

**AUSTRALIAN EMERGENCY
MANUALS SERIES**

**PART IV
Skills for Emergency Services Personnel**

Manual 39

FLOOD RESCUE BOAT OPERATION

Second Edition

EMERGENCY MANAGEMENT AUSTRALIA

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THE AUSTRALIAN EMERGENCY MANUALS SERIES

The first publication in the original AEM Series of mainly skills reference manuals was produced in 1989. In August 1996, on advice from the National Emergency Management Principles and Practice Advisory Group, EMA agreed to expand the AEM Series to include a more comprehensive range of emergency management principles and practice reference publications. The Series is now structured in five parts as set out below.

Parts I to III are issued as bound booklets to State and Territory emergency management organisations and appropriate government departments for further dissemination to approved users including local government. Parts IV and V (skills and training management topics) are issued in loose-leaf (amendable) form to all relevant State agencies through each State and Territory Emergency Service who maintain State distribution/amendment registers. All private and commercial enquiries are referred to EMA as noted at the end of the Foreword on page vii.

AUSTRALIAN EMERGENCY MANUALS SERIES STRUCTURE AND CONTENT

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Manual 2	Australian Emergency Management Arrangements (6th edn)	R
Manual 3	Australian Emergency Management Glossary	A
Manual 4	Emergency Management Terms Thesaurus	A

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Volume 2—Mitigation Planning

	Titles to be advised (covering PPRR)	P
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Volume 3—Implementation of Emergency Management Plans

	Titles to be advised	P
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Guide 3	Managing the Floodplain	A
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Guide 6	Flood Response	A
Guide	Disaster Victim Identification	A/R
PART IV —SKILLS FOR EMERGENCY SERVICES PERSONNEL		
Manual 1	Storm Damage Operations (2nd edn)	A
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Manual 3	Leadership	A
Manual 4	Land Search Operations (2nd edn—Amdt 1)	A
Manual 5	Road Accident Rescue (2nd edn)	A
Manual 6	General Rescue (4th edn—formerly Disaster Rescue)	A
Manual 7	Map Reading and Navigation (Amdt 1)	A
Manual 8	Four-Wheel-Drive Vehicle Operation (Amdt 1)	A
Manual 9	Communications (2nd edn)	A
Manual 10	Flood Rescue Boat Operation (2nd edn)	A/R
Manual 11	Vertical Rescue (2nd edn)	A/R
PART V —THE MANAGEMENT OF TRAINING		
Manual 1	Small Group Training Management (2nd edn)	R
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Key to status: A = Available; A/R = original version Available/under Review;
D = under Development; P= Planned; R = under Review/Revision

FOREWORD

The purpose of this manual is to provide a basic reference for Flood Rescue Boat Operation. It is intended for use in planning, training and operations by all relevant disaster/emergency personnel and organisations.

This Manual has been developed by a national working party representing State and Territory emergency services. The working party was initiated and sponsored by Emergency Management Australia.

The Manual is issued in loose-leaf form to facilitate amendment and insertion of State and Territory supplements.

As situations change and improved techniques are developed the Manual will be amended and updated by the national working party.

Proposed changes to the document should be forwarded to the Director General, Emergency Management Australia, at the address shown below, through the relevant State/Territory emergency management organisation.

The use of trade names in this Manual is not intended to be restrictive, preferential or promotional, rather, trade names are used where descriptive clarity is required.

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CHAPTER 1

GENERAL INSTRUCTIONS TO CREWS

INTRODUCTION

1.1 KNOWLEDGE

Crews of Flood Rescue Boats (FRBs) should have the following minimum knowledge prior to becoming involved in rescue operations:

- a. State/Territory boating regulations;
- b. safety rules of boating;
- c. basic principles of seamanship;
- d. knowledge of boat and motor;
- e. basic navigational skills;
- f. knowledge of their own strengths and weaknesses;
- g. local knowledge of area of involvement; and
- h. basic first aid skills.

1.2 Above all, a good deal of commonsense is absolutely necessary.

1.3 In addition to the above knowledge operators should know the general policy and organisational directives which affect the operation of the FRB.

1.4 QUALIFICATIONS

Crews must also have attained the necessary qualification to operate FRBs as laid down by their respective organisations.

TASKS

1.5 FRB crews will undertake tasks only when instructed to do so by the authority, under whose control they are operating.

1.6 Some tasks which could be allocated to flood rescue boats are:

- a. saving of life;
- b. evacuation of persons from flood threatened areas;
- c. conveying of persons to hospital for medical attention;
- d. conveying essential flood relief officials to isolated areas or on flood activities;
- e. conveying essential food stuffs, supplies and equipment within flood areas;
- f. conveying fodder supplies to isolated stock;
- g. rescue and recovery of livestock;
- h. assistance in search and rescue on inland waterways; and
- i. body recovery.

ALLOCATION OF TASKS

- 1.7** To maintain proper control over appointed tasks and to avoid duplication, individuals who approach boat crews for assistance should be courteously referred to the appropriate Emergency Service Headquarters (HQ). The senior member of the crew (the master) should use their own discretion when a request for assistance is made. If the request is of an urgent nature, the HQ should be informed by the most convenient means and the task carried out. In any case, the task must be reported to the HQ as soon as possible.
- 1.8** Under normal procedures, the crew should await directions from their HQ, but the master must bear in mind that where danger to life exists the first and foremost consideration must be for the crew.

1.9 RECORDING OF TASKS

It is the responsibility of the master to maintain a log listing such information as:

- a. chronological listing of tasks;
- b. operating hours;
- c. fuel consumption;
- d. passenger/cargo details;
- e. equipment serviceability; and
- f. any other relevant information which may be required by unit Standard Operating Procedures (SOPs).

KNOWLEDGE OF BOAT AND MOTOR

- 1.10** Operators will never know everything about the boat and motor which they are required to operate in flood conditions. However they must make every effort to familiarise themselves with the characteristics of the boat, its limitations, and above all, the behaviour patterns of both boat and motor.
- 1.11** No two operating areas are the same, and all boats handle differently. The difference can only be learned with practice.

1.12 LIMITATIONS

The limitations of any boat are of two kinds. Firstly, the physical limitations built into the boat by the designer and by the motor installed on the boat. Secondly, those limitations imposed by government regulations and Emergency Services which are safety limitations.

- 1.13** Irrespective of the type of limitations, the professional boat operator must know all those which affect the boat.

KNOWLEDGE OF ONESELF

- 1.14** Operators may completely fulfil all other requirements but if they lack the knowledge of themselves they are endangering not only themselves but all those who ride with them.

- 1.15** Knowledge of oneself means and includes such things as knowing your job and recognising your own strengths and weaknesses. Knowing what you can do and not being afraid to say no to those tasks which you know are beyond your capabilities is important. If you exceed your capabilities you may place at risk the lives of all involved.

LOCAL KNOWLEDGE

1.16 USE OF GUIDES

Local knowledge is a great asset. Nevertheless, there may be times when you are required to work in unfamiliar areas. In these circumstances it is preferable to use the services of a guide, if possible. However, bear in mind that the guide may not be reliable, as many of the features which are normally used for orientation purposes, especially at night, may be submerged. If time and facilities permit, first fly over the area in which you will operate.

1.17 MAPS

When acquiring local knowledge, each crew member should endeavour to learn the water conditions which may exist in times of flood. In all cases, obtain the latest available maps of an area and as many types as possible. The different maps may give additional information which will assist in building up local knowledge.

1.18 NAVIGATION

Continually practice navigational procedures. A FRB crew must always know its exact location.

- 1.19** Once a guide and relevant maps have been obtained, and perhaps after an overflight of the area has been undertaken, launch the FRB and carry out a reconnaissance of the area in which you are likely to have to operate. There is no substitute for this. Don't make your first trip in flood waters an emergency trip, if it can be avoided.

PERSONAL FLOATATION DEVICES

1.20 STANDARDS

Crews are to wear personal floatation devices (PFDs) which comply with Australian Standards, at all times when operating Flood Rescue Boats in hazardous conditions. The master may direct the crew to wear PFDs at his or her discretion, based on the conditions.

1.21 PASSENGERS

All passengers must comply with the above PFD rules. If they refuse to wear a PFD they are not to board the FRB.

- 1.22** Crews may wear suitable helmets in conjunction with PFDs when conditions warrant.

COMPLETION OF OPERATIONS

1.23 On completion of operations for the day, the crews final responsibility is to check and service the boat and its equipment and to prepare the boat for the next crew or next days operation. It should be appreciated that the boat may be called out again immediately.

1.24 SERVICEABILITY

Any spare time between tasks can be used to advantage to maintain the boat and equipment in a serviceable condition. Under no circumstances is a boat to be stored in an unserviceable condition.

1.25 All equipment must be stowed in its proper place and the boat log book filled in.

1.26 DEFECTS

All crews, before leaving HQ, must check the log to ensure that all defects have been rectified, and if not, ensure that everything is serviceable prior to commencing any task. Log books must also be brought up to date.

1.27 Batteries must be placed on charge to ensure that they are ready for the next operation.

COMMONSENSE

1.28 FRB crews must be able to operate under adverse conditions, and all operators must have commonsense. It is not possible to lay down all the procedures which should be used in every situation. Therefore each crew member must apply commonsense to every situation.

1.29 FRB crews must be able to operate safely and effectively under varied and adverse conditions.

CREW MEMBERS

1.30 FRB crew must be well trained and efficient teams. The safety of boat, passengers and equipment on board is directly dependent on the ability of crew members to perform their particular jobs. All crew members should hold a current first aid certificate, be able to swim and tread water.

CREW RESPONSIBILITIES

1.31 The crew of a FRB normally consists of a master and two crew who must be qualified to hold their respective positions.

- a. The **master** of the vessel is the person in command of the FRB.
- b. The **coxswain** is the person who is driving the FRB. The coxswain is often, but not always, the master of the vessel.
- c. The **crew** are the people who perform duties on the FRB other than those of the master or coxswain.

1.32 MASTER

The master is the senior member of the crew. The master has charge of the boat and has all the responsibilities of command. Beside boat operation, these include proper maintenance of the boat and its equipment while it is under the master's control and strict enforcement of all safety measures.

1.33 RESPONSIBILITIES OF THE MASTER

The master is responsible for:

- a. checking the boat each operational day to ensure it is in all respects ready for use;
- b. applying the rules of the road and regulations affecting the particular area of operation;
- c. knowing the buoyage system (if applicable);
- d. making certain that the boat is properly and securely loaded;
- e. making certain crew and passengers are fully briefed on, and observe all safety precautions;
- f. knowing and using visual and radio communication procedures and signals relating to the operation of the boat;
- g. being as familiar as possible with the area of operation;
- h. acquiring the latest possible weather, flood and navigational data available, including maps or charts of the area of operation if available;
- i. ensuring all standing operating procedures laid down by the control authority are adhered to;
- j. keeping records and reports of the boats condition and activities;
- k. ensuring minor maintenance and repairs within the capabilities of the crew are carried out;
- l. securing the boat and its equipment on completion of operations; and
- m. conducting training for crew members, to ensure efficient working of the boat and continuity of crew skills.

1.34 CREW

All members of the crew should be able to drive the boat, i.e. act as coxswain. In the event of the master being disabled, the most experienced crewmember must take command.

1.35 RESPONSIBILITIES OF THE CREW

The crew is responsible to the master for:

- a. ensuring the boat is ready for each days operation;
- b. handling lines and stowing equipment safely within the boat;
- c. operating any signalling or radio equipment carried in the boat;
- d. acting as lookout whilst underway; and
- e. assisting in the seating and control of any passengers carried in the boat.

NIGHT OPERATIONS

1.36 Because of increased hazards it is not recommended that FRBs be used in flooded areas at night or during periods of poor visibility. Only tasks of a most urgent nature should be carried out under these conditions.

1.37 Due to reduced visibility the hazards are increased and the master must consider the risks before accepting a task at night.

USE OF LIGHTS

- 1.38** There are advantages and disadvantages to using spotlights at night in FRBs. Masters need to consider the situation and their own personal preferences when deciding on the use of lights. Navigation lights, in accordance with State/Territory regulations should be fitted to all FRBs and used.

CHAPTER 2

STATE/TERRITORY BOATING REGULATIONS

Note: Each State/Territory Is to insert details on their own Boating Regulations, Licensing etc and details on any particular State/Territory SOPs.

CHAPTER 3

SAFETY

INTRODUCTION

- 3.1 The first consideration for any person operating a FRB is the safety of the occupants, the boat and its equipment. The safe and competent operation of a boat under any conditions requires seamanship. Seamanship is basically a mixture of commonsense, observation and experience.

GENERAL BOAT SAFETY

- 3.2 The main considerations for the safe operation of boats are listed below:
- a. **The Weather**—Before operations obtain all the latest forecast information including:
 - (1) wind direction and speed;
 - (2) tide times/predicted flood heights;
 - (3) wave height/current speed; and
 - (4) times of daylight/nightfall.
 - b. **The Boat**—Check the seaworthiness of the boat, motor and equipment. Ensure that the boat is suitable for the task to be performed.
 - c. **Fuel**—Always check fuel before leaving shore. Carry sufficient for the task plus a minimum of 1/3 reserve. Be aware of the amount of fuel consumed by your motor under operating conditions.
 - d. **Loading**—Be conscious of the load being carried, its weight and distribution. Ensure there is sufficient freeboard for the prevailing conditions. Distribute the load evenly to ensure good trim. Restrain any load to avoid movement. Keep the centre of gravity low.
 - e. **Seating**—Occupants must sit on the seats provided. If no seats are provided they must sit on the floor. They must not sit on the gunwales or on the foredeck. Hands must not be placed on the gunwales or outside the boat as they may be crushed or injured. Occupants must be seated such that their waist level is below the gunwales or fixed rails.
 - f. **Speed**—Obey all speed limits laid down. Where no speed limits apply ensure speed is related to the conditions. Avoid high speed turns or violent manoeuvres. When approaching any landing, reduce speed to allow a gentle, controlled docking.
 - g. **Reversing**—Where possible avoid reversing in shallow water. The propeller on a reversing motor is at its greatest risk of striking a submerged obstruction which may cause serious damage to the propeller or the motor.
 - h. **Familiarity**—Become familiar with the boat and its equipment before use, and know the limitations of the boat, equipment and crew. Obtain all possible information about the area of operation.
 - i. **Attention**—All crew members must maintain their attention on safety. Always think before acting and use caution.

j. **Care/Maintenance of Personal Floatation Devices (PFDs)**

- (1) PFDs should never be used as seats, cushions, packing or as fenders on boats.
- (2) Regularly check PFDs for damage, (battery acid damage, zips, torn straps etc). Repair or replace, where necessary.
- (3) Stow and clean PFDs in accordance with manufacturer's instructions.

SAFETY RULES

3.3 This is a summary of basic safety rules which should be observed:

a. **Do not** do the following:

- (1) Overload your boat. Always distribute the load evenly keeping the centre of gravity as low as possible. Keep an eye on the freeboard.
- (2) Jump onto the gunwale. Step into the centre of the boat to keep it stable.
- (3) Forget the bungs in the boat before launching.
- (4) Race the boat. The purpose of the powerful outboard motor is to combat fast running water in flood areas, not for racing.
- (5) Leave the boat if it is swamped or capsized. An approved FRB must be designed to remain afloat if it capsizes or is swamped. It is safer to remain with the boat by holding onto the grablines until such time as a rescue can be effected.
- (6) Stand up in the boat. Though the crew may stand to observe the surrounds, others must not do so. If you have to move around in the boat remember, 'one hand for the boat, one hand for yourself', and keep as low as possible.
- (7) Permit horseplay in the boat.
- (8) Drink and drive. Do not allow anyone to handle the boat while under the influence of alcohol or any other drugs.

b. **Do** the following:

- (1) Balance or trim the boat correctly. Evenly distribute the weight of passengers, equipment, and crew.
- (2) Keep the centre of gravity low in the boat. This is achieved by correct placement of equipment and by seating passengers.
- (3) Know the boat. Every boat and motor has its limitations. Learn what you can expect from the boat and motor.
- (4) Carry out a pre-embarkation check. Before launching the boat check the list of essential items, carry out a radio check, and ensure you are prepared for the task.
- (5) Carry sufficient fuel and check it from time to time. All FRBs should carry a spare full fuel tank.
- (6) Obtain local information and familiarise yourself with the locality in which operating.
- (7) Prepare and practice emergency plans and drills. A plan must be prepared by the crew to deal with all emergencies in the boat, ie a fire plan, abandon ship, man overboard, etc.

- (8) Consider others and remember the wash. The wash can cause additional damage to other boats and property in flood areas; large shop windows can be broken by creating too much wake. Always reduce speed through anchorages and keep clear of swimmers.
 - (9) Check the boat before casting off, carry out a check of boat and motor. Check the boat for seaworthiness and ensure the motor starts easily.
 - (10) Check the equipment. As with the pre-embarkation check, conduct an end of day, task check and ensure all life saving equipment is serviceable and stowed correctly.
 - (11) Ensure that there are sufficient PFDs for crew and passengers and that they are worn correctly.
 - (12) Travel at a speed consistent with regulations and appropriate to conditions.
 - (13) Brief the crew and passengers. Ensure that the crew is fully briefed on the task, and understand the requirements. It is important that all passengers are briefed on:
 - (a) where to sit;
 - (b) what to do;
 - (c) what you are doing; and
 - (d) how to wear a PFD correctly. This will give them confidence in what you are doing.
 - (14) Obey the rules of the road.
- c. **Remember:** A well trained crew and a well prepared boat will be able to carry out the tasks with a minimum of risk and a minimum of effort, and should be successful in all they attempt.

FLOOD WATER BEHAVIOUR

3.4 RAPIDS

A rapid occurs where the bed of a river slopes steeply or where there are constrictions in its width or depth. Frequently, both conditions are present, there is a definite increased angle to the bed and either the banks close in or there is an island, or other obstructions reducing the width of the stream.

- a. **Warning Signs**—Signs indicating an underwater obstruction can vary from a 'V' shaped ripple on the surface, which may be caused by a fence post or similar object, to a stationary wave caused by a rock or large fixed object. (See Figure 3:1).

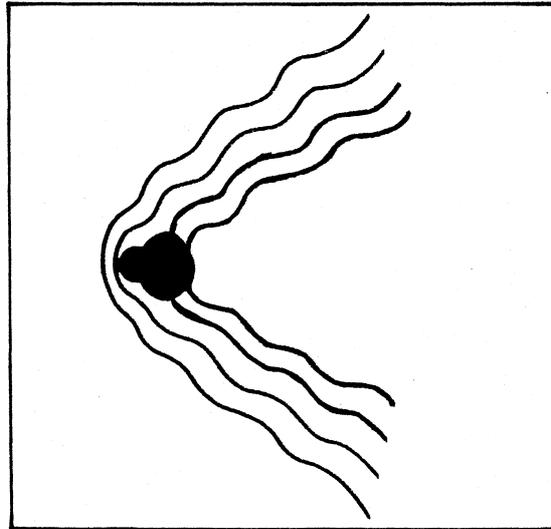


Figure 3:1—Surface Ripple

At sea or on large bodies of water such as lakes, the whole surface of the water may be moving and travelling in a pattern. In a rapidly moving body of water such as a flood, however, the waves are caused by the flow hitting an obstruction, and the waves will be stationary. The effect of the obstruction is modified by a number of factors, including water:

- (1) depth,
- (2) speed; and
- (3) volume.

- b. **Water Depth**—In a simple case water hits the obstruction and is forced upwards, if there is considerable depth or little flow, the effect is ironed out between the obstruction and the surface. (See Figure 3:2). The obstruction should offer little hazard to a boat.

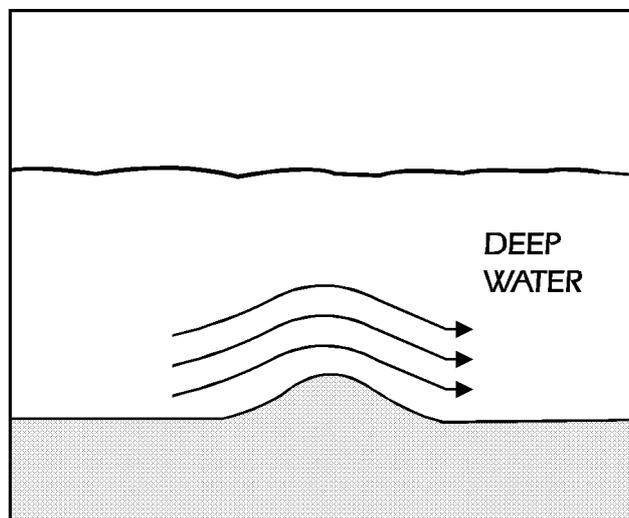


Figure 3:2—Deep Obstruction

If the water is shallower the bump caused by the water being forced upwards may appear as a wave on the surface. (See Figure 3:3).

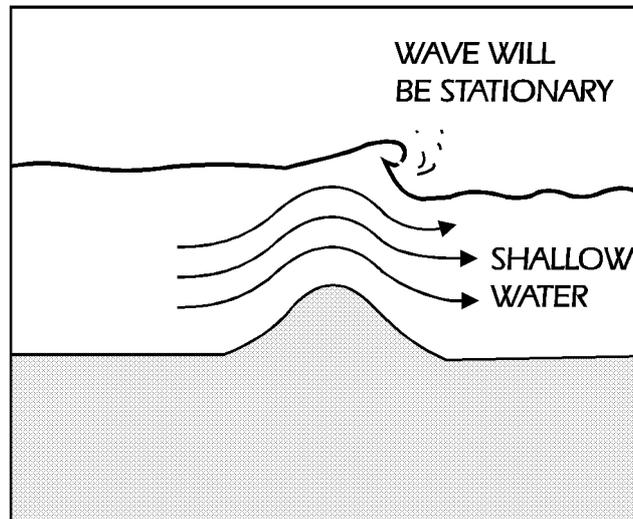


Figure 3:3—Shallow Obstruction

The wave may swing slightly with variation in the flow, but it is always over the same area. If the obstruction is very close to the surface or actually breaking through it, the water will not continue its smooth flow but will be broken drips and spray. Where there is obvious sign on the water surface, there is likely to be a hazard. (See Figure 3:4).

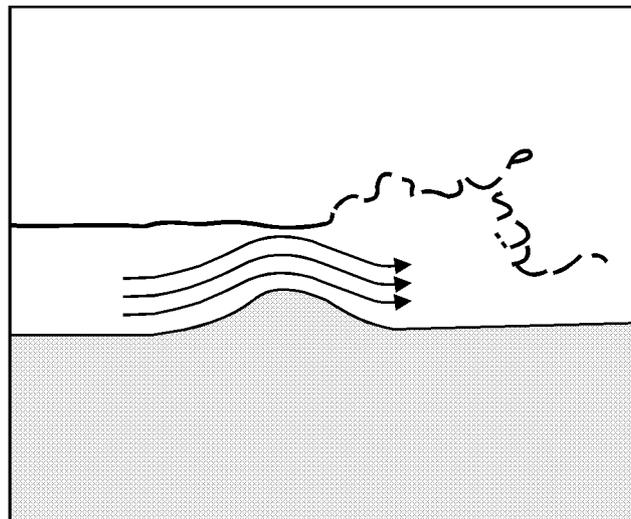


Figure 3:4—Shallower Obstruction

- c. **Water Speed**—With the same size obstruction and the same depth the speed of the water can cause different effects. The obstruction which causes only a smooth bump at 5 km/h may cause a broken wave at 10 km/h.

- d. **Water Volume**—Variations in water level can alter the characteristics of rapid water considerably. It is never advisable to assume that because a patch of water has been negotiated previously it will be passable at a later time.
- e. **Smooth Water**—A large wave may be caused by fast water hitting a patch of deep still water. The effect here is for the fast water to curl back on itself. This is particularly noticeable where water flows over a weir or elevated section of road embankment. (See Figure 3:5).

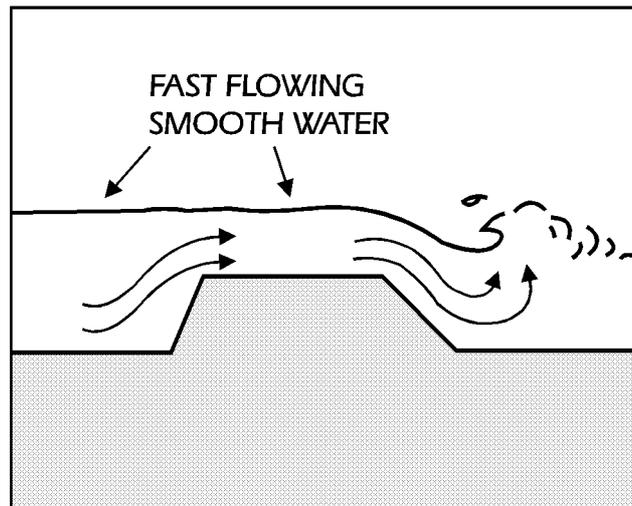


Figure 3:5—Water 'Curl Back'

- f. **Whirlpools**—Whirlpools may be caused by the water changing speed and turning back behind the shelter of a rock, bridge, building or a bay in the bank. (See Figure 3:6).

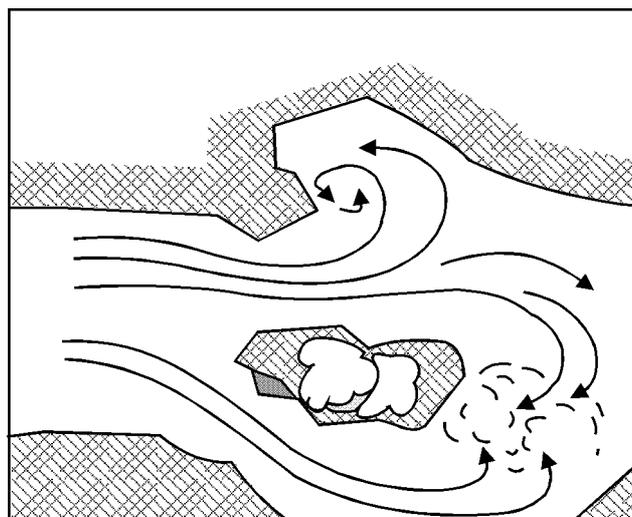


Figure 3:6—Currents around Banks etc

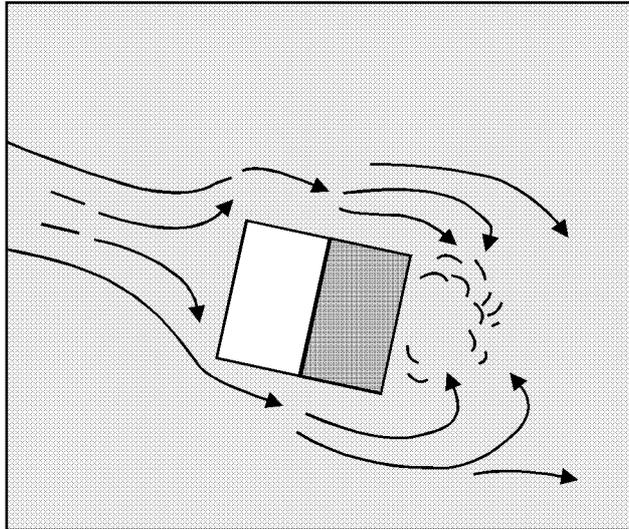


Figure 3:7—Currents around a Structure

3.5 OTHER FLOOD HAZARDS

The following additional hazards may be encountered when operating in flood water:

- a. **Current Crossing**—Avoid direct crossing in fast-flowing water, as logs, trees and other debris may be encountered. Any object moving swiftly in flood waters is a hazard to boats. If possible, cross the current at an angle as this will give greater control of a boat and, with a good lookout, will make collisions less likely.

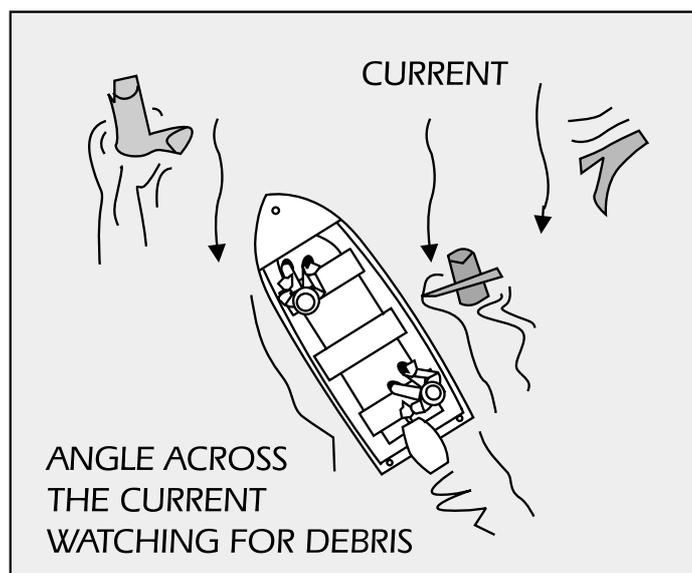


Figure 3:8—Current Crossing

- b. **Current Differentials and Shoreline Eddies**—Current differentials occur when streams converge or the shoreline changes. In these situations, the FRB hull will normally pitch to port or starboard unexpectedly.

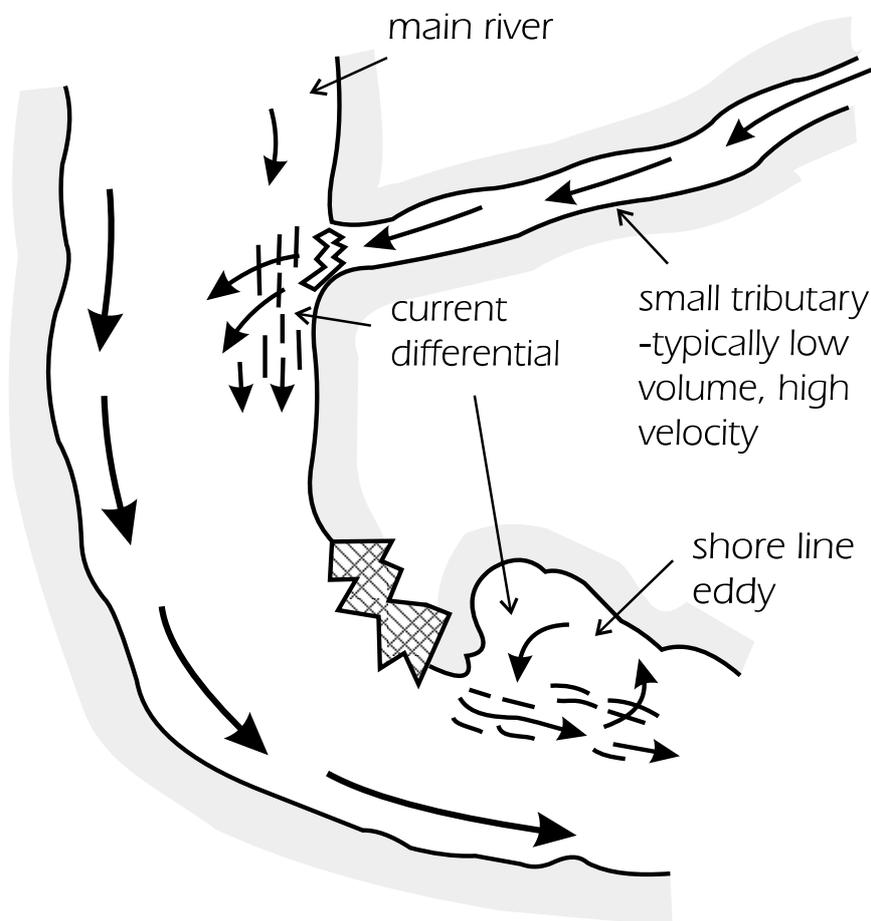


Figure 3:9—Current Differentials

- c. **Weirs and Low-Head Dams**—Weirs usually appear as a uniform feature across a river. They are difficult to see from upstream and very difficult to escape from without help.

You can often recognise a weir or low-head dam by the presence of a boil line which is the most important and hazardous feature to note. The boil line indicates the boundary between the backwash (water flowing back upstream), and the outwash (water flowing downstream.)

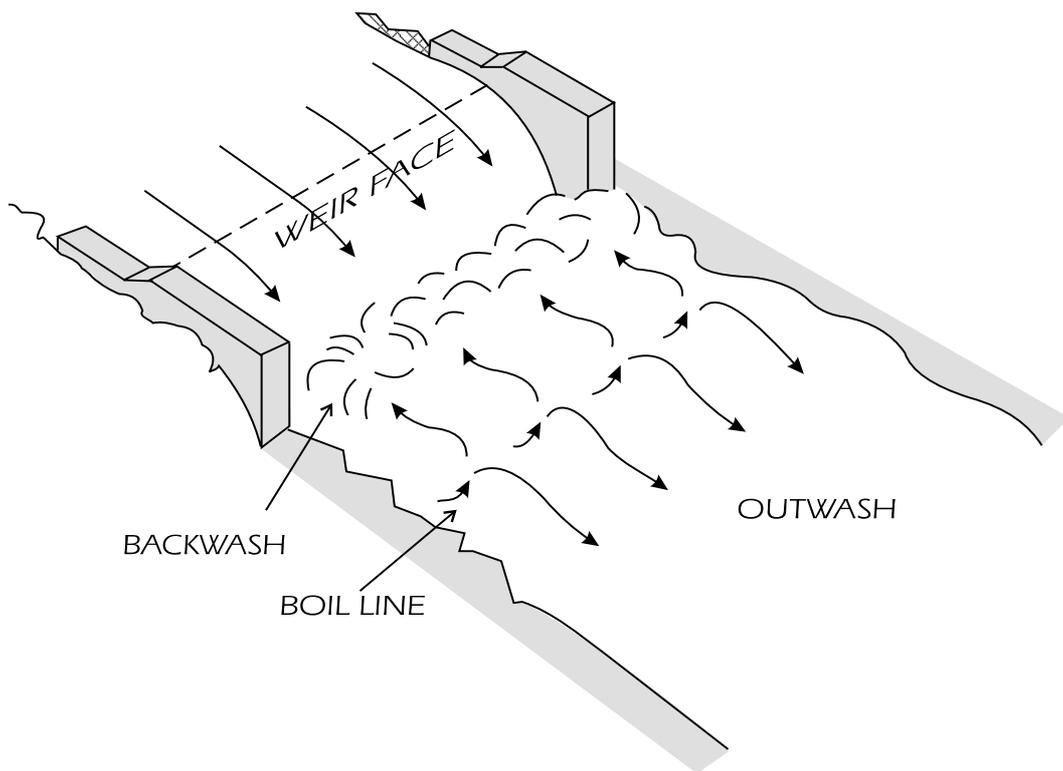


Figure 3:10—Water Currents below Weirs (plan view)

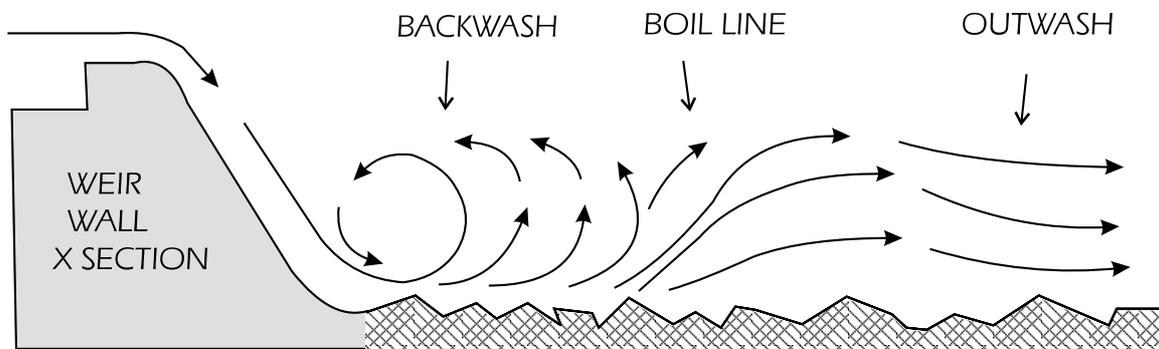


Figure 3:11—Water Currents below Weirs (elevation view)

The water in the backwash is normally frothy, aerated and white. The water in the outwash is darker and smooth.

The previous two diagrams show the hazardous action of the water which can be avoided. **Do not** go over weirs or low-head dams.

