Power Boating

workbook

Student's Name

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Wet Paper

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About this book
This workbook provides guidance in the skills and knowledge necessary to drive a small power boat.

Syllabus
At time of publication, this work book has been written to the syllabi in a variety of states and to national modules in the Certificate 2 in Maritime Operations. Completion of this work book will enable the student to develop the skills and knowledge requirements to obtain a power boat licence. Because of the nature of training in Australia, module names and numbers have been omitted because they are subject to frequent change.

Your licence to drive a power boat
To be able to drive most private powerboats you are required to have some type of boating qualification. In Western Australia boat owners are encouraged to undergo training with a recognised training authority.
In other states some type of licence is required. In addition to this you may undertake an industry course in boating. These run under standard course codes and have national accreditation. An example of an industry course at time of publication was ABF513 – Small boat handling.
There are also recreational boating courses such run by private providers of national training programs such as the Australian Yachting Federation or AYF. These organisations also have nationally accredited and recognised courses such as AYF 004 - Small Power Boat Handling which also allow you to obtain your power boat licence.
At the successful completion of courses such as these you will be given a Certificate of Completion for your licence. The main purpose of the licence is to ensure that powerboat drivers have achieved a minimum standard of boat handling and knowledge so as to operate a powerboat safely. The other two courses extend this to industry requirements.

Course details
The areas that you will need to study in this course to gain your licence include:

- Basic safety
- Pre launch and basic motor maintenance skills
- Basic handling and emergency skills
- International regulations for the prevention of collision at sea and pilotage
- Trouble shooting
- Passage planning

Disclaimer
Although all care has been taken to provide safety instructions, and offers of training and advice, Wet Paper or any of its employees, advisors or consultants accept no responsibility for any accident that may occur as a result of students performing any of these activities. If schools are unsure of any method, they are advised first to consult with their own State regulations and then if further assistance is required, contact us at Wet Paper at the above address.

Power Boating

workbook

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Wet Paper
Marine Education

Contents

Introduction

If you look at boats you will soon realize that there are many shapes, engines and materials used to keep people and their goods afloat. As well, boat users are on the water for different and sometimes conflicting purposes. An understanding of this is necessary if you are going to be able to handle a powerboat.

SECTION 1 HULL DESIGN

Boat stability and carrying capacity are two essential aspects of boat design. Stability refers to the ability of a vessel to return to its original position when displaced from side to side. Carrying capacity simply refers to the boat's ability to support a load placed in the hull.

Design features of boats

Some hulls displace more water than others as shown in Figure 3.1. The round bilge (a displacement hull) will usually displace more water than the hard chine (a semi-displacement hull) and so the displacement hull will support a greater load. *You can compare the volumes of water displaced with different hulls with the computer hull design project (see page 5).*

When studying boat design you will come across many new terms. For example the draught is the depth of water at which a vessel floats and the freeboard is height of the hull above the water line. These and other boating terms are shown in Figures 3.1 – 3.3.

Strenghtening features of hulls include the ribs which are welded into the inside of the hull so that the hull does not break when forced against the water under power. The number of ribs and the strength of the welds are specific to the manufacturer's design. If a too powerful motor is fitted then the ribs will break or the back of the boat (the transom), will become weakened.

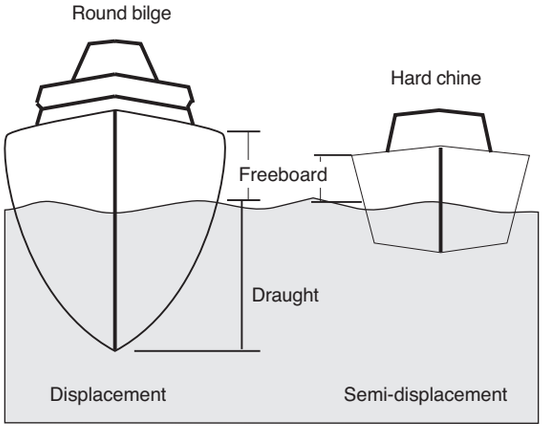


Figure 3.1 Displacement and semi-displacement hulls

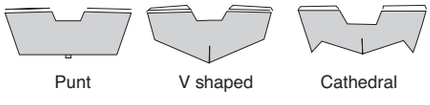


Figure 3.2 Comparison of hull types

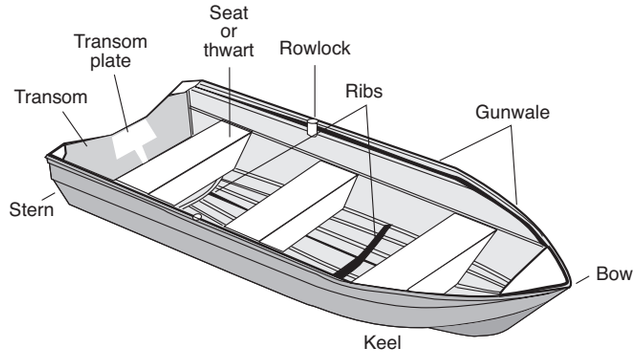


Figure 3.3 Common boating terms

Figure 3.4 "V" shaped hull

Types of hulls

Punt

The most basic design is a punt as shown in Figure 3.2 which is the simplest design to build. This has the greatest stability and carrying capacity. Barges have this design.

The disadvantage of this design is the uncomfortable ride in choppy or rough water. This is reduced by operating the boat at slow speed.

V-hull

The next step in the design of hulls is the V-hull (Figure 3.4). This V shape allows the hull to cut through the water rather that the whole width of the hull hitting a wave at the same time. The V allows it to progressively come in contact with the water softening the ride.

The angles of the V are open to debate as different manufacturer's have different ideas. The deeper the V the softer the ride and the greater the directional stability.

Also larger motors are required on deep V hulls and the boat becomes less stable particularly at rest and the carrying capacity drops. So with all boat designs there is a compromise.

Catamaran

To maintain the ride of a deep V hull as well as the stability of a punt, the catamaran hull was developed (Figure 4.1). The hulls supporting the boat are out wide providing stability and with deep V's make a comfortable ride. Added to this the tunnel between the hulls creates a cushion of air softening the ride further. A disadvantage of the hull is that it turns flat increasing the chance of people being thrown out.

Tri-hull or cathedral hull

The tri-hull or cathedral hull (Figure 4.2) combines the advantages of the catamaran hull and the deep V hull. This type of hull is stable, has a good ride, excellent turning manner but is expensive and complex to build.

Inflatables

An inflatable is a boat where all the hull is inflatable while a rigid inflatable boat (or RIB) is where the bottom of the hull is made of aluminium or fibreglass and the sides an inflatable tube (Figure 4.3).

These have good stability, are lightweight and have excellent carrying capacity. However because of the cost, and the fabric that is easily damaged, they tend to only be popular with rescue and military organizations. The exceptions are the dive industry as the soft sides make for comfortable entry and exits.

Materials used in small power boats

A variety of materials have been used to construct boats. Common types are fibre glass, aluminium, ply and steel.

Fibre glass

The correct name is glass-reinforced plastic or fibre reinforced plastic. As the name suggests fibreglass hulls are built by laying fibres of glass in a mould and encasing it in a plastic (resin). Once a mould of the shape of the boat required is constructed, then it is a reasonably easy task to produce many boats. This helps offset the high cost of the materials and the mould. Fibreglass boats are moderately expensive but can be made into nearly any shape. Provided the fibres are not exposed to the water, the material is durable. However like any plastic it is affected by the sun.

Aluminium

For small power boats aluminium is becoming the most popular. It is light, durable, and easily built provided that some specialist equipment is available. Because of its light weight a boat made in this material only requires moderate engine power.

However aluminium is expensive, does require a specialist to repair any damage but will work harder in water for many years.

Ply

Thin layers of wood called ply, are glued together with waterproof glue. It is good for home construction as it is easy to work and reasonably light. However it must be painted and kept that way as water will cause the ply to rot. A boat built of ply does need to be handled with care as it tends to damage easily; but it is also easy to repair.

Find out about electrolysis and hull fatigue from your boat shop

Steel

This is usually used in large slow boats because of its weight. It is cheap, strong and with the right equipment easy to build with. The biggest problem is the weight of it and rust. Steel must be kept sealed from water.

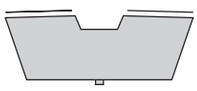
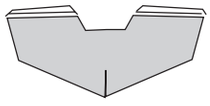
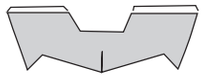
Figure 4.1 Catamaran hull

Figure 4.2 A tri-hull or cathedral hull

Figure 4.3 A rigid inflatable

WORKSHEET 1 HULL DESIGN

Complete the following table:

Design	Name of hull	Advantage of hull design
a. 		
b. 		
c. 		
d. 		

PROJECT 1 - MODEL HULL DESIGNS

Students use this software and design their own hull.

They print out a template, then cut out planks and assemble the boat for speed trials or various hull tests.

Choice of material includes water proof paper and balsa sheets.

You will need

- Hull design computer disk by Seaworld Services and Carene-Edu Hull design*
- PC computer

What to do

Follow the instruction on the disk

Criteria for assessment

- Hull design 5 marks
- Hull construction 10 Marks
- Design report 10 Marks

* *Site licence and disk is available from Wet Paper 14 Milbong Tce Ashmore, Telephone (07) 5597 2806. Site licence cost in 1999 was $99 and included a set of notes on building a boat at school.*

Figure 5.1 Students from St Mary's College Maryborough test out their boat design

Common boating terms

When you are on a boat and want to indicate direction, there are certain terms that describe that direction.

These terms, as shown in Figure 6.1, are all related to the boat you are on and not to a compass or the area around you.

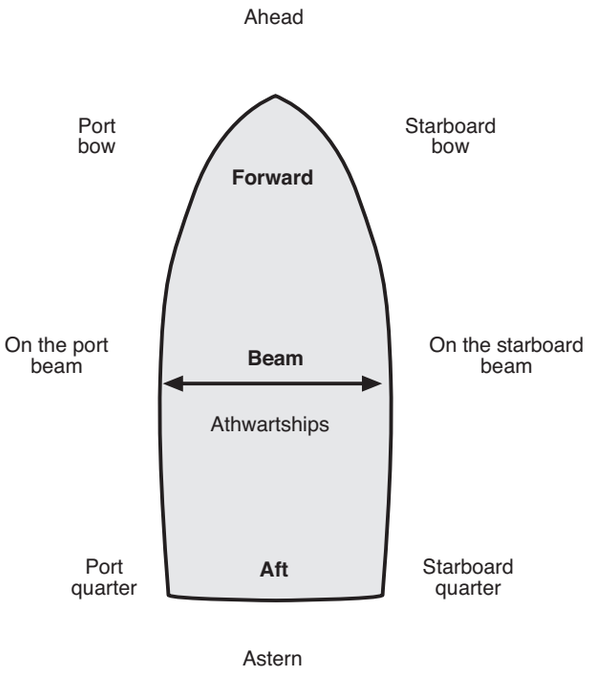


Figure 6.1 Common positions on a ship

Infringements

There are penalties for infringements of the boating laws. The bigger the infringement ... the bigger the fine.

General safety rules

- Keep to your limits – 0.05 alcohol limit also applies on the water
- Always keep a proper lookout especially in the late afternoon as other boats and swimmers are difficult to see.
- Watch out for other boats and their possible direction. Always avoid a collision even if you have right of way.
- Travel at safe speeds. Allow for rough water. Give way to larger boats who can't manoeuvre as quickly as you.
- Watch the weather. Plan the trip and ensure you are one step ahead of a problem.
- Obey the rules because if you break them, you are liable for a fine.
- If the boat does not meet the safety obligation it must not put to sea.

Watch the video

This video demonstrates all of the skills mentioned in this book. To obtain a copy, call us here at Wet Paper.

(07) 5597 2806 or check out our web site:

www.wetpaper.com.au

SECTION 2 BOATING SAFETY OBLIGATIONS AND EQUIPMENT

Boating obligations

The general safety obligations of a boat owner or operator are to ensure that:

- A boat is safe, seaworthy and operated safely
- The boat must carry the minimum safety equipment to meet the regulations and standards.

Registration

A registration number is allocated to each powerboat; the same as registration plates are to cars. Registration labels which in some states must be purchased annually, must be attached to the exterior of the boat on the port side near the registration number. Note that tender boats and personal water craft may fall into a different category in some states.

For boats capable of planing, the numbers and letters must be a certain height (e.g., 200 mm in some states) and either dark on a light background or light on a dark background. These are attached on either side of the vessel.

Insurance

When you register a car you also get third party personal insurance. However when you register a boat you do not and will need to at least obtain third party personal insurance. A better form of protection is comprehensive insurance which covers such things as accidental loss, damage or theft.

Reporting boating accidents

Any accident must be reported to the state waterways regulatory authority. This is generally within 24 - 48 hours and the appropriate form must be completed. In some states this is called a boating incident report.

Workplace Health and Safety

Schools also have a safety obligation under their workplace health and safety manuals

WORKSHEET 2 SAFE BOATING DISCUSSION STARTER

1. List and discuss at least ten things that could go wrong when venturing out on a boat. For each item assess the likelihood as a percentage.

   Example: *The boat could sink if the bung was left out - 99% likelihood of sinking*

2. List 4 different reasons for going out in a boat

3. Draw a map of the area in which you will learn the skills of power boating. Include any hazards such as marine structures, depth of water, reefs and other boating traffic.

WORKSHEET 3 COMMON

BOATING TERMS

Use the diagrams on pages 3, 6 and 25 to fully label Figures 8.1, 8.2 and 8.3.

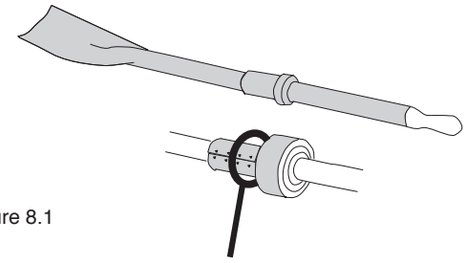


Figure 8.1

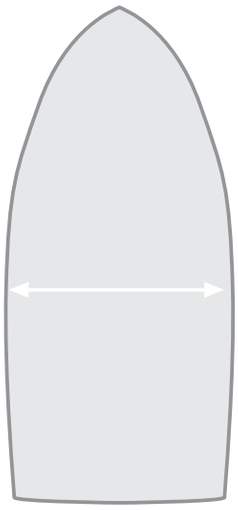


Figure 8.2

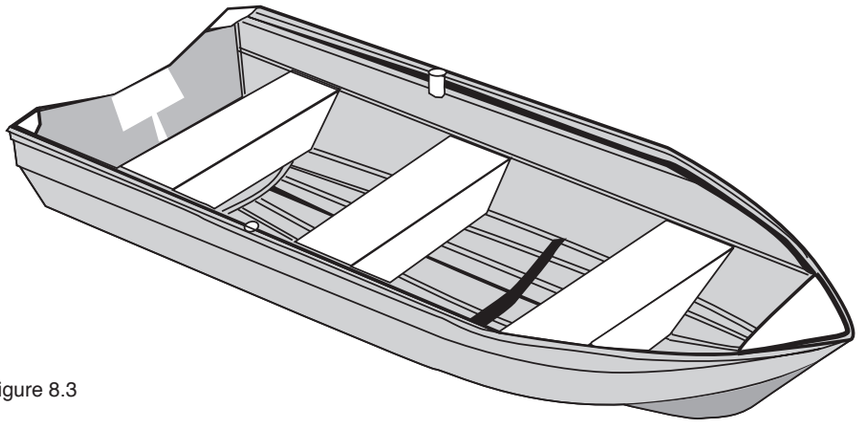


Figure 8.3

PROJECT 2 - HULL MATERIALS

Try the following project and write up your findings.

Materials (use small pieces approx. 20 mm square)

- general use ply; avoid marine and structural ply
- aluminium
- thin steel with no paint or zinc coating
- glass reinforced plastic with cut edges

Suggested method

Collect four containers of seawater and place in each a sample of each material approx. 20 mm square.

Before placing them in the water weigh them and note their appearance, and label the container they are going in. The ply will need to be weighed down in the container. Why is this an advantage in boat building using ply? After 2 - 3 weeks note the appearance of each and record their weight.

Notes:

The fibreglass should be cut carefully out of a larger piece. Some people will find the dust irritating so use disposable gloves.

SECTION 2 BOATING

SAFETY OBLIGATIONS AND EQUIPMENT CONTINUED

State laws

The regulations covering legal obligations are governed by state laws. In some states the type of waters are either classified as inshore (15 nautical miles to seaward) or sheltered (which are specified by each state authority). Sheltered waters are generally regarded as being either partially smooth or smooth. In other Australian states, there is set distance from shore which determines what equipment needs to be carried.

These rules and regulations are set out in a state publications such as the one shown in Figure 9.1. Other regulations to follow are set out in Marine Park Maps.

For example to meet the requirements in some marine parks, boats must come off the plane in turtle protection areas. An example of this is shown in Figure 9.3.

Common sense

Telling others where you are going as shown in Figure 9.2 is an example of a common sense safety obligation.

Training

Training provides the skills to operate a boat safely. Many sailing schools, yachting federations, boating and marine teachers associations run training courses each year.

After Queensland Transport

Figure 9.1 Each Australian State has its own safety handbook publication.

Figure 9.2 Common sense safety obligation

ACTIVITIES	GENERAL USE ZONE	HABITAT ZONE	CONSERVATION ZONE	BUFFER ZONE	PROTECTION ZONE
Boating, diving	yes	yes	yes *	yes	yes
Fishing	yes	yes	yes[a]	no	no
Trolling for pelagic fish	yes	yes	yes	yes	no
Spearfishing	yes[b]	yes[b]	yes[b]	no	no
Recreational bait gathering	yes[c]	yes[c]	yes[c]	no	no
Recreational collecting (limited to five declared fish, or declared invertebrates other than corals)	yes	yes	yes	no	no
Jetskis and similar motorised personal watercraft	yes	yes	yes only within navigation channels	no	no
Trawling	yes[d]	yes[d]	no	no	no

[a] Coombabah Lake and Coombabah Creek is a declared Fish Habitat Area and closed to all forms of fishing and collecting under Fisheries legislation.
[b] Other areas are closed to spearfishing under Fisheries legislation (see overleaf).
[c] A bag limit of 50 worms or parts of worms applies to bloodworms. Other collecting restrictions occur under Fisheries legislation in declared Fish Habitat Areas and on certain foreshores (see overleaf).
[d] This does not include areas closed to trawling under Fisheries legislation.

Please note that under Fisheries legislation other fishing, collecting, commercial and closed water restrictions occur in Moreton Bay Marine Park. Contact Queensland Boating Fisheries Patrol or Queensland Fisheries Management Authority for details.

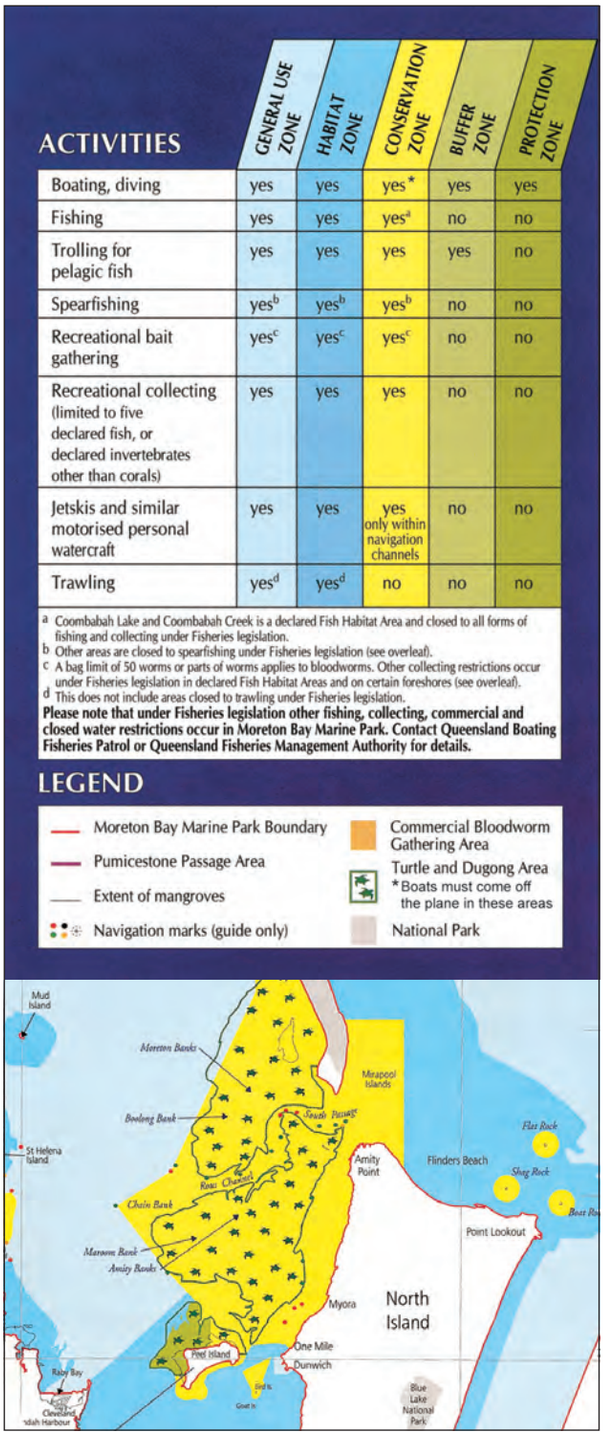


Figure 9.3 Marine Park maps provide information are an important safety obligation to the environment (Courtesy Queensland National Parks and Wildlife)

Common boating safety equipment

Life jackets or personal floatation devices

Three types are shown in Figure 10.2*.

- The PFD 1 lifejacket has sufficient flotation to support the body and head and is usually recommended for smooth, partially smooth or inshore waters.
- PFD 2 life jackets will keep you afloat but do not have a panel to support your head. These are usually recommended for smooth or partially smooth waters.
- PFD 3 are designed to keep you afloat for short periods of time and are often used by water skiers. These are usually recommended for smooth waters use only.

* There are other types such as coastal or SOLAS.

Tip

Why not have a permanent checklist of the things you need to take *every* time you go boating.

Figure 10.2 Three types of PFD or lifejacket

Other general safety equipment

The following is a general list of common equipment that is often used in emergency situations. The items should be easy to get at and stowed so they do not hinder movement in the boat as shown in Figures 10.1 and 10.3.

- Paddles or oars/rowlocks. Common uses include:
  - rowing to and from deeper water to lower the engine
  - rowing to shore when the engine fails
- Anchor, chain/line attached. Common uses include:
  - stopping the boat from moving during periods of high water movement
  - stopping the boat from floating away as the tide comes in
- Bucket or bailer. This should have attached a length of rope that is usually 2 metres long. On larger vessels a bilge pump is used to remove water from the bottom of the boat. The bigger the boat, the more volume of water per minute needs to be pumped out.
- Fire extinguisher
- Compass – liquid damped
- Fresh drinking water
- Local chart
- First aid kit
- Tool kit
- RFD on larger vessels as shown in Figure 11.3.

