsize circuit test switch is mounted on the capsize control unit, one switch to each unit.

16.13.6 Testing Capsize Circuits

(a) The test switch may be used during system checks with the main engines closed down. The port battery isolator switch must be switched ON. The test switch is biased OFF, i.e. spring loaded. Depressing the test switch momentarily, energises the engine idle solenoids and lights the warning lights.

(b) Therefore if the warning lights on the capsize control unit and the RED indicator light on the helmsman's console light up and remain on, one can be sure that the complete circuit is working correctly. The exception in the check is the mercury switch, but as the only 'moving parts' in the mercury switches is a pool of mercury, and the fact that the mercury switches are 'double-banked' then the test switch provides a good check of the whole circuit.

(c) Even under these test conditions the capsize cancel switch has to be operated to return the circuit to its normal condition. Depress the capsize cancel switch and check that both warning lights go out, i.e. light on capsize unit and light on helmsman's console.

(d) When the test switches are used during an exercise at sea it must be remembered -

THAT IRRESPECTIVE OF THE SPEED OF THE LIFEBOAT, DEPRESSING THE CAPSIZE TEST SWITCHES WILL SHUT THE ENGINES DOWN TO IDLE SPEED.

i.e. if the port switch is depressed the port engine will shut down to idle, while the starboard engine will maintain the revolutions set by the position of the dual single lever engine controls, and vice-versa with the depression of the starboard test switch.

(e) The ideal would appear to be to depress both test switches simultaneously, thus reducing the speed of the lifeboat on a straight course (assuming the helm is at midships). In any case the lifeboat must be in an area clear of hazards with plenty of sea room to carry out this test. The correct procedure must be followed as after a capsize, i.e. return engine throttle controls to idle before the capsize cancel switch/s are depressed for return to manual control of the engine throttle control lever/s.

16.14 ENGINE START/STOP CIRCUITS

16.14.1 Remote Electrical Starting - both main engines can be started by means of push button switches on the helmsman's console and locally in the engine room from the engine mounted instrument panel.

W A R N I N G !!

WHILE THE ENGINE IS RUNNING THE START BUTTON SHOULD NOT BE PRESSED OTHERWISE THE STARTER MOTOR CLUTCH DRIVE OR THE FLYWHEEL GEAR TEETH WILL BE DAMAGED.

16.14.2 Remote Electrical Stopping - both main engines can be stopped by means of push button switches on the helmsman's console and on the engine mounted instrument panel.

16.14.3 Manual Stopping - the main engines may be stopped manually in the engine room and by the remote manual 'pulls' in the wheelhouse.

16.14.4 Auxiliary Generator Stop/Start - the auxiliary generator engine can be started and stopped either electrically or manually locally at the set.

16.14.5 Engine Starter Batteries - the port battery bank provides power for the main engine starter motors and the starboard battery provides the power for the auxiliary generator set prime mover starter.

16.14.6 Engine Isolator Switches - both main engines have an isolator switch mounted on the instrument panel fitted to each engine. The isolator switches are used to disable the electrical remote engine starter push button switches when the mechanic is working on the stationary engines. Thus the isolator switches prevent the main engines from being started from the helmsman's console.

16.14.7 Main Engine Stopping Procedure - under normal conditions, before stopping an engine that is hot, the throttle controls should be moved to the idle position for a few minutes to allow the coolant to reduce the temperature of the engine's moving parts. Then the STOP button should be pushed in firmly and held until the engine stops. See also Sect.4.7.

16.15 ENGINE TACHOMETER CIRCUIT

16.15.1 Both main engines are fitted with a Tacho Sender unit that drives tachometers on the helmsman's console.

16.15.2 Lights are provided for 'back illumination' of each tachometer together with dimmer controls to set the level of illumination.

16.16 DOOR/HATCH WARNING SYSTEM

16.16.1 Door/Hatch Warning - five door and hatch openings throughout the lifeboat are fitted with actuators and sensors that operate lights on a display panel in view of the helmsman.

16.16.2 Display Unit - the display unit fitted to earlier lifeboats of the class indicate a door or hatch open by means of a light glowing. Later lifeboats have a display unit that indicates a door or hatch is closed by means of a GREEN light and open by means of a RED light.

16.16.3 Watertight Doors & Hatches - the watertight openings fitted are :-

Forward survivors compartment access door.

Forward escape hatch.

Crew/Radio cabin access door.

Aft Survivor cabin door.

Cable locker door.

16.16.4 **W A R N I N G !!**

THE DISPLAY UNIT LIGHTS WILL NOT OPERATE IF THE DOOR/HATCH ACTUATORS OR FRAME SENSORS ARE PAINTED OR OTHERWISE COATED.

16.17 ALARM CIRCUITS

16.17.1 Alarm Bell - bell is mounted in the wheelhouse and is actuated by -

a. Low pressure in the starboard engine lubricating system.

b. Low pressure in the port engine lubrication system.

c. High cooling water temperature in the starboard engine cooling system.

d. High cooling water temperature in the port engine cooling system.

e. Low pressure in either the Primary or the Secondary engine room fixed fire extinguishers.

16.17.2 Alarm Sirens - alarm sirens are sited, one in the engine room and one in the wheelhouse. The sirens are actuated by the fire detectors.

16.17.3 Fire Detectors - the fire detectors (or heat sensors), three in number, that actuate the alarm sirens are mounted one over each main engine and one over the auxiliary generator set. The fire detectors operate the sirens at a temperature reaching 155°F (68.8°C).

16.17.4 Warning Lights - in addition to the audible alarms, warning lights will light-up as follows to indicate-

a. Main Engines - low lub.oil pressure. RED warning lights on the helmsman's console.

b. Main Engines - high coolant temperature. RED warning lights on the helmsman's console.

c. Low pressure in the fixed fire extinguishers. RED warning lights on the helmsman's console.

d. Fire warning lights operated by the fire detectors. Large RED warning lights on the helmsman's console.

16.17.5 Visual Only Warning - the following systems provide visual warning only by means of lights or displays.

a. Door/Hatch warning.

b. Earth leakage indication unit.

c. Alternator charge warning.

d. Capsize indication.

16.17.6 Alarm Cancel Switch - the alarm bell and alarm sirens can be cancelled by operating the cancel switch on the helmsman's console. The bell and/or the sirens stop sounding but the appropriate warning light or lights continue to glow until the cause is removed. This feature is useful because the alarm bell rings when the engine are stopped and the lubricating oil pressure falls, also the alarm bell will sound when the battery isolator switches are made before starting the engines. This feature provides a constant check that the alarm bell circuits are working correctly.

16.17.7 Alarm Test Switches - alarm circuit test switches are fitted on the helmsman's console to test the alarm systems. The tests are described in the Routine Maintenance section of this Handbook.

16.18 AUXILIARY GENERATOR SET ALARMS & SHUT-DOWN.

16.18.1 This system gives visual warning by RED indicator lights for low lubricating oil pressure and for high cooling water temperature. An automatic shut-down device operates for failure of either of these services. The indicator lights are sited on the auxiliary generator set instrument panel in the engine room. This feature allows unattended operation of the auxiliary generator set, but -

THE PRIME MOVER IS A DIESEL ENGINE AND SHOULD NOT BE STOPPED BY ALLOWING IT TO RUN OUT OF FUEL.

16.19 WINDLASS

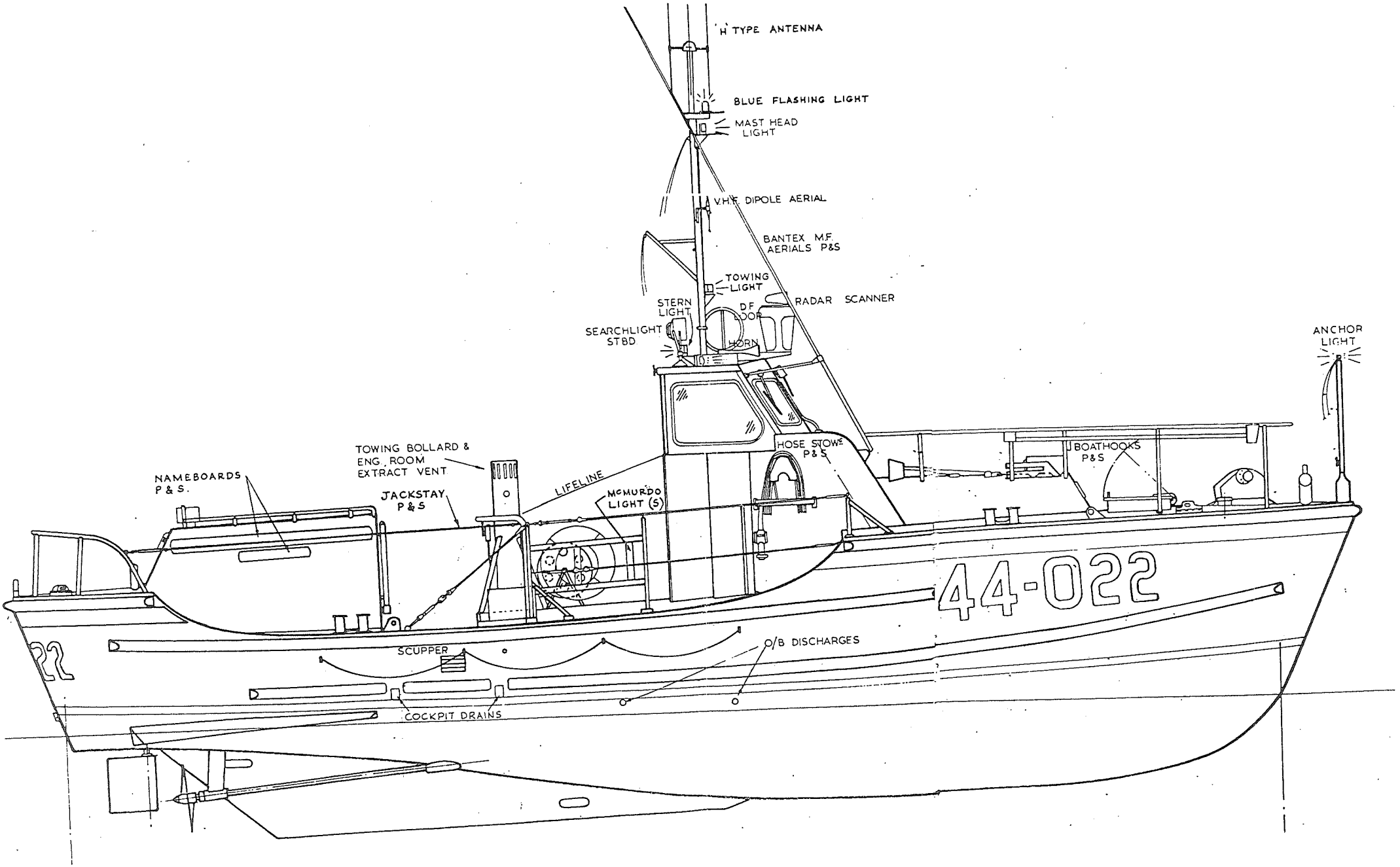
A non-reversible windlass Francis Type 800 having one warping drum to starboard is fitted on the foredeck.