- d. **Fast-Flowing Water**—While operating in fast-flowing waters, all FRB crew should be aware of the effect of obstructions and currents on their FRB, particularly when carrying heavy loads or when fitted with low-powered motors. Unless great care is taken, an FRB may foul an obstruction and be holed, capsized or the motor may be damaged. **Rapids** are caused when fast-flowing water is restricted, disturbed when obstructed, or travelling down a steep bed slope.

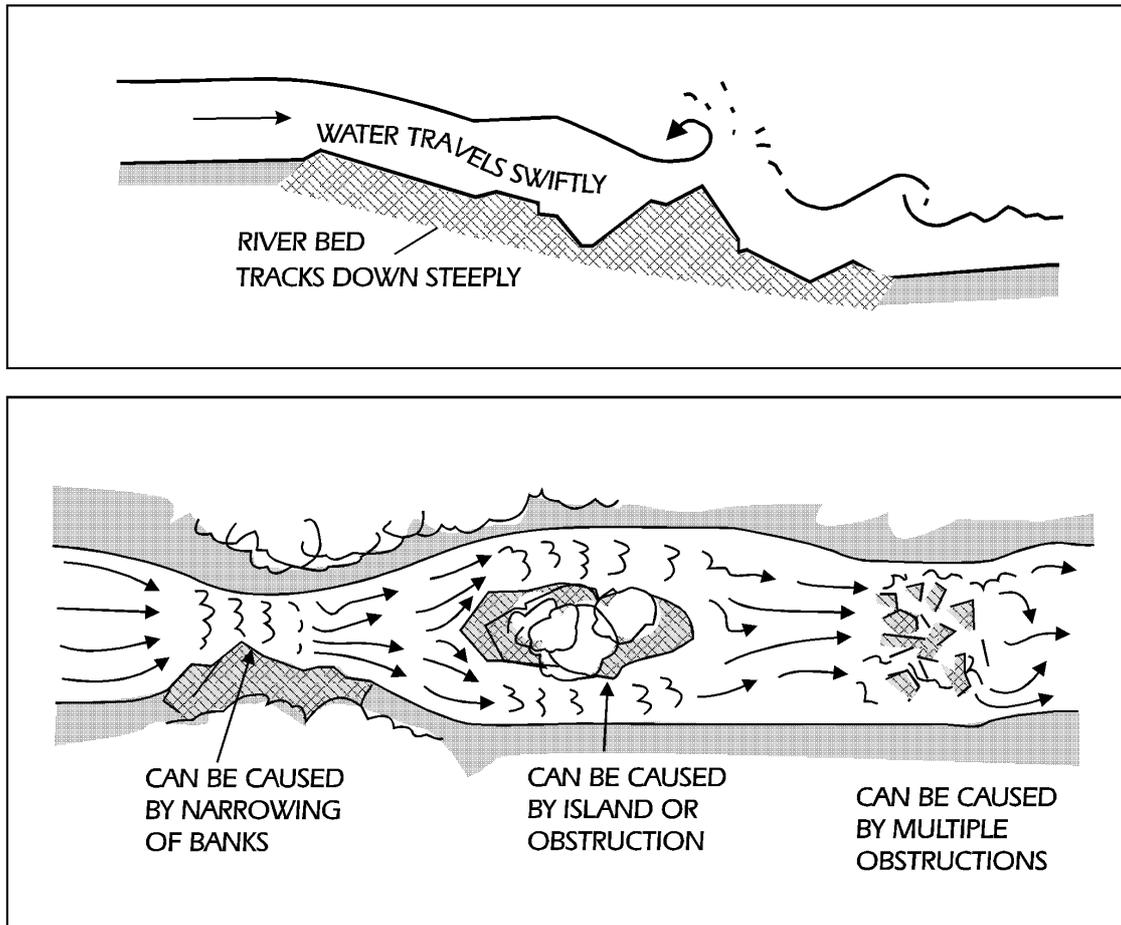


Figure 3:12—Rapids

- e. **Approaches**—If approaching a jetty, wharf, flooded house or any floating object, travel slowly and approach from downstream if possible. Use extreme care as any miscalculation may have serious consequences.
- f. **Human-Made Dangers**—Power lines, fences, roads, and other constructions are often very difficult to see in flood conditions. A sharp lookout must be maintained to avoid hitting such obstacles. Where such obstacles may exist speed should be kept to a minimum. It may also be necessary to rig the motor for shallow water running.

Note: For particular detail on electrical safety, refer to 'Electrical Safety Handbook for Emergency Personnel' published by the Electricity Supply Association of Australia.

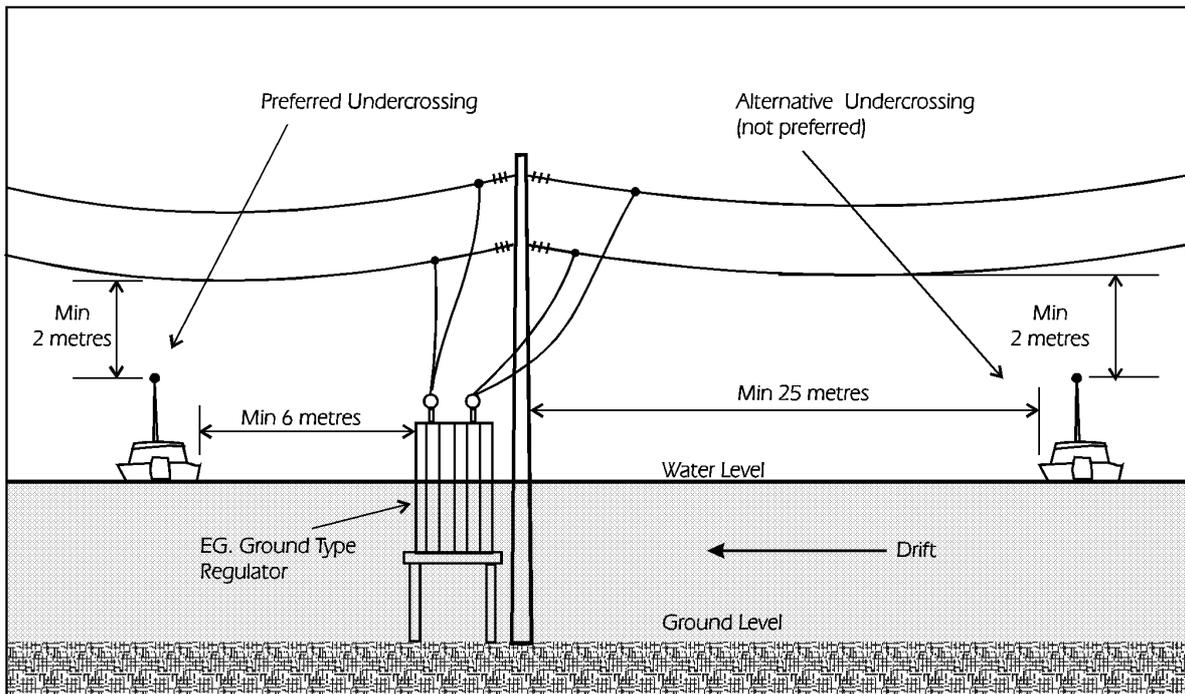


Figure 3:13—Undercrossing Near Ground Structures—Wooden Pole Lines (not to scale)

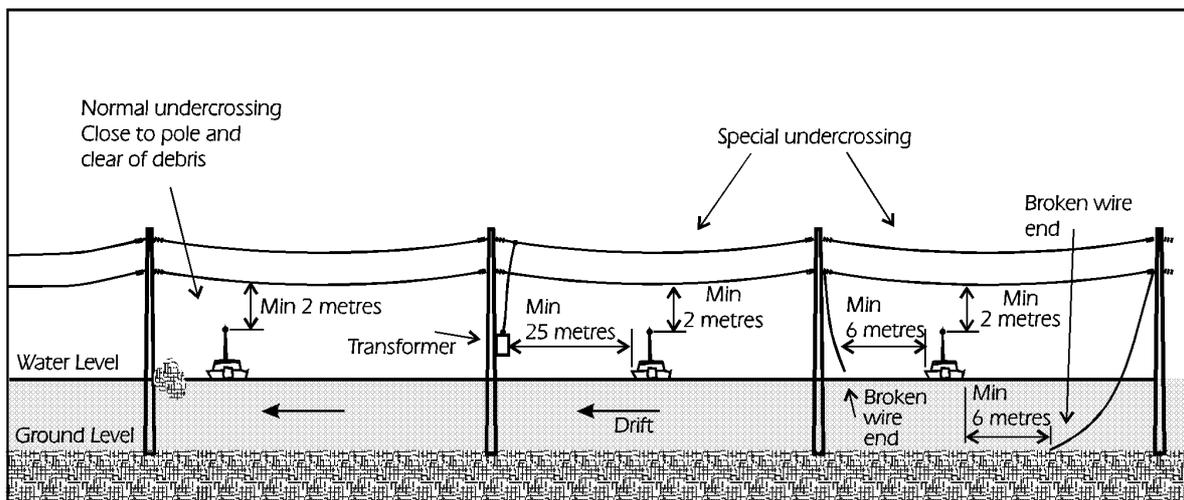


Figure 3:14—Undercrossing Wooden Pole Lines (not to scale)

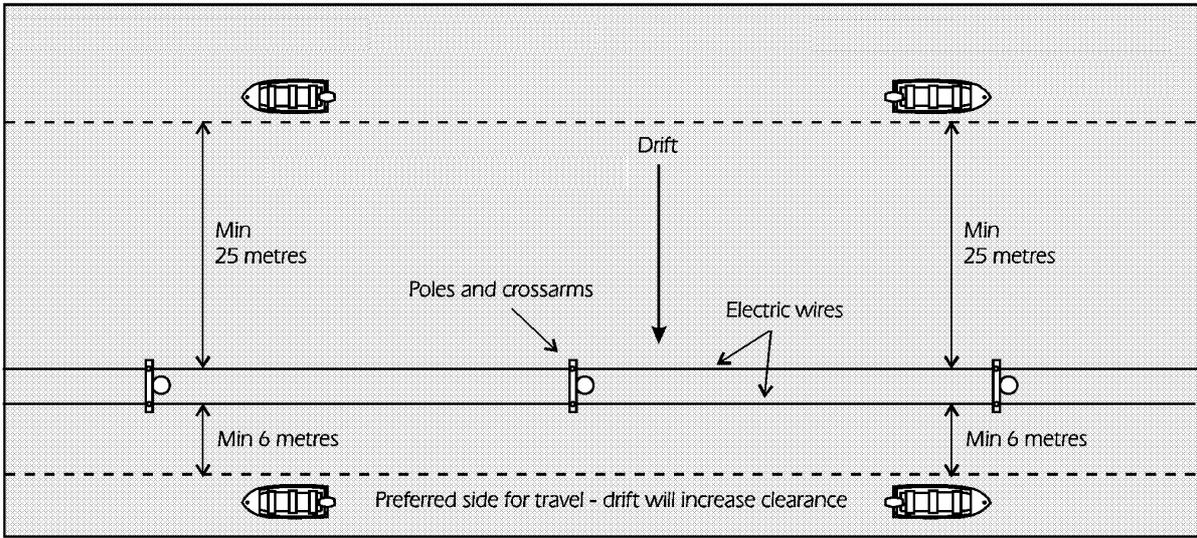


Figure 3:15—Travel Alongside a Wooden Power Line where there is Lateral Drift (not to scale)

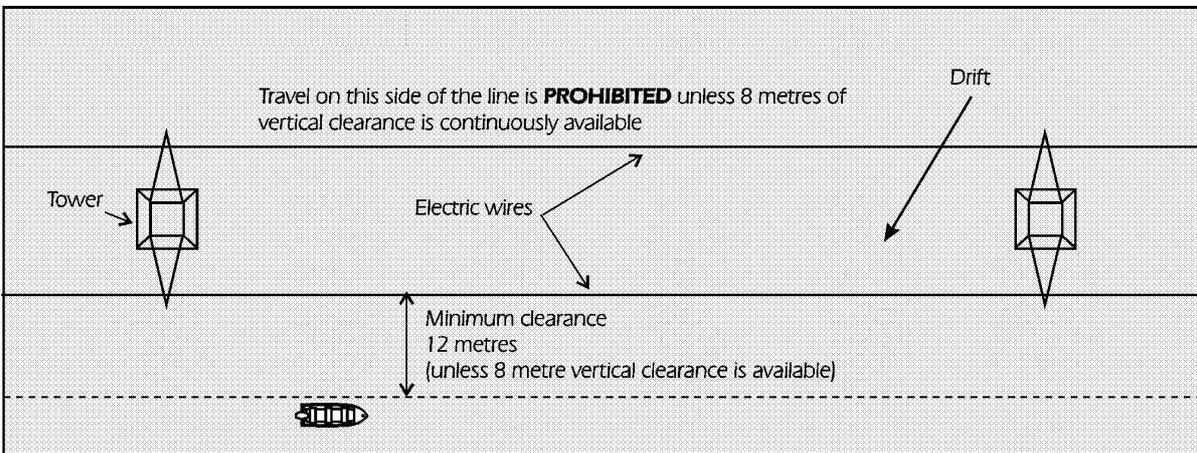


Figure 3:16—Travel Alongside a Steel Tower Line where there is Lateral Drift (not to scale)

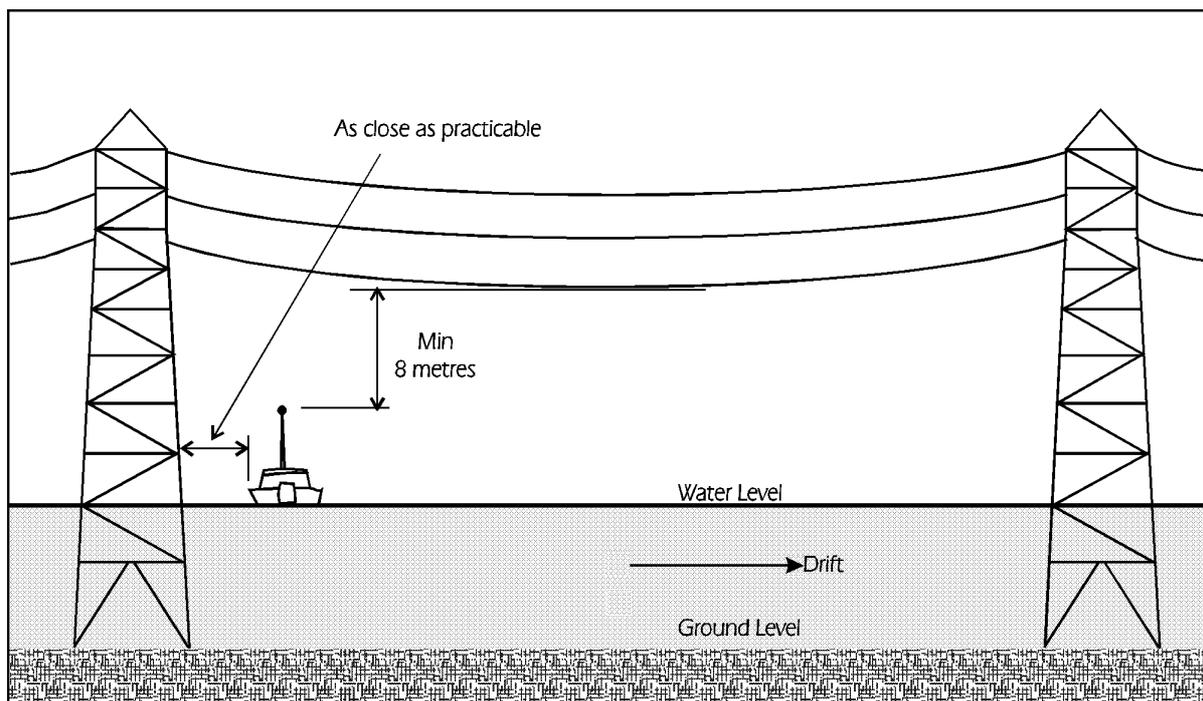


Figure 3:17—Undercrossing Steel Power Lines (not to scale)

- g. **Animals**—Snakes and insects as well as drowned and swimming stock can be hazards in flooded areas. Particular care should be taken of panicking animals attempting to board boats. Crews should be watchful of snakes where craft are driven through overhanging trees or where landings are to be made. Starved domestic or feral pigs, isolated by flood waters, have been known to attack people.
- h. **Chemicals**—Flooded factories and properties are often a source of floating chemical containers. All drums and containers should be avoided. Many chemicals, particularly if mixed with others, may explode, cause burns or form toxic gases.
- i. **Water Contamination**—Flood water is usually contaminated and should never be used for drinking. Crew members should not swim in flood waters, unless necessary, particularly where chemicals or sewerage may have been released.
- j. **Weeds**—Weeds are a hazard as they often become entangled in propellers. This is usually indicated by:
 - (1) a loss of power; or
 - (2) a change in motor noise.

The quickest method of clearing a weed-fouled propeller is to reverse the motor. This permits the weed to unwind from the propeller. If this fails, stop the motor, lift it clear of the water and clear the propeller by hand. Reduce speed in weedy areas and continually observe the cooling water outlet to check that water is still being pumped through the motor. Periodically or as required, stop the motor, clean the propeller and water intake completely of weeds then continue on with the operation. If necessary, the motor may be rigged for shallow water running by using a shallow water bracket.

- k. **Loss of Motor Power**—Should the motor stop for any reason when operating in flood waters, the procedure is as follows:
 - (1) Immediately take steps to regain control of the boat. This is done by dropping anchor or passing a line around a tree, fence, post etc. If an anchor does not hold, or there are no trees or posts available, or it is not possible due to the speed of the current to get a line around a fixture, then the oars must be used for steering.
 - (2) Only after the boat has stopped moving with the current, do you try to start the motor or trouble shoot. Many boats have been wrecked, or capsized, due to the loss of the motor and while action was being taken to rectify this, the boat has struck trees or obstacles with disastrous results.
- l. **River Rise**—All crew must be aware of the rapid rate at which rivers can rise and fall and the effect fast moving waters will have on the boat and motor performance. If caught unaware, a boat can be forced against obstacles, the motor may stall and the boat be overturned or take in water and sink. Caution is required. All equipment should be adequately stored and secured so that in the event of a capsize, the equipment will not be lost. Crews operating in bays or estuaries of the sea must also be aware of tidal rise and fall and its effect.
- m. **Roads and Highways**—During flood operations, roads can be used as relatively safe and obstruction free areas for FRBs to move along, providing there is sufficient depth of water. Remember the deepest water is on the sides of the road.
- n. **Fuel Economy**—At times fuel economy will become paramount due to operational requirements. Fuel saving without appreciable loss of speed can be obtained after the boat is 'on the plane' by throttling back slightly. This will allow the boat to be kept 'on the plane' while reducing fuel consumption and conserving full power.

PERSONAL EQUIPMENT AND HYGIENE

3.6 CLOTHING

When operating during floods, weather conditions may change rapidly and crews should be prepared accordingly. Consideration should be given to protection from sunburn, cold and insects by selecting suitable clothing. Consideration must also be given to the effect clothing will have on freedom of movement and personal floatation. Wearing wetsuits is an option that may be appropriate.

3.7 FOOTWEAR

Always use footwear while operating FRBs. Bare feet are easily injured by objects in the boat and crew members will often have to wade in debris-strewn shallows. Footwear should provide protection, support and warmth for feet and ankles. Wearing woollen socks will help protect feet from sharp objects and cold. Gum boots or thongs must never be worn in FRBs.

3.8 HYGIENE THREATS

All floodwater should be treated as contaminated. It is advisable not to participate in flood operations with open wounds or cuts, or during a menstrual cycle. During flood operations it is advisable to cease shaving to avoid skin irritation or infection.

CHAPTER 4

EQUIPMENT

INTRODUCTION

- 4.1 All FRBs must carry the equipment required by state/territory boating regulations, as set out in Chapter 2 of this manual.
- 4.2 All equipment must be kept in a good state of repair and properly stowed in an accessible place where it will not interfere with the effective operation of the boat.
- 4.3 Crew members must know the location of all equipment, how to use it and when it should be used. The crew of a boat are responsible for briefing passengers in the use of safety equipment on their boarding.

EQUIPMENT LIST

- 4.4 Equipment recommended to be carried in a FRB is as follows:

a. Basic Equipment	Quantity
Personal Floatation Devices (life jackets in accordance with AS1512)	1 for every person up to the anticipated loading
Oars with rowlocks (to match)	1 pair of each
(or) Paddles	1 pair
Anchors (complete with chain and line attached):	
Danforth or reef anchor	1
Galvanised metal bucket or bailer, (min 9 litre, fitted with lanyard of at least 2m)	1
First aid kit (waterproof)	1
Approved fire extinguisher	1
Torch (waterproof with spare batteries)	1
Spotlight (complete with batteries)	1
Drinking water	
Bolt cutters	1
Wire cutters	1
Axe/hatchet	1
Bow and stern lines (10m x 12mm)	1 of each

Basic Equipment	Quantity
Boat hook	1
Towing bridle	1
Knife (with sheath)	1
Fuel tank (complete with fuel lines)	2
Propeller	2 spare
De-watering spray (WD 40 or similar)	
Ropes	as required
Split pins	
Shear pins	
Spare bungs	
Tool kit (complete)	
Safety chain (motor to transom)	
Radio (complete with Antenna)	
Navigation lights	
Maps, charts and compass	
b. Special Equipment	
Stretcher	
Space blankets	

4.5 SPECIAL EQUIPMENT

Special equipment, as required for particular tasks, will need to be added to the above list.

CHAPTER 5

SEAMANSHIP

GENERAL

- 5.1 The term 'seamanship' is a broad one. It covers many topics and would be defined in different ways by different people. For FRB crews it includes:
- a. knowledge of the FRB;
 - b. nautical terms;
 - c. rope work;
 - d. anchors/anchoring;
 - e. boat-handling skills; and
 - f. rowing/paddling.

5.2 KNOWING THE BOAT

Boat handling in adverse conditions is a flexible and individual matter, since no two boats are exactly the same in the same water conditions. When the going is difficult, each hull design reacts differently, as do individual boats of the same type, because of factors such as trim, load etc. Masters and crew must know their boat. Training is a help but the real coxswain only emerges after being out in fast debris strewn flood waters. FRB training can only teach the basic principles.

5.3 TIDINESS AND SAFETY

The FRB must be maintained in first class working order. Ensure the decks are kept clean and free from obstacles, equipment is stowed in an appropriate stowage and fuel and oil spills are cleaned up promptly. Tangled ropes and lines are a particular hazard. Ropes should always be kept neatly coiled for instant use.

5.4 TERMINOLOGY

Following are definitions or descriptions applying to parts of the boat, its movement, direction, location and important terms:

a. **Terms Applied to the Hull**

- (1) **Benches**—Seats that run fore and aft. These may also provide floatation.
- (2) **Bilge**—The inside bottom of the boat adjacent to the keel. The bilge is also the foul water that collects inside a boat's bilges. (See Figure 5:1).

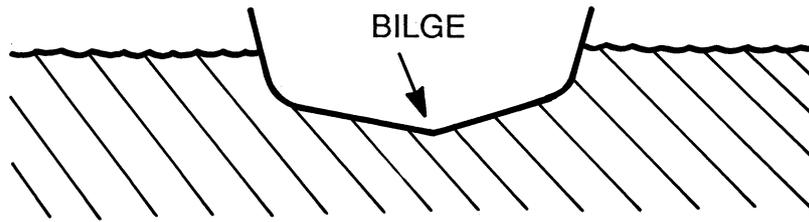


Figure 5:1—The Bilge

- (3) **Bung**—The drain plug in the transom.
- (4) **Chine**—The turn of the hull where the hull sides join the bottom of the hull.
- (5) **Draught**—Depth below water line of the lowest portion of the boat and motor. (See Figure 5:2).

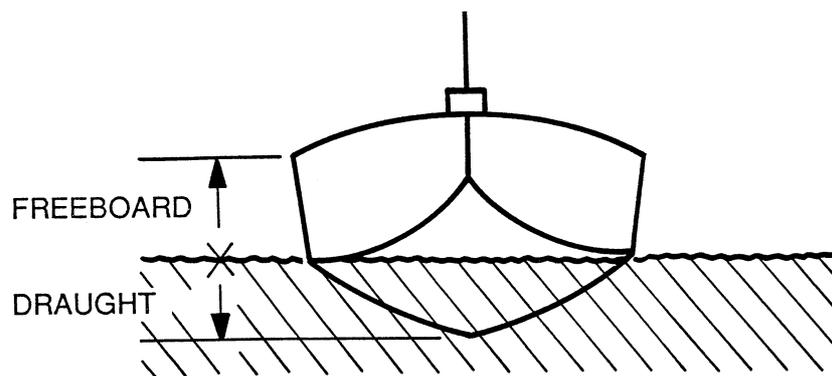


Figure 5:2—Freeboard and Draught

- (6) **Foredeck**—A small deck at the front of the hull.
- (7) **Freeboard**—Height between water line and the gunwale. (See Figure 5:2).
- (8) **Gunwale**—(pronounced gunnel) The continuous strip around the top of the hull.
- (9) **Hull**—The main body or shell of the boat.
- (10) **Keel**—The member joining the two halves of the hull bottom usually along the hull centre line.
- (11) **Keelson**—A reinforcing member to protect the keel and assist in directional stability.
- (12) **Rowlocks**—The brackets which are used as pivot points between the hull and the oars.
- (13) **Stem**—The rising or vertical section at the front of the boat where the hull sides meet to form the bow.
- (14) **Thwarts**—The seats built into the hull. Originally those that run across the hull. These often provide floatation and hull structural integrity.

- (15) **Transom**—The flat back section of the boat joining the two hull sides to form the stern upon which an outboard motor may be mounted.
- (16) **Tuck**—The section (often timber) attached to the centre of the transom where the motor is clamped to the hull. It reduces slippage and wear when the motor is fitted.

The main parts of a typical boat hull are shown in Figure 5:3.

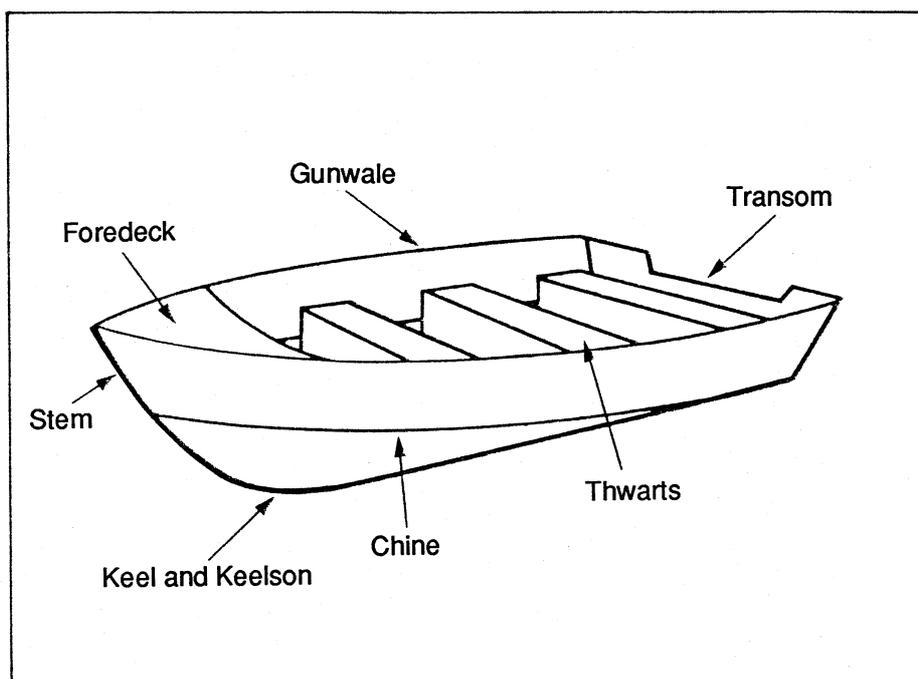


Figure 5:3—Boat Hull Parts

b. **Terms Defining Movement of a Boat**

- (1) **Broadside**—Moving sideways.
- (2) **Give Way**—Alter course, stop, or go astern to avoid a collision.
- (3) **Headway**—Moving ahead.
- (4) **Make Way**—Beginning to move through the water.
- (5) **Making Leeway**—Underway and being blown sideways by the wind.
- (6) **Steerage Way**—Sufficient speed for steering to be effective.
- (7) **Sternway**—Moving astern (backwards through the water).
- (8) **Underway**—When not at anchor or made fast.

c. **Terms of Direction/Location**

- (1) **Abeam**—At right angles to the fore and aft line of a vessel.
- (2) **Abreast**—Level with.
- (3) **Alongside**—Side by side.
- (4) **Bow**—The front of the vessel. (See Figure 5:4).

- (5) **Port**—The left hand side of a vessel looking towards the bow. (See Figure 5:4).
- (6) **Quarter**—The area between abeam and astern. (See Figure 5:5).

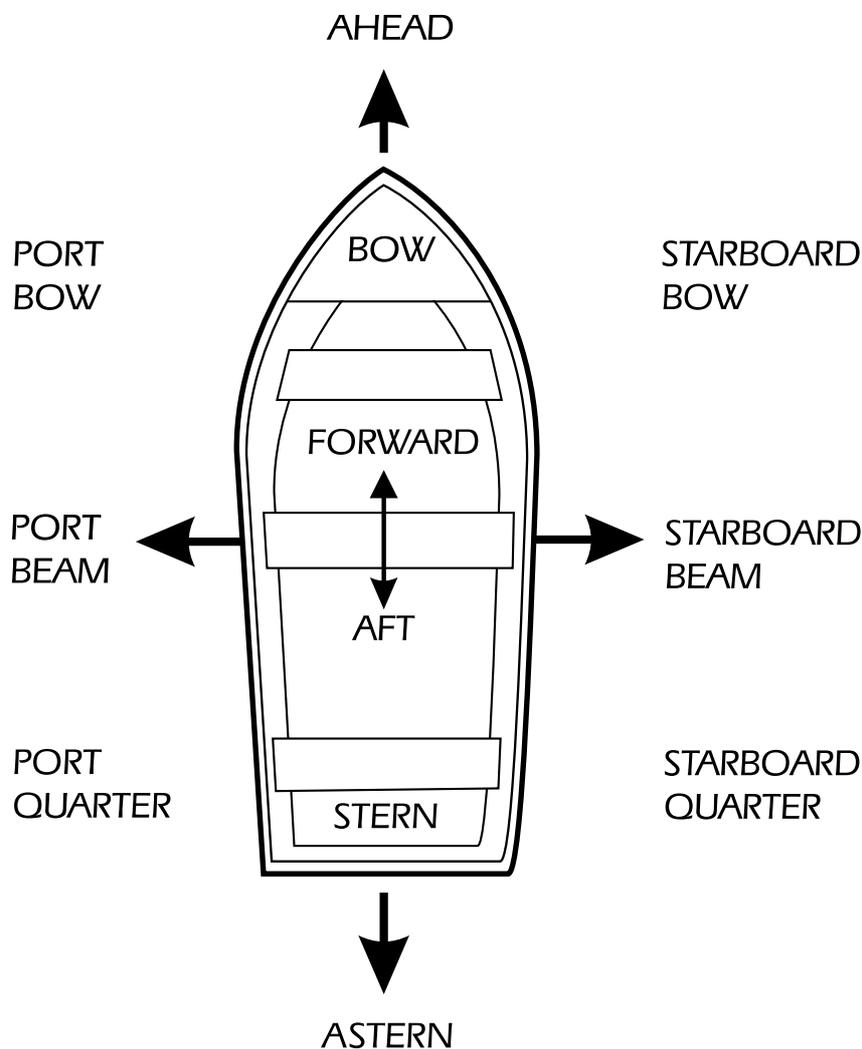


Figure 5:4—Terms of Boat Direction and Location

- (7) **Starboard**—The right hand side of a vessel looking towards the bow. (See Figure 5:4).
- (8) **Stern**—The rear or back end of a vessel. (See Figure 5:4).

d. **Other Terms**

- (1) **Aboard**—Inside or on a boat.
- (2) **Adrift**—Broken from mooring, at the mercy of wind and tide.
- (3) **Amidships**—Is the centre of the vessel either with reference to her breadth or length.
- (4) **Awash**—Level with the water surface.
- (5) **Aweigh**—When the anchor is broken out of the ground.
- (6) **Bearing**—A direction or in a direction.
- (7) **Belay**—To secure a rope to a cleat or belaying pin. (Also to stop what you are doing).

- (8) **Broaching**—When a boat yaws too widely and swings broadside on to a wave.
- (9) **By the Head**—When a boat is loaded too heavily forward or the bow lies low down in the water, it is said to be ‘Down by the Head’. (See Figure 5:6).

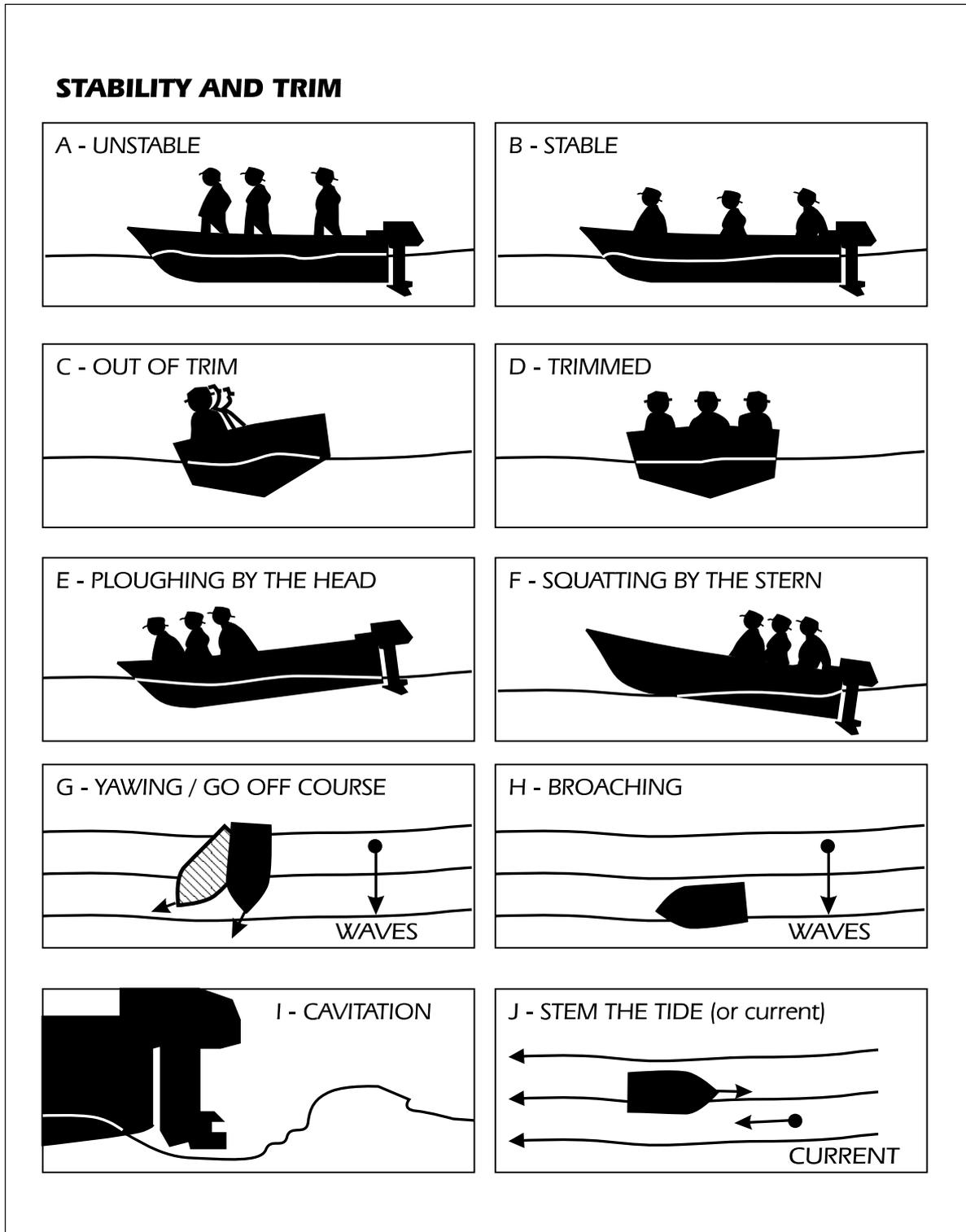


Figure 5:5—Terms Relating to Boat Stability and Trim

- (10) **By the Stern**—When a boat is loaded too heavily aft or the stern lies lower than usual, it is said to be 'down by the stern'. (See Figure 5:6).
- (11) **Aeration**—Often referred to as **cavitation**, this is aeration of the water causing loss of propeller drive and efficiency. Aeration is often caused by the motor being fitted so that the propeller operates too close to the surface.
- (12) **Cleats**—Fittings to which lines are made fast. Some boats may be fitted with bollards which perform a similar function. (See Figure 5:8).

