CHAPTER ELEVEN

UNDERWATER SEARCH AND RECOVERY

INTRODUCTION

11 01 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 FRBs can work together and join in with Police, and other search vessels with a minimum of difficulty or delay.

11.02 However, FRBs 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

11.03 Lakes, rivers and estuaries are the areas in which FRBs are equipped to operate and FRBs are the best vessels to carry out search operations on inland waters.

OBLIGATIONS AND RESPONSIBILITIES

11.04 Search in Australia is a Police responsibility, so in most instances, callout will be by the Police. Once a callout has been initiated by the Police, FRB operations will follow the normal chain of command.

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

DROWNINGS

11.06 FRB crews must be prepared to assist with searches for drowned or suspected drowned persons. The Police have the responsibility for such operations, particularly in relation to the Coroner's inquest, and any involvement must be at Police request and under Police direction. Crews may also be tasked to search for other objects.

11.07 The remainder of this chapter only deals with the underwater aspects of search operations. However, surface and land search techniques should also be employed in conjunction with the underwater methods where necessary. Refer to the Australian Emergency Manual - Land Search Operations.

OPERATION AT SCENE OF DROWNING

11.08 A water search recovery team should consist of a minimum of the boat crew plus two. The coxswain 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.

11.09 The coxswain is to ascertain from the 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 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 Fig 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.

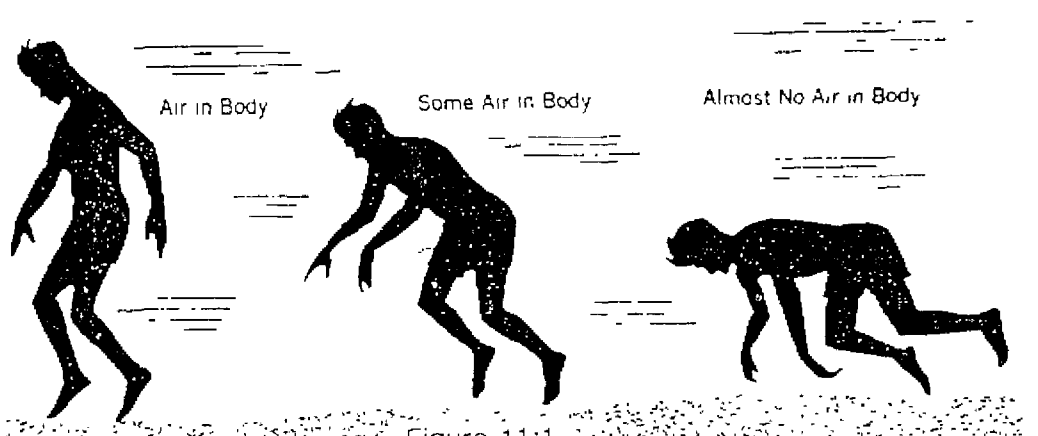


Figure 11:1

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 10-20m of that location. Even with a strong current, it will probably be found within 30-60m of where it went down. It has been established that 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 10m deep the body will probably be found within 15m 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 manpower 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 3-4m 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 Fig 11 2).

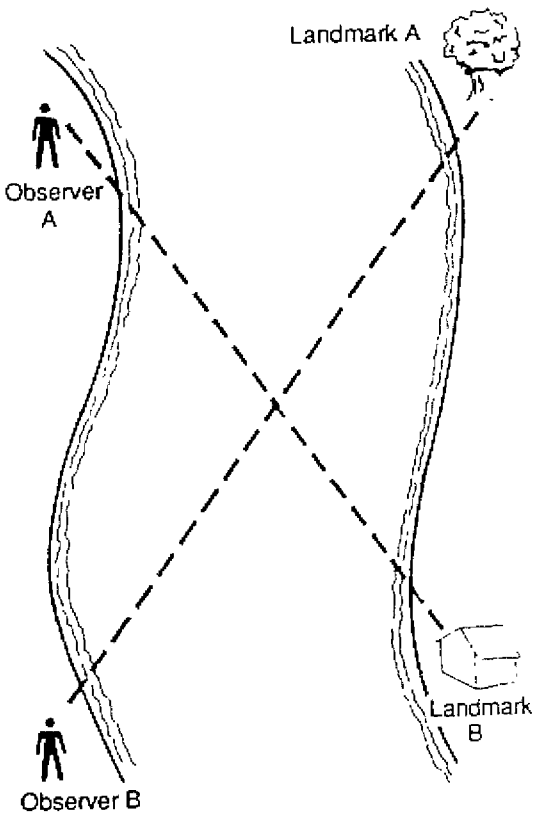


Figure 11:2

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 Coxswain 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

j. Obstructions, snags, etc.

k. 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 Figure 11:3.

