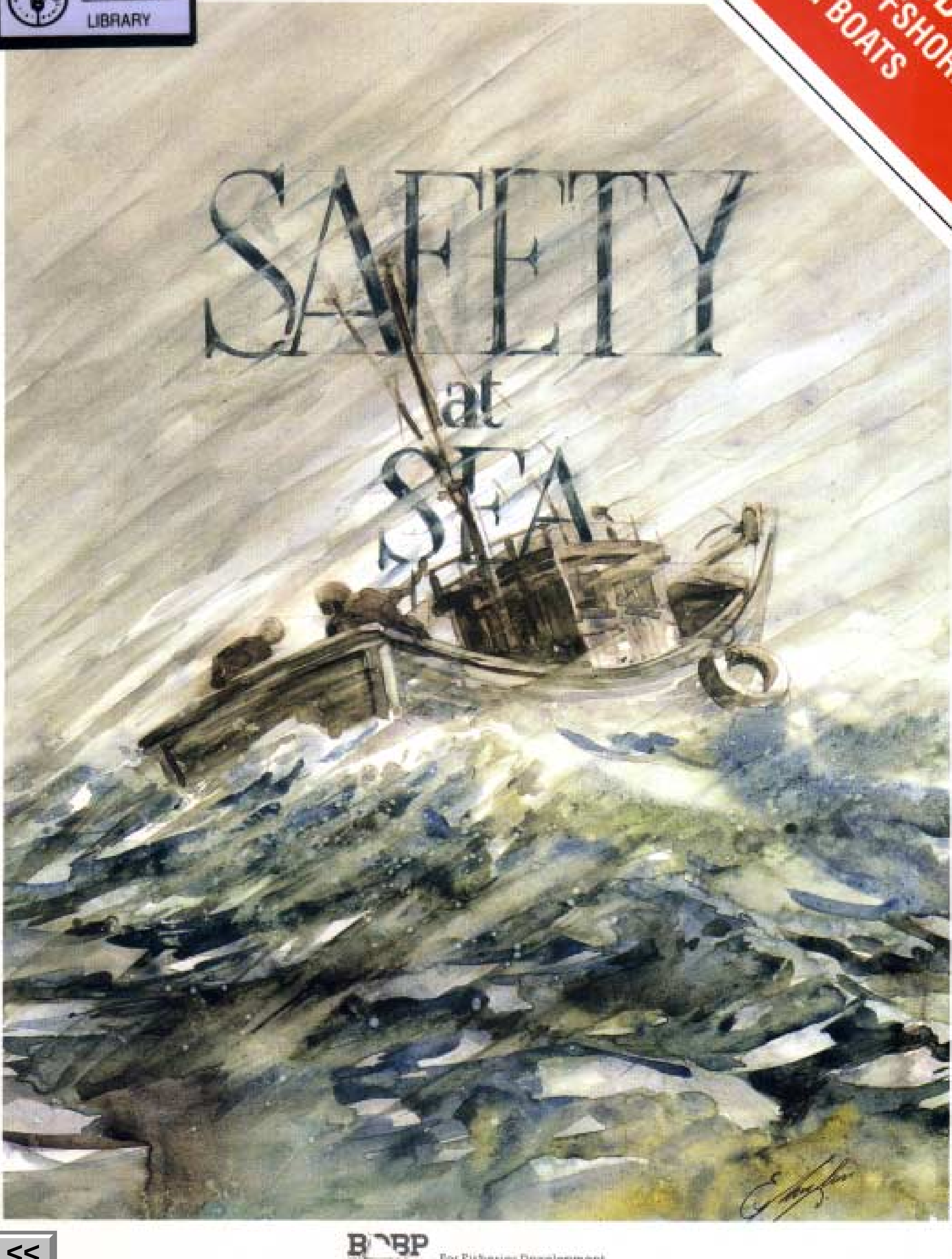
BOBP/MAG/16

SAFETY GUIDE FOR SMALL OFFSHORE FISHING BOATS



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BOBP For Fisheries Development
BAY OF BENGAL PROGRAMME

A SAFETY GUIDE FOR SMALL OFFSHORE FISHING BOATS

BY

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and

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BAY OF BENGAL PROGRAMME

Madras, India

1993

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INTRODUCTION

Small boats, less than 12 m in length, are not used in most countries to fish offshore for large pelagic species. That was the case in Shri Lanka too, upto around 1980. All the fishing there took place in coastal areas during the day or night and fishing trips never lasted more than 12 hours. That is not true any more. About 400 small decked boats of 9-11 m now venture out as far as 200 n miles from shore and stay at sea for upto ten days in search of tuna, shark and billfish

The expansion of the offshore fisheries in Shri Lanka was, in many ways, hurriedly done, without the required upgrading of boat technology for boat and crew safety. These fishermen are still facing new challenges and do not have the experience to prevent breakdowns and, worse, losses at sea. The result is a relatively high accident rate. Every year, an average of eight boats and around 30 men are lost at sea without trace.

The Bay of Bengal Programme (BOBP) undertook a subproject in 1982 to develop small offshore boats in Shri Lanka. Besides developing these boats, the subproject, as a follow-up, dealt with the problem of safety at sea and offered advice on search-and-rescue for the offshore fisheries. Various studies, followed by seminars and consultations held during the last few years, identified two avenues for improved safety:

- Government regulations to be introduced at some stage, but which will have to be carefully considered before introduction.
- Information to be provided to boatyards, boat-owners and crew on the design and operational aspects which contribute to making a safer fishing boat that will provide adequate protection for the lives of those aboard.

The purpose of this manual is to assist the latter effort.

Since no international rules or guidelines exist for fishing boats less than 12 m in length, advantage has been taken of local experience and of the work done on the safety of small fishing boats in European countries, the United States of America and Australia.

The manual covers aspects of safety that are relevant to all decked fishing boats less than 12 m in length, but it deals more in detail with the engine installation, since experience in Shri Lanka has shown that engine breakdown. which leads to drifting, is a major cause of fishing boats being lost. The manual indicates practical solutions to safety problems faced by multiday offshore boats off Shri Lanka and elsewhere.

When dealing with safety for small fishing boats in developing countries, the question of cost is unavoidable. For example, the cost of an inflatable liferaft is high in relation to the total cost of these small boats and might not,' at this stage, be feasible. A better engine installation, however, will not increase the cost substantially, but will, together with better engine maintenance, lead to a substantial reduction in engine breakdowns at sea and, thereby. lessen the number of fishermen lost.

Other low-cost safety measures are:

- Increased fuel tank capacity, to avoid placing fuel drums on deck.
- Lashing of hatch covers.
- Better installation of gas cooker.
- Emergency sail for small boats.
- Introduction of the 'buddy' system, whereby several boats keep in contact with each other at the fishing grounds in order to assist each other when in trouble.

As the Guide is intended to be of practical use to boatbuilders, boat-owners and fishermen, it has been necessary to be specific and go into detail. It will also be very useful to teachers in fisheries training schools and extension field officers dealing with small-scale offshore fisheries.

The Safety Guide has been prepared by Ø Gulbrandsen, Consultant Naval Architect, and G. Pajot,Senior Fishing Technologist. It incorporates the work of Emil Aall Dahle, Consultant on Safety at Sea, BOBP staff, Fisheries Officers, boatyard personnel and all those who were involved in the development of offshore fisheries in Shri Lanka. It has not been cleared by the Government concerned or the FAO.

CONTENTS

ABBREVIATIONS

L	=	Length
D	=	Diameter
iD	=	Inner diameter
H	=	Height
B	=	Beam
F	=	Freeboard at bow
K	=	Empirical constant
T	=	Thickness
S	=	Spacing
V	=	Volt
A	=	Ampere
R	=	Radius
	=	Effective length
	=	Minimum freeboard
d	=	Distance
m	=	Metre
m2	=	Square metre
mm	=	Millimetre
GM	=	Metacentric height
KW	=	Kilowatt
Tr	=	Rolling period
RM	=	Righting Moment
PA	=	Nylon
PP	=	Polypropylene
PE	=	Polyethylene
Kg	=	Kilogram
Ah	=	Ampere hour
hp	=	Horsepower
SWG	=	Sheet and wire gauge
FRP	=	Fibreglass reinforced plastic
GPS	=	Global Positioning System
PVC	=	Polyvinyl chloride
LOA	=	Length overall
CUNO	=	Cubic number

NOTE: Unless otherwise stated, all dimensions are in mm

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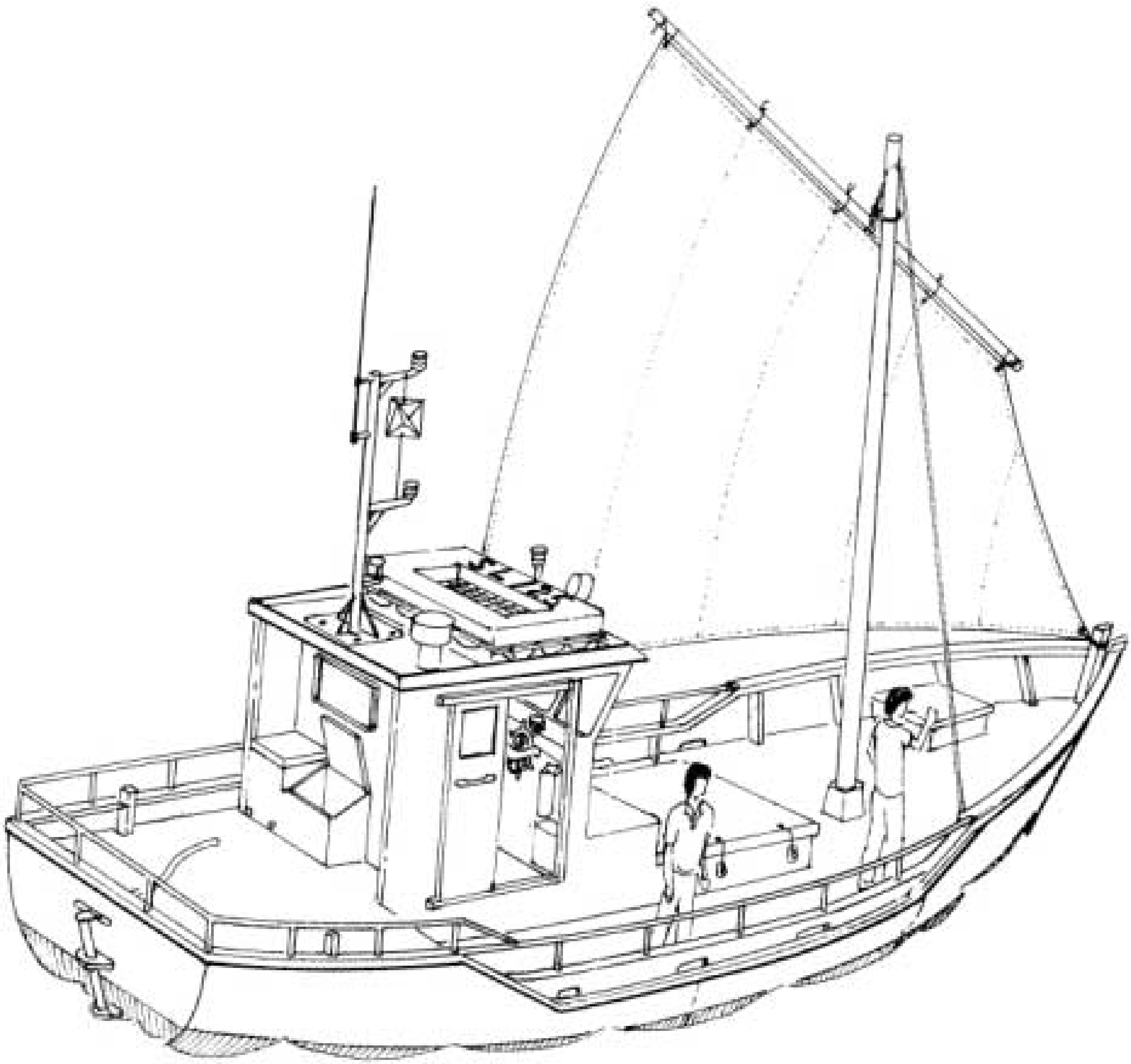
An offshore fishing boat fitted *with* the necessary safety equipment



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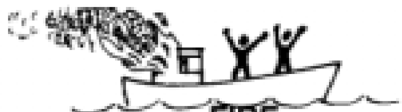
ACCIDENTS

DRIFTING

- Bad engine installation
- Bad maintenance of engine
- Lack of trouble-shooting experience
- Lack of fuel



FIRE

- Careless use of open fire
- Bad installation of cooker
- Wrong location of gas bottle

SINKING

- Poor standard of construction
- Bad maintenance

COLLISION

- Lack of navigation and fishing lights
- Lack of radar reflector
- Careless crew

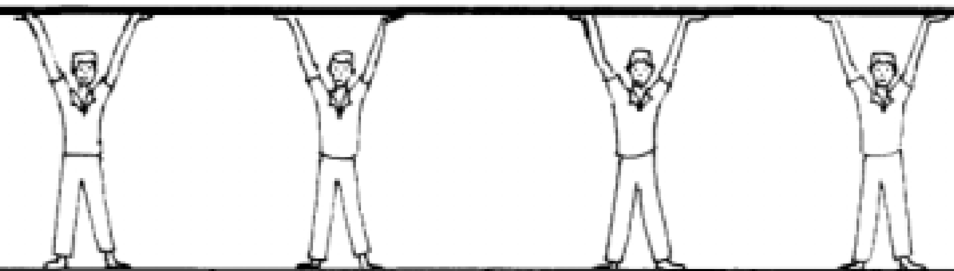
CAPSIZAL

- Poor stability
- Heavy loads on deck
- Water trapped on deck

WORK ACCIDENTS

- Slippery decks
- Unprotected deck equipment and machinery
- Tired crew

THESE PEOPLE MUST LIFT TOGETHER TO AVOID ACCIDENTS



AUTHORITY	BOATBUILDER	BOAT-OWNER	BOAT CREW
– Regulations for construction and safety equipment	– High quality in construction and equipment	– Caring for good boats and equipment for safety of boat and crew	– Good maintenance and safe operation

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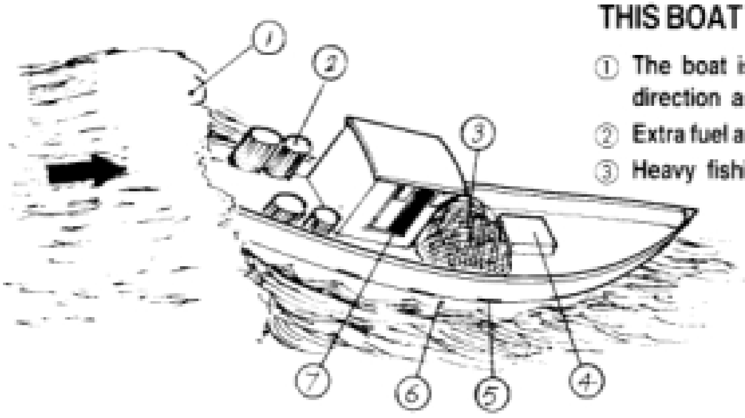
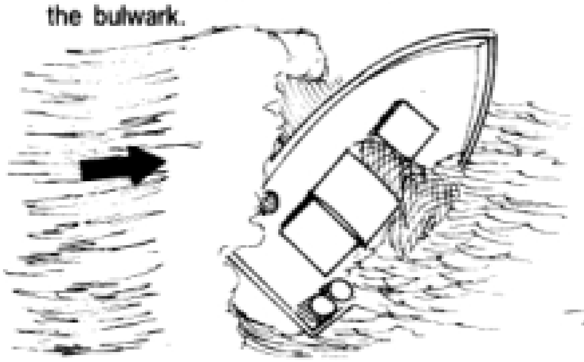
CAPSIZAL

THIS BOAT IS IN DANGER OF CAPSIZING

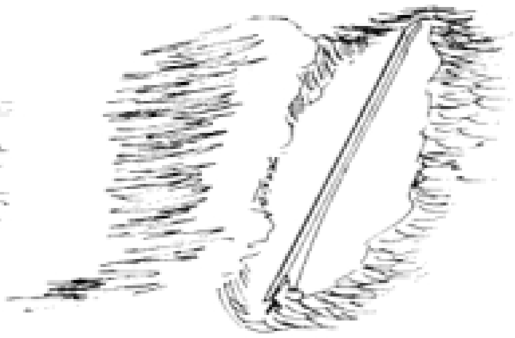


1. The boat is going full speed in the same direction as the waves
2. Extra fuel and fresh water are in drums on deck.
3. Heavy fishing gear is on deck.
4. Hatch covers are not lashed.
5. Freeing ports are small.
6. Freeboard is low.
7. Deckhouse door is open.

The boat is likely to be thrown broadside to the waves and the fishing gear and drums are likely to slide over the bulwark.

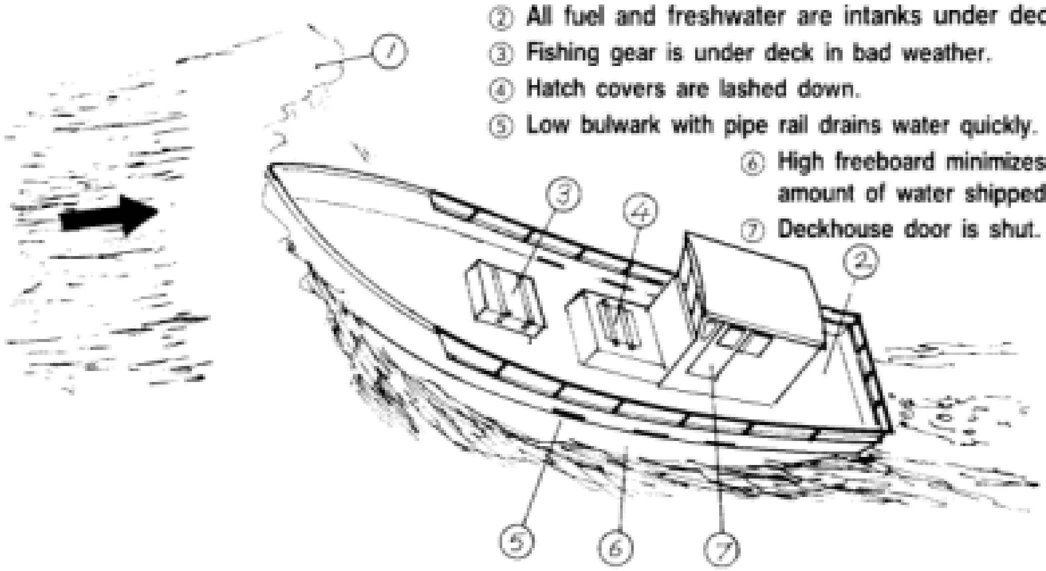


The boat is then likely to capsize with the next large wave.



THIS BOAT IS BETTER PREPARED AGAINST CAPSIZING

1. The boat is going slowly against the waves.
2. All fuel and freshwater are intanks under deck.
3. Fishing gear is under deck in bad weather.
4. Hatch covers are lashed down.
5. Low bulwark with pipe rail drains water quickly.
6. High freeboard minimizes the amount of water shipped in.
7. Deckhouse door is shut.



