JET RESCUE BOAT

Operating Procedures

South Australia

DOCUMENT CONTROL

Version	Date	Notes
0.1	7 September 2000	Initial draft
0.2	9 April 2001	Amendments after initial review
0.3	18 May 2001	Changes to document structure
0.4	27 July 2001	Further refinement to contents

Surf Lifesaving Association of Australia

Operating Procedures for Jet Rescue Boats

1st Edition

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PREFACE

This Manual has been divided into three main sections:

- Section 1 – deals with items that are specific to the Jet Rescue Boats as a whole. It includes, for example, the prerequisites for training Jet Rescue Boat crew and drivers, the main documentation that would be found in normal operations, the general principles for driving the boats, and how to perform rescues and searches.

- Section 2 – describes each of the Jet Rescue Boats that are currently in service at the time of publication of the Manual. This includes the general specifications, but also includes detailed information about each for Pre-Launch checking purposes, for example, as each is quite different from the other.

- Section 3 – provides hints and tips for general seamanship. These chapters are meant to broaden the overall knowledge of trainees, crew and drivers alike on issues that they are likely to experience on the water.

Sections 1 and 2 are the sections on which drivers and crew will be examined. Section 3 is not examinable, but parts of it will assist trainees in their examination, and further experience in the boats.

Remember – Ignorance is **NOT** bliss – it just might kill you.

ACKNOWLEDGEMENTS

SECTION 1

JET RESCUE BOAT GROUP SPECIFIC INFORMATION

OVERVIEW

INTRODUCTION

The safety of the Jet Rescue Boat and its personnel must at all times be the prime requirements of the crew. The JRB Driver and crew must communicate and co-operate at all times to ensure safe operations. As crew, you are expected to be fully competent with all rescue and first aid equipment, safety and operations of the Jet Rescue Boat. Through regular training, professional attitude, good communication and public relation skills, the Jet Rescue Boat Service will provide a vital community service along our vast coastline.

This Manual contains various techniques, requirements and protocols relevant to the Jet Rescue Boat Service. It has been written so that information applicable to all boats is contained in the main body of the document. Information specific to each individual boat is in Appendixes.

The development of the aluminium craft powered by turbo-charged diesel engines has meant a significant advancement in white water rescue capabilities for South Australian aquatic safety in a period of rapid local and tourism population expansion on our coastline.

SCOPE

In addition to being used as the source document for Jet Rescue Boat driver and crew training, this document aims to provide additional information for them above that given during formal training. It can also be used as a reference on a wide range of nautical topics. At no time is this document meant to replace formal training and experience gained “on-the-job” while patrolling.

DEFINITIONS

A glossary of commonly used terms is at the end of the manual. These will be found in everyday use while patrolling, and may also be encountered during rescues and other situations on the water.

CREW RESPONSIBILITIES

TRAINING REQUIREMENTS

The training requirements for skippers, drivers and crew are detailed in the “Blue Book”.

GENERAL REQUIREMENTS

- Checking of all equipment must be completed prior to the commencement of your patrol. The JRB must be ready for immediate callout.
- Previous log sighted, all equipment pre-launch checks must be conducted under the direction of the Driver. When checking your equipment, remember your life depends on its proper operation, don't depend on others to check it - it's your responsibility.
- All ropes, life jackets, etc. used are to be washed thoroughly in fresh water and dried in the shade prior to being stored or replaced in the JRB.
- The boat shed and vehicle are to be kept clean, and all equipment stored in the area allocated.
- The Crew is to clean the JRB at the completion of each patrol, under the direction of the Driver.
- Patrol Log Book must be completed before the completion of each patrol. It is the responsibility of the Driver to ensure all logs and crew training logs are completed at the close of each day's patrol.
- It is the responsibility of the Driver to contact the Jet Boat Officer in regard to any mechanical, service, gear problems written in log book.
- All Crew are expected to undertake regular fitness training and maintain a high standard in this area.
- A non-proficient Crew will be stood down from duty until deemed proficient by the Jet Boat Officer. This relates to all areas of JRB Crew Awards.
- All Crew are expected to have above average knowledge and skills in all lifesaving areas, particularly resuscitation and first aid. Regular training in this area is essential.
- Alcohol is prohibited to all crew members on duty or on standby. No member shall undertake JRB duty after consuming alcohol within 12 hours immediately prior to duty.
- The Jet Boat Officer is to ensure drivers undertake training and be familiar with all areas of the JRB operations and functions.

PATROL ROSTERS

- It is the responsibility of crew persons to contact the Driver to confirm patrol availability.
- It is the responsibility of all crew to arrange a substitute if unable to attend patrol. Senior Crew may only swap with Senior Crew.
- JRB Crew will be stood down immediately from JRB Service, pending an inquiry, if absent from patrol without a replacement.

UNIFORMS

- The uniform is a very important item to portray a professional image.
- For identification purposes, all Jet Rescue Boat Crew must wear the official uniform whilst on duty.
- Uniforms must be kept clean and neat.
- Whilst wearing the official JRB Crew uniform and representing the Association, all Crew must be clean and well groomed, and conduct themselves in a professional and courteous manner.

- Trainee Crews are required to wear Club patrol uniforms and red peak cap.

CREW DAILY PROCEDURES

1000	Previous log sighted, radio Surf Command - advise JRB is on standby. The boat is not operational until the pre-check has been completed and has been launched.
1010	Conduct functional checks as per Operations Log Book.
1100	Morning surf patrol.
	Communicate with Command and Clubs regarding any problem areas as reported by Helicopter, IRB and Patrols.
	Can also include training e.g. driving, pick-ups, search patterns, anchoring, etc.
1330	Lunch. Advise Surf Command of standby status.
1400	Afternoon surf patrol. Training, etc.
1700	Wash craft and equipment. Carry out minor repairs.
1800	Completion of Log Books - patrol completed. Notify Surf Command of status.