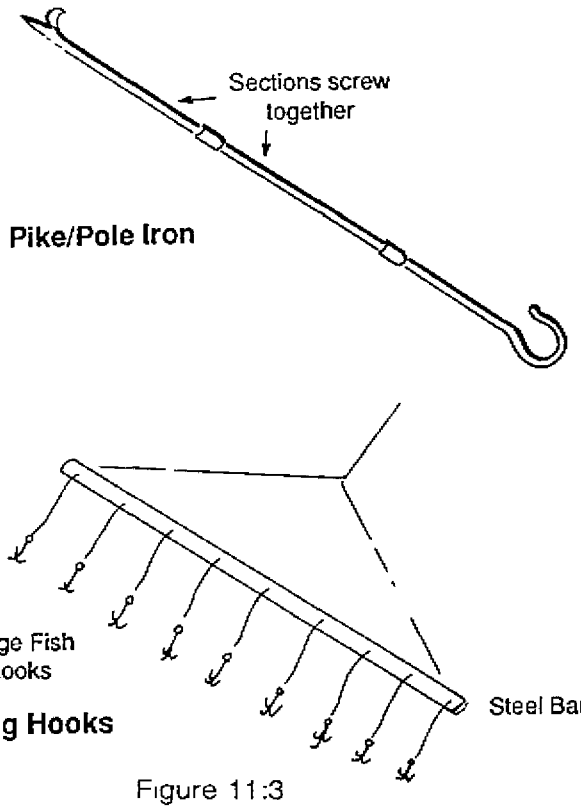


Figure 11:3

PROBING

11.24 In shallow water, particularly where there is debris or snags (logs, trees etc) it may be preferable to probe the bottom. Probing tools can be improvised from boat hooks, garden rakes, hoes, or similar tools, lashed to long poles or saplings (see Fig 11·4).

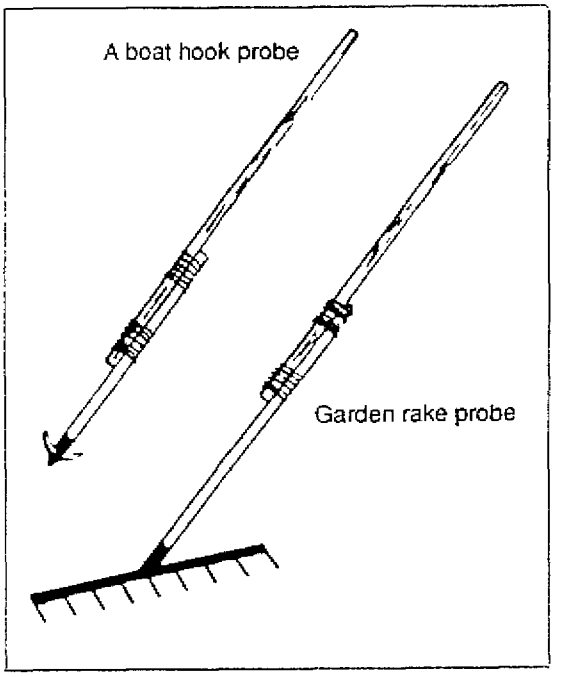


Figure 11:4

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. To improvise a drag, weld mesh or a similar material can be used. A panel of the material about 2m by 1m is selected, then complete as follows.