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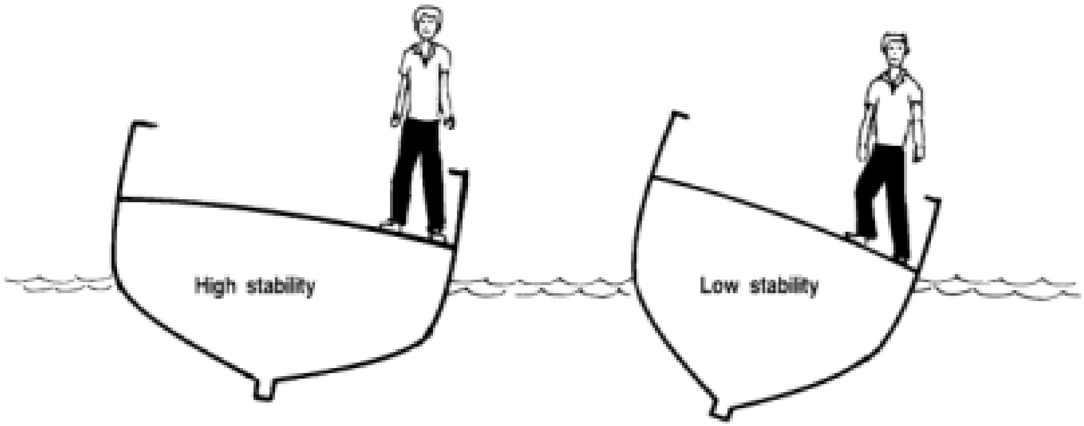
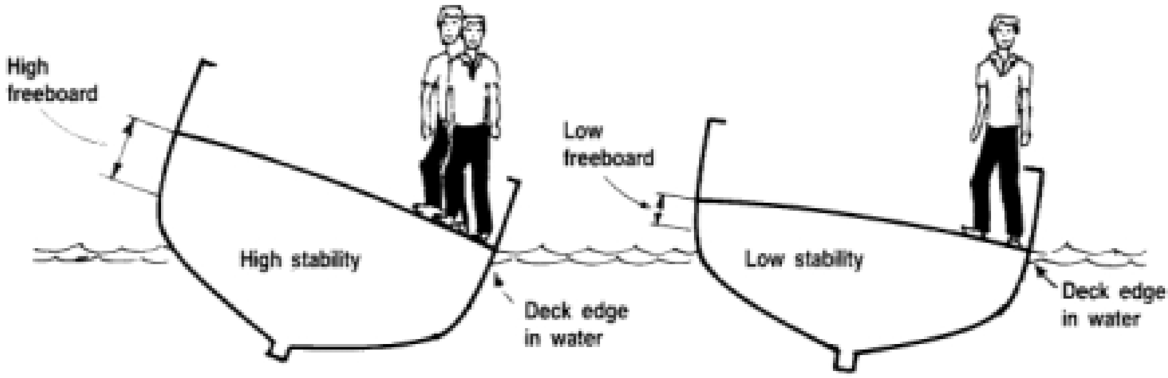
STABILITY

BEAM

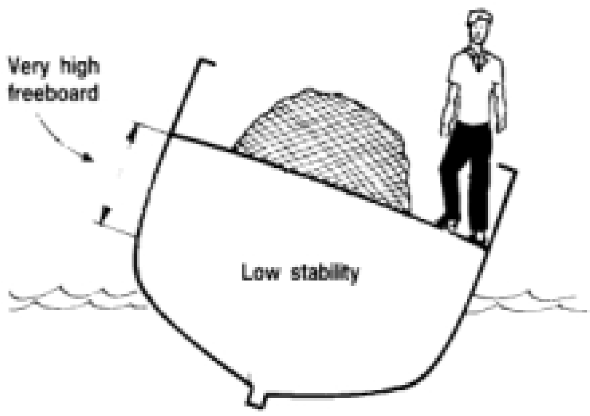


When you walk to one side of a broad-beamed boat, it will not heel over as much as a narrow boat. We, therefore, say a beamy boat has more stability.

FREEBOARD



Comparing two boats with the same beam but different freeboards, the one with the higher freeboard has more stability and is able to take more people at the deck edge before the deck touches the water.



The freeboard is, thus, very important for the safety of a fishing boat. However, if it is increased too much, the boat will lose stability more quickly than a boat with less freeboard. This will happen if heavy fishing gear is put on deck. So, a compromise has to be found to select the optimum freeboard.

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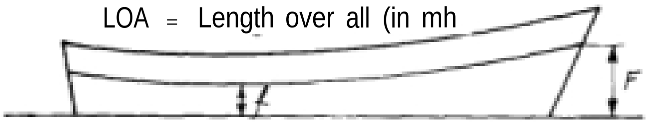
HOW TO CHECK THE STABILITY 4

1. MINIMUM FREEBOARD

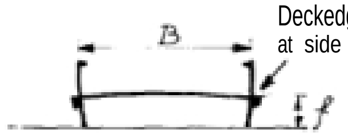
Measured with maximum load on board

Minimum f=200mm F= 17xLOA+700(mm)

LOA = Length over all (in mh



Deckedge at side



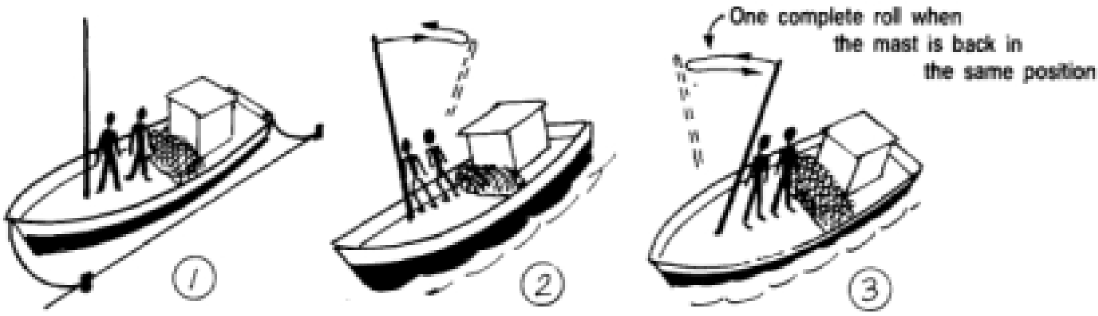
B is measured inside fenders

2. MAXIMUM ROLLING PERIOD

The rolling period, measured in seconds, is an indication of the boats' stability. Comparing two boats with the same beam, the one with the lower rolling period is more stable. The maximum rolling period acceptable for good stability is dependent on the beam and the freeboard of the boat. It is given in the table below.

It is based on the formula: Tr = KxB
\GM

(where K = 0.8, Minimum GM = 0.60 + 0.05B – O.25f)



How to measure the rolling period

® The fish-hold must be empty but the boat must carry a normal amount of fuel and freshwater. The fishing gear and crew must be on deck. The boat must be away from the quay with the mooring lines sJack.

© Start the boat rolling by making the crew run from side to side.

® When the boat is rolling freely, stop the crew amidships quickly and start the stopwatch when the mast is furthest to one side. Count five rolls and take the time. Divide this time by 5 to get the time for one roll. Repeat the same procedure three times and calculate the average time for one roll. Measure freeboard = f (mm) and beam = B (m). If the *measured rolling time is less than what is shown in the table below,* the stability is acceptable.

NOTE: This is only a check. If possible, a complete stability investigation should be done by a naval architect.

		BEAM "B" (in metres)										
		2	*2.2*	*2.4*	*2.6*	*2.8*	*3*	*3.2*	*3.4*	*3.6*	*3.8*	*4*
		ROLLING PERIOD (in seconds)										
FREEBOARD "f" in mm	200	2	2.2	2.4	2.5	2.7	2.9	3.1	3.2	3.4	3.5	3.7
	400	2.1	2.3	2.5	2.6	2.8	3	3.2	3.3	3.5	3.7	3.8
	600	2.2	2.4	2.6	2.7	2.9	3.1	3.3	3.4	3.6	3.8	4
	800	2.3	2.5	2.7	2.9	3.1	3.3	3.4	3.6	3.8	4	4.2

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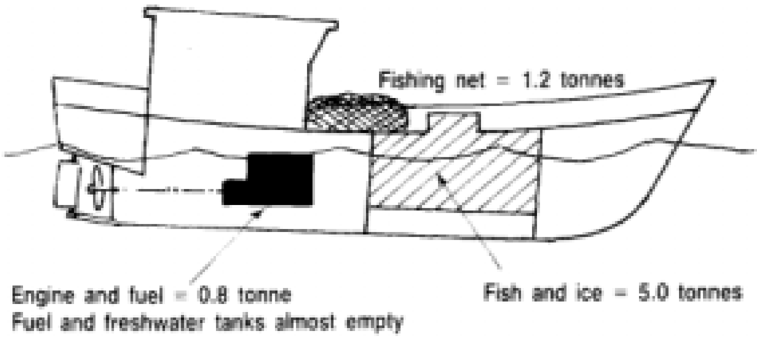
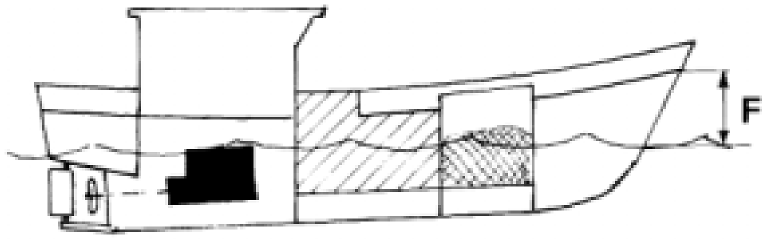
GENERAL ARRANGEMENT

Example: 10 m driftnetter with heavy load of fish and ice

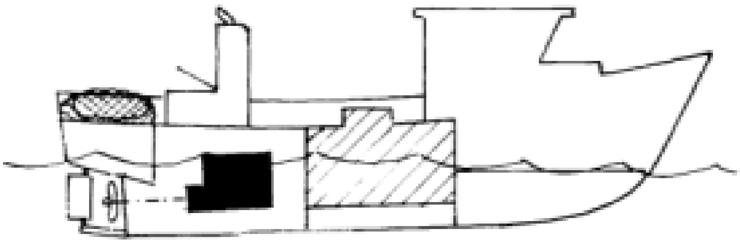


Fish-hold is too far forward. Boat is trimming by the bow and will be dangerous in rough seas. Heavy fishing gear (net) on deck gives poor stability.



Option 1

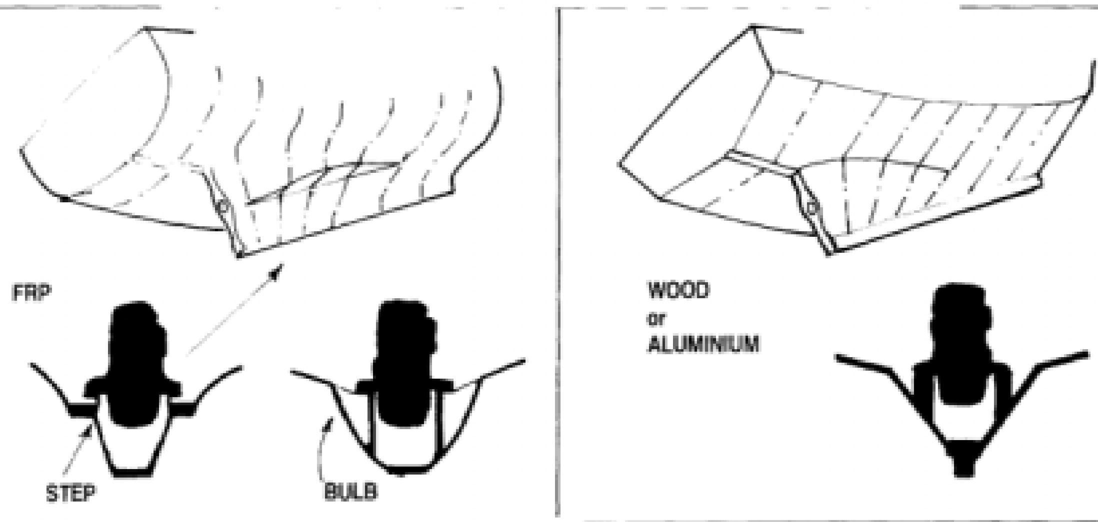
Fish-hold is amidship. Net is in fishing gear-hold during rough weather. Freeboard (F) at the bow should be at least equal to 17 LOA + 700 mm (LOA = 10 m, F = 870 mm) for acceptable safety



Option 2

Deckhouse is forward. Access to engine is through a hatch with a high coaming on side. (Engine can be removed through a flush hatch bolted to deck.)

CHANGE OF HULL SHAPE TO MOVE ENGINE AFT



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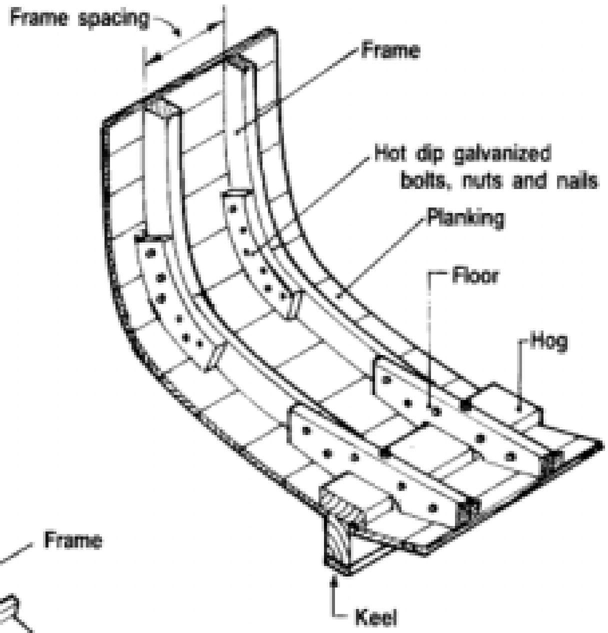
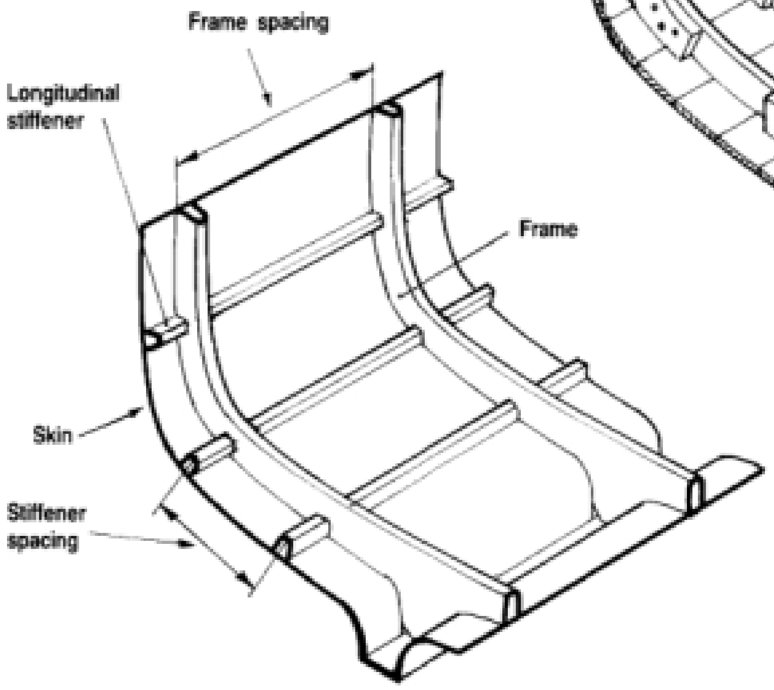
HULL CONSTRUCTION 6

Shown below are the parts of the hull that give strength to a boat. It is advisable that the thickness and width of these parts is according to the rules of an internationally recognized classification society.

WOODEN CONSTRUCTION



FRP CONSTRUCTION



The following classification societies have rules for fishing boats under 12 m (40 ft) length:

- Sea Fish Industry Authority
  Sea Fisheries House, 10 Young Street, Edinburgh EH2 4JQ, U.K.
- Det Norske Veritas
  Postbox 300. 1322 HOVIK, Norway
  (Nordic rules for boats under 15 m - 45 ft - length)

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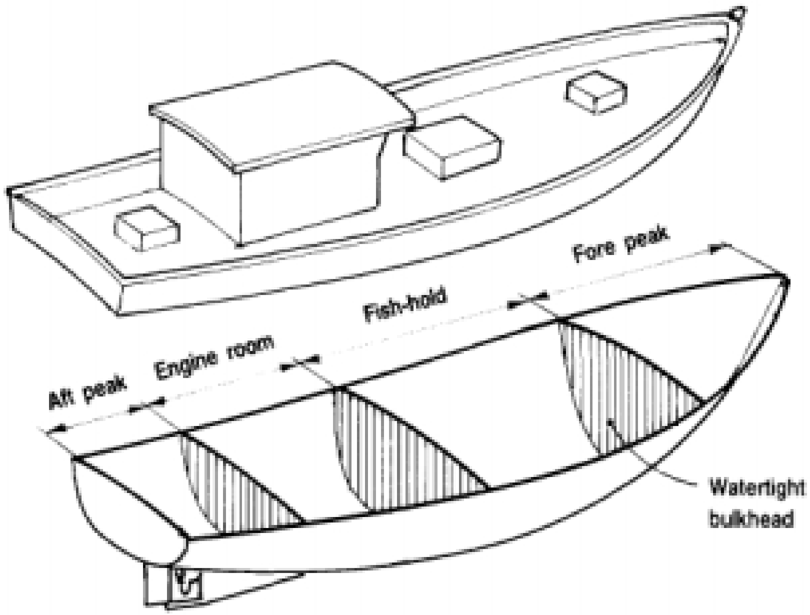
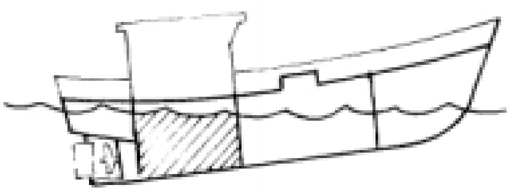
WATERTIGHT BULKHEADS

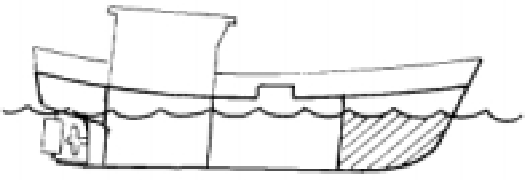
If a heavy leak develops, watertight bulkheads that divide the boat into compartments will prevent flooding of the whole boat. In a wooden boat, it is difficult to make the bulkheads watertight. In FRP boats, watertight bulkheads can be installed at little extra cost.

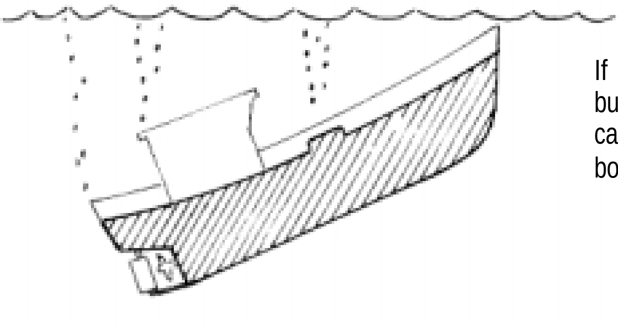


Leaks in the engine room are often caused by a corroded seacock, damaged seawater hoses, poor quality and installation of wet exhaust hose and a faulty stuffing box in the stern tube. If the buoyancy of the aft peak is sufficient, the boat will float.

A collision with a boat, a log or a rock could lead to flooding of the boat. A forward watertight bulkhead will prevent flooding of the whole boat.



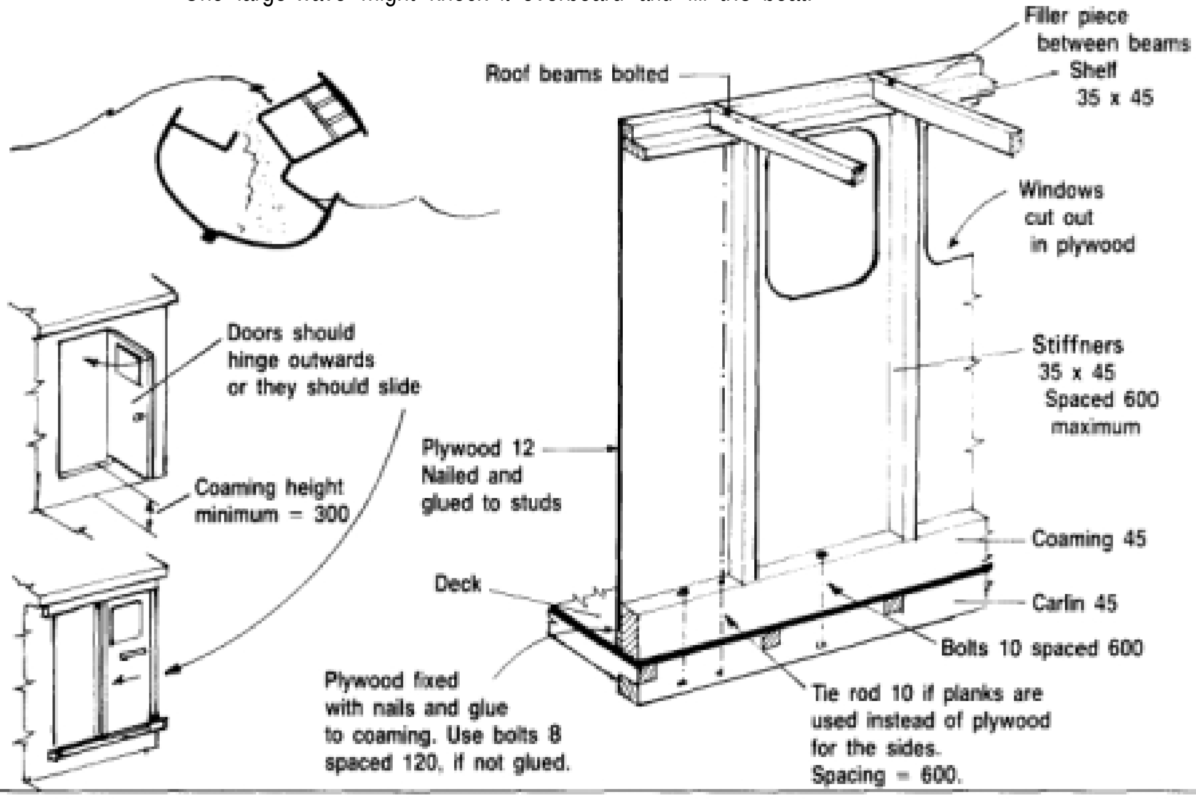




If the boat has no watertight bulkheads and if the bilge pump cannot cope with the leak, the boat will certainly sink.