This is a basic guide for Driver and Crew, and can be varied depending on the requirements of the day. All JRB Crew are to be involved in training or familiarisation during their patrol. It is the Driver's responsibility to set the day's training exercises. During the patrol, always advise Command of your intentions.

HANDLING

WARNINGS

WARNING 1: Reverse Thrust

The reverse duct on this jet provides a powerful reverse force. It must be used with caution.

(a) Astern motion causes wave making at the transom. With smaller craft and excessive astern speed the wave making could be such that water flows over the top of the transom and into the hull. This can be avoided by either limiting the astern speed or limiting the height of the transom.

(b) The high speed stop (operating the reverse duct when the craft is at speed going forward) will cause the bow to drop, and in some cases cause the bow to be immersed which may result in water flowing into the hull. This can be avoided by having a closed bow and adequate windshield, or by limiting the boat speed at which the reverse thrust is applied. Also the craft will quickly decelerate under crash stop operation, in which case the passengers need to be warned before the maneuver is carried out.

Hamilton recommend that the operator learn the limits and capabilities of the reverse system on each particular boat, establish safe operating limits by building up from low throttle settings, and drive within these limits once they have been established.

WARNING 2: Turbo Impeller

The optional "Turbo" impeller is designed to give superior "grip" in white or aerated water such as in rapids. Hamilton Jet have carefully developed and extensively tested the Turbo impeller to ensure it will operate effectively over as wide a range of conditions encountered in white water as possible, but because of the risky and unpredictable nature of white water boating Hamilton Jet can take no responsibility for the safety of the boat fitted with this product when used in white water conditions. Good safe boating practice starts with the helms person who must have suitable training and experience and who must ensure that the product and the boat are fit for the intended purpose.

WARNING 3: Freedom of Controls in Operation

Reverse and steering control is provided by the movement of components outside the boat. Both have small clearances between moving parts. In sandy conditions or debris-filled water, grit or small objects sometimes stiffen or seize the controls. The operator must continually check that the controls are operating freely, especially just after beaching.

WARNING 4: Close Coupling Engine Mount

For this option the rear engine mount is on the jet. This engine mount however, is not to be considered as providing restraint for the engine in a crash situation beyond its normal load-carrying capacity. It is therefore the responsibility of the person installing the engine to ensure that adequate separate anchor points are provided to hold the engine in place in a crash situation

WARNING 5: MAINTENANCE OF CONTROLS

Steering

Failure of certain components can cause loss of steering. Of particular importance are:

- security of the cable mounts and attachments,
- freedom of the steering shaft,
- security of the cotter,
- freedom of the steering nozzle, and
- the proper torque on the steering nozzle bolts.

Maintain the steering system in good repair.

Reverse

Failure of certain components can cause either loss of the ability to stop, or can cause a sudden and dangerous stop while under way. Of particular importance are:

- security of the cable mounts and attachments,
- latch adjustment,
- freedom of the reverse shaft,
- security of the cotter,
- security and correct torque on the duct-link bolt,
- freedom of movement of the duct,
- clearance between the duct and the splash guard,
- security of the splash guard bolts, and
- security of the duct pivot pins.

Maintain the reverse system in good repair.

WARNING 6: Control with Engine Stopped

There is no steering or reverse control when the engine is stopped. This is because control is achieved by the water flow from the jet. Never stop the engine when approaching a mooring or any time when steering will be required.

WARNING 7: Zero Speed Detent

Unlike other propulsion systems that have a gearbox and therefore a positive neutral, the waterjet relies on the reverse duct position to provide this neutral. Correct operation of the zero speed detent is the only way the operator has of knowing he is in the neutral or zero speed position. Proper selection of the zero speed position is essential prior to startup, for safe startup and maneuvering

LOW SPEED MANOEUVRING

The steering nozzle deflects the jet stream to port or starboard causing the boat to steer to port or starboard respectively.

The following points should be remembered when operating a water jet craft:

(a) If the engine is stopped, there is no jet stream to deflect and thus the craft cannot be steered.

Never stop the engine when approaching a mooring or at any time when steering will be required.

(b) The wider the throttle is opened the greater the steering effect - i.e., the sharper the turn.

(c) Steering is available at **"neutral"** as well as all ahead and astern speeds, a feature which gives the water jet unrivaled manoeuverability.

1. Before starting up check:

- the craft is securely tied up or well clear of other objects, and
- the helm is centred and the reverse lever at neutral.

2. After starting, move the helm and reverse lever if necessary to stop boat moving.

Neutral

The neutral position for the reverse lever, or thrust or "bucket" control, allows the boat to be pivoted in one spot. As mentioned earlier, this gives the boat unparalleled manoeuverability in skilled hands.

The neutral position can be found easily in some boats and with difficulty in others – it's a matter of trial and error locating the spot between forward and reverse that keeps the boat stationary. This may fluctuate depending on the amount of power the boat is producing at the time.

Forward

Forward movement is obtained by pushing the reverse lever forward of the neutral position and increasing engine revolutions. Forward motion can be controlled by the amount of thrust being generated by the motor and the degree of deflection of the water jet. At slow speeds, the crew can assist the driver by moving amidships or even towards the stern of the boat in order to trim the boat level.

Reverse

As with forward motion, reverse is any reverse lever position below the neutral mark. Reverse speed depends on the amount of power applied and the degree of deflection of the water jet stream. Again, the crew can assist the driver by stepping towards the stern, as when the jet is deflected downwards and to the front of the boat, it tends to lift the stern up and out of the water, reducing the steering effectiveness.