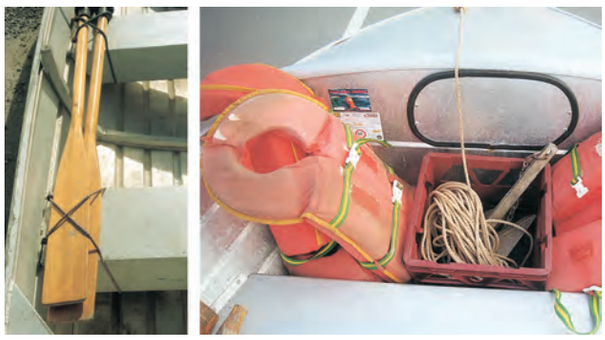


Figure 10.1 Safety items should be easy to get at and safely stowed so they do not hinder movement in the boat

Figure 10.3 Other general safety equipment

Signalling equipment

Common visual signalling equipment as shown in Figure 11.2 includes:

- Water proof torch
- V Sheet
- Heliograph or signalling mirror
- Set of flares

This equipment is used to attract attention in a distress situation and should be stowed in a safe and preferably dry place on board in water tight containers as shown in Figure 11.2. Flares should not exceed their expiry date and a spare set of batteries for the torch is recommended.

Navigation lights

These are an essential form of safety equipment and are discussed in full on Pages 52 - 56.

Electronic signalling equipment

Common electronic signalling equipment includes the marine radio and Emergency Position Indicating Radio Beacon. You will learn a lot more about marine radios and EPIRB's when you complete the Marine Radio Workbook in this series.

Figure 11.1 A marine radio (Left) and EPIRB (Right) are two forms of essential safety equipment

Distress flares

Flares are a means of attracting attention because they are very visible and instantly recognised as an indication that help is required.

Three main types of hand flare are:

- Daytime use – orange smoke flares
- Night time use – red flares
- Long distance use - rocket parachute flares

Red flares are designed to show a brilliant continuous red light for 50 seconds.

Orange smoke flares emit a dense orange smoke for 30 seconds.

These distress signals are fitted in self-contained units (with means of ignition) and can be operated even when wet.

The life expectancy of commercial flares is about three years, after which time they should be replaced. Check the use by date (see Figure 12.2)

Figure 11.2 Common signalling equipment

Additional equipment may include:

- Depth sounder
- Barometer
- RFD.s (life raft)
- Emergency navigation lights
- Life buoy

Figure 11.3 RFD Life raft (Insert courtesy Pains-Wessex Schermuly)

Parachute flares

Parachute flares are usually fitted with a striker mechanism located underneath the bottom cap as shown in Figure 12.1.

The following steps are recommended to operate a parachute flare:

1. The parachute and flare composition are cocked by removing the safety pin and bottom outer cap.
2. The unlocked striker mechanism and safety pin will then drop into position at the base of the flare.
3. The safety pin is then removed and the striking mechanism pushed upwards to fire the parachute and propellant. These are then visible for about 20 nautical miles at night and a lesser distance during the day.

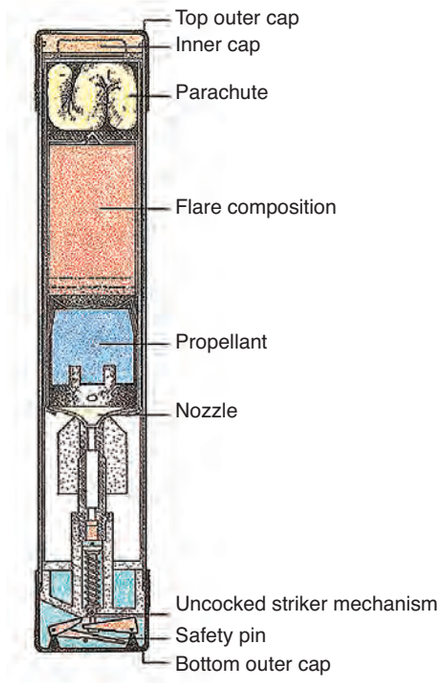


Figure 12.1 Section through rocket flare. Illustration courtesy TAFE NSW

Hand held flares

Always read the instructions on the side.

Hand flares are usually ignited by turning the handle to arm the flare and then pushing it to ignite; or removing a cap and using a striker pin to ignite the flare. The striker pin method is shown in Figure 12.3 and Figure 13.2.

These are visible by aircraft for about 16 kilometres at night and 8 kilometres during the day.

Flares generate heat so be careful of burns. If you become involved in a marine safety day as shown in Figure 12.4, it may be a good idea to wear gloves and sunglasses. Hold the flare up high and away from your face and check that no one is downwind. When finishing with flares, they should be placed in the sand, till they cool down and removed from the beach and placed in the garbage bin at home.

Finally, flares should not exceed their expiry date as shown in Figure 12.2.

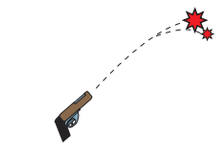
Figure 12.2 Flare expiry dates

Figure 12.3 Orange smoke flare. Photos courtesy TAFE NSW

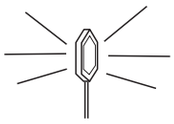
Figure 12.4 Red hand flares (Courtesy Marine Teachers Association of Queensland)

Distress signals

Figure 13.1 shows other forms of distress signalling used in emergency situations.



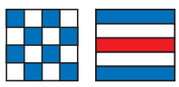
A gun or other explosive signal fired at intervals of about a minute



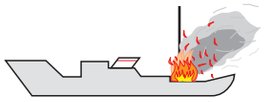
A continuous sounding with any fog- signalling apparatus

Rockets or shells throwing red stars fired one at a time at short intervals

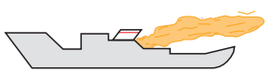
A signal made by radio, telegraphy, or by any other signalling method consisting of the group (SOS) in the morse code



The International code signal of distress indicated by N.C



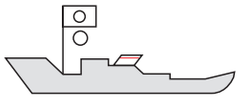
Flames on the vessel (as from a burning tar barrel, oil barrel etc.)



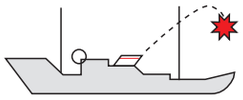
A smoke signal giving off orange-coloured smoke

A signal send by radio telephony consisting of the spoken word "Mayday" or a DSC alert

Distress Signals (Merchant Ship Search and Rescue Manual)



A signal consisting of a square flag have above or below it a ball or anything resembling a ball



A rocket parachute flare or a hand flare showing a red light

Slowly and repeatedly raising and lowering arms outstretched to each side

Figure 13.1 Common forms of emergency signalling

As a general rule orange or smoke flares are used in the daytime and red flares at night.

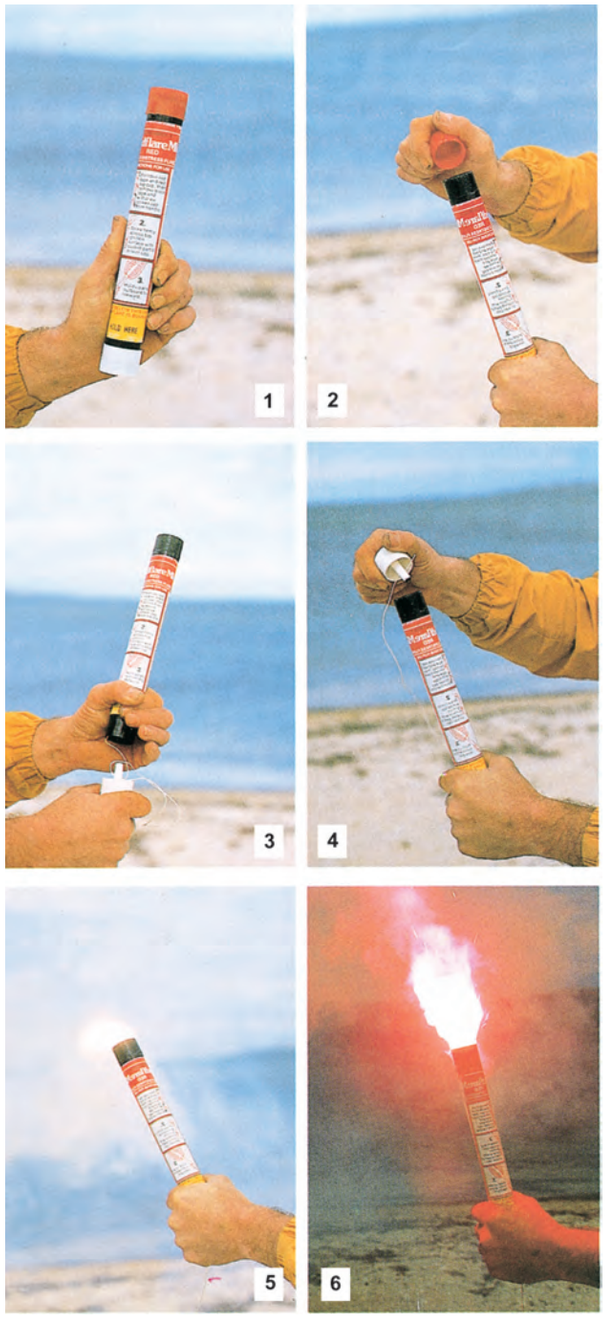


Figure 13.2 Red hand flare. Photos courtesy TAFE NSW

WORKSHEET 4 SAFETY EQUIPMENT

1. Name three types of life jacket (PFD), their intended area of use and one feature that distinguishes each from the others.

2. Name one source of information regarding safety on the water.

Figure 14.1 Common safety equipment (photo courtesy AGPS)

3. Use Figure 14.1 identify four other types of general safety equipment other than flares and write a sentence on their use.

1.

2.

3.

4.

Fires and extinguishers

A fire needs three things to exist — oxygen, heat and fuel as shown in Figure 15.1.

Most fire extinguishers remove the oxygen part of the triangle. Not all fire extinguishers come in a container. A blanket can be an effective way of starving a fire of oxygen. For example a wet towel can be used to smother a small fire. However when it comes to a burning engine, time is of the essence and a fire extinguisher is required. Remember that preserving life is the first concern and it may be best to call the fire brigade.

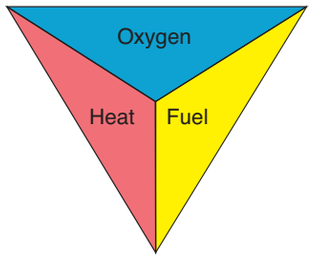


Figure 15.1 The fire triangle

Not all fire extinguishers are alike as shown in Figure 15.3 however most boats are equipped with Type AB.

To use this type of extinguisher remember PASS.

- Pull the pin (and test the extinguisher)
- Aim the extinguisher
- Squeeze the handle
- Sweep the fire

A water extinguisher is never used on electrical fires or fires that contain flammable liquids.

Specialized fire extinguishers are available for different types of fire. For example, fires that contain burning fat are fought with a special extinguisher that emulsifies the fat to stop it from spreading.

Generally on small boats dry chemical extinguishers are used. Also remember that fire extinguishers have a use by date. For a full fire extinguisher guide you can write to Fire Protection Association, PO Box 389 Port Melbourne, Victoria, 3237 .

Figure 15.2 Using a AB fire extinguisher (Courtesy Chubb Extinguishers)

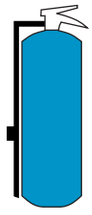
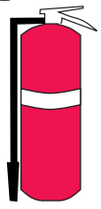
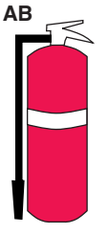
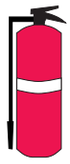
Fire extinguisher selection chart (modified for common fires) 		**Water**	**Foam**	**Dry chemical powder**			**CO_2**
				**B** 	**AB** 	Special powder 	Carbon dioxide 
Indicator colour		Red	Blue	Red with white band	Red with white band	Red with white band	Red with black band
Class	Type of fire	Contents electrical conductive		Contents electrical non-conductive			
A	**Ordinary combustible materials** Paper, wood, textiles, rubber etc	**Yes** Most suitable	**Yes**	**No**	**Yes**	**No**	**Yes** Suitable small surfaces only
B	**Flammable liquids** Petrol, oils, paint, grease, cooking oils etc	**No**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
E	**Fires involving live electrical equipment** Fires in motors, switches, appliances where a non-conductive extinguisher is required	**No**	**No**	**Yes**	**Yes**	**Yes**	**Yes** Most suitable

Figure 15.3 Modified fire extinguisher chart (Note: Class C and F not shown)

SECTION 3 PRE-LAUNCH SKILLS AND KNOWLEDGE

Conservation tip – keep oil and fuel out of the sea by maintaining equipment in good working order.

Outboard engines

The outboard is the most popular type of motor for recreational boats and was invented by a farmer (whose name was Evinrude), in the central USA area of the Great Lakes. He wanted a motor that could be removed from the boat easily and taken home for security. This was in the 1920's. The original had little resemblance to the modern outboard. Early models were heavy and low on power. The closest type of outboard to this design today is the Seagull which is shown on the back cover.

The outboard engine gets its name because the complete unit is hung over the stern of the boat. Outboards have the advantage in that they are easily removed for maintenance, storage and cleaning and automatically tilt to reduce damage if they hit an underwater obstruction.

Controls

In dinghies fitted with small outboard motors, all the controls are at the stern of the vessel. Outboards steer the boat by the turning of the whole motor thereby directing the thrust enabling the boat to be manoeuvred to port or starboard. At the end of the steering arm is the throttle which accelerates or decelerates the engine.

An outboard has a number of components; the major parts and controls are illustrated in Figures 16.1 and 16.2.

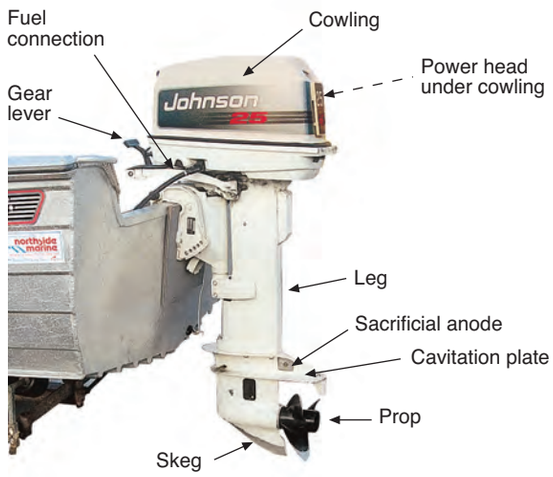


Figure 16.1 View of outboard from outside boat

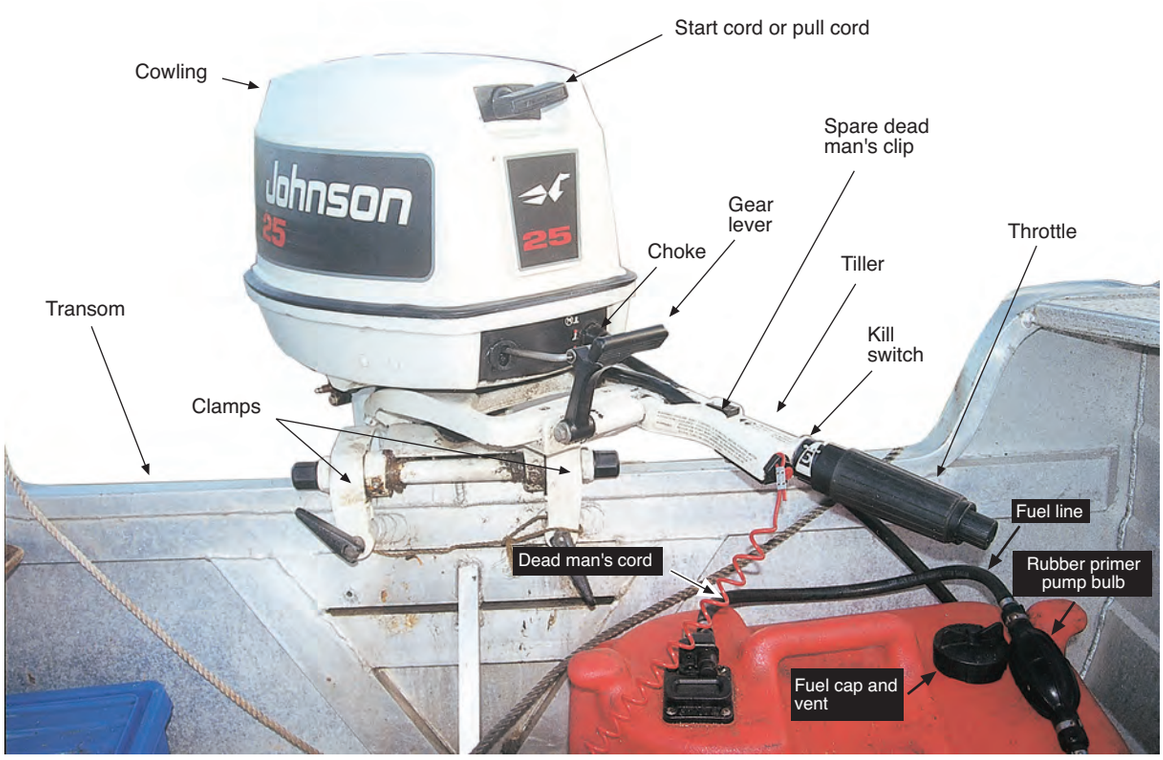


Figure 16.2 View of outboard from inside boat

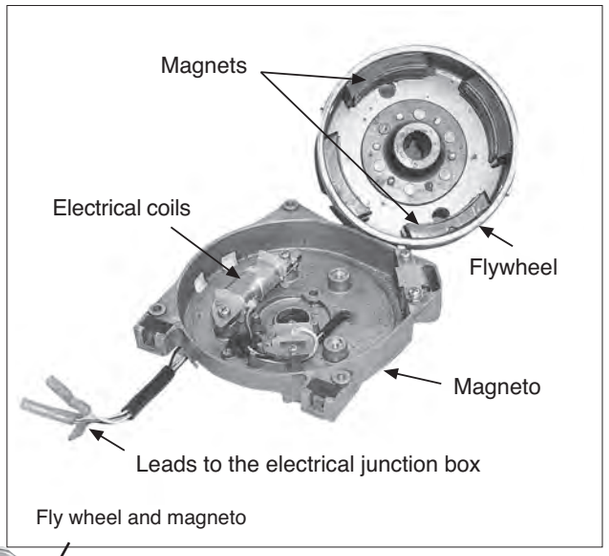
Name	Function	Name	Function
Cavitation plate	A plate just above the propeller that stops air being sucked down around the propeller	Power head	The engine itself that contains the pistons and associated components. The part of the outboard that generates the power.
Carburetter	A device for mixing fuel with the correct proportions of air in order to form an explosive gas	Propeller	A device having a revolving hub with rotating blades
Choke	A valve to enrich the fuel mixture by diminishing the amount of air in the carburetter	Pull cord	Also called the start cord. A cord that when pulled turns over the motor to start it.
Clamps	A device to fasten the motor to the transom	Sacrificial anode	A small block of highly corrosive metal (zinc) that is designed to corrode before the metal associated with the engine does.
Cowling	A streamlined cover for the motor to prevent water entering the engine	Safety chain	A chain that loosely secures the motor to the boat in the event of the clamps failing
Fly wheel	A heavy wheel that carries the pistons over dead centre	Spark plug	A device which provides the electrical spark for igniting the explosive gases in the power head
Fuel line	A hose connecting the fuel tank to the motor	Tell tail	A small stream of water that reveals that water is flowing through the cooling system
Fuel filter	A small chamber containing a fine mesh that removes foreign material	Throttle	A device that controls the amount of fuel being fed to the engine
Fuel tank	A receptacle for holding fuel	Tiller	A level fitted to the motor to allow for turning of the motor and therefore steerage
Kill switch	Also called the stop button. A button or switch that cuts the current to the spark plugs thereby stopping the motor	Transom	A flat stern on a boat
Intake	The point at which water is taken into the motor	Leg	The section that connects the power head to the propeller in the water
Impeller	The rotating member of a centrifugal pump (used to move water up and into the cooling system of the motor)	Skeg	A small stabilising fin attached to the bottom of the
Gear box	A casing in which gears are enclosed		
Magneto	A generator that produces the current to the spark plugs		

Figure 17.1 Summary of some of the main parts and functions of an outboard motor.

How an engine works

Inside the flywheel (Figure 17.2) are a series of magnets which generate a magnetic field. When these spin around the electrical coils as shown in the figure opposite, an electric current is generated. This passes through the electrical junction box and to the spark plug.

At the same time, fuel is delivered from the carburetter to the pistons inside the powerhead, and compressed. The spark plug ignites the fuel, pushing the pistons up and down rapidly. At the bottom of the pistons is a crankshaft which turns gears in a gear box which turns the propeller.



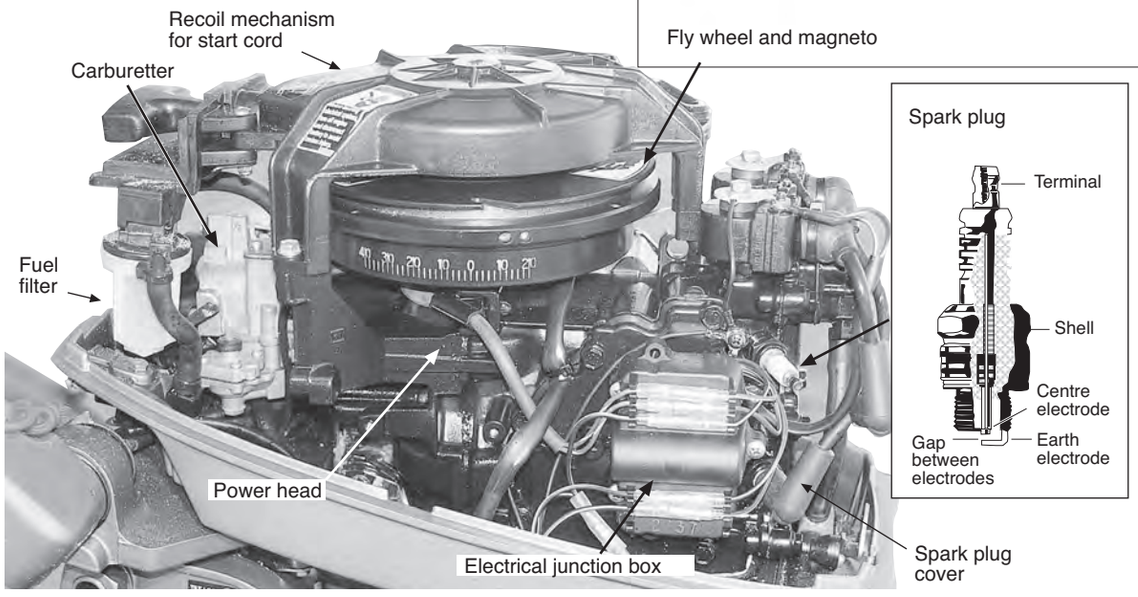


Figure 17.2 Under the cowling

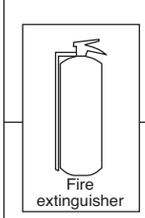
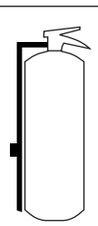
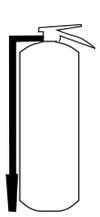
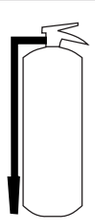
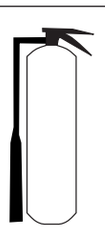
WORKSHEET 5 FLARES AND FIRE EXTINGUISHERS

1. Examine the packet of flares from your boat safety kit.
   a. How and where do you think flares should be stored on a boat?

   b. On what date do they expire?