DECKHOUSE

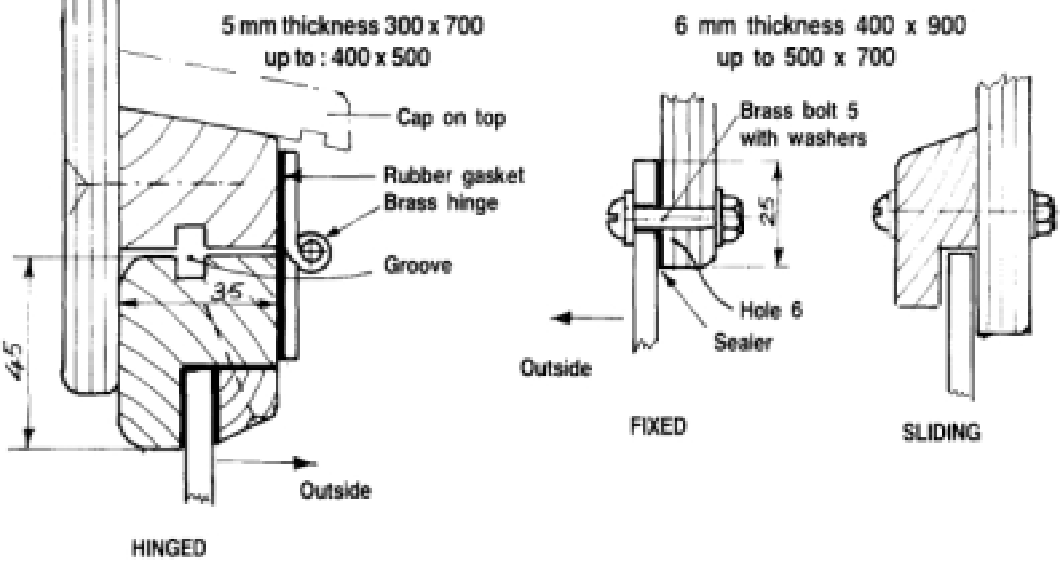
The deckhouse is often the weakest part of a boat.
One large wave might knock it overboard and fill the boat.



WINDOWS

Windows should be fixed outside the plywood for adequate strength. Window panes should be made of safety glass, as used in automobiles, acrylic (Perspex) or polycarbonate.

The thickness should be according to window size (mm)



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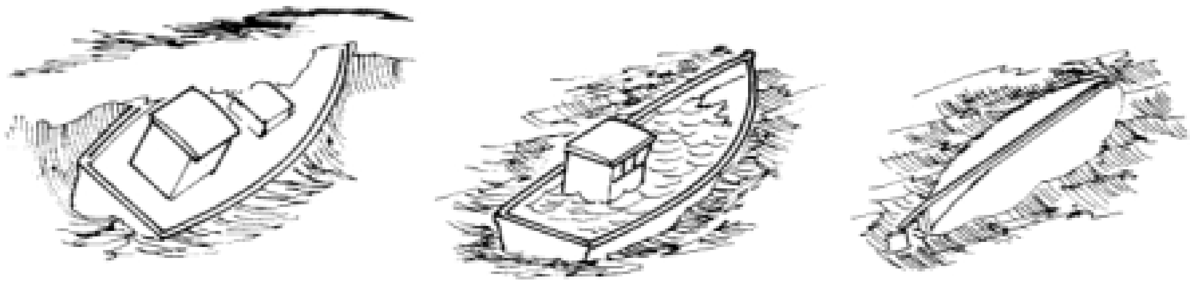
FREEING PORTS

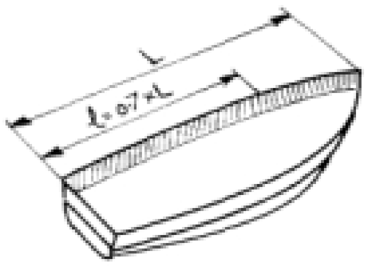
Why are freeing ports required?

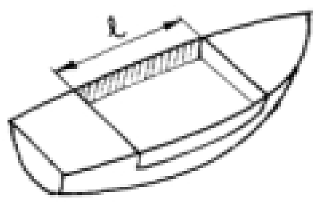


When a big wave breaks on the deck, leaves it awash and does not drain quickly, the boat may capsize, depending on the amount of water left on the deck.
The purpose of providing freeing ports is to drain the water quickly.

The amount of water trapped will increase with the height of the bulwark (H)...

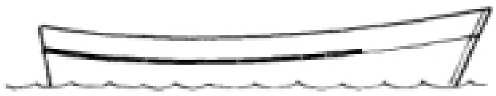
.and the effective length (9) of the bulwark = 0.7 x L

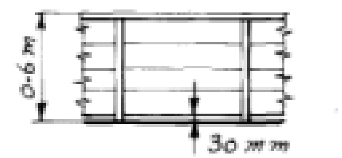




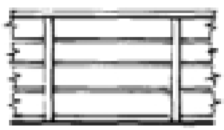
The area of freeing ports on one side should be : $A = 0.04\ H\ell$ in m^2 (H, ℓ in m)

EXAMPLE : Boat $L = 10.0$ m, $H = 0.6$ m. Freeing port area: $A = 0.04 \times 0.6 \times 0.7 \times 10 = 0.17\ m^2$

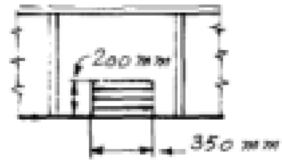




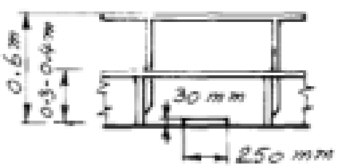
On a wooden boat, a gap of 30 mm will provide enough freeing port area.



A better way is to provide a gap of 10-15 mm between the bulwark planks.



Large freeing ports must have a grid to prevent fish on deck sliding overboard.



The best system is to have a low bulwark with a galvanized pipe rail.

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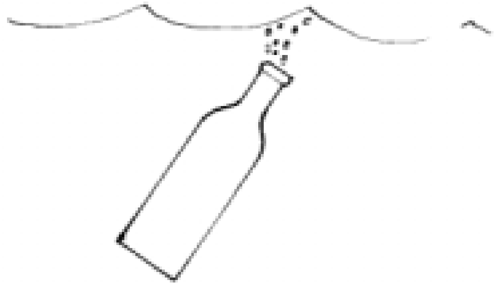
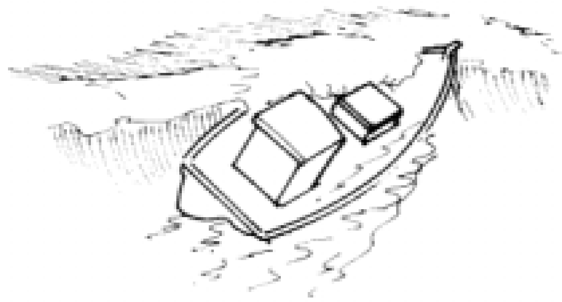
WEATHERTIGHT HATCHES

A corked empty bottle will float as long as its cork is in place

Take the cork out and it will sink

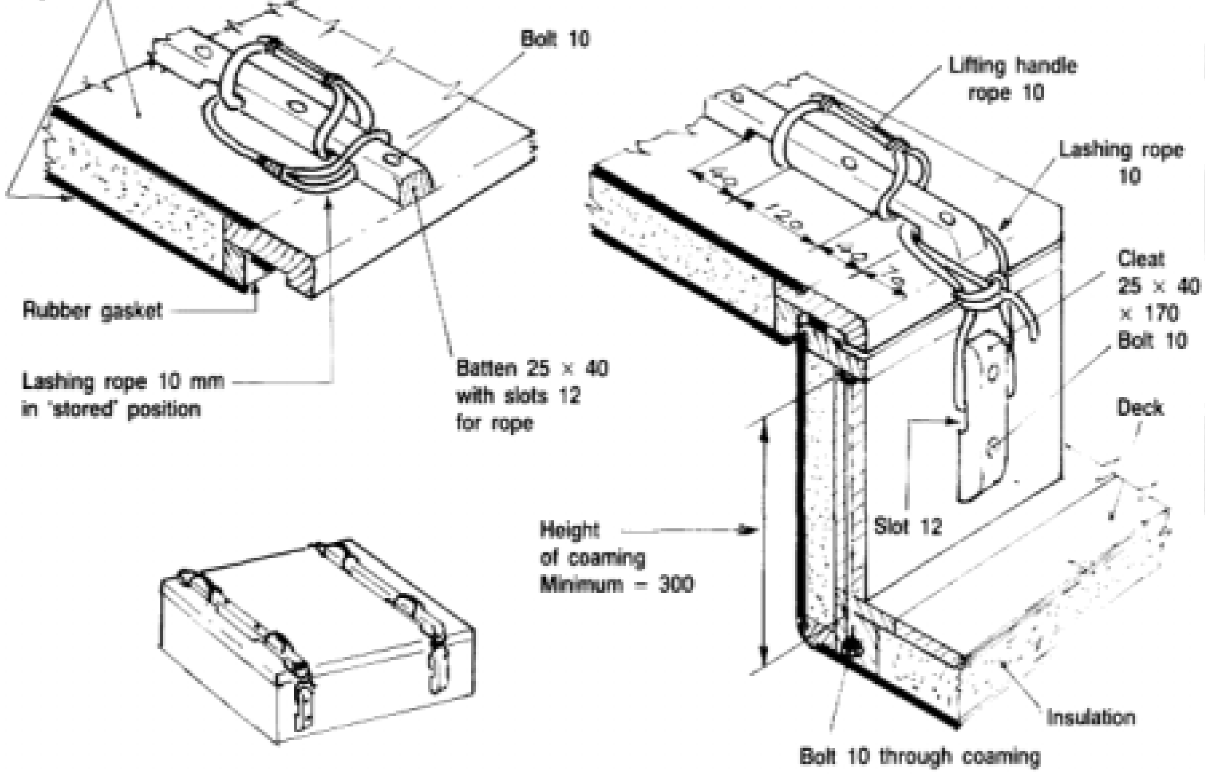


A boat will float as long as its deckhouse is strong and weathertight and the hatch covers are lashed down



If the hatch covers are not secured the boat will fill and sink

AN EXAMPLE OF A HATCH COVER LASHING FOR AN INSULATED FISH-HOLD THAT WILL NOT SNAG FISHING GEAR



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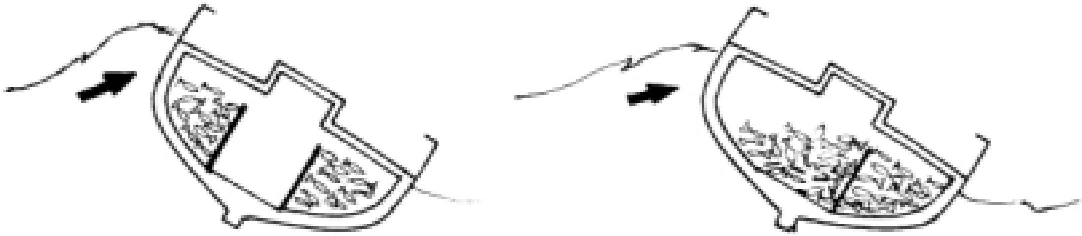
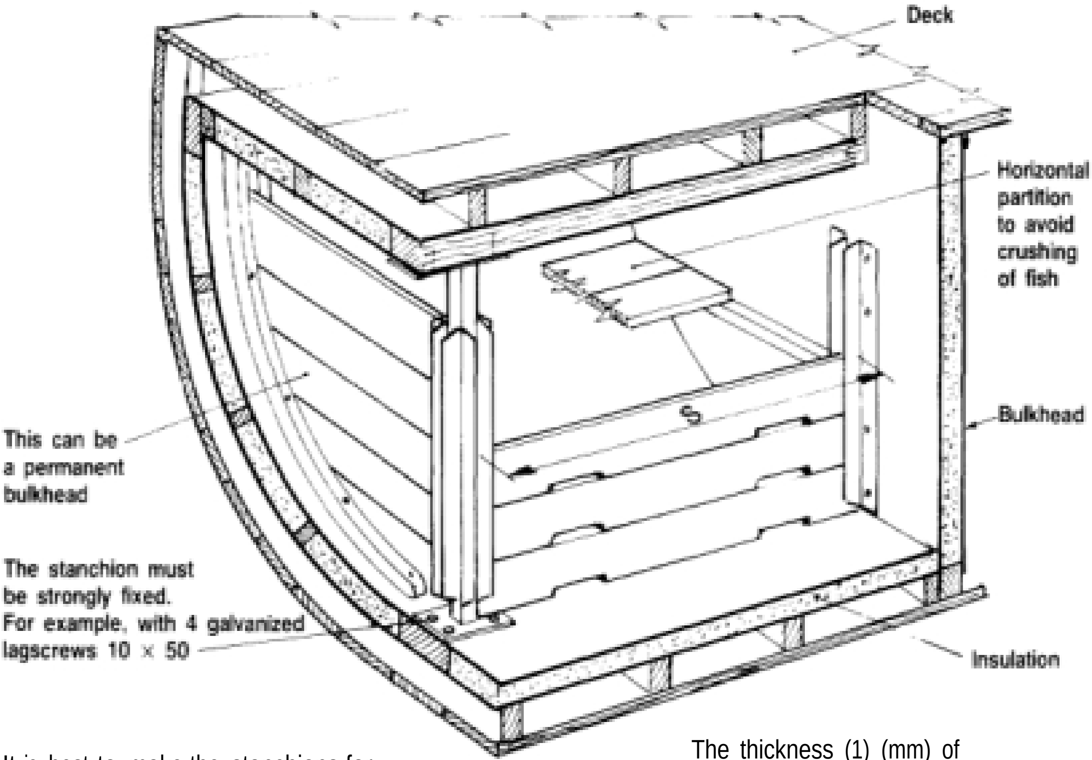
FISH-HOLD PENBOARDS

The penboards and penboard stanchions must be strong to prevent the fish and ice sliding to one side when the boat is hit by a wave



The boat could capsize.

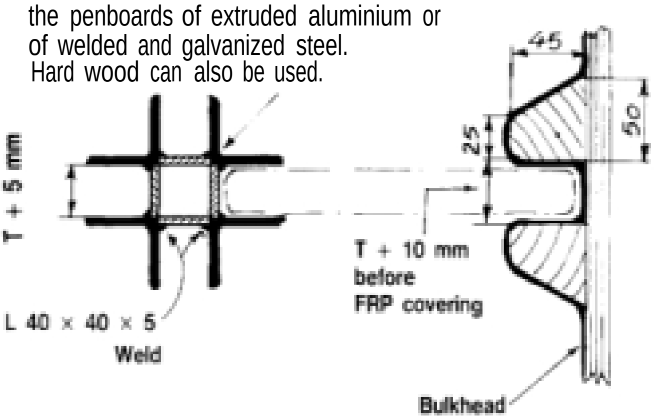


It is best to make the stanchions for the penboards of extruded aluminium or of welded and galvanized steel. Hard wood can also be used.

The thickness (1) (mm) of a wooden penboard is proportional to the span S (m)

T = 24 x S (mm)

EXAMPLE: S = 1.0 m, T = 24 mm

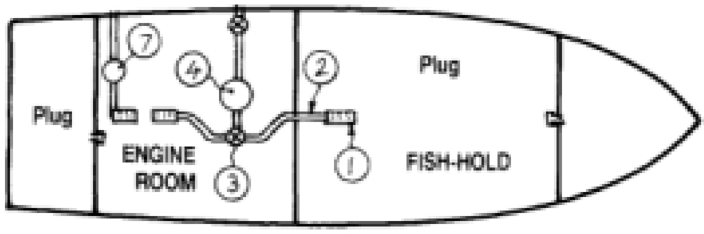


Wooden penboard

Aluminium penboards are best because they are easy to keep clean.

BILGE PUMP SYSTEM

All decked boats should have two pumps; one engine-driven and the other manual to pump out water. The following system is suitable for a boat where the engine room and the fish-hold have watertight bulkheads: (1) Strainer easily accessible and connected with a flexible pipe so that it can be lifted out and cleaned. (2) Pipes must be oil-resistant and reinforced so that they do not collapse under suction. Diameter must be at least the same as the pump inlet (3) Three-way valve, alternatively two valves of stainless steel or bronze. Ball valves are preferable to gate valves because ‘on’ and ‘off’ positions are easily seen.



(4) Engine-driven pump, self-priming of the following capacity:

Boats up to 8 m: 60 litres per minute

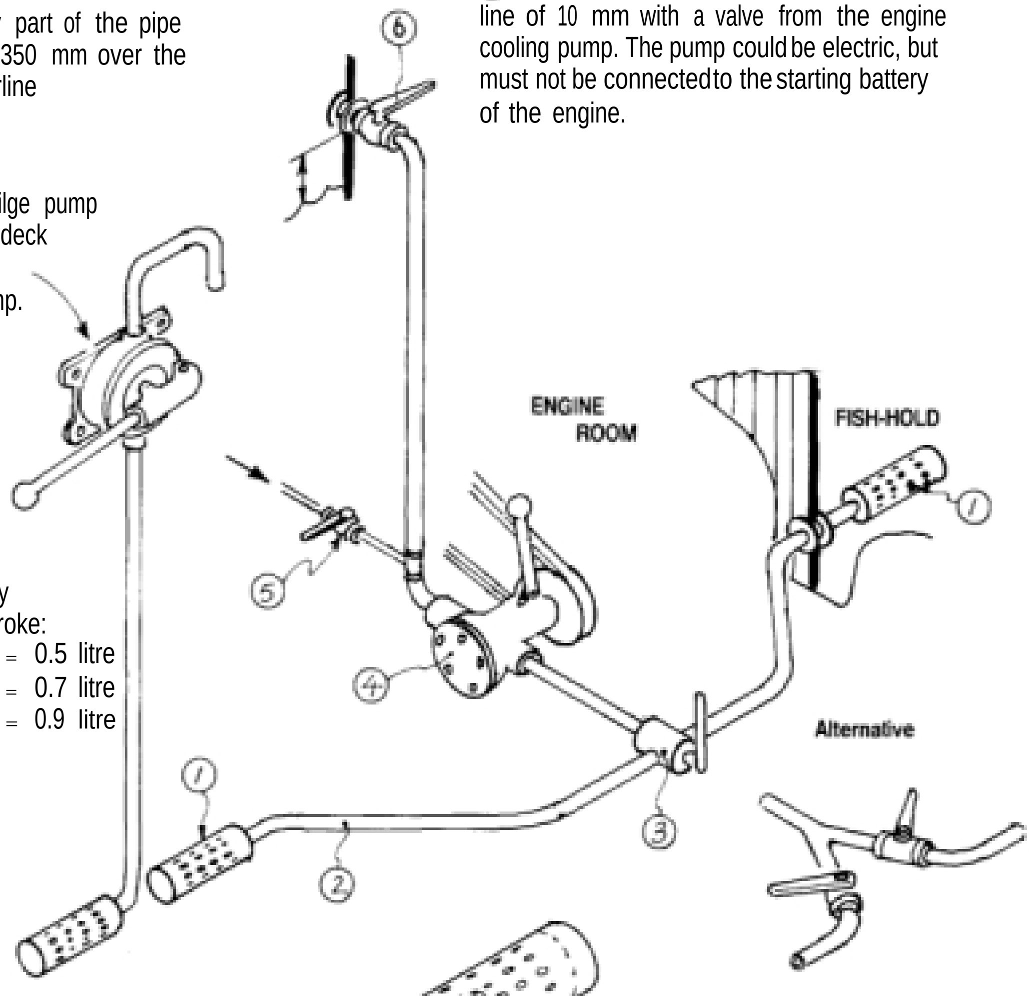
8 m - 10 m : 80 litres per minute

10 m - 12 m : 120 litres per minute

(6) A valve must be used if the outlet or any part of the pipe is less than 350 mm over the loaded waterline

(5) Rubber impeller pump must have a bleed line of 10 mm with a valve from the engine cooling pump. The pump could be electric, but must not be connected to the starting battery of the engine.

(7) Manual bilge pump fixed above deck can also be a piston pump.