Planing

The most efficient hull position at speed is called “planing”. This occurs when the hull lifts out of the water, creating minimal drag, and thus providing the most economical fuel usage.

Planing is best achieved by accelerating quickly yet smoothly until the hull is felt to lift out of the water, dropping the bow to a more level attitude. Power should then be reduced to maintain the desired speed.

Turning

REMEMBER whether going ahead, at **“neutral**”, or astern:

The bow of the boat will always turn the way the steering wheel is turned.

i.e., turn wheel to port, bow of boat will move to port and vice versa.

This means that going astern the boat has the **opposite steering** to a motor car, a feature which can be used to advantage when manoeuvering.

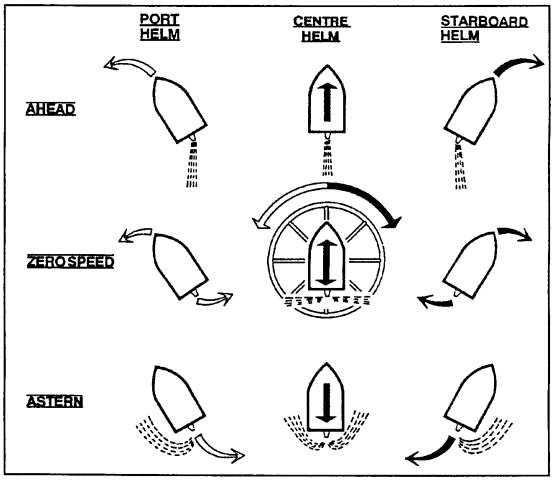


Figure 1: Operating a waterjet steered craft

Manoeuvre with one hand on the helm and one hand on the reverse deflector.

Turn the boat using the helm. **REMEMBER** - the bow will always move the way the helm is turned.

Move ahead or astern by using the reverse lever slightly either side of neutral position.

Use only low throttle settings – high settings will give faster response but makes control more difficult.

If the bow is rotating to starboard, then port lock must be used to stop the rotation (or vice-versa) then helm centered to hold position.

If the boat is moving ahead then the reverse lever must be moved astern to bring the boat to rest (or vice-versa) and then neutral selected to hold position.

Braking

For normal operation to "brake" the boat's forward motion:

- close the throttle;
- select zero speed or astern; and
- open the throttle, gently at first.

EMERGENCY BRAKING

CAUTION!

If the **astern** or **neutral** positions are selected with the throttle left open and the boat moving forward at speed, **the resultant "braking effect" is very severe** - even more so than full braking with a motor car.

The above procedures should therefore be used only in an emergency, and only after warning the crew and any other passengers where possible.

Switching Off

Before switching off the engine:

- ensure all manoeuvering is completed and the boat secured,
- centre the helm and move the reverse deflector to neutral., and
- allow the engine/turbo to cool to appropriate temperature before switching off.

REMEMBER - if the **ENGINE** is **STOPPED** you have **NO STEERING.**

BEYOND THE BREAK

Maintaining Nose Attitude to Swell

Run Between Swells

Green swell waves that have not peaked are of little or no consequence and do not impede the boat by any amount. Care must be taken though not to power up the face of the wave or the boat will become airborne, causing possible damage to the boat and discomfort or injury to the driver and crew.

Turn Into Swells

Weed Removal

If the driver suspects that the water intake screen is blocked with weed, one of the crew will be directed to clear the blockage. Ideally, this will occur beyond the surf zone, where wave conditions are more stable. The driver will stop the boat and hold it stationary while the crew dives under the boat to clean the screen.

WITHIN THE BREAK

There is almost no limit to the ability of the Jet Rescue Boat to handle surf conditions, and, in the hands of a highly skilled operator, it can perform most satisfactorily. The greatest limiting factor is the courage of the driver and the driver's confidence in the craft to do what is required of it.

Aggressive Attitude

When approaching the surf with the jet boat, the driver should display an aggressive attitude. In doing so, the driver should keep all options open until the last moment. Situations and circumstances can occur where the driver is required to change the approach at the last moment. The driver must therefore be alert to abort any run into the surf before being totally committed to attacking a wave.

Square On

Although the boat will traverse most waves at an oblique angle, as a general rule they should always be approached square on, i.e. at right angles. It is also important to have some forward momentum at the time of impact with the wave. Firstly, this ensures the boat is not pushed back towards the beach (called a "backshoot"), and secondly, if this does occur, then in shallow water the chances of damaging the thrust deflector are minimised.

Breaking Waves

A wave that has capped and is about to break is the most difficult to traverse, but a steady run up to it followed by maximum power just prior to contact with the wave will ensure that the boat "punches" through.

With larger waves, the driver must take care not to be dislodged from the driving position by the weight of water falling onto the driver. In all cases, the speed of the approach should be in proportion to the speed and size of the approaching wave.

As a general rule, a broken wave lacks power and, providing the boat is moving efficiently (i.e. planing), it will pass through the wave with very little trouble. A long broken wave may require some additional throttle as it reaches the boat to lift the boat through the wave.

Overtaking Waves

Figure 2: Overtaking waves

If it is found necessary to overtake a wave, then this must be done aggressively in order to keep the nose of the boat up when running over the face of the wave. It is important that this be done at right angles to the wave, as veering to one side may cause the boat to broach when it passes the wave. Full throttle should be maintained until the wave has been passed and the boat is clear.

Parallel Running

Parallel running is the skill of driving a boat within the surf zone and the shore between sets of waves. The skill is in maintaining speed and not deviating too much from the chosen path. This should only be undertaken on the plane, which gives responsive turns, and maintains momentum.