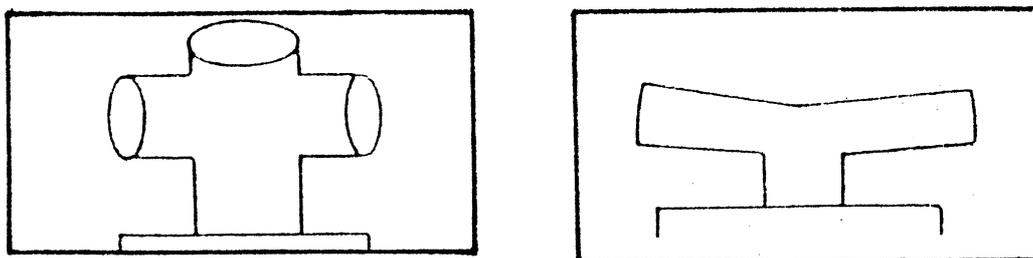


Figure 5:6—Bollard (left) and Cleat (right)

- (13) **Drag**—A boat is said to be 'dragging' when the anchor/s are not holding.
- (14) **Electrolysis**—This is a chemical process which occurs when two different (dissimilar) metals are in contact, either physically or electrically. One of the metals will corrode at an accelerated rate. This is why crew should never attach fittings to FRB hulls.
- (15) **Heel**—When a boat lists (or leans) to port or starboard, and is out of trim. (See Figure 5:5).
- (16) **Lee Side**—Sheltered side of a boat.
- (17) **List**—A vessel is said to have a list if it leans to one side.
- (18) **Overhaul**—To overtake another vessel. Also means to examine.
- (19) **Painter**—A line at the bow of a boat used for making fast.
- (20) **Riding**—A vessel is held in position by an anchor or a buoy and is free to move 360 degrees due to the effect of wind or water.
- (21) **Sound**—To find the depth of water.
- (22) **Stem the Tide or Current**—Using power to hold position against a tide or current.
- (23) **Trim**—The way a boat sits in the water.
- (24) **Wake**—Track or disturbance a boat leaves in the water as a result of its movement.
- (25) **Warp**—An anchor line.
- (26) **Wash**—A wave created by the boat moving through the water.
- (27) **Weather Side**—The side of the boat facing the wind.
- (28) **Yawing**—To run off course, especially in a following sea.

ROPEWORK

5.5 Rope is in common use in FRBs and a knowledge of ropes and knots is essential for boat crew. Details of rope construction, care and maintenance and various knots are given in the Australian Emergency Manual—General Rescue. Some of the rope work skills specific to FRB operation follow.

5.6 BELAYING

When a rope may need to be cast off, while still under strain, it cannot be secured with a bend or a hitch, except perhaps a slipping one. It is therefore belayed to a fitting made for the purpose, such as a cleat or bollard. The action of belaying consists of taking sufficient turns round the fitting to hold the rope by friction existing between rope and fitting. A wet and slippery rope or bollard, or a smooth cleat and a well worn rope, may require extra turns.

5.7 BELAYING TO A CLEAT OR BOLLARD

To belay a rope to a cleat or bollard, take initial turns as shown in Figures 5:7 and 5:8 then continue with figure-of-eight turns round the horn of the cleat or bollard as many times as required. When the figure-of-eight turns are removed the rope is ready for casting off at a moments notice; therefore the turns should not be completed with a half hitch, because this may jam them. Cleats are not suitable for belaying wire rope.

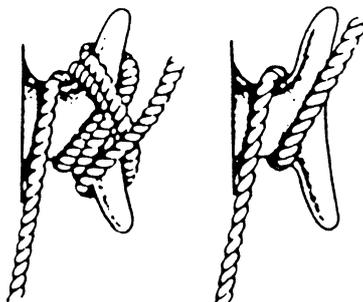


Figure 5:7—Belaying a Rope to a Cleat

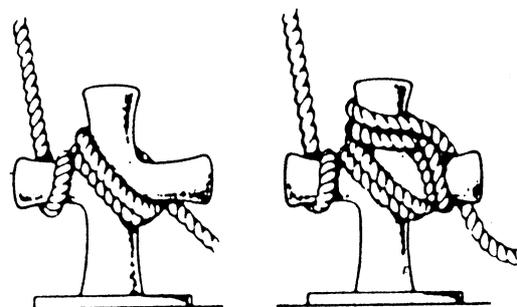


Figure 5:8—Belaying a Rope to a Bollard

5.8 ROPE STOWAGE

Whenever possible rope should be stowed so as to keep the deck clear and the rope dry.

5.9 USEFUL KNOTS

FRB crews must be proficient at the knots, bends and hitches in the Australian Emergency Manual—*General Rescue*. Particularly useful knots for boat use include the bowline, timber-hitch, (double) sheet bend, reef knot, thumb or figure 8 knot.

5.10 Quick release versions of the clove hitch and sheet bend are useful, but must never be used for rescue situations.

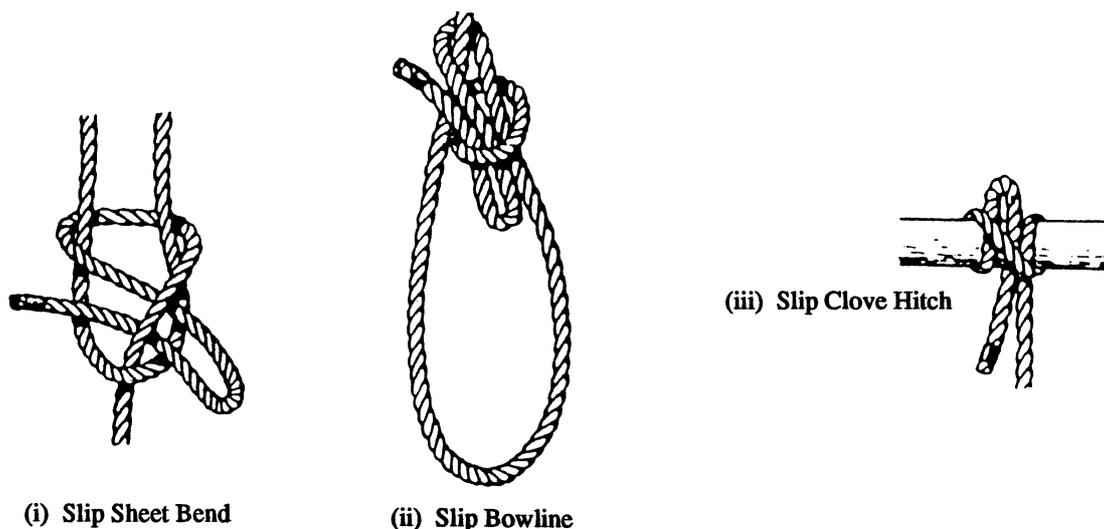


Figure 5:9—Quick-Release Knots

5.11 HEAVING-LINE KNOT

This knot is used as an alternative to the Monkeys Fist and is quickly and easily made. Form a bight about 1.5 m long at the end of the line. Start frapping the end round both parts of the bight at about 20 cm from the actual bend of the bight, and continue until it is all but used up. Then pass the end through the small loop left and haul on the standing part. (See Figure 5:10).

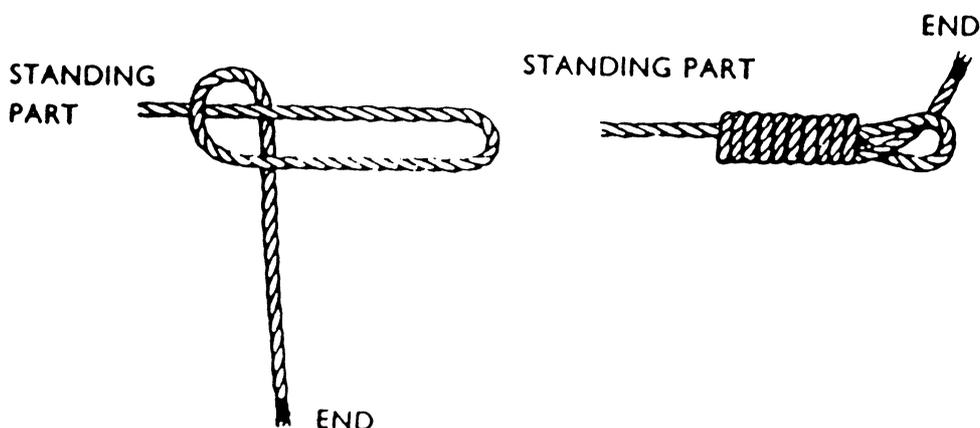


Figure 5:10—Heaving-Line Knot

Heaving lines may be stuffed into a small bag for rapid deployment. These small bags are often called 'throw bags' and are a particularly useful tool for getting a rope to a casualty either from a boat or from the shore.

5.12 HEAVING-LINES

As its name implies, a heaving-line is a light flexible line that can be thrown. It is used as a messenger to pass heavier lines from boat to shore, or vice versa, and boat to boat. (See Figure 5:11).

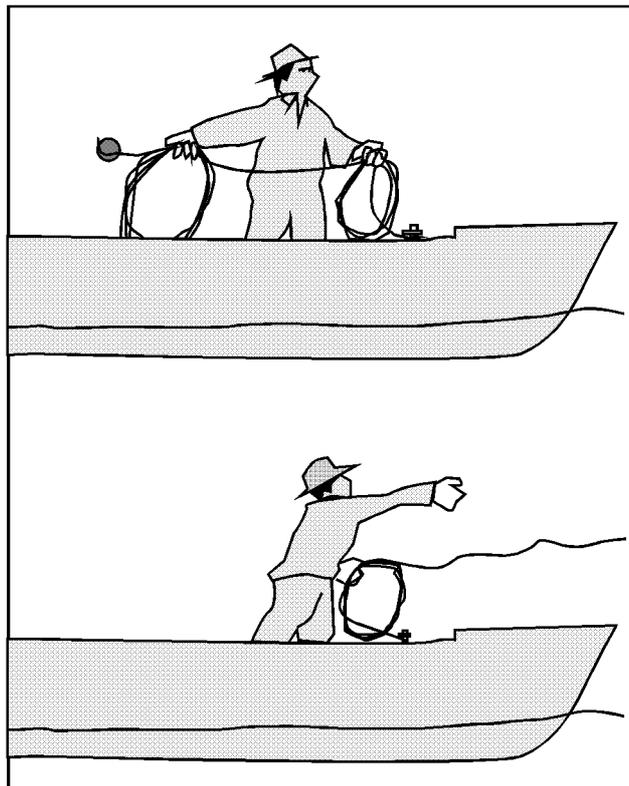


Figure 5:11—Throwing a Heaving-Line

5.13 THROWING A HEAVING-LINE

A heaving-line consists of approximately 30 metres of 10 mm cordage. To prepare a line for throwing, two thirds should be coiled carefully in the left (non-throwing) hand using small coils. One third of the line is taken in the right (throwing) hand; the line is then thrown with right arm straight. The rope must be allowed to run out freely from the coil in the left hand. The most frequent cause of bad casts is failure to have this coil properly clear for running. (See Figure 5:11).

ANCHORS AND ANCHORING

- 5.14 The ability to anchor a boat effectively is of great importance to FRB crews. Apart from using the anchor to tie the boat to a beach or river bank, crews may have to anchor in a current in order to avoid being swept into a hazardous area. Therefore, it is essential that the anchor holds.

5.15 SAFETY AT ANCHOR

The following points are important when using anchors:

- a. Do not anchor in busy boating or shipping lanes or channels.
- b. Do not anchor in prohibited areas shown on charts, in line with cable markers, or too close to another boat.
- c. Do not anchor in shallow water without having first checked the state of the tide. If the tide is low, allow for the rise when deciding how much warp to let out. (See Figure 5:12). If the tide is high, check to make sure that the boat won't be aground at low water.

5.16 OTHER POINTS ON ANCHORING

See that shackles on the anchor and chain are well secured and preferably wired. Withdraw the pin periodically to check the state of the thread. If it shows signs of stripping or corroding, it should be replaced. Also observe the following:

- a. See that the boat end of the warp is secured on board before letting the anchor go.
- b. Lay the anchor so that the warp pulls the anchor in to the river bottom.
- c. The shorter or steeper the angle of the warp the lesser the holding power of the anchor. The longer the warp and the flatter the angle, the greater the holding power.
- d. The minimum length of anchor rope to be let out is at least four times the depth of the water at high water. (See Figure 5:12).

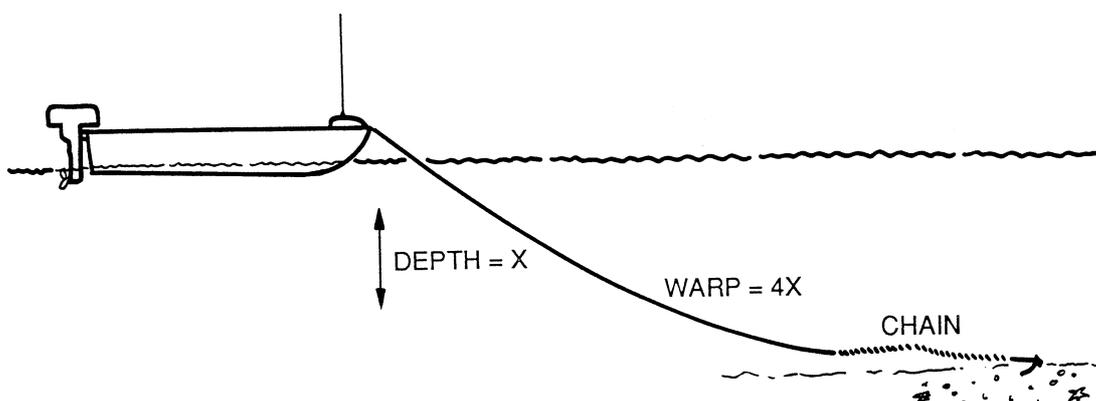


Figure 5:12—Safe Anchoring

5.17 DROPPING ANCHOR

The following procedures should be applied when dropping anchor:

- a. First choose a spot carefully. Consider wind, depth of water under the keel, state of the tide, type of bottom and positions of other boats. Come head to wind or current and stop where the anchor is to lie, allowing room to lay back the required distance.

- b. When in position lower the anchor over the bow and go astern when the anchor is on the bottom. Continue to lay out warp as the boat goes slowly astern. The rope should never be laid out so fast that it piles up on top of the anchor. When the required amount of warp is out, take a turn around the bollard. The weight of the chain will settle the anchor into the river bed. It will be apparent that the anchor is holding if the boat stops.
- c. A dragging anchor can sometimes be felt bumping along the bottom by holding the rope lightly in the hand. In the event that the anchor does not grip and there is plenty of warp out, raise the anchor and try again.
- d. A line buoyed to the crown of the anchor will permit it to be pulled up in the event of it becoming fouled under a rock. (See Figure 5:13). This line should be long enough to prevent the buoy pulling the anchor out if the water level should rise.

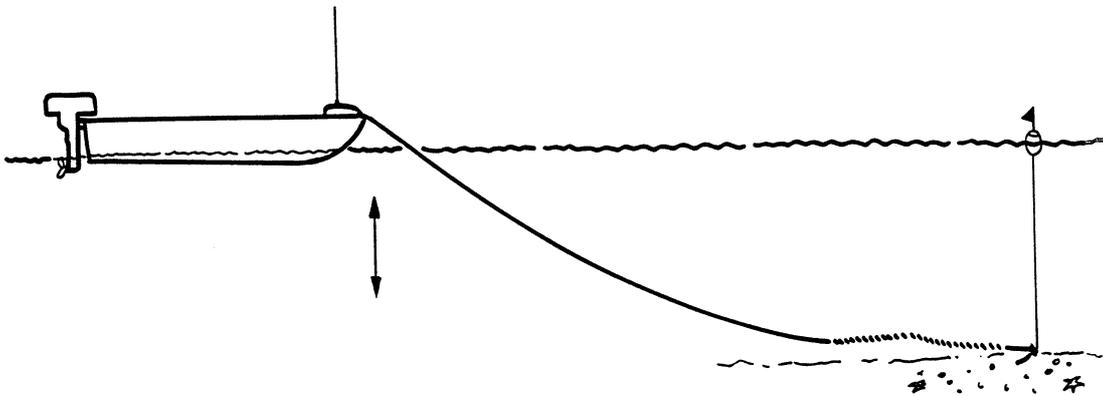


Figure 5:13—Anchor Buoy

- e. It is advisable to have a second anchor if the boat will be operating in flood waters or fast currents. If an anchor begins to drag, give it more warp if there is time and room. If there is neither, then lower the second anchor over the side and adjust the two warps so that the weight is taken evenly by both anchors. This will usually happen automatically if one anchor has been dragging. (See Figure 5:14).

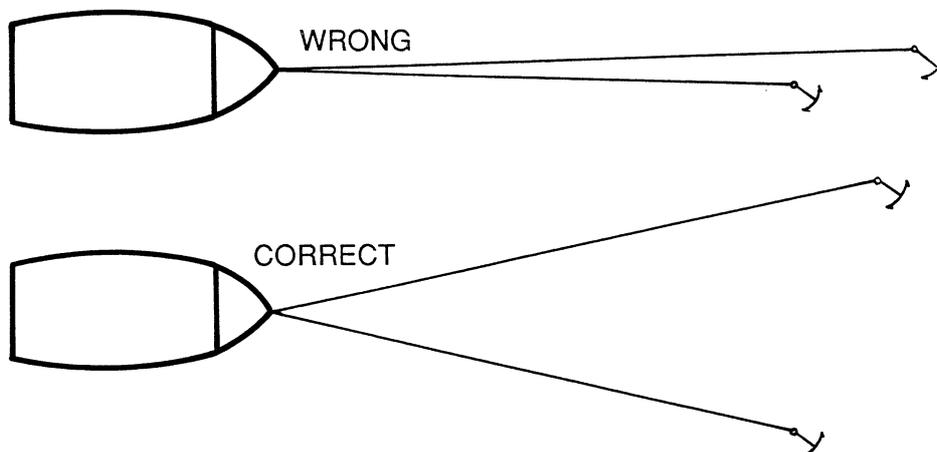


Figure 5:14—Using Two Anchors

- f. If the second anchor holds, it is wise to bring up the first to see if there is any cause for dragging that could be cleared. Once securely at anchor check your position against objects ashore to ensure that the boat is not dragging.
- g. Make sure room has been allowed for the boat to swing freely through 360 degrees without contacting other boats or obstacles. Swinging may happen as winds and currents change.

5.18 KEDGING

Kedging is a method of controlling the approach of a boat to a beach, bank or hazardous landing area where the wind, waves or current are astern of the boat. (See Figure 5:15). It is also a method of refloating the boat from a beach, bank or landing area.

CAUTION

Kedging is a hazardous technique due to the possibility of swamping.

- 5.19 When kedging, the anchor is lowered over the stern of the boat as it approaches the shore. The forward movement of the boat can be controlled by paying out anchor line under control as required.
- 5.20 In extreme circumstances it may be necessary to lower a kedge anchor over the bow, raise the motor out of the water, control the boat with oars and proceed to shore stern first whilst paying out anchor line under control. This method is required when waves are large enough to swamp the boat if they were to come in over the stern.

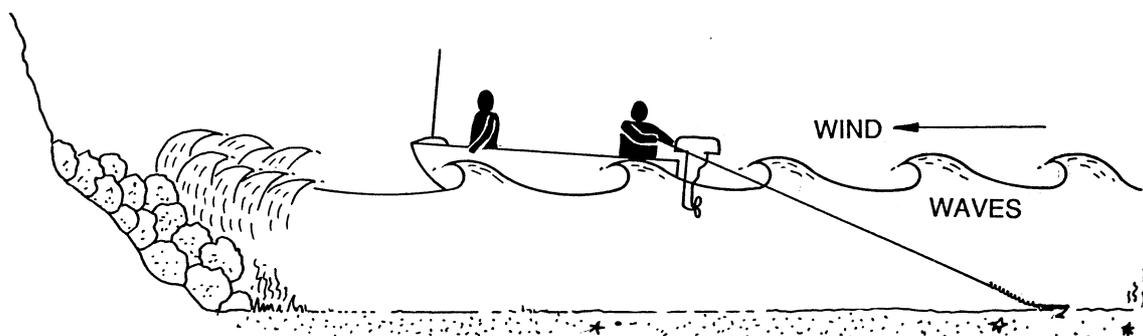


Figure 5:15—Kedging

5.21 DANFORTH ANCHOR

While there are a number of types of anchor, the type of anchor most commonly used in FRBs is the Danforth Anchor. (See Figure 5:16). The Danforth anchor is a burying anchor where any dragging force on the shank causes the flukes to bury deeper into the bottom. Danforth anchors are designed for sandy or muddy bottoms. Where the bottom is rocky or where there are submerged trees a reef anchor is more appropriate.

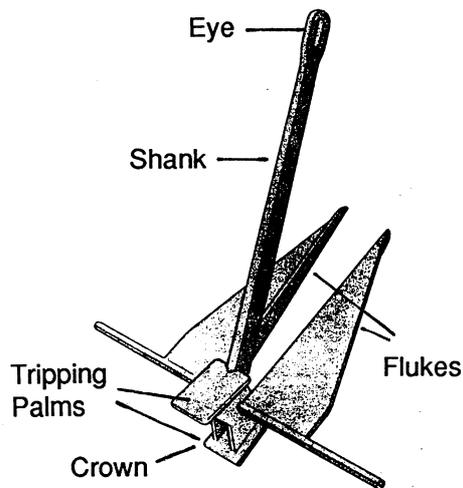


Figure 5:16—The Danforth Anchor

5.22 HOW AN ANCHOR HOLDS

Figure 5:17 shows how an anchor beds itself in the bottom after it has been let go and the strain comes on the anchor rope. The anchor lies flat on the bottom until the pull of the boat on the rope drags the anchor along the bottom. The tripping palms then tilt the flukes, which dig themselves in. After a further amount of dragging the anchor imbeds itself completely until it holds. For the anchor to maintain its hold, the pull of the rope must always be horizontal where the anchor chain emerges from the bed.

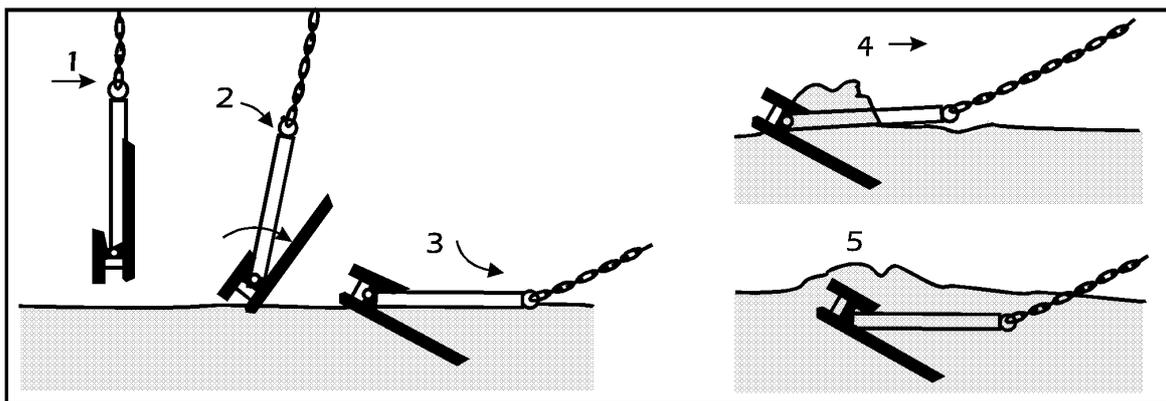


Figure 5:17—How the Danforth Anchor Holds

5.23 ANCHOR CHAIN

The anchor line should not be attached directly to the anchor but to a chain at least 2 metres in length by 6 mm in diameter. The purpose of this chain is twofold: It minimises chafe on the anchor line, and it acts as a shock absorber when the boat surges, preventing the anchor from being lifted out of the bottom. The shock absorbing feature of the chain also reduces strain on the bollard.

5.24 RECOVERY

The Danforth anchor is readily removed by moving the boat forward under power while taking up the slack and hauling the anchor rope in a vertical direction ensuring that the rope does not foul the propeller. Should the anchor become snagged, the buoyed line to the crown of the anchor can be used to recover the anchor.

CHAPTER 6

BOAT TRAILERS

GENERAL

6.1 All FRBs should come equipped with a trailer of suitable size and construction for that boat.

6.2 PARTS OF A TRAILER

A typical trailer consists of a galvanised box form chassis and a draw bar with a tow coupling. Mounted on the draw bar is the stem post attached to which is a hand winch. The boat rests on rollers, which support the keel, and either rollers or bilge strakes, which steady the hull near the chines. (See Figure 6:1).

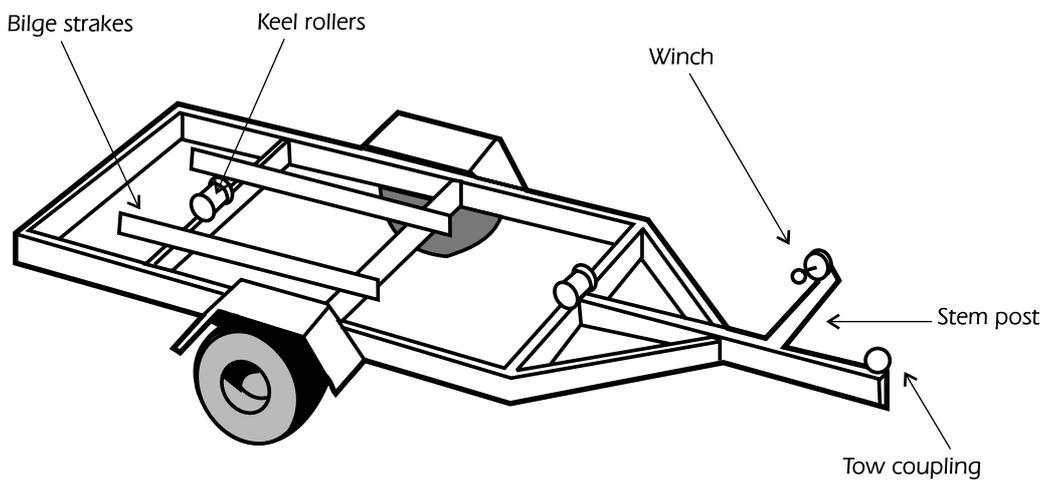


Figure 6:1—FRB Trailer with Bilge Strakes

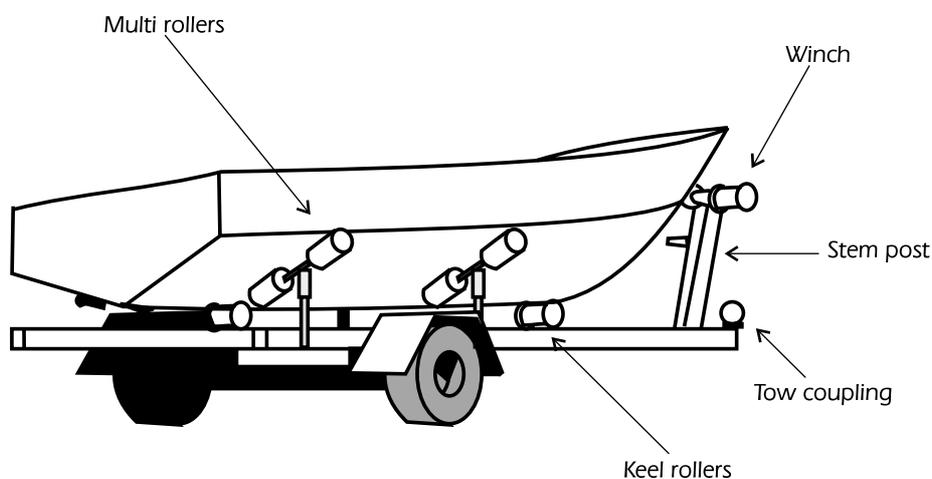


Figure 6:2—FRB Trailer with Multi Rollers

The trailer is fitted with lights, a spring-mounted axle and may be fitted with brakes. Most FRB trailers tilt to assist when launching and recovering.

TRAILER ADJUSTMENT

- 6.3** The trailer will have to be adjusted to fit the boat and to ensure the balance of the trailer is correct. The position of the stem post can be adjusted to ensure that the boat is correctly positioned on the trailer. A well balanced trailer should be easily lifted by one person at the tow coupling. If the trailer is heavy to lift at the coupling this indicates the weight is too far forward. If there is no weight on the coupling this indicates the weight is too far back.
- 6.4** The trailer should exert sufficient downward weight and pressure on the towbar, so that should the vehicle brake heavily, the pressure continues downward. This downward pressure helps the towing vehicles brakes by increasing traction on the rear wheels of the towing vehicle.
- 6.5** Some trailers are built specifically to suit a particular boat and cannot be readily or easily balance-adjusted to suit another boat. Slight adjustment can be made to some trailers by moving the stem post whilst other trailers have adjustable axle/spring hanger assemblies. Trailers must be balanced by a qualified person. In an emergency, adjustment is made by jacking and supporting the trailer and load, moving the axle/spring assembly locating bolts and sliding the assembly either backwards or forwards along the chassis rails and relocating the bolts in the desired chassis locating holes.
- 6.6** A boat being carried on a trailer needs to be supported along its keel. All keel rollers must be adjusted to allow the boat load to be distributed evenly. When this has been achieved the bilge strakes are adjusted to brace the boat against lateral movement. A properly adjusted trailer will carry its boat on an even keel with the bow winched firmly against the stem post and the transom supported by the rear roller. (See Figure 6:2).

TRAILER TOWING

6.7 CHECKLIST

It is the responsibility of the driver of the towing vehicle to check the condition of the trailer and its load before towing. The check should ensure that:

- a. the trailer is properly connected to the towing vehicle and the safety chain is attached;
 - b. all lights, brakes and other trailer fittings are operating;
 - c. the boat is securely attached to the trailer by the winch wire and safety chain, stern hold-downs and all items of equipment in the boat are safely secured or stowed;
 - d. the motor is secured in the tilt position and supported by a motor support bracket as the weight and leverage of a motor supported only by the tilt lock can cause damage to the lock mechanism and transom during transport;
 - e. the trailer is properly balanced;
 - f. tyres are roadworthy and air pressure is correct; and
 - g. spare tyre, bearing set (including grease, castle nut, washer and split pin) are safely secured or stowed.
- 6.8** Where possible, avoid carrying equipment in a boat while towing. Anchors, fuel tanks and other bulky objects can wear holes in aluminium hulls through vibration and movement over long distances.

- 6.9 Where equipment must be carried in the boat while being towed, any item likely to cause wear or damage should be padded to minimise damage.
- 6.10 When towing over long distances allow regular stops in order to inspect the security of the boat, boat trailer and towing vehicle.

TRAILER SERVICING

- 6.11 Trailers should be serviced every three to six months or more often if use dictates. Trailers that are used on rough roads and long distance towing will often require inspection and servicing after each use. Servicing should include:
- a. **Tow Couplings**—Grease the coupling, release and work it several times to ensure complete lubrication. If the trailer is fitted with a brake override system, grease any grease nipples and check brake fluid level in the hydraulic reservoir. Check the trailer safety chain for security. Always use correct size tow balls.
 - b. **Frame and Chassis**—Check the security and tightness of all nuts and bolts. Ensure all trailer sections are secure, check any welds for cracks and inspect frame for sagging or distortion.
 - c. **Wheels and Tyres**—Check the tyres for tread and any cuts or damage, ensure tyre pressure is correct. Inspect the wheel bearings for side movement by pulling sideways on the wheel by hand. If the movement is excessive, wheel bearings may require adjustment or replacement. When in use, listen for unusual noises from the wheel bearings (these may often be heard while backing down a boat ramp) and check for hot wheel centres after use. Wheels should be removed and wheel bearings thoroughly cleaned and inspected at regular intervals (about every six months). When reassembling, use new wheel bearing grease and replace the bearing seals. A simple, inexpensive means of increasing wheel bearing life and trailer reliability is by means of a device which packs the bearings in grease and allows them to be readily regreased. These devices, which are fitted with a grease nipple, take the place of the wheel bearing dust cap. A common name for this device is a 'Bearing Buddy'. These devices do not reduce the need for constant inspections and maintenance.
 - d. **Springs**—Inspect springs for broken or fatigued leaves, check the retaining shackles attaching the springs to the frame for worn bushes. Regularly painting spring assemblies with oil will increase spring life.
 - e. **Wiring**—Ensure the electrical wiring is in good condition, inspect any joins, look out for deterioration in the insulation or cracks in fittings.
 - f. **Lights**—Remove light lenses and clean. Clean bulbs and contacts and lightly coat with petroleum jelly. If there is evidence of moisture inside the lens, replace the lens seal.
 - g. **Brakes**—Grease any grease nipples on the system. Check that the brakes are not frozen and the brake pads/discs are in good condition. A spray of 50/50 mixture turps and light machine oil applied regularly should ensure brakes are free. Operate the handbrake to ensure satisfactory performance.
 - h. **Rollers**—The rollers take the weight of the boat along its keel line. When not loaded they should turn freely by hand. The side braces do not take the weight of the boat and are meant only for balancing. Oil the rollers frequently, using only a light oil. Avoid the use of heavy oils or greases as these tend to attract dirt and eventually can cause rollers to jam. If rollers are jammed they should be removed, taken apart and washed in kerosene, reassembled, replaced and oiled. Check roller alignment.

- i. **Winch Post**—Check the condition of the winch post, ensure the post retaining bolts are tight. Adjust the winch post and align to the correct height for the boat. The boat bow safety chain should be inspected.
- j. **Winches**—Oil the winch ratchet and pawl regularly. Check the winch wire for excessive fraying by running out the wire. Replace the wire if necessary. Check the winch wire attachment to the winch drum. Nylon tape can be fitted instead of wire. The tape should be run out after a boat has been garaged for inspection and so it can dry. Allowing the tape to dry avoids moisture collecting around the winch and is especially important where FRBs are operated in salt water. Ensure the winch handle, if fitted to the winch, is secure.

GARAGING

- 6.12** Before garaging the trailer should be fully inspected, serviced and repaired. As with a boat the trailer is best stored under cover. Clean and inspect the trailer regularly.
- 6.13** Do not leave the trailer handbrake locked on for long periods as brake shoes may freeze onto disks or drums.

CHAPTER 7

OUTBOARD MOTOR AND BOAT MAINTENANCE

GENERAL

7.1 FRBs are never to be considered 'out of use' and must always be kept in a state ready for action. Regular and efficient maintenance of the hull, the trailer and the boat motor are critical.

7.2 Every FRB and motor comes with the manufacturer's operator manual. This chapter is not a substitute for reading and following the guidelines and recommendations of the manufacturer. Always read the owner's manual before attempting any maintenance. Motors must be serviced by qualified marine motor mechanics as recommended by the manufacturer. FRB crews must not tamper with motors as lives may depend on proper servicing.

7.3 OUTBOARD MOTOR TERMS

Important parts of the motor are described below. See Figures 7:1 to 7:5.

- a. **Angle Adjustment Pin/Rod**—This allows the motor to be set at different angles so that the trim of the boat can be varied.
- b. **Anti-Cavitation Plate**—The plate positioned above the propeller to prevent cavitation.
- c. **Clamp Screws**—These secure the motor by the stern brackets to the transom.
- d. **Exhaust Relief**—The two holes in the shaft below the pump indicator are for dispersal of excessive exhaust fumes.
- e. **Fuel Connector**—The point at which the fuel line is connected to the motor.
- f. **Fuel Line**—The hose linking the fuel tank to the motor.
- g. **Motor Rest**—The frame or projections on the motor head allowing the motor to be laid down when removed from the boat.
- h. **Motor Shaft**—The section of motor below the engine, ending at the propeller region.
- i. **Priming Bulb**—The bulb on the fuel line used to pump fuel from the tank and inject fuel into the carburettor for starting.
- j. **Shift Lever**—The gear selection lever for forward, neutral and reverse.
- k. **Skeg or Skid**—Provides directional stability and protects the propeller.
- l. **Tiller Handle**—The arm used for steering and throttle control.
- m. **Stern Brackets**—The brackets for placing the motor on a boat's transom.
- n. **Tilt Grip**—The grip on the motor cover for tilting the motor forward.
- o. **Tilt Lock**—The lever which allows the motor to tilt or to be locked in position.
- p. **Twist Grip Throttle**—The moving part on the end of the steering arm to govern the speed of the motor.