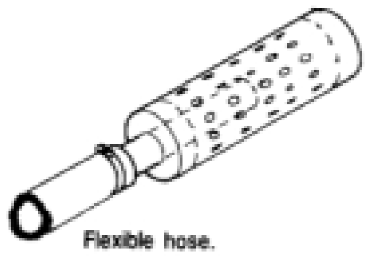


Manual bilge pump. Capacity in litres per stroke:

Boatupto8m = 0.5 litre

8m-10m = 0.7 litre

10m-12m = 0.9 litre



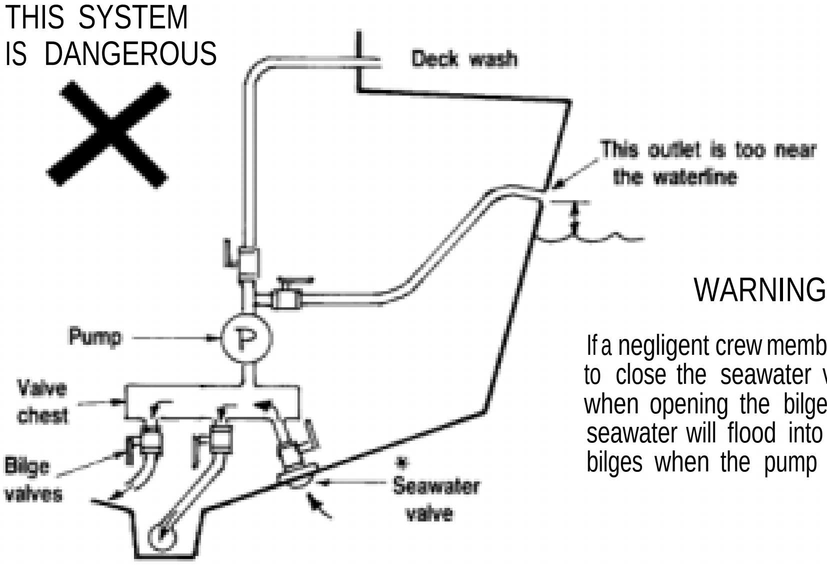
Strainer made from PVC pipe with 8 mm holes. Ends blocked. Suction pipe to middle of strainer.

(9) All boats should have an alarm to indicate high water-level in the engine room.

BILGE PUMP – DECKWASH SYSTEM

A seawater outlet on deck that can be used for cleaning fish as well as washing the deck and fish-hold is very convenient. On some boats, the bilge pump is used for this purpose, but experience has shown that this has, in many cases, resulted in seawater accidentally entering the bilges and the boat sinking.

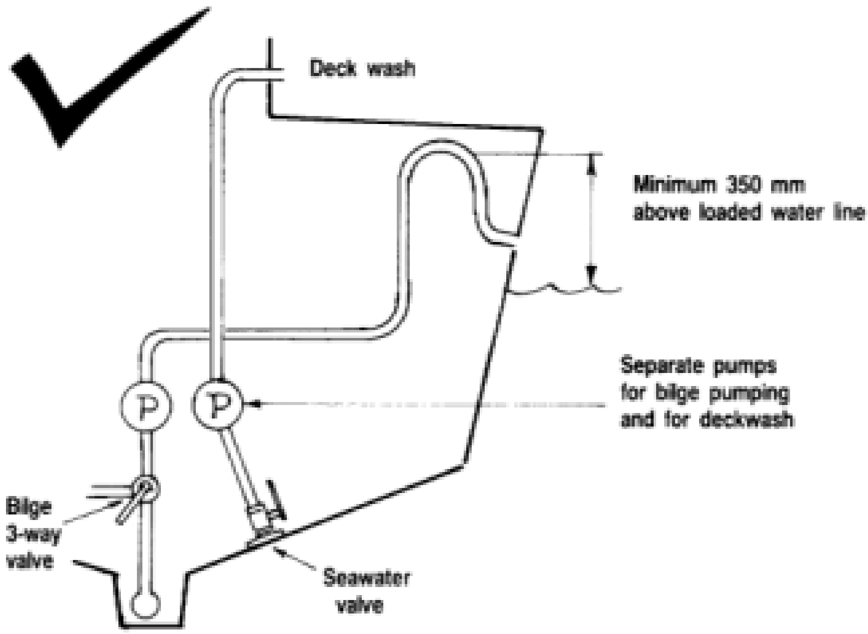
THIS SYSTEM
IS DANGEROUS



WARNING

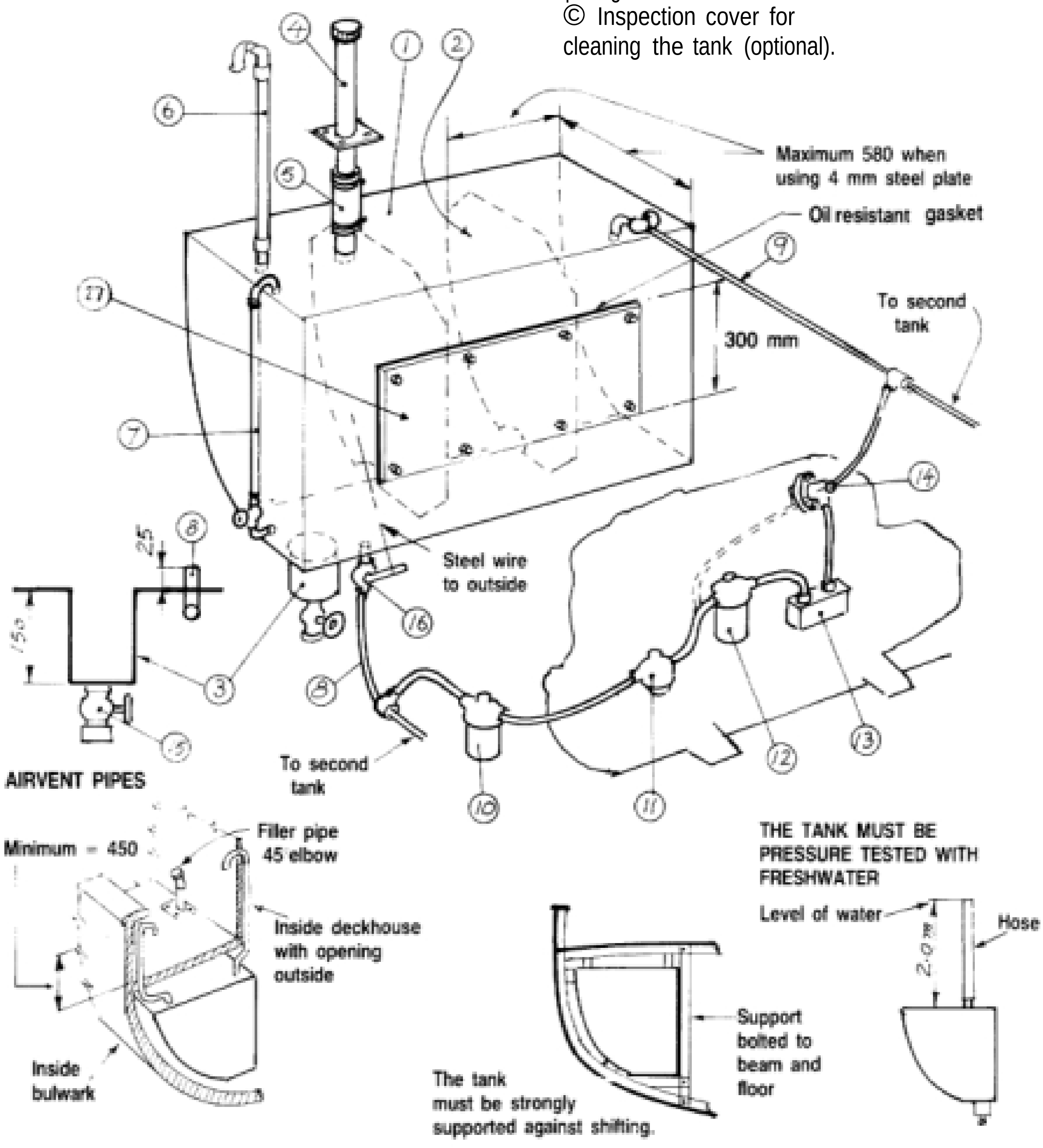
If a negligent crew member forgets to close the seawater valve,* when opening the bilge valves, seawater will flood into the bilges when the pump stops.

THIS IS A BETTER SYSTEM



FUEL SYSTEM

POOR INSTALLATION AND DIRTY FUEL ARE FREQUENT CAUSES OF ENGINE BREAKDOWN.
Shown below is a typical installation with two fuel tanks each of 200-500 l capacity and made of mild steel. The tank can also be made of FRP (minimum T=6.5 mm).
① Tank welded from 4 mm steel plate. ② Baffles of 4 mm plate with maximum spacing, as shown. ③ Sump made from pipe 105/114to collect water and dirt. ④ Filler pipe 38'47 with cap. ⑤ Flexible hose 50 iD of diesel-resistant material. ⑥ Airvent pipe 15'21 with gooseneck. ⑦ Level gauge, plastic 15 21, with self-closing valve on bottom. ⑧ Fuel supply hose, steel, soft copper 68, or metal-braided flexible fuel hose. ⑨ Fuel return pipe 68. ⑩ Primary fuel filterwater separator. ⑪ Fuel pump ⑫ Engine fuel filter ⑬ Injector pump ⑭ Injector ⑮ Drain valve 19 blanketed with a plug. ⑯ Ball valve 10. Can be shut from outside by pulling steel wire in case of fire
© Inspection cover for cleaning the tank (optional).



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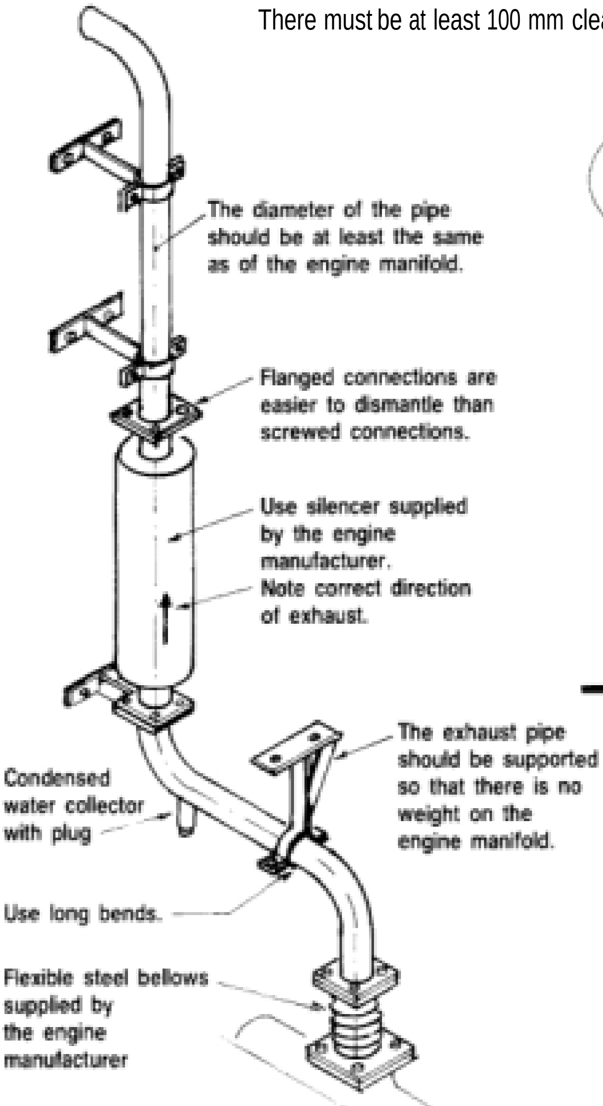
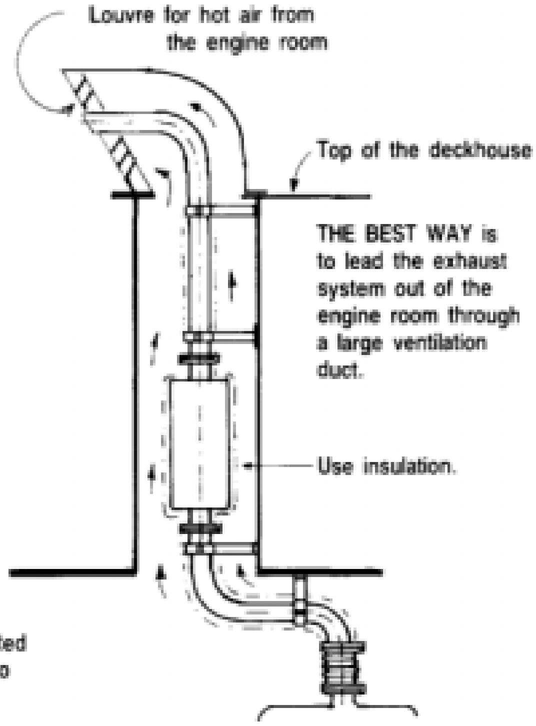
DRY EXHAUST SYSTEM

The exhaust system and piping should be leakproof to prevent toxic fumes from fouling the accommodation spaces.

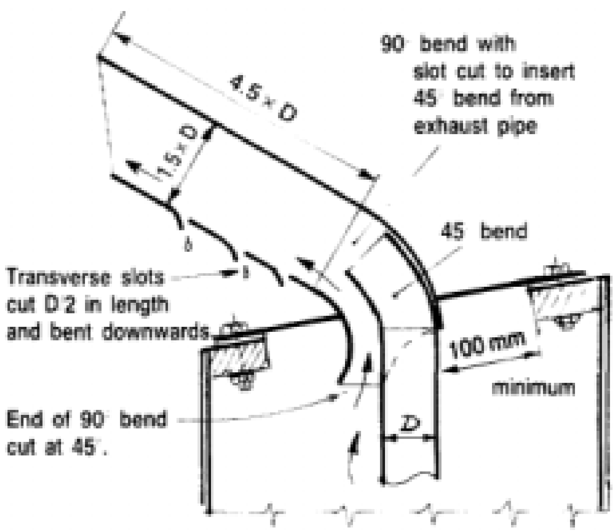
Pipes should be insulated, as a dry exhaust system gets very hot.

There must be at least 100 mm clearance for any wood or FRP material.



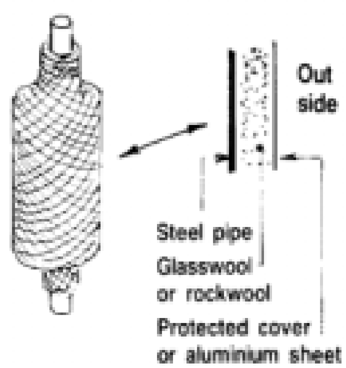


EXHAUST AIR EJECTOR



The ejector will suck warm air from the engine room and improve ventilation considerably. Based on recommendations from Caterpillar Diesels Ltd.

INSULATION



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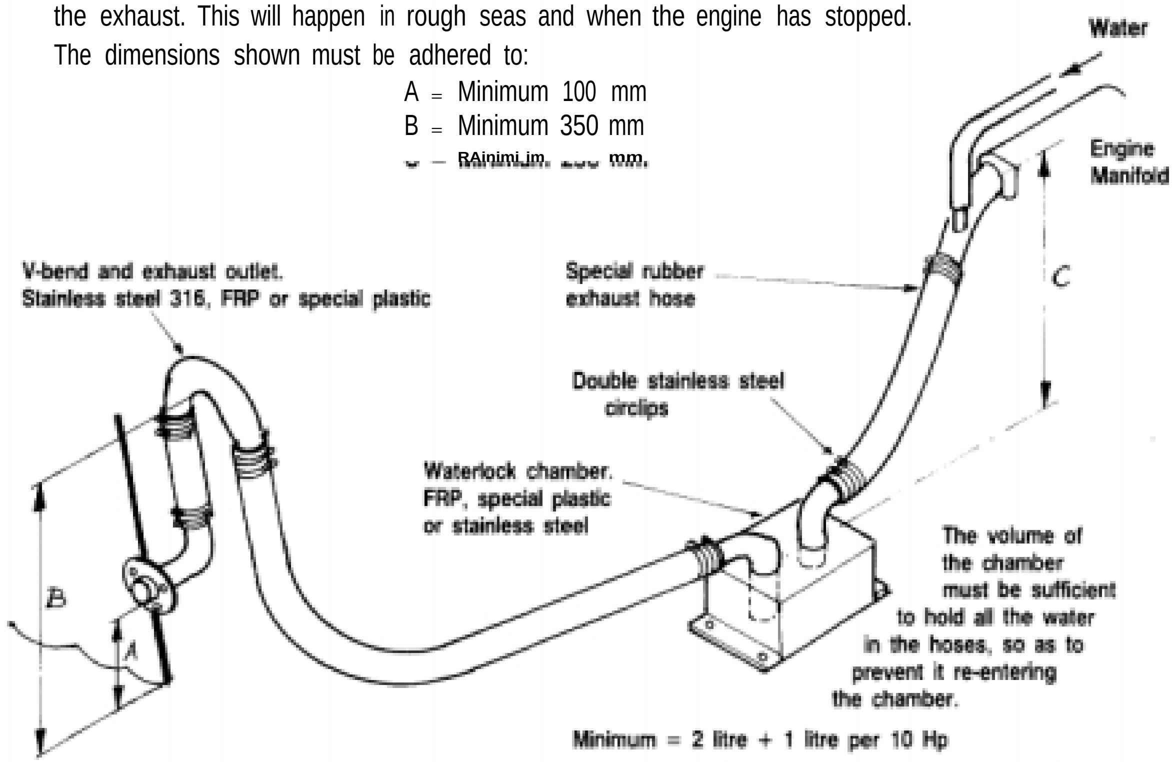
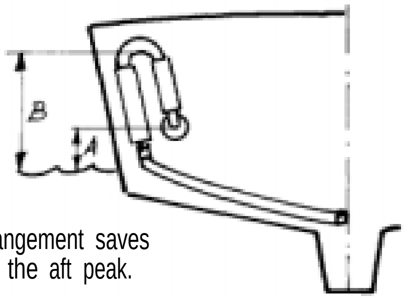
ENGINE MANIFOLD IS ABOVE THE LOADED WATERLINE

If the wet exhaust system is not correctly installed, water can enter into the cylinders through the exhaust. This will happen in rough seas and when the engine has stopped.

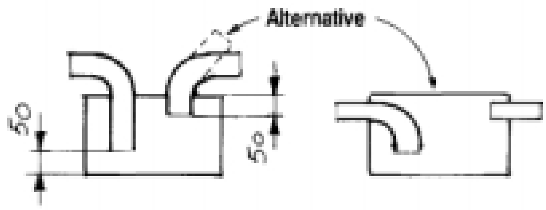
The dimensions shown must be adhered to:

A = Minimum 100 mm
B = Minimum 350 mm
C = Minimum [illegible] mm



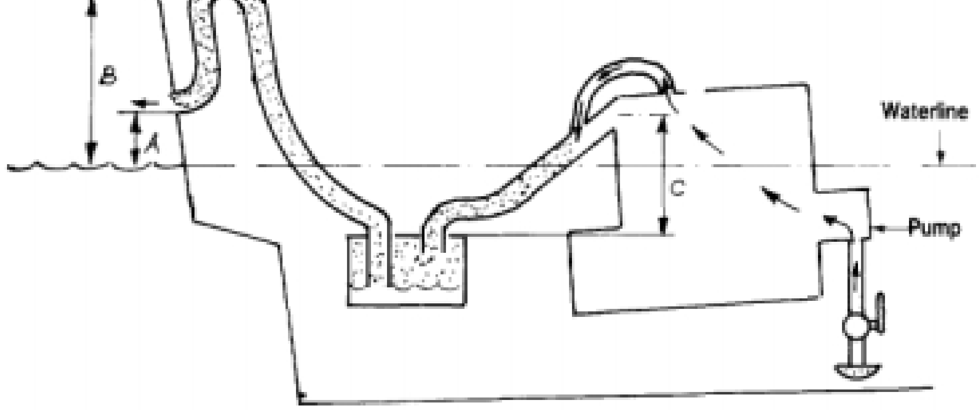


This arrangement saves space in the aft peak.