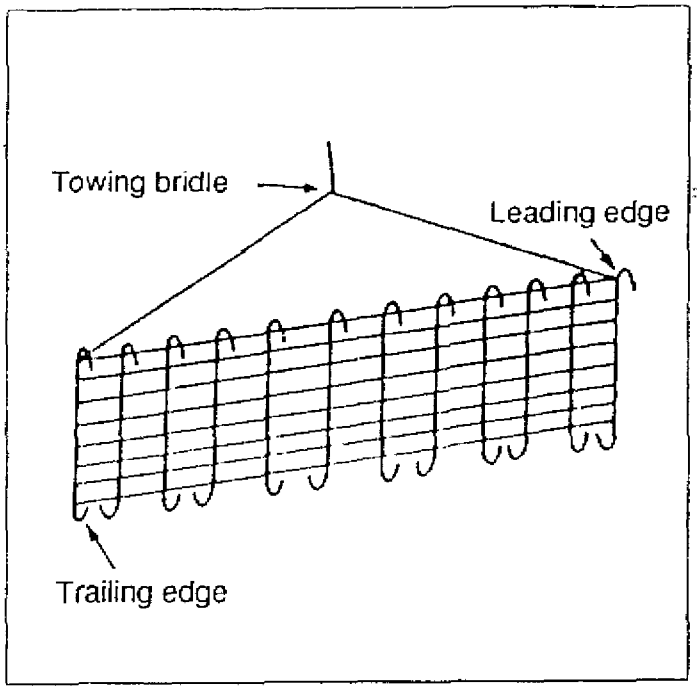
a. A leading edge is created by bending one of the longer edges over, this will assist the device in riding clear of mud and snags. The fold must not be greater than 50mm in height or it may resist picking up a body.

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 Fig 11:5).



Improvised Drag

Figure 11:5

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. 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:

a. Cut a 4mm diameter steel rod into four lengths of about 1.3 metres each.

b. Cut a piece of water pipe, about 20mm internal diameter, into a length of about 150mm.

c The steel rods are bent in half and fed through the centre of the water pipe.

d. An eye large enough to accept a shackle or line, is formed through the bent ends of the rods.

e. The free ends of the rods are bent to form four hooks retained by the water pipe (see Fig 11:6).

f. If desired the anchor hook points may be filed sharp.

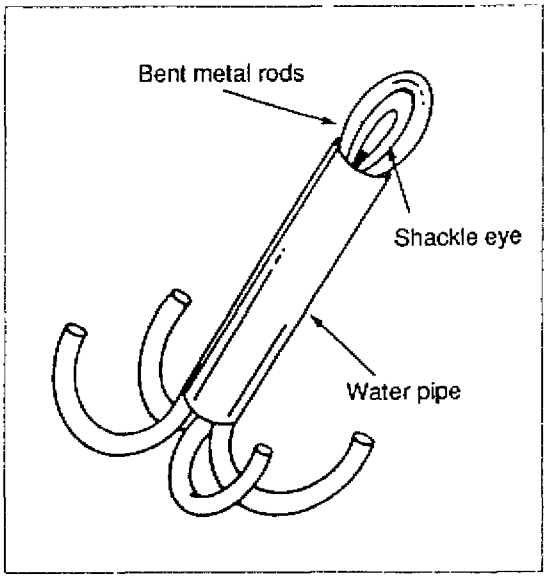


Figure 11:6

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

One method is where the boat is securely anchored fore and aft. A man 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 Fig 11:7).

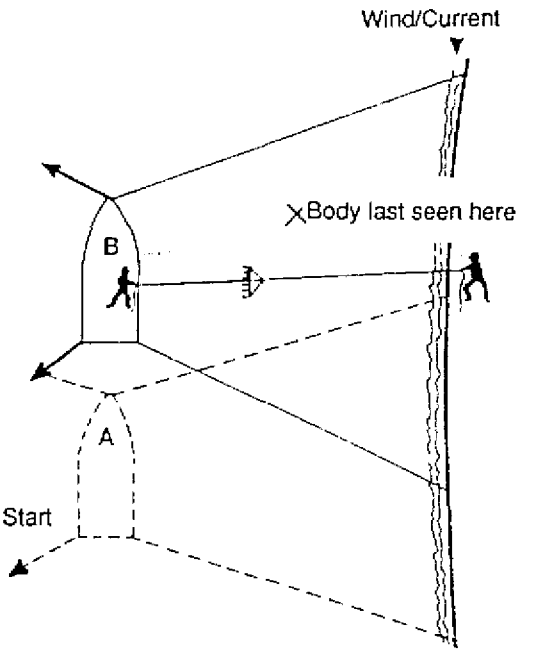


Figure 11:7

11.36 SHORE TO SHORE GRAPPLING

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 Fig 11:8 overleaf).

d. Should the above fail, the search area will need to be enlarged in both directions and the procedure carried out again.