- q. **Water Pump Indicator**—The outlet, often called a ‘tell-tale’, which allows a steady discharge of water to pass through, indicates the correct functioning of the cooling system.

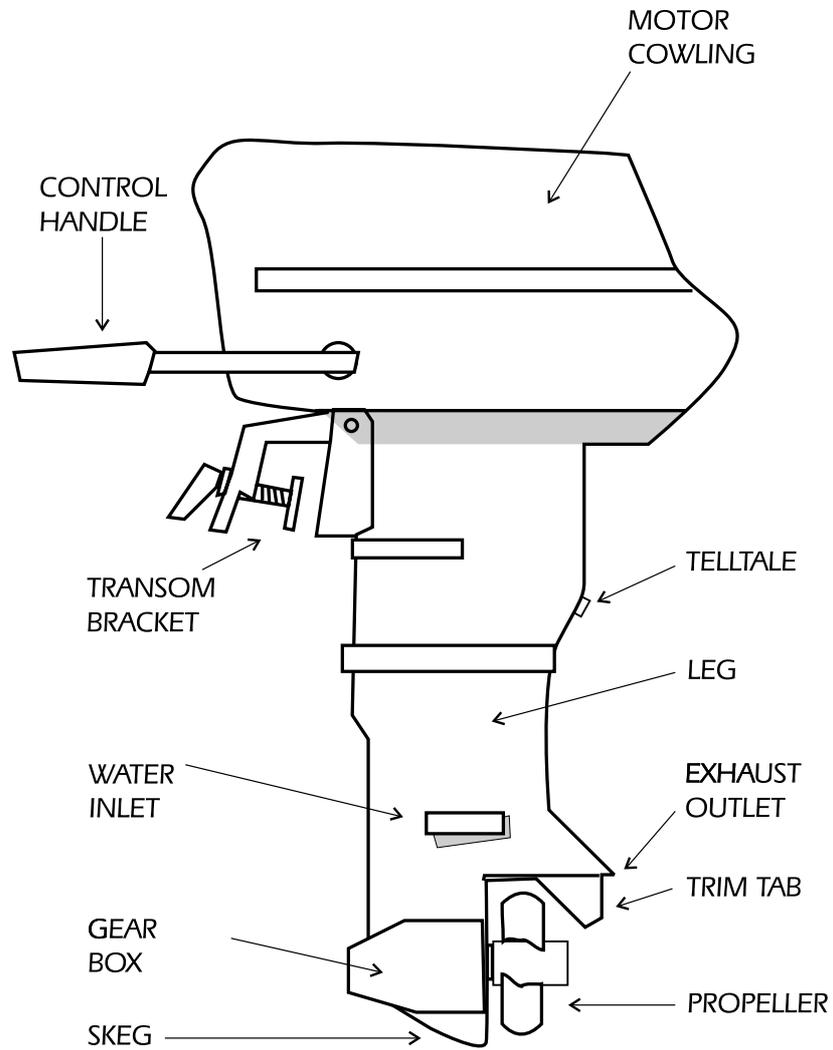


Figure 7:1—Parts of an Outboard Motor

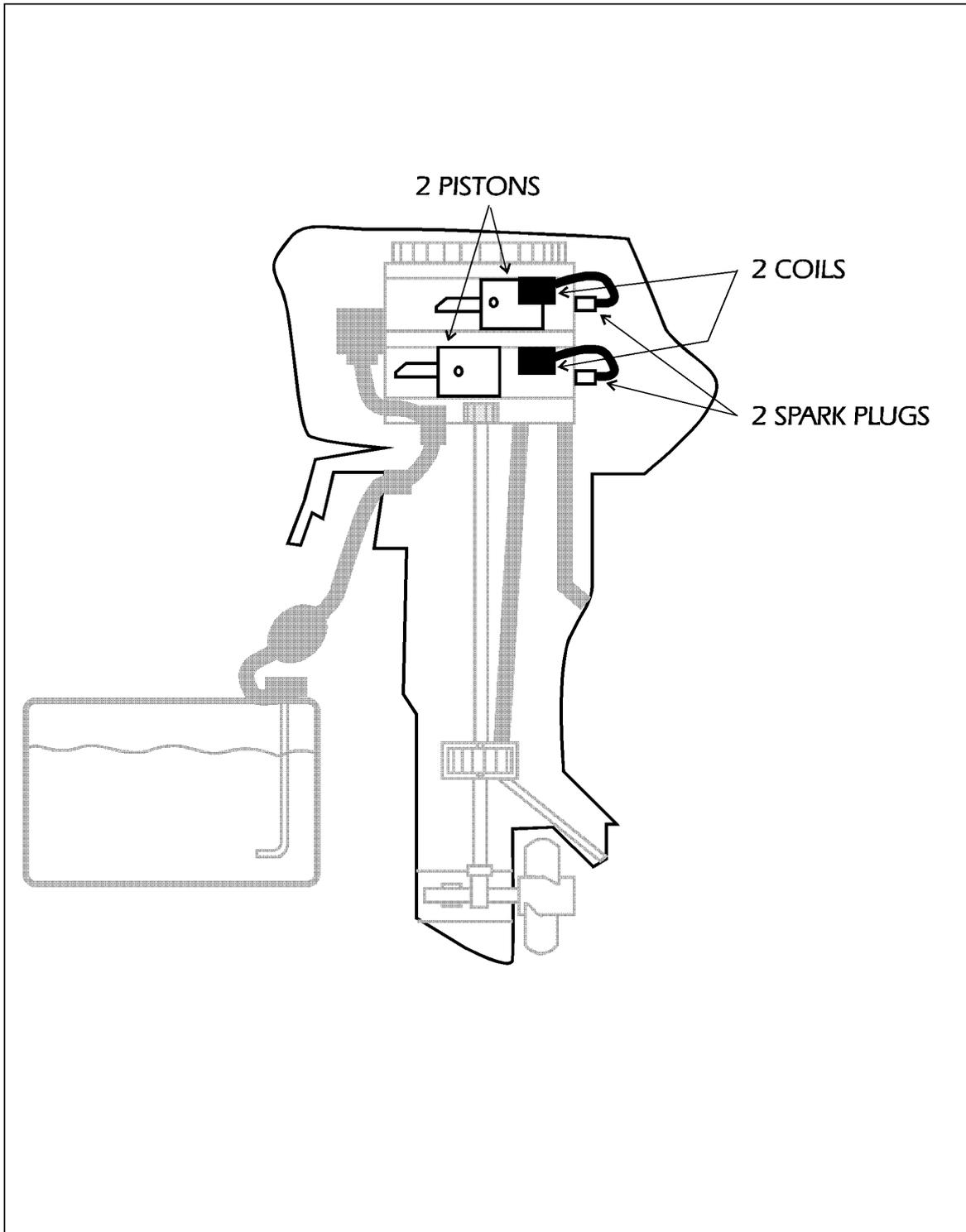


Figure 7:2—Ignition System

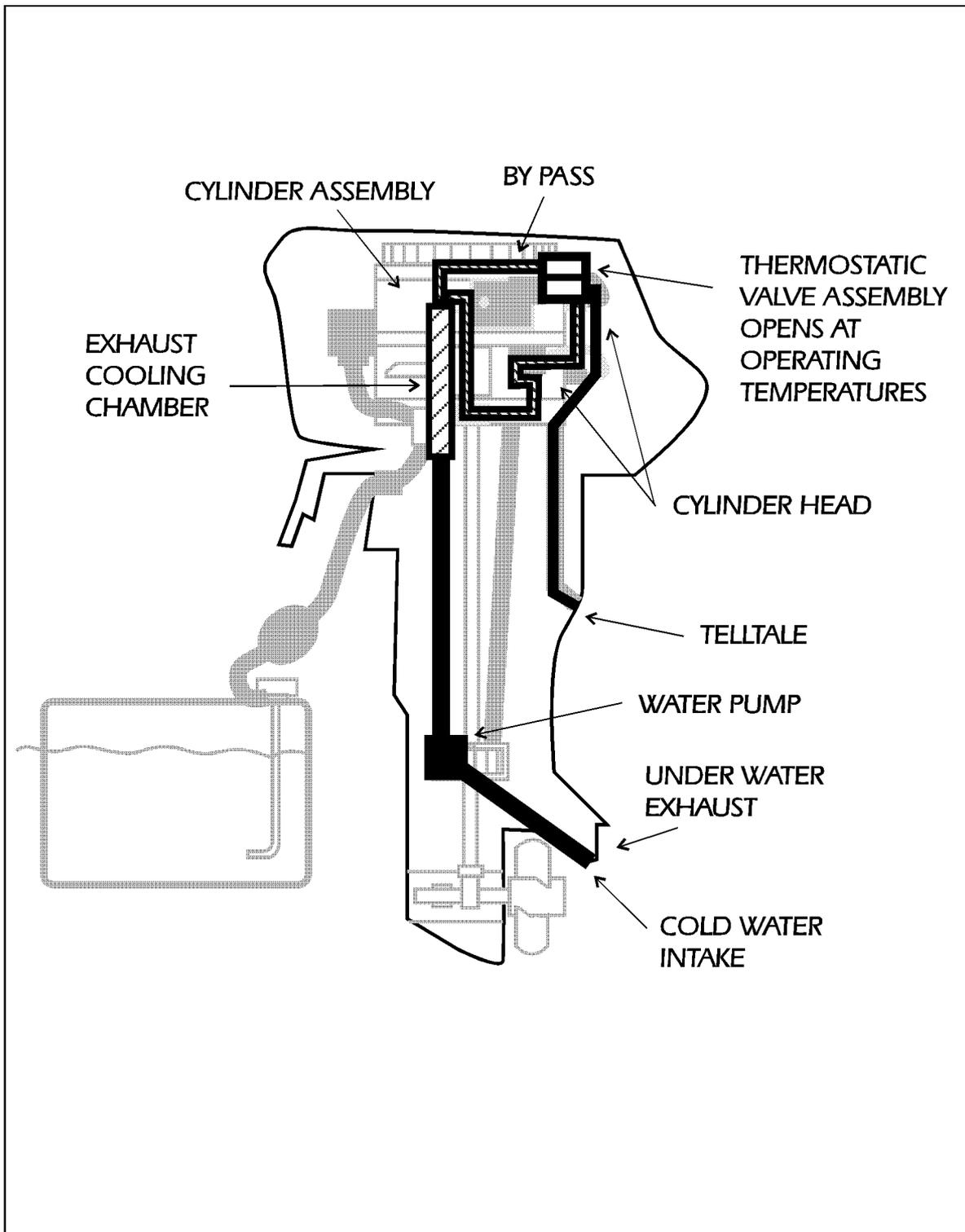


Figure 7:3—Cooling System

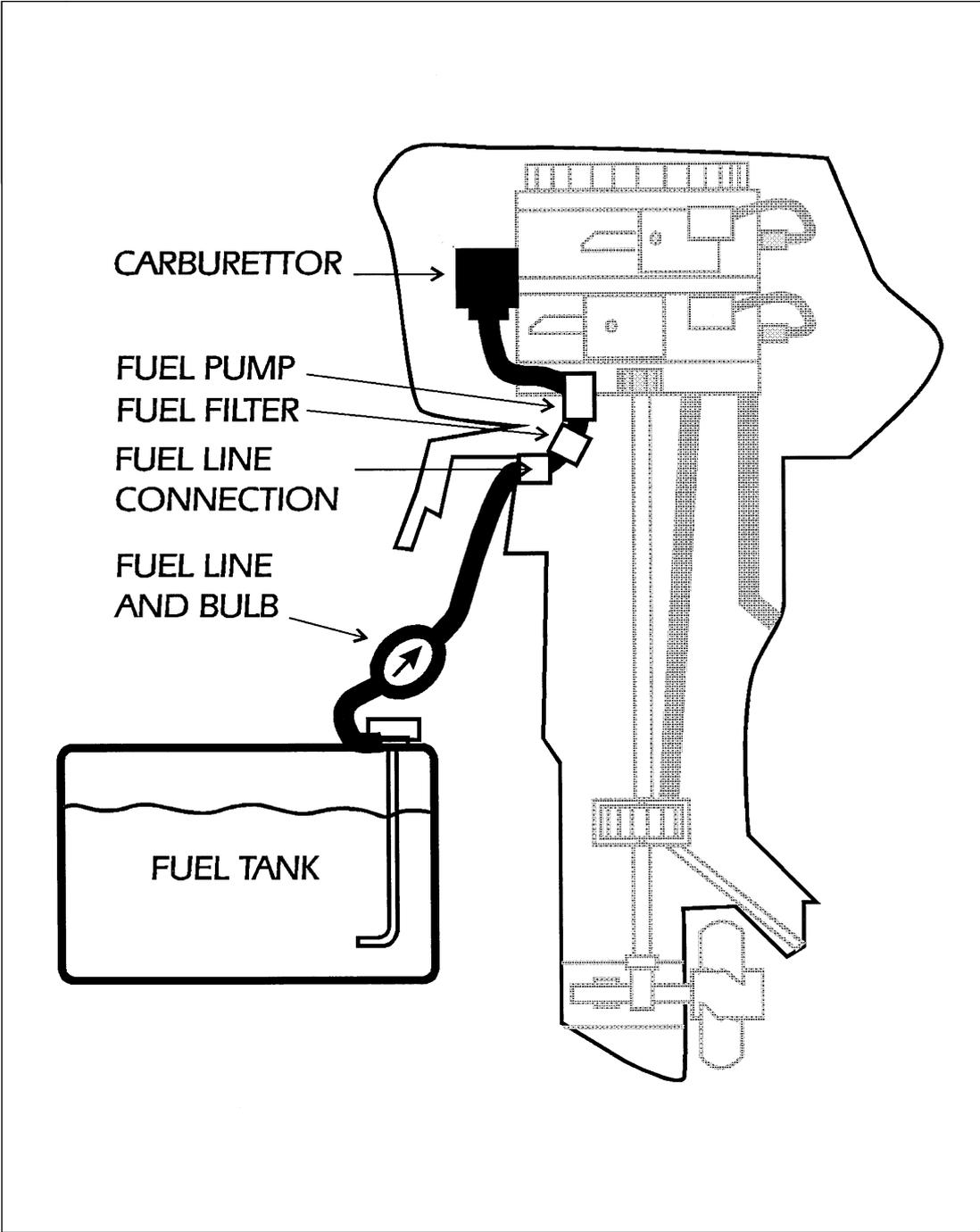


Figure 7:4—Fuel System

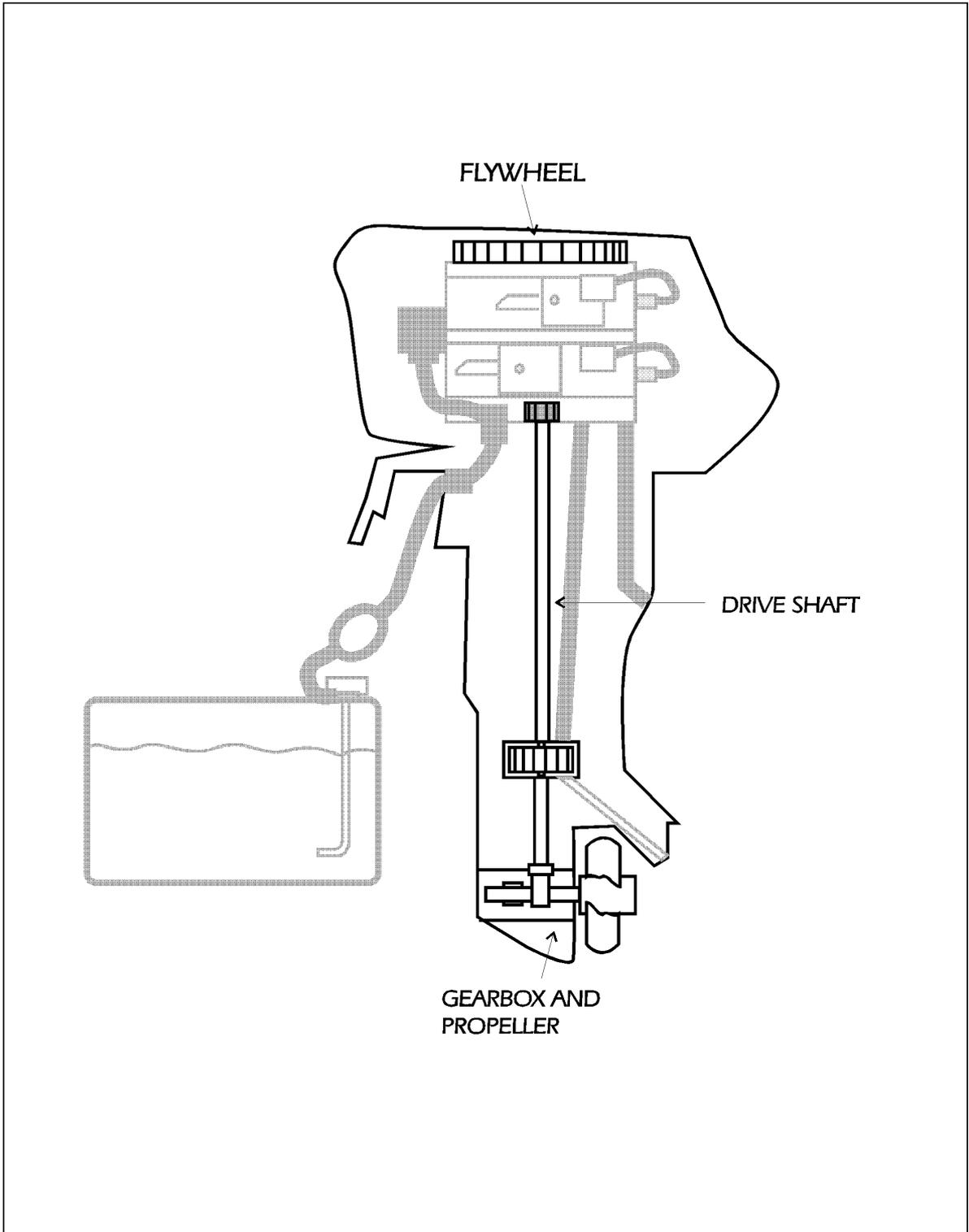


Figure 7:5—Power Train

7.4 FLOOD RESCUE BOAT MAINTENANCE AND MOTORS

FRBs are predominantly equipped with petrol-powered two-stroke outboard motors. Some FRBs may be fitted with four-stroke motors. In this manual only two-stroke motors are discussed as they are the most common motors installed.

7.5 Crew members are advised to consult the owner's manual supplied with the motor provided to their unit and make themselves familiar with all recommended procedures.

7.6 PARTS OF AN OUTBOARD MOTOR

By knowing the part of one make or model of motor, crew will often be able to use a motor they may have never seen before. Crew must be aware of the fact that various manufacturers have different names for the same parts.

MOTOR SYSTEMS OVERVIEW

7.7 Each outboard motor consists of a number of systems whose combined actions produce power to drive an FRB. All crew should be familiar with the main systems. This will assist in motor operation and fault finding.

7.8 THE IGNITION SYSTEM

An electric current at 6 to 12 volts is transformed into a momentary charge of extremely high voltage capable of jumping the spark plug gap into the cylinder and igniting the fuel-air mixture.

7.9 THE COOLING SYSTEM

Outboard motors are commonly cooled by water. Water enters the system through an intake and is directed to the water pump located in the lower unit. Cooling systems on most outboard motors show a water discharge through the exhaust outlet or through a 'tell-tale' to indicate the circulation of water through the cooling system.

Note: After use in salt or dirty water, always flush the cooling system with clean fresh water. Watch for wasps nests blocking intakes or outlets, especially if a motor has not been used for some time.

7.10 FUEL MIXING

The majority of FRB motors are two-stroke motors that run on a mixture of oil and petrol. The oil can be premixed with petrol or supplied from an oil reservoir in the motor. A number of newer motors use the oil reservoir system. This is called a variable ratio oil system. If a motor has its own oil reservoir the fuel system will mix the appropriate amount of oil with the fuel to lubricate the motor. Crews must ensure the oil reservoir is topped up with the correct grade of oil according to the owner's handbook.

7.11 Most FRB motors are lubricated by premixing oil with petrol at a defined ratio. It is critical to verify the correct fuel:oil ratio in the owner's manual. Fuel mixing is a potentially hazardous activity and must be done in a ventilated area away from any source of ignition. Never decant fuel into portable containers onboard the vessel.

- 7.12** Fuel is mixed in five steps as follows:
- a. Calculate the quantity of oil required.
 - b. Place half the quantity of fuel in the container.
 - c. Add the required quantity of oil to the container.
 - d. Shake thoroughly.
 - e. Top up with the remaining fuel and shake again.

PARTICULAR KNOWLEDGE

- 7.13** All crew members must be proficient in:
- a. installation of a motor on a boat;
 - b. knowledge of names and functions of the parts of a motor;
 - c. fuel mixing;
 - d. starting procedures;
 - e. motor angle adjustment;
 - f. fault finding;
 - g. emergency starting procedures; and
 - h. basic motor maintenance.

MOTOR MOUNTING

- 7.14** Transom heights vary from boat to boat. Outboard motors come in long and short shaft varieties. The motor fitted must be appropriate to the transom height.
- 7.15** If the motor is not mounted correctly, efficiency will be reduced. If the propeller is too close to the water's surface, air is mixed with the propeller. This is known as cavitation or aeration. Cavitation seriously reduces the power output of the motor.

INSTALLATION

- 7.16** Lift the motor on to the transom and align the leg of the motor with the keel of the boat. Tighten the clamp screws and check regularly. (See Figure 7:6).
- 7.17** A safety chain must be attached. The chain must be of 8mm diameter or greater, and should be attached to a strong point in the boat and a strong point on the motor, preferably to a safety chain bracket attached to the pivot bolt. No free play should be left in the chain in order to prevent the motor jumping off the transom and kicking up to injure the crew.

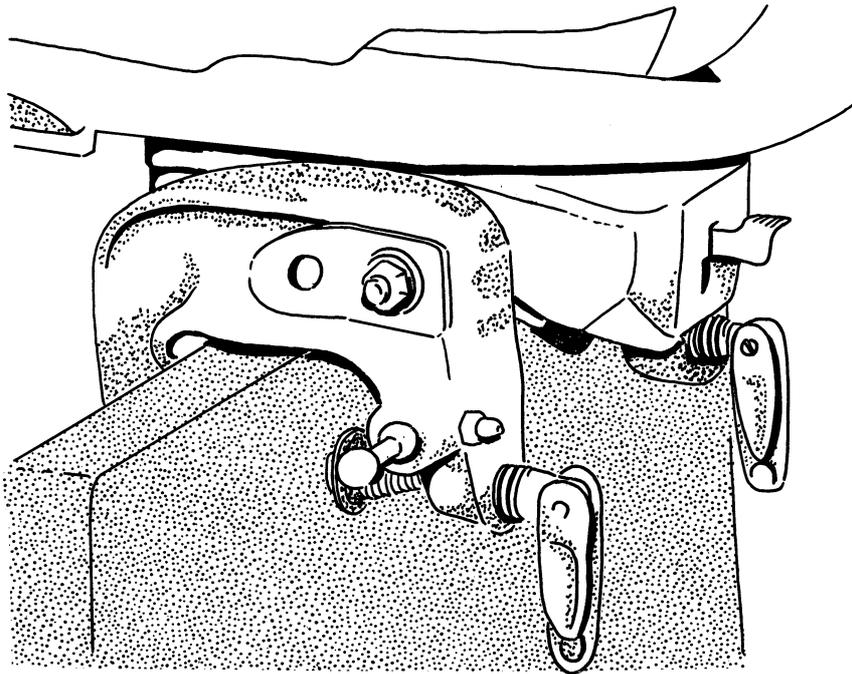


Figure 7:6—Motor Mounted and Clamped to Transom

- 7.18** It is, however, strongly recommended that all FRBs have their motors bolted through the transoms.
- 7.19** Secure the fuel tank in a position where sufficient fuel line allows for ease of movement and operation. Some fuel tanks have an air vent screwed on to the fuel tank cap. This must be opened before operating and then closed when not in use.
- 7.20** Ensure that the fuel line connection is clean and functioning correctly. This is checked by connecting the fuel line to the tank and squeezing the fuel line primer bulb until resistance is felt.

MOTOR ANGLE ADJUSTMENT

- 7.21** The outboard motor drive thrust comes from one point of the transom, and unless the outboard is fitted in such a way that the thrust pushes the boat directly ahead, the vessel will be hard to steer. A slight downward or upward component in the thrust will cause the boat to trim bow down or bow up respectively. This may cause excess fuel consumption, loss of performance and will give a hard ride. In fast water the boat will be dangerous as it will be difficult to control. The boat must be trimmed to float on its designed water line with the motor perpendicular to the water when the boat is planing.
- 7.22** For information about adjusting the tilt of an outboard motor always consult the owner's guide.
- 7.23** Adjustments are made by placing the adjusting rod in the appropriate holes in the stern bracket and locking the retaining clip into position. The results of adjustment are:
- propeller moved forward, bow trims down; and
 - propeller moved aft, bow trims up.

MOTOR OPERATION

7.24 STARTING PROCEDURES

Starting procedures must be practised until they are instinctive both day and night, and in adverse and emergency situations. Check the operators manual for the starting procedure.

7.25 SHUT DOWN PROCEDURES

On completion of operations for the day 'close down' and store the motor in accordance with the manufacturer's instructions.

7.26 FAULT FINDING

A fault finding sequence will be found in the operators manual. Photocopy this trouble-shooting 'check-chart', seal it in a plastic cover and carry it in the boat tool kit. A glance at the chart, when in trouble may assist in locating the problem.

7.27 MOTOR MAINTENANCE

The owner/operator handbook provides the necessary guide to motor maintenance. Items to constantly check are:

- a. spark plugs (clean, test and replace if necessary);
- b. fuel pump filter;
- c. lubrication of grease points and check of oil level in gearbox;
- d. idle speed adjustment;
- e. carburettor adjustment;
- f. propeller and operation (check shear pins or rubber clutch, whichever applicable, and check the propeller for damage); and
- g. forward control cables etc, where fitted.

7.28 EMERGENCY STARTING

All outboard motors have provision for emergency starting. Details of emergency starting procedures can be found in the operators handbook.

7.29 THE COOLING SYSTEM

Outboard motors are cooled by water. Water enters the system through an intake and is directed to the water pump located in the lower unit. From the water pump the water passes through a jacket to cool the engine and exhaust system before discharging through the exhaust outlet.

7.30 FRB motors have a thermostat which maintains optimum engine operating temperature by either recirculating water within the head, or by bypassing the head until operating temperature is reached.

7.31 Cooling systems on FRB motors show a water discharge through the exhaust outlet or through a 'telltale' to indicate the circulation of water through the cooling system.

- 7.32** On starting the motor, check that water is being discharged from the outlet. Never run a motor out of the water. This may not only cause overheating but may also seriously damage the water pump. If water is not being discharged, stop the motor immediately and locate the cause which could be:
- a. weeds blocking the water intake;
 - b. plastic bags blocking the intake;
 - c. mud or debris blocking the intake;
 - d. motor not deep enough into the water; or
 - e. damaged or faulty water pump.

7.33 FLUSHING AND CLEANING OF MOTOR

Many manufacturers of outboards specify that internal flushing of motors with fresh water is no longer necessary. As FRBs are required to operate in conditions far worse than those envisaged by the manufacturers, FRB crews are still required, at the end of a days operation (especially when operating in muddy weedy or salt water), to flush the motor internally, wash the external parts and wipe them dry. Clean fresh water must be used.

7.34 THE POWER TRAIN

The power head delivers power to a drive shaft which in turn drives a propeller shaft through a gear box located in a streamlined housing in the lower leg. The power is transmitted to the propeller which imparts thrust to the water.

7.35 PROPELLERS

An outboard motor propeller moves through the water in a similar manner to a wood screw through wood. Propellers are rated by the following:

- a. **Diameter**—The distance through a circle described by the blade tips. The correct propeller diameter is determined by motor design, especially by horsepower and gear ratio and this should not be changed from manufacturers recommendation.
- b. **Pitch**—The distance travelled forward by one revolution of the propeller. Propeller pitch is like the gear ratio in a car and should be individually selected to suit boat design and usage. Too little pitch will cause a motor to overspeed which will cause motor damage. Too much pitch will overload the motor and reduce performance. (See Figure 7:7).

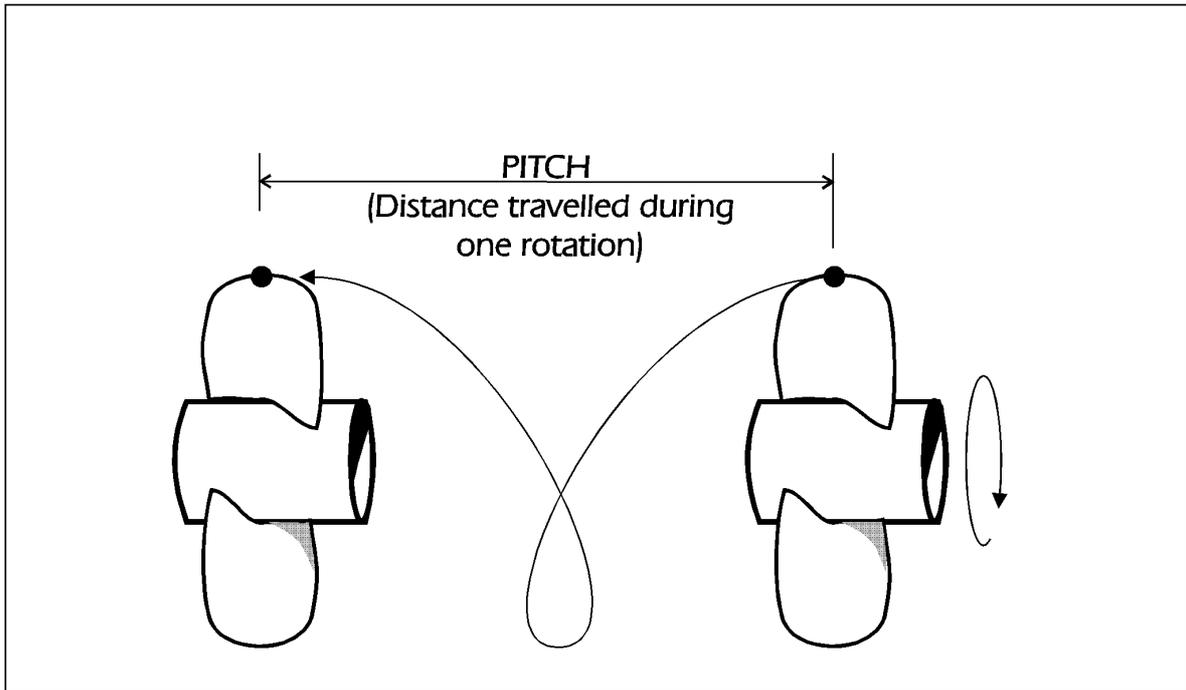


Figure 7:7—Propeller Pitch

- c. **Number of Blades**—Propellers of the same diameter and pitch may have a different number of blades.

PROPELLER CARE AND REPLACEMENT

- 7.36** Any unusual or excessive vibration in the motor may be caused by a badly bent or nicked propeller which must be replaced.
- 7.37** A spare propeller must always be carried as part of boat equipment.
- 7.38** Many propellers have an inbuilt shock absorber, to minimise propeller damage and also to reduce the possibility of shearing the pin when the propeller strikes an object. If a shear pin or propeller becomes damaged, it can easily be replaced.
- 7.39** Before installing a new propeller or shear pin, remember to put some special outboard grease on the propeller shaft. Also, be sure that the shift lever is in the neutral position to prevent injury should the motor accidentally start.
- 7.40** Some models don't utilise shear pins. The propeller is splined to the propeller shaft and a live rubber safety clutch gives on impact, then resumes running but only at low power. The propeller will then need to be replaced as soon as possible.

7.41 PROPELLER MAINTENANCE

Propellers are subject to frequent damage especially in flood work. The maintenance necessary to ensure proper propeller performance is as follows:

- a. File away any minor burring.
- b. If a propeller is damaged, dented, or out of shape to any degree, arrange for repair and balancing. Ensure there is a spare propeller, drive pin, propeller nut and cotter pin available before using the boat.

7.42 CONTROL SYSTEM MAINTENANCE

All control systems including steering, throttle and gear change will require maintenance. This includes:

- a. push-pull cables in the control system that may have fittings requiring lubrication as directed in the owner's manual; and
- b. inspection of all controls and cables and testing for smooth, efficient operation followed by replacement of any damaged or worn cables.

MOTORS DROPPED OVERBOARD

7.43 An outboard motor may be lost overboard at any time if either:

- a. the clamps are loose; or
- b. the stern bracket or transom breaks.

7.44 When a motor is dropped overboard, the procedure under the headings 'MOTOR NOT RUNNING', 'MOTOR RUNNING', and 'IN SALT WATER' should be followed except that if sand has entered the motor, no attempt to start it should be made until it has been fully serviced.

7.45 If the motor is not retrieved immediately and is recovered only after an extended submersion followed by a delay in having it serviced, the power head should be submerged in clean fresh water, to prevent oxidation until it can be serviced.

7.46 MOTOR NOT RUNNING

Proceed as follows:

- a. Recover the motor from the water immediately, if possible.
- b. Remove the engine cover and wash the motor in clean water.
- c. Disconnect the spark plug leads and remove the spark plugs.

WARNING

Detach rubber spark plug lead covers and ground spark plug lead terminals by attaching them to the motor block so as to avoid electric shocks.

- d. Expel as much water as possible by pulling the starter handle several times with the motor in the upright and then in the inverted position. Pour a small amount of oil through the spark plug hole of each cylinder and pull the starter handle several times to distribute the oil.
- e. Remove the pull start assembly and flywheel.

- f. Wipe the magneto dry with a clean cloth, being sure that no water stays between the breaker points.
- g. Drain the carburettor and fuel filters.
- h. With the carburettor high speed needle removed, connect the fuel line to the motor and the tank (presuming of course, that the tank did not go into the water). Squeeze the primer bulb so that the fuel mixture will be forced through the fuel line and out of the high speed needle orifice.
- i. Reassemble the parts removed and follow the starting instructions. Liberally spray with de-watering fluid (WD 40 or similar).
- j. If the motor fails to start, remove the spark plugs again, to see if water is present between the electrodes. Blow out any water from between the electrodes and reinstall, or replace with new ones. If the motor fails to start, have it serviced immediately. To minimise damage, the motor must be started or serviced within 2 or 3 hours of recovery.

7.47 MOTOR RUNNING

Follow the same procedures as for motor dropped overboard 'MOTOR NOT RUNNING'. However, if there is any binding when the flywheel is rotated (by pulling the starter handle), it may indicate a bent connecting rod and no attempt should be made to start the motor. It must be serviced immediately.

7.48 IN SALT WATER

Follow the same procedures as motor dropped overboard 'MOTOR NOT RUNNING'. However, have it serviced as soon as possible, even if it can be started, as salt water can cause excessive corrosion of internal parts.

7.49 REACTION PROCEDURE

The following procedures should be adhered to should a motor go overboard:

- a. Drop anchor immediately and get the way off the boat so that it stops as near as possible to where the motor disappeared.
- b. Mark the spot. Bubbles or mud will, for a while, indicate where the motor disappeared. Throw a spare life jacket with line and weight attached over to mark the spot.
- c. Call for assistance from any other boats in the area.
- d. Try to locate the motor with grapples, or by any other means available.
- e. In shallow water it may be possible to recover the motor immediately but in deep water, divers may have to be used.

7.50 The most important factors in successful recovery of a motor are rapid reaction and the crews ability to obtain a good 'fix' on the point where the motor disappeared.

GENERAL MAINTENANCE

7.51 Each unit must prepare and implement a planned maintenance programme to ensure the outboard motor is at all times ready for use and will provide safe efficient operation, as required under hazardous conditions.