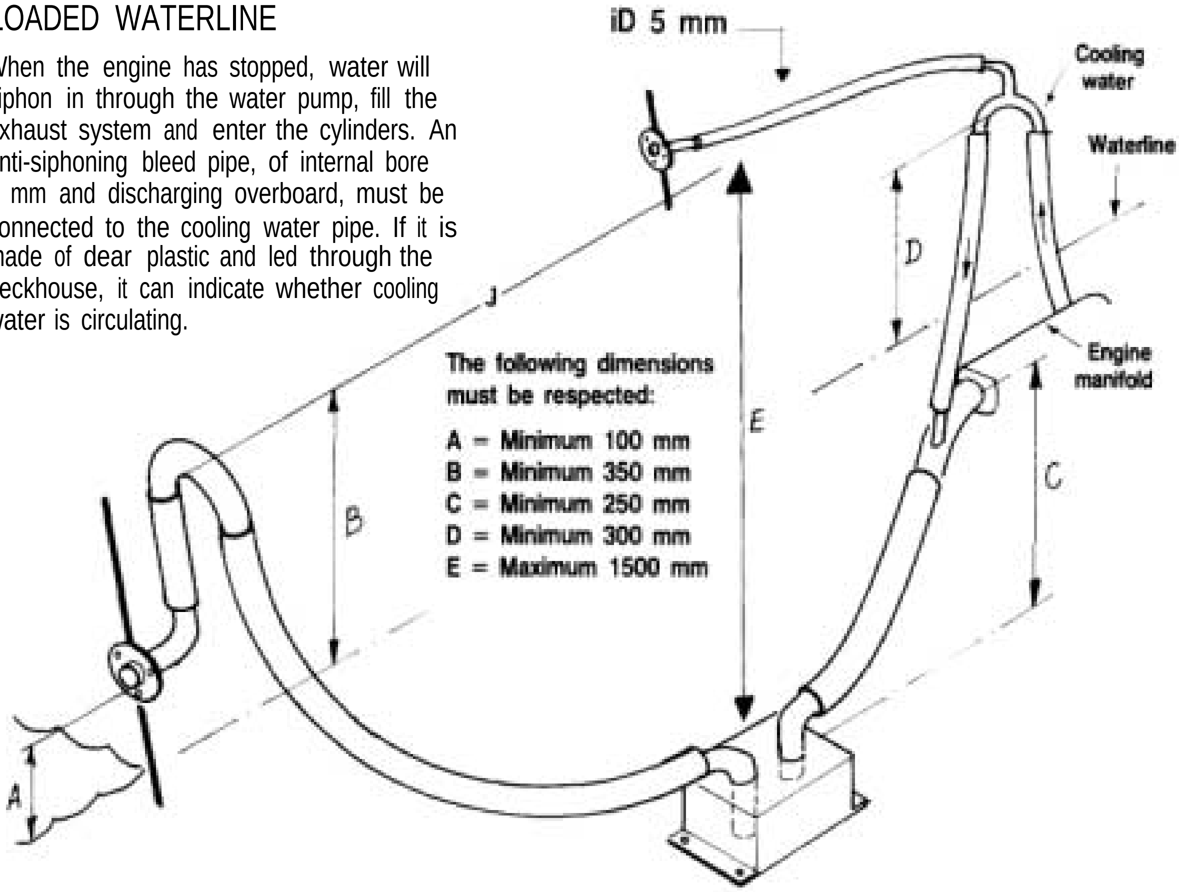
WATERLOCK CHAMBER

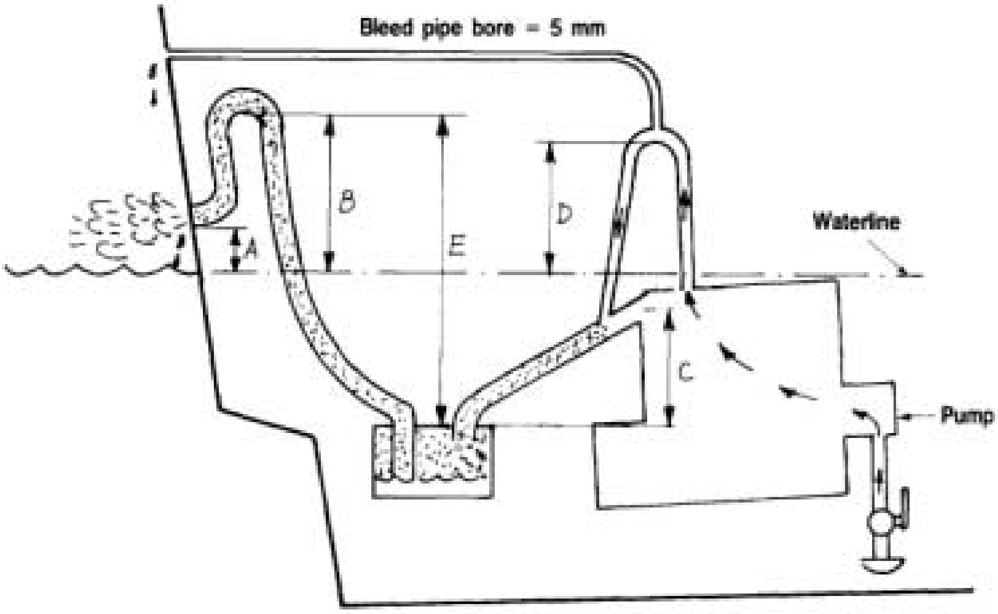
ENGINE MANIFOLD IS ABOVE THE LOADED WATERLINE



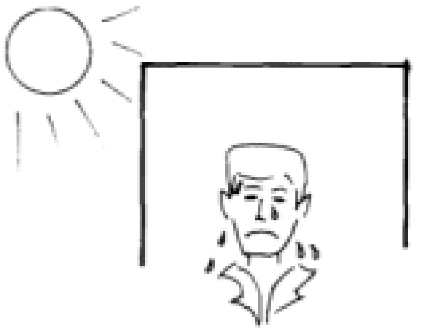
ENGINE MANIFOLD IS BELOW LOADED WATERLINE

When the engine has stopped, water will siphon in through the water pump, fill the exhaust system and enter the cylinders. An anti-siphoning bleed pipe, of internal bore 5 mm and discharging overboard, must be connected to the cooling water pipe. If it is made of dear plastic and led through the deckhouse, it can indicate whether cooling water is circulating.





ENGINE ROOM VENTILATION



Would you like to be in a room without ventilation on a hot day?

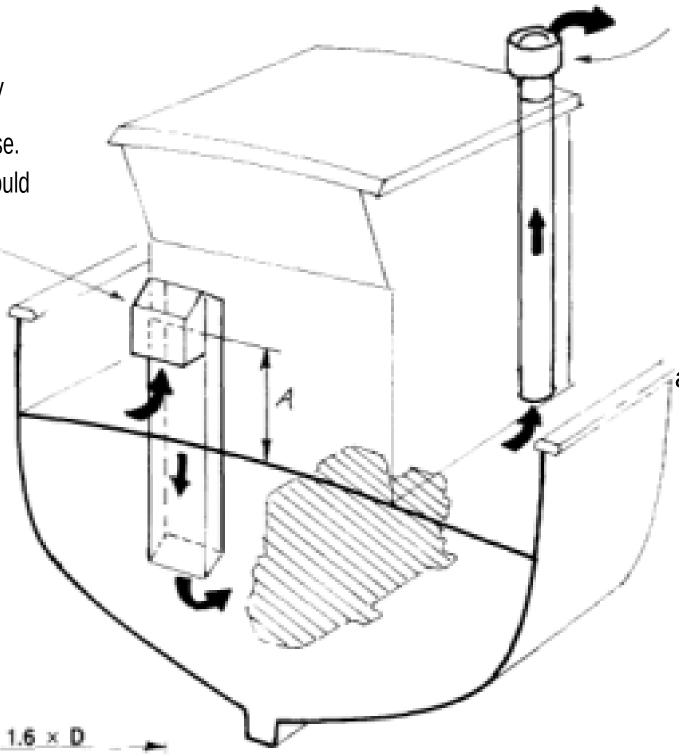
Your engine does not like it either. It needs plenty of fresh air for combustion. If the air in the engine room gets too hot, it will produce less power.

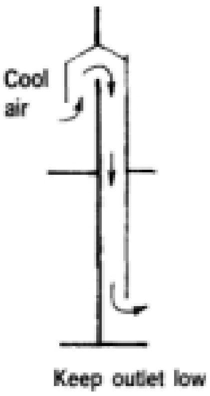
THIS IS HOW VENTILATION SHOULD BE DONE:
To get rid of the hot air, an efficient ventilation outlet is very important. It should be located above the roof of the deckhouse.

The hot air outlet should be located far from the cool air inlet and high up in the engine room.

The air intake should preferably be in front of the deck house.

The opening should be at least 450 mm (A) above deck.





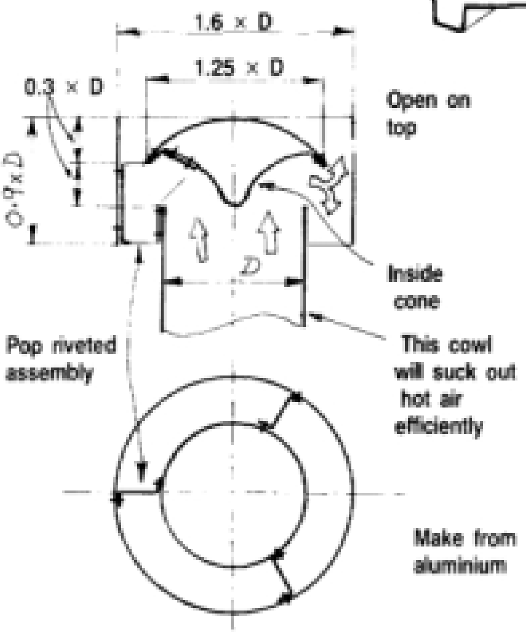
If the engine has a dry exhaust system, it is possible to combine the exhaust duct and the ventilation duct and get efficient air suction by ejector action as shown on page 15.

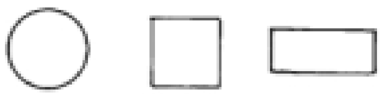
For tropical countries, the cross-section area of the air ducts should be 8 cm2 per engine hp (10 cm2/kw)

EXAMPLE : A 30 Hp engine requires:

30 x 8 240 cm2 of duct area.

This can be arranged with different shapes of ducts.

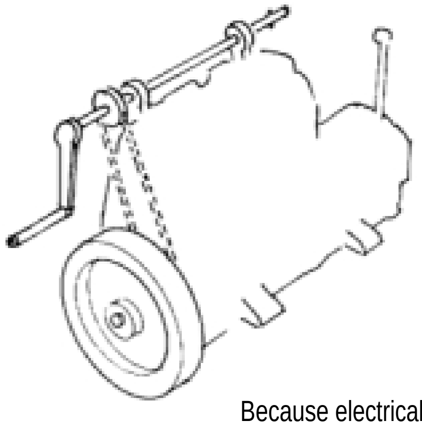




Intake and exhaust ducts should have the same cross-section area.

ENGINE STARTING SYSTEMS

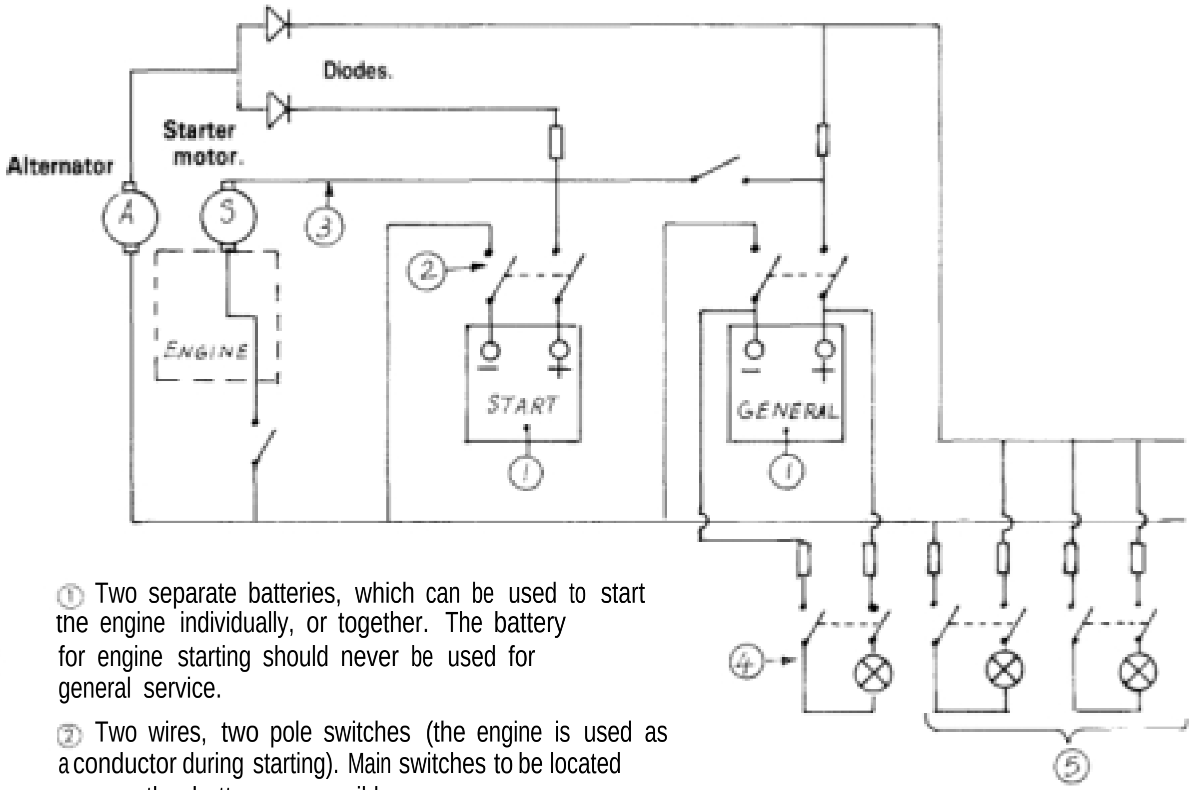
HAND STARTING



Hand-starting is the most dependable in tropical countries. Preferably choose an engine with hand-starting even if it is fitted with an electric starting system. REMEMBER that space is required in front, or aft, of the engine for one or two men to exert full force during starting.

ELECTRIC STARTING

Because electrical systems are vulnerable in tropical countries, correct installation is very important. Shown below is a good system



① Two separate batteries, which can be used to start the engine individually, or together. The battery for engine starting should never be used for general service.

② Two wires, two pole switches (the engine is used as a conductor during starting). Main switches to be located as near the battery as possible.

③ Batteries should be placed as near the starter motor as possible. Use wire of size recommended by the engine manufacturers.

④ All user points to be disconnected when the main switches are off, with the exception of the bilge water level alarm and the automatic electrical bilge pumps.

⑤ General switchboard, Navigation lights to have separate fuses. All switches and fuses to be clearly marked.

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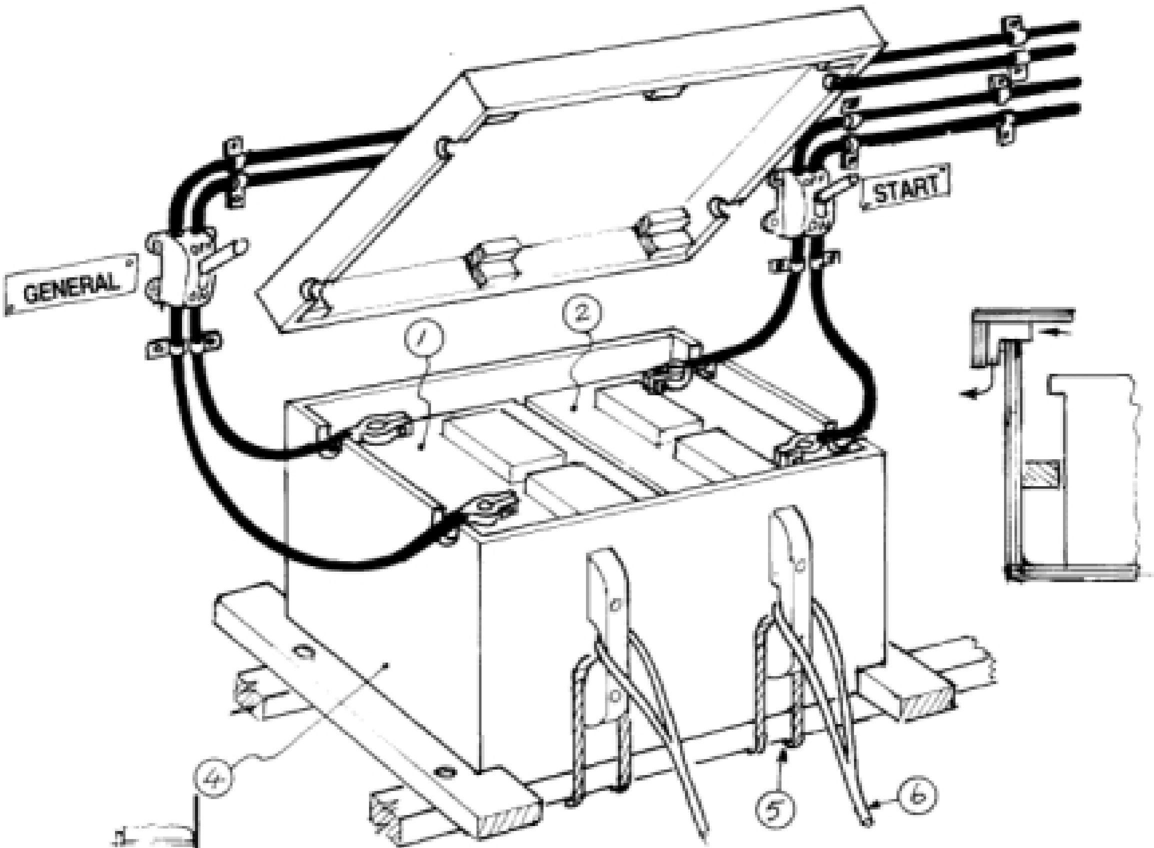
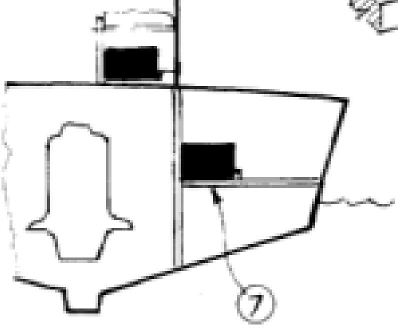
Without the possibility of starting the engine manually, you will be in a precarious situation if you are far offshore with dead batteries. Therefore, take good care of your batteries.

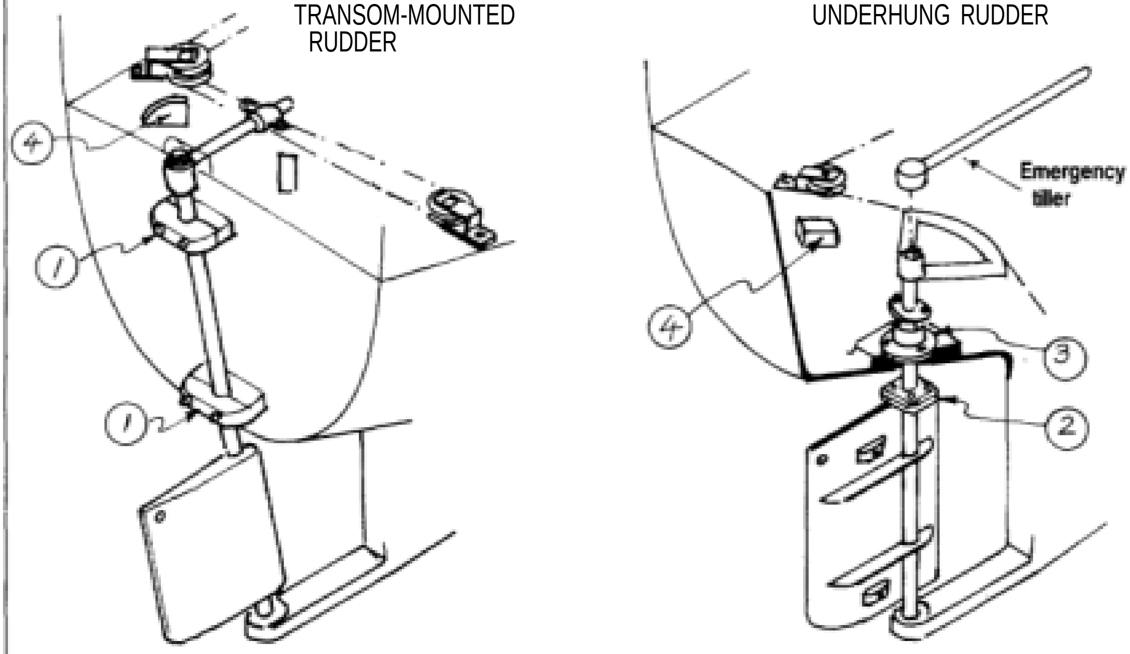




1 For general service, use a deep cycle battery, such as the double separation type, with sufficient capacity in Ah so that the battery is never discharged more than 60 per cent (Approximately: 6 x daily consumption). 2 The starting battery can be of the general automotive type and should have a capacity 50 per cent greater than specified for engine starting. 3 A voltage measuring instrument is essential to ensure that the generat service battery is never discharged more than 60 per cent (12.1 V) and the starting battery 25 per cent (12.5 V). 4 Battery box made of 12 mm marine plywood lined with FRP on the inside and on the outside corners. There must be a 10 mm ventilation gap all around the lid and adequate space to lift the batteries out. 5 The box must be bolted or lashed down to prevent sliding. 6 The lid must be lashed down. 7 The batteries must be easily accessible and placed high so that any short circuiting is delayed in case the engine room is flooded. 8 The alternator should be capable of delivering 30A for every 100 Ah of total installed battery capacity. ***(See page 19)***

TRANSOM-MOUNTED RUDDER

UNDERHUNG RUDDER



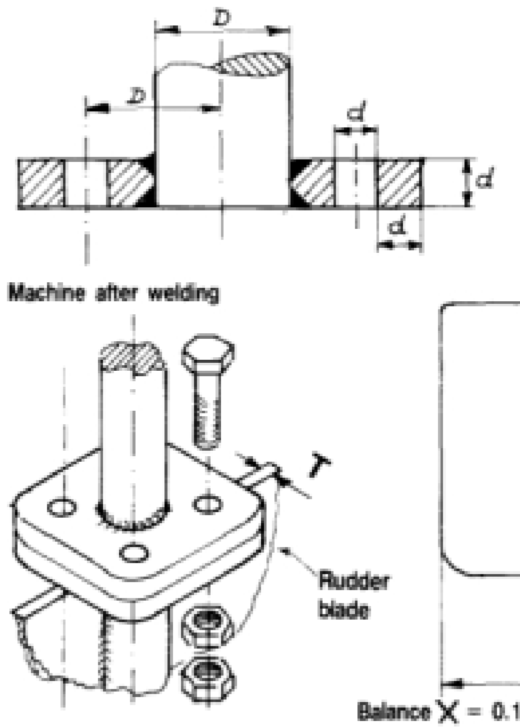
A rudder mounted on the transom is the most reliable and should be chosen if it does not obstruct the fishing operation. The two bearings ® of heavy wood are bolted through the transom. The underhung rudder usually requires a coupling ©, and a bronze bearing with a gland ®.