SECTION

SEVENTEEN.

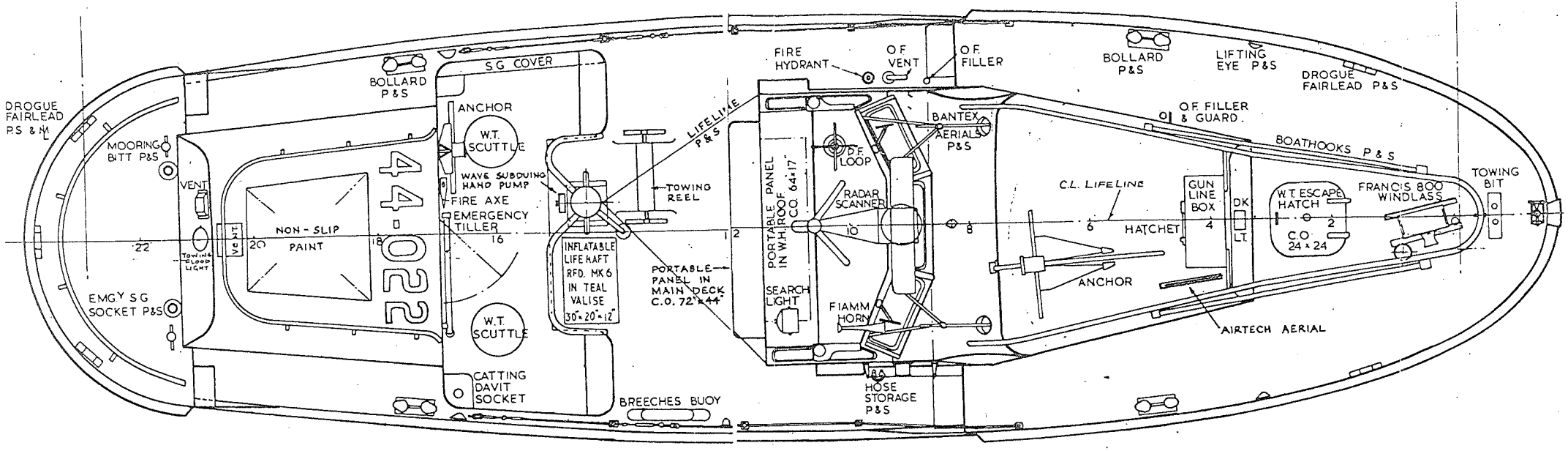
DRAWINGS.

17.1	General Arrangement
17.2	Plan View. Main deck
17.3	Plan View. Below main deck
17.4	Centreline Profile
17.5	View. Looking forward from Fwd. Survivor Compt. View. Looking aft from Fwd.Survivor Compt.
17.6	View. Looking forward from Crew/Radio Cabin
17.7	View. Looking aft from Crew/Radio Cabin
17.8	View. Looking forward from Engine room
17.9	View. Looking forward from Aft Cabin
17.10	View. Looking aft from Cockpit or Well Deck
17.11	Wheelhouse Plan View View. Looking forward from Steering Gear Compt.

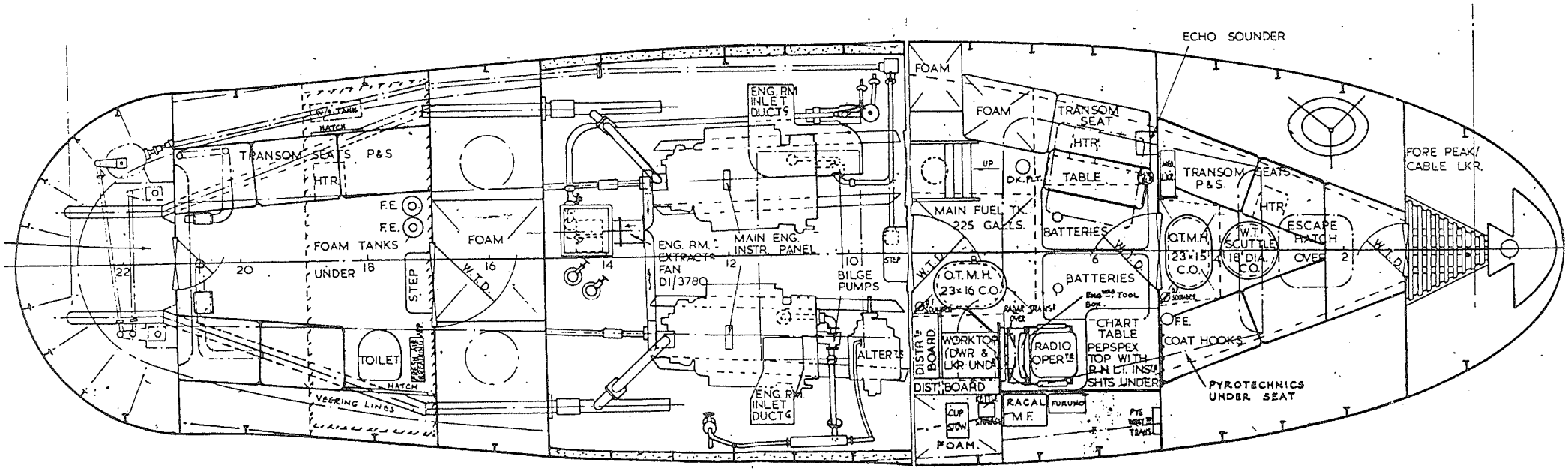


17.1 WAVENEY CLASS LIFEBOAT.

General Arrangement.

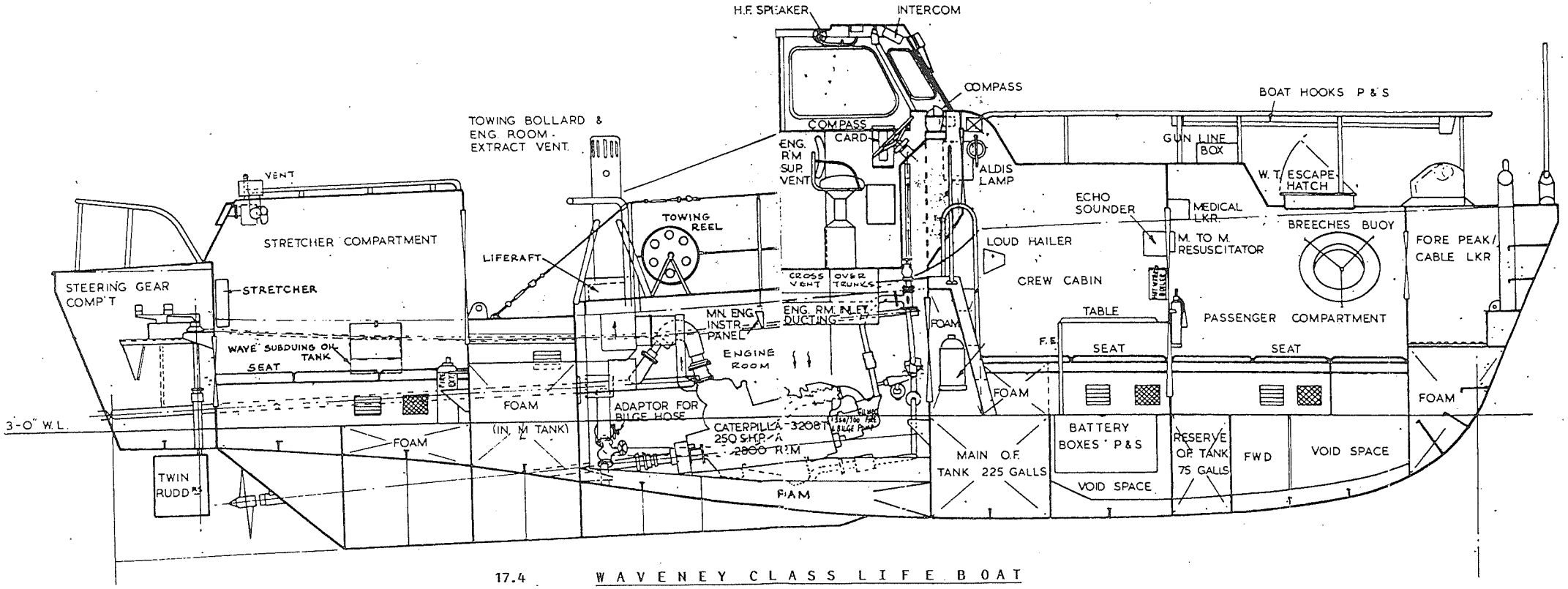


17.2 Plan View. Main Deck.



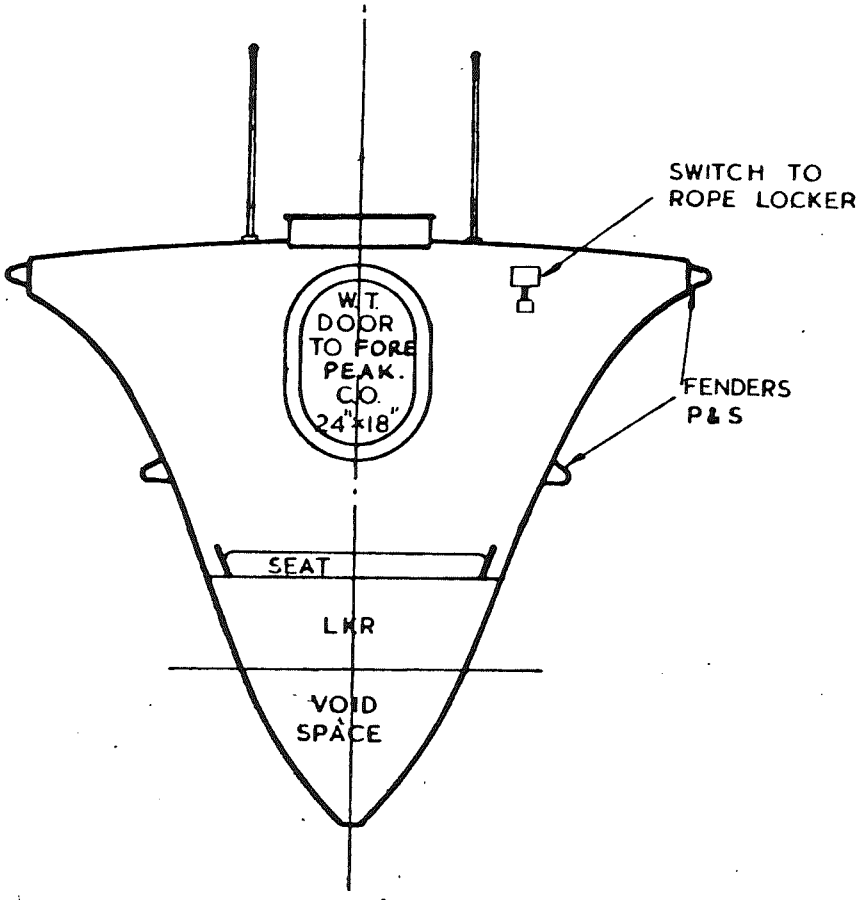
WAVENEY CLASS LIFEBOAT.