7.52 Outboard motor general maintenance is carried out by the crew and no particular mechanical ability is required. Crew members should be aware of their limitations and not go beyond the bounds of user maintenance or their ability.

7.53 Maintenance routines should be carried out each month, if a boat has not been used, or after each use. Where a motor is used frequently or is subject to hard usage, the requirement for maintenance will increase. In addition to general maintenance carried out by crew members, the motor should be inspected and serviced by a qualified outboard motor mechanic at least annually or more often where use dictates.

7.54 IRB MAINTENANCE

Inflatable Rubber Boat (IRB) hulls are made of specially treated rubber compounds. IRB hulls must be well maintained to get maximum life from the hull. Always follow the manufacturer's guidelines for hull maintenance and garaging.

BOAT MAINTENANCE

7.55 A most necessary part of the care and maintenance of a FRB is cleaning after each use and at regular intervals when garaged. The cleaning procedure for a typical aluminium hull is as follows:

- a. Hose down the hull with clean, fresh water to remove dirt or salt and to soften stains, rubbing down with a soft brush or cloth will assist.
- b. Using a soft scrubber and detergent, scrub the hull to remove stains. Do not overscrub antiskid patches or abuse the paintwork.
- c. Suds should be hosed off with fresh water and excess water drained from the boat.

7.56 CORROSION

While requiring comparatively little maintenance, aluminium hulls are subject to corrosion. Any light surface corrosion on a well cleaned hull will usually cause only minor discoloration.

7.57 HULL INSPECTION

Cleaning the boat will provide an opportunity to inspect the hull. All fittings should be checked for operation and security. Watch out for cracked welds, popped rivets, dents, distortions and scratches in the paint work. All defects should be noted and rectified as soon as possible.

7.58 NEW FITTINGS

Electrolysis can be a major problem in aluminium boats. This occurs where dissimilar metals come into contact with each other. This paragraph should be read in conjunction with paragraphs 7.47 and 7.48.

Where a new fitting is attached to a hull, care must be taken that metals are insulated by a nonconductive gasket of neoprene rubber or similar material. Care must be taken to ensure that the hull member to which any fitting is attached is capable of withstanding any load likely to be generated in use.

7.59 PAINTING

For identification purposes, all FRBs should be painted inside and out with yellow recognition gloss. The first step in painting the boat is to remove all the old loose or flaking paint. Then sandpaper and thoroughly wash the surface. To prepare the surface for good paint adhesion, an etch-primer combination should be used, followed by a layer of undercoat having the same base as the final coat chosen. The final coat should be a vinyl, alkali or epoxy resin base, all of which are excellent for aluminium. Do not use any paint that has a copper, lead or mercury base. These metals cause the destructive action of electrolysis to the aluminium. The boat's paintwork should be retouched when scratched.

7.60 HULL MAINTENANCE

Where an aluminium hull suffers major damage or distortion, it will require repair by a skilled tradesperson using specialist equipment. Some minor repairs are within the capabilities of local units and crew members. Minor dents can be carefully taken out using a rubber mallet. Bolts, nuts and screws which have worked loose or been lost can be replaced using non-corrosive stainless steel replacements.

GARAGING

- 7.61** FRBs should be kept in a state of instant readiness. Prior to any long-term garaging, all equipment should be removed from the boat and thorough inspection made of the hull. All materials likely to cause corrosion (batteries, nails, chemicals etc) should be cleaned from the bilges or any corner into which they may have slipped.
- 7.62** When the inspection is complete, the hull should be thoroughly cleaned and dried.
- 7.63** The boat should be garaged in a building on a properly adjusted trailer or cradle and covered by a tarpaulin or boat cover. If indoor garaging is not possible, it is advisable to garage the boat with the bow elevated and the bungs removed, to allow drainage.
- 7.64** All safety and ancillary equipment (such as PFDs, which are often stored hanging up outside the boat) should be readily accessible for immediate operational use.

CHAPTER 8

LAUNCHING AND RECOVERY

INTRODUCTION

- 8.1 Where possible FRBs should be launched and recovered at properly constructed boat launching ramps. These, however, may not always be available. In the absence of a boat ramp, any gently sloping bank or beach which will safely bear the weight of the towing vehicle and/or trailer may be used.

LAUNCHING CONSIDERATIONS

8.2 FROM A PREPARED SITE

Check the launch site for debris and sudden drops. Check that the ramp is safe and that the water is deep enough to allow for safe launching.

- a. **Uncertain Ground**—If uncertain of the ground, in order to avoid bogging the towing vehicle, it is sometimes advisable to uncouple the trailer and manhandle it to the waters edge. Care must be taken to avoid rolling the trailer into the water. If launching over very muddy or boggy ground, the boat could be removed from the trailer and either carried or pulled into the water.
- b. **Vertical Banks**—When there is neither a boat ramp nor suitable beach, it is possible to launch over a low vertical bank, providing sufficient people are available.
- c. **Public Boat Ramps**—When using public boat ramps, park well clear of the ramp to prepare the boat for the water. This then permits others to use the ramp and avoid delays.
- d. **Trailer Attachments**—All trailer attachments (such as removable light fittings) likely to be affected by immersion should be removed from the trailer before launching.
- e. **Bungs**—Bungs and drain plugs must be checked and secure.
- f. **Boat Equipment**—Stow all equipment to ensure it will not be damaged or create a hazard during the launching operation. Check that the radio is correctly fitted and operational.
- g. **Motor**—Prepare the motor for starting. Lock it in the tilt position to avoid the skeg striking the bottom on launching.
- h. **Fuel**—Check fuel tank contents, fuel lines and that there are no fuel leaks.
- i. **Tie Downs**—Remove the tie down strap and loosen the winch cable but leave the boat attached to the cable.

8.3 FROM AN IMPROVISED SITE

The following factors must be considered before launching from an improvised site:

- a. It is always much safer to launch a FRB from a prepared launch site rather than from an improvised launch site.
- b. The urgency of the task might dictate that it is a better proposition to launch a boat at a prepared site and travel 10km to the scene of the operation. On the other hand, if the scene of the operation is 40 to 50km from a prepared launch site then obviously it is quicker to transport by road and launch at an improvised site closer to the area of operation.
- c. Fuel usage over long distances and the operational range of the FRB will often determine the acceptability of a launch site.
- d. The availability of a 4WD vehicle. Nearly all launches from improvised sites necessitate the use of a 4WD and at the very minimum, a winch or Tirfor.
- e. Is vehicle access to the area of operations possible.

LAUNCHING USING A VEHICLE

8.4 FROM A PREPARED SITE

When reversing, all normal precautions for safe driving should be observed, and care must be taken on slippery, sloping surfaces near the water. Reverse, if possible, to your right hand side so that you can always see where you are going. (See Figure 8:1).

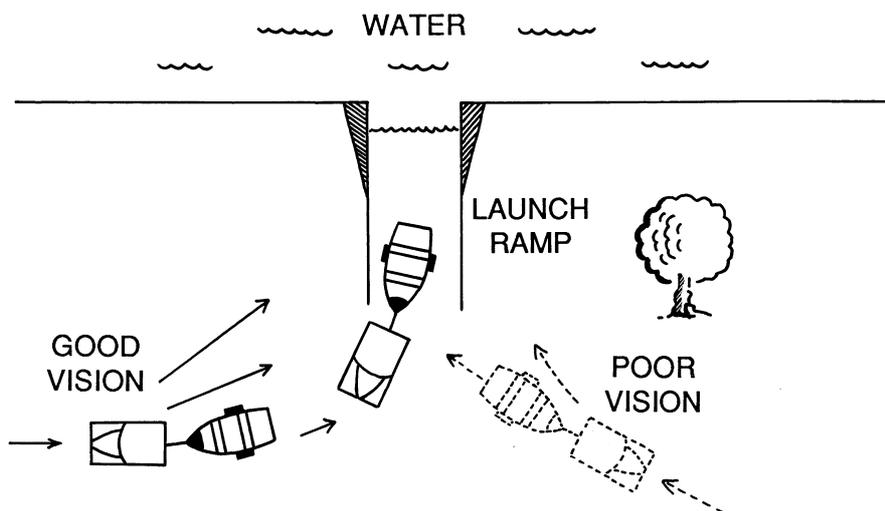


Figure 8:1—Reversing to a Launch Site

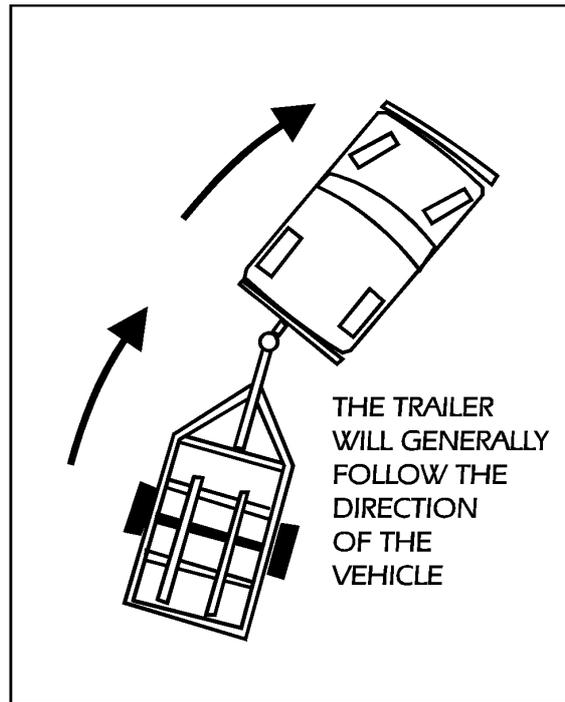


Figure 8:2—Pulling a Trailer

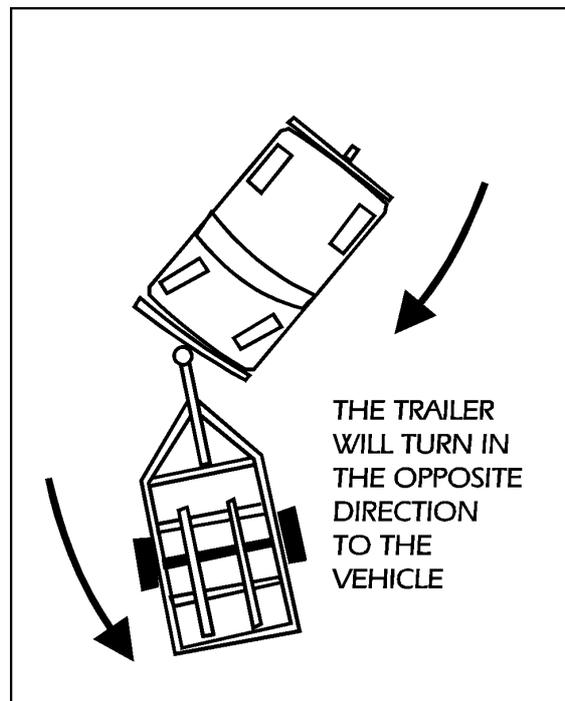


Figure 8:3—Pushing a Trailer

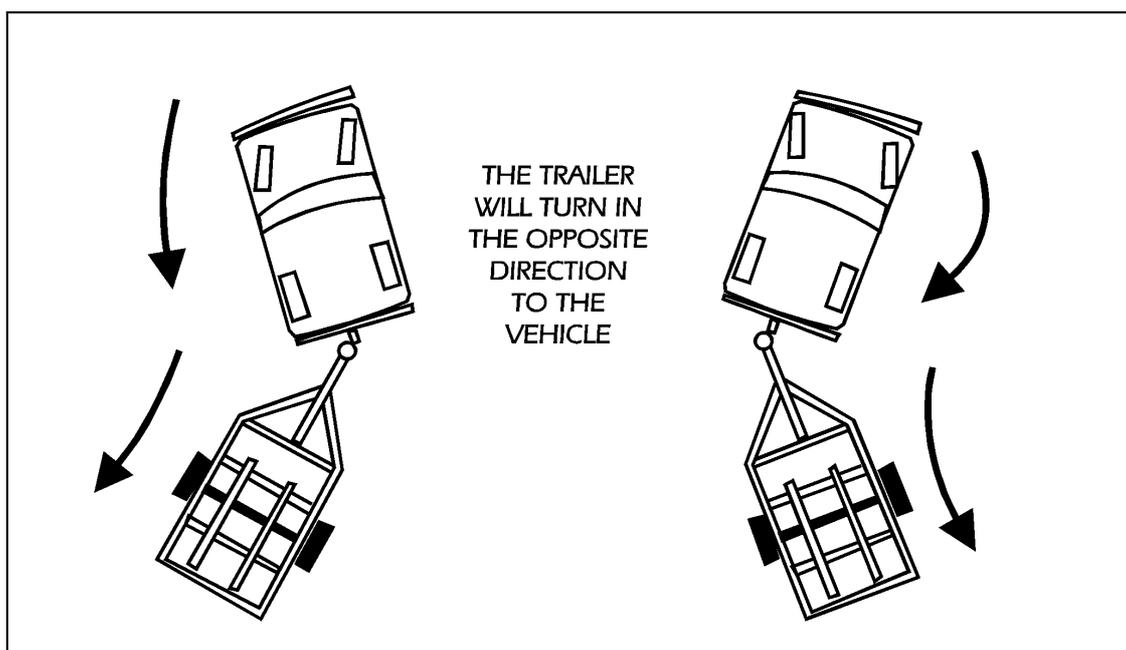


Figure 8:4—Reversing a Trailer

- a. **Wheel Bearings**—Avoid submerging hot wheel bearings in cold water as they may fail due to thermal shock. If possible, always allow the wheel bearings to cool before launching. Properly maintained ‘bearing buddies’ will reduce the chance of bearing failure from thermal shock by preventing water entry.
- b. **Hand Brake**—When the trailer is in sufficient depth of water stop the vehicle, switch off the motor, apply the hand brake and engage first gear.
- c. **Painter**—Ensure a painter (bow line) is attached to the boat and is held by one of the crew.
- d. **Trailer Tilt**—The boat can be pushed off the trailer into the water. If fitted, the trailer tilt will assist in this operation.
- e. **Parking**—At this stage the towing vehicle can be driven away and parked. Ensure the towing vehicle is parked well above likely flood or tide heights.

8.5 FROM AN IMPROVISED SITE

Once it has been decided to launch the FRB at an improvised site, the following procedures should apply:

- a. The first consideration is to conduct a thorough inspection of the area. Choose a spot where the bank is least steep, or the lowest part of the bank and the surface is more even (not over wash aways, etc). If you are able to reverse back or lower the boat trailer to the waters edge, check to see if the ground is firm under the waters surface, so that the trailer does not catch or sink on one side during launching or recovery. Clear any obstacles away from the intended launch site eg logs, large rocks etc, the less hazards the better.
- b. Once the site has been inspected and prepared, the next step is to launch the boat. For this operation a minimum of two persons is required, and preferably three. One to operate the 4WD vehicle and one to observe the progress of the trailer and issue any corrective instructions.

- c. If three persons are available, one to drive, one observing from the port quarter of the boat trailer and the third walking alongside the driver of the vehicle passing on instructions to the driver. At no time during launching, must anyone stand or get behind the boat or vehicle in case of failure of the vehicles brakes, the boat trailer breaking away from the tow vehicle or loss of traction by the tow vehicle.
- d. Once the trailer wheels are at the desired water level, the person or persons not in the vehicle can tilt the trailer and launch the boat. The driver of the vehicle must stay in the vehicle at all times during launching and recovery.
- e. There is a possibility of a launching vehicle sliding on a slippery ramp surface. Drivers may choose not to wear a seatbelt during the launching operation. To reduce the chance of rolling or slipping back any further than required, chock the wheels of the tow vehicle. Always launch the boat at right angles to the waters edge.
- f. Fitting a tow-ball to the front of a vehicle and pushing the trailer into the water is often an easier way to launch a boat.

LAUNCHING FROM AN IMPROVISED SITE WITHOUT A VEHICLE

8.6 If the bank is too steep to use a vehicle, it may be necessary to lower the boat and trailer to the waters edge with the aid of a winch. Area preparation is carried out as for a vehicle launch.

8.7 PROCEDURE

Reverse the trailer to the edge of the launch site, chock the wheels of the trailer then disconnect it from the tow vehicle. Secure the winch to the trailer. While one person operates the winch, another person moves with the boat and trailer down the bank, making any alterations to the boats direction as necessary. When the trailer has reached the desired water level, launching can be effected by tilting the trailer and allowing the boat to slide off into the water with the following precautions:

- a. Never disconnect the trailer's winch cable from the boat, until the boat is ready to be launched.
- b. Never step over a winch cable or rope while it is under tension.
- c. Always use gloves when handling steel wire rope.
- d. Use a log, bag etc to prevent cable from dragging or cutting into the top edge of the bank.
- e. It may be necessary to extend the length of the winch cable by using additional cordage or steel wire rope.
- f. Very steep launch sites. In most cases, launching FRBs down vertical, or near vertical inclines, can be made easier by sliding the FRB off the trailer and lowering it over the edge with the aid of ropes and/or winches. Care must be taken not to let the progress of the boat get out of hand:
 - (1) At no time must anyone be between the boat and the water.
 - (2) If the motor is fitted always launch the boat with the motor in the tilt position, to prevent fouling.

HAZARDS OF IMPROVISED LAUNCH SITES

8.8 SAND

It is virtually impossible to launch a FRB from dry sandy areas without the aid of a 4WD vehicle. Even with a 4WD it may be necessary to lower the pressures in the tyres, boat trailer included. The main factor to remember when operating (driving) in sand is do not spin the wheels. Once the wheels start spinning, the vehicle may become bogged. Clearing sand away from in front of the wheels and/or winching are usually the options available in these circumstances.

8.9 MUD

Mud greatly increases the hazards of launching from improvised sites. Crew members must use great care when operating on steep muddy slopes, as the loss of footing which could result in one or more personnel in the water or someone being run over by the trailer or vehicle. Vehicles do not have the same traction in muddy conditions which may result in the vehicle having to be secured to a tree or some form of anchor.

8.10 CROSS-WINDS

Strong cross-winds may require the aid of a person holding a rope tied to the stern cleat and standing on the upwind side of the boat to keep the boat in line with the trailer until fully launched.

8.11 ONSHORE WAVE ACTION

On lake or sea launches, when the wind and wave action is directly onto the launch site, care must be taken that waves do not wash over the boat and swamp it.

8.12 Listed above are some of the major hazards that can be encountered during launching from improvised sites. No matter what the hazard may be, remember that it is better to slow down and launch smoothly rather than make haste and damage the boat.

MOTOR STARTING

8.13 PRE-START CHECKS

The master should board the boat and carry out final checks prior to starting including:

- a. **Motor**—Consult the operator handbook for motor pre-start checks.
- b. **Leaks**—Ensure there are no leaks, particularly in the area of the bungs and drain plugs.
- c. **Trim**—The trim of the boat is checked and corrected where necessary.

8.14 START UP

When satisfied that the boat, its equipment and the motor are ready for safe operation, the coxswain can start up. Ensure:

- a. **Propeller Clearance (smooth water)**—The boat is moved into deeper water stern first with the crew steadying the bow. When in water deep enough for the skeg and propeller to clear the bottom, the coxswain lowers the motor to the run position, and starts the motor.

- b. **Water Pump Indicator**—When satisfied that the motor is running smoothly and after ensuring the water pump indicator has a flow of water, the coxswain orders the crew aboard.
- c. **Push Off**—On being ordered aboard the crew pushes the boat toward deeper water at the same time as boarding. The coxswain then engages reverse gear and moves the boat clear of the shore.
- d. **Propeller Clearance (rough water)**—If launching into rough water or into surf it is often necessary to keep the bow of the boat into the waves. In this case the crew turn the bow towards the waves and move into deeper water. One crewperson boards the boat, ships the oars. The master and coxswain board the boat and prepare the motor for starting. The crew rows out into deeper water and the coxswain starts the motor once sufficient depth is obtained. The coxswain then engages forward gear and moves the boat clear of the shore.

RECOVERY

8.15 FROM A PREPARED SITE

On completion of an operation the boat may be recovered to the boat trailer the following manner:

- a. **Winch Wire**—The winch wire should be run out to the end of the trailer and hooked to the chassis. The outboard motor should be tilted.
- b. **Reverse**—The trailer is reversed into the water, taking care not to submerge wheel bearings if they are hot.
- c. **Hook On**—The crew moves the boat to the rear of the trailer and rests the bow on the rear roller, then hooks the winch wire to the bow eyelet.
- d. **Wind In**—While the crew steadies the boat, the winch is wound in with the pawl engaged, using the trailer tilt if necessary.
- e. **Stem Posts**—After the bow is secure against the stem post, the trailer can be towed clear of the boat ramp.
- f. **Attachments**—Light fittings, boat tie downs and motor supports are fitted and the trailer is prepared for road towing.
- g. **Drain**—Remove the bungs so that bilge water can drain out.
- h. **Equipment**—Stow and prepare all equipment for road travel.

8.16 FROM AN IMPROVISED SITE

Generally, a boat is recovered from an improvised site in the same manner in which it was launched, ie if the trailer was lowered down the bank by means of a winch, then it is usually recovered using the trailer and winch. There are exceptions but the above is generally the rule. All precautions should be observed during recovery, because there is more tension on the rope or cable during recovery than there is during launching. Again, do not stand behind the boat and do not step over cables under tension.

- 8.17 Once the boat is on level ground again, check the trailer wheels, If necessary, secure the boat, pack equipment and prepare for road towing.

CHAPTER 9

OPERATIONS

INTRODUCTION

- 9.1 When manoeuvring the boat, whether in open water, to a specific point, or within the confines of a narrow channel, the following factors must be remembered:
- the boat's ability to stop;
 - the boat's steering characteristics;
 - the influence of wind and water;
 - the boat's load; and
 - the boat's trim.

STOPPING

- 9.2 Outboard motors have the advantage that the normal boat rudder is replaced by a propeller, and steering, even at slow speeds, is generally positive and effective. Once the propeller stops, however, the boat loses steering. In addition, unlike a car, the boat has no braking system. FRB operators must keep this in mind and travel at a speed appropriate to conditions, avoiding the need for emergency stops. When operating in current the coxswain should assess the situation and select an appropriate method to slow down or stop. Some methods are:
- throttle back and stem the current;
 - turn into the current and then stem it;
 - manoeuvre safely to slower-flowing water;
 - drop anchor; or
 - use the oars.

For an emergency stop, reverse the thrust of the propeller by throttling back to shift speed, **pausing in neutral**, then engaging reverse gear. This will not immediately stop the forward motion of the boat, as water is a fluid and there is little or no resistance on the boat. Once reverse is selected, the boat will slow down, and once the reverse thrust is great enough, it will pull the boat backwards through the water.

STEERING CHARACTERISTICS

- 9.3 A boat is generally driven and steered by the thrust of the propeller. A boat is steered by the stern. This occurs because a rotating propeller bites into the water, converting a lot of its power into thrust. Power not used in forward momentum is dissipated sideways, giving a sideways thrust. Although this effect is relatively small, it will make itself felt, particularly at slow speeds, and may create problems when manoeuvring in tight corners.

- 9.4** Most propellers rotate clockwise to move forward. This creates a sideways torque that tends to 'walk' the motor to the right when the propeller is turning. (See Figure 9:1). This effect will cause a boat to turn to port more readily than starboard, and can be quite useful in low speed manoeuvring.

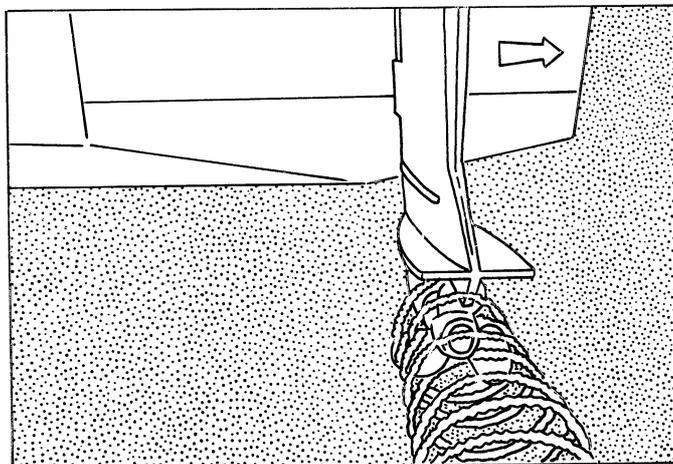


Figure 9:1—Sideways Torque

- 9.5** As the stern is pushed out, the bow is pushed in the required direction. The pivot point of the boat is approximately one third the length of the boat from the bow. The centred motor should drive the boat straight ahead, except for a slight adjustment to the tiller to compensate for the sideways thrust. Unless forward controls are fitted, the tiller must be moved in the opposite direction to which you wish to travel for forward movement. When reversing, the motor pulls the boat stern first, and the tiller is again moved in the opposite direction to which you wish to go.

WIND AND WATER

- 9.6** As the water exerts little or no resistance on the boat, strong winds, currents and wash will impede the manoeuvring of the boat. By studying these elements and the boats characteristics in normal conditions, a good coxswain should be able to use the stronger factors to advantage when manoeuvring.

LOAD AND TRIM

- 9.7** A consideration in loading a boat is the trim. A properly loaded and trimmed boat will ride level in still water. If the load is placed too far to one side, the boat will heel to that side. If a load is placed too far forward, the boat will ride bow down; while a load too far aft will cause the stern to squat. Always make sure any load is well secured to prevent it shifting and upsetting the trim of the boat.
- 9.8** Any boat with a pronounced heel is in danger of capsize, particularly while manoeuvring. Fast waters or winds striking a heeling boat can cause an upset or may cause cargo to move, increasing list.
- 9.9** A boat riding bow down will be slow to rise to waves, difficult to steer and may drive itself under if too much power is applied. In this situation, fuel consumption will be increased.

- 9.10** A squatting boat will have difficulty planing and therefore will have poor performance. Forward vision will be restricted and fuel consumption will be high. In extreme circumstances the boat may flip over backwards.

BASIC MANOEUVRES

- 9.11** The essential manoeuvres are related to undocking, (moving away from a jetty or wharf) docking (returning back to such position) and manoeuvring in confined spaces. It is preferable that the following manoeuvres are made into the wind and/or current.

9.12 LEAVING A FIXED STRUCTURE

In many instances, it is possible to get away from a jetty or pier in an outboard powered boat by merely pushing off, and once sufficient space has opened up between craft and jetty, go ahead slowly with a gentle outward turn. A short turn may mean that the stern of the vessel will hit the jetty with some force. This must be avoided. If the craft is being pinned to the jetty or wharf by wind or current, it is best to reverse out ie, the outboard motor propeller is turned away from the jetty and power, in reverse, is applied slowly and the propeller draws the boat smoothly and safely away. Some coxswains always use this method in any circumstances, and it is often taken as a sign of a prudent operator. Take care that you have reversed far enough out from the wharf, so that when forward thrust is applied, the boat does not come right back to the wharf and strike it. It is better to back out further than necessary, rather than back out too little and have to repeat the whole manoeuvre. When reversing, watch for waves that may come over the transom into the boat.

9.13 COMING ALONGSIDE A FIXED STRUCTURE

Propeller torque, wind and current will affect this manoeuvre. It is essential to maintain safe momentum to retain control of the boat. To achieve good docking always position the approach so that if the boat motor fails, any resulting collision will result in a slow and glancing blow. The steps to coming alongside (port side) are:

- a. advise crew 'coming alongside, port (or starboard) side';
- b. aim at the wharf (or structure) at an angle of 15° to 20°, engine slow ahead;
- c. as the bow is almost alongside the wharf, pull the stern into the wharf by angling the propeller towards the wharf and reversing; and
- d. tie off the vessel securely.

WARNING

**Ensure that no fingers or other body parts are outside the vessel
when coming alongside**

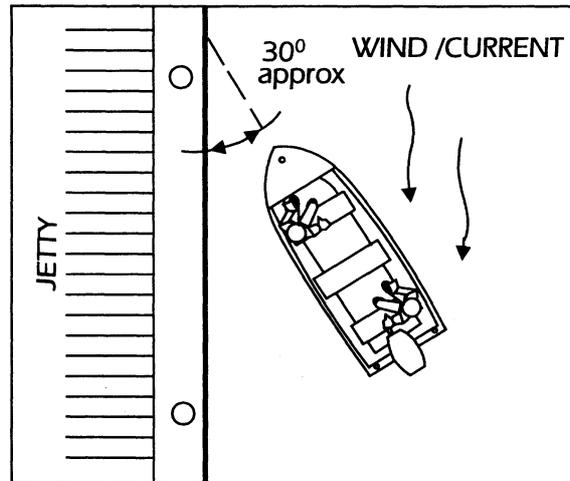


Figure 9:2—Coming Alongside

9.14 COMING IN BOW ON

Approach the landing bow on, watching for wind, current, and torque effect. Put the motor into reverse to lessen approach speed. The boat should come to the stop position almost touching the landing. Before the reverse thrust has time to move the boat astern, select forward gear and open the throttle slowly to allow the boat to rest on the landing. By use of the propeller as forward thrust, and compensating for wind and drift, the boat should be able to remain in that position until the task is completed. When the task is completed, reverse clear of the landing.

9.15 TURNING A BOAT AROUND

A common manoeuvre in boat handling is to turn a boat around in confined spaces. To achieve this effectively, crew members should practise in open spaces. Steering is much more positive when the propeller is rotating, use short bursts of power directly from ahead to astern, rather than allowing the boat to coast in neutral with no steering. To complete a turn:

- a. put tiller hard to starboard, slow ahead;
- b. put tiller hard to port, slow astern; and
- c. repeat until the boat is turned around.

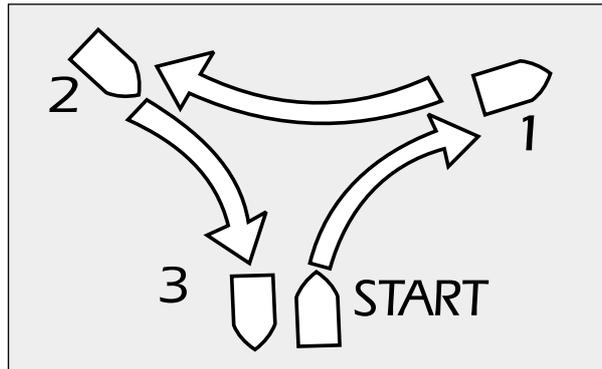


Figure 9:3—Turning Around

SECURING FLOOD RESCUE BOATS

- 9.16 Consideration must be given to the methods of securing the FRB for loading, unloading or securing. Two methods are shown below.
- 9.17 To secure alongside one rope from the bow and one from the stern are tied to an anchor point with regard to the prevailing wind and current. A third short line is used to secure the vessel completely. (See Figure 9:4).

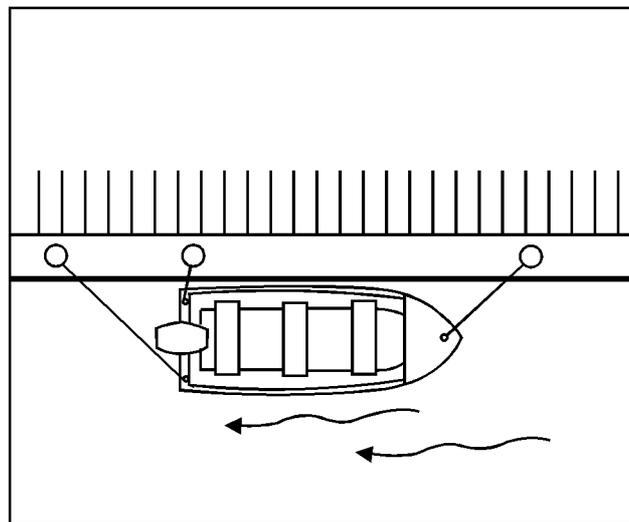


Figure 9:4—Securing Alongside

- 9.18 On occasions it may be necessary to hold the boat bow on. In that case tie quarter lines from the boat, to the shore. To do this, the bow should be driven against the landing and a line run from each quarter and attached to an anchor point. (See Figure 9:5).

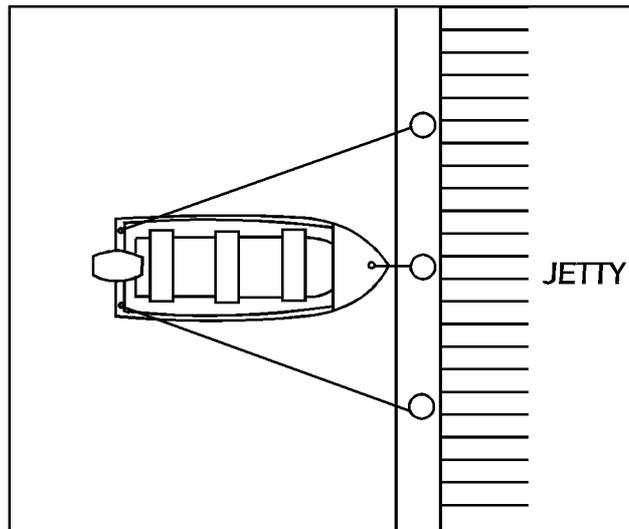


Figure 9:5—Secured 'Bow on' by Quarter Lines

- 9.19** All lines should be long enough to allow for variations in tide, wind and flood heights. In some circumstances lines should be long enough so that they can be taken around an anchor point and brought back into the boat and secured so that the crew can release the lines from inside the boat.

BEACHES AND BANKS

- 9.20** For detail on leaving a beach or bank refer to paragraph 8.14 'Start Up'.

- 9.21** In flood operations it will be necessary to land on beaches or river banks. This is more likely to be the case than landing at jetties or on structures. The points to note for beaching are as follows:

- a. **Selection**—Select a landing point that can be approached safely and with a minimum of effort (avoid landings in muddy areas or areas which require crew to wade long distances through shallows).
- b. **Current**—When approaching the landing point, allow for the effect of any current or strong winds.
- c. **Slow Down**—On the approach, slow down to idle speed while clear of shallows. Raise the motor to shallow running operating trim if possible. Ensure the motor is not locked down in case you strike a submerged object.
- d. **Stop**—When in shallow water, place the motor in neutral and then stop the motor. Raise it to the tilt position and allow the boat to run in under its own momentum.
- e. **Strong Current**—If the current is too strong, drive in at low speed until grounding. When the boat has grounded, the crew can step over the bow on the upstream side and hold the boat. A line may then be run to shore or an anchor used.
- f. **Waves**—Where it is necessary to land with waves astern a kedge anchor could be used. Refer to paragraph 5.18 Kedging.

TOWING

9.22 It may be necessary to tow a boat which has broken down, or a log or tree which causes obstruction. Towing will significantly increase fuel consumption and reduce the manoeuvrability of the vessel.

9.23 APPROACH

Approach the object (boat) from downwind or down current, whichever is stronger. Allow sufficient room to manoeuvre, especially in waters which could endanger the crew or the boat. Always treat with caution.

9.24 TOWLINE

If using a tow line, the line should be belayed around the forward cleat/bollard or rail from the towed boat; or in case of an object, around the fore part. The towline should be secured to the towing boat by means of a towing bridle. It is the duty of one of the crew to watch the towline to ensure there is no danger of the towline snagging or fouling the propeller, nor the towed object striking into the towing boat. In strong currents it is safer to tow upstream where possible, to prevent the load being washed or drifting into the tow boat or allowing slack in the towline which could foul the propeller.

9.25 TOWING BRIDLE

Two towing bridles are used by FRB crews. Figure 9:6 shows a pulley bridle and Figure 9:7 a hand-tied bridle. The pulley bridle is quick to set up but may be difficult to release quickly. Sharp turns can cause the pulley to run quickly to one quarter, forcing it down and possibly shipping water. The hand-tied bridle uses a rope from the towed vessel. It can be quickly cast off and is often secured by a crew member holding the rope with a couple of turns around a bollard, rather than a quick release knot. It is important to tie the alpine butterfly so that the motor can turn freely.