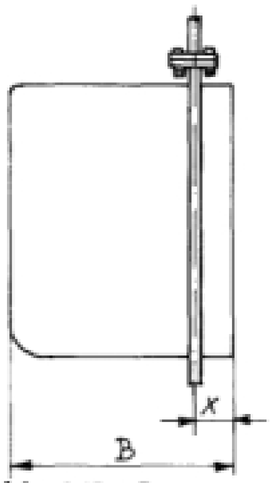
Rudder stoppers ® are required to limit swing to 40°.

The rudder stock diameter - D - should be selected according to classification societies' rules, but as a guide the following dimensions may be used:

Length x Beam x Depth of boat = CUNO in m3

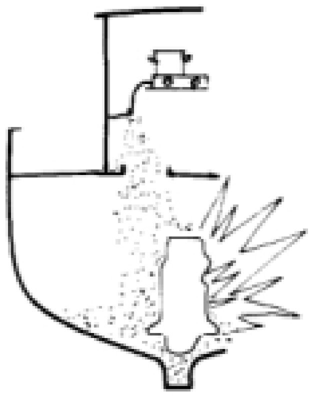
CUNO	D	d	T (steel)
Up to 25	30 mm	10 mm	6 mm
25 - 45	40 mm	12 mm	8 mm
45 - 100	45 mm	14 mm	8 mm





Balance X = 0.15 × B

COOKER AND GAS BOTTLE INSTALLATION 22



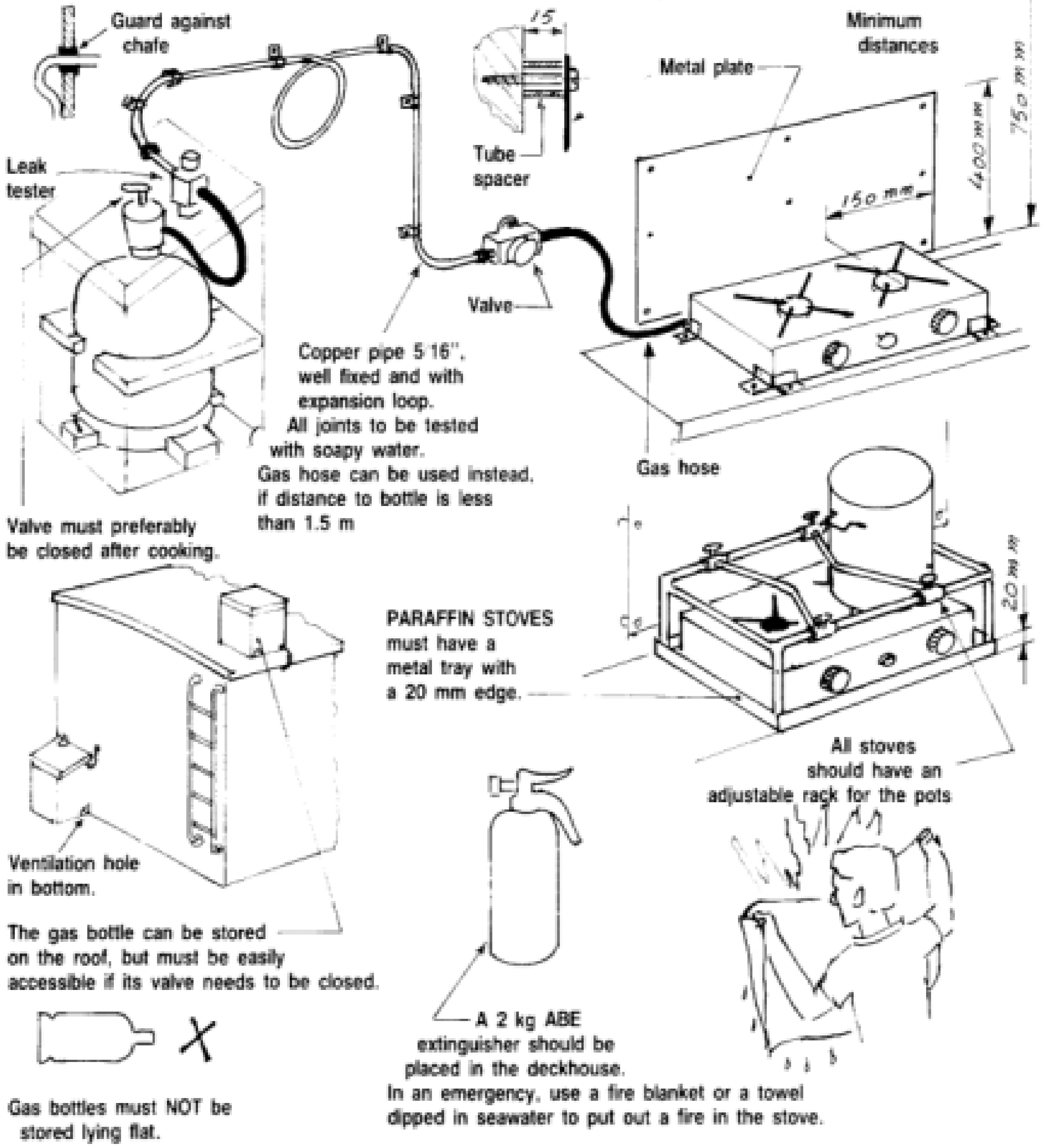
Many fires are caused by poor installation or maintenance of the cooking stove.

Gas stoves are especially dangerous, if the leak is because of poor connections or faulty hoses.

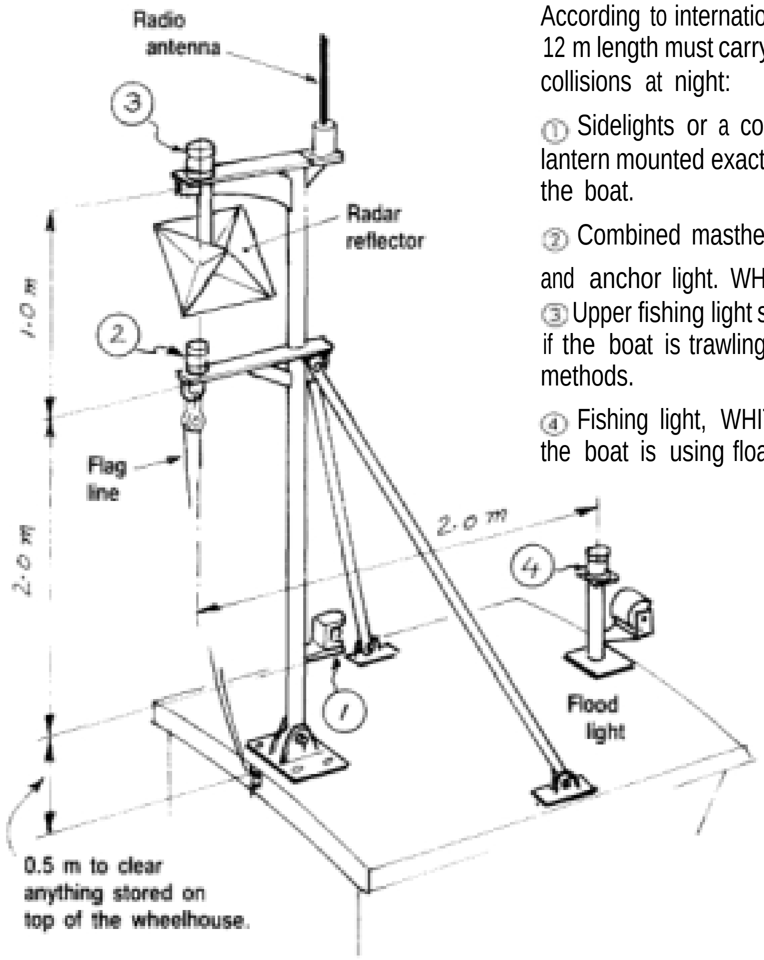
Gas will sink and accumulate in the bilge.

If it is ignited by a spark, a very powerful explosqr3 will destroy the boat.

Gas bottles must always be stored outside.



NAVIGATION AND FISHING LIGHTS



According to international rules, fishing boats under 12 m length must carry the following lights to prevent collisions at night:

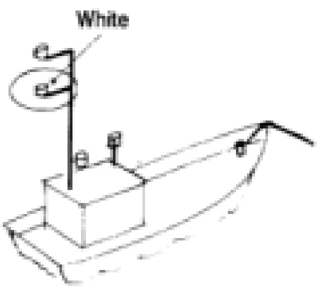
① Sidelights or a combined (RED and GREEN) lantern mounted exactly parallel to the centre line of the boat.

② Combined masthead lantern, lower fishing light and anchor light. WHITE showing all around.

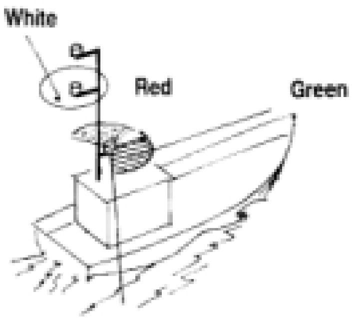
③ Upper fishing light showing all around – GREEN if the boat is trawling, RED for other fishing methods.

④ Fishing light, WHITE showing all around. When the boat is using floating fishing gear extending more than 150 m from the boat, this light indicates the direction of the floating fishing gear so that other boats can avoid the gear.

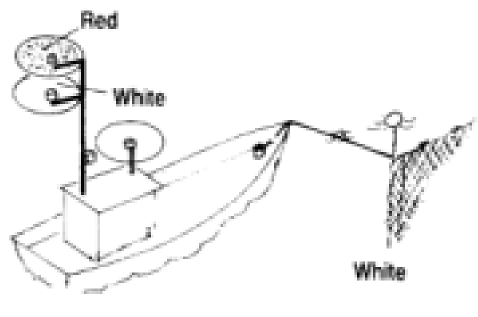
All lights must be fixed at the minimum distances shown in the drawing. All lights must be approved for boats upto 12 m and have bulbs of 18 watts.



Boat at anchor, showing WHITE anchor light



Boat under power, showing RED/GREEN sidelights and WHITE masthead light.



Boat with floating fishing gear extending more than 150 m, showing top RED and lower WHITE fishing light and WHITE directional light.

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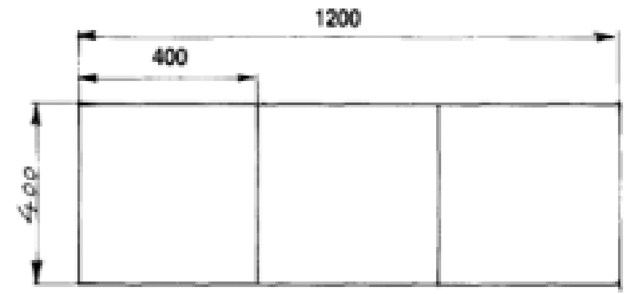
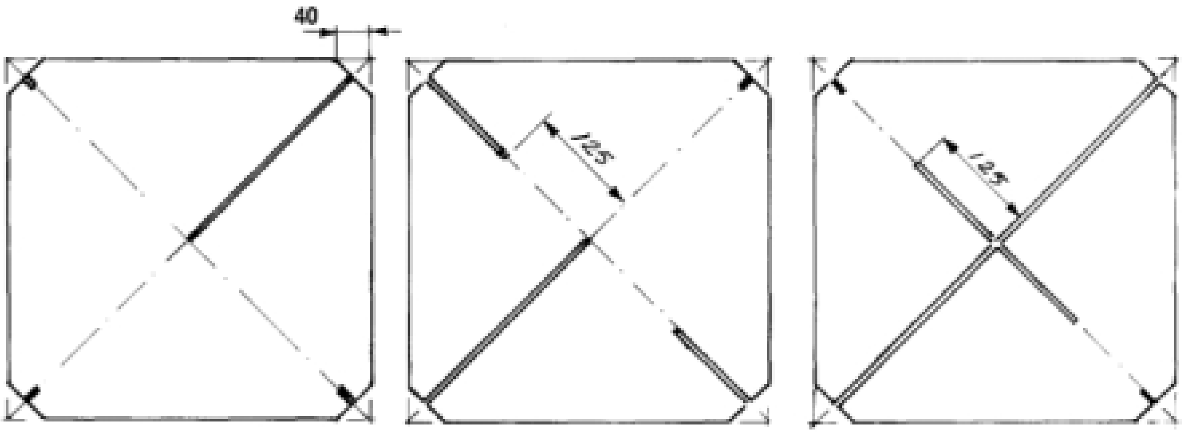
RADAR REFLECTOR

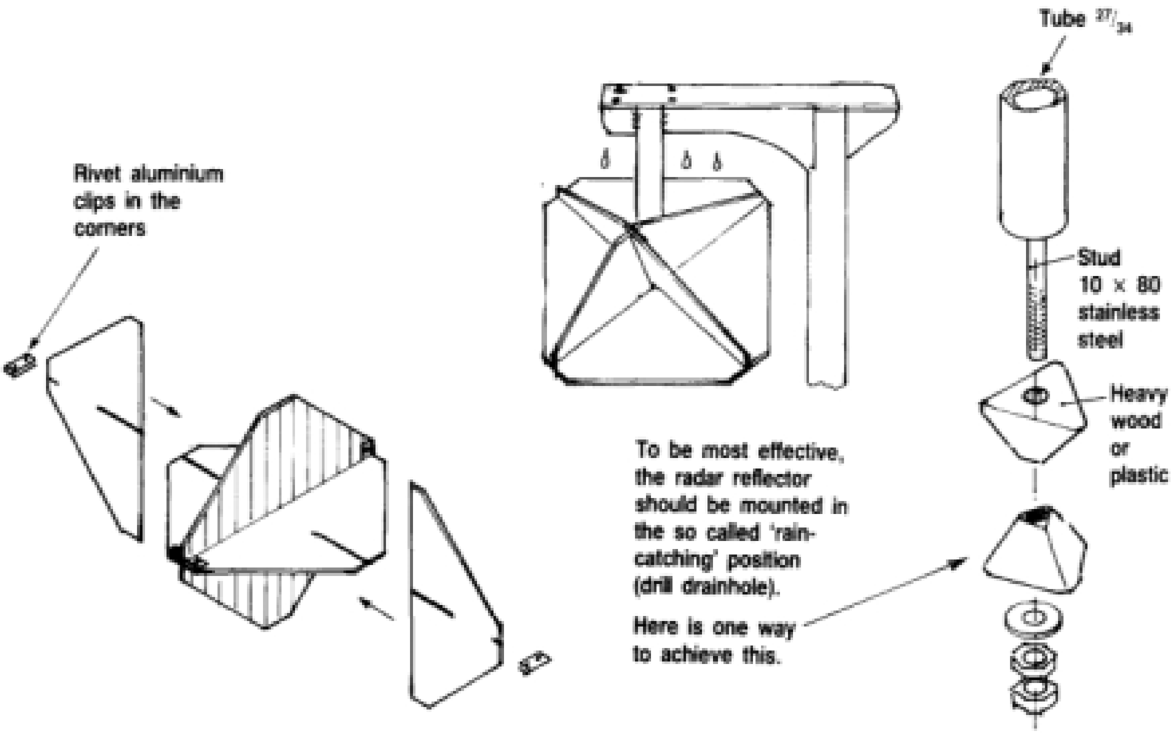
A small boat must be seen on the radar of a large ship at night if it is not to be run down. The radar beams sent by the big ship must be reflected by the small boat. Since an FRP or wooden boat reflects radar beams poorly, the small boat needs a special radar reflector.

Here is how it is made:



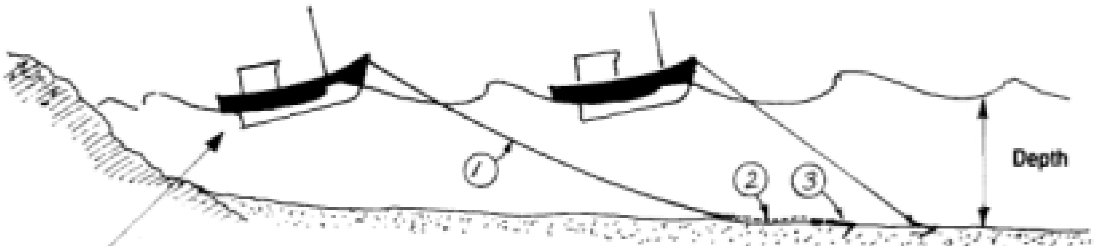
Aluminium sheet minimum 1.6 mm (16 SWG)





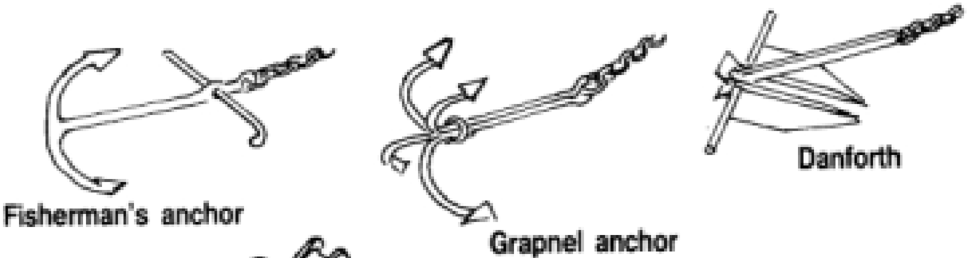
In this situation you want an anchor that holds well.

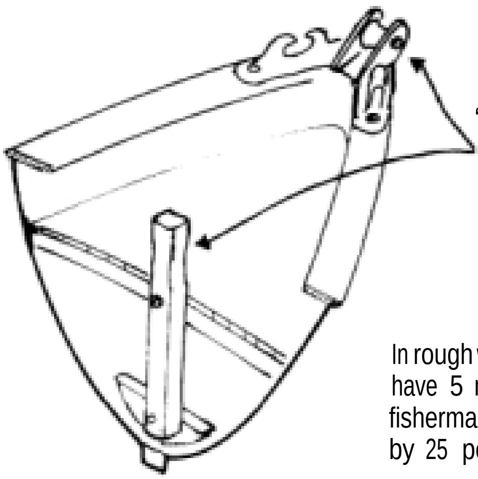
Which boat is safest?



This boat is safest because it has: 1 An anchor rope of sufficient diameter and at least 55 m length. The length of the anchor rope should be 7 times the depth. 2 A galvanized chain of minimum 8 mm and length 5 m attached to the anchor. 3 An anchor of high holding power. The type of anchor depends on the bottom condition:

Fisherman's anchor and grapnel can be used in rocky areas, but only a high holding power anchor, like Danforth, will hold well in mud or sand.





Having a good anchor is not enough. You must 'also have a strong point on the boat to fix the anchor rope and be able to protect it against chafe with a good fairlead. To haul up a heavy anchor, an anchor roller will be of great help.

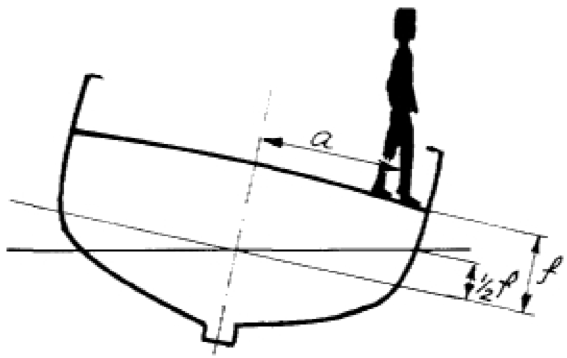
Every boat should carry two anchors, one main anchor used for anchoring overnight and in heavy wind and one kedge for anchoring for a short time. In rough weather, both anchors can be used. Each anchor should have 5 m of chain and at least 60 m of rope. If you use a fisherman's or a grapnel, increase anchor weight by 25 per cent.