2. Complete the following tables using colours where appropriate.

Type of flare	Description of how to use	When to use	Colour of signal
Red			
Orange			
Parachute			

	Water	Foam	Dry chemical powder			CO_2
Fire extinguisher selection chart  Fire extinguisher						
Indicator colour						
Class Type of fire	Contents electrical conductive		Contents electrical non-conductive			
A						
B						
E						

Mixing outboard fuel

Always carry 50% more fuel than you expect to use on the voyage.

- To calculate this you need to know the fuel consumption of your vessel.
- Remember that fuel requirements will change depending on the conditions and load.
- Carry spare fuel in a separate container so that if the main tank of fuel is contaminated then you have the spare available.
- Different petrol engines use different fuels, some straight unleaded, other different fuel/ oil mixtures.
- Check the manuals as to the mixture to use remembering that 50:1 means 50 parts fuel to 1 part oil. Some engines mix the oil in the engine. In this case it is necessary to also carry spare oil. Even if you are familiar with motors each brand and model have different procedures for care of that particular motor.

Answer the following questions in the space below.

1. Using 25:1 mixture how much oil would you need in a 65 litre tank of fuel.
2. If your vessel uses 0.75 litres of fuel per nautical mile, how much fuel would be needed for a journey of 36 nautical miles.
3. Using 100:1 mixture how much oil would you need to fill the fuel tank in the boat you are driving at present.
4. How much oil would be needed to fill a 25 litre fuel tank using a 50:1 mixing ration of fuel to oil?

Working

Safety points when refuelling

- Remove tank from boat if possible
- Refuel in a well ventilated space
- No flames or smoking near area
- Clean up any spillage
- Don't overfill tanks (allow for expansion)
- Replace caps securely remembering to re-open vents
- Boat internal fuel tanks need to be earthed

Other types of engines

Outboard motors tend to lack low-end power and low speed manoeuvring ability, particularly the 2-strokes. Because of this the inboard is still popular with commercial vessels such as trawlers and larger ships that require power and manoeuvring ability at slow speeds. In-boards are usually diesel engines rather than petrol, they are heavy and slow revving but diesel fuel is safer than petrol. Diesel generally provides better economy in these vessels.

Inboard diesel displacement boats can carry heavy loads at reasonable cost while outboard petrol planing boats move quickly and are easy to maintain. An inboard motor is shown in Figure 19.1. Figure 19.2 shows an inboard/outboard stern drive that is used in some larger high performance boats.

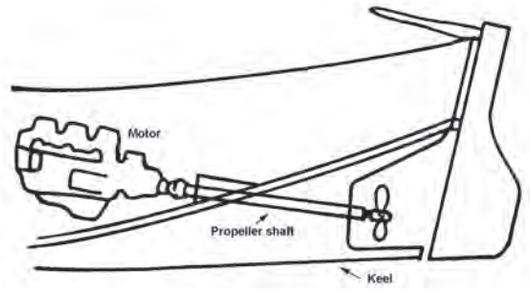


Figure 19.1 Inboard motor schematic

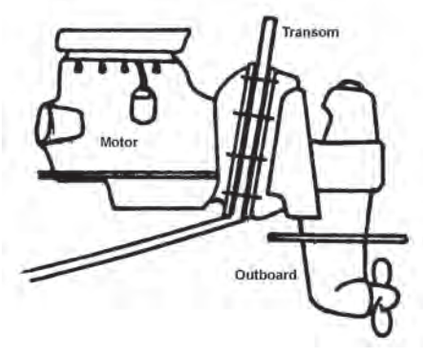


Figure 19.2 Inboard/outboard motor schematic

Cooling the powerhead

Most outboard motors are water cooled. Water enters through an intake point near the propeller and is directed to a water pump located in the lower unit.

From the pump the coolant passes through tubes or channels to the power head where operating temperature is thermostatically controlled. Discharge is effected through an exhaust relief and main exhaust outlet.

Water for cooling the power head is circulated by the water pump located on top of the gear case, and driven by the drive shaft between the engine and the gear case. A typical pump as shown in Figure 20.1, consists of an impeller which is keyed to the drive shaft.

Upon starting a cold motor the thermostat is closed and prevents the water from circulating in the system. As the engine warms up, the thermostat opens allowing the whole of the power head to be cooled.

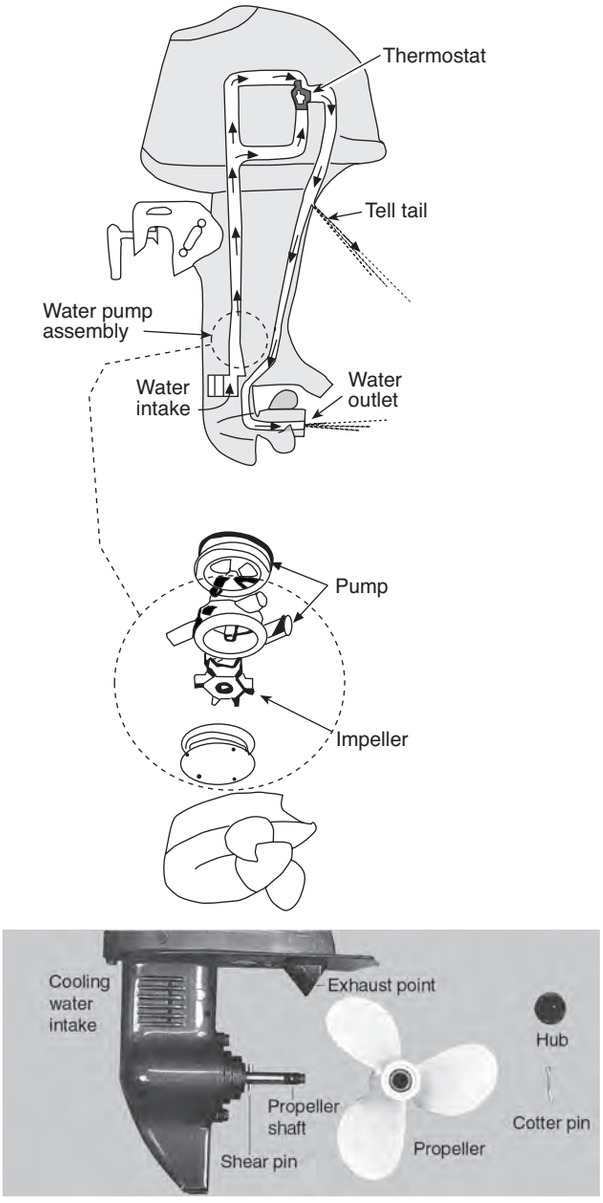


Figure 20.1 Cooling system and impeller (after Sheffield 1990)

PROJECT 3 SAFETY REVIEW

Research the following questions. Use the space below to make notes and type up your report on a separate sheet.

1. What is the maximum blood alcohol content allowed when driving a vessel? How many standard drinks is this?

2. List the general safety obligations of a boat owner.

3. How does boat insurance differ from car insurance?

4. List the safety equipment required if going offshore in a vessel 5.5 m in length?

5. Make a list of distress signals you could use on a small power boat.

6. You are 30 km offshore on a calm day and drifting out to sea. Which of the distress signals listed above would be most appropriate and why?

WORKSHEET 6 OUTBOARD MOTORS

Using the photographs below, name the main parts of an outboard motor.

WORKSHEET 7 BUYING A BOAT

Adapted from an original exercise by John Wiley, Maroochydore State High School.

Questions

Study the list of boats for sale in the figure to the right and answer the questions below.

1. You would like to buy a 10 ft (3 m) to 14 ft (4.2 m) boat for fishing in your local river. You need a motor and trailer and have $2 500 to spend.
   a. From the list of boats for sale, select the most suitable boat for your needs.

   b. Give 2 reasons for your choice

2. You select the boat you want to buy, ring the owner and go to inspect the boat. Your Grandmother has given you a checklist of what to look out for, shown in the box to the right.
   a. Rewrite the checklist and for each of grandma's checkpoints, giving a reason for her wisdom.

   c. How should you pay for the boat – cash, personal cheque, bank cheque or credit card? Give reasons for your answer.

   b. The owner cannot prove ownership but can show a current certificate of registration. Should you buy the boat? Give reasons for your answer.

Boats for sale

1. FIBREGLASS dingy, 12ft, $850 ono. Ph 7743 4199
2. FISH or Ski, aluminium, near new trailer, registered, 25 Evinrude, $2130 Ph 7743 4188
3. F'GLASS dingy, 8ft with motor, $770, 7794 7457
4. FIBREGLASS 17 ft Swiftcraft, Viking, excellent condition, $5,100 ono
5. FIBREGLASS, 12 ft, 20 Mercury, full covers, ideal family boat, $2,400 7743 5104
6. FIBREGLASS 4.2 m runnabout, back to back seats, trailer, excellent condition, no motor, $2,100 Ph 7745 7831
7. FIBREGLASS boat, forward steering, 25 electric start Mercury, registered, $2350, one 7795 6931
8. ALUMINIUM 10'6 9.5 Evinrude all access $1670 Ph 7713 5690
9. ALUM 12 ft, plus trailer, good condition $950 ono 77 53 6732
10. ALUM 14 ft, no trailer, needs work $500 ono 7719 7103
11. ATTENTION Must sell, 30 Hp Tohatsu motor, vgc, little use, $2100 ono, Ph Nev 7748 0022 a/h 7764 0182
12. BOAT, Quintrex, 16ft aluminium, 50 hp Johnson, many top quality extras, excellent condition, $8,200 ono. Ph 7799 6633
13. BOAT roof rack, h/d aluminium with rollers, storage section, $500. Poly-trolley ge $130, 2hp outboard $385, 9955 2211
14. SAILING DINGY, "125", ideal family or competition boat, excellent condition, $1300 Ph Ted 7766 2134
15. PUNT, flat bottom, 12 ft and trailer, 9.9 Mariner outboard, excellent condition, jut serviced, plus lots of extras, Top crabbing boat, $2320 Ph. Judy 7732 9000 A/h 7767 4351
16. HIRE, 3.8 Aluminium dingy, outboard motor and trailer, $50 for 24 hours. ($300 per week). Hypothetical Bay hire, 24 Jensen Way, Dawsville Industrial Estate 9967 0000

Grandmother's checklist

1. Hull
2. Safety buckets, flares, mirrors, PFDs
3. Anchor
4. Transom
5. Welds around keelson
6. Lines
7. Colour of hull
8. Proof of ownership, registration

for towing. An efficient knot must be easily and quickly tied, become more secure as the strain on it increases, and be quickly and easily untied.

The clove hitch

This is a simple knot for fastening the end of a rope to a solid bar or ring. It is probably the most common knot used by the average person. The method of tying is shown in Figure 23.1 A second half hitch over the free end of the rope will strengthen the knot.

The bowline

This is used to provide a loop at the end of a piece of rope that will not slip under great strain, but is easy to undo.

The method of tying is shown in Figure 23.2

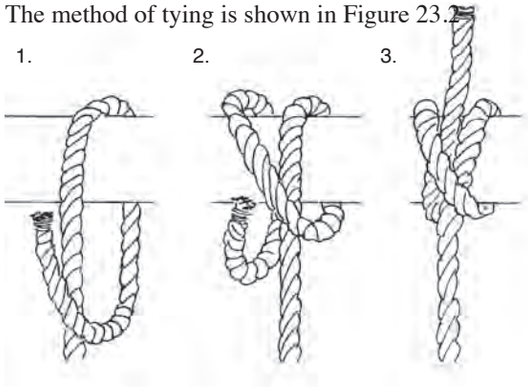


Figure 23.1 The clove hitch

Knots and ropes

Before setting out, a few basic knots need to be mastered. You need to know how to tie the boat to the trailer, throw a line to and from a disabled boat and tie up a disabled craft

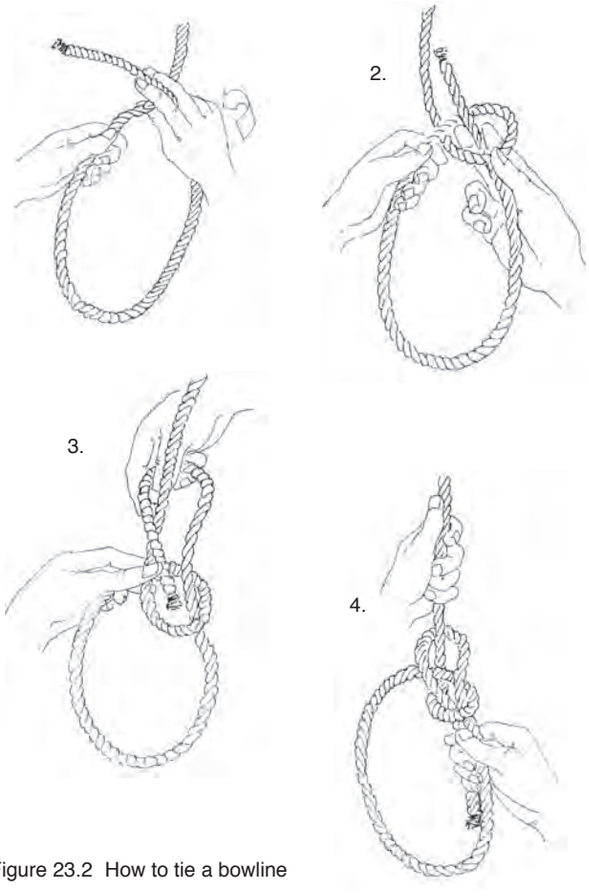


Figure 23.2 How to tie a bowline

Other knots

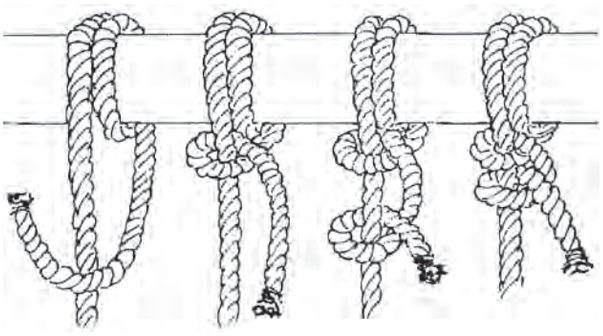


Figure 23.3 Round turn and two half hitches

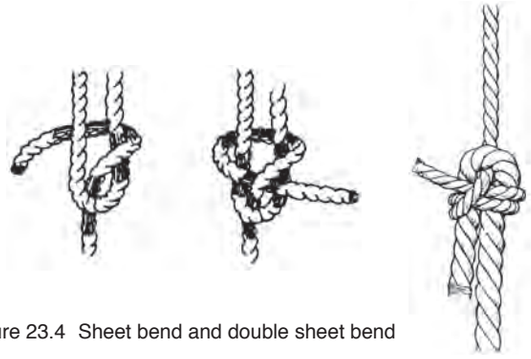


Figure 23.4 Sheet bend and double sheet bend

Figure 23.5 Tying off to a cleat

Figure 23.6 Coiling rope with and without a lay

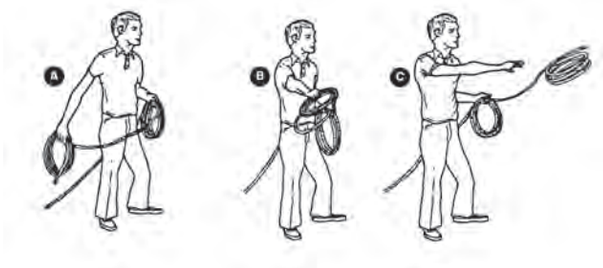


Figure 23.7 Throwing a rope

SECTION 4 ON THE WATER

Before boarding and disembarking

Backing and launching

In backing a trailer steering is in reverse. Turn the car one way and the boat trailer will go the other. Also check how the boat is mounted on the trailer. The keel should touch the rubber rollers. This is shown in Figure 24.1. Remember that the keel is the strongest part of the boat.

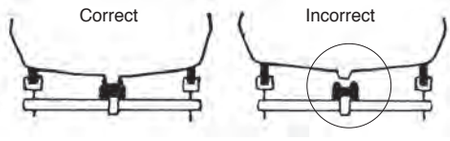


Figure 24.1 Correct and incorrect adjustment of trailer rollers

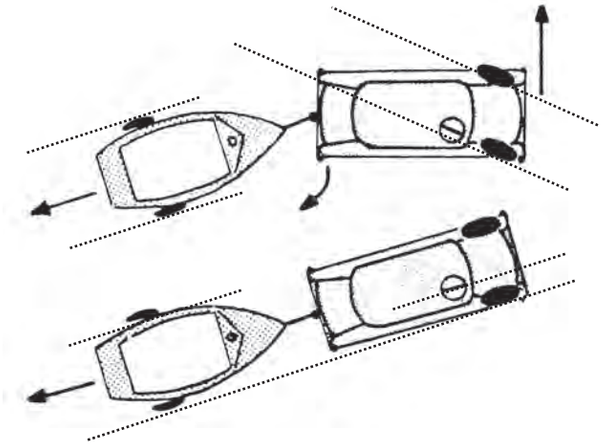


Figure 24.1 Backing the trailer

If you have your driver's licence you can learn how to back a trailer. This requires time and practice. It's best to practise in an empty shopping centre car park. Align the car and boat straight with ramp and use small steering wheel movements so that the car and boat trailer go straight back.

Ramp etiquette

Etiquette is the consideration of others. There are many things that make for a pleasant day's boating and many of these start at the boat ramp such as:

- When launching make sure the bungs are in.
- Be quick and efficient so others can get underway as soon as possible.
- Make sure everything you want is in the boat before you launch it.
- Check the brakes and have a block to secure the towing vehicle when on the ramp and remove the block when finished.
- Have someone to assist you when the boat is in the water and you have to park the car.
- Make sure the trailer tail lights are disconnected before you back the trailer into the water.

Figure 24.2 Launching a boat from a trailer

Use and care of winches

Beware of dangerous situations when the boat is being **winched**. A lot of weight is controlled by a thin piece of wire which has to be maintained in good condition.

The following are suggestions for safe practice.

- Keep the winch cable and components greased.
- Make sure the boat is moving up and down the trailer on the rollers and guides.
- Don't let the boat move too fast down the trailer.
- If the boat is heavy, get someone to help you.
- Avoid leaving the winch cable connected as the boat is launched.
- Make sure you have a rope attached to the boat as it is launched.
- Unwind the winch cable so that it is ready upon return.
- **Never stand in line with the winch cable**, because if it breaks under strain, serious injury may result.

Safety

- If the ramp is steep, the boat may enter the water rapidly. This may force water up the drive shaft housing through the exhaust chamber and damage the motor. The boat should be launched as slowly as possible.
- In trailers with hand winches, the boat may move off the trailer quickly causing the winch handle to spin quickly. Always keep complete control of the boat as it enters the water.
- Each trailer will have its own mechanism for launching and you should discuss with the dealer or vendor the operating procedure. Some trailers have tilt mechanisms, some have power winches, others have manual winches.
- Make sure there is a rope attached to the boat so it doesn't float away when launched.
- Make sure you don't slip on the ramp especially at low tide.
- Make sure you wear protective footwear because many ramps have broken glass, sharp stones or invertebrate animals with hard shells e.g. oysters or barnacles.

- Pull on the oars with equal strength.
- You don't have to dip the oars in too deep, they just have to dip under the water so the blades are covered.
- Line up a point that you are rowing from and keep it in line in order to row straight.
- If the boat has an observer, seat this person in front of you so they can see where you are going.
- If the boat is fitted with a motor make sure it is in the up position.

Turning

The oars also control the direction in which the boat travels.

If you want to go to port, then pull on the oar that is in your left hand, while moving the oar in your right hand in the opposite direction. Line up a point on the horizon and row away from it.

Returning to shore — rowing

Select your landing site and row towards it.

Look around to check condition of beach and warn crew not to get up until the boat has stopped.

As the hull touches bottom, raise the oars and stow inside the deck area.

Ask crew to disembark warning them of sharp objects in the water, slippery surfaces and the rocking of the boat, which may be caused by waves or wash from passing craft. Pull the dinghy well up the beach. If the boat is to be left set the attached anchor on the beach.

Pre-launch safety review

When setting up a small powerboat remember the following:

- Set up the motor; clamps must be firm and the safety chain on. On larger motors there should be bolts holding the motor to the transom.
- Safety equipment stowed so that it will not cause a problem during operation and is accessible.
- Stow the fuel tank in a position so as not to cause injury and also to help maintain stability and balance in the boat.
- Stow the anchor and warp in a box or compartment.
- Take basic food and water that may be needed where

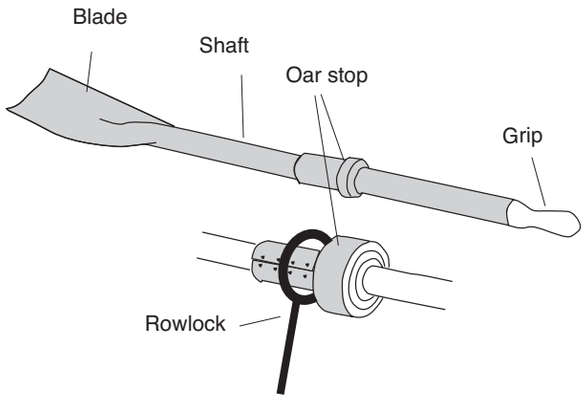
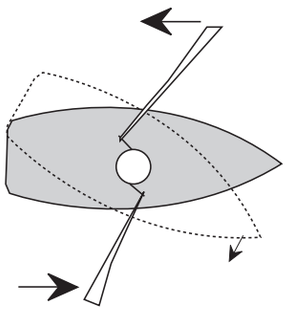


Figure 25.1 Parts of an oar

Figure 25.2 Rowing

Boarding and disembarking a small V-shaped dinghy



Always face the stern when you get into this type of boat and step towards the middle so that the centre of gravity is as low as possible. Take hold of the gunnels to steady yourself. If you move from side to side the centre of gravity changes and the boat will move accordingly. If you have a passenger, any sideway movement will move the boat also, so the weight of the occupants should be distributed equally. The photograph on the cover of this book illustrates these points. Before you get in however, make sure you:

- Can swim with a life jacket.
- Can throw a rope 3 metres.
- Can tie a clove hitch.
- Can balance yourself in a boat.
- Have clean feet or shoes so that mud does not get everywhere in the boat

Leaving or casting off — for rowing

This is most easily achieved by giving a good push off, starting off slowly and looking all around for other boats. Before leaving shore have the oars set in position and clear of the water.

Rowing

When rowing, sit comfortably in the middle of the boat and face the stern. Grasp the oars and push forward so that the oar blade moves towards the bow of the boat. Dip the blade in the water. Pull back until the oar blade just passes you and then manoeuvre the blade out of the water so as to repeat the cycle.

- Don't try to row too fast.

Controls

The first control to be learnt is the stop. You should never start any machinery unless you know how to stop it.

The stop is usually the red button that is pushed and held until the motor stops.

However some motors have other coloured buttons or switches and large motors will tend to have a key that fits into an ignition like a car.

Starting an outboard motor

Procedures

Follow the manual of the motor you are using to connect the fuel line to the motor. Figure 26.1 shows this connection.