As a wave approaches from the seaward side, the boat should be leaned into the wave by turning slightly into the face of the wave. Power should be maintained at this point – the throttle should not be backed off at this stage. When the boat clears the shoulder of the wave, the boat should be turned back to its original course. If this manoeuvre has been successfully accomplished, then the wave often straightens the boat out.

Figure 3: Parallel running

Beaching is no longer used as a common practice, as the size of the boats generally precludes driving them up onto the sand, and then launching them afterwards – it is only to be used as an emergency procedure.

Before beaching the boat, ensure the reverse deflector is up in the "forward" position. Straighten the helm so that the nozzle is amidships. In the event that sand jams some of the components, it allows the boat to make its way beyond the break into deeper water, where attempts may be made to free up the controls.

When the boat is to be beached the motor should be switched off prior to contacting the sand.

It is important to note that the boat can stop suddenly on contact with the sand, therefore, the driver should warn all crew to brace themselves for a sudden stop. The driver and crew should not attempt to get out of the boat until it has stopped, or they could be catapulted forward and injury may result. Once the jet boat has stopped, the crew should get out and position the boat on the beach ready for retrieving or re-use. Care should be taken to ensure that there are no large rocks or stones buried beneath the surface of the sand. Severe damage can be caused to the hull of the boat if it is beached onto rocks.

Shallow Water Running

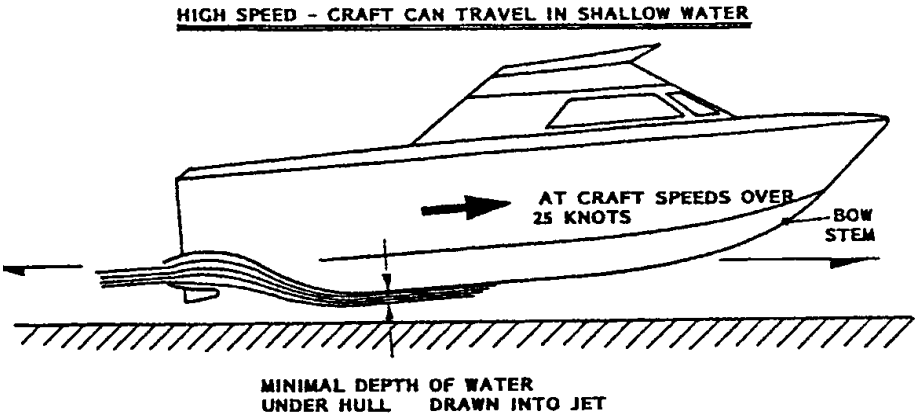


Figure 4: Shallow water running - planing

1. At high planing speeds pumping stones, sand etc through the jet unit is not a problem until the boat is nearly aground.

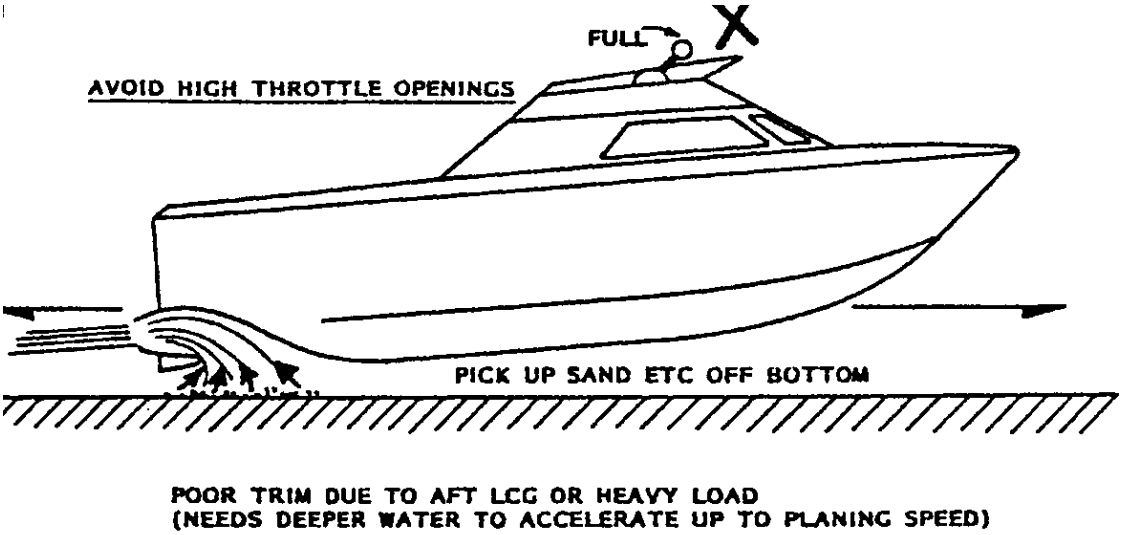


Figure 5: Shallow water running – poor trim

2. Avoid pumping stones, sand etc through the jet unit - this will blunt and wear the impeller.
3. At slow displacement speeds avoid using high RPM in shallow water.