Length of boat	*High holding anchor weight (kg)*		*Main anchor rope [diameter (mm)]*			*Kedge anchor rope [diameter (mm)]*		
m	*Main*	*Kedge*	*PA*	*PP*	*PE*	*PA*	*PP*	*PE*
8	13	7	12	14	16	10	12	14
9	15	8	12	14	16	10	12	14
10	17	9	14	18	20	12	14	16
11	20	10	14	18	20	12	14	16
12	23	12	14	18	20	12	14	16

EMERGENCY SAIL — DIMENSIONS

If your engine breaks down and you are far from shore, an emergency sail may be your only means to get home. The simplest type of sail is the dipping lug sail. The sail area will depend on the stability of your boat. Estimate the sail area as follows:

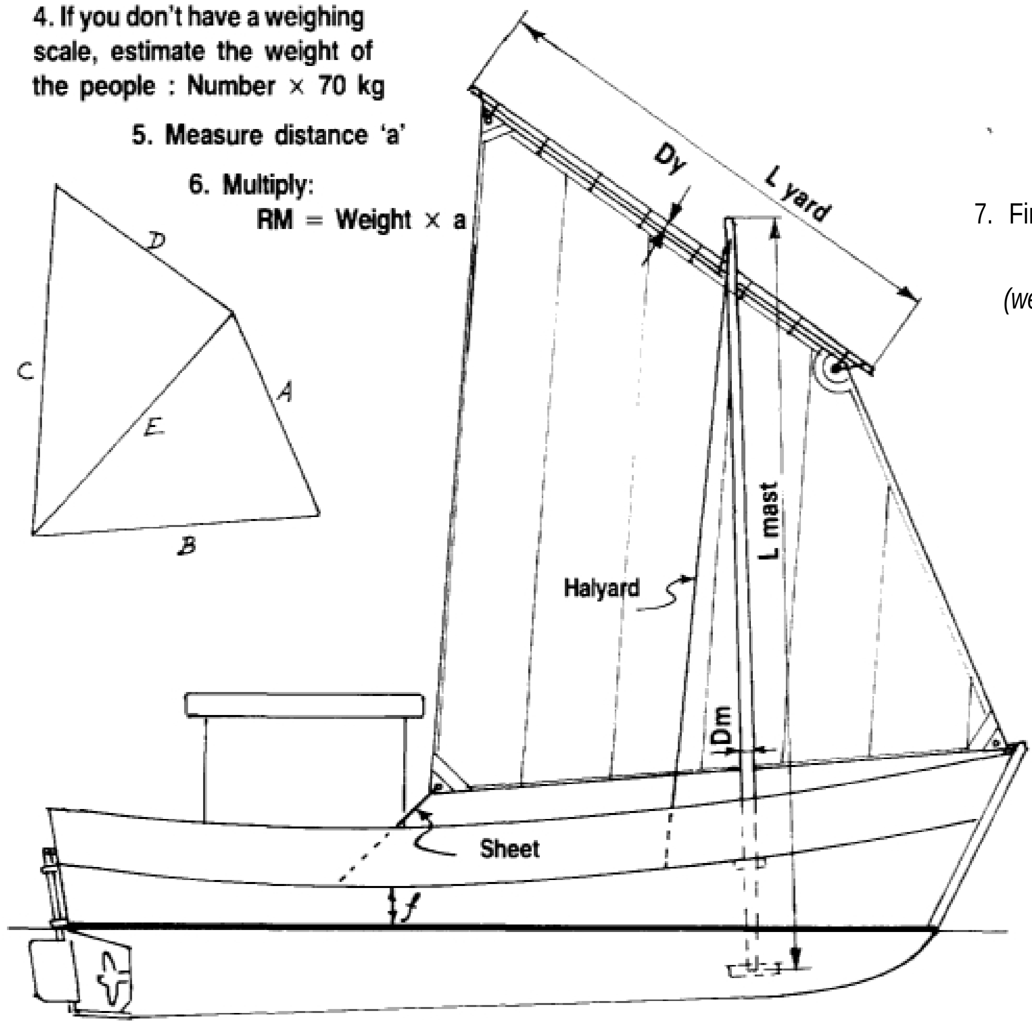
1. Measure the minimum freeboard (f) without any load in the fish-hold.
2. Make a mark on the side of the boat at half f.
3. Get a number of people to stand alongside the rail until the boat is inclined to half f.



4. If you don't have a weighing scale, estimate the weight of the people : Number × 70 kg

5. Measure distance 'a'

6. Multiply:
RM = Weight × a



7. Find sail area:

RM (weight x a) kgm	*Sail area m2*
310	15
470	20
650	25
880	30

8. Find dimensions of sail, mast and yard from tables (in m)

Sail					
Sail area m2	*A*	*B*	*C*	*O*	*E*
15	3.4	4.5	5.5	3.3	4.8
20	4.0	5.2	6.3	3.8	5.5
25	4.4	5.8	7.1	4.4	6.1
30	4.8	6.4	7.8	4.9	6.5

Halyard		*Sheet*	
Length m	*Dia mm*	*Length m*	*Tha mm*
13	10	12	10
15	12	14	10
16	12	15	10
18	12	17	12

Sail area m2	*Mast Length m*	*Mast Dia mm*	*Yard Length m*	*Yard Dia mm*
15	6.4	105	3.6	60
20	7.0	120	4.1	65
25	7.7	130	4.7	70
30	4.8	140	5.2	

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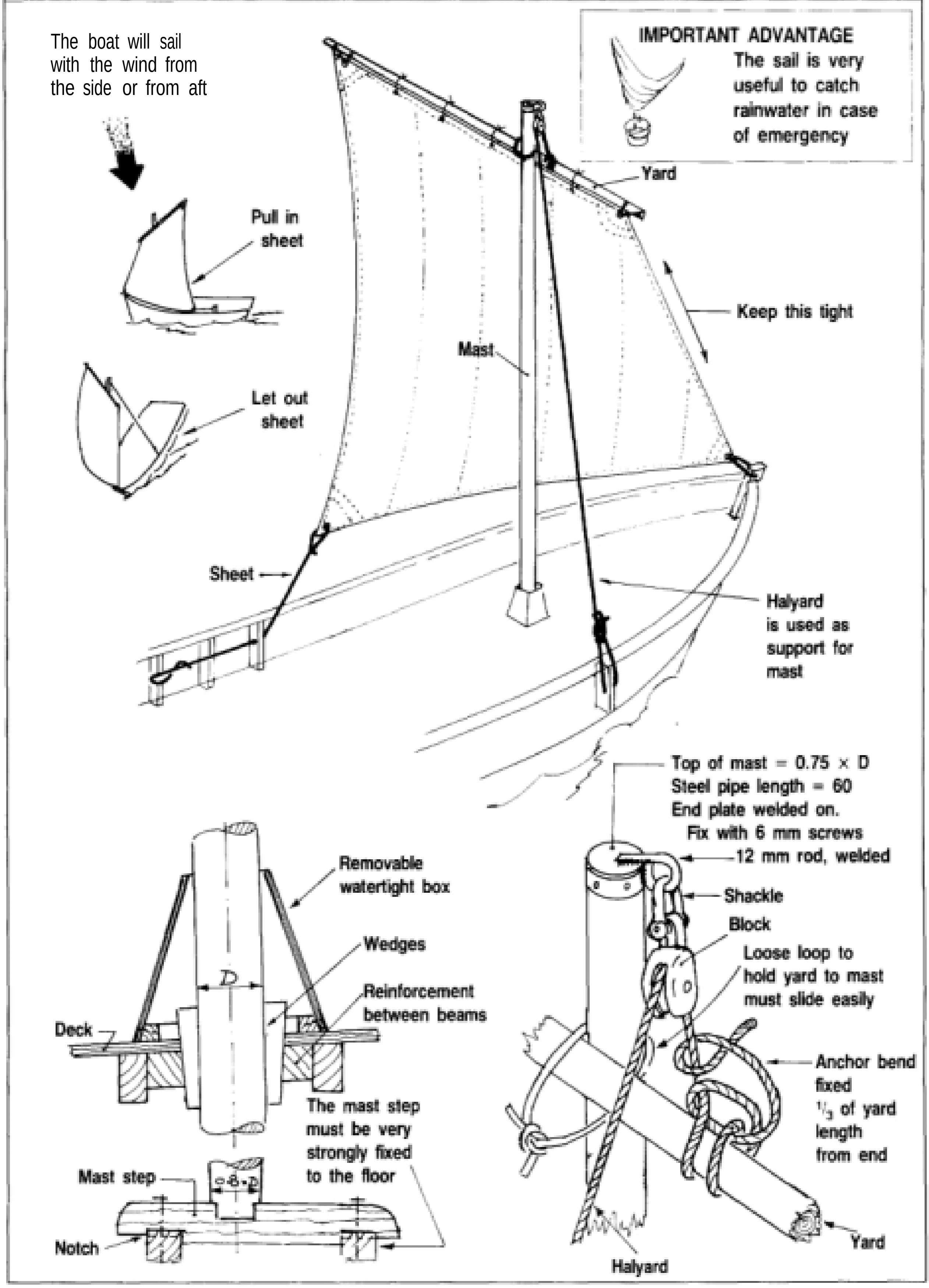


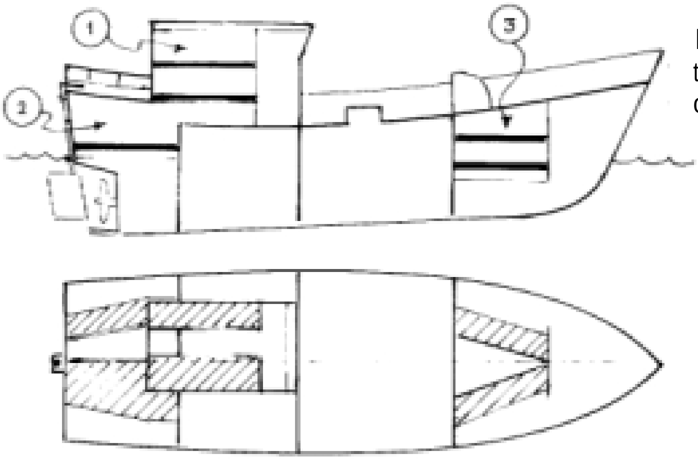
The boat will sail with the wind from the side or from aft
Pull in sheet
Let out sheet
IMPORTANT ADVANTAGE
The sail is very useful to catch rainwater in case of emergency
Yard
Keep this tight
Mast
Sheet
Halyard is used as support for mast
Top of mast = 0.75 × D
Steel pipe length = 60
End plate welded on.
Fix with 6 mm screws
12 mm rod, welded
Shackle
Block
Loose loop to hold yard to mast must slide easily
Anchor bend fixed
1/3 of yard length from end
Yard
Halyard
Removable watertight box
Wedges
Reinforcement between beams
Deck
D
The mast step must be very strongly fixed to the floor
Mast step
Notch

<<

CREW ACCOMMODATION

A CREW THAT GETS A GOOD REST MAKES FEWER MISTAKES.

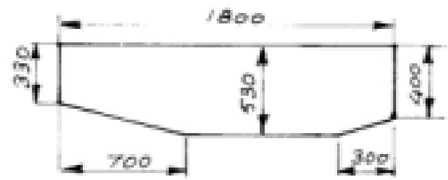
The number of berths should be at least the number of crew *less* one person who will be on duty.



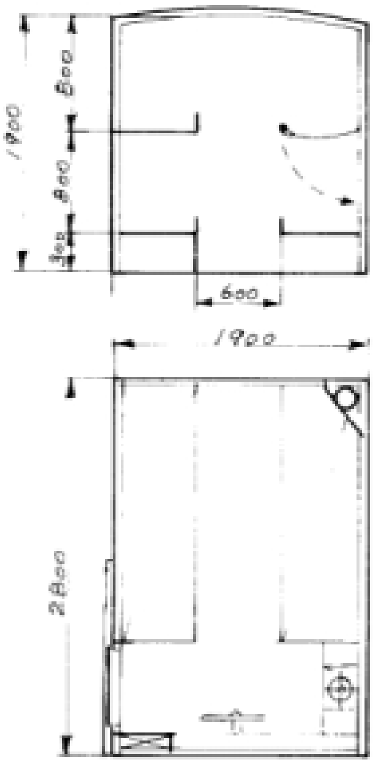
In a boat with an aft deckhouse, there are the following alternatives (listed in order of priority):

1. Deckhouse. Good ventilation.
2. Aft peak. Difficult to get good ventilation. Double berth necessary to utilize space. Note that outside rudder saves much space. Raised aft-deck may be needed.
3. Fore peak. Difficult to get good ventilation (except with deckhouse forward). Uncomfortable when the boat is pitching.

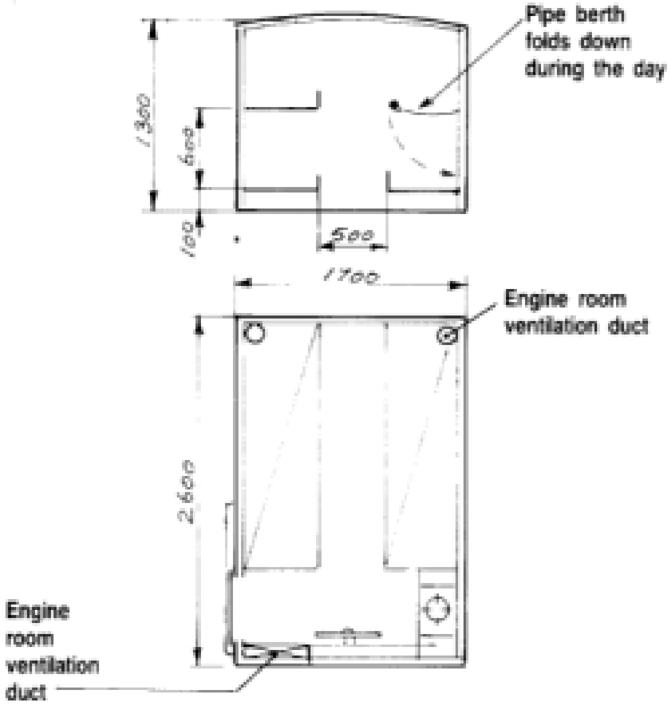
This is the normal size of a berth and should be preferred.



This is the minimum size of a berth. Use foam mattresses that have a cover of a material that does not easily catch fire.



Normal space requirement in deckhouse



Minimum space requirement

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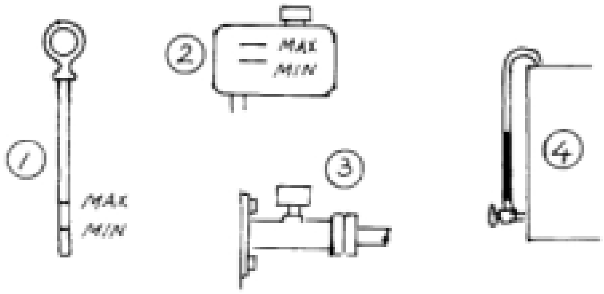
ENGINE MAINTENANCE

REGULAR MAINTENANCE IS THE BEST WAY TO PREVENT BREAKDOWNS

The engine manufacturer knows best how the engine should be taken care of. Read the manual carefully and follow the instructions regarding maintenance, regular checks and periodic overhauling.



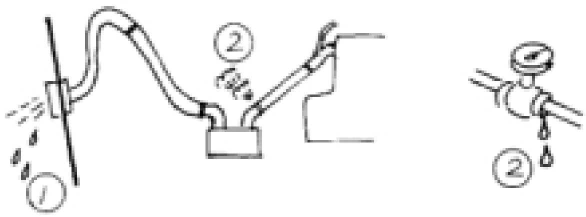
CHECK DAILY, BEFORE STARTING

① Oil level of engine.

② Water level, if the engine has freshwater cooling.

③ One turn on the sterntube greasing cup.

④ Sufficient fuel for the trip.



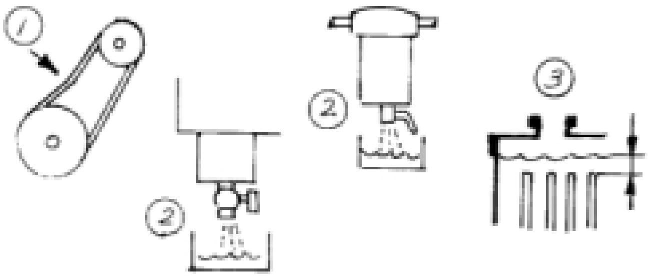
CHECK DAILY, AFTER STARTING

① Whether engine cooling water is flowing.

② The water pipes, exhaust pipe, fuel pipes and oil pipes – for leaks.

③ Oil pressure gauge.

④ Battery charging gauge.



CHECK EVERY 14 DAYS

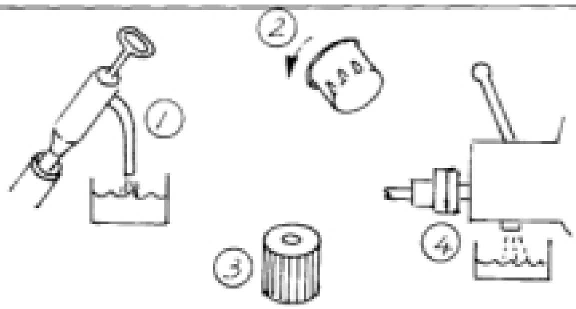
① Belt tension on alternator belt. With proper tension, it should be possible to push belt down 5 mm-10 mm.

② Dirt and water in fuel tank sump and primary filter. Drain off.

③ Battery level. Fill with distilled water as necessary.

④ Whether bolts of engine mount and propeller shaft coupling are tight.

⑤ Gland, packing of stuffing box. Replace packing as necessary.



EVERY 100-150 ENGINE HOURS

Follow the engine-maker's recommendations on:

① Change of engine oil.

② Change of oil filter.

③ Change of fuel filter.

④ Change of gear oil.

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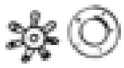
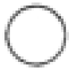
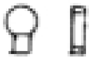
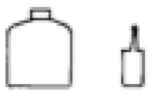
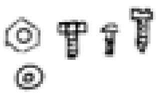
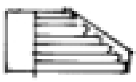
TOOLS AND SPARE PARTS TO BE CARRIED ON BOARD

	Combination spanners set 8 mm – 24 mm		Fuel injector with sealing washer
	Adjustable spanners 6” and 10”		Fuel injection pipe with end fittings
	Pipe wrench 18”		1 set spare parts for engine waterpump,
	Ball peen hammer 0.5 kg		V-belts for alternator waterpump etc.
	Combination pliers 6”		Cartridges for fuel and lub-oil filters
	Pump pliers 12”		Gland packing for sterntube with special spanner
	Vice grip 10”		Spare parts for manual pump
	Diagonal cutting pliers, 6”		Coil of copper wire. Stiff steel wire
	Hacksaw, with spare blades		Insulating tape. Tape for pipe threads
	Cold chisel		Spare bulbs and fuses
	Flat single-cut file, fine		Engine oil 2-5 litres Oil squirt can.
	Flat screwdrivers, 3 mm, 6 mm, 10 mm		Grease gun
	Pozidrive screwdrivers, Nos 2 and 3. Philips, type 1		Gasket cement. Epoxy glue
	Hand drill		Assorted bolts, nuts, washers, screws, hoseclips
	One set of drill bits, high speed 3mm-10mm		Waterproof torch

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EMERGENCY AT SEA – I

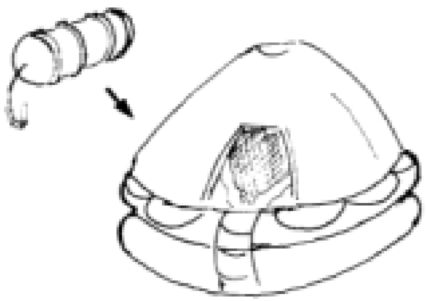
SAFETY GEAR

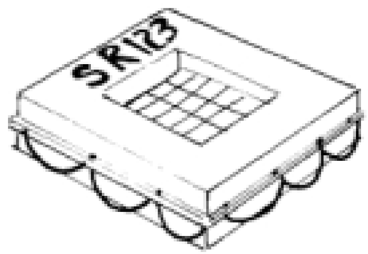
LIFE-JACKET

One for every crew member

LIFE-BUOY

One per boat, stored on port or starboard side of the deckhouse





INFLATABLE LIFE-RAFT

Unfortunately, expensive.
Must be checked every year.