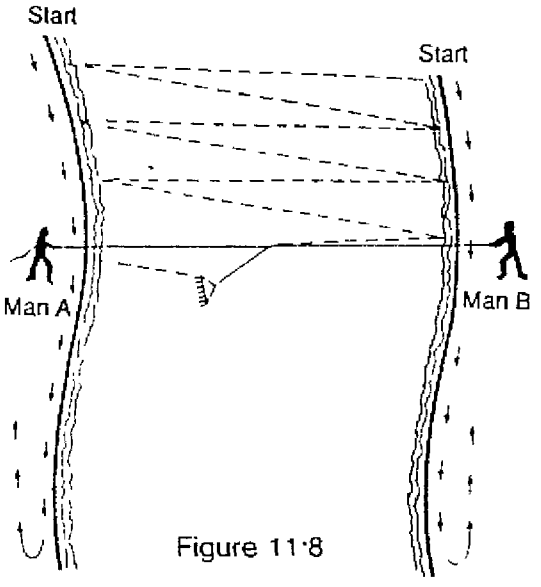


Figure 11·8

11.37 BOAT TO BOAT GRAPPLING

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.

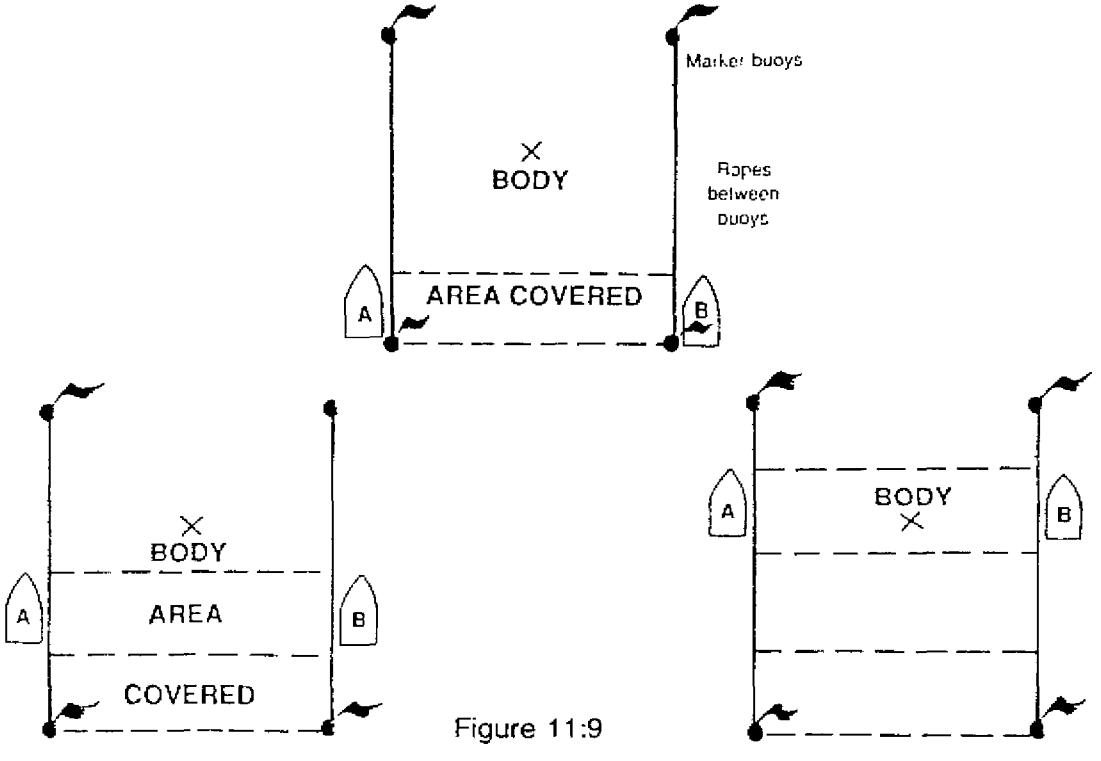


Figure 11:9

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 0.5kg 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. A motor may be used in rough water. It is best to utilize the motor to power the boat upstream with the hooks out of the water. Then allow the boat to float slowly downstream with the hooks on the bottom. If there is no current, rowing into the wind will give the oarsman the best chance to keep the boat on a straight course.