17.3 Plan View. Below Main Deck.

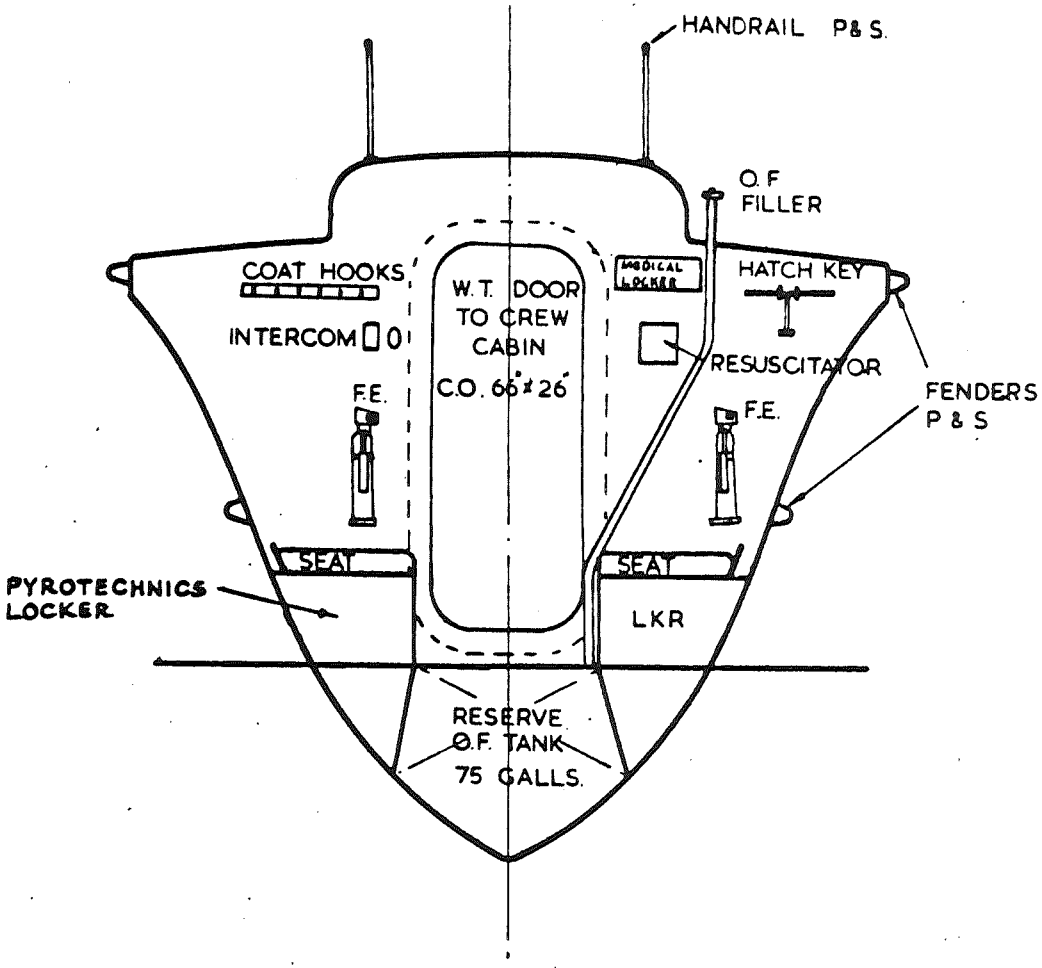


17.4 WAVENEY CLASS LIFE BOAT

Centreline Profile.



SECTION AT FR. 2. LOOKING FWD.

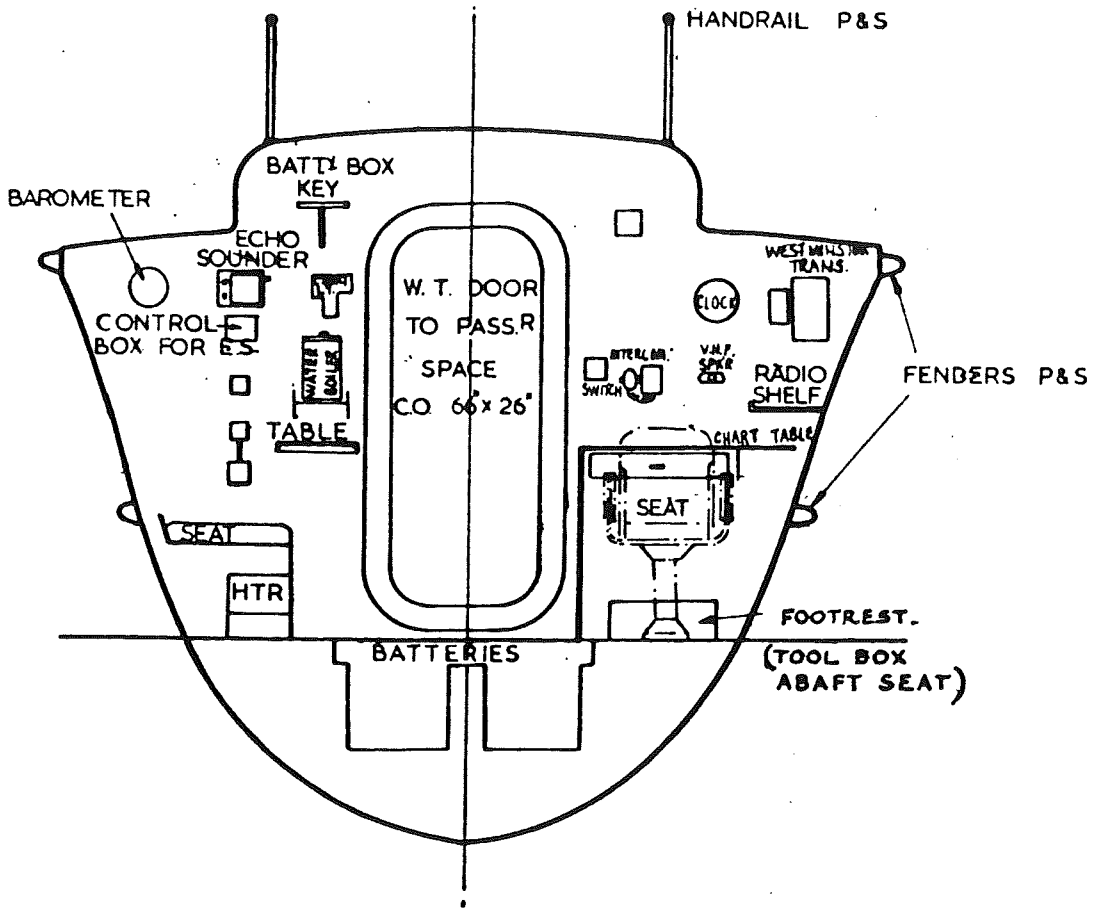


SECTION AT FR. 4. LOOKING AFT.

17.5 WAVENEY CLASS LIFEBOAT

View. Looking forward from Fwd.
Survivor Compt.

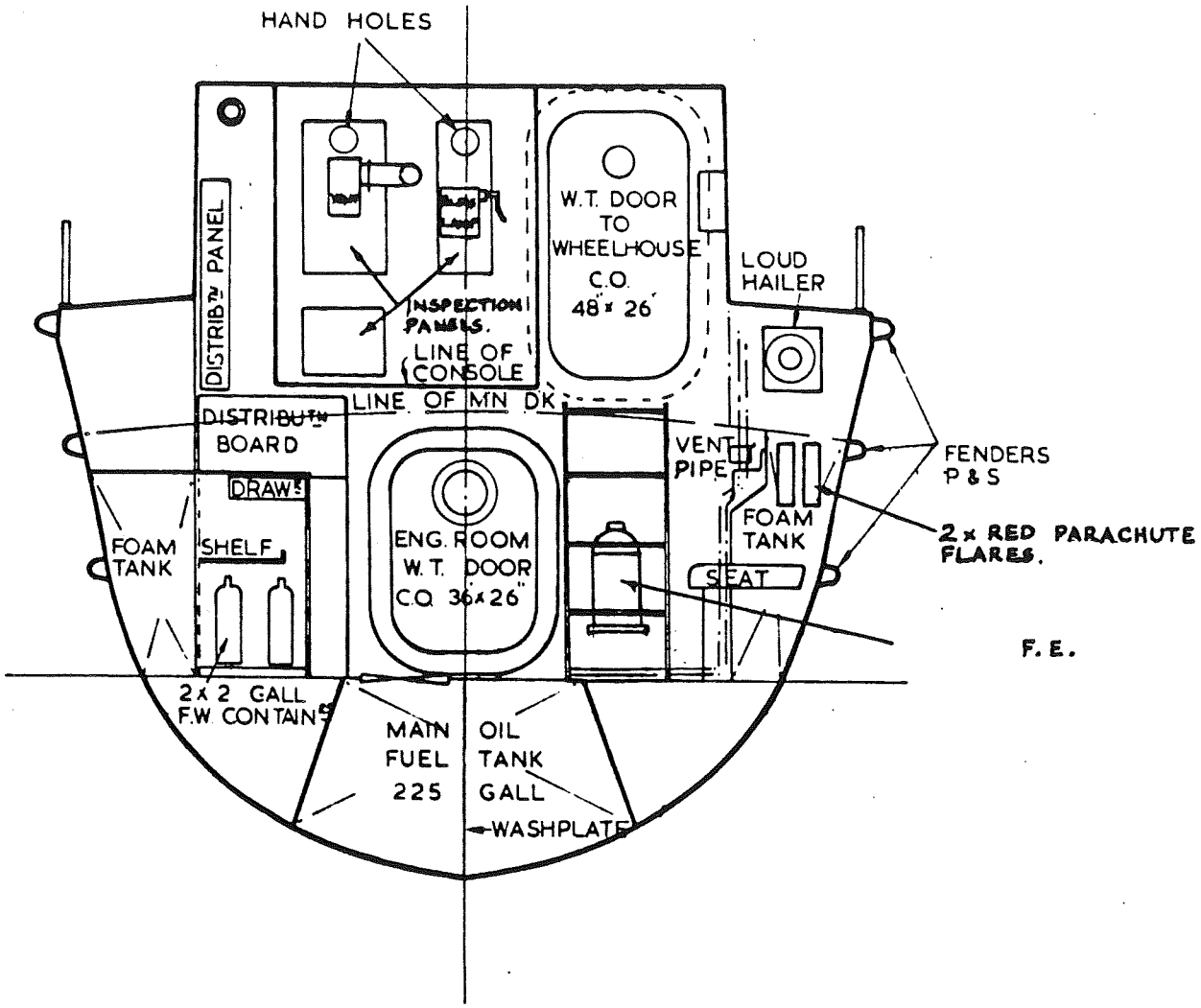
View. Lookin aft from Fwd. Survivor Cabin.