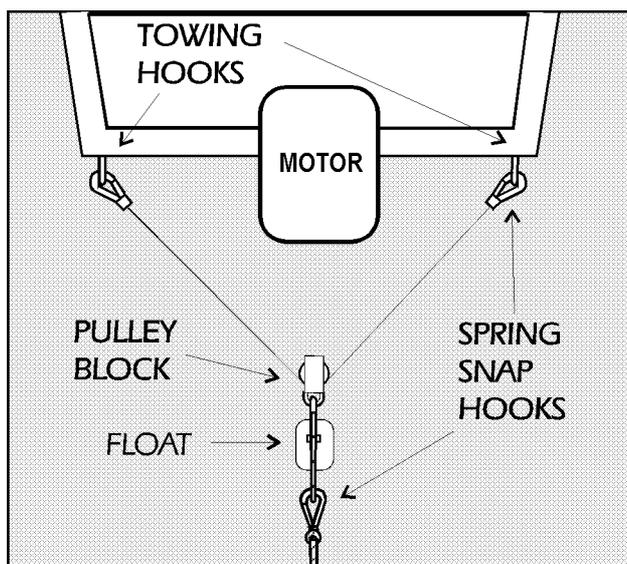


Figure 9:6—Pulley Bridle

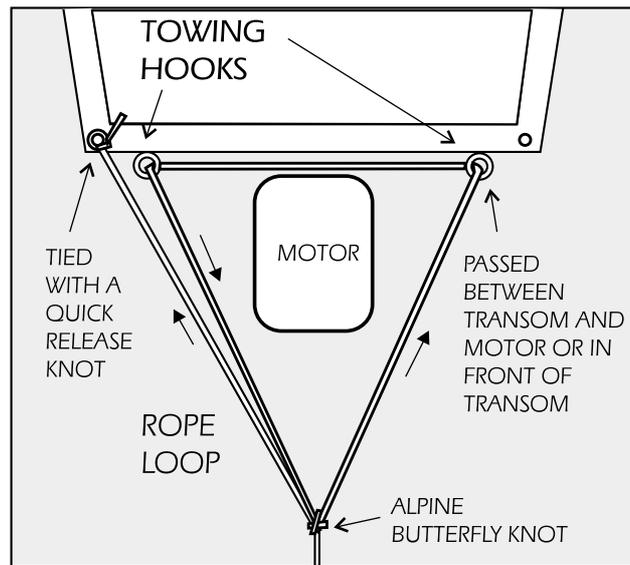


Figure 9:7—Hand-Tied Bridle

9.26 TAKING UP THE STRAIN

A gradual taking up of the strain permits the towed object to gather way gently and prevents damage to the transom of the tow boat. It also protects the rope and reduces the possibility of it snapping. This movement will also allow the towed boat to align itself with the towing boat.

9.27 CREW POSITIONS

At least one crew member must be aft watching the towline. The crew must warn the coxswain of any impending threat, and be prepared, if ordered, to slip or cut the towline where there is any danger to either boat.

9.28 TOWED BOAT

If there are crew or passengers on a towed boat, they should, except for the member watching the line, be moved aft as far as possible. This makes the towed boat less liable to yaw widely to either side. If the weight is forward the boat is likely to ride bow down. The best position for towing a disabled boat is to adjust the towline so that the bow of the disabled boat rides on the second wave of the wash produced by the boat towing. The motor of the disabled boat is left in the water to provide steerage should the front boat have to stop suddenly for any reason.

9.29 TURNING

While towing, the towing boat should keep to low speed in order to avoid straining the tow line. When turning, allowance must be made for the tow as it may tend to cut across the arc of the turn and could foul any object around which a turn is being made. It is advisable to shorten the tow when turning or manoeuvring in confined waters. (See Figure 9:8).

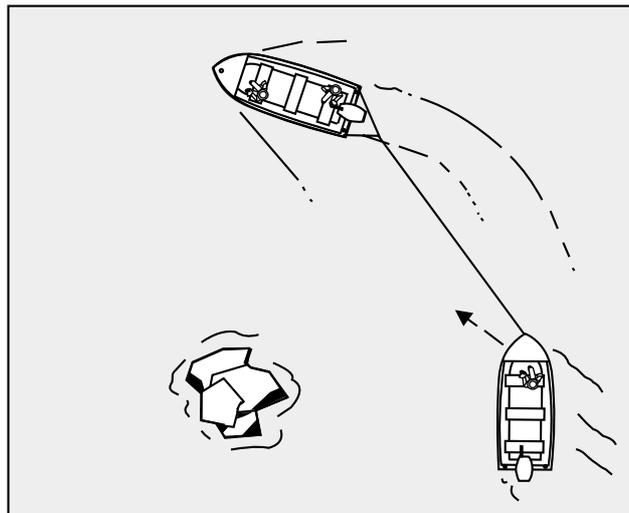


Figure 9:8—Towing with a Bridle

9.30 TOWING ALONGSIDE

Where there are numerous obstacles to manoeuvre through it may be necessary to secure the disabled boat alongside the towing boat. This reduces the arc of the turn. It is only suitable for short tows at slow speed and in calm waters. The towed boat should be secured alongside with a head rope, stern rope and a back spring. (See Figure 9:9). Fenders will need to be placed between the boats. Life jackets must not be used as fenders. In an emergency improvised fenders eg tree branches could be used.

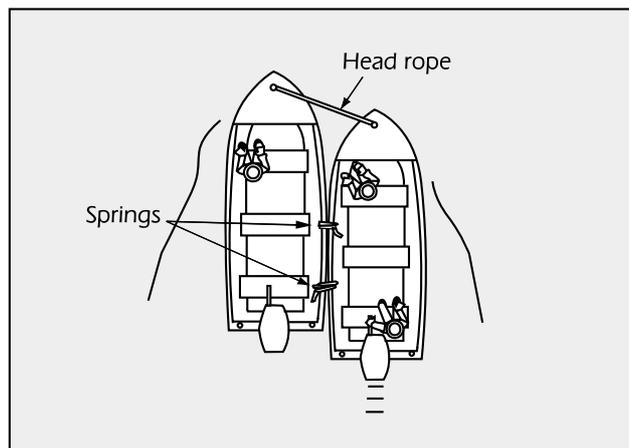


Figure 9:9—Barge Towing

9.31 CASTING OFF

The sequence when letting go of a towline will depend on the situation. You must ensure that the tow line does not foul the propeller or become tangled in any obstruction.

HANDLING ANIMALS

9.32 ANIMALS ON BOARD

Small animals can be carried in the boat providing this does not jeopardise the safety of the passengers. This decision is at the master's discretion.

9.33 TOWING ANIMALS

Nearly all animals can swim. Halter lines around their necks will assist in guiding them to safety. The halter should be of sufficient length to ensure some freedom, while at the same time keeping the animal clear of the propeller. When towing animals the tow rope should be held in the hand and not attached to the towing bridle, to enable the line to be released quickly if the need arises. If necessary a number of turns may be taken around a cleat but the line must remain hand held. Care should be taken when towing any animal that it does not panic and try to board the boat.

9.34 MOVING CATTLE AND HORSES

Cattle and horses can be towed on a halter. Another method is for a halter to be placed on the head of the animal and the animal brought alongside the boat, the rope wrapped around the bow cleat and hand held. With fingers placed in the nostrils of the animal, the head is assisted upwards and the nose is kept out of the water. Two beasts at once can be moved in this way. If one animal only, it is best to tow it behind the boat. There are some steering problems with only one animal on one side.

9.35 MOVING SHEEP AND GOATS

Large numbers of sheep or goats can be moved quickly and easily. The following procedures apply:

- a. If possible, yard them near reasonably deep water. This will cut down considerably on handling.
- b. Place them sitting upright as for shearing, in the stern of the boat and across it in a row.
- c. The next row is placed between the legs of the first row, also sitting upright, and so on.
- d. When the boat is full, the crew holds the oar across the last row and the boat gets under way.
- e. Rapid progress can be made over long distances.
- f. Be careful when unloading. There is a tendency for them to jump out the river side of the boat rather than the land side.

REMOVAL OF PERSONS FROM FLOOD-THREATENED AREAS

9.36 Most states have no legal means of compelling persons to leave flood-threatened areas. However, crews, by using tact, can often accomplish an evacuation. The persons concerned are often worried and look to crews for guidance.

9.37 When evacuating persons, remember only limited personal possessions should be taken by those evacuated or rescued by boat. Depending upon circumstances, this may range from essential medical requirements, to a small overnight bag.

- 9.38** Never overload the boat, and never leave one person by themselves. It would be preferable to undertake two trips than risk on overloaded boat. All necessary details of evacuees must be recorded by the crew.

LOOTING

- 9.39** In past emergencies, homes and buildings isolated by flood waters have been looted by persons using boats. Whenever possible, crews should immediately report any suspicious activities to the relevant authorities.

RECOVERY OF DISABLED VESSELS

- 9.40** FRB crews will be required to recover various types of craft. Each type should be recovered with minimal risk to life and without causing damage to the FRB or further damage to the vessel being recovered.

9.41 SAILING VESSELS

On inland and estuarine waters it will be rare to encounter yachts longer than 7m. Most larger yachts will be of the 'trailer sailer' type. Such vessels in distress present FRB crews with the following problems:

- a. The physical size of the vessel.
- b. The number of people carried on the vessel.
- c. The amount of debris that can be floating and the ropes and lines encountered, which create hazards for rescue craft.
- d. Possible fuel spillage.
- e. Area in which difficulty has occurred eg reef, sandbank.
- f. The crew members in cold conditions, at times, may be incapable of helping themselves due to exposure and exertion in trying to right their vessel after a capsize.
- g. There are a number of other points which should be kept in mind by FRB crews:
 - (1) Keep clear of floating lines and hazards.
 - (2) If a yacht is aground, it is unlikely that you will be able to tow it clear, and if the keel or centreboard is raised it is unlikely that there is enough water for the FRB either.
 - (3) Should a vessel have capsized and persons are missing, never dive under the hull to see if anyone is trapped. Tap the hull and if persons are alive inside, they may tap back.
 - (4) Ascertain from survivors the number of persons who were on board and where they were last seen.
 - (5) Ascertain whether or not they were wearing life jackets. If the yacht has capsized it may be that they have been unable to get out and have drowned.
 - (6) Once the crew have been accounted for it will be up to the skipper, if they are able, and the FRB crew to decide whether or not to right the craft and try and salvage it.
 - (7) If left floating the wreck must be secured and marked until further action can be taken.

9.42 POWER CRAFT

Most of the points applicable to sailing vessels apply to power craft with the exception that the lines and debris are usually less and there are no sails to worry about. Again, with a capsized of the larger type of power craft it is not good policy to swim under the hull. The most likely sources of trouble with a power boat are mechanical failure or fire.

- a. **Mechanical Failure**—This usually requires straight forward seamanship from the rescue craft when assisting and then a tow to the nearest port.
- b. **Fire**—This usually means that rescue of survivors may have to be effected from a hulk. Fire on petrol driven power boats usually follows an explosion. As LP Gas or fuel for the stove may also be carried, this explosion could be quite powerful. Therefore burns are likely along with shock for the survivors.

COMMONSENSE

- 9.43 Crews must take time to think and plan even if the operation, at first glance, appears to be a simple one. Take care, plan, act confidently and use commonsense. These actions, along with theoretical knowledge and experience, will ensure that FRB crew are able to handle any emergency to which they are called.

OPERATIONS IN POOR VISIBILITY

- 9.44 Reduced visibility may be brought about by fog, heavy rain, smoke, haze, snow, etc. These call for special skills in seamanship, but the general rules and procedures are applicable whatever the situation. Fog is the most common and severe.
- 9.45 Seamanship in fog is primarily:
- a. avoiding collisions with other craft or obstructions of any kind; and/or
 - b. navigation and position determination.
- 9.46 Of greatest importance in fog or conditions of reduced visibility, is to see and be seen and to hear and be heard. Masters must take every possible action to see or otherwise detect other craft or hazards to navigation. Also they must take all steps to ensure that the boat is detected by others.
- 9.47 The key to detection by sight and sound is that it is early enough to allow proper corrective action. Rules of the road require a reduction of speed in poor visibility. Rules require that all vessels go at a safe speed having a careful regard to the existing circumstances and conditions.
- 9.48 Admiralty Court decisions have established that safe speed is: 'that from which a vessel can come to a complete stop in one half (1/2) of the existing range of visibility'.
- 9.49 The correct situation is to be able to stop in time rather than to have to take violent evasive action. Rules require that a power driven vessel hearing the fog signal of another vessel forward of the beam and not knowing the position of the other vessel, shall insofar as circumstances permit, reduce speed, navigate with caution and stop if necessary until the danger of collision is past.
- 9.50 It is important that increased lookout activity is taken and the boat should stop if necessary to listen for other craft. When a signal is heard, an effort should be made to identify its source and determine its bearing. Experience in the use of

sound signals indicates that they are not reliable. In particular, relative intensity of a sound is not a reliable indication of its distance, or whether the distance is increasing or decreasing. A signal may be totally inaudible in certain areas close to its source. Its apparent direction is not always a correct indication of its actual direction. In poor visibility it may be necessary to stop until the visibility improves. Consideration must be given here to the depth of water, conditions and other traffic.

HELICOPTER OPERATION WITH FLOOD RESCUE BOATS

- 9.51** Helicopters are now quite common throughout Australia, especially in the vicinity of capital cities. In routine rescue operations police or emergency service helicopters are those most likely to be called to assist in search and rescue operations, and they are the ones with which FRB crews will need to be most familiar.
- 9.52** In disasters/emergencies the aircraft of the Armed Forces may be deployed to support the civil community, particularly as a result of floods or cyclones.
- 9.53** Procedures for the operation of FRBs with helicopters have been developed from operational experience and exercises. These procedures are set out below.

DOWN-DRAUGHT EFFECT OF THE ROTOR

- 9.54** The down-draught from the rotors of a hovering helicopter plays havoc with stationary FRBs. The down-draught from the helicopter to the boat is at about 45 degrees and this blast of air pushes the boat along in front of the approaching aircraft. On smaller FRBs it may rotate the boat on the water.
- 9.55** This results in the relative positions of the helicopter and the FRB remaining constant and hinders a person or cargo being lowered into or retrieved from the FRB. (See Figure 9:10).

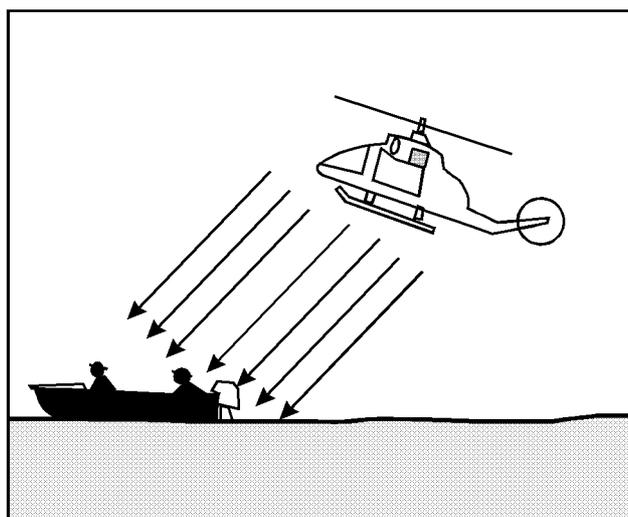


Figure 9:10—Down-Draught Effect

- 9.56** FRBs not under way when approached by hovering helicopters will be pushed ahead and in circles by the down-draught making it very difficult for the helicopter to hover directly over the boat. To overcome this effect the boat should be travelling at a speed of about 15 knots. As the helicopter approaches

the boat, the coxswain can hold the boat steady and the helicopter can then hover over the boat, and match its forward speed. However, as the pilot cannot see the boat because it is directly below the aircraft, it is very difficult to hold station relative to the boat. The pilot is dependant on directions from the helicopter crew and the ability of the coxswain to hold a constant course and speed.

- 9.57** The winch line may be dropped into the FRB by this method and a person, or stretcher and patient removed. This method requires a high degree of skill and practice in order to be carried out safely and effectively. Avoid getting the winch rope wrapped around a person or object.
- 9.58** When winching a stretcher from a FRB a guy line needs to be attached to the foot end of the stretcher to prevent it spinning in the rotor wash causing further injury to the casualty, damage to the helicopter or a broken winch cable.
- 9.59** A fast and effective method of winching into or out of a FRB is as follows:
- Two FRBs proceed in a straight line in line astern formation approximately 3 boat lengths apart at a speed of about 15 knots.
 - The helicopter approaches astern the lead boat and positions itself so that the pilot looks straight down at the stern of the front boat at a height of about 10 to 20 metres. (See Figure 9:11).

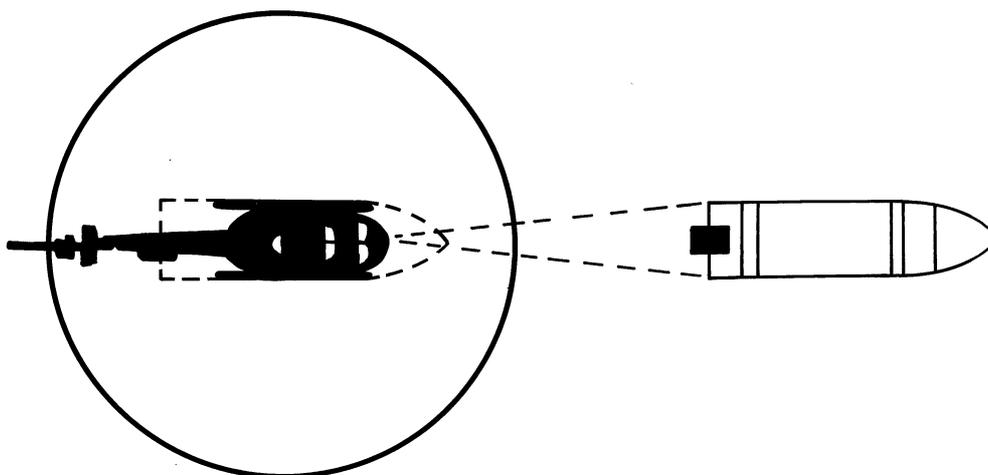


Figure 9:11—Helicopter Winching Position

- The helicopter should then be directly above the rear FRB and the crew can winch directly to or from the rear boat (see Fig 9:12).

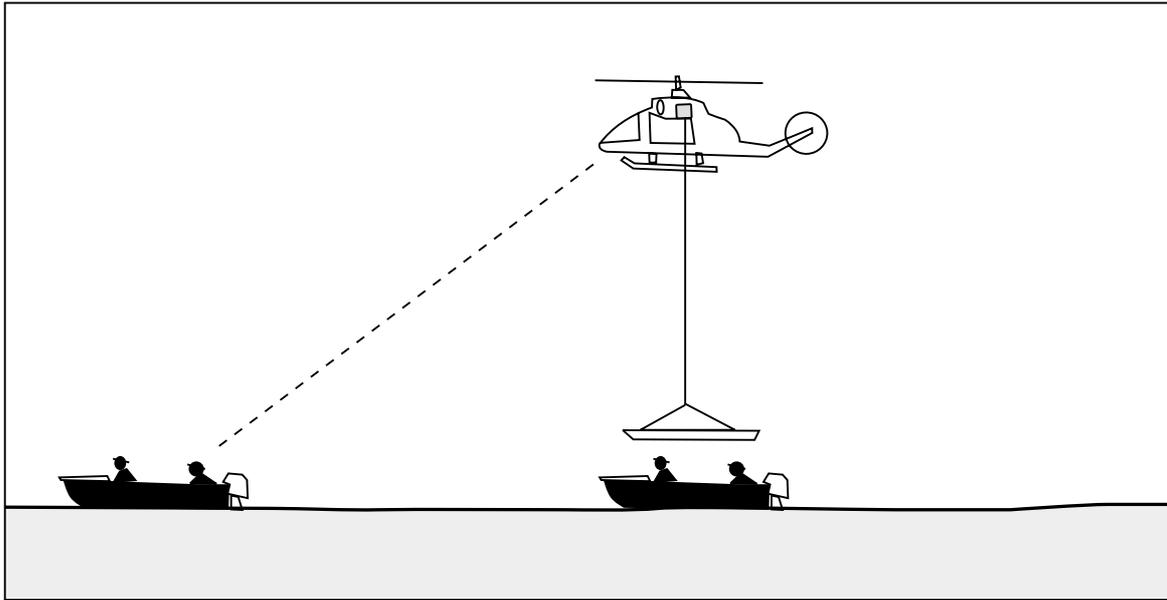


Figure 9:12—Helicopter Winching Position

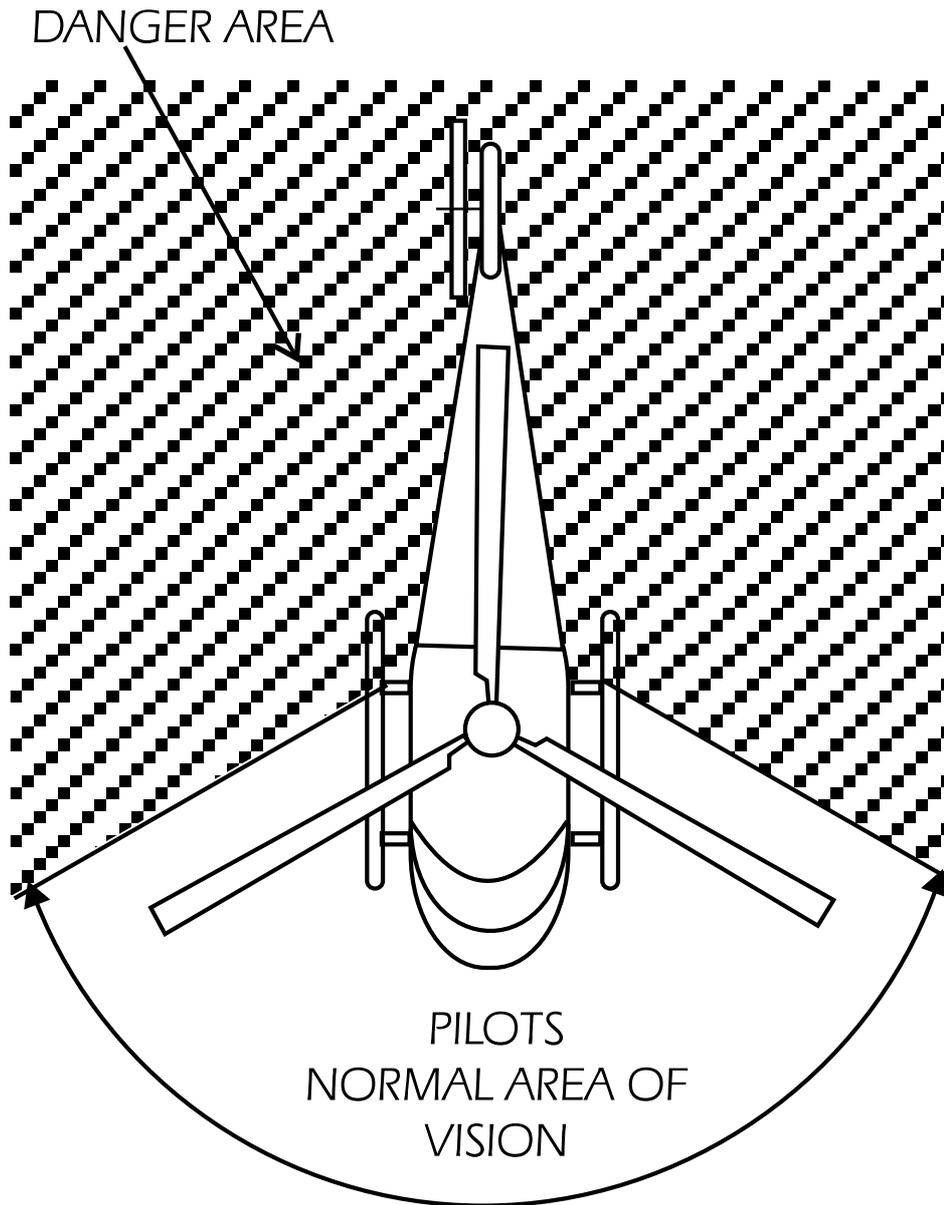
- 9.60** Should a passenger from an FRB need to be winched into a helicopter when only one boat is available, the following procedure should be observed:
- The boat may be secured fore and aft by anchors or some other means.
 - The winch cable and sling can be dropped into the water as near the FRB as possible and the passenger should swim to the sling. For this to occur, the passenger must not be injured, and the crew will need to explain the winching procedure to the passenger. This method is dependant on calm conditions with little or no current.

WIND

- 9.61** All aircraft are affected by wind. Where possible the FRBs should be moving into wind to allow the helicopter to approach into wind. Excessive cross wind or down wind approaches may result in the pilot aborting the mission.

FAMILIARISATION TRAINING

- 9.62** All FRB crew that are likely to have to work with helicopters should undergo appropriate familiarisation training.
- 9.63** For further general detail on working with helicopters refer to the Australian Emergency Manual—*Land Search Operations*.



APPROACH AND DEPART ONLY FROM THIS AREA

Figure 9:13—Approaching a Helicopter

EMERGENCY DRILLS

FIRE DRILL

1. All FRBs must carry fire extinguishers. The extinguishers must be positioned where they can be easily stowed, seen, and picked up rapidly if necessary. They must never be stowed where stores or other equipment can be placed on them.
2. The extinguisher must be placed away from fire sources eg fuel tanks or motors. If these catch fire it may not be possible to reach the extinguisher. If these catch fire it must be possible to reach the extinguisher.
3. In the event of fire, the following procedures must be carried out:
 - a. If possible steer the boat to keep the fire downwind. This may prevent the flames being fanned or the flames blowing back the boat.
 - b. Fight the fire.
 - c. If possible clear the area of gear, equipment or flammable equipment.
 - d. Cut off fuel and isolate tanks, if necessary and possible, throw tanks overboard.
 - e. If all else fails, capsize the boat.

ABANDONING SHIP

4. This is a last resort action. Ensure everyone is wearing a personal floatation device and check that they are being worn correctly:
 - a. Send a radio signal or activate an emergency signal if possible. Give call sign, location, nature of problem, number of persons involved and what action you are taking.
 - b. Do not jump into the water. You don't know what is below. Ease all persons into the water.

CAPSIZE DRILL

5. If a boat has capsized, survivors should ensure no one is trapped inside the hull and all are accounted for. Recover all floating equipment and take action if possible to reduce equipment loss. The crew and passengers should stay with the boat as the boat will provide extra buoyancy, it is more easily spotted and will provide some protection from obstacles.
6. All persons from a capsized or swamped boat must ensure they are positioned upstream of the hull to provide some protection from debris and to avoid bodies being crushed between the boat and fixed object eg trees, poles, rocks etc.
7. When a capsize occurs:
 - a. Stay with the boat.
 - b. Use it to aid buoyancy and for protection.
 - c. If in flood water where there are trees, obstacles and fences, position the boat between you and the obstacle otherwise you may be trapped.

- d. Right the boat if possible, and reboard. It will be full of water but will still float and provide some all round protection. Once inside, bail and splash the water out and try to paddle to a calm spot.
- e. Remember that the safety of crew and passengers is more important than recovering the boat. If it is unsafe to remain with the boat the master should determine appropriate action.

8. BOAT RIGHTING

It is possible to right the boat by rolling and bailing. To do this:

- a. each crew member attaches a rope to the upwind or downstream gunwale, depending on conditions and passes them over to the opposite side of the hull;
- b. crew members then haul on the ropes as they walk up the hull;
- c. this will create a rolling motion in the hull causing it to come upright; but
- d. when the boat rolls, care should be taken to avoid injury to the crew.

9. Usually when the boat is upright it will still be partially swamped (crew still in water). The next steps are:

- a. one crew member moves to the bow and one to the stern;
- b. the bow crew holds the bow to stabilise the boat;
- c. the stern crew climbs carefully into the boat and bails;
- d. when the water level is sufficiently low the second crew member may enter the boat; and
- e. both crew members continue bailing until the boat is emptied.

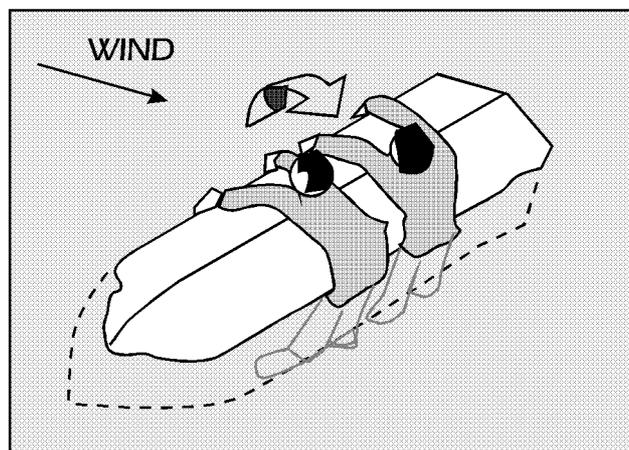


Figure 9A:1—Boat Righting

BOAT PINNING DRILL

10. If the FRB becomes pinned onto a bridge, tree or other obstacle, the crew must take immediate action. Otherwise it is likely that the vessel could be swamped and/or capsized.

The steps in the boat pinning drill are illustrated below:

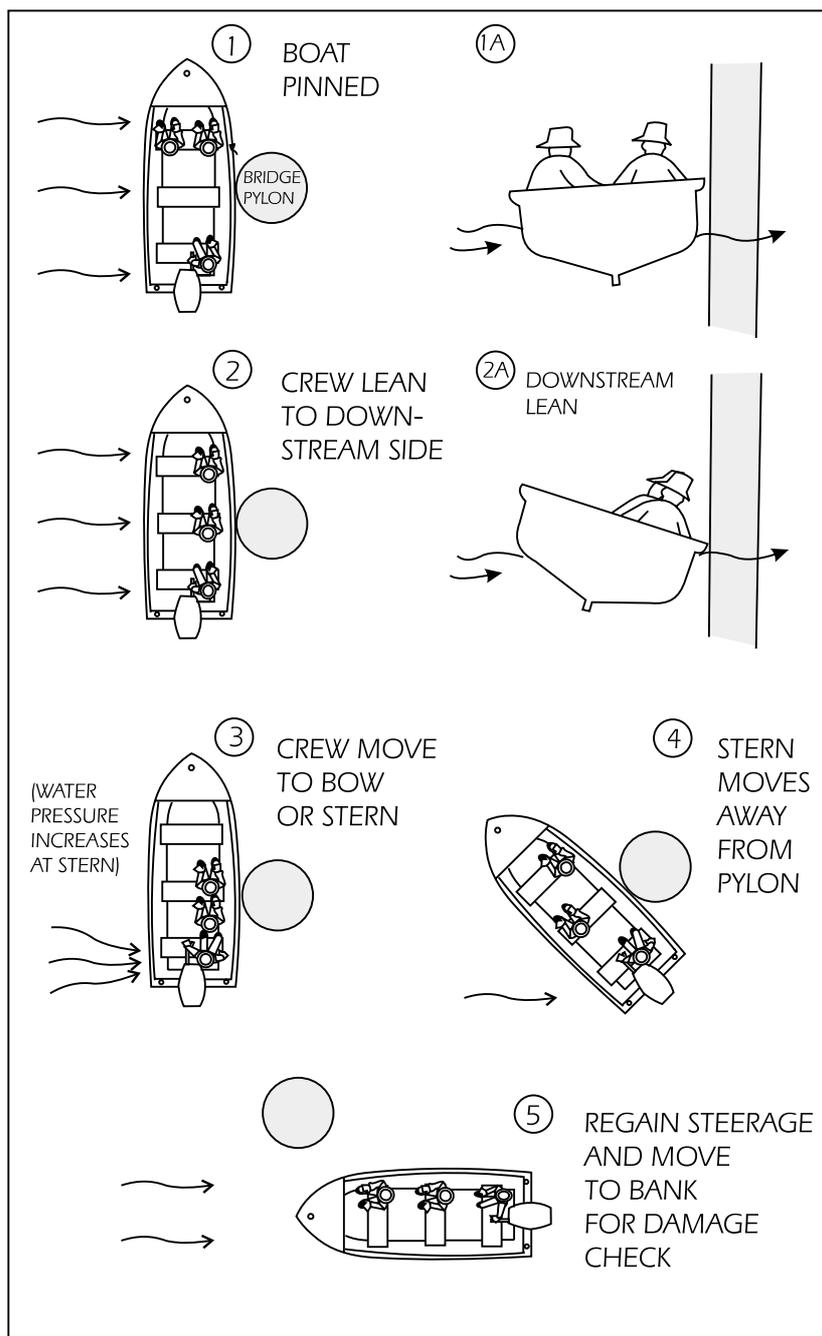


Figure 9A:2—Boat Pinning Drill

MAN OVERBOARD DRILL

11. If a person falls out of the boat the following procedure applies:
- a. Shout 'man overboard' and point to the person, attracting the coxswain's attention. Refrain from excessive movement. If possible throw the person a buoyancy aid.
- Note:** The propeller presents a major hazard to a person in the water. If evasive action needs to be taken, the boat must be manoeuvred in such a way that the propeller does not come into contact with the person in the water.
- b. The observer is to maintain a watch on the person in the water to direct the coxswain to them. At night a light should be kept on the person.
 - c. The crew carry out normal recovery drills of the person in the water.
 - d. When close to the person and if safety permits, the motor should be placed in neutral or stopped.
 - e. If unable to get downstream of the person, an approach may be made from upstream and reverse gear used to match the persons speed through the water while recovery is effected.
 - f. At all times during a recovery great care must be taken to avoid hitting the person and keeping the person away from the the rotating propeller.
12. A person who has gone overboard and finds themselves caught in a strong current should attempt to float on their back with their feet downstream as this will assist in avoiding injury.

FLOOD RESCUE BOAT EMERGENCY PROCEDURES

13. During FRB operations, emergencies of various kinds may arise; be they motor breakdown, loss of motor overboard, illness or injury to a crew member, or an accident of one kind or another. Experience has shown that set rules and procedures will reduce confusion in these circumstances.
14. **ACCIDENT/EMERGENCY**
- Should an accident or an emergency occur during operations involving FRBs the following procedures are recommended:
- a. The FRB concerned makes an immediate radio call and informs HQ of:
 - (1) the problem (eg an accident);
 - (2) seriousness of the problem (ie major or minor);
 - (3) what the crew are doing about it;
 - (4) the location of the incident; and
 - (5) other boats in the vicinity.

15. RADIO FAILURE

Should the FRB in distress lose radio contact as a result of the emergency, or have a radio failure, the nearest FRB to the boat in trouble will contact the HQ. It will then become the communications link with the boat in distress and will stay until its services are no longer required.

EMERGENCY/DISTRESS SIGNALS

INTRODUCTION

1. Any FRB which is likely to operate with aircraft should carry an appropriate radio. When radio facilities are incompatible or otherwise unavailable aircraft should acknowledge an internationally recognised set of visual signals.

AIR TO GROUND SIGNAL CODE

2. This signal code is as follows:

Sequence	Aircraft Action	Meaning to Ground Party
1.	Aircraft orbits ground party at low level changing engine noise.	I require your attention.
2.	Aircraft flies over the ground party at low level and sets off in a particular direction.	Follow the aircraft in same direction.
3.	Aircraft rocks wings and orbits.	Investigate object/position underneath aircraft orbit.
4.	Aircraft drops smoke on a particular location.	Investigate object/position adjacent to smoke.
5.	Aircraft drops message canister.	Retrieve and read instructions contained in canister.

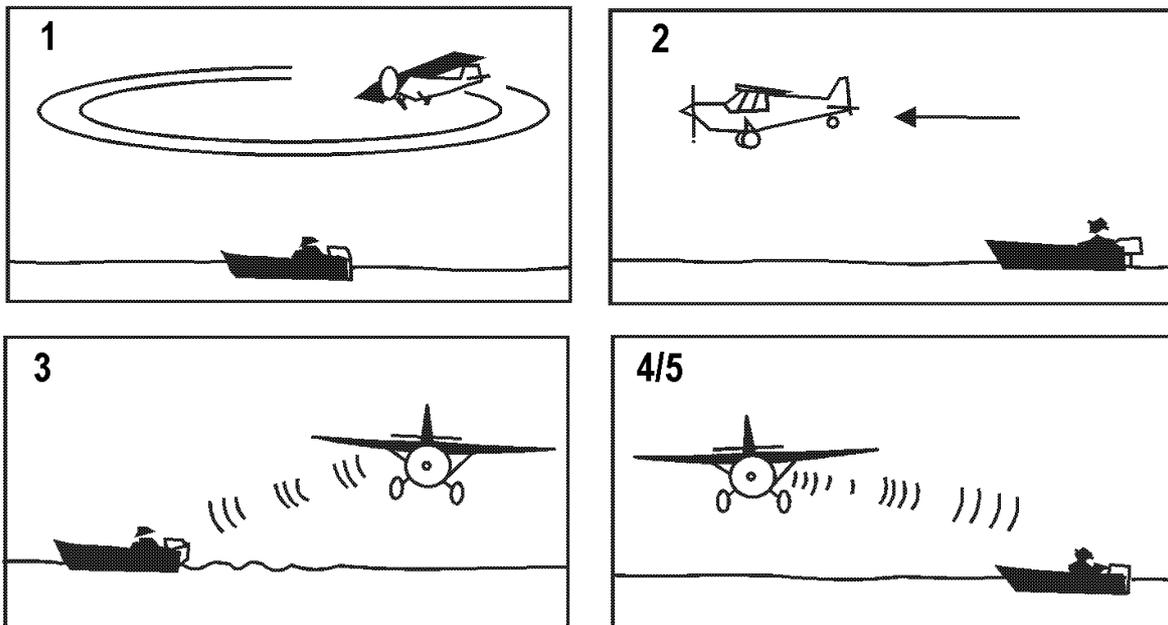


Figure 9B:1—Air to Ground Signal Code

AUSTRALIAN AREA DISTRESS SIGNAL

3. **The 'V' Sheet**—This is a nationally recognised distress signal and should be treated as such. In the event of a boat being swamped or disabled, the V sheet may be displayed by tying it to the deck in order to be spotted from the air, or tying it vertically between two oars or poles to be spotted from the shore.