c. Buoys and floats should be used to establish the body location as nearly as possible. Always be sure that each drag sweep overlaps the one just completed. Additional markers dropped at the end of each sweep will give a positive indication of the area which has been covered.

d. When a number of boats are in use, the boats should form a 'V' 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 the one next to and ahead of it.

e. Where there is a current, drop a bag of old clothes or other such material into the water, placing a weight in the bag so that it will sink, and attaching it to a float so that it will be suspended a foot or two off the bottom. Place this bundle in the water where the victim was last seen. Follow the float and drop markers along the path which is established; this route should be followed with the grappling hooks. It is most probable that the body will be found in the first eddy or deep hole where the marker stops.

NETS

11.39 If the water has a current such as in a river or creek, a large net placed well downstream and crossing the full width may also assist in catching a body being washed downstream.

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 have

a a stretcher, preferably a wire basket type;

b. a body bag or shade cloth, (a section approximately 2m x 1.5m);

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 Coxswain 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 includes:

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 TWELVE

TIDES AND CURRENTS

INTRODUCTION

12.01 This section will, in a very basic form, acquaint coxswains 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 coxswain 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 coxswain 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.

12.02 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.

12.03 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 vs CURRENTS

12.04 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

12.05 TIDAL ACTION

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

12.06 EFFECTS

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

12.07 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:

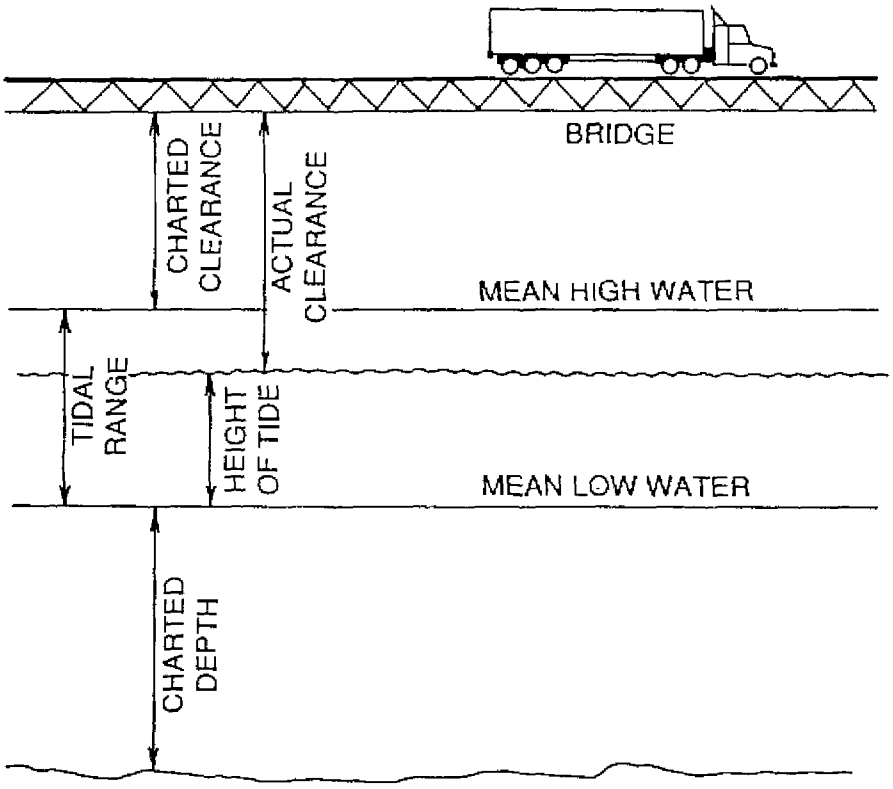


Figure 12:1

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.

12.08 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.

12.09 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 coxswains should have an understanding of them all.

12.11 TIDAL CURRENTS

a. 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.

b. 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.

12.12 RIVER CURRENTS

a. Coxswains 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 it will be one of the hazards that the boat crews will encounter.

b. 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

12.13 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

12.14 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/HR with regard to river currents. Current drift is stated to the nearest one tenth of a knot or KM/HR.

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.

12.15 SLACK vs STAND

a 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.

b. 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.