The description below is for a small outboard engine. For a larger engine, you should consult the manufacturer's handbook because many larger engines use a key, a trim and tilt mechanism, and require specific sequences for starting.

Ashore (cold)

Check the motor is mounted correctly and is sitting in a bucket of water so that the cooling system will suck the water in through the inlet and out through the tell tail. Alternatively attach a set of rubber flushing ear muffs to the end of a hose and run water from the tap continually through the motor until it starts. Note the following points:

1. Connect fuel line (check for sand or gunk on end) and make sure the screw on the cap is loose so the tank can breathe.
2. Pump bulb until reasonably firm.
3. Check the dead man's clip is in place.
4. Is the gear lever in neutral?
5. Is the choke on?
6. Is the throttle on "start"?
7. Gently pull starter cord until it catches.
8. Look behind you (so no-one gets belted in the mouth when you pull cord!)
9. Take up the slack in the pull cord and pull firmly until motor starts. If motor does not start after a few pulls, turn the choke off and try again.
10. As soon as motor "kicks" turn off choke and drop the revs.
11. Check to see if water is coming out from the tell tail (shows water pump is operating).
12. Never change gears when the motor is revving hard.

Ashore (Hot)*

Use the following suggestions when the motor is hot:

1. Gear lever should be in neutral and throttle on start.
2. Same as 9, 10, 11.

* NB. When motor is hot do not use choke.

Most larger outboards have steering wheels and engine controls located some distance from the motor.

The gears and throttle are in one lever. If this level is pushed forward the boat goes forward. Often the starting and stopping of the motor in this situation is with a key.

Trouble shooting

The motor won't start

- Flooded carburetter — remove the fuel line and empty the carburetter by cranking the motor with the pull cord about 6 times and then replace the fuel line and start again.
- Dirty spark plug — remove the plug and clean it.
- No fuel getting through to carburetter — check for a kink in the fuel line or open the vent on the cap of the fuel tank.
- Not enough fuel to the carburetter — pump the primer bulb.
- Electrical or fuel problems — return to repair shop.

The motor starts but the boat goes nowhere

- Broken shear pin — remove propeller and replace

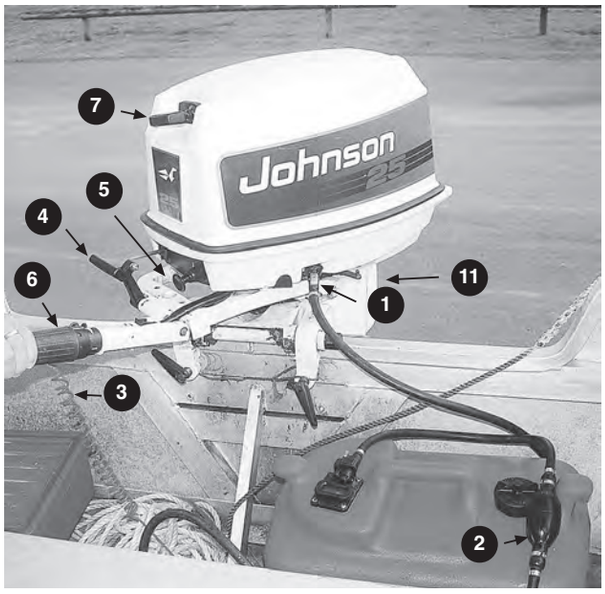


Figure 26.1 Starting controls of an outboard motor

Safety hints

- knowing how to load and distribute the weight in your boat for maximum stability – have the heaviest items placed centrally in a low position and evenly distribute passengers around the boat.
- Never over rev an engine while running on ear muffs and hose as some water pump capacities are sometimes more than the volume of tap water.

Preparing to go out

Put the bung in

Before you do anything, make sure the bung is in, everyone is wearing life jackets and all the safety gear is in the boat.

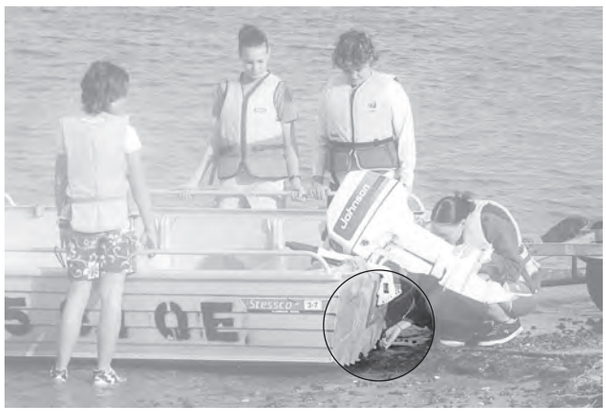
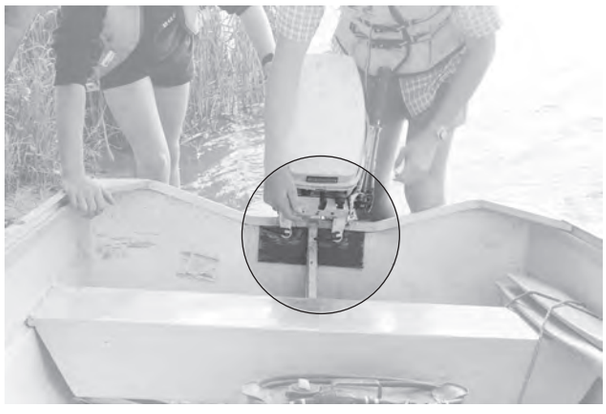


Figure 27.1 Put the bungs in and check that all the safety gear is stowed

in the Figure 27.2.

Now make sure the trim and tilt mechanism is adjusted so that when you mount the motor, it sits at the correct angle as shown in Figure 27.3c.

Have someone hold the bow as shown the Figure 27.4 while you board the dinghy and follow the steps as you practised ashore. Make sure you have your balance and that there is nobody behind you when you pull the starter cord.



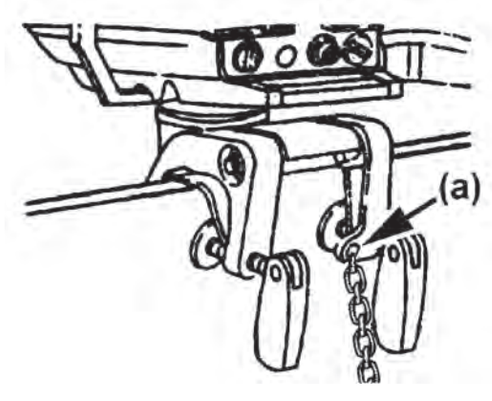


Figure 27.2 Mounting the motor on the transom plate

Mount the motor on the transom and centre it as shown in Figure 27.2. Then check to see if the cavitation plate is level with the bottom of the transom.

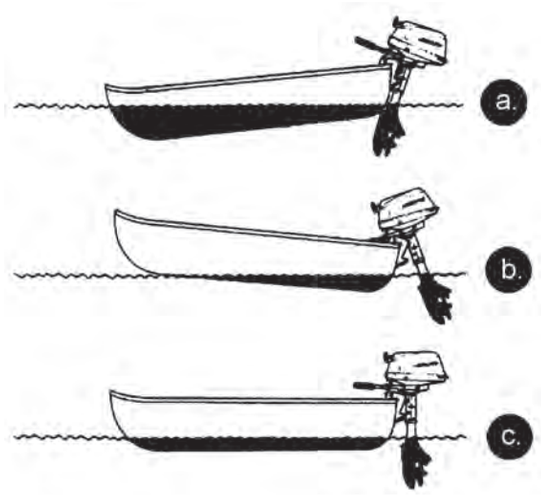


Figure 27.3 Correct and incorrect adjustment of cavitation adjustments

Now screw the engine clamps on firmly but not to a point where you break them. Connect the safety chain to an appropriate attachment point on the motor so it won't drown if the motor comes loose. This is indicated by the letter (a)

Figure 27.4 Always start the motor from inside the boat

Conservation tip - stow it don't throw it

- make sure all items of rubbish or potential rubbish are stowed in bags or containers that can be returned to rubbish bins at home.
- pack your boat for minimal rubbish. For example sugar in a resealable water proof plastic container instead of sugar in a disposable bag.
- plastic bags in the sea look just like jelly fish and choke baby turtles to death

WORKSHEET 8 PREPARING TO GO OUT

1. What is the first thing you should check before you take a boat out to sea?

2. Write out the starting procedure for the motor shown in Figure 28.1. Number the relevant parts and make reference to these in your description.

Figure 28.1

3. If you were boarding a boat from a rocky shore as shown in Figure 28.2 what additional hazards should you be aware of.

Figure 28.2

Boating rules

These rules are part of an international set called *The Regulations for the Prevention of Collision at Sea*.

For more detailed wording consult the recommended text reference on page 62. Note that other rules are discussed in Section 6, pages 49 - 56.

Responsibility (Rule 2)

It is the responsibility of the skipper to know the international rules and he or she cannot be excused for failing to know or adhering to them. In other words once you take charge of the tiller, you are in charge as the skipper of the vessel and your crew are under your command.

Vessel definitions (Rule 3)

The word vessel includes every description of watercraft capable of being used as a means of transportation on water.

- A sailboard or sailing boat would be one driven by sails.
- A vessel engaged in fishing means the boat has fishing gear that restricts is manoeuvability i.e., trawler nets or lines.
- Power driven means its driven by a motor.
- Seaplanes include any plane capable of being propelled on water.
- A vessel not under command means the vessel is unable to abide by the rules and cannot get out of your way.
- A vessel restricted in her ability to manoeuvre is one which is working on a difficult task such as laying submarine cables, dredging, towing , transferring cargo or picking up navigation marks.
- A vessel restricted by her draft is one which has to stick to the centre of the channel or she will run aground.
- A vessel under way means the vessel is not at anchor, aground or tied up at the dock.
- Vessels are said to be in sight of one another when they can be seen with the naked eye.
- Restricted visibility means you cannot see other vessels because of fog, mist, snow, sandstorm or heavy rain.

Look-out rule (Rule 5)

Basically this means that you should constantly look out and listen for any other vessel or obstruction.

Safe speed (Rule 6)

At all times you must proceed at a safe speed so as to avoid collision and be able to stop in an appropriate distance. You must take into consideration:

- visibility
- traffic density
- manoeuvability of the vessel
- at night the presence of background light
- the state of the sea, wind and current
- the draught of the vessel

Some speed limits apply in areas of confined water or close to stationary vessels. Check with local authorities as to these regulations. When close to people in the water, cut the motor if possible.

Remembering port

- PORT - has 4 letters
- Left - 4 letters
- I *left* my *port* at home

Risk of collision (Rule 7)

You must at all times use all available means to determine if there is a risk of collision. Such a risk shall be deemed to exist if the compass bearing of an approaching vessel does not change. However it may occur in other situations.

Action to avoid a collision (Rule 8)

Any action to avoid a collision shall be positive, in ample time and with due regard. This will allow the other vessel to see your action and take this into account when determining their action.

Rivers and channels (Rule 9)

When in a narrow channel as shown in Figure 29.1, keep to starboard.

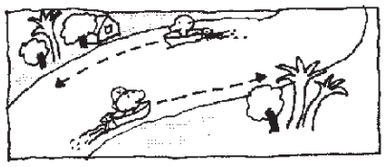


Figure 29.1 Rivers and channels

Sailing vessels (Rule 12)

If two sailing vessels approach each other when each has the wind on different sides, the vessel which has the wind on the port side keeps out of the way of the other.

If two sailing boats approach each other and have the wind on the same side, the vessel which is to windward shall keep out of the way of the vessel which is to leeward.

If a vessel with the wind to the port side sees a vessel to windward and cannot determine with certainty whether the other vessel has the wind on the port or on the starboard side, she shall keep clear.

Sailing boats and power driven boats

A power boat as shown in Figure 29.2, must give way to sailing boats, row boats, ferries and craft under tow.

This rule does not give a sailing vessel the right to hamper the safe passage of a power driven craft in a channel where the power craft can only navigate inside such channel.

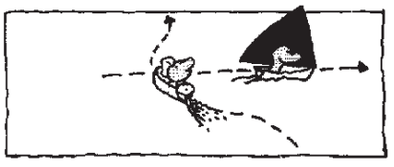


Figure 29.2 Sailing boats and power driven boats

Overtaking (Rule 13)

When overtaking another vessel as shown in Figure 30.1, the vessel being passed has right of way and you must always keep clear of that vessel.

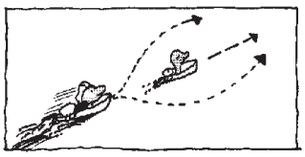


Figure 30.1 Overtaking

Approaching bow on to another boat (Rule 14)

When two power boats are approaching head on as shown in Figure 30.2, or nearly head on, each must alter course to starboard and pass on each others port side.

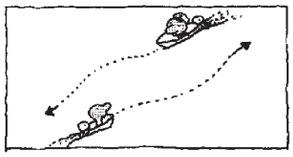


Figure 30.2 Rivers and channels

Power driven boats crossing (Rule 15)

When a vessel is crossing your bow from *starboard to port* as shown in Figure 30.3a, that vessel has right of way and you should keep clear. Stop or reduce speed and pass under the stern. (Give way to the vessel on the right)

When a vessel is crossing your bow from *port to starboard* as shown in Figure 30.3b, you should maintain course and speed as you have right of way. If the other vessel does not give way, you should take all action to avoid collision.

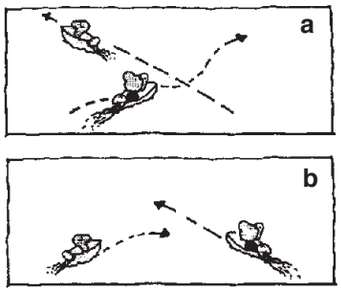


Figure 30.3 Power driven boats crossing

Cross river ferries

All vessels under 40 meters in length (except when they are towing or assisting another vessel) must give way to cross-river ferries.

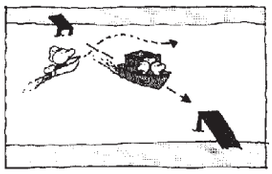


Figure 30.4 Cross river ferries

Action by give-way vessel (Rule 16)

The vessel giving way shall keep well clear.

Action by stand-on vessel (Rule 17)

The stand on vessel shall maintain course and speed until it is obvious that the other vessel doesn't know the rules and then the stand on vessel should take what ever action as is necessary to avoid collision.

Responsibilities of vessels (Rule 18)

A power driven vessel under way shall keep out of the way of: a vessel not under command; a vessel restricted in her ability to manoeuvre; a vessel engaged in fishing; or a sailing vessel.

A sailing vessel under way shall keep out of the way of: a vessel not under command; a vessel restricted in her ability to manoeuvre; a vessel engaged in fishing. The term not under command means a vessel which is unable to manoeuvre through some exceptional circumstances.

Vessel restricted in ability to manoeuvre means a vessel restricted by the nature of her work.

Restricted visibility (Rule 19)

This rule applies to vessels not in sight of each other when visibility conditions are poor.

- Proceed at a safe speed
- Have respect for the prevailing conditions
- If you have radar and see the possibility of a collision take whatever steps are necessary to avoid that collision.

Sound signals (Rule 32 and 34)

Most recreational boats do not use sound signals, however they are used by ships and larger vessels who have restricted movement. A short blast lasts about a second, whereas a long blast for about 5 seconds.

Boat users should be aware of these signals and what action is being taken when heard.

These sound signals are:

1 short blast	I am altering course to starboard (right)
2 short blasts	I am altering course to port (left)
3 short blasts	I am operating engines astern (reversing or stopping)
5 short blasts	Alerting the other boat — I am unsure of your intentions.
Note:	All boats should use sound signals in restricted visibility to alert others of their position and all skippers of vessels should be extremely cautious when operating in restricted visibility.

Note Rules 20 - 30 are discussed in the colour section on pages 49 - 56

WORKSHEET 9 LAUNCHING YOUR BOAT

1. Write out the starting procedure that you use to start the outboard you are learning on.

2. Draw lines to match the motor with the hull displacement and describe how and where a motor should be correctly mounted on a boat

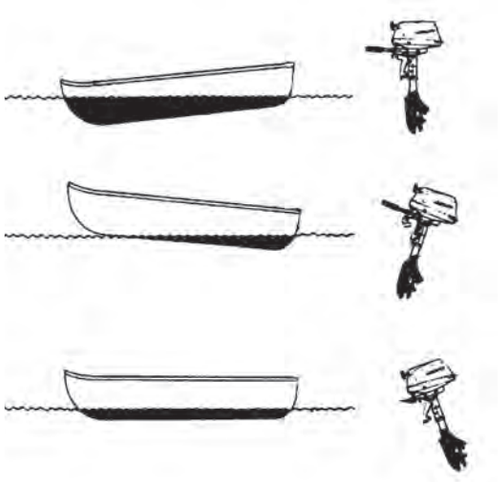
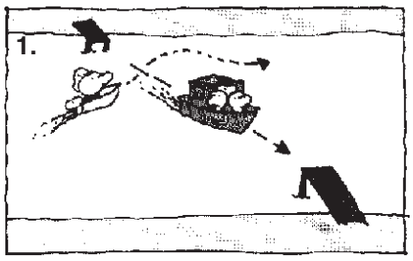


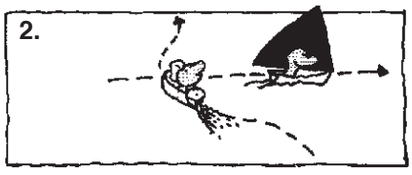
Figure 31.1 Match the motors

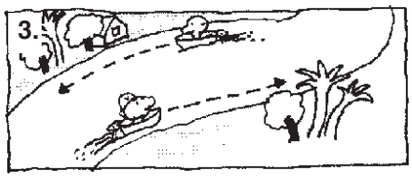
3. Look at the photo of a person boarding a small boat. If this were on rough water what hazards and difficulties would you expect?

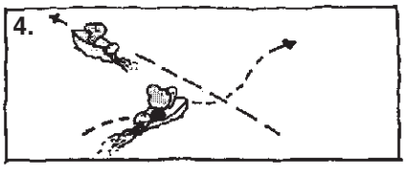
WORKSHEET 10 SOME BOATING RULES

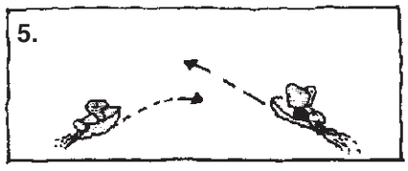
1. Study the illustration to the left and then write out the rule in the space provided to the right

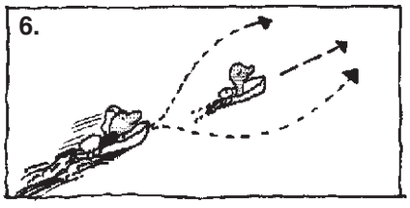


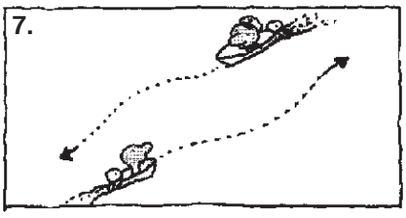












1. _____

2. _____

3. _____

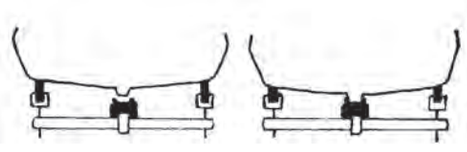
4. _____

5. _____

6. _____

7. _____

2. Which boat in the diagrams below will be harder to launch. Give reasons for your answer.



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SECTION 5 GETTING

UNDER WAY

Check surrounding conditions

Once the boat is in the water, a final safety check must be done.

- The check will include the wind, tide, currents, other boats, waves and particularly other people.
- For the first lesson all operations should be done at very slow speeds.

Start the motor

Figure 33.1 For the first lesson all operations should be done at very slow speeds.

Before starting the boat, the driver and all but one of the crew should be on board. This person should hold the bow while the motor is started (Figure 27.4). If you are the person starting the motor:

- Make sure you are in the boat when the motor is started and that your crew is seated so the boat is balanced.
- Check to see if water is coming out of the tell tail.
- When the motor is warmed up ask your remaining crew members to board and engage the motor in gear when the motor is idling.
- Check the fuel tank is vented and there are no kinks in the line to stop the flow of fuel.
- If you change gears when the motor is at high revs, the chance of damage to the gearbox is great. You may also break the sheer pin in small motors.

Factors affecting handling

The handling of a boat depends on a multiplicity of factors some of which are:

- Power unit, drive, propeller type and hull design and superstructure.
- Wind blowing against the superstructure of small lightweight boats.
- Conditions of loading, sea conditions.
- Weather, tide, current, waves and swell.

Conservation tip - slow down in turtle protected zones

- In many marine parks, turtle protection zones have been identified as areas for special consideration in conservation.
- Many turtles die each year from being hit at high speeds by power boats.
- These areas are identified in Marine Parks Maps. A sample map is shown on page 9.

To engage forward gear, drop the revs, wait a few seconds and pull the gear lever into forward.

Now sit in a comfortable position with one hand firmly on the throttle and another on the gunwale as shown in Figure 33.2. Make sure you engage your brain before moving off.

Practise increasing and decreasing revs so that you "get the feel "of the motor.

Practise steering to port and to starboard so that you get the feel of the motor acting as a rudder.

Figure 33.2 Sit in a comfortable position

Driving your boat

Forward

Figure 33.3 Driving a boat forward

Figure 34.1 Learning to drive aboard with forward controls

Driving a boat with forward controls

Learning to drive a boat with forward controls as shown in Figure 34.1 is much the same as learning to drive a car. Because the steering wheel controls the motor by linkages, it will move the boat in the direction you turn the wheel.

Reversing

Drop the revs, wait a few seconds and place the gears into neutral. Now turn your body around, face the motor and slip the gear into reverse. Point the motor in the direction you wish to go and accelerate slowly. Notice that the wash becomes an important issue so control the speed to avoid water splashing into the boat. Water can also enter the boat rapidly when reversing into waves.

Figure 34.2 Reversing

Planing your boat

Planing is an important part of boating because it makes best use of your hull design.

Accelerate the boat so that the bow rises and then falls as you gather speed thus trimming the boat on an even keel as shown in Figures 34.3 and 34.4.

Often all or most of the power in the engine is required to get the boat on the plane.

Some suggestions to make your boat plane properly are:

- If you are in a small boat you may have to lean forward to get the boat to plane. Be careful of wind and control your balance.
- Don't try to plane the boat in rough sea conditions.
- You don't have to go flat out to plane a boat. All you have to do is accelerate enough to get the bow of the boat to rise and then fall onto an even keel.
- Always have a firm grip of the gunwale and throttle.
- Use your brain to control your hand movements and think about what you are doing. Be prepared to adjust speed to sea conditions.
- If you see a wave coming, slow down and ease the boat through the wash as described in Figure 35.1 for crossing a wash.
- Make sure everyone and everything are secure before you start planing. Get the seating right so that the boat is balanced and planes properly. Distribute the load evenly.
- Cut back on the throttle as the boat planes to economise on fuel.
- Before accelerating look ahead and see that it is clear as you may not be able to see ahead again until the bow drops.

Figure 34.3 Correct seating for on the plane

Figure 34.4 On the plane

Crossing the wash of another boat

There is an art to this. A small wash will be easily crossed straight ahead but hang on, and keep an eye on your passengers. A larger wash demands some skill.