SECTION AT FR 6 LOOKING FWD.

17.6 WAVENEY CLASS LIFEBOAT.

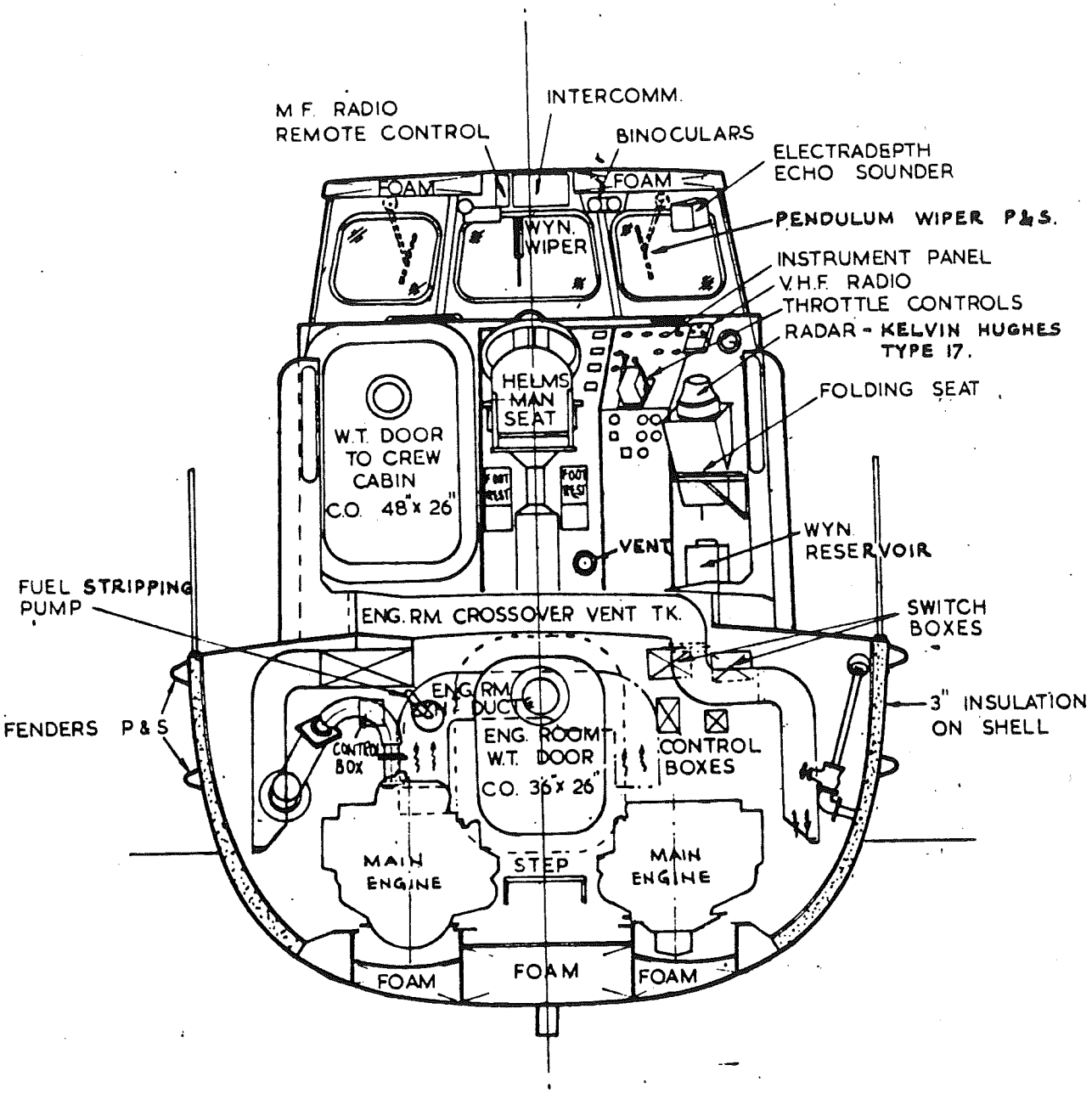
View. Looking forward from Crew/Radio Cabin.



SECTION AT FR 8 LOOKING AFT.

17.7 WAVENEY CLASS LIFEBOAT.

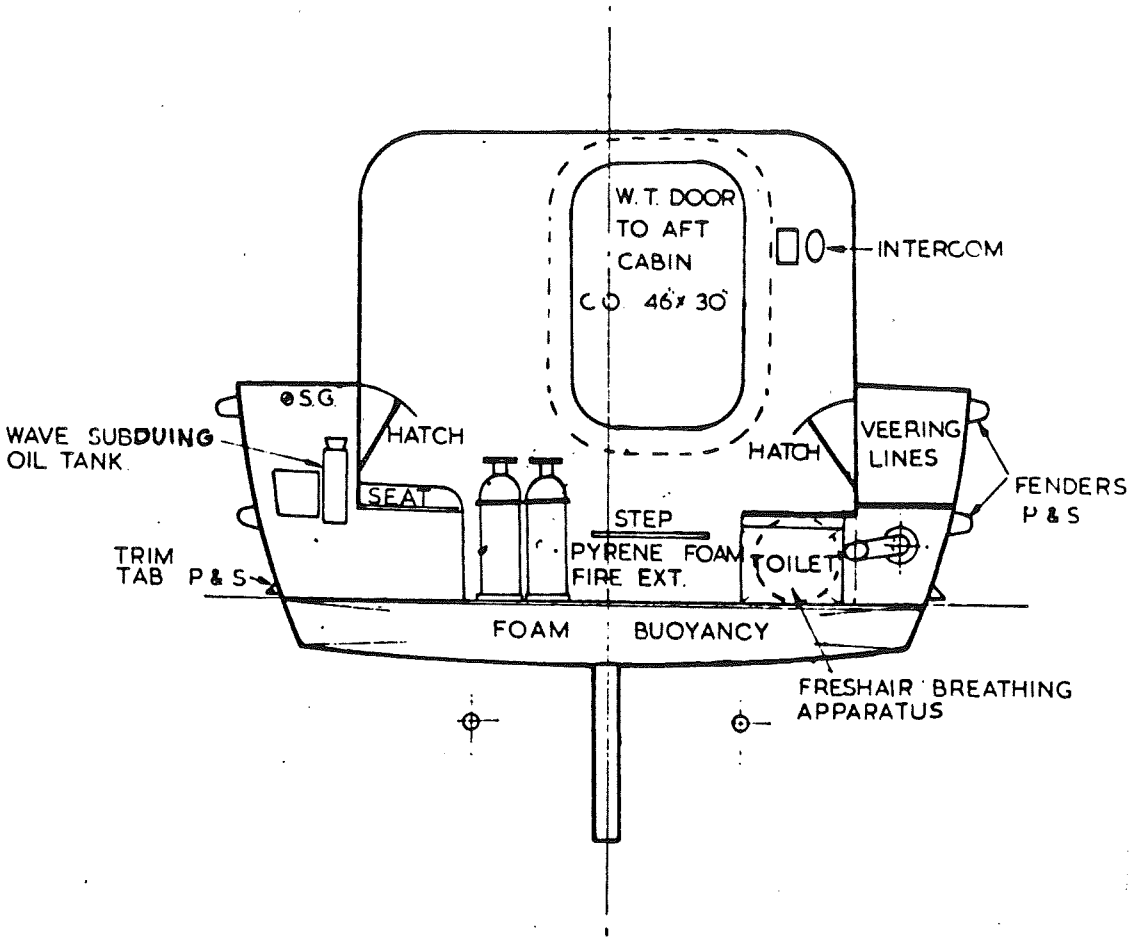
View. Looking aft from Crew/Radio Cabin.



SECTION AT FR. 11 LOOKING FWD.

17.8 WAVENEY CLASS LIFEBOAT.

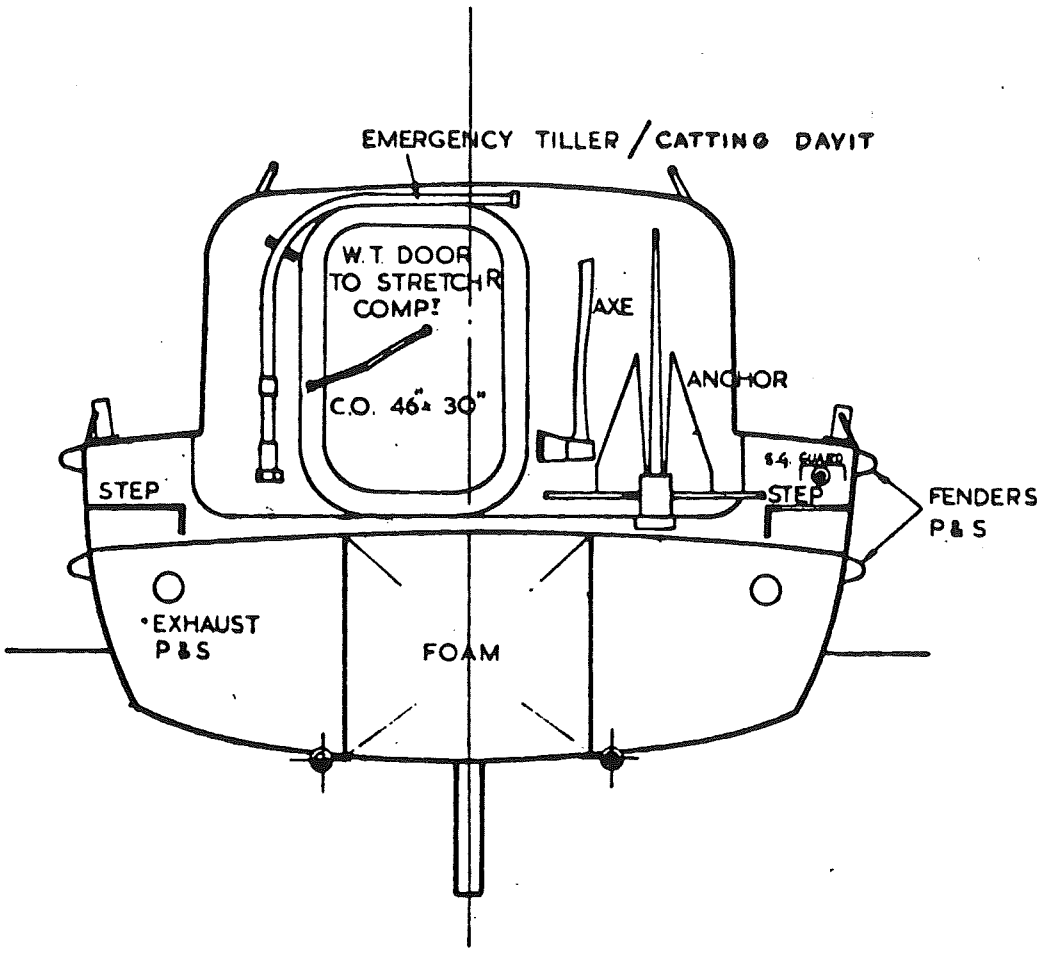
View. Looking forward from Engine Room.