GROUND TO AIR SIGNAL CODE FOR USE DURING EMERGENCY OPERATION

4. Directions for use:
- Lay out these symbols using pieces of wood, stones, or any other available material.
 - Provide as big a colour contrast as possible between the material used for the symbols and the background against which they are exposed.
 - Symbols should be at least 2.5m (approx, 8") in length or larger if possible. Care should be taken to lay out symbols exactly as depicted to avoid confusion with other symbols.
 - Signals must be obliterated after the request has been met to avoid waste and duplication of effort.
 - It is of the utmost importance that these symbols be used only during times of actual emergency. As soon as the service requested by the use of these symbols has been fulfilled the symbol should be removed or obliterated immediately.

NATSAR ground-air visual signal code for use by survivors

<i>Message</i>	<i>Symbol</i>
Require assistance	V
Require medical assistance	X
Proceeding in this direction	→
Yes (affirmative)	Y
No (negative)	N
International symbol	SOS

NATSAR ground-air visual signal code for use in civil emergencies

<i>Message</i>	<i>Symbol</i>
Require fodder	FF
Require evacuation	III
Power failure	VI

Source: Commonwealth of Australia (1997), National SAR Manual, AMSA, Canberra

USE OF THE PRO-WORDS 'MAYDAY' AND 'PAN'

5. A 'MAYDAY' situation is one in which you are in grave and imminent danger and you require immediate assistance; eg you are sinking. In other words immediate assistance is required to provide safety of life. A 'PAN' situation is one involving the safety of a boat or person but there is no immediate danger; eg you require medical advice or assistance but not of a 'life or death' nature, or you have run out of fuel and are drifting, but not in any immediate danger.

FLARES

6. Flares and smoke pyrotechnics are recommended for vessels operating in remote areas.

POSITION LOCATORS

7. Vessels may be fitted with EPIRB (emergency position indicating radio beacon) or PLB (personal locating beacon), particularly if they are operating in remote or isolated areas.

FRB TYPES AND OPERATIONAL USES

1. FRBs come in a number of different configurations for different purposes. Common types are the V-hull, flat bottom (or punt) and the Inflatable Rescue Boat (IRB). Control configurations include tiller control, forward control or console control. Each vessel type and configuration has its advantages and disadvantages. FRB crew should be familiar with all the types and configurations of vessel they are likely to operate in their area.
2. In general, FRBs must be robust and able to cope with the most common operational use in their area. The operational use should dictate the hull type chosen.
3. The following table provide some guidance on the different characteristics and operational uses for the different hull types. The tables are generalisations and provide a guide to stimulate discussion on the most useful vessel for a particular purpose. Often, only one type of vessel is available and it may have to be used sub-optimally.

Characteristics and operational uses of different FRB hull types

V-Hull	Flat bottom	IRB
low maintenance	low maintenance	high maintenance
keelson for protection and strength	no keelson	no keelson
highly manoeuvrable	low manoeuvrability in confined waters	highly manoeuvrable
Suitable for rough and choppy water	Prone to ship water in rough and choppy conditions	Especially suitable for rough and choppy water
Generally deep draft	Generally moderate draft	Generally very shallow draft
Suitable for high velocity flowing water of sufficient depth	Less suitable for high velocity flowing water	Suitable for high-velocity shallow water
Moderate load capacity	high load capacity	limited load capacity

- e. It is of the utmost importance that these symbols be used only during times of actual emergency. As soon as the service requested by the use of these symbols has been fulfilled the symbol should be removed or obliterated immediately.

NATSAR ground-air visual signal code for use by survivors

<i>Message</i>	<i>Symbol</i>
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No (negative)	N
International symbol	SOS

NATSAR ground air visual signal code for use in civil emergencies

<i>Message</i>	<i>Symbol</i>
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Require evacuation	III
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CHAPTER 10

CASUALTY HANDLING AND RECOVERY OPERATIONS

CASUALTY HANDLING IN FLOOD RESCUE BOATS

- 10.1** All FRB crew should have current first aid qualifications. When it is necessary for crews to go ashore to conduct rescue and transport of injured, the following points must be observed:
- a. Secure the boat correctly.
 - b. Once ashore remove life jackets to avoid snagging.
 - c. First-aid equipment (kits, blankets, stretchers, lashings etc.) should be taken from the boat to save time.
 - d. If on call-out, the operation is identified as a casualty evacuation, take an ambulance officer if possible.
 - e. If a HF radio is to be used ashore and the terrain is bushy or rough, turn it off and remove the aerial to prevent damage whilst travelling.
- 10.2** Crews may encounter various types of casualties. If there are doubts as to the severity of injuries or illnesses or the treatment required, professional advice should be requested. If practicable, an ambulance officer, doctor or nurse should be requested to give instructions.

TRANSPORT OF THE INJURED

- 10.3** Stretcher cases are to be blanketed and lashed to the stretcher, if necessary, and transported to the FRB. Before a stretcher is loaded into a FRB, the lashing should be removed from the patient and a life jacket fitted, having regard to injuries.
- 10.4** Patients are not to be lashed to the stretcher again until they have been removed from the boat. The stretcher is lashed into the boat. A person qualified in first-aid is to attend to patients and reassure them during the trip.

RECOVERING PERSONS FROM WATER

- 10.5** The procedure for recovering a person or body from the water will be governed by a number of factors. These include:
- a. area of operations;
 - b. resources available;
 - c. current;
 - d. weather, in particular, wind;
 - e. calm or rough water;
 - f. whether or not the victim is capable of assisting in the rescue; and
 - g. hull type.

10.6 Whatever the situation, it is essential that the master should carefully plan the operation. A hasty, unsuccessful reaction can cause loss of time, further endangering the life of the victim.

10.7 The master must exercise firm control during the operation, especially if there are persons other than crew members in the boat. It is essential that silence be maintained so that;

- a. the coxswain's orders may be heard; and
- b. possible noises from a victim may be pinpointed.

10.8 Wherever possible, a person should be recovered from the water over the side or stern. If the casualty must be taken aboard over the side of the boat, special care must be taken to maintain the balance of the boat. Never rock the boat to bring the casualty aboard due to the possibility of swamping or capsizing. When recovery is over the stern, the motor must be stopped, not merely out of gear.

10.9 STILL WATER

The procedure for the recovery of a person from still water is:

- a. Attract attention of the coxswain or crew by shouting 'person in water'.
- b. If the person is capable of self-assistance, a buoy or a life jacket (at night a waterproof torch should be attached) should be attached to a line and thrown near them. Do not throw items to the person unless it is certain that they can reach them.
- c. The crew must keep the person in sight. At night, a light is to be kept on the person.
- d. The coxswain must:
 - (1) slow down;
 - (2) plan the pick-up;
 - (3) stem the current and/or approach into wind; and
 - (4) approach as slow as possible.
- e. If the pick-up is missed, the coxswain should go around in a large circle, rather than risk failing again with a short cut approach. It must be emphasised that the procedure outlined above is for still water and ideal conditions.

10.10 FAST-FLOWING WATER

Help the person in the water to hold on to the side of the boat well away from the propeller. The boat should then be turned into the current and the person taken over the side of the boat. Some weight should be placed on the opposite side of the boat for balance to prevent capsizing.

10.11 DANGEROUS CONDITIONS

A recovery in fast flowing, dangerous flood water requires an approach into the current with the coxswain stemming the current. Manoeuvre so that the person in the water drifts down the side of the boat. They must be grabbed before they get near the propeller and secured so that they are kept away from it.

10.12 The boat is then steered towards a safer area, at the same time sheltering and protecting the person in the water by keeping the hull between them and any debris floating down.

- 10.13** Care must be taken not to broach the boat thereby increasing the risk. The coxswain must head the boat across the current.
- 10.14** No attempt should be made to take the person over the bow. Not only could they receive injury from floating debris if the boat is stemming the current, but the boat could pass over the top of them if an attempt was made to retrieve them while moving with the current.

RECOVERY OF INJURED PERSONS

- 10.15** The pick up operation is as previously described. However, if persons in the water are unable to help due to injuries, the crew must recover them having regard to their injuries. Two methods can be safely used to recover people that cannot assist themselves from the water.

10.16 BASKET STRETCHERS

The procedure is as follows:

- a. Attach life jackets to the foot end of the stretcher (if required).
- b. Position the boat alongside the person.
- c. Position the stretcher underneath the person.
- d. Then float the foot end of the stretcher until the stretcher is at right angles to the boat and the head end is closest to the boat.
- e. Grasp the head end of the stretcher and lift it on to the gunwale.
- f. Slide the stretcher over the gunwale and into the boat.

10.17 RECOVERY BOARD

A device that can assist in the recovery of a person from the water is a recovery board. Spinal boards that are purpose-designed for water recovery are commercially available. (Never use a spinal board that is not specifically designed for water recovery). Alternatively, a recovery board can be made using 20 mm marine ply or similar material and consists of:

- a. a board 1300 mm x 350 mm to which is bolted, at about half the length of the board;
- b. a pivot made of 50 mm water pipe about 400 mm long; and
- c. rope handles are attached through holes drilled at the head and sides of the board. (See Figure 10:1).

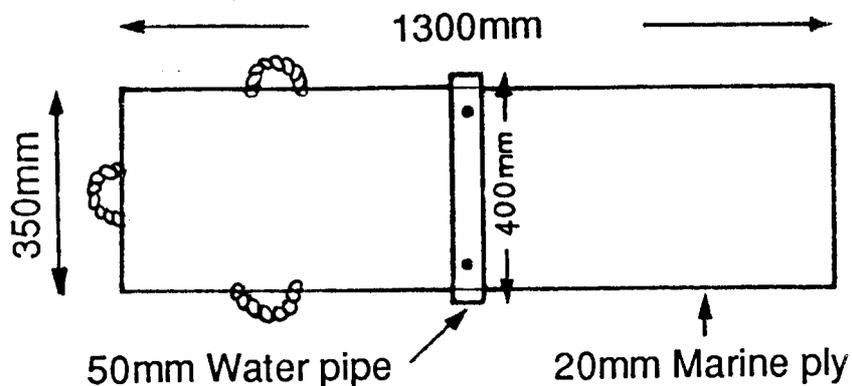


Figure 10:1—Recovery Board

10.18 RECOVERY BOARD USE

In order to use a recovery board the following actions are taken:

- a. the board is placed vertically outboard of the gunwale with the pivot resting on the gunwale;
- b. the casualty's back is positioned against the board;
- c. two crew members grasp the victim under the armpits and the casualty is pulled up the board;
- d. simultaneously, the board is pivoted to the horizontal position; and
- e. the board, supporting the victim, is then lifted inboard.

If available, additional crew members may assist in supporting the board during recovery.

10.19 If suitable equipment is not available it may be necessary, depending on injuries, to tow the person to shore or shallow water to undertake recovery. If this is not possible then casualties must be recovered the best way possible with regard to injuries. In these situations the boat is trimmed so that the gunwale is closer to the water line so as to assist with the recovery of the casualty.

10.20 RECOVERY WITHOUT EQUIPMENT

Casualties can be brought into the boat without using equipment if necessary. The technique is to roll the casualty aboard over the gunwale, either from a position parallel with the boat's side or head-first into the boat. This technique is particularly suitable for IRBs. FRBs with high freeboard (such as many of the large, flat-bottomed transport vessels) are generally not suitable for this type of recovery. Caution is needed when rolling a casualty in head-first, to avoid injury. **Never attempt to lift a casualty into a boat on their back.**

CHAPTER 11

UNDERWATER SEARCH AND RECOVERY

INTRODUCTION

- 11.1 In order that a search for a missing person or overdue vessel is effective, it is essential that search patterns and procedures should be planned and rehearsed so that FRB crews can work together and join in with police, and other search vessels with a minimum of difficulty or delay.
- 11.2 However, FRB crews often operate in country areas where there are no boating facilities belonging to other organisations and therefore, they will have to carry out search operations using their own resources.
- 11.3 Lakes, rivers and estuaries are the areas in which FRBs are equipped to operate and they are usually the best vessels to carry out basic search operations on inland waters.

11.4 BASIC UNDERWATER SEARCH/RECOVERY

This chapter is only a basic coverage of underwater search and recovery. It deals mainly with FRB operational aspects of the topic. It does not aim to cover specialist areas such as use of divers, river fences, etc.

11.5 MARINE SEARCH/RESCUE

Full details of marine surface search and rescue considerations, planning procedures and search patterns are given in the 'National Search and Rescue Manual' published by AusSAR.

DROWNINGS

- 11.6 FRB crews must be prepared to assist with searches for drowned or suspected drowned persons. Police have responsibility for such operations, particularly in relation to coroners' inquests, and any involvement must be at police request and under police direction. Crews may also be tasked to search for other objects.
- 11.7 The remainder of this chapter deals only with the underwater aspects of search operations. However, surface and land search techniques should also be employed in conjunction with underwater methods where necessary. Refer to the Australian Emergency Manual—*Land Search Operations*.

OPERATION AT SCENE OF DROWNING

- 11.8 A water search recovery team should consist of a minimum of the boat crew plus two. The master will determine the number required in the boat, depending on the task. Two members are to maintain liaison with the police OIC and to act generally as a support team for the boat.
- 11.9 The master is to ascertain from police or witnesses, the location of the drowning and gather as much information relevant to the operation as possible. He/she will then brief the FRB crew prior to their commencement of operations.

- 11.10** Searches can be conducted at night, especially if there is a support team ashore. Normal boat crew changes can be carried out on a roster basis and the shore team can attend to refreshments, fuel generators, floodlights, etc. Before deciding to conduct a search at night all factors, particularly the risks, must be considered.
- 11.11** On calm days, in lakes, ponds, etc, where there is no significant current, the search may be more efficient if the boat is rowed. Most outboards tend to move the boat too fast for effective dragging. The weighting of the dragging/grappling equipment is a matter of experience and practice as it varies due to depths of water and current speeds.

GENERAL INFORMATION ON DROWNED BODIES

- 11.12** The average body has about the specific gravity of water. This means that the body will displace its own volume of water and the volume of water displaced will weigh about the same amount as the body. Therefore, the average body will almost float, sometimes bodies of victims who are fat and bodies of small children do not sink, but remain floating on the surface. As long as the body is totally submerged in the water it will weigh approximately half a kilogram. For this reason, heavy tackle is not needed to make a recovery. The slightest hook in the clothes or body will bring it to the surface provided gentle pressure is used and the hook is not torn out.
- 11.13** When a person falls into the water, the momentum of the fall will make the body sink. The victim will be holding some air in the lungs, and there will be some trapped in clothing, instinctive swimming movements will bring the victim back to the surface. He/she may gasp, take in air and water, and sink again; this cycle may be repeated until he/she finally sinks to the bottom.
- 11.14** The position of the body in the water largely depends upon the amount of water in the lungs and stomach. (See Figure 11:1). In drowning cases where there is little water or no water in the lungs and stomach the body will be in an almost upright position. With less air in the lungs and stomach, the body will be in a crouched position, and with almost no air in the body it will be in a crawling position.

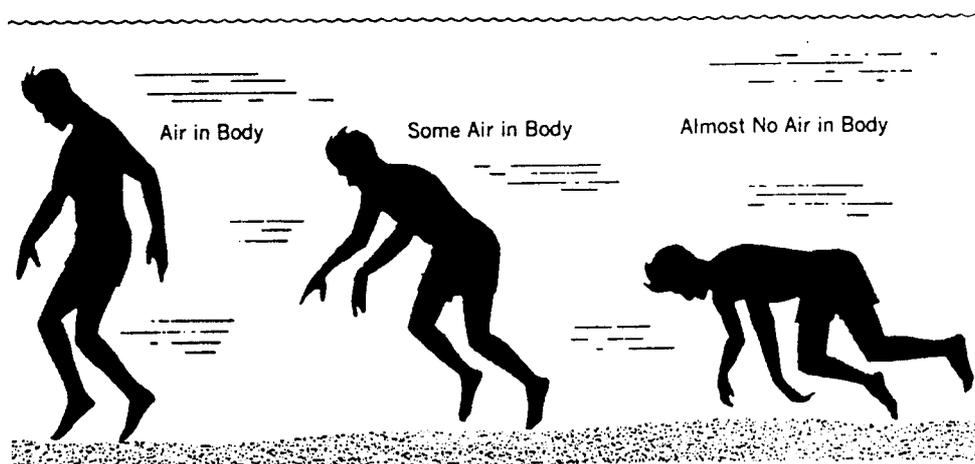


Figure 11:1—Body Positions

- 11.15** A body will rise slowly to the surface when sufficient gas is formed in the intestinal tract to make the body buoyant; this gas is the result of bacterial decomposition. The time to generate the necessary gas will depend upon the

temperature of the water and contents of the victim's stomach when drowned. In summer, the average time is eighteen to twenty-four hours. In winter, or when the water is very deep and cold, the time will be much longer. A body will not rise suddenly from the bottom, but rises gradually as more gas is formed and the body becomes buoyant.

- 11.16** A body will usually remain in the general area where it submerged and will likely be found within 10–20 m of that location. Even with a strong current, it will probably be found within 30–60 m of where it went down. The average body under average conditions will be within one and one-half times the depth of the water for example, if the water is 10 m deep the body will probably be found within 15 m of where it went down.
- 11.17** Where a current exists, or where the victim was wearing a life jacket, a body may drift to the first eddy or deep hole, depending upon the force of the current and obstructions on the bottom. If the body is floating, it may hang up on some obstruction down current or down stream. If a recovery operation has sufficient people available at the scene, it is good policy to dispatch personnel down current on the chance that the body was floating.
- 11.18** Immediately after submersion, if the water is very calm, the victim may be located by a thin stream of air bubbles coming from the body. These bubbles are caused by water pressure on the chest and abdomen forcing out the air remaining in the body. Even under these circumstances, the body may be 3-4 m from the spot where the bubbles are breaking the surface of the water. Other things can give off similar streams of air bubbles, but any such leads should be checked out.

11.19 POSITION FIXING

To gain a fix, all witnesses should be questioned on the location of the last sighting. A line to some prominent object combined with a distance will often give a reasonable accuracy. Even greater accuracy is possible if two or more witnesses can give cross lines to prominent objects. (See Figure 11:2).

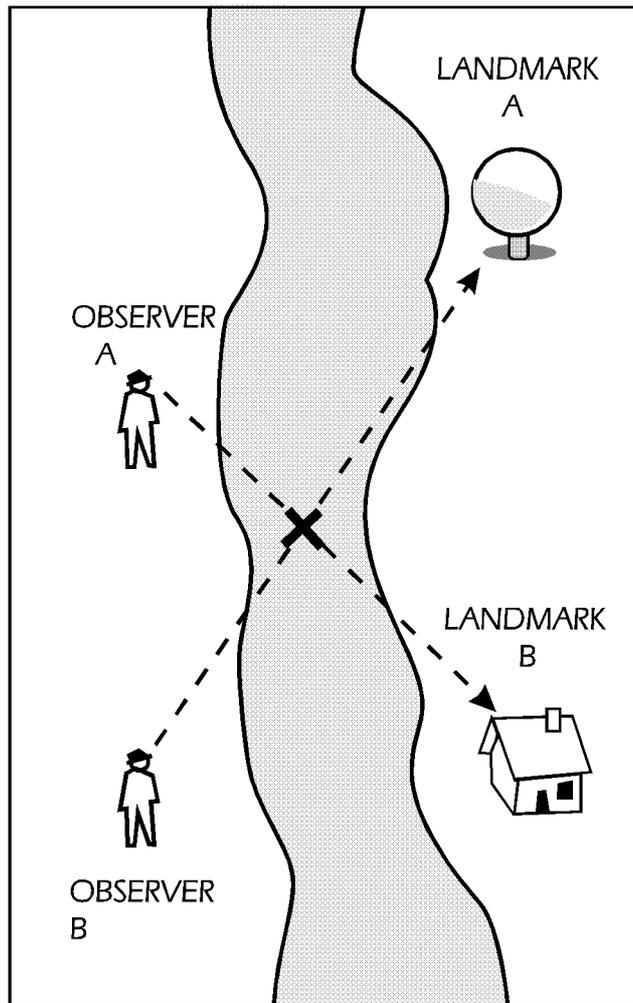


Figure 11:2—Position Fixing

11.20 POSITION MARKING

When the location of the last sighting has been determined it should be marked by a buoy or other marker as soon as possible. The next task for search teams is to determine the current and possible movement of a drowned body in elapsed time. Buoys can then be laid to define the boundaries of the likely area of search.

OPERATIONAL ASSESSMENT

11.21 The initial thought that the master gives to the operation is important if a rapid and successful recovery is to be made. The following should be considered:

- a. Where was the victim last seen?
- b. How long has the victim been submerged?
- c. How was the victim dressed? (eg clothes, swim trunks).
- d. Type of bottom to be searched.
- e. Current flow.
- f. Direction of wind.

- g. Depth of water.
- h. Width of water.
- i. Obstructions, snags, etc.
- j. Banks undergrowth, trees, etc.

11.22 LOCATING STARTING POINT

Where there are witnesses to a drowning, the starting point is relatively easy to determine. If there is no sure fix, the starting point becomes an educated guess based on the information available.

11.23 RECOVERY METHODS AND TOOLS

During the early stage of an underwater search, where there is a small area of probability, the common methods used for the location and possible recovery of a body or object, are by:

- a. probing;
- b. dragging; or
- c. grappling.

Emergency Service units may not have the proper tools for a bottom search, but many suitable tools can be improvised from common items. Some specialist recovery tools are shown at Figures 11:3 and 11:4.

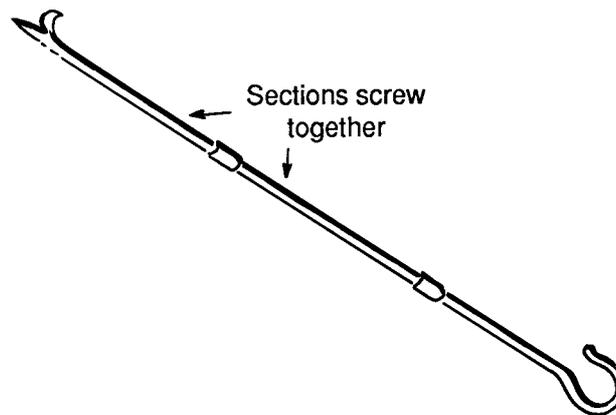


Figure 11:3—Pike/Pole Iron for Probing or Grappling

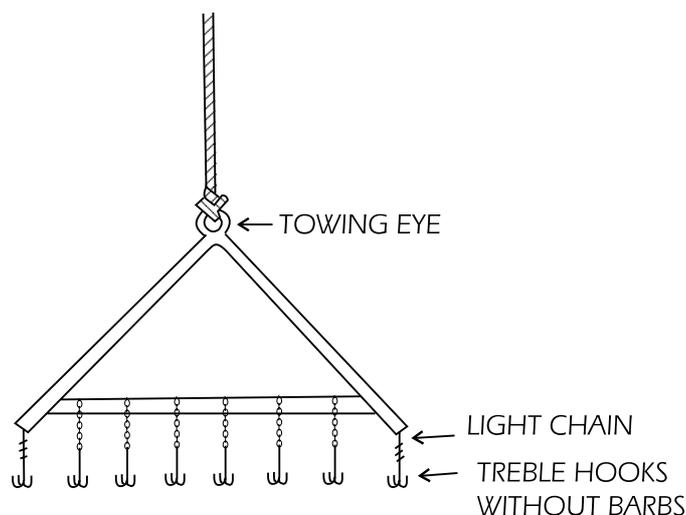


Figure 11:4—Dragging Tool

PROBING

11.24 In shallow water, particularly where there is debris or snags (logs, trees etc) it may be preferable to probe the bottom. (See Figure 11:3). Probing tools can be improvised from boat hooks, garden rakes, hoes, or similar tools, lashed to long poles or saplings. (See Figure 11:5).

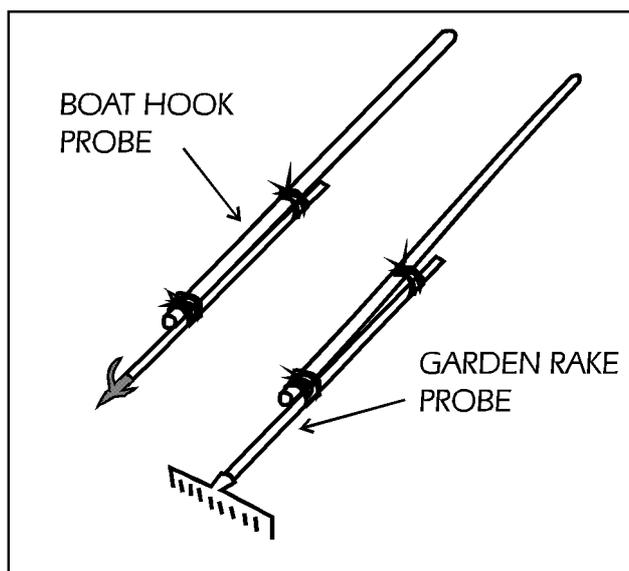


Figure 11:5—Improvised Probing Tools

11.25 The probe may be held in a vertical position and the river bed tamped with quick up and down strokes. This action assists the operator to determine what is being struck by the lower end of the probe and lessens the possibility of the hook becoming fouled with debris on the bottom.

11.26 In most cases, the depth in which it is practical to probe is not more than 5 to 6 metres. This method is not very efficient as it is difficult to ensure complete coverage of the area of probability. It does, however, permit a search through snags or obstructions.

DRAGGING

11.27 Where the bottom is fairly flat and clear of debris or snags, a more efficient method of search is by dragging. (See Figure 11:4). To improvise a drag, weld mesh or a similar material can be used. A panel of the material about 2 m by 1 m is selected, then complete as follows:

- a. A leading edge is created by bending one of the longer edges over, this will assist the device in riding clear of mud and snags. The fold must not be greater than 50 mm in height or it may resist picking up a body.
- b. Transverse frames on the trailing edge are cut from the panel.
- c. Alternate frames are bent up and down to form hooks.
- d. A towing bridle is attached.

11.28 When completed, the device may be used either weighted or unweighted. (See Figure 11:6).

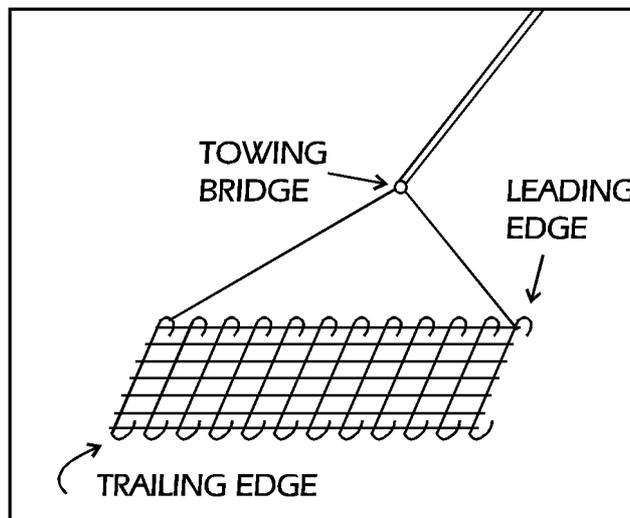


Figure 11:6—Improved Dragging Tool

11.29 If weighted, the drag travels along the bottom, and is intended to pick up a body lying on the bottom. A body coming into contact will normally be lifted onto the device and held by the uppermost hooks.

11.30 If unweighted, the device may pass over a body and snag with the lower hooks.

11.31 The drag is moved in a series of sweeps until the area of probability has been covered. With this method a reasonably detailed search of an area may be effected.

GRAPPLING

11.32 Another method of bottom search is by grappling. (See Figure 11:3). This method can be used in either shallow or deep water. It may be the only practical method in water greater than 15 metres deep.

- 11.33** A fairly readily available improvised grappling hook is a reef anchor. If not carried, a reef anchor can be made up quickly from common materials. To make a reef anchor:
- Cut a 4mm diameter steel rod into four lengths of about 1.3 metres each.
 - Cut a piece of water pipe, about 20 mm internal diameter, into a length of about 150 mm.
 - The steel rods are bent in half and fed through the centre of the water pipe.
 - An eye large enough to accept a shackle or line, is formed through the bent ends of the rods.
 - The free ends of the rods are bent to form four hooks retained by the water pipe. (See Figure 11:7).
 - If desired the anchor hook points may be filed sharp.

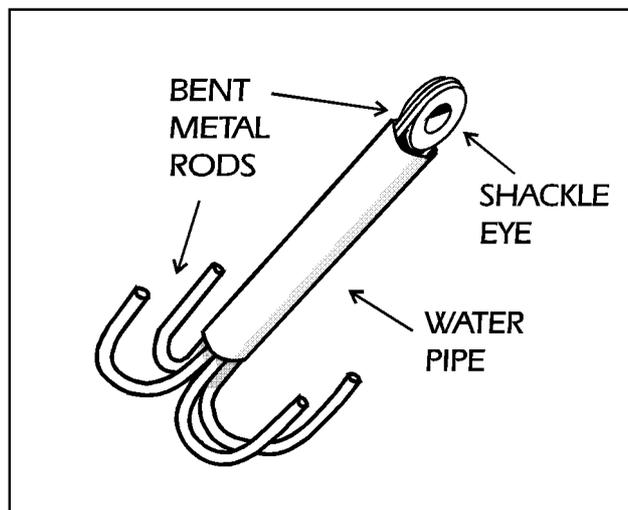


Figure 11:7—Improvised Grappling Tool

- 11.34** The reef anchor may be used by dropping it into gaps between snags or it may be used as a form of drag. A number of small reef anchors made of lighter materials can be attached to a bar to form a drag bar.

11.35 BOAT TO SHORE GRAPPLING/Dragging

One method is where the boat is securely anchored fore and aft. A person on shore does all of the moving by side stepping one half of the length of the dragging bar at each drag. If dragging from position 'A' is not successful, then the boat is moved to position 'B' and the procedure repeated and so on. (See Figure 11:8).

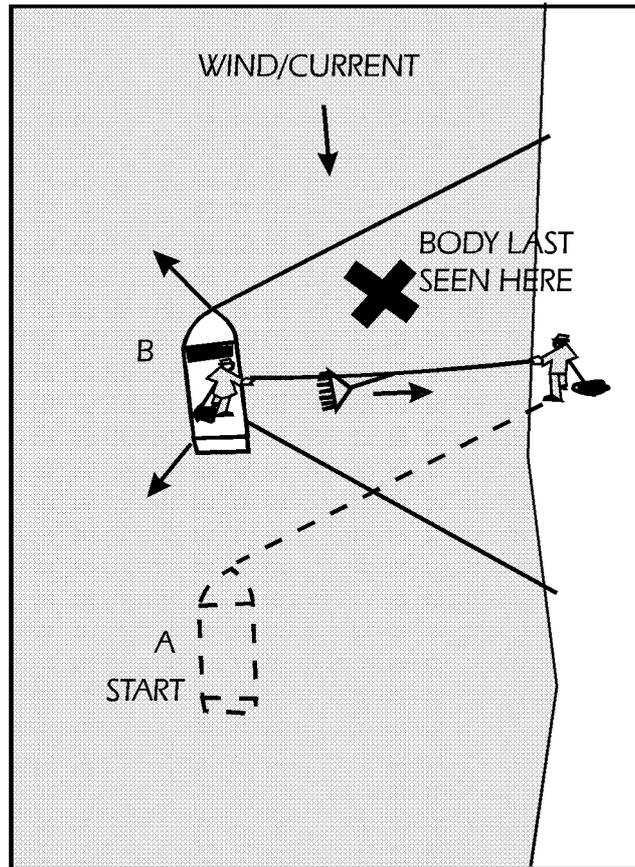


Figure 11:8—Dragging Boat to Shore

11.36 SHORE TO SHORE GRAPPLING/DRAWING

This method is achieved as follows:

- a. Secure the dragging bar and hooks to the centre of the rope which should be twice as long as the width of the area to be dragged.
- b. A minimum of two people will be necessary. One person drops the hooks straight to the bottom. They then signal the other person to draw the hooks slowly to them, allowing them to drag the bottom of the entire width of the area.
- c. If the body is not located both people step one half of the bar length in the direction that it is desired to search. The procedure is then repeated as long as necessary. The procedure is then reversed so that the bottom is covered again from the opposite direction. (See Figure 11:9 overleaf).
- d. Should the above fail, the search area will need to be enlarged in both directions and the procedure carried out again.

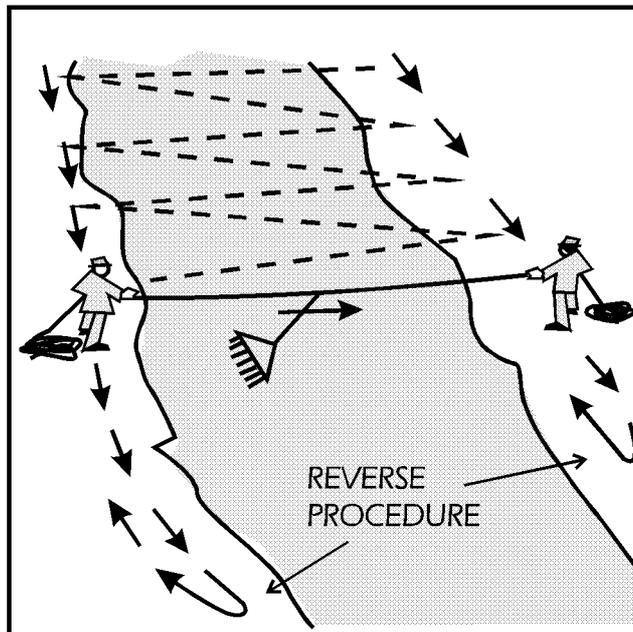


Figure 11:9—Dragging Shore to Shore

11.37 BOAT TO BOAT GRAPPLING/Dragging

The following procedure is usually the most successful where the whole operation must be conducted from the boat, due to the distance from the shore.

- a. Place four buoys to mark the area to be searched.
- b. FRBs should be anchored bow and stern.
- c. FRBs should be headed in the same direction.
- d. FRBs should be broadside to each other at all times. The length of the boat is grappled and then boat 'A' moves forward; one boat length. Boat 'B' then moves up level with boat 'A' and so on.