12.16 NEED FOR KNOWLEDGE

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

12.17 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.

12.18 DIFFICULT LOCATIONS

a. 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.

b. 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 THIRTEEN

SURVIVAL

INTRODUCTION

13.01 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

13.02 In hot weather those persons in an open boat will be subjected to direct sunlight and 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, but 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 number of hours, people can suffer sunburn and/or heat exhaustion.

13.03 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.

13.04 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

13.05 After rain, 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.

13.06 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.

13.07 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.

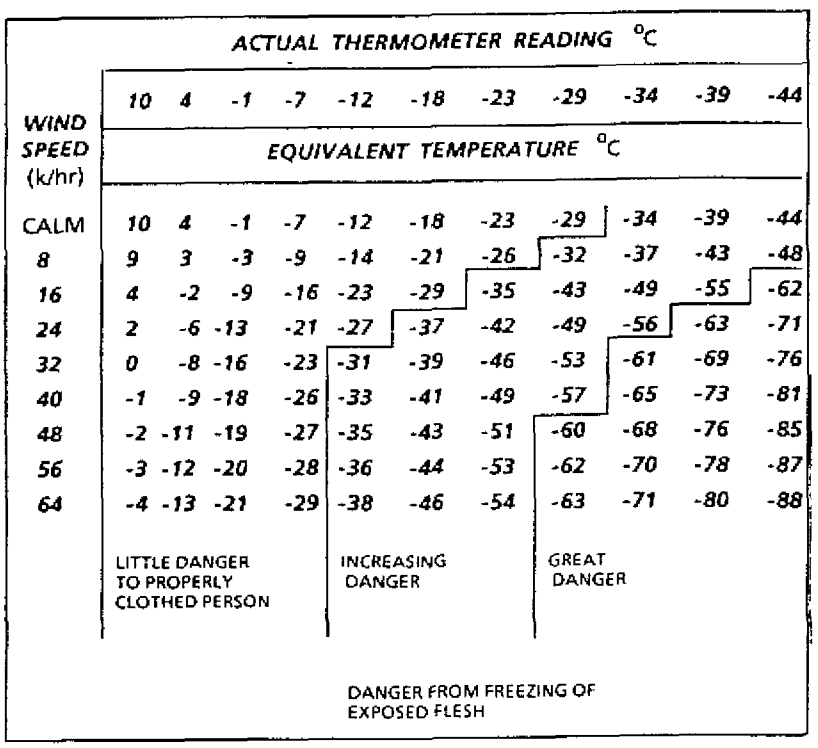


Figure 13:1

13.08 Possible signs of hypothermia include extreme shivering, loss of coordination, confusion and amnesia, muscular rigidity, collapse and unconsciousness.

13.09 The first aid for hypothermia involves gently rewarming the casualty by the provision of shelter, rest, warm clothing, warm drinks (no alcohol) 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.

WATER IMMERSION CHART

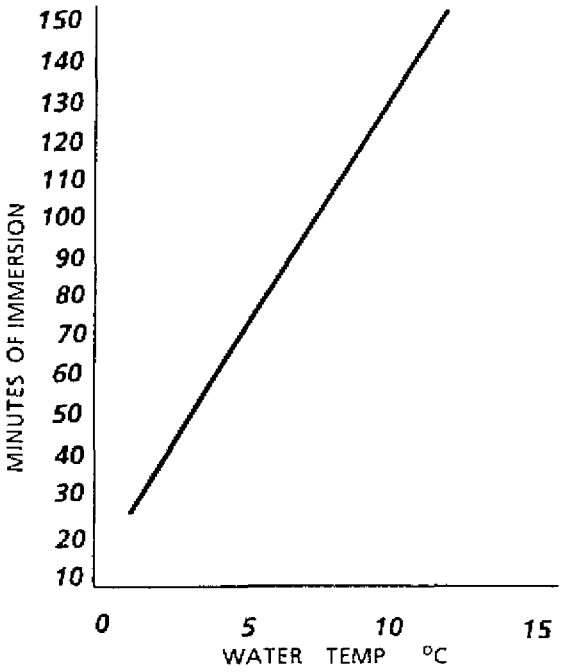


Figure 13:2

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 Fig 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:

a. holds the arms so as to cover the sides of the chest and upper body;

b raises the legs, shielding the groin and chest; and

c. then endeavours to float on the back.