SECTION AT FR 18 LOOKING FWD

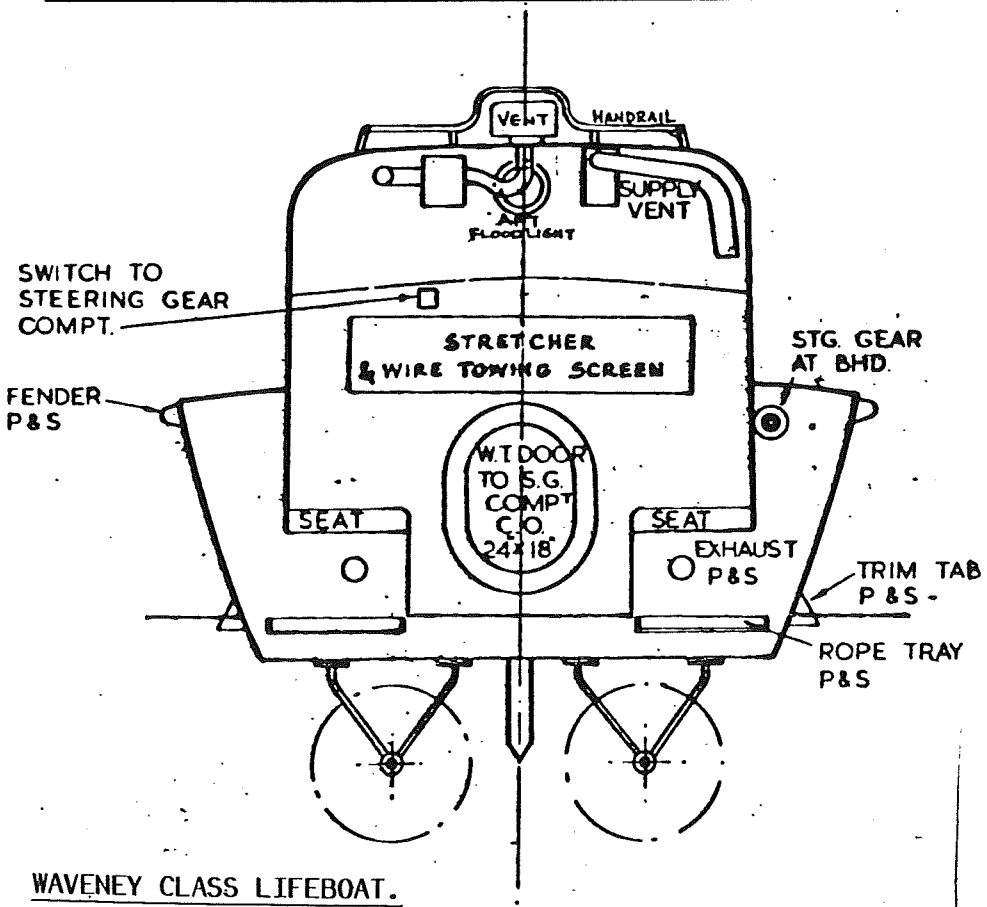
17.9 WAVENEY CLASS LIFEBOAT.

View. Looking forward from aft cabin.



SECTION AT FR. 16 LOOKING AFT.

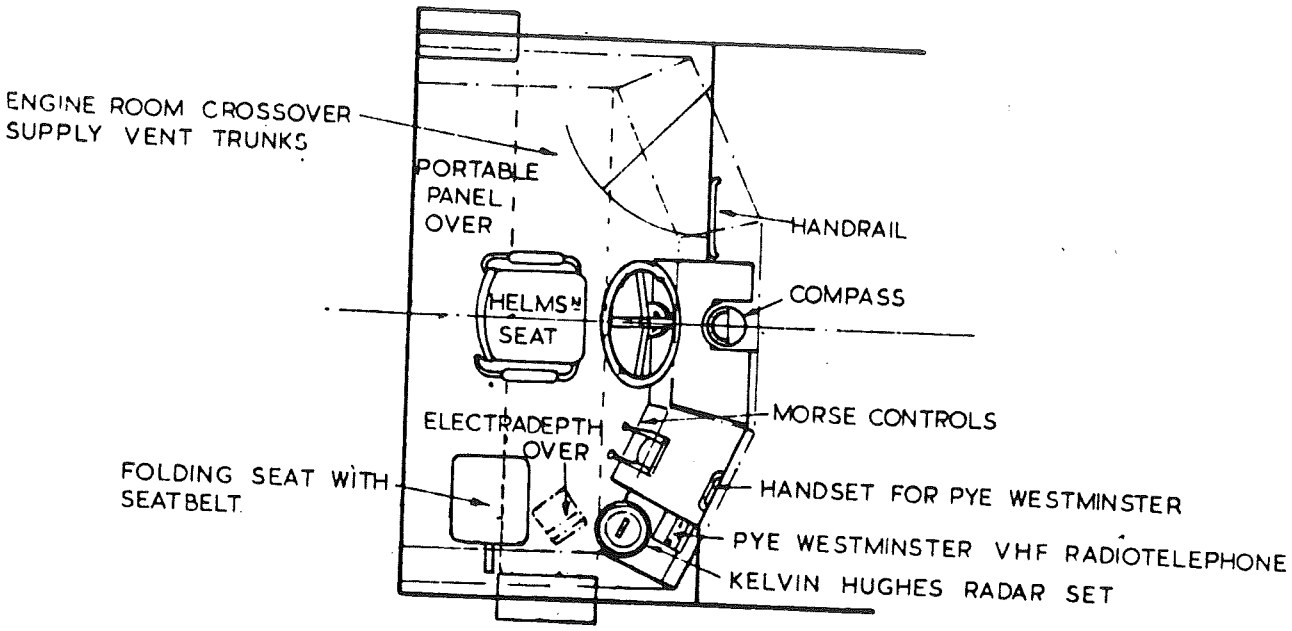
View. Looking aft from Cockpit or Well Deck.



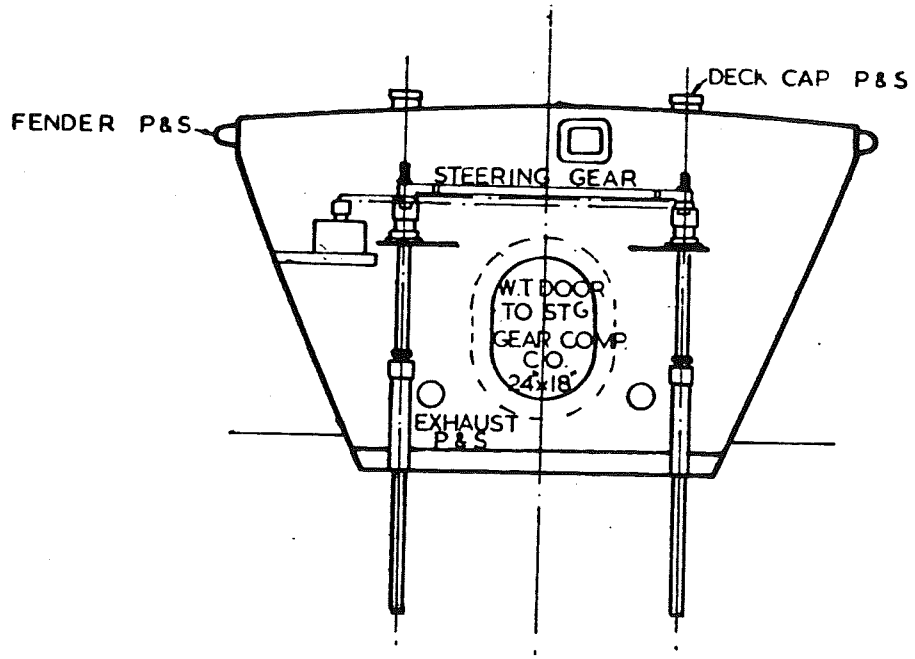
17.10 WAVENEY CLASS LIFEBOAT.

SECTION AT FR. 20 LOOKING AFT

View. Looking aft from aft cabin.



WHEELHOUSE PLAN VIEW



SECTION AT FR 22 LOOKING FWD

17.11 WAVENEY CLASS LIFEBOAT.

View. Looking forward from Steering Gear Compt.

A P P E N D I C E S

1. Pyrotechnics - Specifications

2. Mersar Search Procedures

3. **I N D E X.**

APPENDIX 1

PYROTECHNICS - SPECIFICATIONS

A1.1 GUIDE TO THE SAFE USE AND HANDLING OF PYROTECHNICS

1. Learn by heart the purpose of the pyrotechnic devices you carry and know how and when to use them.

2. Follow the manufacturer's instructions exactly to obtain optimum performance.

3. Carefully read the operating instructions on each label and memorise them for future use.

4. Store all pyrotechnics in the magazine provided ashore, or in their correct stowages on the lifeboat. Make sure their stowages onboard, together with operating instructions are known to all who may need to use them.

5. Never 'sky-lark' with pyrotechnics. It is foolish to do so and can also be illegal. They should only be used for their designed purpose.

6. Dispose of all outdated pyrotechnics in a safe and responsible manner in accordance with the instructions in Sect.7.3.2. The best place for dumping is at sea in **DEEP** water but make sure all parcels are sufficiently weighted for them to sink to the bottom, otherwise they can float ashore where children may accidentally fire them.