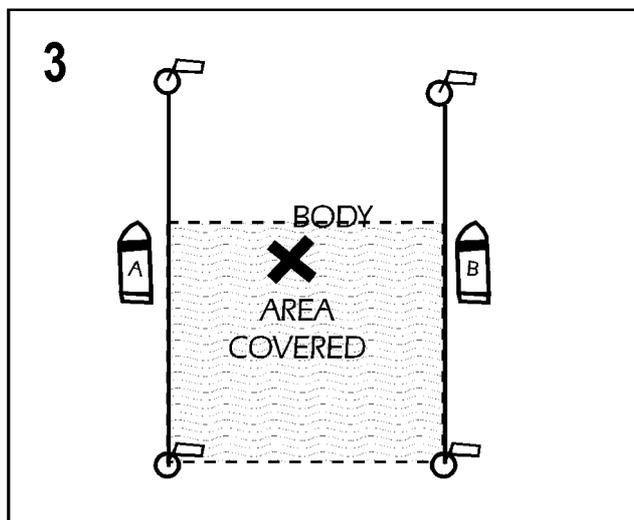
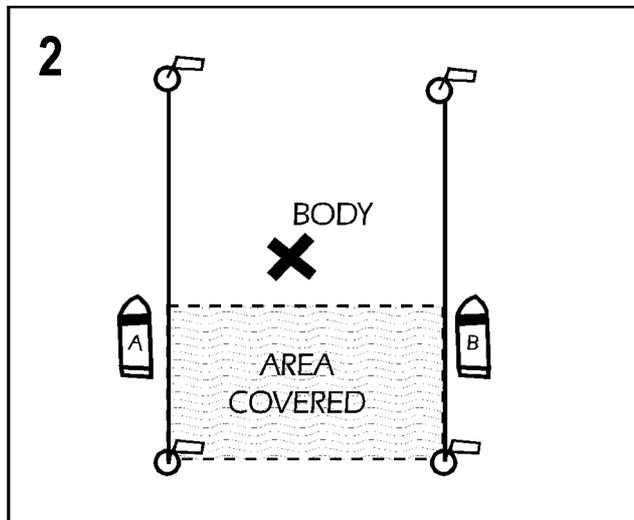
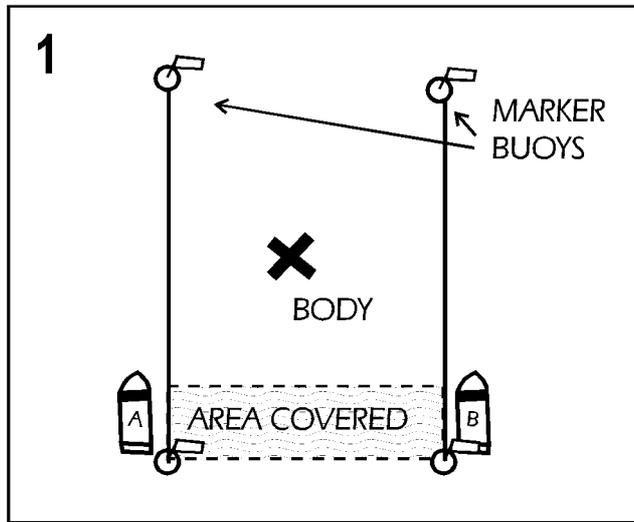


Figure 11:10—Dragging Boat to Boat

11.38 GRAPPLING FROM A MOVING BOAT

The least advantageous method of grappling is from a moving boat since movements can not be controlled perfectly; the entire bottom may not be thoroughly covered. However, dragging from a boat is one means of searching large, deep lakes and rivers. The following points should be kept in mind:

- a. A body submerged in water weighs approximately 0.5 kg and is resting on the bottom; therefore, the grappling hooks must sink to the bottom if they are to make a strike. Fast movements will not permit the hooks to stay down where they can make a solid contact if they hit the victim's body. Examination of many drowned persons shows that the body was hit many times with the drag hooks, but the hooks were moving so fast and with such force that they only slashed the body and did not remain fastened.
- b. It is best to utilize the motor to power the boat upstream with the hooks in the water. If there is no current, rowing into the wind will give the oarsman the best chance to keep the boat on a straight course. Always be sure that each drag sweep overlaps the one just completed.
- c. The search area needs to be clearly defined. Any type of boundary definition that is stable, easily used and easily identified is acceptable. This may include such methods as buoys, fixed reference points, theodolites, etc.
- d. When a number of boats are in use, FRB crews should agree on a formation and make sweeps in the same manner as is recommended for one boat. Special care must be taken to see that each drag path overlaps and the integrity of the search area is maintained.

RIVER FENCES

11.39 If the water has a current such as in a river or creek, a fence placed well downstream and crossing the full width may assist in catching a body being washed downstream. A variety of styles of river fences have been developed to suit various circumstances. Consideration can be given to the use of these fences depending on operational conditions and state organisation policies.

RECOVERY

11.40 Before beginning operations, instruction should be sought from the Police OIC for action on locating or recovering the body or object. Should the search be successful, the Police instructions should be followed, after due consideration for the safety of the crew and boat.

11.41 The location and recovery of a body is likely to create a disturbing reaction among rescue crews. Crew members, who have had little or no experience of such a task, may find a personal revulsion at even the thought of it. Even members who have taken part in previous recoveries probably will find the task distasteful.

11.42 The length of time the person has been dead and in the water will determine the condition of the body. A body that has been in the water for more than a couple of days, particularly if the water temperature is warm, is likely to be unpleasant and even difficult to handle.

- 11.43** To assist in the handling and recovery of a body, it is advisable to wear disposable overalls and take universal precautions against infection. Items carried should include:
- a. a stretcher, preferably a wire basket type;
 - b. a body bag or shade cloth, (a section approximately 2 m x 1.5 m);
 - c. blankets or tarpaulins;
 - d. detergent and disinfectant; and
 - e. a change of clothing for the crew.
- 11.44** When the body has been brought to the surface and before attempting to lift it into the boat, a stretcher should be passed under the body to support the full length.
- 11.45** While a rigid framed stretcher is preferable in the recovery in its absence, shade cloth, a tarpaulin or blanket may act as a substitute.
- 11.46** If a body is located, the following points should apply:
- a. Maintain security of the body.
 - b. Recover the body onto a float or into the boat.
 - c. Keep the boat between the body and shore.
 - d. Do not attract undue attention.
 - e. Treat the body with reverence and care.
 - f. Advise the Police OIC to arrange transfer to shore and hand over. It should be suggested that the landing area be cleared of onlookers if possible.
 - g. Place the body in a body bag or tarpaulin before moving into public view.
 - h. On completion take all necessary hygiene precautions.

WORKING WITH DIVERS

- 11.47** Underwater diving is a specialist task. There may be occasions for FRBs to act in support of divers involved in a bottom search for a body or an object.
- 11.48** If a FRB crew is asked to assist divers in a search, it is the responsibility of the master to liaise with both the Police OIC and the Diving Supervisor to establish clearly the tasks to be carried out by both the boat and the crew. Information which should be sought is as follows:
- a. What is the job of the boat? (eg diving tender, safety boat, surface search, etc)
 - b. What equipment and who will be travelling in the boat?
 - c. What search patterns and methods of operation will be used?
 - d. What safety precautions and signals will be used?
 - e. What speeds and distances should the boat maintain?
 - f. What action to take in the event of a find or a problem?
 - g. What hazards are likely to be encountered?

CHAPTER 12

TIDES AND CURRENTS

INTRODUCTION

- 12.1** This section will, in a very basic form, acquaint FRB crews with some of the peculiarities of tides and currents, and the reasons why they come into being. This understanding must then be related to the flood situation and it is only with time and experience that a master will be able to read the signs and so brief the crews with regard to the way they should handle a particular situation, e.g., when crews are working in rivers with tidal influence, the master should be able to brief crews adequately on the tide state, ebb, flood, slack water, etc., and so put a further safety mantle over the operation due to the increased knowledge.
- 12.2** Some influences that will affect a FRB are the current, leeway from wind and steering. Of these factors, current is the easiest to allow for accuracy.
- 12.3** Its effect will vary greatly with the relative values of current strength, and boat speed through the water, but current influence can be a major factor in piloting.

TIDES VERSUS CURRENTS

- 12.4** Tide is vertical change. Current is horizontal change.
- a. **Tide**—The rise and fall of the ocean level as a result of changes in the gravitational attraction between the sun, moon and earth. It is a relative motion.
 - b. **Current**—The horizontal motion of the water from any cause at all.
 - c. **Tidal Current**—The flow of current between any two points that results from a difference in tidal heights at those points. Tides do not run. They may be high or low.

TIDES

12.5 TIDAL ACTION

Tidal action is a primary cause of currents, and tides themselves are an important factor in the safe navigation of FRBs.

12.6 EFFECTS

The effects of tides will be observed on beaches, in bays, sounds, and up rivers as far as the tidal influence reaches.

12.7 TERMINOLOGY

Coastal regions in which water levels are subject to tidal action are known as tidal areas. Terms used to define tidal action are shown in Figure 12:1 and listed below:

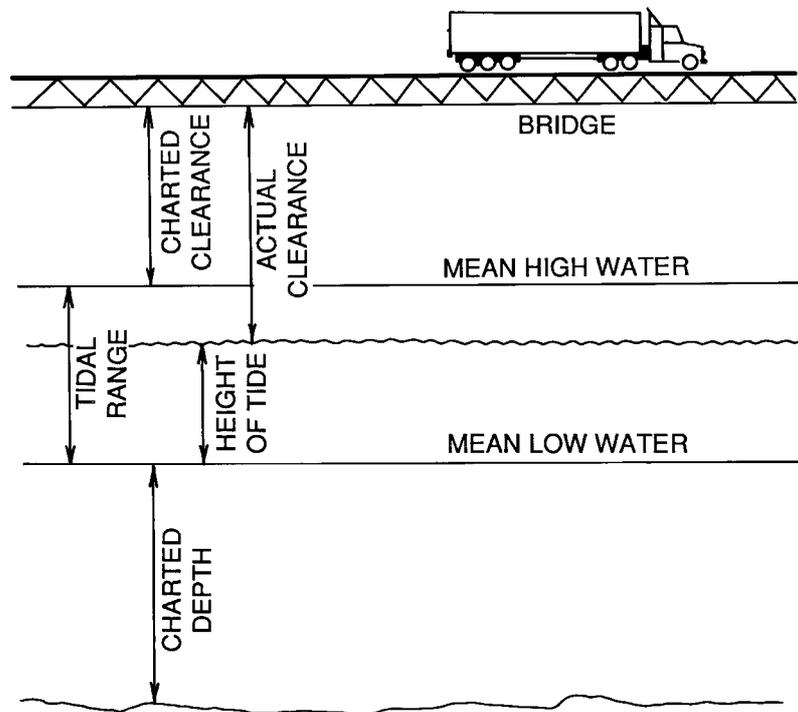


Figure 12:1—Tidal Action Terms

- a. **Height of Tide**—The vertical measurement (at any time) between the surface of the water and the TIDAL DATUM or reference plane. DO NOT CONFUSE HEIGHT OF TIDE WITH DEPTH OF WATER. Depth of water is the total distance from the surface to the bottom.
- b. **High Water or High Tide**—The height level reached by an ascending tide.
- c. **Low Water or Low Tide**—The lowest point reached by a descending tide.
- d. **Range of Tide**—The difference between high water and low water.
- e. **Stand of Tide**—Changes in tidal level do not occur at a uniform rate, but start slowly then increase in rate and then taper off as a flood or ebb is reached. At both high and low tides there will be periods of relatively no change in the level. These periods are called stand of tide.
- f. **Mean Sea Level**—The average level of the open ocean and corresponds closely with the mid tide levels offshore.

12.8 TIDAL THEORY

Tidal theory is based on the gravitational attraction of the earth to the sun and the moon. The earth/sun effects and the earth/moon effects are separate but, in practice, they both occur simultaneously. The sun has a lesser effect on tides than does the moon.

12.9 TIDE TABLES

The basic source of information on the time of high and low water and their heights above or below the datum will be found in the publication 'Tide Tables'. Any predictions appearing in the newspapers or broadcast over radio or TV will have been extracted from these tables. During floods these predictions may be

inaccurate because of the effect of flood waters. Also, extracts are published in the daily papers usually under the weather maps for the day. The following information will be given:

- a. Height and time of high water today and tomorrow.
- b. Height and time of low water today and tomorrow.

There will be a time difference for tides at various datum points around the coast. All boat crews should be aware of this time difference and should check the tides daily when working in estuaries or rivers that are under tidal influence.

CURRENTS

12.10 A current is the horizontal motion of water. This motion may be the result of any one of several factors or a combination of two or three. Some of these causes are of greater importance than others, but masters should have an understanding of them all.

12.11 TIDAL CURRENTS

Boats operating in coastal areas will be affected by tidal currents. The flow of water to and from a given locality is a result of a rise and fall of tidal levels. This flow results in tidal current effects.

12.12 The normal type of tidal current in bays and rivers is the reversing current that flows alternately in one direction and then the other. Tide is the vertical rise and fall of water levels. Current is the horizontal flow of water. Although most FRB operations will be concerned with river and wind driven currents, tidal and sea currents should also be given some thought.

12.13 RIVER CURRENTS

Masters on rivers above tidal influence must take into account river currents. River currents vary as to strength and speed with the width and depth of a stream, the season of the year, recent rainfall and flood conditions. During flood operations current will be one of the most significant hazards that boat crews will encounter.

12.14 In rivers where tidal influences are felt, river currents are merged into tidal currents and are not considered separately. Invariably, the areas in which they meet may produce some unpredictable effects, depending on the tide and time, and crews should be prepared for the unusual at these points.

12.15 WIND-DRIVEN CURRENTS

In addition to consistent sea currents caused by sustained wind patterns, local wind driven currents may be established by temporary conditions. The effect of the wind blowing across the sea or over a lake is to cause the surface of the water to move. The extent of the effect varies with many factors but generally a steady wind of 12 hours or longer will result in a discernible current.

12.16 CURRENT TERMS/DEFINITIONS

Currents have both strength and direction. Proper terms should be used for describing the relevant characteristics:

- a. The drift of a current is its speed. This will be measured in knots in the sea and km/h with regard to river currents. Current drift is stated to the nearest one tenth of a knot or km/h.

- b. The 'set' of a current is its direction in degrees or compass points.
- c. Tidal current is said to flood when it flows in from the sea and results in higher tidal levels. A tidal current ebbs when the flow is towards the sea and the water levels fall.

12.17 SLACK VERSUS STAND

As the currents reverse there are brief periods when there is no discernible flow, and these periods are called slack or slack waters. The time of occurrence of slack is not the same as the time of stand when the vertical rise and fall of the tide has stopped.

- 12.18** Tidal currents do not automatically slack and reverse direction when tide levels stand at high or low water. High water at any given point simply means that the level there will not get any higher. Further up the bay or river the tide will not have reached its maximum height or water and, therefore, will continue to flow in so that it can continue to rise. The current can still be flooding after stand has been passed at a given point and the level has started to fall.

12.19 NEED FOR KNOWLEDGE

Currents, primarily of the tidal type, will affect many routine boating situations. Currents will be definite factors for FRB crews during operations in flood waters, tidal rivers, bays and estuaries. Currents can also affect the safety of flood waters, the boat and crew, if you have estimated your fuel too closely and have run into a 'bow on' current.

12.20 EFFECT ON COURSE AND SPEED MADE GOOD

A twelve knot boat speed and a two knot current (reasonably typical situations) can result in either a ten knot or a fourteen knot, speed made good. The forty percent gain on a favourable current over an opposing one is significant both in terms of times en route and fuel consumed. Lesser currents also have significance. A half knot current will inconvenience a swimmer and make rowing a boat more difficult.

12.21 DIFFICULT LOCATIONS

In many areas there will be locations where current conditions will be critical. Numerous ocean inlets are difficult or dangerous, and in certain combinations of tide, current and perhaps surf, can be fatal. The most difficult conditions will arise at entrances to rivers, bays, etc., where there is some surf and an outward flowing current. Flood waters present similar hazards.

- 12.22** There are a number of narrow bodies of water where the maximum current velocity is such that at times it is not possible for boats to make headway, and FRBs of medium power will also find the going very difficult in such areas.

CHAPTER 13

SURVIVAL

INTRODUCTION

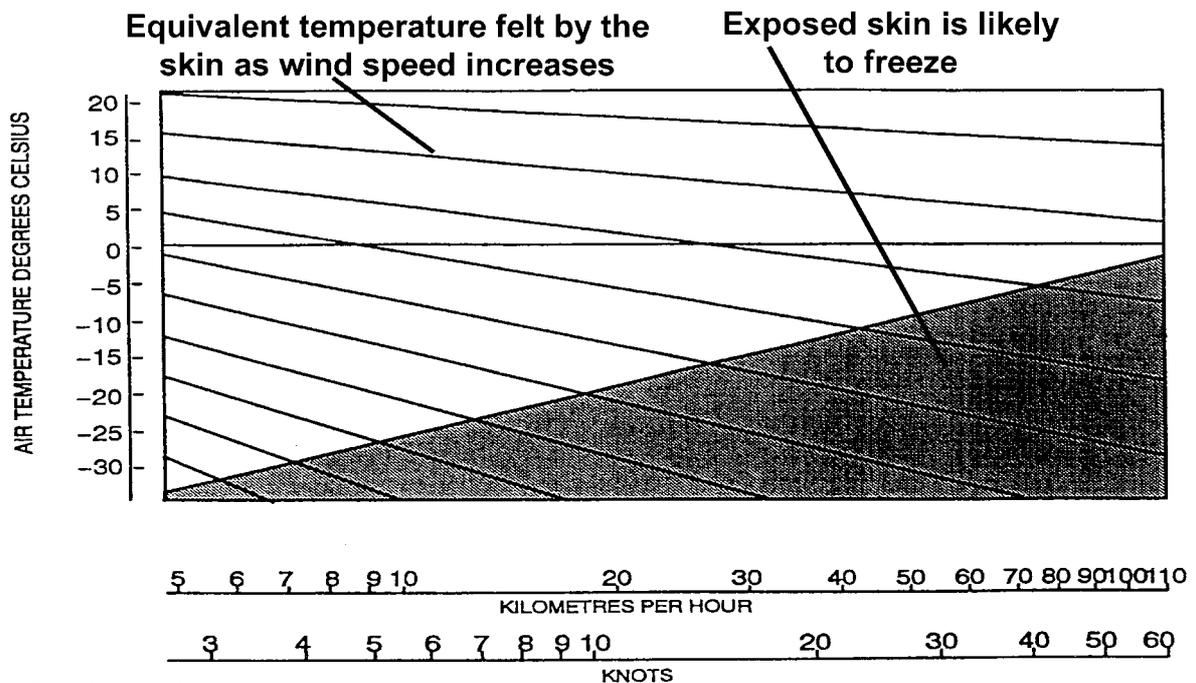
- 13.1** FRB operations often require crew and passengers to work and travel in unfavourable conditions. Boats operate in sun, wind and rain and those travelling in boats are in the open with little or no shelter. There is always the possibility of crew, passengers or the person being rescued being affected by exposure to the elements. The conditions most likely to have an effect are:
- a. heat;
 - b. cold; and
 - c. moisture.

HEAT

- 13.2** In hot weather those persons in an open boat will be subjected to direct sunlight, light reflected from the water, and any light coloured surface such as the boat hull. If the boat is stationary, the effect will be most obvious. While moving the effect is less obvious because of the breeze created by the boat's movement. In either situation, the end result can be similar; after a short period, people can suffer sunburn and/or heat exhaustion.
- 13.3** A person suffering from heat exhaustion will often become pale and cold, have temperature variations, be dizzy and nauseous. First aid for this condition is to cool the casualty by providing shade and rest. A cold drink with added salts may assist.
- 13.4** When operating in hot weather, all crew should wear shady hats or caps and sunglasses and cover up in loose fitting clothing, preferably of cotton. Minimise exposure to the sun and heat, drink plenty of fluids and wear a good sunblock lotion.

COLD

- 13.5** When it is raining, during winter when strong winds are blowing, or when operating at night, cold will have an effect. The most common effect of cold conditions is discomfort, but if not checked, discomfort can extend to hypothermia.
- 13.6** Hypothermia is basically a loss of body core temperature. The human body has a body core temperature of about 37°C. With prolonged exposure to cold, people may tend to lose body heat faster than the body can cope. With this loss of body heat will come a loss of efficiency, injury or even death. A loss of as little as 2°C in body core temperature will cause serious hypothermia.
- 13.7** Where there is any wind, a 'wind chill' effect can be created even when the still air temperature is quite high. An example of wind chill effects is shown in Figure 13:1.



Graph provided from Data provided by
AUSTRALIAN BUREAU OF METEOROLOGY

Figure 13:1—Wind Chill Graph—Equivalent Temperature Curves
(Source, National SAR Manual)

- 13.8** Possible signs of hypothermia include extreme shivering loss of coordination, mental rigidity, uncaring or flippant attitude, confusion and amnesia muscular rigidity, collapse and unconsciousness.
- 13.9** The first aid for hypothermia involves gently rewarming the casualty by the provision of shelter, rest, warm clothing, warm (never hot) drinks (no alcohol or cigarettes), and huddling together to share body heat.
- 13.10** In cold weather operations, crew should wear layered clothing which can easily be adjusted to changing temperatures. This clothing should be preferably of wool, with a light windproof outer layer, gloves and wool hat or balaclava.

MOISTURE

- 13.11** Wet conditions are common when operating in FRBs. Crews are required to wade, work in the rain or mist and are frequently splashed by waves or spray. When combined with cold and wet conditions, this can be extremely uncomfortable and exhausting and will greatly increase the likelihood of hypothermia.
- 13.12** Another problem relating to wet conditions is immersion. Persons trapped in flooded buildings, marooned by flood water or the survivors of sunken boats may have been immersed in water or exposed to cold for long periods. These conditions may affect the survivability of the victim/s.
- 13.13** Studies have shown that an average person wearing a life jacket and immersed in water has a life expectancy under various conditions, as shown in Figure 13:2.

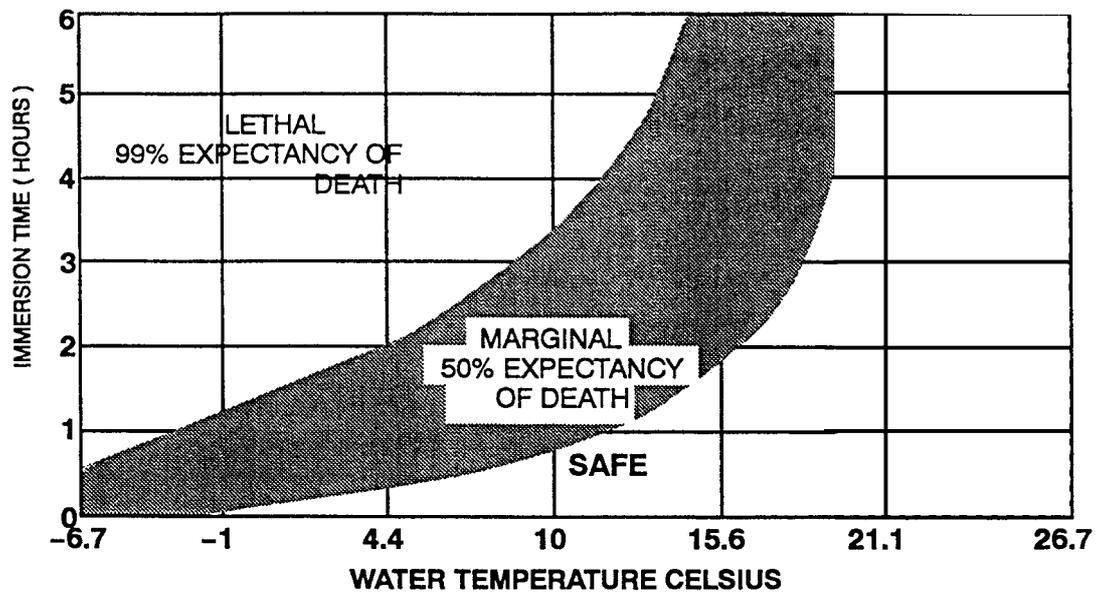


Figure 13:2—Water Chill without Anti-exposure Suit
(Source, National SAR Manual)

- 13.14 The above figures are intended as a guide only. There are many variables relating to individuals and the effect of clothing.
- 13.15 Generally the precautions for wet conditions are similar to cold. Clothing requirements are much the same with the exception of waterproof clothing. Crews are advised to carry a change of clothing.

HEAT ESCAPE LESSENING POSITION (HELP)

- 13.16 A person in the water will lose body heat at a greater rate than in dry air. Attempts to swim or any vigorous movement, while appearing to create body heat, will cause more rapid loss. The areas of the body where the greatest loss of heat occur are the groin, the trunk, the neck and the head.
- 13.17 Where a survivor is unable to swim to shore and is likely to be in the water for any length of time, the rate at which body heat is lost must be minimised. To reduce this rate, a survivor should adopt the heat escape lessening position (HELP). (See Figure 13:3).
- 13.18 In the HELP the chest and groin are protected from much of the heat loss to the water, with up to a 50% reduction in heat loss. To effect this position, the survivor:
- holds the arms so as to cover the sides of the chest and upper body;
 - raises the legs, shielding the groin and chest; and
 - then endeavours to float on the back.
- For greatest effect, it is desirable for the survivor to have floatation assistance.

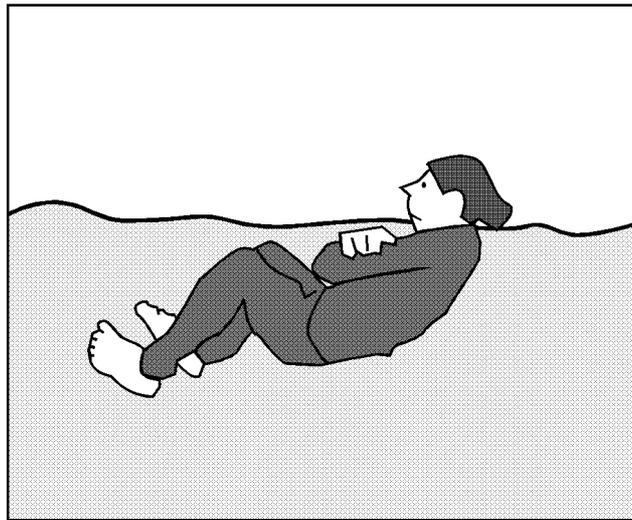


Figure 13:3—Survival Position

Where a number of survivors are in the water, they should huddle together and individual body heat loss will be reduced. Individuals huddled together should shield as much of their collective body trunks as possible. (See Figure 13:4).



Figure 13:4—Huddling Position

SELF RESCUE

- 13.19** Annex A to Chapter 9 of this Manual outlines the procedure to be used if a boat should capsize. It states: 'where safe to do so, crew members should stay with the boat'.
- 13.20** In situations where there is a current and it is not safe to stay with the boat, or where a crew member is swept away from the boat, personal survival becomes the main priority.

13.21 DEFENSIVE POSITION

Once in the water adopt the standard defensive position for swimming in a current ie lying/floating on your back with your feet pointing downstream. (See Figure 13:5). Use your feet to fend-off any obstacles.

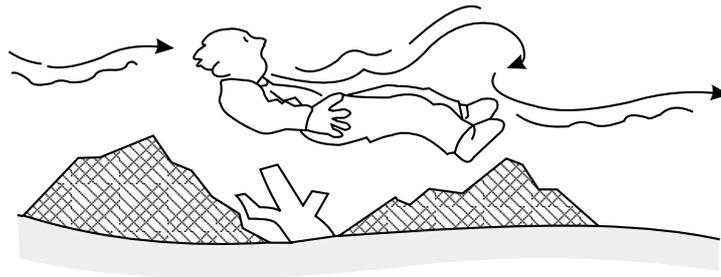


Figure 13:5—Defensive Swimming Position

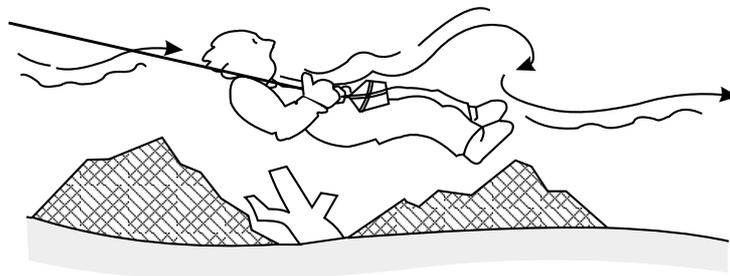


Figure 13:6—Safe Towing Position (helmet should be worn if possible)

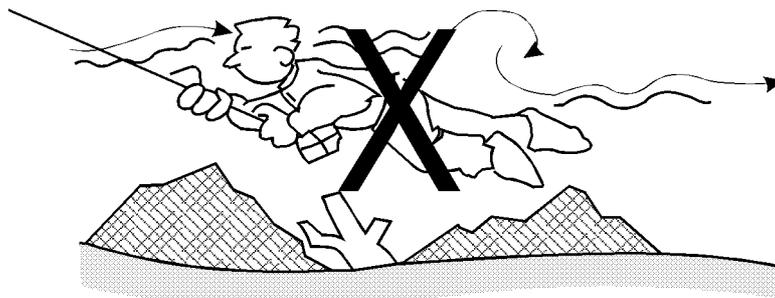


Figure 13:7—Never Face into Flood Water

- 13.22** Try to maintain a horizontal position as near to the surface as possible. A vertical position in the water will increase the possibility of hitting submerged obstacles and/or becoming stuck or snagged. Look downstream for obstacles, calmer water and exit points. Swim with the current and manoeuvre yourself towards calmer water and a safe exit point.
- 13.23** In fast-flowing rivers with tree-lined banks, it may well be safer to stay mid-stream initially, until you find a safe exit point, than to risk being swept into and under trees near the bank.

13.24 In the defensive swimming position you can manoeuvre yourself by kicking your legs back and forward, and paddling with your arms. You can also use your body to 'ferry glide' to help you manoeuvre in the current.

EMERGENCY FEEDING

13.25 FRB masters may be required to effect the rescue of survivors, and should endeavour to have available warm food or drinks to aid in the recovery of casualties. A thermos flask on board the boat, or warm food ready on shore, is probably the most practical means of providing this emergency feeding. Never give hot drinks or food to people suspected of suffering from hypothermia. Small quantities of warm food or drink may be offered instead.

CHAPTER 14

FLOOD RESCUE BOAT PILOTAGE

INTRODUCTION

- 14.1** The ability to pilot a FRB on inland or estuarine waters is an essential skill for all flood boat crew. Coxswains and masters must be able to:
- plan a journey nominating courses, distances and timings; and
 - effect a journey using dead reckoning (DR).

14.2 NAVIGATION

The subjects of Map Reading and basic Navigation are covered in detail in the Australian Emergency Manual—*Map Reading*. Navigation in FRBs is greatly aided if Global Positioning System (GPS) equipment is available.

14.3 PILOTAGE AIDS

In order to pilot a boat on a journey it is usual to have available:

- a compass;
- a map or chart of the area; and
- a watch.

COMPASS INSTALLATION

- 14.4** The compass should be installed in the FRB in gimbals, which always allow the bowl to remain perpendicular to the earth's surface irrespective of the boat's movements. A fair degree of accuracy is achievable however using hand bearing or portable compasses.
- 14.5** The compass lubber line (the line on the compass glass or bowl) should always be parallel to, or directly over the centre line of the boat. This is essential to ensure that the boat's heading is exactly the same as the compass heading. The compass should be placed so that it can be easily seen by the Coxswain.
- 14.6** In FRBs the compass should be of a type readily removed from its mounting so that it can be raised high enough for a bearing to be taken on a distant object. This high position is not suitable for FRB operations, so after the bearing is taken it must be replaced in its lower position.
- 14.7** The crew should be aware that any compass in a boat will be effected by outboard motors and radios.

DEAD RECKONING (DR)

- 14.8** With pilotage, the master will usually use dead reckoning. This is a procedure by which the vessel's approximate location at any time is deduced from its movements since the last accurate determination of position. Piloting and DR are important parts of navigation skills, and although they require the least study, they require the most experience and the best judgment. These skills are used by boat operators on inland waterways. In these waters, the hazards to safe navigation can be quite high.

14.9 The basics of pilotage are direction, distance and time. Other information required will be speed, position, depths and heights. Coxswains must understand how this information is used in calculations and how it is plotted on charts and maps.

14.10 DIRECTION

Direction is the position of one point in relation to another without consideration to the distance in between. When plotting it is essential to always designate the reference used for directional measurement. True (T), Magnetic (M) or Compass (C). Directions are always expressed in three digit form such as, 004, 135, 170 etc.

14.11 DISTANCE

Distance is defined as the spatial separation between two points without regard to the direction of one from the other. Distance is the length of the shortest line that can be drawn between any two points. For FRB purposes the unit of measure is the kilometre.

14.12 TIME

FRB masters will not need an accurate knowledge of the time of the day as they are not navigating by sextant from celestial objects. They must, however, have the ability to keep a check on the passing of time and perform calculations with regard to elapsed time. This can be done with an ordinary wrist watch but a stop watch is more accurate if available. The time of day is expressed in the 24 hour clock system and all crews are familiar with this system.

14.13 SPEED

An essential factor in pilotage is being able to assess speed. Speed is the number of units of distance travelled in a stated unit of time. The basic unit is kilometres per hour.

14.14 POSITION

It is essential that a master is able to accurately describe the position of the vessel. Refer to the following examples.

- a. **Relative and Geographic Coordinates**—Position can be described in relative terms or by geographic coordinates. In defining the relative position, the location of the vessel is described as being a certain distance and direction from an identifiable point, such as a landmark or an aid to navigation. The position may be described with a varying degree of accuracy as determined by the information on which it is based. A master may say that 'I am about one km south west of Black Rock', or it able to be more precise, may say, 'I am 1.2 km, 230 °T from Black Rock'.
- b. **Grid References**—The above example used identifiable objects. It is also possible to state the geographical position in terms of grid references.

14.15 DEPTHS

Water depths are important for two reasons. These are:

- a. preventing grounding; and
- b. for navigational purposes.

14.16 HEIGHTS

The height or elevation of various objects will be of concern to the master. Their height and whether or not they are illuminated at night will determine the objects range of visibility. Vertical measurements from the surface to the bottom of bridges will be of concern as well. This vertical clearance will usually be in metres.

NAVIGATION AT SPEED

- 14.17** Compasses in rough water above a certain speed are less likely to function accurately. They gyrate madly and it is impossible to steer a course by the compass. The bucking and bouncing of the boat will make writing or drawing a line on a chart difficult.
- 14.18** A planing hull will make a lot of leeway which will vary in direct relationship to wind force, direction and the speed of the vessel.
- 14.19** It will be difficult in choppy waters to maintain a constant speed for plot purposes as it will be necessary to slow down occasionally for large waves.
- 14.20** The best action is to limit speed to the point of Maximum Compass Speed. This being the best speed at which it is possible to still read an accurate bearing from the compass.
- 14.21** If high speed is a requirement due to urgency, the navigational problem can be countered in the following ways:
- a. Set the course at a slow speed with the compass functioning normally.
 - b. Line the boat up on a point of land by day or a star or terrestrial object at night. If these are not available, then judge water direction and conditions in relation to your intended course.
 - c. Having headed the boat on the desired course, increase speed ensuring the correct heading is maintained. Slow down occasionally to pick a new mark or to check whether the water direction has changed. Make appropriate provisions for the inaccuracies of this method.
- 14.22** As you will not be able to draw a plot during the voyage, pre-plot your intended course marking in your DR positions every ten minutes or so, calculated at the speed that you think you will average.
- 14.23** Also identify easily recognised transits. Transits are when two objects or points come into line, such as a beacon in line with the end of an island, etc. At each of these you mark in your anticipated transit times. A few minutes spent on your plot will be well rewarded with time saved at the end and a far greater chance of finding the destination.
- 14.24** On the water, constantly check your forecast positions, transits, bearings, etc., with the actual results you are obtaining. Simple variations can be submitted to memory, e.g. running five minutes late every hour, or allowing ten degrees starboard for leeway. However, if the variations become too complex or too great, slow down, re-plot with a proper fix and amend your course, if necessary.
- 14.25** During night operations it is important to check off each mark as it is passed. If the marks do not appear on schedule, assume that something is wrong. Slow down and fix your position as accurately as possible back on the chart.

- 14.26** Constant speeds will be difficult, but your distance run against the clock should give a guide. The greatest problem could be leeway and this can only be assessed by taking a periodic bearing to confirm position.
- 14.27** The results gained from these methods will obviously not be as accurate as those obtained by more deliberate methods. However they can provide sufficient accuracy for the safe operation of Flood Rescue Boats.

REFERENCES

Material used in the development of this manual was taken or adapted from a number of existing publications. The National Working Party extends its appreciation and acknowledgment to the authors editors and publishers of the following:

Australian Search and Rescue (AusSAR)—‘National Search and Rescue Manual’

New South Wales State Emergency Service—‘Handbook for Crews Operating Flood Rescue Boats, February 1971’

Queensland State Emergency Service—‘Flood Boat Operating Manual’

Victoria State Emergency Service—‘Flood Rescue Boat Manual’