- Slow down to a speed that you can safely accelerate and decelerate.
- Approach the wash at an angle so that the hull of the boat just rocks through it. For a bigger wash accelerate and decelerate so that you go up and over the waves in the wash.

Safety note

Make sure crew knows what you are doing, look over your shoulder each time you turn and check for waves and submerged objects in the turning path.

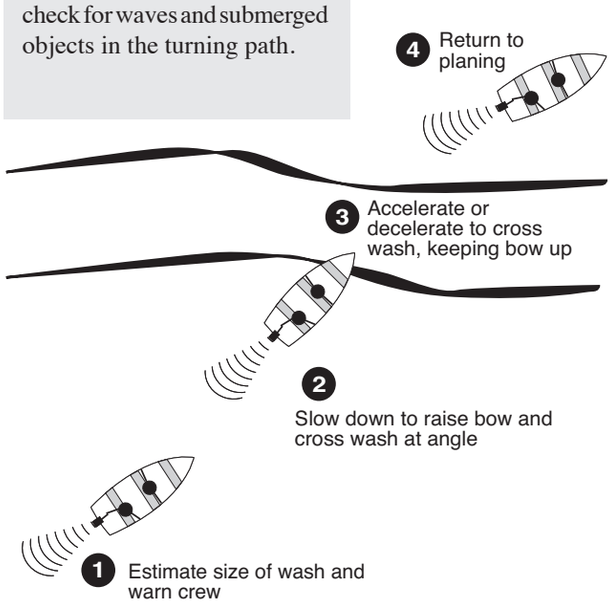


Figure 35.1 Crossing the wash

keel.

- Cross the wash and hang on tightly. Slow a little to ride over the waves.
- Keep the boat on the plane.
- Look over your shoulder again and make another turn.

Figure 35.2 Making a U turn

Making U or S turns

Practice making a U or S turn while on the plane. Make sure you warn crew of your intentions, look over your shoulder to see if it is safe to turn, and cast a careful eye out for obstructions.

Here are some suggestions to help you in the manoeuvre as shown in Figure 35.3:

- Decelerate and accelerate in the turn to:
  - Keep the boat on the plane.
  - Decelerate and or accelerate in the turn so the chine of the boat does not slip out (fishtailing).
  - Don't slow down too much or the boat will come off the plane.

Figure of eight

This is performed on the plane. Make sure you have plenty of space, that there are no other boats in the vicinity and you have good control of the throttle.

- Warn crew of what you are about to do.
- Look all around to see you have space to safely make the manoeuvre and make a wide arc.
- Keep the boat on the plane in a wide arc and on an even

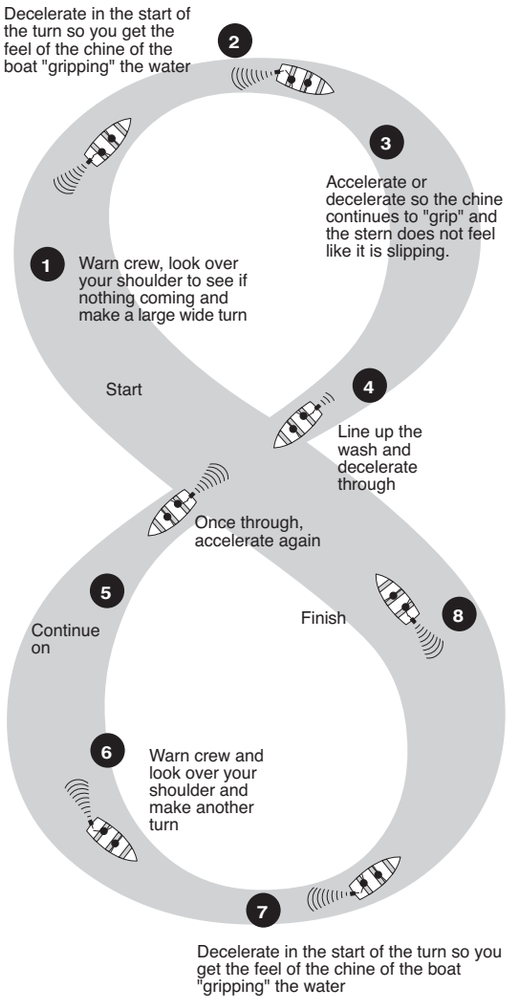


Figure 35.3 Figure of 8

WORKSHEET 11 FORWARD AND REVERSE

1. Suggest a simple way to remember the difference between port and starboard?

2. Explain the procedure involved in engaging forward gear?

3. Complete the sentence: Make sure you engage ... ...

4. a. If you are driving a tiller steer motor and you turn the tiller to port, which direction does the bow go?

   b. How is this different from a forward drive situation?

5. Explain the procedure involved in reversing a motor?

6. Which side of the channel do you drive the boat on?

7. How can you tell if you are doing approximately 6 knots?

8. Now that you have had your first go at driving a boat, make a list of things you need to practise to become more competent.

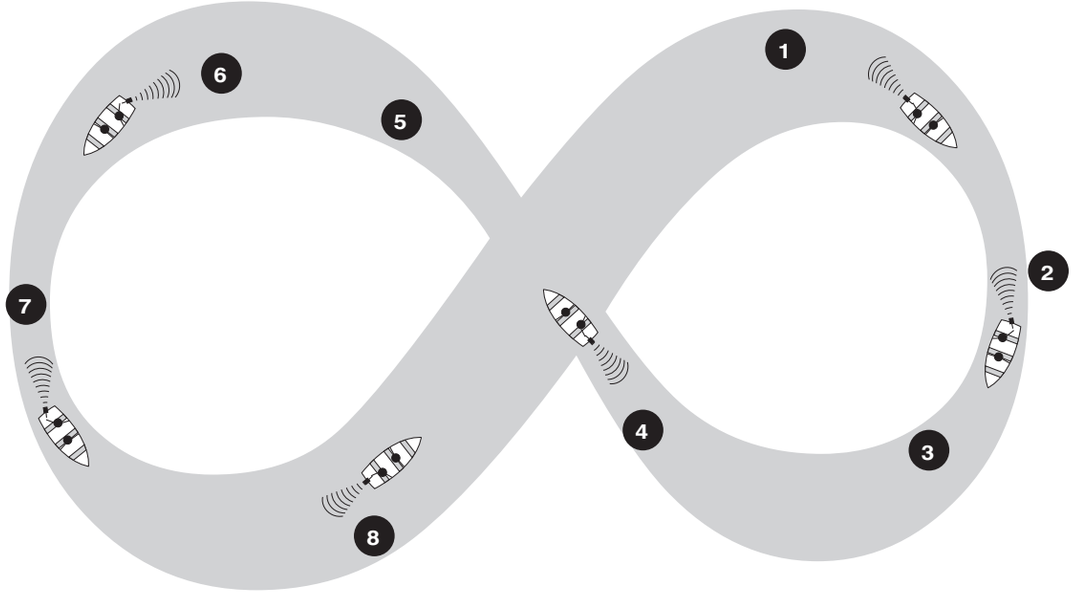
9. List two conservation tips to save turtles in the marine environment.

WORKSHEET 12 ON THE PLANE

1. Describe how to get a boat on the plane.

2. List 10 points that will help you to plane the boat correctly and safely.

3. Complete the diagram below of the suggested points in completing a figure of 8.



The emergency stop

The sudden sighting of a log, or something falling from the boat, may cause you to want to stop suddenly. This can be dangerous if not done correctly because different hull designs handle this manoeuvre differently. Remember to power off before turning the boat through 90 degree.

Rough weather handling

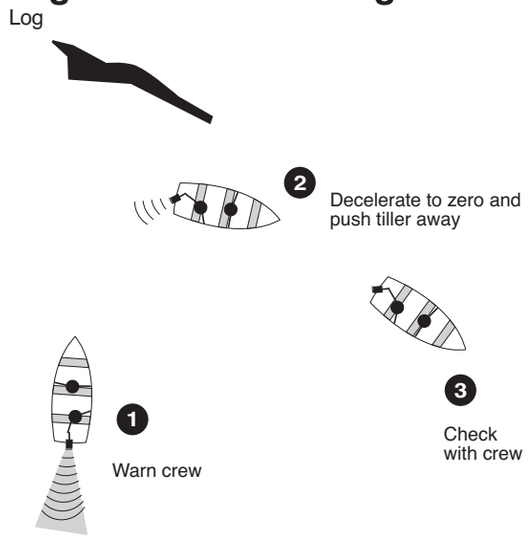
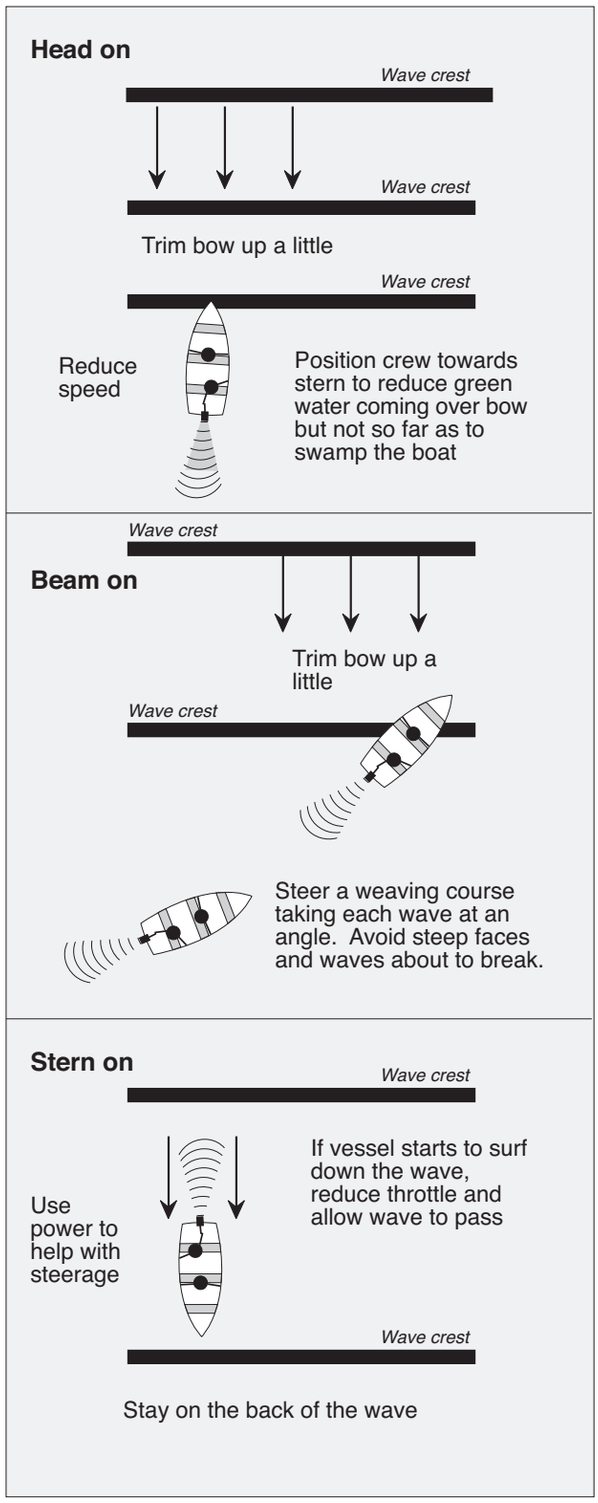


Figure 38.1 Emergency stop

The skill required is very similar to crossing a wash. A planing boat does not handle well in rough weather and is in danger of swamping. If caught in rough weather in a small dinghy head for the nearest windward shore, beach the boat and wait for better weather. If this is not possible you will have to handle each wave as if you were crossing a large wake keeping the bow up at all times.

Figure 38.2 Waves and swell can affect a boat's handling (Illustration courtesy Queensland Transport)



Conservation tip

Many turtles and other marine life that live in the surface waters of the sea die each year from prop damage.

A role of the observer and driver should be to keep an eye out for marine life at all times.

SECTION 6 LANDING

BACK AT SHORE

A beach landing

Landing is a skill requiring considerable practice in which you judge your speed so that you can disengage the gears, turn off the engine and pull it up just as you glide into the beach. The only way is to practise and you have to take into account factors such as tide and wind as well as the type of material that makes up the beach. Here are some suggestions assuming you are now operating the craft by yourself:

- Remember that your boat does not have brakes.
- Always turn your motor off before you pull it from the water.
- Remember that the propeller will hit the bottom if you don't pull the motor up.
- Come in very slowly. When the boat has completely stopped, disembark. Never jump out of a boat while it is in motion.

There will be some additions to the list above depending on the shoreline and the environment around it. (For example a rocky foreshore will be very uneven and damaging to the vessel and can result in injury to the crew. Jetties and pontoons can also provide difficult circumstances to get in and out of small boats. What ever the landing site look and think — how will be the safest way to get to land?

Once you have completed your first practical session on the water you may have to pack up the boat. If this is the case follow instructions carefully. Remember to protect you back by using your leg muscles to lift heavy items. Share or reduce the load to avoid strain or injury.

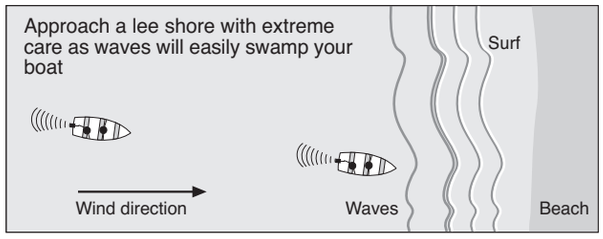


Figure 39.1 Always try to find a windward shore as lee shores have surf which is very tricky to handle

Mooring and docking

Mooring means coming up to an object in the water while docking is coming along side a marine structure.

Mooring may be necessary if no berth is available or you are in an environmentally sensitive situation, e.g., Marine Parks require that no boat be anchored to avoid anchor damage to coral reefs.

Docking requires a number of skills that are discussed over the section on close quarters handling. In this situation, wind, tide and other boats play a very significant role and real skills are needed to dock larger vessels in tight situations.

Figure 39.1 A beach landing

Figure 39.2 A rocky shore landing

Mooring

Docking

Figure 39.3 The difference between mooring and docking

Marina berths developed designs to assist where the boat can be driven into a dock and other boats are protected by the marina berth.

Mooring

Here are some mooring hints:

- Approach the buoy in the forward gear slowly and if possible, into the wind and waves or the current, which ever is the stronger. Watch wave action as this will affect your rate of progress.
- When close to the buoy, engage reverse so that you stop the boat. Use reverse to check your rate of progress.
- Ask you crew to pick up the buoy, or if you are by yourself, disengage gears and move to the bow and pick up the buoy.
- Remember that a boat does not have brakes. Reverse will need to be used if you want to stop the boat if it is going to drift further than you wish.
- The amount of reverse can easily be over done resulting in the boat not stopping but going backward.
- Use reverse to withdraw from the mooring so as to keep the propeller as far as possible from the ground tackle; don't reverse into waves as the water can splash over the stern easily.

Docking

For docking, as shown in figure 40.2, include the first 3 points of mooring noting the following:

- You are coming up to a large solid object not a buoy.
- Approach at about a 30 degree angle to the jetty.
- Drift the bow into position.
- Turn the motor so that using reverse pulls the stern into position.

Figure 40.2 Docking at a jetty

Some principles of close-quarters boat handling

To get the best results when manoeuvring, the fundamental action of the propeller must be understood and remembered. The appropriate reactions required when manoeuvring need to become automatic.

- Figure 40.1 shows looking at the craft from astern and illustrates how the propeller affects the bow.
- Figure 40.3 shows other situations involved in docking under a variety of conditions of wind and tide

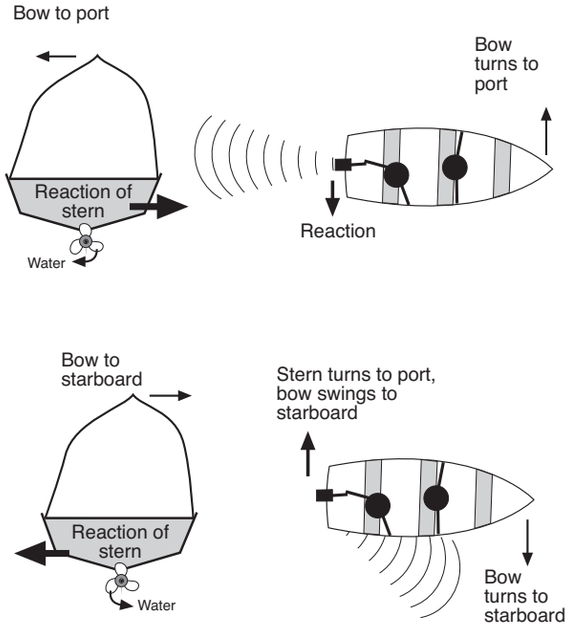


Figure 40.1 The action of the propeller — the paddle wheel effect

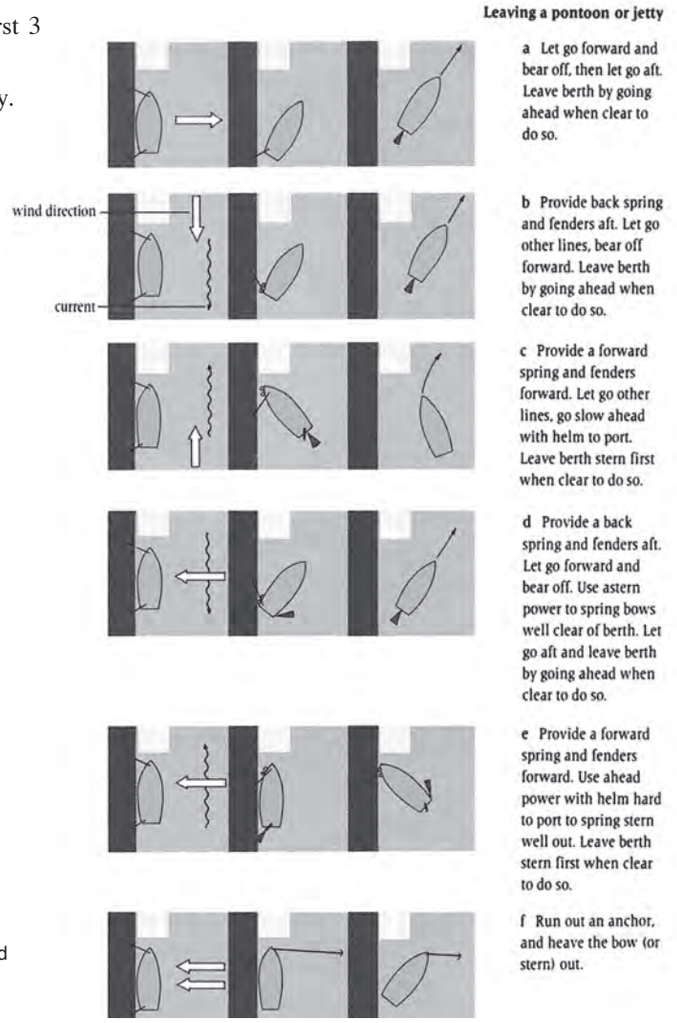


Figure 40.3 Docking under a variety of conditions (Illustration courtesy AGPS)

WORKSHEET 13 LANDING BACK ON SHORE

1. Write out 6 hints to assist mooring a boat at a buoy.

2. List common sense conservation tips while boating.

3. Which way would you approach the jetty or shore line given the following situations? Give reasons for your answer.

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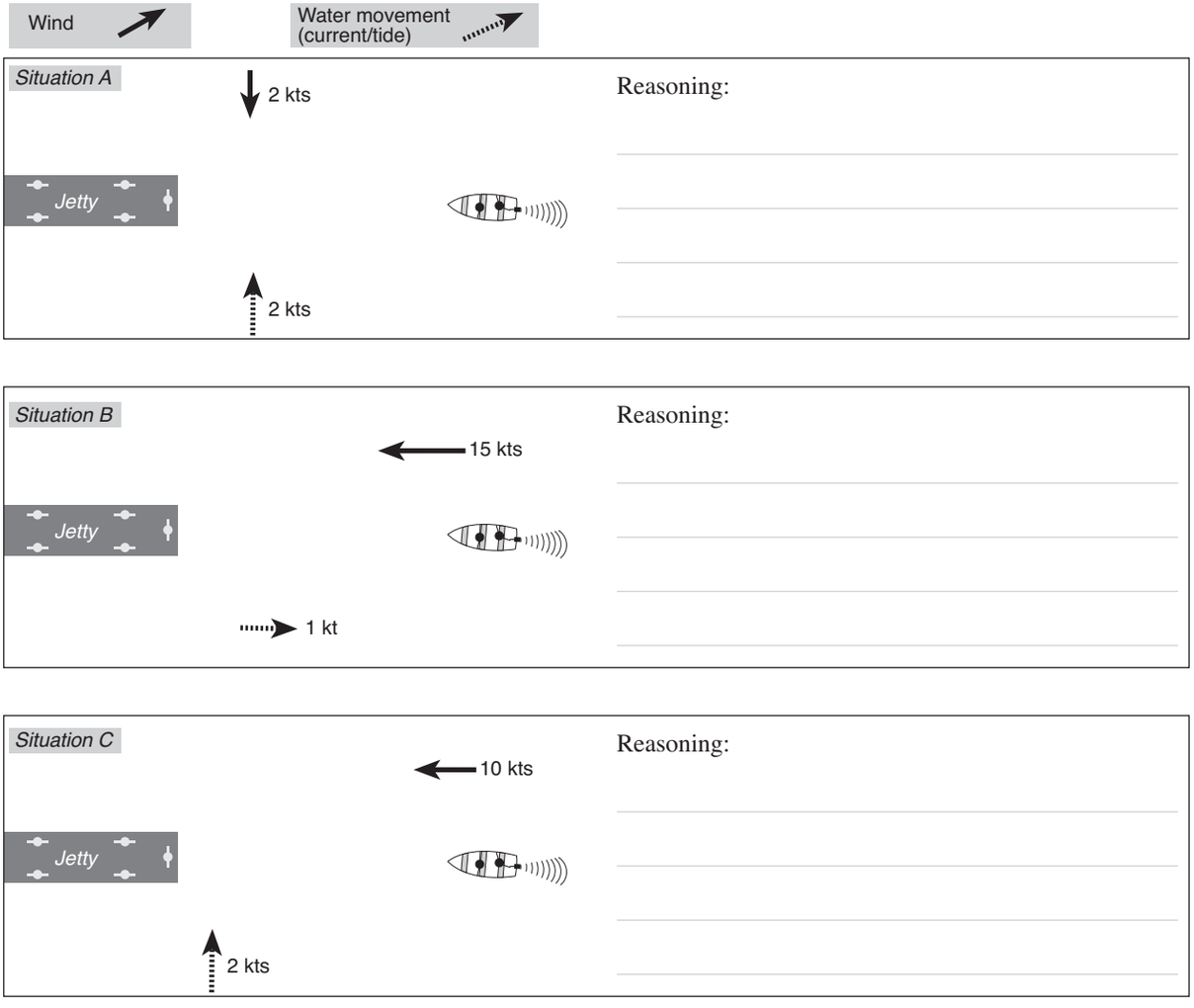


Anchoring

Anchors vary in design and performance as well as in size. The holding power of a modern anchor is strictly dependent upon its design, and is proportional to the area of the fluke and the depth to which they are buried in the bottom.