RIGID LIFE-RAFT WITH MARKING

Can be made locally, but does not offer the crew much protection

FIRST AID KIT

Every boat should have a first aid kit, even if it has not been made mandatory. It should include medicine for pain, antiseptic bandages, tape, cotton wool etc., for injuries, gloves, scissors, sharp cutter and any other items which may be recommended by a local doctor. It is also advisable to have on board a first aid manual to help you to deal with injuries, such as treatment of minor cuts, broken bones, getting a hook out of a finger etc.

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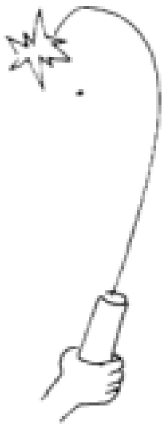
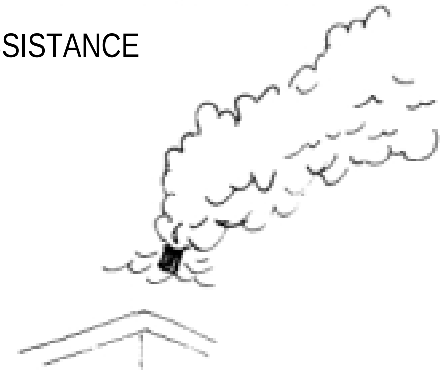
EMERGENCY AT SEA - II

SIGNALLING FOR ASSISTANCE



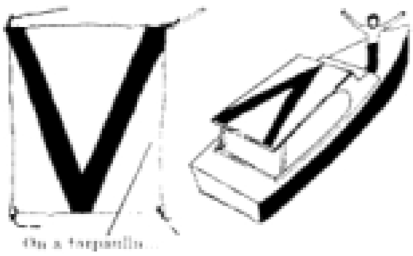
PARACHUTE DISTRESS ROCKET

Six per boat for offshore operation



SMOKE SIGNAL

Two per boat

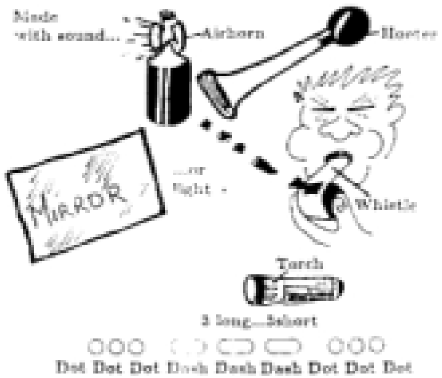


'V' SIGNAL

The letter 'V' painted on a tarpaulin put on the top of the deckhouse is a distress signal particularly useful for attracting the attention of an aircraft. Expose the tarpaulin with a 'V' on it ONLY in an emergency.

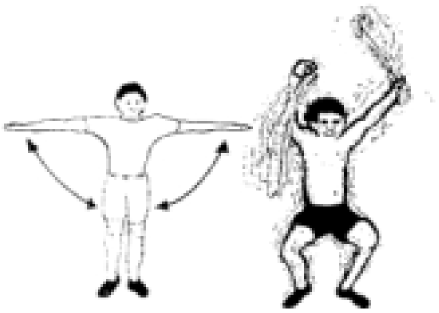
NATIONAL FLAG

A national flag can be very useful to identify yourself at sea or when reaching a foreign country



'SOS' SIGNALS

This signal is one of the best-known international distress signals. It consists of three short pulses, followed by three long ones, then three short ones, the sequence repeated regularly. This signal can be made at night by switching a torchlight (flashlight) or the masthead light, on and off. During the day, use a mirror or other flat, shiny object to flash sunlight towards an observer. This signal can also be made with sound. Use a whistle hooter or any other sounding device.



'ARM' SIGNALS

The recognized arm signal for distress is to hold arms out horizontally from the sides and lower and raise them repeatedly. If there is no response to this signal, wave arms about frantically, using coloured cloth as a flag.

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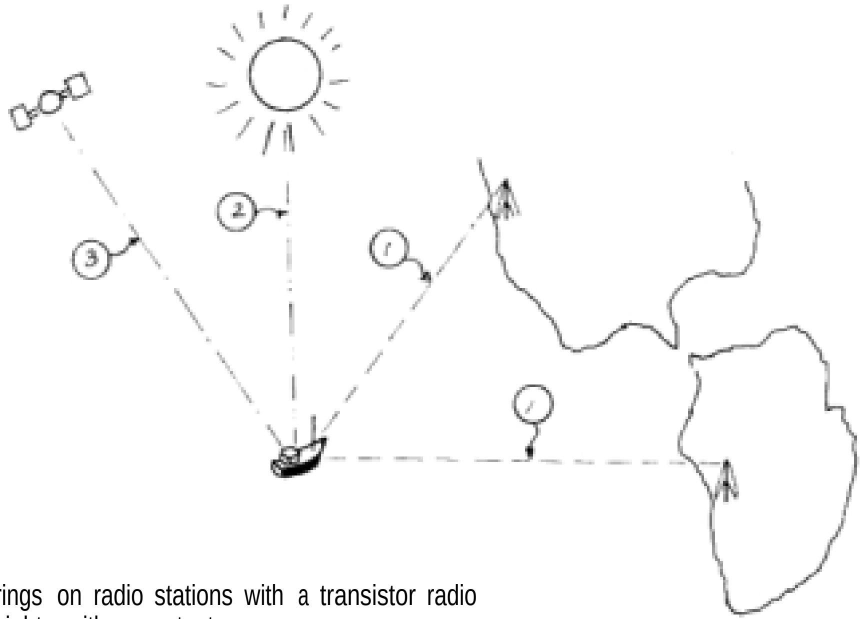
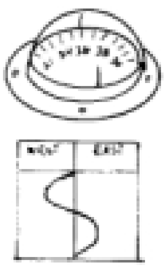
RECKONING POSITION OF BOAT

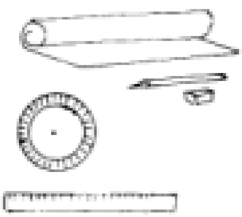


① Take bearings on radio stations with a transistor radio
② Take sunsights with a sextant.
③ Use the Global Positioning System (GPS)

MINIMUM EQUIPMENT



A reliable compass which should either have been corrected for deviation by a specialist or for which you carry a deviation diagram

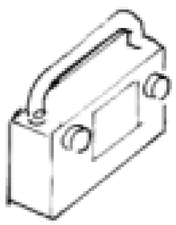


An Admiralty Chart of the area you are sailing in.

Pencil and eraser

A 360° protractor

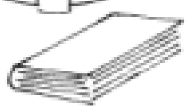
A plastic transparent ruler



A transistor radio to take bearings on radio stations and listen to weather forecasts.

DESIRABLE EQUIPMENT

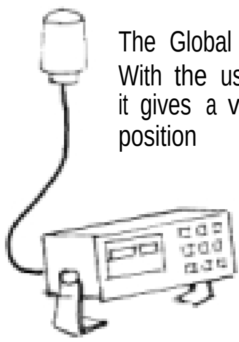
A sextant



Nautical Almanac

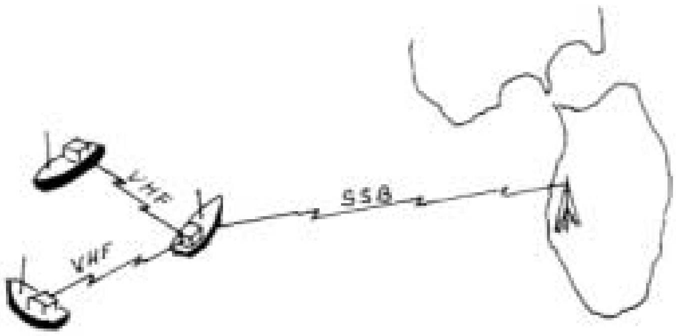
An accurate quartz wrist watch

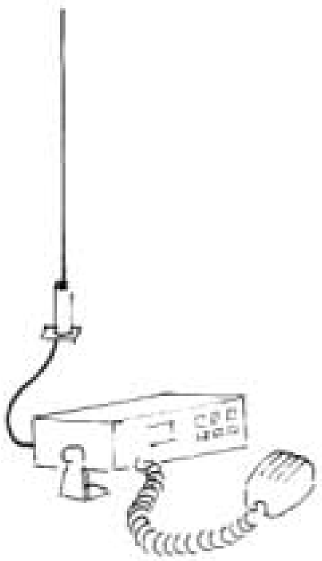
GPS



The Global Positioning System. With the use of satellites, it gives a very accurate position

REMEMBER: Always have a second positioning method on board





To be able to send messages to other boats or to shore stations, that you are in trouble, is the first step towards rescue.

The only radio that can transmit to the shore when you are more than 30 miles offshore is the Single Sideband (SSB) radio. Unfortunately, it is also very expensive (minimum US$ 2500)

Near the shore, a Very High Frequency (VHF) radio can be used. It has a maximum range of 30 nautical miles. Its cost is much less than the SSB radio (US$ 400).

The VHF radio is useful for offshore boats if skippers of several boats agree to cooperate in the following way:

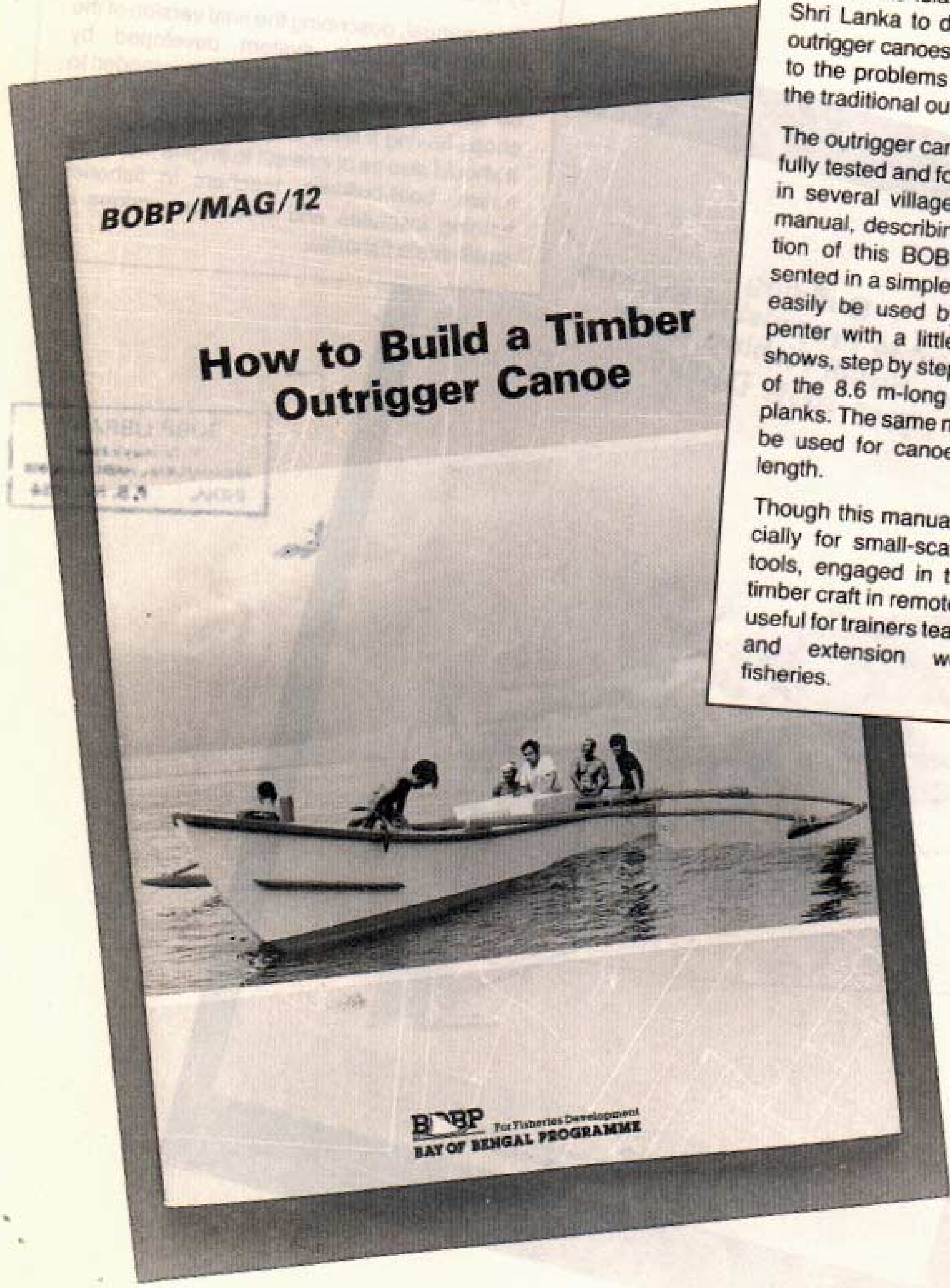
1. Fish in the same area.
2. Communicate daily with each other on the VHF radio at a set time.
3. Determine position with a GPS and inform each other.
4. If you are in trouble because of an engine breakdown, the other fishing boats will assist you with a tow to shore.
5. If one of the larger boats has an SSB radio, it can relay messages to shore stations.

BOBP/MAG/12—How to Build a Timber Outrigger Canoe

Outrigger dugouts, traditional fishing craft found from Madagascar in the west to Indonesia and the Pacific islands in the east, are made from tree trunks of adequate diameter. But logs for construction of large canoes are becoming difficult to find and construction is consequently becoming more and more expensive. Dugout construction also wastes a lot of timber. For each dugout, two or three planked canoes can be built. The Bay of Bengal Programme (BOBP) undertook a project in Nias Island, Sumatera, Indonesia, and Shri Lanka to design and construct planked outrigger canoes that would provide an answer to the problems now being faced in building the traditional outrigger canoes.

The outrigger canoe developed by BOBP was fully tested and found acceptable by fisherfolk in several villages of North Sumatera. This manual, describing the design and construction of this BOBP-designed canoe, is presented in a simple 'how-to-do' format that can easily be used by any boat-builder or carpenter with a little experience. The manual shows, step by step, how to build the main hull of the 8.6 m-long INS-5 canoe using sawn planks. The same method of construction may be used for canoes from 7.5 m to 10.8 m length.

Though this manual has been prepared specially for small-scale carpenters with basic tools, engaged in the construction of small timber craft in remote villages, it could also be useful for trainers teaching in fisheries schools and extension workers in small-scale fisheries.



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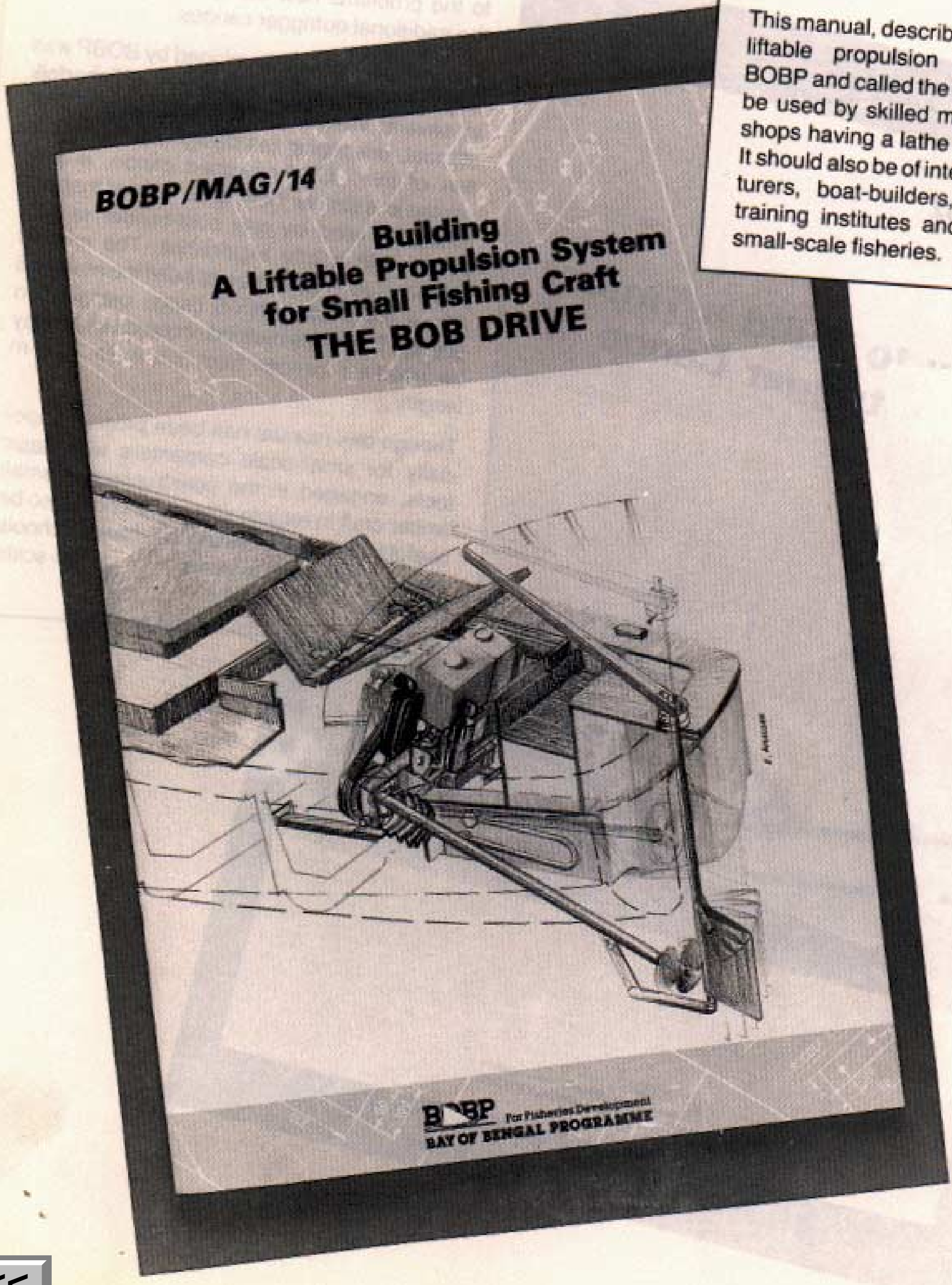
BOBP/MAG/14—Building A Liftable Propulsion System for Small Fishing Craft—The BOB Drive

The Bay of Bengal Programme (BOBP) undertook a project for development of beach-landing craft and their propulsion systems in India and Shri Lanka in 1979. The main challenge was to develop a propulsion system that could be fitted to a variety of air-cooled and water-cooled diesel engines that were available locally, provide good manoeuvrability when crossing the surf, permit rapid retraction of the propeller and the rudder and be strong enough to withstand both the impact when landing on the beach and the rough handling by users.

This manual, describing the final version of the liftable propulsion system developed by BOBP and called the BOB Drive, is intended to be used by skilled mechanics in small workshops having a lathe and welding equipment. It should also be of interest to engine manufacturers, boat-builders, teachers in fisheries training institutes and extension workers in small-scale fisheries.



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BOBP/MAG/16

Fishing Technology

Shri Lanka's offshore fishery has been growing considerably in the last few years. About 400 small decked boats of 9-11 m now venture out as far as 200 n miles from Shri Lanka's shores and stay at sea for up to ten days in search of tuna, shark and billfish.

The expansion of this fishery in Shri Lanka was, in many ways, hurriedly done, without the required upgrading of boat technology for boat crew and safety. The result has been a relatively high accident rate. Every year, an average of eight boats and around 30 men are lost at sea without trace.

A Bay of Bengal Programme (BOBP) subproject in Shri Lanka studied this problem and offered advice on safety at sea for the offshore fisheries. It recommended that information should be provided to boatyards, boat-owners and crew on the design and operational aspects which contribute to making a safer fishing boat, with adequate protection for the lives of those aboard. This manual was developed to assist in this effort.

The manual covers aspects of safety that are relevant to all decked fishing boats less than 12 m length, but it deals more in detail with the engine installation, since experience in Shri Lanka has shown that engine breakdown, which leads to drifting, is a major cause of fishing craft being lost. The manual indicates practical solutions to safety problems faced by multiday offshore boats off Shri Lanka and elsewhere.

As this safety guide is intended to be of practical use to boatbuilders, boat-owners and fishermen, it has been necessary to be specific and go into detail. It will also be very useful to teachers in fisheries training schools and extension field staff dealing with small-scale offshore fisheries.

The Bay of Bengal Programme (BOBP) is a multiagency regional fisheries programme which covers seven countries around the Bay of Bengal – Bangladesh, India, Indonesia, Malaysia, Maldives, Shri Lanka and Thailand. The Programme plays a catalytic and consultative role: it develops, demonstrates and promotes new technologies, methodologies and ideas to help improve the conditions of small-scale fisherfolk communities in member countries. The BOBP is sponsored by the governments of Denmark, Sweden and the United Kingdom, and also by UNDP (United Nations Development Programme). The main executing agency is the FAO (Food and Agriculture Organization of the United Nations).

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