7. See also - Sect.4.2.3 - Pyrotechnics on exercise.

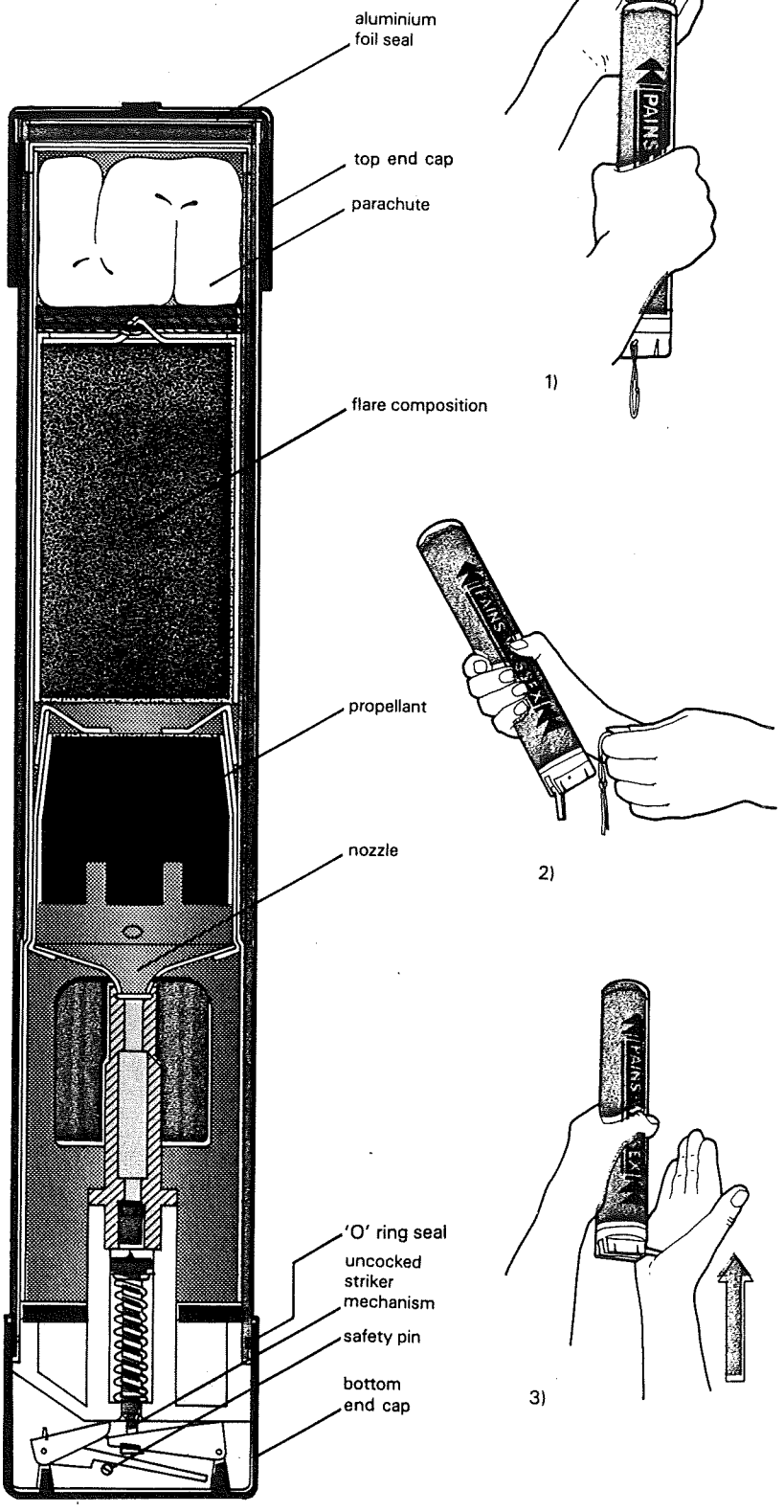
   Sect.8.3 - Pyrotechnics/Boathouse.

   Sect. 8.9 - Pyrotechnics Outfit.

PAINS-WESSEX SCHERMULY

Para Red Mk 3

A hand-held distress signal



DESCRIPTION AND METHOD OF OPERATION

Description

The Red Parachute Rocket is a hand-held distress signal ejecting a parachute suspended red flare at 300m altitude. Major features include:

a) An aluminium foil seal at the top and an 'O' ring at the bottom of the signal to give greater environmental protection.
b) The trigger-lever operation now includes an uncocked striker mechanism and a safety pin to prevent inadvertent ignition.

The rocket casing is of a tough plastic to ensure optimum protection and reliability in severe marine weather conditions.

Applications

Long range distress signalling.
This signal is approved by International Maritime Authorities for use on ships of all types and in ship's lifeboats and liferafts.

Operation

USE ONLY WHEN VESSEL OR AIRCRAFT IS SIGHTED

Although the signal is normally fired vertically to provide maximum range of visibility, in low cloud conditions (below 300m), it is advisable to fire the rocket at an angle of 45° downwind.

1) Remove top and bottom end caps.
2) Remove safety pin.
3) Hold signal firmly. Squeeze trigger lever. Fire vertically, slightly downwind.

Specification

Flare deployment height: 300m when fired vertically, 200m at 45° angle.
Flare burning time: 40 seconds.
Flare light output: 30,000 candela.
Rocket dimensions: 267mm×48mm diameter.
Rocket weight: 360g.
Total explosive content: 143g.

Storage

Should be ideally stored in the robust specially designed Pains-Wessex Poly Bottle.

Conforms to SOLAS '83 Amendments DTp (UK) Approved.

WARNING: EJECTS ROCKET PROJECTILE DO NOT POINT AT PEOPLE

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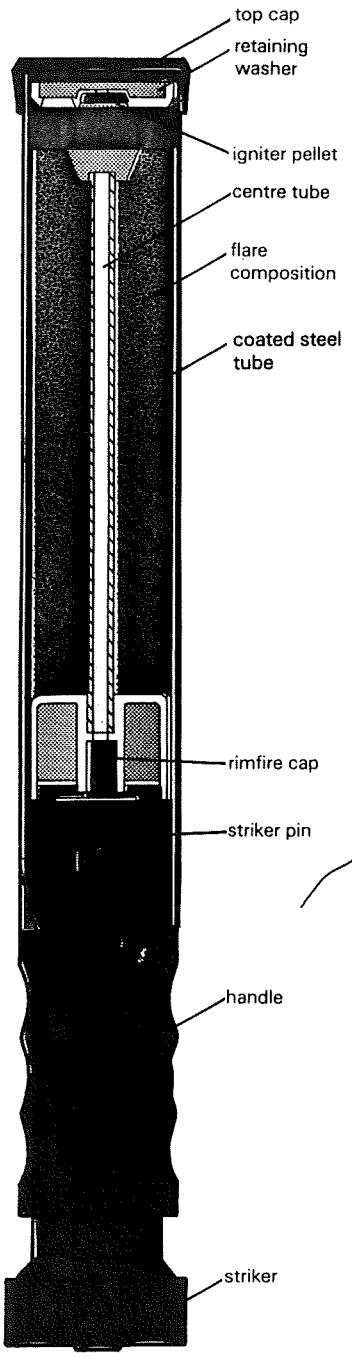
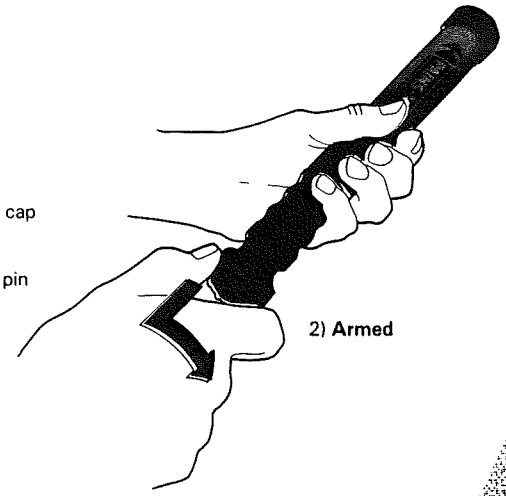
PAINS-WESSEX SCHERMULY

Red Mk 6 Handflare

A hand-held red distress flare




1) Safe


2) Armed


3) Ignited

DESCRIPTION AND METHOD OF OPERATION

Description

A hand-held red flare designed to withstand exceptional environmental exposure and to perform reliably under extreme conditions. The flare is encased in a steel tube for safety to eliminate risk of damage from burning ashes. For greater operational comfort and safety, it is fitted with a pull, twist and strike mechanism integral with the handle. Additional features of this signal are that waterproofing is achieved without the use of sealing tapes, hence easier operation, and once ignited the flare will continue to operate during immersion.

Applications

Shorter range distress signalling to pinpoint position. May be carried on the ship's bridge and is a requirement in lifeboats and liferafts.

Operation

USE ONLY WHEN VESSEL OR AIRCRAFT IS SIGHTED

1) Pull knurled handle to release spigot from safety gate.
2) Rotate handle clockwise until the two arrowheads align. The signal is now ready to be fired.
3) Ignite by striking the knurled section of the handle a **sharp blow** with the palm of the hand or on a hard surface.
4) Hold up and outboard. Point downwind.

Specification

Performance: Burns for 60 seconds at a minimum of 15,000 candela.
Dimensions: 248mm×35mm diameter.
Weight: 260g.
Explosive content = 95g.

Storage

Should be ideally stored in the robust, specially designed Pains-Wessex Poly Bottle.

Conforms to SOLAS '83 Amendments DTp (UK) Approved.

WARNING: PRODUCES HOT RED FLAME

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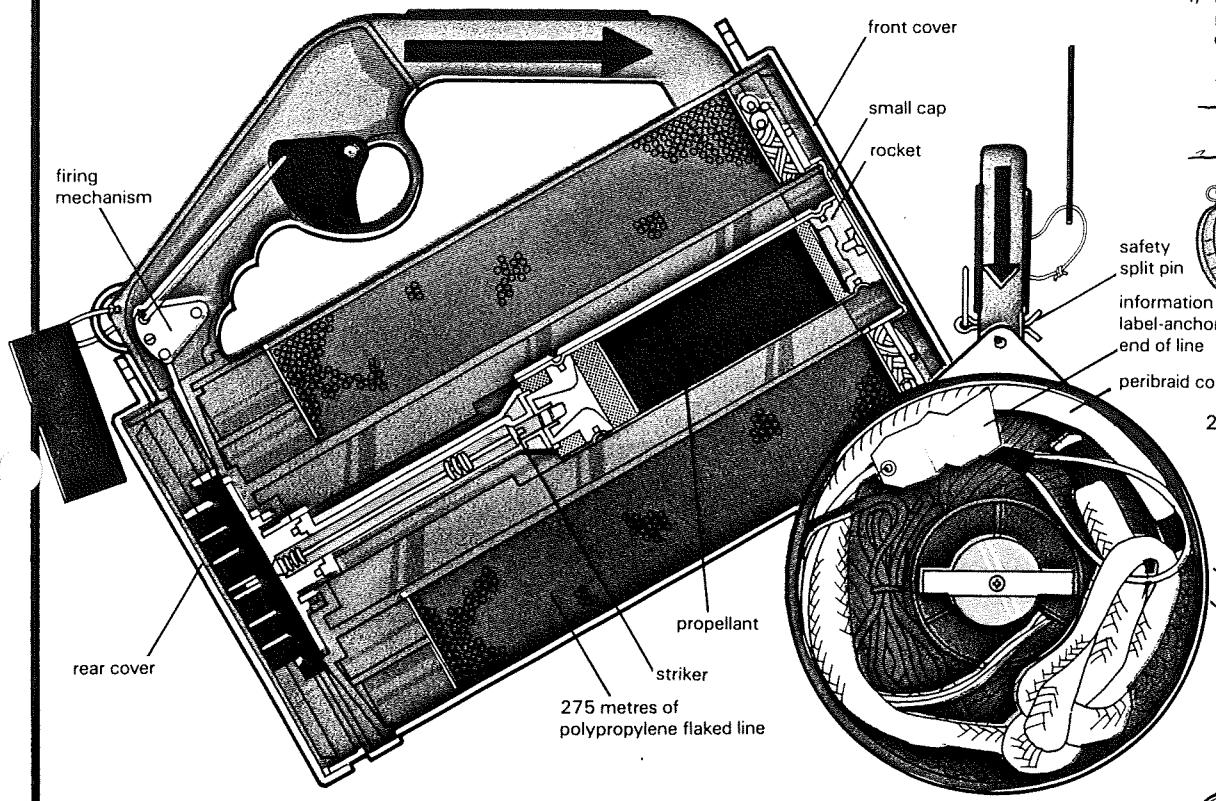
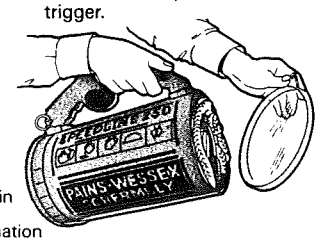
PAINS-WESSEX SCHERMULY

Speedline 250

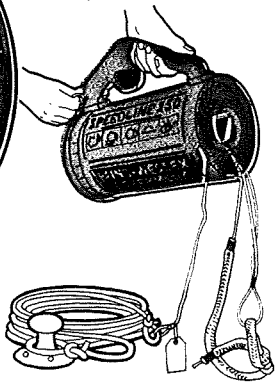
A self-contained linethrowing apparatus



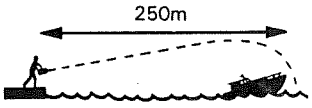
1) Remove front cover and point arrow on unit in direction of firing. Keep hand well away from trigger.