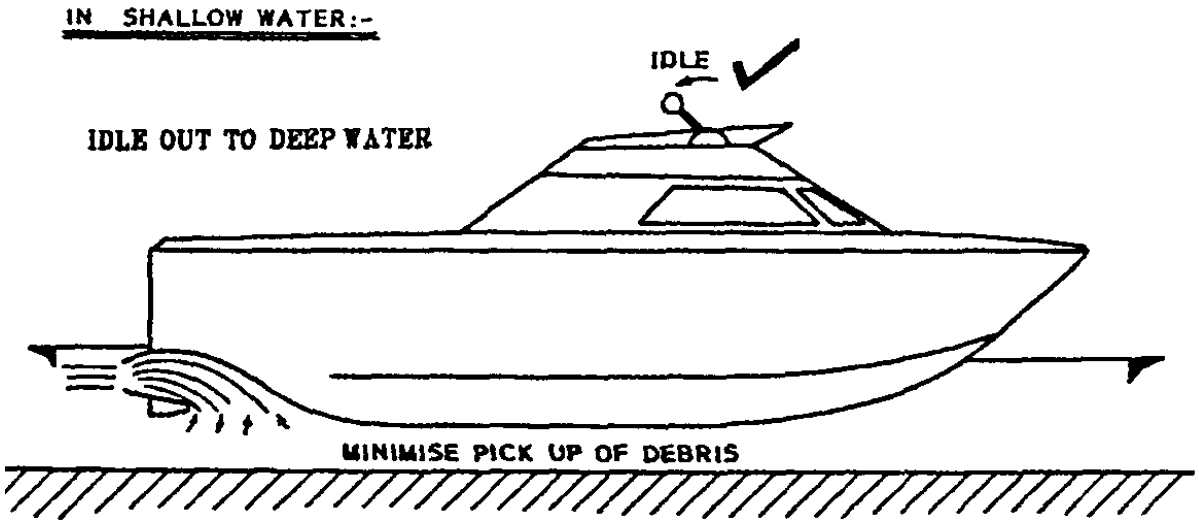


Figure 6: Shallow water running - idling

4. If it is not possible to pick a deep water area to start off and stop in, “idle” over the shallow area into deep water before accelerating up to speed. If any debris has been picked up in the intake screen, momentarily stopping the engine should allow the debris to drop away from the screen.
5. Operate the sand traps when in very shallow water.

Beach Departure

Position the boat in the water with the bow square to the waves, pointing out to sea. The crew (and any other helpers) should stand on both sides near the bow and stern to steady the boat and keep it in position while the driver boards the boat. The driver requests "ALL CLEAR?" Crew ascertain that no-one is standing behind the jet outlet and that there is sufficient water to take off. One then answers in the "AFFIRMATIVE" or "NEGATIVE". The driver then starts the motor with the reverse deflector in the neutral position. Crew board the boat when instructed by the driver, and signify by word or signal that they are on board and in position.

Figure 7: Beach departure

Weed Removal

In the event of weed blocking the intake screen within the break, the driver should firstly try to remove it by stopping or even reversing for a short distance. If that is unsuccessful, then the driver may direct one of the crew to go over the side with a bow rope to provide stability against oncoming waves while the other crew dives under the boat to clear the blockage.

ROLLOVER/CAPSIZE

Sometimes during operations, either due to driver error or motor failure, the boat is going to roll over.

If a rollover is imminent and the motor is still running, every endeavour should be made to switch the motor off to prevent damage. Every effort should be made to right the boat immediately. If this is done before the engine compartment fills with water, it is possible to restart the motor and continue with operations.

Note: Plugs may be wet from fuel flooding, and so may not start immediately.

If, however, the boat is upside down long enough to allow water to enter the engine compartment and submerge the motor, then it will be necessary to beach the craft, recover it, and immediately commence repairs. Every attempt should be made to re-right the boat immediately to prevent additional damage to the motor and other equipment by continuos submersion.

Return to Shore after Power Failure or Rollover

If it is not possible to restart the motor after a rollover of power failure, then the boat must be returned to shore for service. This can be carried out by a number of methods, two of which are:

- By the driver and crew hanging onto the rear of the boat, pointing the bow to the shore and surfing the craft in. In doing this, the crew act as a counter-weight and rudder and, if they keep hold of the boat, they can quite successfully swim and surf the boat into shore. This technique should only be used in light sea conditions.
- By tying a rope to the bow eye and the crew holding onto the rope, keeping the bow pointed out to sea and allowing waves to wash the craft into shore. The crew act as a "sea anchor" in this case and prevent the craft from being picked up by the sea and rolled over. Approximately 10-20 metres of rope are required for this technique, depending on conditions.

JET UNIT FAULT FINDING

Jet Unit

No.	Symptom	
	Possible Cause	Solution
1	**The engine unloads (rpm increases).**	
	There is some blockage in the jet unit.	Clear blockage.
	Air is getting into the jet.	Check waterseal, inspection cover; Consult Hamiltons.
2	**A lack of jet thrust (boat speed drops while rpm is high).**	
	There is some blockage in the jet.	Clear jet.
	Air is getting into the jet.	Check waterseal, inspection cover, hull design; Consult Hamiltons.
3	**Excessive noise and vibration comes from the Jet Unit.**	
	Blockage of the Jet Unit.	Clear jet.
	Blockage of the impeller or stator.	Clear impeller.
4	**Water leaking from under front bearing.**	
	Faulty water seal.	Replace water seal.
5	**Excessive high pitched rattling, or rattling whine.**	
	Blockage of the Jet Unit.	Clear jet.
	Faulty thrust bearing.	Inspect and repair the thrust bearing.
	Cavitation is occurring.	
6	**Bad vibrations.**	
	Blockage of the Jet Unit.	The blockage must be removed.
	Worn cutless bearing, or cutless bearing water drain hole blocked.	Check water drain hole; inspect and repair the cutless bearing.
	Something caught in the impeller.	Check through inspection hatch; clear obstruction.
	Worn driveshaft universal joints.	Inspect and repair the driveshaft as per manufacturer's recommendations.
7	**Engine revolutions gradually increasing over a period of time.**	
	Worn or blunt impellers.	Inspect and repair the impeller as well as the wear ring.
	Excessive impeller tip clearance.	Inspect and repair the impeller as well as the wear ring.
8	**Sudden increase in engine revolutions with no noticeable decrease in thrust.**	
	Air ingestion, or cavitation.	
	Faulty tachometer.	Repair tachometer.
9	**Excessive engine revolutions, noisy jet unit with aerated water from nozzle.**	
	Screen blocked with wood or debris or rope through screen and wrapped around shaft.	Remove blockage.
	Object jammed in stators an/or impeller.	Remove object.
10	**Low engine RPM.**	
	Problem with engine.	Investigate operation of engine.
	Incorrect impeller and nozzle selection.	Consult Hamiltons.
11	**Thrust bearing housing too hot to keep your hand on.**	
	Thrust bearing or seal failure.	Overhaul thrust bearing.