For greatest effect, it is desirable for the survivor to have floatation assistance.

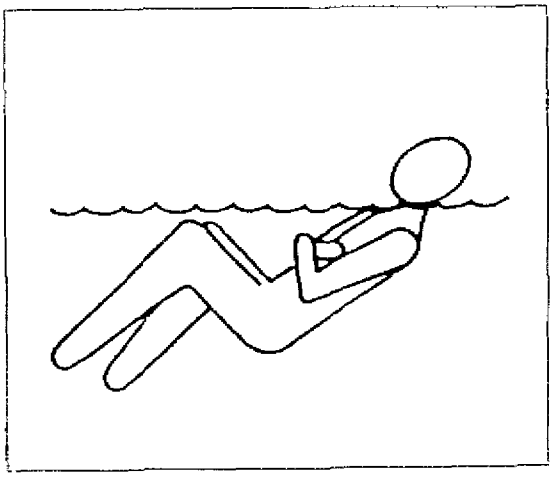


Figure 13:3
HELP

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 Fig 13:4).

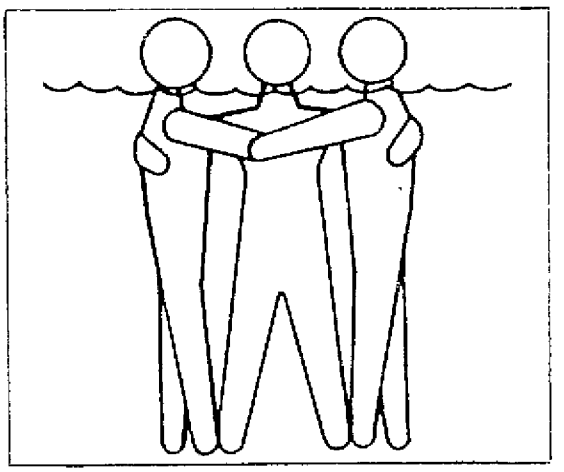


Figure 13:4

EMERGENCY FEEDING

13.19 The coxswain of a FRB 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.

CHAPTER FOURTEEN

FLOOD RESCUE BOAT PILOTAGE

INTRODUCTION

14.01 The ability to pilot a FRB on inland or estuarine waters is an essential skill for coxswains. Coxswains must be able to:

a. plan a journey nominating courses, distances and timings; and

b. effect a journey using dead reckoning (DR).

14.02 **NAVIGATION**

The subjects of Map Reading and basic Navigation are covered in detail in the Australian Emergency Manual-Map Reading.

14.03 **PILOTAGE AIDS**

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

a. a compass:

b a map or chart of the area; and

c. a watch.

COMPASS INSTALLATION

14.04 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.

14.05 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.

14.06 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 it's lower position.

14.07 The crew should be aware that any compass in a boat will be effected by outboard motors and radios

DEAD RECKONING (DR)

14.08 With pilotage, the coxswain 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 most 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.

14.09 In these conditions, the coxswain must have adequate training and knowledge and must be able to give close attention to detail as frequent determinations of position are necessary, and changes of course and speed will be required at short intervals.

14.10 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.

14.11 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.

14.12 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.

14.13 TIME

FRB coxswains 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 14 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.

14.15 POSITION

A coxswain must be able to accurately describe the position of the vessel. This is essential.

a. Relative and Geographic Coordinates. Position can be described in relative terms or by geographic co-ordinates. 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 coxswain may say that 'I am about one km south west of Black Rock', or if 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.

14.16 DEPTHS

Water depths are important for two reasons. These are:

a. preventing grounding; and

b. for navigational purposes.

14.17 HEIGHTS

The height or elevation of various objects will be of concern to the coxswain. 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

14.18 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.

14.19 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.

14.20 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.

14.21 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.

14.22 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.

14.23 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.

14.24 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 25 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.

14.26 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.

14.27 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.

14.28 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 acknowledgement to the authors, editors and publishers of the following:

Queensland State Emergency Service

Flood Boat Operating Manual

New South Wales State Emergency Service

Handbook for Crews Operating Flood Rescue Boats, Feb. 1971

Victoria State Emergency Service

Flood Rescue Boat Manual

Commonwealth Department of Transport and Communications

National Search and Rescue Manual