The weight of the anchor is only one factor. All anchors, rigid or pivoted, rely on the principle of the ploughshare. A flat or curved piece of metal (the fluke) catches obliquely in the bottom. This is shown in Figure 42.1.

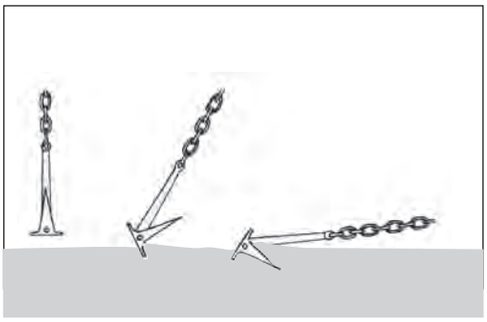


Figure 42.1 How an anchor works

There are many different types of anchor, the most common in small boats being the danforth. Other types of anchors are shown in Figure 42.2.

Parts of anchor system

The fluke is the pointy part which makes contact with and penetrates into the ocean bed. It is attached to an arm which then connects to the crown at the bottom of the anchor. The crown is connected to the shackle by means of the shank. At the top of the shank is the stock. An anchor chain is connected to the ring which helps weigh down the anchor. These features are shown in Figure 42.3.

On large boats chain is used from the anchor to the boat, however on small boats 2 meters of chain is recommended to be attached to the anchor – the rest being rope that does not float. The rope and the chain together make up the warp.

Technique

The amount of warp required will depend on a lot of factors including the condition (both sea and air), the bottom and the vessel. However the minimum should be 3 times the depth. In rough conditions 9:1 may be necessary. A weight mid way along the warp may be used to assist the holding power of the anchor particularly in rough conditions. It acts as a shock absorber. This is shown in Figure 42.4.

Conservation tips

- Anchors wreck coral reefs and seagrass beds. If you can do boating activities such as fishing while drifting with the tide, it will help save valuable habitat.
- Motor up to anchors and then lift them, don't use the motor to drag the anchor out.

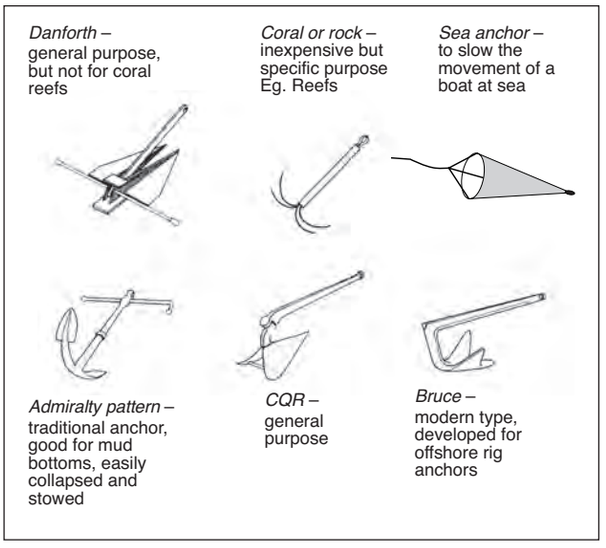


Figure 42.2 Modern types of anchor

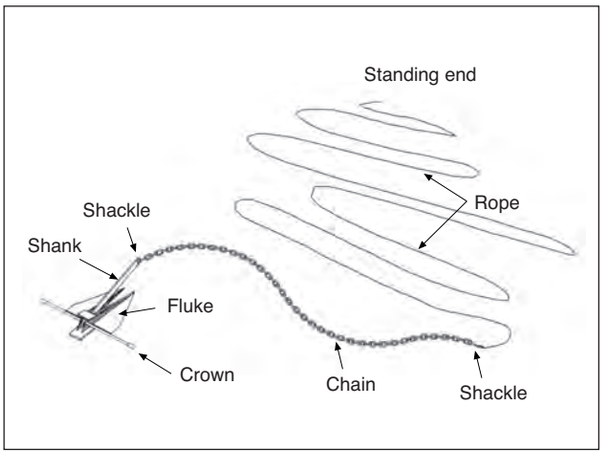


Figure 42.3 Parts to an anchoring system

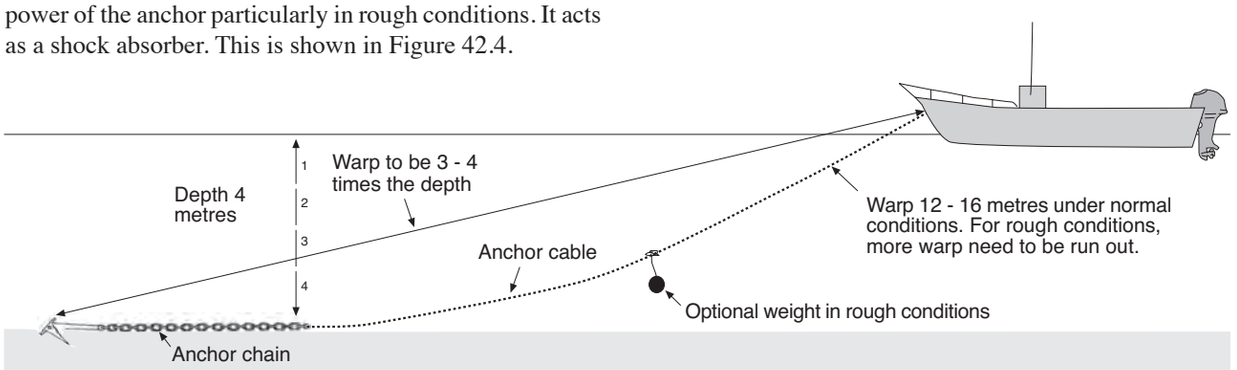


Figure 42.4 Parts to an anchoring system

Man overboard drill

This is a drill where an object (representing a person) is thrown out of the boat at speed and you are asked to recover it. Many testing officers have their own variation and it may be wise to check with them first. Here are some points to consider when performing this activity:

1. Tell someone to watch "the person" all the time until rescue is complete. A GPS can be used to fix this position.
2. If conditions are such that you cannot immediately turn the boat around, throw a life buoy or something buoyant into the water to use as a marker. This will increase your chances of returning to the right place quickly.
3. Turn the boat around with safety and head back towards "the person".
4. When near "the person", bring the boat up into the wind (or into the current if it is stronger than the wind).
5. If you have a quoit and line, heave it to "the person" and haul alongside. If no line is available, drive the boat close to "the person".
6. Once you have contact with "the person" in the water cut the motor. If this could endanger the vessel then go into neutral and don't cut the motor (the type of situation that determines this action is bar crossings, very rough weather or if there is a problem in restarting the motor).
7. If the boat is a small dinghy, retrieve "the person" over the stern, so as to avoid capsizing the boat. Care should be taken not to cut "the person" with the prop.
8. For other boats retrieve "the person" at the side of the boat. If there is difficulty getting "the person" on board rig a rope (the anchor line will do if nothing else is available) by tying it onto the boat at bow or stern and allowing the bight to fall into the water where it can be used as a step to assist recovery.

Accepting a tow

Throw your line to the other vessel in the hope they will accept it (see the section on salvage on page 44). Before doing so make sure your boat is secured so it will be towed evenly. Here are some additional points to consider when towing or being towed.

- Knots used will be under great strain, so its best to tie to the strongest part of the vessel. A small cleat would be of little use under strain. If knots are used, then choose the one that will undo easily i.e., a bowline.

  Keep in mind what safety precautions you would need

Figure 43.1 Towing

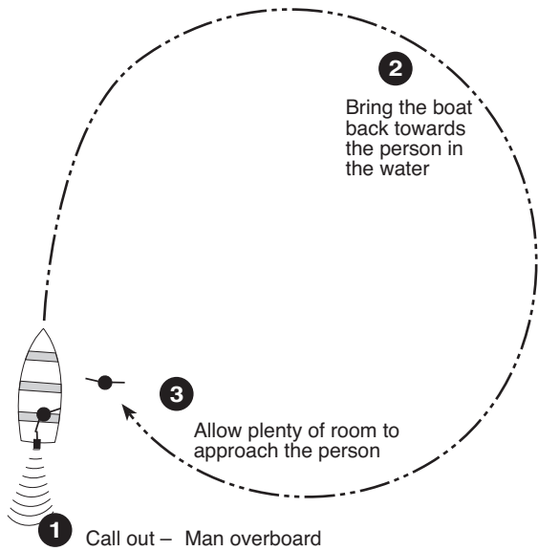


Figure 43.2 Recovery of an object from the water

to have if the line were to break and advise personnel accordingly.

- Towing should be at a slow speed depending on conditions. The towing vessel must have an observer watching the vessel being towed.
- Try to avoid being in line with the tow line under strain. If it breaks it can whip back. Let go the tow if either vessel endangers the other e.g. one is sinking.
- Leave the motor down to help steer the boat and provide a little drag thereby keeping the tow line tort.

Salvage

- All mariners help each other at sea. If one boat can help another it will with very little asked or given. However when commercial vessels are involved, time is money and if a person can show that he or she helped save boat and/or its crew, then a salvage claim against that person or its insurance company can legally be made.
- The claim should be well documented so that proof of an agreement between both parties can be established. In salvage, if you accept the line thrown by the rescue boat, you could be entering into such an agreement.
- Make sure you discuss this first before taking a tow or it may be better to throw your line first and then start discussions.
- Commercial vessels are easily distinguished as are the vessels of volunteer rescue associations. Check your insurance policy to see if it contains salvage clauses and find out if you are covered and for how much.

Preparing for storage

After a boat and engine come out of salt water, they should be cleaned so that the corrosive forces of salt do not attack vital components. The service and maintenance manuals of outboard engines should be consulted on how to do this, however the following suggestions may be useful.

- Wash the outside of the boat and trailer down to remove excess salt with a trigger hose to conserve water.
- Clean the fuel tank and fuel lines.
- Check and clean the winch.
- Wash, dry, coil and dry all ropes.
- Clean out the inside of the boat removing scales, rubbish. In aluminium boats check for any sinkers or metal which may corrode the hull.
- Check the life jackets or buoyancy vests, radio, connections, flares, mirrors and other safety gear.
- Inspect the hull for any damage and make arrangements for any necessary repairs.

Figure 44.1 Flushing a motor in a bucket conserves water

Conservation tips

- Oils and fuel can end up in waterways from boat wash down procedures. Protection is provided by having a properly drained area that discharges to the sewer system or a wash down area that directs water to a bunded area where trees grow and accumulate the boat wastes.
- Avoid washing rubbish down the drain - it ends up back in the ocean.

(Courtesy WaterWise Queensland)

Figure 44.2 A trigger hose directs water to where you want it .

WORKSHEET 14 MOORING AND DOCKING

1. Write out 9 steps to effect a beach landing with a small boat.

2. List 6 steps to moor a boat at a buoy.

3. For docking write out three additional steps.

4. What is a lee shore and how would you approach it?

WORKSHEET 15 ANCHORING

1. Describe how an anchor works. Use a diagram to illustrate your answer.

2. How does anchoring affect marine life? What can be done to avoid this damage.

3. Name the anchors a-f in the illustration below and recall their most common use.

   a.

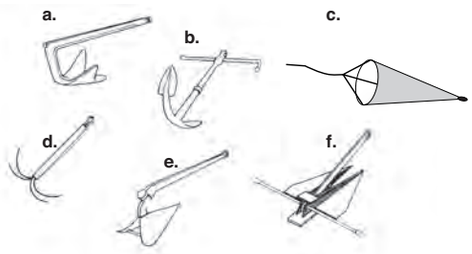
   b.

   c.

   d.

   e.

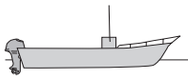
   f.



4. Label the diagram below showing the most common parts of an anchoring system.

5. How much anchor warp would you use in the situation below?

   Mark this in the diagram.



Depth 7 metres,
2 m tidal range
Moderate wind conditions
Wave height 1 m
Freeboard 1m

WORKSHEET 16 BOAT SHUTDOWN

1. List 2 factors which influence the handling of a power boat?

2. Checklist 8 points to effectively clean an outboard motor.

3. Give five examples to illustrate the phrase – ‘Don't destroy what you came to enjoy’

WORKSHEET 17 ACCEPTING A TOW

1. List three points to consider when towing another vessel.

   a.

   b.

   c.

2. What is salvage and how does it affect a towing situation?

WORKSHEET 18 MAN OVERBOARD DRILL

Describe the procedure for a man overboard drill.

1.

2.

3.

4.

5.

6.

7.

8.

SECTION 7 PILOTAGE AND THE BUOYAGE SYSTEM

Pilotage is the term used to describe the means by which skippers use a series of buoys, beacons and marks to enter and leave ports. The bouyage system identifies the marks and their meanings.

In 1980, the International Association of Lighthouse Authorities or IALA, agreed to a common code of marking the world's ports. In this system five types of marks were used in any of the following combinations:

- Lateral, cardinal, isolated danger, safe water and special marks.
- Marks shaped as cans, cones, spheres, pillars or spars.

Lateral marks

- These indicate port and starboard hand sides of the channel and are positioned in well established channels.
- The port mark is coloured red and has the basic top shape of a can as shown in Figure 49.1.

  At night the port buoy shows a red light and flashes to any of the sequences shown in Figure 49.3.
- The starboard mark is green and has the basic conical top shape.

  At night the starboard buoy shows a green light and flashes to any of the sequences shown in Figure 49.3.

Figure 49.1 Lateral marks (Top marks courtesy TAFE NSW)

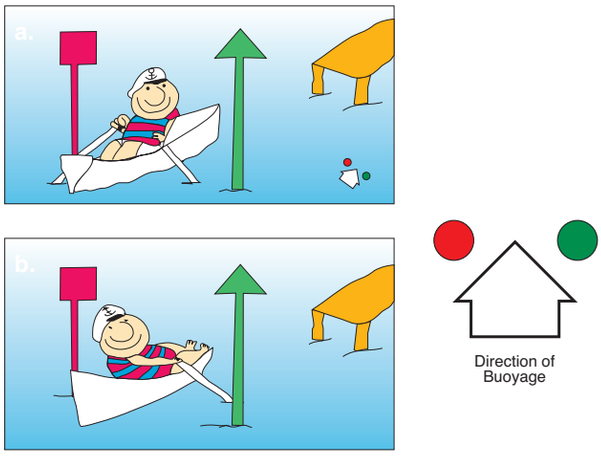


Figure 49.2 Direction of buoyage symbol and rules for entering and leaving port

Entering port

Upon entering port, the port hand mark (red) should be passed on your vessels port side as shown in Figure 49.2a.

Leaving port

When departing a port the port hand buoy (red) should be passed on the vessels starboard side as shown in Figure 49.2b.

Direction of buoyage

Where there may be doubt, the direction of buoyage may be indicated by the symbol shown in Figure 49.2.

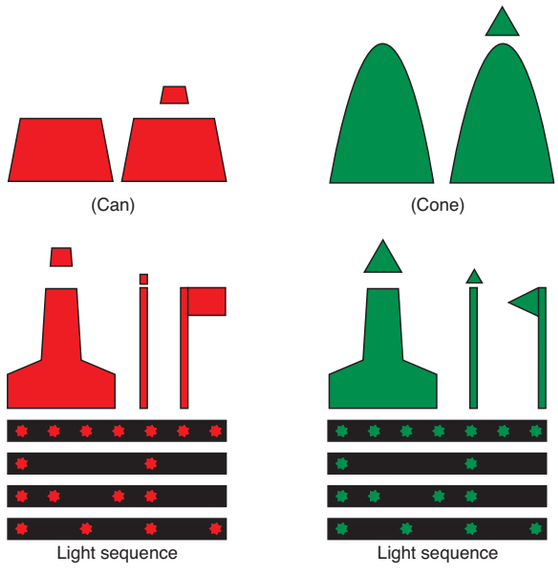


Figure 49.3 Lateral marking system including light sequences

Cardinal marks

A cardinal mark indicates where safest water may be found and is used in conjunction with the compass.

These marks are show in Figures 50.1 and include the following features:

- Two black double cones are clearly separated.
- Black and yellow horizontal bands with the position of the black band (or bands) relative to the respective cardinal points.

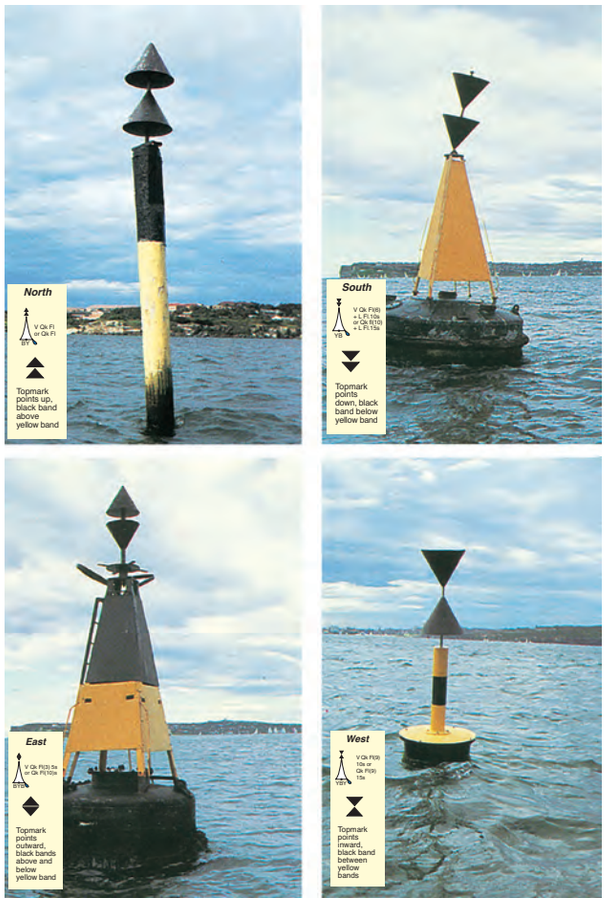


Figure 50.1 Cardinal marks (Courtesy TAFE NSW)

Figure 50.2 shows how cardinal marks could be used to navigate around a reef if the skipper passes north of the north mark, east of the east mark, south of the south mark or west of the west mark.

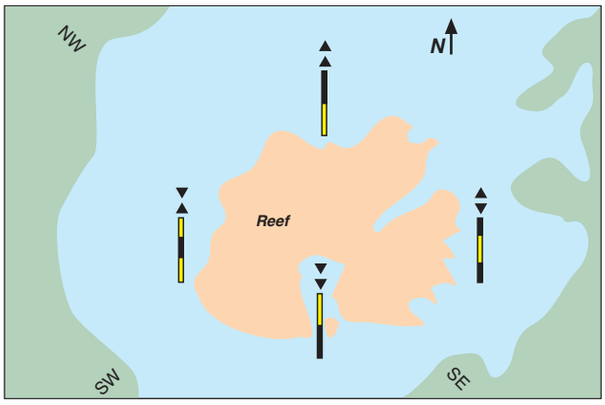
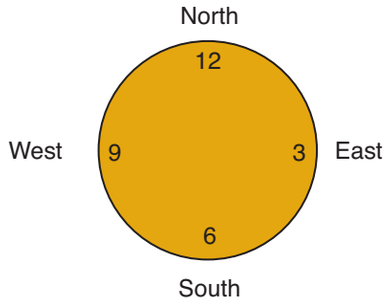


Figure 50.2 Cardinal marks protecting a reef (after TAFE NSW)

At night a white light flashes in a sequence that indicates the type of mark. The flashes are:

North	Uninterrupted continuous flash
East	3 flashes in a group
South	6 flashes in a group plus one long
West	9 flashes in a group

To help you remember this associate the number of flashes of each group with that of a clock face.



Isolated danger marks

These designate an isolated danger of limited extent which has navigable water all around it. For example an isolated shoal, rock or wreck.

These marks are black with one or more horizontal red bands.

The top mark has two black spheres positioned vertically and clearly separated.

The light comprises a white flash showing groups of two flashes.

The best way to remember this is by associating the two flashes with the two spheres.

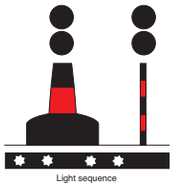


Figure 50.3 Isolated danger mark (Courtesy TAFE NSW)

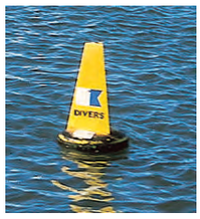
Safe water marks

These are painted red and white vertical stripes and have one red ball on the top. They indicate that there is safe water beyond this point and are usually found at the end of a channel or when entering a port. At night they flash with a white light followed by a period of darkness.

Figure 51.1 Safe water marks (Courtesy TAFE NSW)

Special marks

These indicate a special feature such as a cable, outfall pipe, recreational diving area or ground marks. They also define a channel within a channel. For example a channel for deep draught boats in a wide estuary within the limits of the channel for normal navigation. Generally they are used where no other mark can be so the top of the mark carries a single yellow cross.



At night a yellow light with any light sequence (other than that used for the white lights or cardinal, isolated danger and safe water marks). When you see a special mark – consult your chart.

Figure 51.3 Special marks

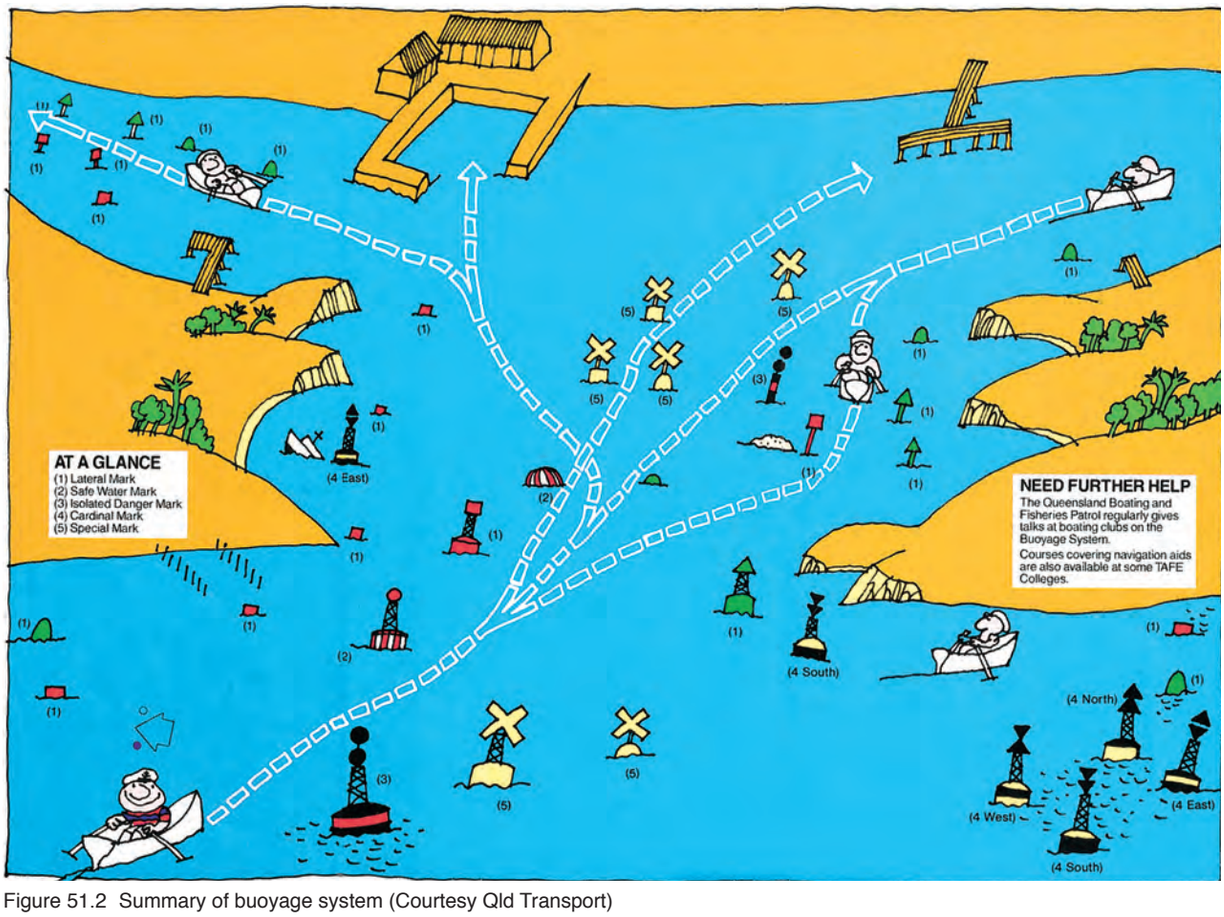


Figure 51.2 Summary of buoyage system (Courtesy Qld Transport)

Lights and shapes

These rules continue on from page 30.