Table 1: Jet unit fault finding

Reverse System

No.	Symptom	
	Possible Cause	Solution
1	**Reverse duct not moving.**	
	Reverse duct jammed by debris.	Remove debris and then check for correct operation.
2	**Reverse duct creeping down from the up position.**	
	Reverse latch faulty.	Adjust nuts.
3	**Reverse duct will not stay in position unless hand controller held.**	
	Reverse latch worn.	Adjust nuts.
4	**Poor reverse thrust.**	
	Reverse duct not travelling fully down.	Determine reason for limited travel and correct.
5	**Poor forward thrust.**	
	Reverse duct not travelling fully up.	Determine reason for limited travel and correct.
6	**Reverse control lever movement is stiff.**	
	Reverse control lever or cable is stiff.	Disconnect the reverse control cable at the latch. Check controller movement and cable movement. Lubricate as necessary. Check for bent or loose linkages. Check cable run from control lever to latch that cable is not being accidentally bent or squashed, thus restricting movement. Check cable type, length and route are as specified.
	Latch is stiff.	Disconnect the reverse control cable at the latch. Check latch movement. Dismantle, lubricate and repair as necessary.
	Linkages are binding.	Disconnect latch from reverse shaft and check linkages and bucket movement.
	Detent pressure too great.	Adjust detent as per installation instructions.
7	**Reverse duct vibrates or judders during control movements.**	
	Spring is disconnected.	Reconnect spring.

Table 2: Reverse system fault finding

Steering System

No.	Symptom	
	Possible Cause	Solution
1	Steering stiff at the helm.	
	Grit jamming nozzle.	Work nozzle from side to side to release grit. Flush out.
	Helm wheel or cable system stiff.	Disconnect cable system from the jet. Check, rectify and lubricate as necessary.
	Steering tiller shaft stiff.	Disconnect cable system from the jet. Check movement of shaft, and clearance on shaft bushes. Rectify to a loose running fit.
	Grit between nozzle bushes.	Remove bolts, bushes and O-rings. Check bushes and O-ring seal for wear. Replace with new parts as necessary.
	Nozzle bearing bushes worn, allowing the nozzle to rub on the housing.	Remove bolts, bushes and O-rings. Check bushes and O-ring seal for wear. Replace with new parts as necessary.
2	**Steering jamming.**	
	Grit jamming nozzle.	Work nozzle from side to side to release grit. Flush out.
	Nozzle pivot bolts loose or bent.	Remove, check and replace bolts to the torque specified on the drawing.
	Nozzle holder bowl deformed by impact.	Remove, rebuild or replace as necessary.

Table 3: Steering system fault finding

RESCUE EQUIPMENT

Rescue tubes

Mask, snorkel, flippers

Diving knife

Diver's tow line

Towing bridle

Long tow rope

Short tow rope

First Aid Kit

Oxygen Resuscitation equipment

Fire extinguishers

PFDs

Boat hook

Fenders

SAFETY EQUIPMENT

PFDs

Each boat is fitted with a number of Personal Floatation Devices (PFDs)

Fire Extinguishers

Next in line after PFDs, fire extinguishers are a very important safety item. As a general rule, boat extinguishers should be regularly shaken to mix the chemicals, as prolonged storage on the boat settles all the chemicals.

Portable fire extinguishers are designed to attack a fire in its initial stage. The selection of a suitable extinguisher is primarily influenced by the following factors:

- the size and rate of fire spread
- the Class of fire (i.e.. type of materials involved)
- the training and capabilities of the person using the extinguisher

Note: *Always follow the specific instructions on a fire extinguisher and familiarise yourself with these instructions prior to an emergency situation. Persons should be trained in the use of extinguishers to optimise their effectiveness.*

General Guidelines for Using a Fire Extinguisher

- Raise the alarm, summon help and have someone call the fire service on '000'
- Keep your escape path at your back. Never allow the fire to get between you and the escape path
- Select the correct extinguisher for the Class of fire
- Remember **P.A.S.S.**

Pull	the pin
Aim	the extinguisher nozzle at the base of flames
Squeeze	trigger while holding the extinguisher upright
Sweep	the extinguisher or nozzle from side to side covering the base of the fire.

- Observe fire after initial extinguishment, it may rekindle
- The contents of small extinguishers may last as little as 8 seconds and up to 60 seconds for larger extinguishers. The time to discharge an extinguisher depends on the type and size of the extinguisher

Do Not Use (or continue to use) an extinguisher if:

- the fire is larger than a waste paper basket
- the fire is spreading quickly beyond the point of origin
- the extinguisher is not having any effect or is having an adverse reaction on the fire
- you are putting your life at risk
- you cannot extinguish the fire quickly (less than 30 sec)
- you do not know what fuels are involved in the fire

REMEMBER - Saving lives through a quick escape is far more important than saving property.