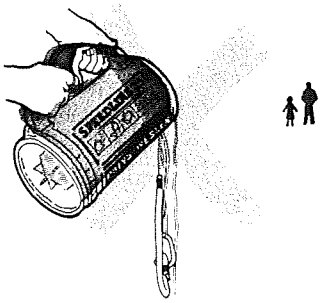
2) Make cord fast to a heavy line and secure to vessel. Ensure small cap is in place.



3) Remove safety pin and hold in firing position.



4) Aim over top of vessel. If misfire occurs hold unit in firing position for one minute. Then dispose of overboard.



5) Rocket ejected from unit. **Do not point at people.**

DESCRIPTION AND METHOD OF OPERATION

Description

A self-contained linethrowing unit consisting of a weatherproof plastic casing with end caps; incorporating the handle and trigger assembly and housing the rocket, striker and 275m of ready-flaked line. Full pictorial instructions are printed on both sides of the unit. The set of 4 units normally carried can be dispersed in strategic positions throughout the vessel.

Stowage

Speedline 250 is designed as a self-contained unit ideally stored in a water resistant locker allowing easy access in an emergency. Speedline 250 must be stored in an upright position with the arrows on the handle pointing upwards and the safety pin fitted.

Applications

Speedline 250 is designed for ease of operation in the most extreme weather conditions. It can be used in all situations where a line is required to be passed accurately and quickly.
This includes:

1) All line throwing operations at sea between vessels or from shore based rescue services.
2) Rescue of swimmers in distress using optional buoyant head to keep rocket afloat.
3) Line carrying across obstacles and rough country.

Specification

Performance: Projects a line to a nominal range of 250m in calm conditions.
Dimensions: Length 334mm×295mm height ×190mm diameter.
Weight 4.6kg.

Precautions

Spares Kits are available to replace consumed or time expired rockets. Reference should be made to the reloading instructions (supplied with spares kit) before attempting to replace the rocket and striker. The new 250 (rocket and striker) can be fitted to existing Speedline International units **but** they must be fitted as a pair. Both are coloured black.

DO NOT ATTEMPT TO FIT THE NEW ROCKET COLOURED BLACK WITH THE OLD IGNITION COLOURED YELLOW.

Disposal of time expired rockets and ignitors/strikers should be in deep water at sea.

Conforms to SOLAS '83 Amendments. DTp (UK) approved.

WARNING: EJECTS ROCKET PROJECTILE DO NOT POINT AT PEOPLE

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APPENDIX 2

MERSAR SEARCH PROCEDURES

A2.1 In order that vessels at sea can conduct an effective search for a casualty it is important that search pattern and procedures should be pre-planned to enable ships to co-operate in a co-ordinated operation.

A2.2 To achieve this a number of search patterns have been internationally established. It is the responsibility of the On-Scene-Commander (OSC) or Co-ordinator Surface Search (CSS) to initiate the most suitable search pattern.

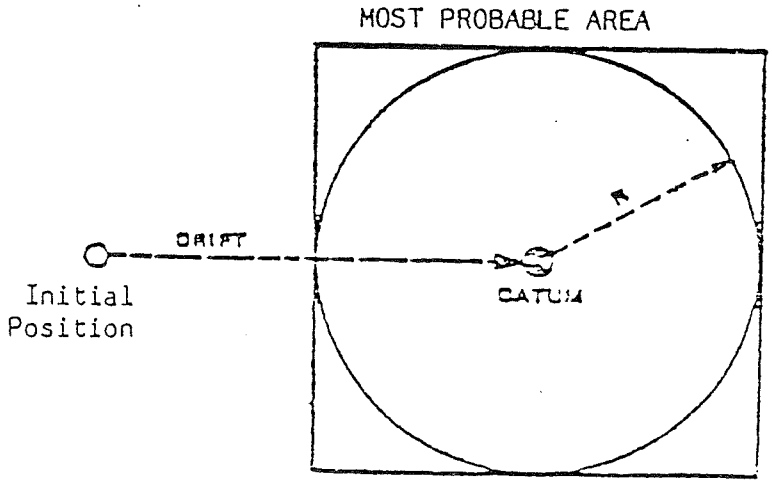
A2.3 It will be necessary to establish a datum, this is the most probable position of the casualty based on information received. This datum is subject to error as the initial position given may be in doubt, and a suitable radius applied from the datum. The most probable area to search must take into account the following factors:-

a. The reported position and time of the casualty.

b. The expected drift, this is the estimated result of wind and/or tide since the position was established and the estimated movement of the casualty. e.g. a liferaft will make more leeway than a keel craft.

c. The time taken to reach the reported position.

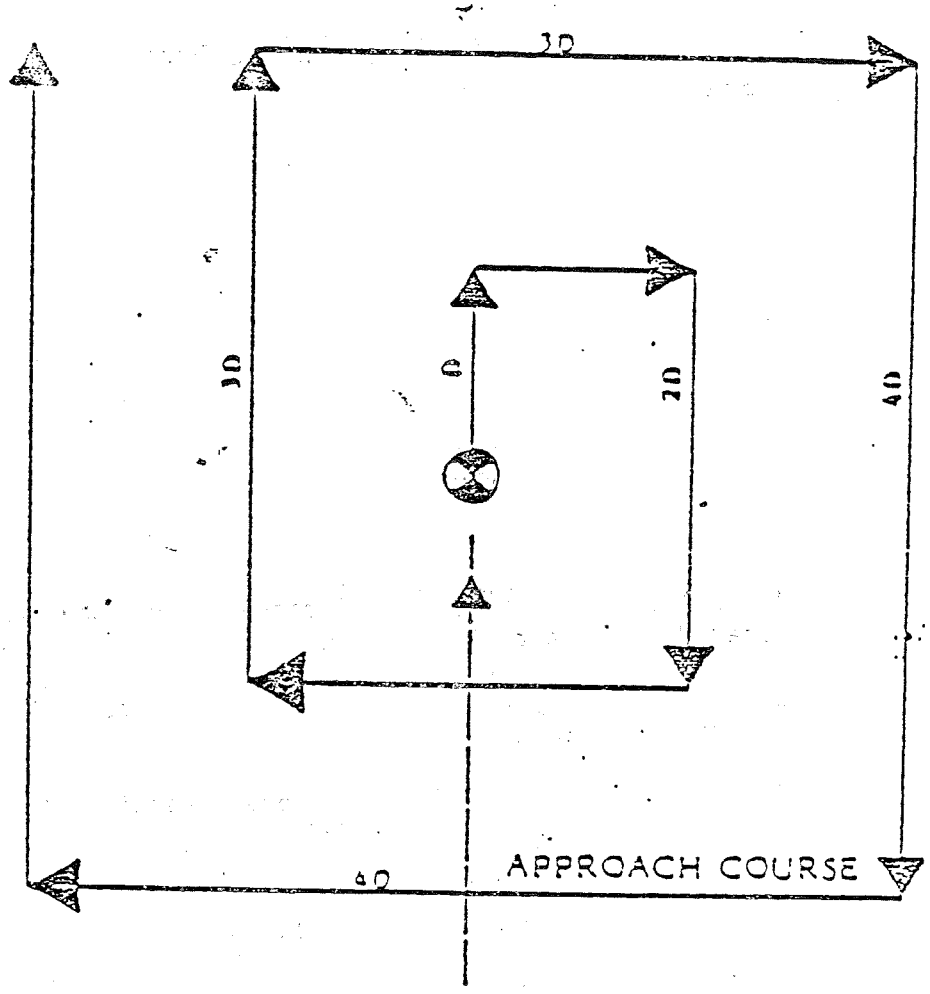
A2.4 When determining the most probable area for a search there may be occasions when large errors may have to be applied to the datum.



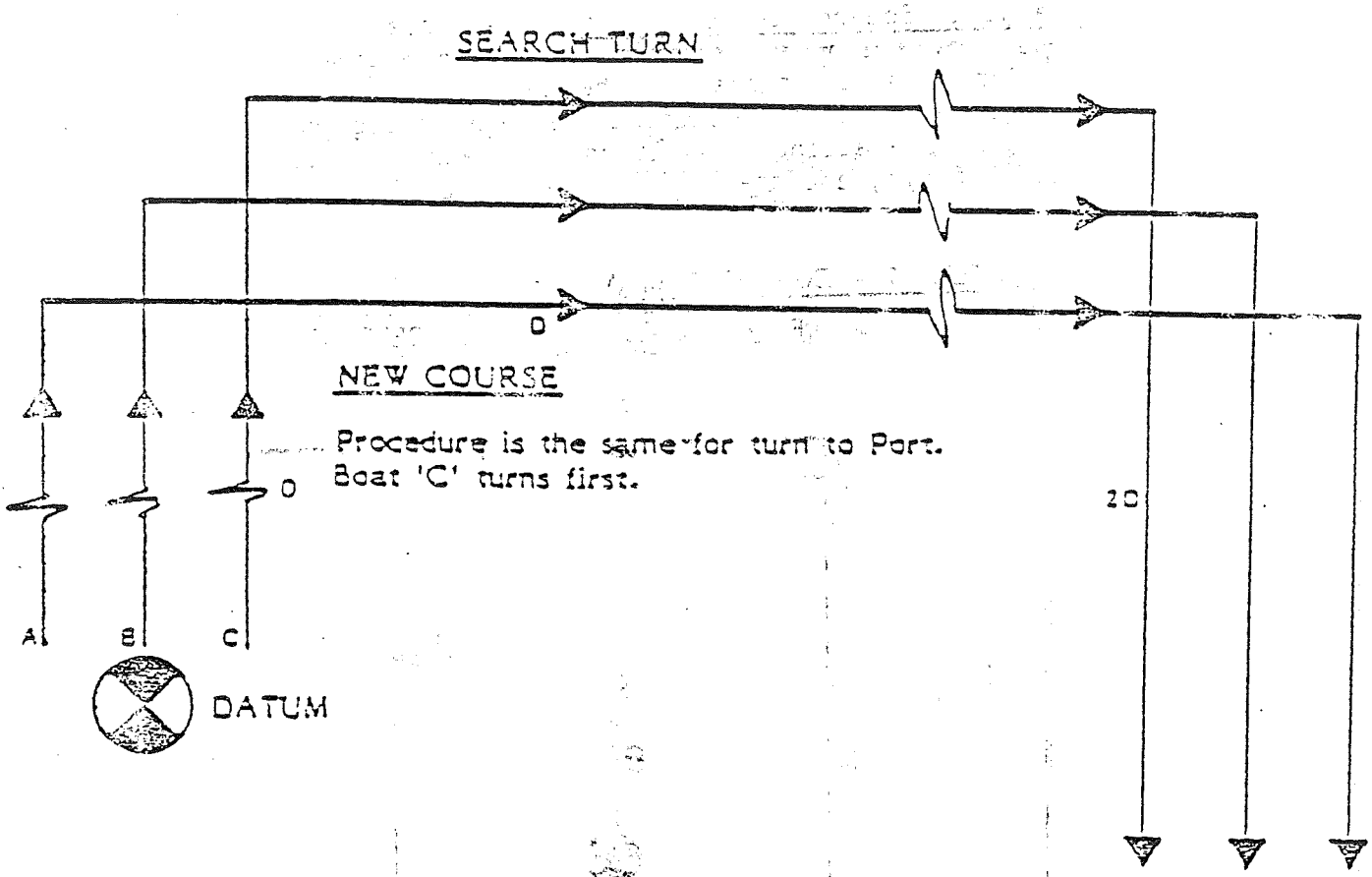
A2.5 Expanding Square Search Pattern - this pattern may be used by a single vessel, or a number of boats searching for a small target. The length of each leg and the speed of the searching vessels being determined by the prevailing conditions, weather, visibility, height of eye, and the size of the casualty.