Lights (Rule 20)

All vessels used at night or in periods of restricted visibility must carry lights so that the vessel can be seen between dawn and dusk. This enables other vessels at sea to work out:

- the type of vessel,
- where the vessel is, and
- the direction you are approaching from.

Definitions of lights (Rule 21)

This rule defines the types of lights.

- "The masthead light is a white light placed over the fore and aft centre-line of the vessel showing an unbroken light over an arc of the horizon of 225 degrees and so fixed as to show the light from right ahead to 22.5 degrees abaft the beam on either side of the vessel."
- "Side lights mean a green light on the starboard side and a red light on the port side each showing an unbroken light and over the arc of the horizon of 112.5 degrees and so fixed as to show the light from right ahead to 22.5 degrees abaft the beam on its respective side. In a vessel of less than 20 metres in length the sidelights may be combined into one lantern carried on the fore and aft centre-line of the vessel".
- "The stern light means a white light placed as nearly as practical to the stern showing an unbroken light over an arc of 135 degrees and so fixed to show the light 67.5 degrees from right aft on each side of the vessel".
- A towing light is similar to the stern light except it is *yellow*.
- An all round light is made so that it can be seen all round the vessel.
- A flashing light means a light that is flashing at regular intervals.

Lights are constructed and positioned on the boat at definite angles so that an observer can determine which direction the vessel is approaching.

Figures 52.2 and 52.3 illustrates these points.

Visibility of lights (Rule 22)

The distances these lights can be seen is as follows:

For big vessels (50 metres or more)

- Masthead light - 6 nautical miles
- Side lights - 3 nautical miles
- Stern and towing lights - 3 nautical miles
- Any other lights - 3 nautical miles

For middle sized vessels (12 to 50 metres)

- any light - 2 nautical miles

For small vessels (less than 12 metres)

- Masthead light - 2 nautical miles
- Side lights - 1 nautical mile
- Stern and towing lights - 2 nautical miles
- Any other lights - 2 nautical miles

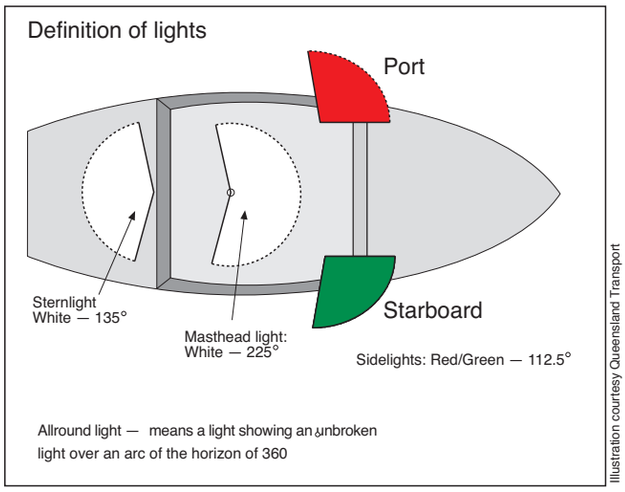


Illustration courtesy Queensland Transport

Figure 52.1 Definitions of lights (Rule 21)

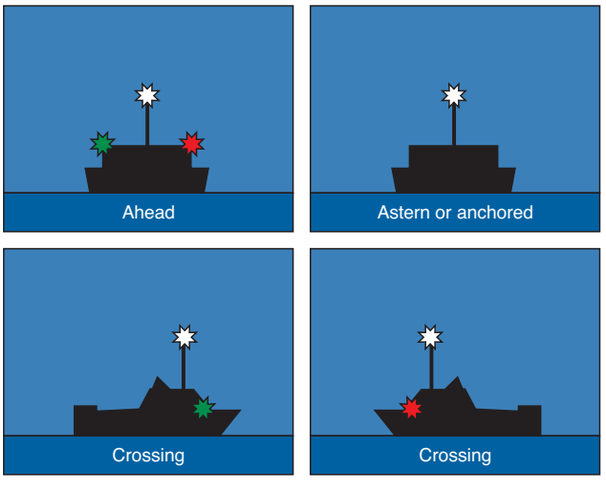


Illustration after NSW Waterways Authority

Figure 52.2 Small power driven vessel seen from a variety of positions

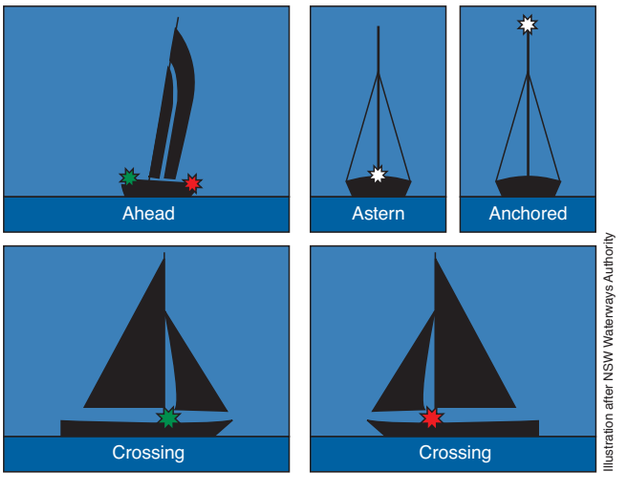


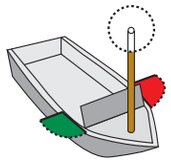
Illustration after NSW Waterways Authority

Figure 52.3 Sailing vessel seen from a variety of positions

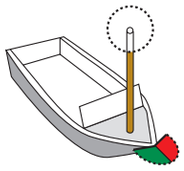
For power driven vessels under way (Rule 23)

Power driven vessels under way have to show a masthead light - forward (if over 50 metres a second masthead light abaft of and higher than the forward one), side lights and a stern light.

1. Power driven vessels of less than 7 metres in length and whose maximum speed does not exceed 7 knots shall exhibit...
... a white light visible all round and, if possible, separate or combined sidelights

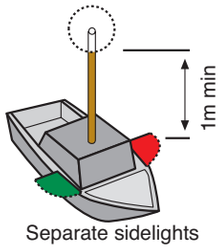


Separate sidelights where practicable

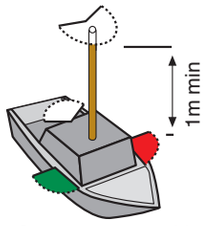


Combined sidelights where practicable

2. Power driven vessels of less than 12 metres in length shall exhibit...
... a white light visible all round and separate or combined sidelights

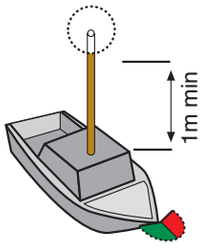


Separate sidelights



Separate or combined sidelights

Or ... a white light visible all round and combined soundlights



Combined sidelights

Or ... a masthead light, combined sidelights and sternlight.

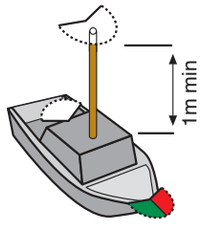


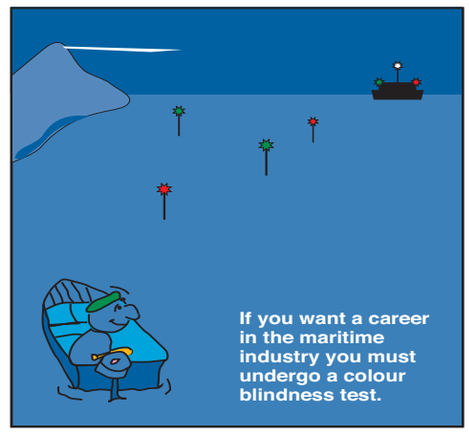
Illustration courtesy Queensland Transport

Figure 53.1 For power driven vessels under way (Rule 23)

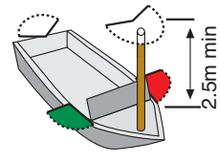
Vessels towing or pushing (Rule 24)

These vessels shall display at night:

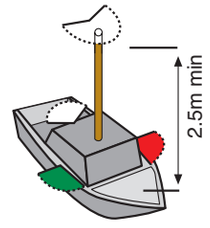
- Two white masthead lights in line
- Sidelights
- Stern light
- Yellow towing light
- However if the length of the two exceeds 200 metres three lights are required and for daylight hours a diamond shape where it can be best seen on both the towing and towed vessels.



3. Power driven vessels of less than 20 metres in length but more than 12 metres in length shall exhibit...
... a masthead light, separate sidelights and stern light.

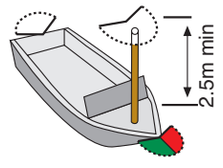


Separate sidelights

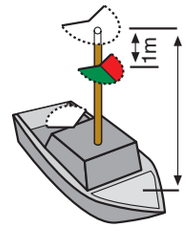


Separate sidelights

Or ... a masthead light, combined sidelights and stern light



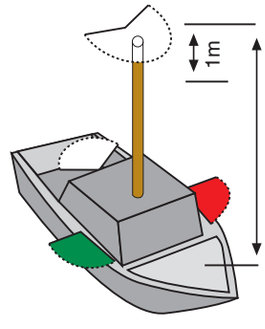
Combined sidelights



Combined sidelights

Illustration courtesy Queensland Transport

4. Power driven vessels of less than 50 metres but of 20 metres or more in length shall exhibit...
... a masthead light, sidelights and stern light.



Min 6m or breadth if more than 6m but not greater than 12m

N.B. Sidelights to be carried at a maximum height of three-quarters of the height of the masthead light.

Illustration courtesy Queensland Transport

Sailing vessels under way or vessels under oars (Rule 25)

You can tell the difference between a sailing vessel and a power driven vessel because a sailing vessel is required to display a white stern light and two side lights. Figure 52.3 shows this. What would a sailing vessel have to do, if it started is auxiliary engine and continued on under power?

5. Sailing vessels of less than 7 metres in length, or vessels under oars, shall if practicable exhibit lights prescribed for sailing vessels under 20 metres in length, but if not, shall have ready at hand.... an electric torch or lighted lantern showing a white light which shall be exhibited in sufficient time to prevent a collision.

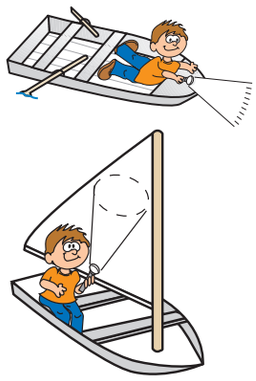
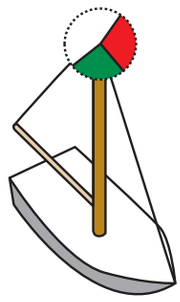
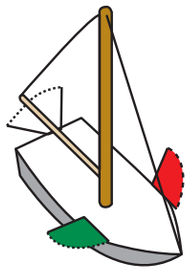


Illustration courtesy Queensland Transport

6. Sailing vessels of more then 7 metres in length and not more than 20 metres in length shall exhibit.... .... combined sidelights and stern lights.



Or .... sidelights and sternlights



Or .... sidelights, stern light and in addition two allround lights in a vertical line at or near the top mast (where best seen). The upper red and the lower green (not to be exhibited in conjunction with combined lantern)

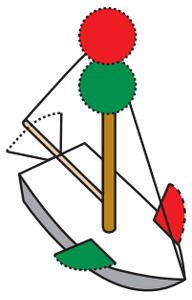


Illustration courtesy Queensland Transport

7. Sailing vessels of more than 20 metres in length shall exhibit..... .... sidelights and stern lights.

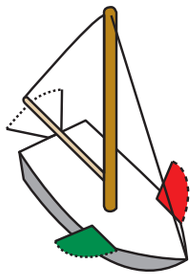


Illustration courtesy Queensland Transport

8. Sailing vessels whilst underway (being motor driven) shall exhibit ... . navigation lights applicable to power-driven vessels.

Fishing vessels (Rule 26)

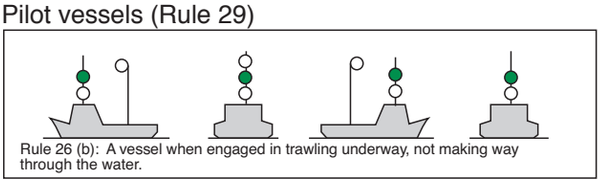
This rule is to enable you to see commercial fishing vessels at night. **Commercial vessels** either fish by means of long lines, poles or nets or trawl or by means of nets that move along the ocean floor and are hauled up from time to time. A vessel engaged in fishing by any means shall display lights as follows:

- Two all round lights in a vertical line, the upper green and the lower white. In the daytime two cones apex together or if less than 20 metres, two baskets.
- A masthead light behind and higher than the green light but if less than 50 metres in length need not do so.
- If under way sidelights and a stern light.

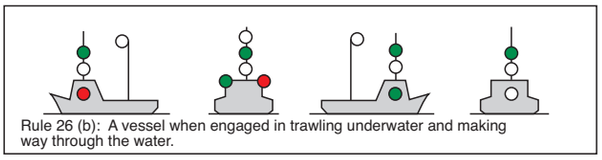
A vessel fishing other than trawling shall show an all round red light above the all round white light.

- If out laying gear extends more than 150 metres horizontally from the vessel, an all round white light at night and in the daytime a cone apex upwards towards the gear.
- If making way through the water additional side lights and stern lights must be displayed.

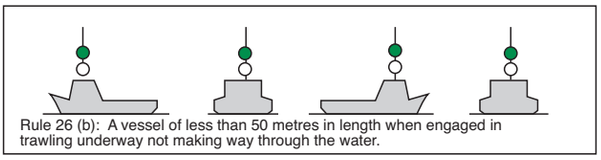
Pilot vessels (Rule 29)



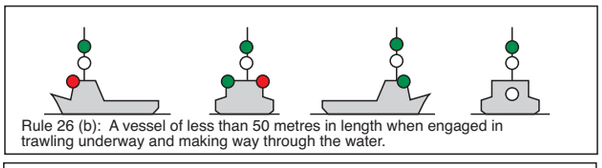
Rule 26 (b): A vessel when engaged in trawling underway, not making way through the water.



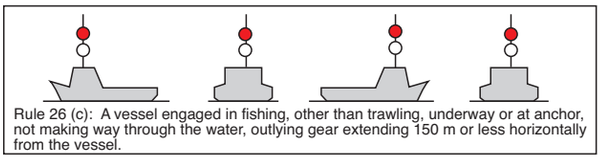
Rule 26 (b): A vessel when engaged in trawling underwater and making way through the water.



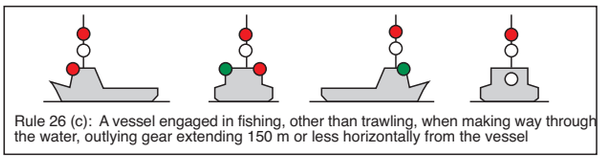
Rule 26 (b): A vessel of less than 50 metres in length when engaged in trawling underway not making way through the water.



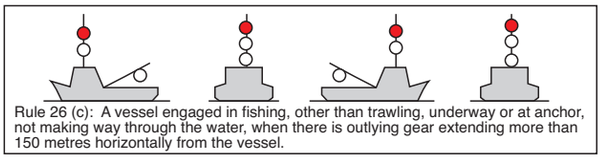
Rule 26 (b): A vessel of less than 50 metres in length when engaged in trawling underway and making way through the water.



Rule 26 (c): A vessel engaged in fishing, other than trawling, underway or at anchor, not making way through the water, outlying gear extending 150 m or less horizontally from the vessel.



Rule 26 (c): A vessel engaged in fishing, other than trawling, when making way through the water, outlying gear extending 150 m or less horizontally from the vessel



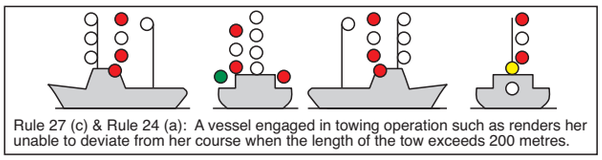
Rule 26 (c): A vessel engaged in fishing, other than trawling, underway or at anchor, not making way through the water, when there is outlying gear extending more than 150 metres horizontally from the vessel.

Figure 55.1 A dredge is a vessel restricted in her ability to manoeuvre (Rule 27)

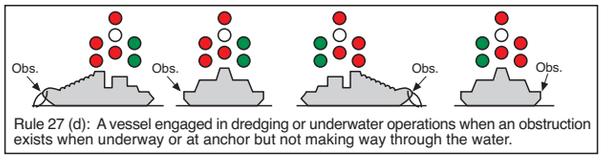
Vessels not under command or restricted in their ability to manoeuvre (Rule 27)

A vessel not under command shall exhibit two all round red lights in a vertical line where they can best be seen or two balls or similar shapes. When underway the vessel shall display sidelights and a stern light. Special rules are involved with vessels clearing mines or dredging.

A vessel restricted by her ability to manoeuvre shall exhibit red, white, red in a vertical line.



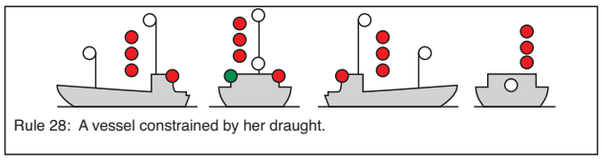
Rule 27 (c) & Rule 24 (a): A vessel engaged in towing operation such as renders her unable to deviate from her course when the length of the tow exceeds 200 metres.



Rule 27 (d): A vessel engaged in dredging or underwater operations when an obstruction exists when underway or at anchor but not making way through the water.

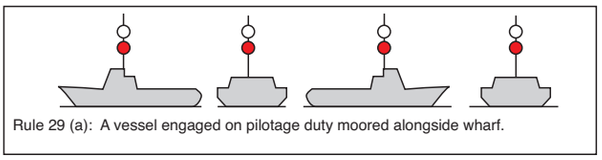
Vessels constrained by their draft (Rule 28)

In addition to the lights normally carried or displayed, the vessel shall exhibit three all-round red lights in a vertical line or a cylinder.

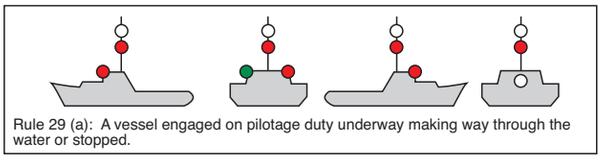


Rule 28: A vessel constrained by her draught.

These vessels shall exhibit at or near the masthead, two all round lights in a vertical line the upper being white, the lower being red. When underway, she shall turn on sidelights and a stern light.

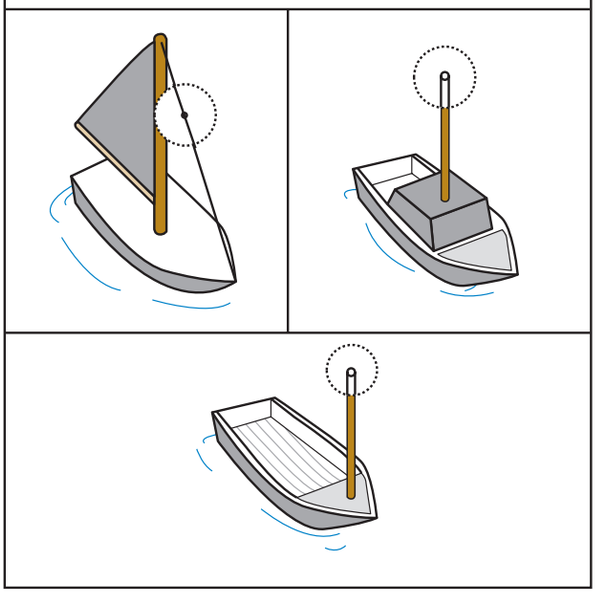


Rule 29 (a): A vessel engaged on pilotage duty moored alongside wharf.



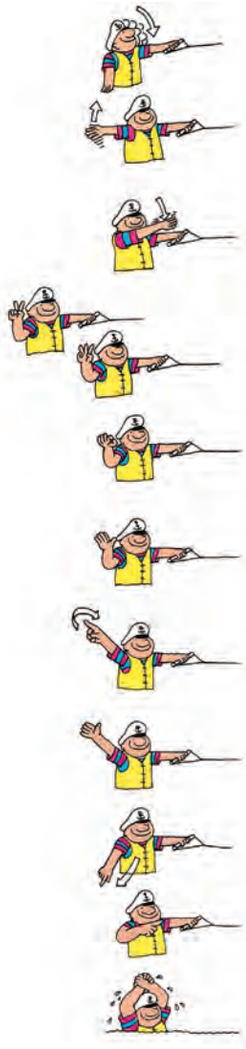
Rule 29 (a): A vessel engaged on pilotage duty underway making way through the water or stopped.

9. Vessels less than 50 metres in length, at anchor, shall exhibit an all round white light placed where it may be best seen.



Ski signals

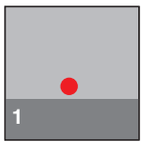
The following are recognised ski signals.

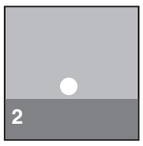


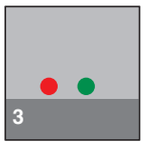
1. **Start:** Nod the head
2. **Faster:** Open palm facing up — motion upwards or nod head if both hands are in use.
3. **Slower:** Open palm facing down — motion downwards or shake head if both hands are in use.
4. **Speed required:** Use the number of fingers required. Thus, 23 — first two fingers then three fingers
5. **Speed OK:** Arm up raised with thumb and forefinger making an "O" — the O.K. signal.
6. **Turns:** Palm vertical, curving motion of hand in direction required
7. **Whip off:** Point to direction and then give quick circular motions with hand.
8. **Stop:** Hand up with fingers outstretched — policeman style
9. **Back to beach:** Point with downward swing of the arm
10. **Cut motor:** Finger drawn across throat in cutting motion
11. **O.K. after fall:** After a fall, skier should clasp hands over head if unhurt, until seen by the boat driver

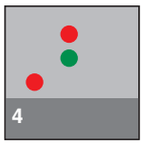
WORKSHEET 19 SAFETY, BUOYAGE AND LIGHTS

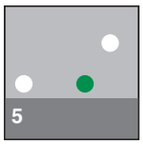
Identify the following navigation lights, safety marks and signals.