An emergency is not the time to read extinguisher instructions. If you do not know how to use the extinguisher or the type of materials involved in the fire:

- Close the door to contain the fire
- Ensure everyone is out of the building

- Ring the fire service on '000'
- Never go back into the building once out
- Wait to meet the fire service

RESCUES

UNCONSCIOUS PATIENT

1. Rescue of unconscious patient which requires No. 3 (crewman) to jump overboard, retrieve the patient, fit rescue tube and support patient until Jet Boat (by the Driver No. 1) is manoeuvred into position for pick up.

2. No. 3 thrusts patient upwards as No. 2 grasps patient under arms and starts to lift patient into boat; rising to a standing position.	
3. No. 3 supports patient under legs with left arm, both hands on gunwale grips, such that he levers patient's legs upwards as No. 2 pulls patient into boat. No. 1 may accelerate slightly to assist in floating the patient.	
	

Rescue of unconscious patient without time to fit rescue tube

1. No. 3 (crewman) jumps overboard, retrieves the patient, and supports him until the boat is manoeuvred (by the Driver No. 1) into a position of the pick up.	
2. No. 3 thrusts patient upwards to No. 2 who grasps the patient under the arms and starts to lift the patient into the boat while rising to a standing position.	
3. No. 3 continues to assist by levering legs upwards with the left arm, both hands on the gunwale grips, as No. 2 pulls the patient into the boat. No. 1 may accelerate slightly to assist in floating the patient.	

Rescue of unconscious patient with both No. 2 and No. 3 on board

1. Driver manoeuvres boat alongside patient, No. 2 grasps patient under arms, driver moves boat forward allowing legs to trail behind.	
2. No. 3 grasps legs and assists in lifting patient into boat.	

CONSCIOUS PATIENT

Rescue of Conscious Patient

1. No. 2 leans over gunwale and grasps patient's left arm (or both arms), driver throttles boat forward at approximately 10 knots, allowing patient's body to trail alongside boat.	
2. No. 3 positions himself aft, leans over and grasps patient's legs. Both No. 3 and No. 2 lift and swing patient into boat.	
3. Completion of swinging lift of patient into boat.	

RESUSCITATION

In Boat after airway is cleared by No. 2 whilst patient is on deck

1. Patient is lifted onto engine hatch with legs extending aft and head supported on the hatch, not over the end.	
2. No. 2 and No. 3 jointly determine patient is not breathing and No. 2 gives 5 quick breaths.	
3. No. 3 feels for carotid pulse "No pulse".	
4. No. 2 continues with EAR and No. 3 commences ECC.	

WITHIN THE BREAK

BEYOND THE BREAK

NEAR ROCKS

PATIENT TRANSFERS

WITHIN THE BREAK

Recovery of unconscious patient on return to beach

1. Driver gives "Assistance Required" signal.
2. Patrol acknowledges and selected patrol members run to water's edge to meet boat.
3. Boat is beached or where considered desirable spun around whilst still afloat to enable boat to be quickly relaunched.
4. No. 2 and No. 3 lift patient ready to hand over to patrol.
5. As patient is lifted across boat, the patient is rolled onto side, face towards patrol. No. 1 and No. 2 patrol members at front link arms under patient and take patient's weight and continue to roll patient over to face down position.
6. No. 3 patrol member places right upper arm under legs, rolling patient's legs onto right shoulder.
7. The No. 1 and No. 2 patrol members then swing the patient's arms over and down, the No. 3 patrol member then stands, fully supporting the patient's legs, such that the patient is then carried in the classic face down draining position. If a further patrol member is available he should support the patient's head so that the airway is kept open.
8. The patient can also be transferred in the face upwards position.

BEYOND THE BREAK

Patient transfer from IRB to JRB

1. IRB Driver positions craft alongside JRB preferably on leeward side of prevailing wind and sea conditions. If sea conditions are bad both boats should be positioned facing the oncoming swells. No. 2 and No. 3 JRB crew holds IRB secure via rescue lines.
2. IRB Driver grasps patient's leg whilst crewman supports and lifts patient under armpits.
3. Patient is lifted across JRB gunwale. JRB No. 2 and No. 3 then take over support of patient whilst IRB crew then take over grip on side of JRB.
4. JRB No. 2 and No. 3 then move across and carefully lower patient onto engine hatch.
5. Before IRB departs, the crew should inform the JRB crew of the condition of the patient.

CALL OUT CREW EQUIPMENT LIST

Listed below are suggested items that crew should have with them at all times when on-call. These are broken down into mandatory (depending on season) and optional items:

MANDATORY

Patrol uniform (including cap)