PATTERN 1 - EXPANDING SQUARE SEARCH - 1 SHIP

D = 75 % OF EXPECTED CASUALTY DETECTION RANGE



When searching for a small target with a number of boats carrying out an expanding square search, this is probably the most suitable type of search for a lifeboat to carry out, the search turn is used as shown in the next drawing.



1. O.S.C. asks the boat furthest from the new course (Boat "A") to turn 90° to STBD.

2. When Boat "A" passes astern of Boat "B" - Boat "B" then turns 90° to STBD.

3. When Boats "A" and "B" pass astern of Boat "C" - Boat "C" also turns 90° STBD.

N.B. (a) This procedure is identical no matter how many boats are involved.

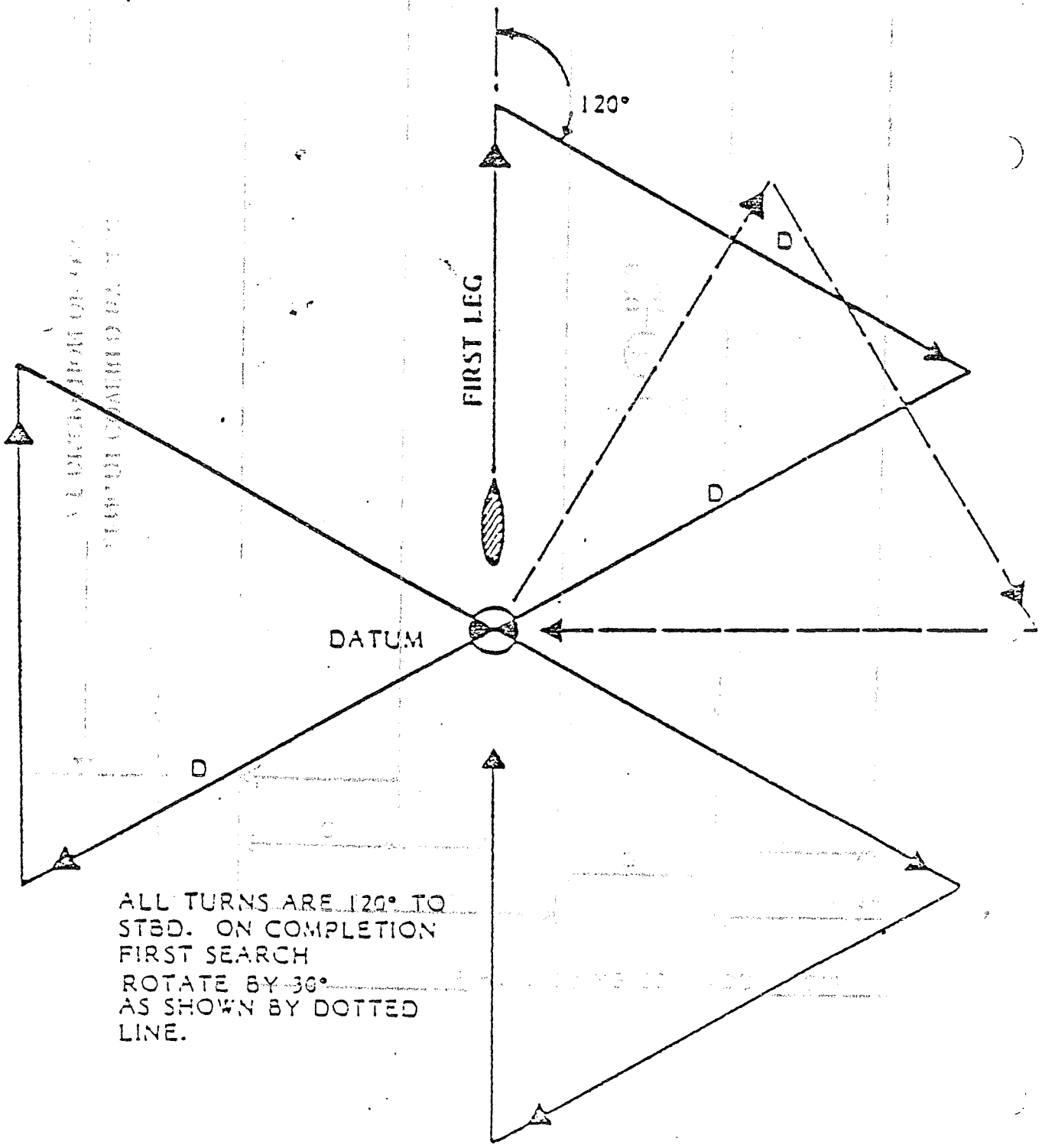
(b) All boats will then be parallel on each leg and proceed at the speed of the slowest boat.

(c) Turns can of course be made to port or starboard. In either case the boat furthest from the new course turns first.

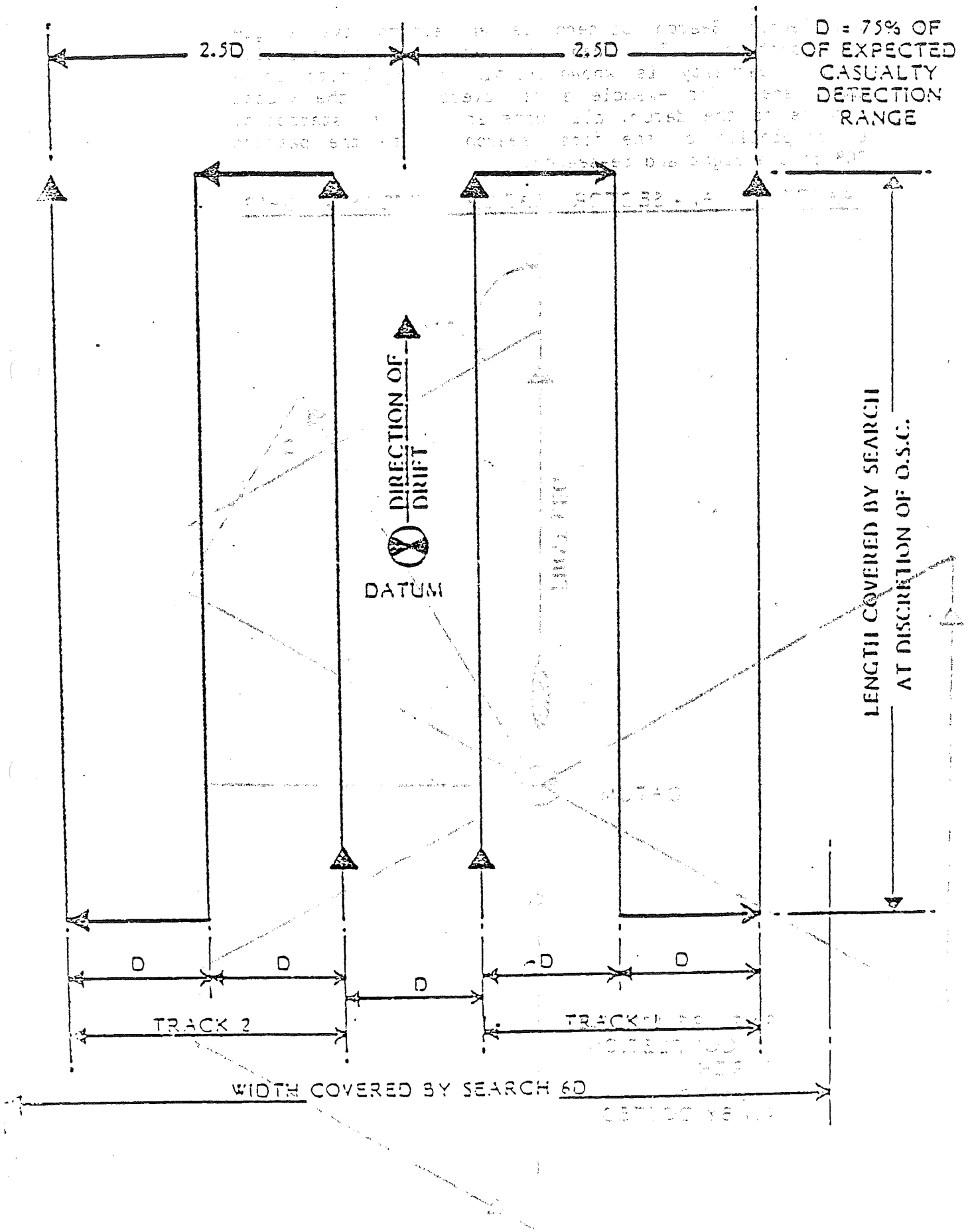
A2.6 PATTERN (A) - SECTOR SEARCH PATTERN - 1 SHIP

The Sector Search pattern is an alternative single ship pattern. This can be used when the position of the casualty is known within close limits in a small area, for example a man overboard - the vessel returns to the datum, all turns are 120° to starboard. On completion of the first search rotate the pattern 30° to the right and re-search.

PATTERN I(A) - SECTOR SEARCH PATTERN - I SHIP



A2.7 PARALLEL TRACK SEARCH PATTERN – 2 SHIPS



I N D E X

NOTE : The subject matter is followed by the Section number, paragraph and sub-paragraph number where required, e.g. the entry for "Alarm Test Switches" 16.7.7, means Section 16, paragraph 7, sub-para 7.

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