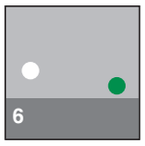


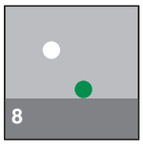


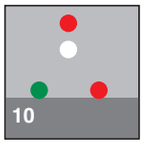


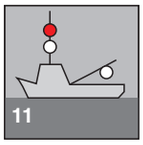


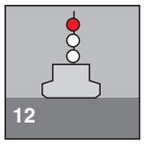


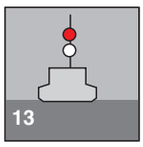


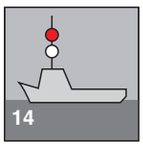


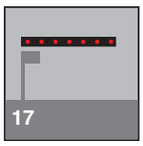


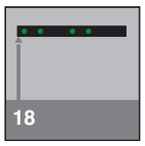


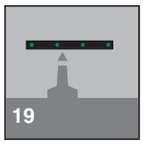


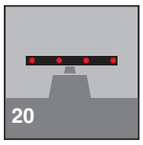


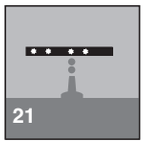


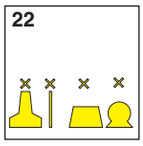


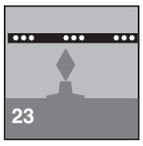


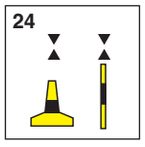


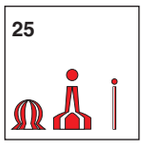


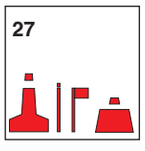


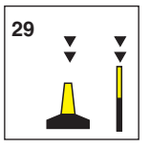


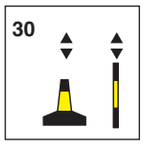






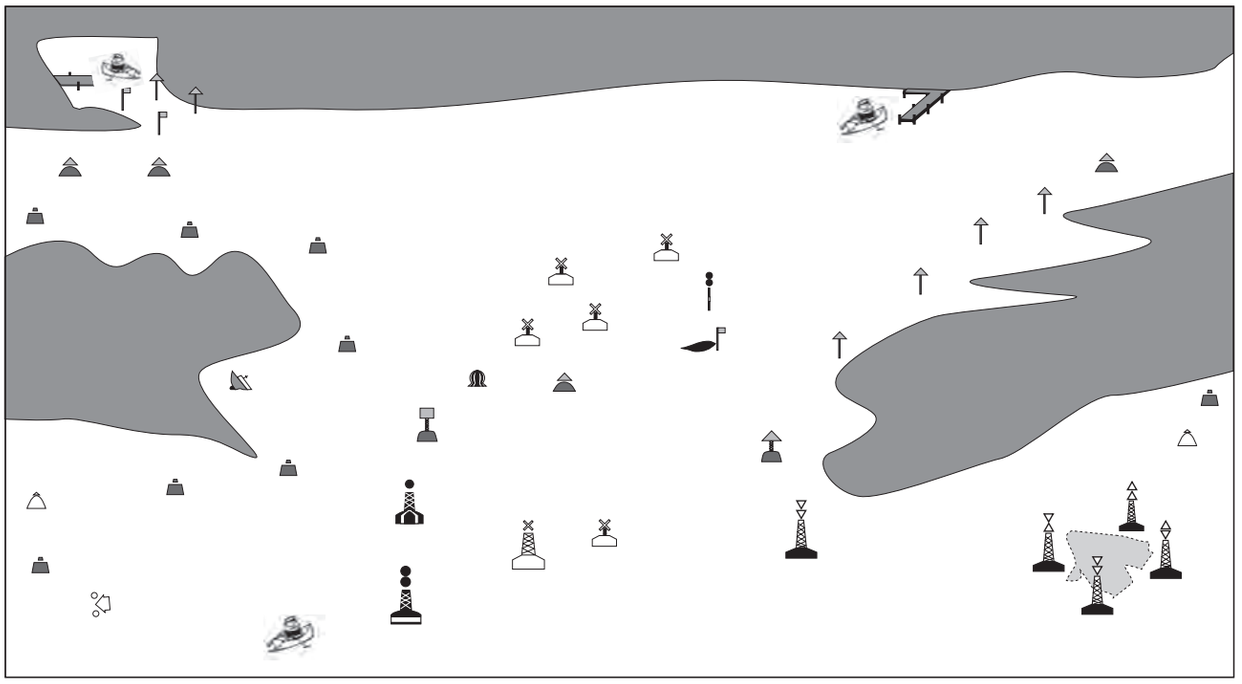




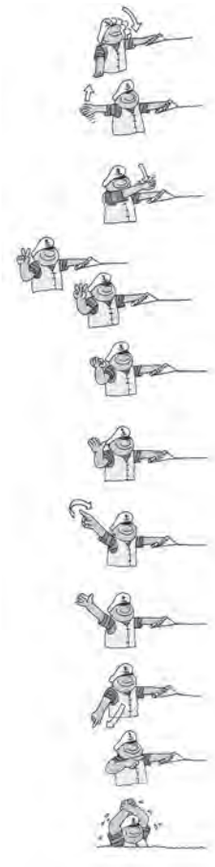


WORKSHEET 20 REVIEW

1. Draw in the possible courses for the boat entering port shown in the diagram below.



2. Explain what each of the following hand signals mean?



WORKSHEET 21 NAVIGATION LIGHTS

1. Complete the following table using rules 21 and 22.

Type of light	Color	Arc	Position on vessel
Mast head			
Side lights			
Stern light			
Towing light			
All-round light			

2. Use the model boat as shown in Figure 59.1 to colour in the definitions of lights.

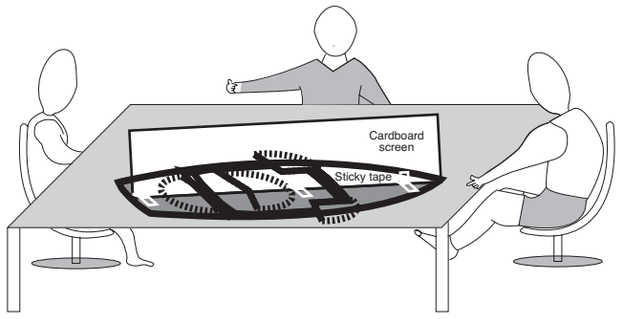
   Sit in a group as shown and push the boat around the group. Ask each member to say what lights they can see and write answers to the following questions.

   a. How do you know that the boat you have made is coming directly towards you?
   b. How do you know the boat is passing you on its port side and which way is the boat moving?
   c. How do you know the boat is passing you on its starboard side and which way is the boat moving?
   d. How do you know the boat is moving away from you?

3. Group presentation

   Make up similar models of the following boats using the information in your workbook.

   a. Power driven vessel less than 7 m whose speed does not exceed 7 knots
   b. Power driven vessel of less than 12 m in length
   c. Power driven vessel less than 20 m but more than 12 m
   d. Sailing vessel less than 7 m or vessel under oars
   e. Sailing vessel more than 7 m but less than 20 m
   f. Sailing vessel more than 20 m
   g. Vessel less than 50 m at anchor
   h. A vessel over 50 m



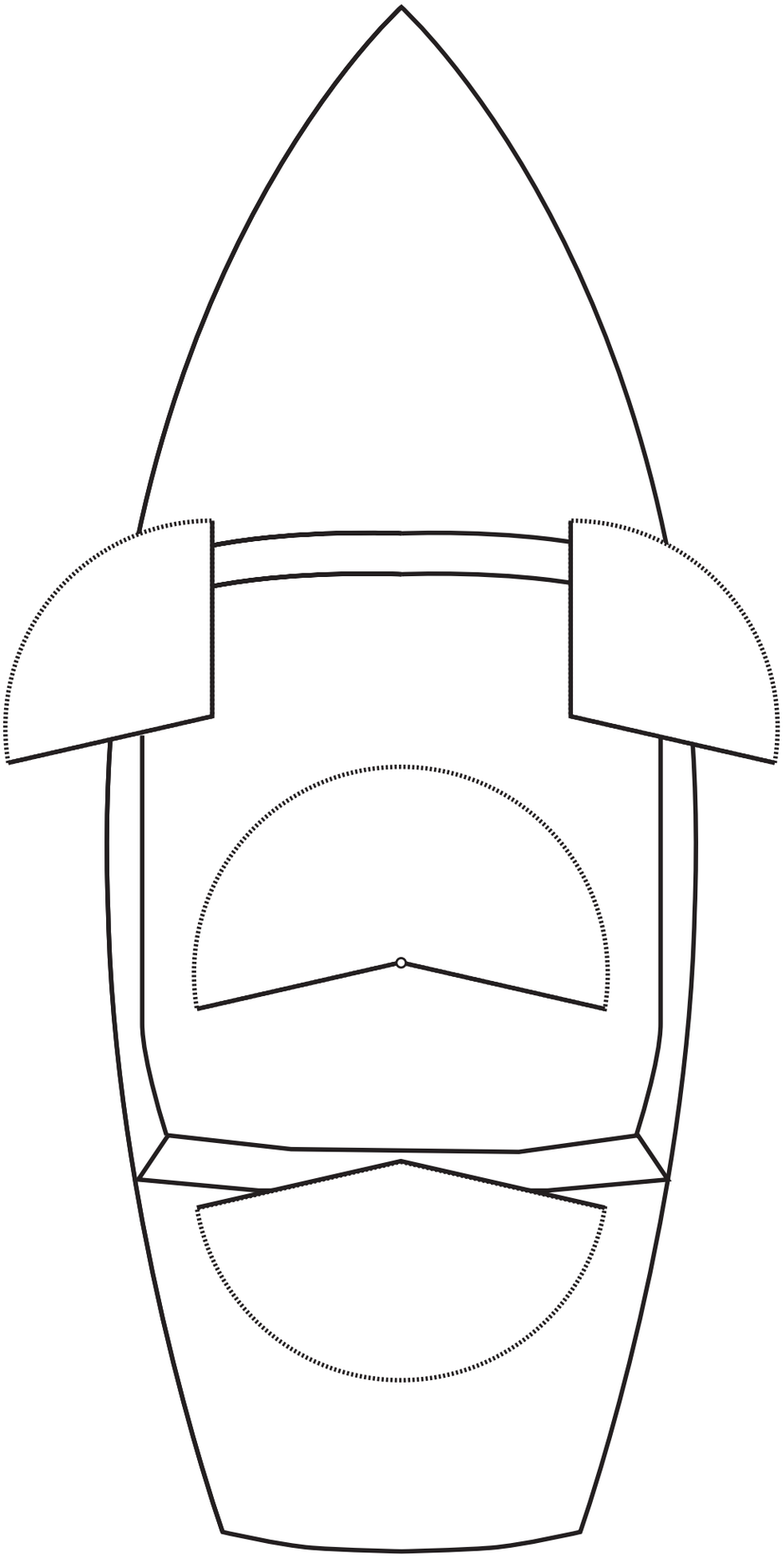


Figure 59.1

WORKSHEET 22 REVISION

1. Define the term vessel.

2. State in your own words the following rules:

   Safe speed (Rule 6)

   Action by give way vessel (Rule 16)

   Conduct of vessels in restricted visibility (Rule 19)

3. Which rule is indicated by the following statements?

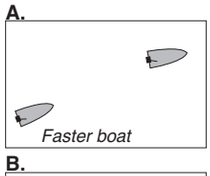
   You must at all times by sight and hearing and all other means. Rule:

   Your action must be positive, in ample time and with due regard. Rule:

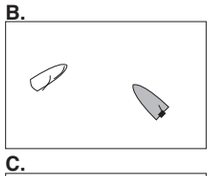
   The vessel which has the other on her starboard side shall keep out of the way. Rule:

4. Who has right of way in the following situations. Give reasons for your answer.

A.



B.



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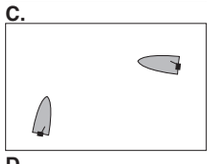
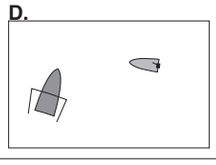
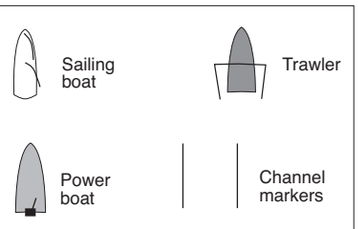


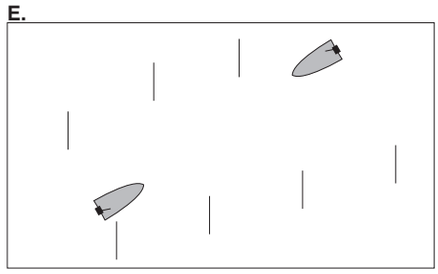
D.



Legend



E.



5. Explain why ramp etiquette is important.

6. There are many things that make for a pleasant day's boating and many of these start at the boat ramp. Name 3.

7. Provide one tip for using winches safely.

8. List two ways to check the surrounding conditions before launching.

9. Complete the sentence: Before starting the boat, the ... ...

10. Name three points to note when starting a motor.

11. Name two sources of common injury on a boat ramp.

12. Research the answers to the following questions on boating conservation. You may like to invite a officer from the boating and fishers patrol to help you answer these questions.

    a. When worming why should you turn sods back with a pitch folk - like you do in Golf?

    b. Why should you not disturb shore birds from resting?

    c. Why are domestic animals not allowed in a marine park?

    d. List three ways to minimize rubbish when boating.

    e. Why are discarded fishing lines a problem in our seas?

    f. Why do danforth anchors degrade our coral reefs?

    g. Last year 32 billion butts were dropped in Australia. This is enough to circle our planet 16 times. How could this be minimised?

SECTION 8 ADDITIONAL INFORMATION

Water skiing and scurfing

You need to know the rules associated with these activities. Make sure you have a competent and alert observer who is of a suitable age. You will have to judge the competence of the skier and be prepared for many spills.

Scurfing is one of the easiest forms of skiing because there is a larger area under the skier. If the skier first lies, then kneels and then stands up, the skill can be mastered in a short time. The areas designated for boating and skiing are defined by the local harbours and marine authorities. A typical set of local rules are:

a. Private water skiing only.

b. Not more than four boats to operate at any one time.

c. Not more than one skier to be towed by each boat.

d. Boats having a centre line length in excess of 5.2 metres are not permitted to engage in water skiing.

e. Water skiing restricted from dawn to dusk unless sign posted.

Passage planning

Passage plans are essential for safe boating whether short or long trips are envisaged. The following is based on a short trip. Extended voyages require greater planning. Points to think about are:

- Where you want to go and how to get there.
- How long it will take you to get there and back.
- How much fuel you will need.
- What to take and how to stow it.
- Predict and plan for hazards along the way.
- The experience and type of crew you wish to take.
- What type of additional safety gear is needed.
- What type of first aid kit is appropriate to the area of intended use.
- What extra tools and spare parts should be carried.
- Are there rescue authorities in the area?

All this has to be considered in terms of what type of craft you intend taking. A small 12 foot tinny has obvious limitations but is still suitable for many trips. In such a small craft, weather plays a major role in when to go or when not to go. In selecting where you want to go, it is a good idea to check for local knowledge to see if the area is what you want in terms of fishing, camping, surfing or bush walking.

Do you need water and are there toilet facilities? Is there a supply of fuel along the way and are there any permits required or places in which certain activities are prohibited?

Local knowledge will also help you when it comes to navigation markers. In small coastal towns, there is often a lack of navigation aids because the estuaries are not considered deep enough for commercial use. Local knowledge on tide and currents, and navigation hazards will help you get there and back safely. Find out where the safe anchorages are for protection from bad weather and strong winds.

When planning a passage consider the following points:

The days before the passage.

- Watch the weather reports, maintain the trailer, hull, and motor, check all safety equipment and plan when and where to go as well as the what ifs.

The day of the passage

- Check that all the equipment is there and stowed correctly, tell someone where you are going and the expected time of return ETA and check the trailer.

At the ramp

- Prepare for launching before taking the boat onto the ramp, launch with care and efficiency, park the car and lock it and log in with a rescue organization and out on your return. When logging on state the type of vessel, its name, number of persons, where you intend to go and ETA.

After the passage

- Clear the boat. Take everything out of the boat, clear, dry and replace and wash the motor and trailer.

Hygiene and health

Shower recesses, bilges, toilets and floors require regular cleaning on smaller boats. Wherever possible open windows and hatches to ventilate the boat properly. Treat cuts, bites and other small accidents immediately.

Stowage

It is important that everything is securely stowed. All the safety gear should be arranged so that it does not fall or break and does not get wet. Stowage containers with large screw tops are ideal for stowing gear in small craft.

Emergencies

Distress and urgency signals

In emergencies use the radio as described in the marine radio workbook in this series. If one is not available, take out the emergency V sheet and display this in a prominent position. If this is not available stand up in the boat and signal by waving arms at side. Other distress messages and signals are discussed on page 15.

Waves on open water

Checking weather forecasts and keeping alert is part of routine safety, however things can change quite quickly and even a lake can turn into a nightmare situation.

Bringing a small boat safely through a storm can be a real challenge. It requires a cool head, skilful handling and a sound well equipped craft.

Waves in open water can cause a boat to capsize. Usually the best way to avoid this is to "lay to" and keep the boat stationary into the wind. If you have a power boat, turn the boat into the wind and keep the motor running to such a speed that the boat stays in position. A sea anchor can be used if the engine fails or you are in a sailing craft.

Capsizing

Some studies have shown that many fatalities occur when a boat capsizes and that the most common cause is overloading. Having the boat turn over is a very frightening experience particularly in the dark, lots of gear is floating around and you are disoriented and probably injured. The safest thing to do is to stay with the boat. Most have sufficient built in buoyancy to keep the boat afloat. In a small dinghy, you can try to re-float it and then bail it out but it may be best to find the V sheet and wait for a tow. Remember the boat is more easily seen.

Beaching and grounding

This may occur accidentally or on purpose. Should the need arise to beach your vessel care should be taken to avoid hull damage. Usually the activity is done to off load or for overnight stays. If long term, make sure the boat does rest on sand or mud and that when the tide comes in, waves will not rock the boat, thus damaging the hull.

No boat should be beached on rocks or reefs for obvious reasons. Correct setting of anchors as described earlier will prevent the vessel from beaching on rocks. Sometimes you can accidentally run aground and want to get off. Here are some suggestions:

- Shift the weight of the passengers; this will often free a lightly grounded boat.
- Try pushing the boat free with oars or a boat hook.
- If the bottom is firm and the water is shallow, the passengers with protective footwear may be able to get out and push the boat free.
- If your craft is grounded in a tidal area, the rising tide will probably float the boat free. If you are waiting for the tide to free your boat, drop an anchor in the direction of deeper water. This will stop the boat from being washed further ashore as the water rises.
- Ask another boater to give you a tow. Trying to dig your way out with your propeller will only damage your engine.

Sinkings

If the boat is sinking, send out a Mayday, launch your E.P.I.R.B. flares and life raft, put on your PFD and get into the life raft. If you are unable to get into a life raft, stay together in a huddle position to reduce hypothermia.

Collisions

If you are involved in a collision that results in injuries or damage to another boat, you should assist any injured persons immediately and radio the appropriate distress message. You should then head for shore as soon as possible. In many Australian States, a boating accident has to be reported to the Marine Authorities within 24-48 hours so fulfil your obligations in this regard.

Personal safety

Although discussed at length in various places, we should remember that the wearing of life jackets PFD's in emergencies is mandatory. Adequate warm and dry clothing will help you work at maximum efficiency and special care should be taken to care for children on board. Make sure each child has a children's PFD for the area appropriate and that it is worn at all times. Children do not have either the strength or experience to cope with rocking vessels and may well have to be cared for individually.

Abandon ship

Always stay with the vessel as long as possible. If you must leave the vessel be as prepared with EPIRB, life raft and other safety gear. All crew should stay together.

Launching a boat from a davit

These are a type of crane that is used to lift small boats onto large ones. They tend to be popular with yacht owners and those with large powerboats that require a tender to go ashore. Many commercial vessels have these to carry tourists on activities from the main vessel.

Davits consist of two cranes one aligned with each end on the smaller boat.

- The small boat comes along side.
- The hooks are lowered and secured to the smaller boat and the boat raised evenly.

Most systems have the two lifting cables coming to one point so the operation can be done by one person.

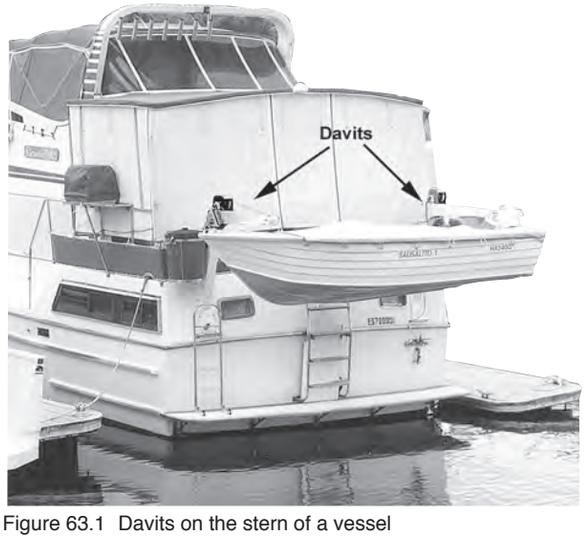


Figure 63.1 Davits on the stern of a vessel

SECTION 9 GLOSSARY

OF TERMS

Check out the glossary of terms on the Wet Paper student web site:

www.wetpaper.com.au/student

Use the space below to make a list of terms that you need to know for your boat licence

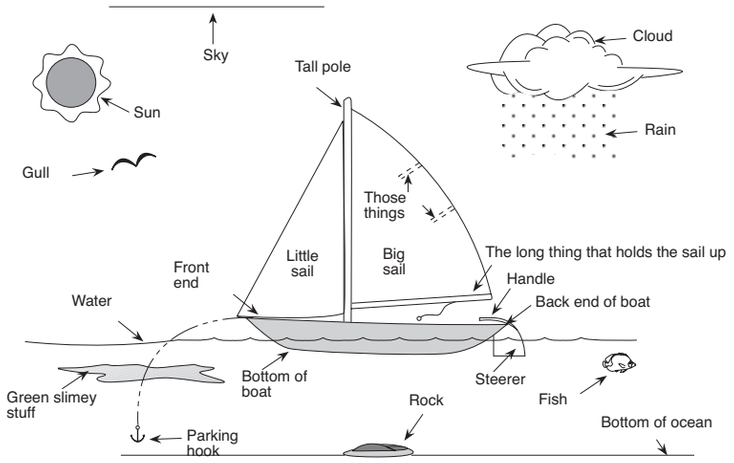


Figure 64.1 Non standard boating terms (author unknown)

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