Wetsuit

Booties

Gloves

Hood

Sunglasses

Sunscreen

Zinc

Surf Rescue spray jacket

Dive knife

Torch

Compass

Full change of warm clothes

Towel

Beanie

Peak hat

Dry-bag

Garbage bag for wet clothing

OPTIONAL

Chemical light (cyalume) sticks

Toilet paper

Small personal First Aid Kit

Emergency money

Drink bottle

Low volume sleeping bag

Crew list, including phone numbers

GPS

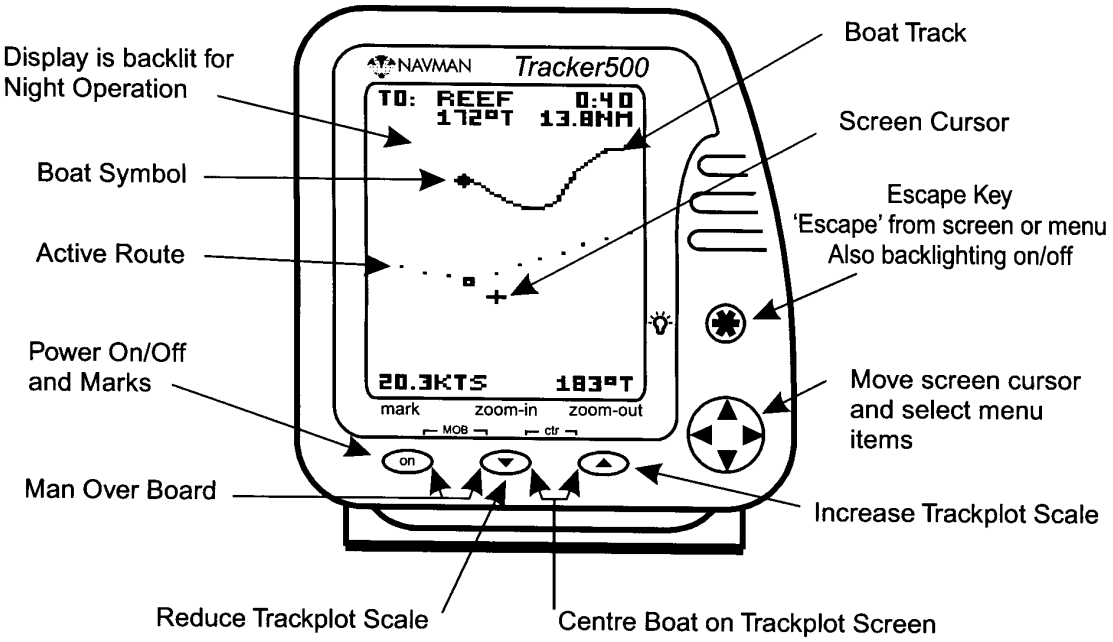


Figure 8: NAVMAN Tracker500 controls and functions

TROUBLE SHOOTING GUIDE

Problem	Cause - Solution
Tracker500/500i will not switch on.	Power/data cable not connected or not fully connected into its socket. Power supply connections reversed.
Tracker500/500i switches itself off.	Check for a poor connection in the power cable causing intermittent loss of power. When the Tracker500/500i detects a large supply voltage surge, it will turn itself off to protect itself. Check for loose battery connections.
Some previously available navigation functions are no longer available. "GPS FIX LOST" message displayed.	GPS no longer has a fix. This may occur occasionally if the antenna does not have a clear view of the sky. The satellite positions are constantly changing so that their signals can come from any direction. It is essential that the antenna has a clear view of the sky.
Prolonged period to obtain a fix.	This will occur if the Tracker500/500i has been moved more than 500 kilometres since it was last switched on, or if it has not been used for several months. The Tracker500/500i will automatically "search" the sky for all available satellites. This may take a few minutes. This function is fully automatic and requires no user intervention. Subsequent times to first fix should typically be 45 seconds.

Problem	Cause - Solution
Position indicated on Tracker500/ 500I varies by up to 100 metres from true position.	The US Department of Defense introduce a varying offset known as “selective availability” (SA). The direction and magnitude of the offset is constantly varying. SA will cause errors typically of 0-100 metres, but can occasionally cause errors in excess of 300 metres. The effects of SA can be reduced with the installation of a differential receiver, if this service is available in your area.
Indicated speed does not match the boat’s speed/log instrument.	The constantly changing SA offset results in an indicated speed error that is normally less than 1 knot, but occasionally exceeds 1.5 knots. A Tracker500/500i connected to a differential receiver will not exhibit this error. The Tracker500/500i indicates speed over the sea bed. A speed/log instrument indicates speed through the water. if there is any tidal current, these two will be different. Speed/log instruments are often not calibrated accurately and do not accurately show the boat’s speed.
Indicated heading does not match the boat’s compass.	The boat must be moving before the Tracker500/500i can determine its direction. The Tracker500/500i BEARINGS setting must be set to MAG before the indicated heading will match the compass. The constantly changing SA offset results in an indicated heading error, usually apparent only at low speeds. The Tracker500/500i indicates the boat’s direction of movement over the sea bed. External influences such as tidal currents and wind induced leeway mean that this may not be the same direction that the boat is pointing in, which is what a compass indicates. Magnetic materials on the boat may influence a compass but not a Tracker500/500i.

Table 4: NAVMAN Tracker trouble shooting guide

COMMUNICATIONS

COORDINATION WITH SEA RESCUE AND/OR COAST GUARD

CALLSIGNS

Callsign	Meaning
Surf Command	Surf Lifesaving Radio Room
Lifesaver 1	JRB covering northern metro beaches
Lifesaver 2	JRB covering mid-south coast beaches
Lifesaver 3	JRB covering south coast
Support 1	Jet Boat Officer
SRM 1	Lifesaver 1's 4WD
SRM 2	Lifesaver 2's 4WD
SRM 3	Lifesaver 3's 4WD
Lifesaver Crew	Generic callsign to any JRB crew

Table 5: Commonly used JRB group callsigns

RADIO FREQUENCIES

SLSA UHF Radio

This radio is a Motorola MCS 2000. It is programmed with five zones, each of which is a collection of different radio frequencies.

Zone Summary

- **Zone 1** Label **SURF LIFESAVIN**

  Channel Name:

  1 – TRAINING

  2 – ALDINGA LINK

  3 – MET/STH RPT

  4 – TALKAROUND 3

  5 – MIDCOAST RPT

  6 – TALKAROUND 5

  7 – MYPONGA RPT

  8 – TALKAROUND 7

All the above channels are scanned when the radio is in **scan** mode.

- **Zone 2** Label **UHF CB RADIO**

  Channel Name:

  CB REPEATER 1

  CB REPEATER 2

  CB REPEATER 3

  CB REPEATER 4

  CB REPEATER 5

  CB REPEATER 6

  CB REPEATER 7

CB REPEATER 8

CB REPEATER 9

CB CHANNEL 40

Only the first eight channels are scanned when in **scan** mode.

- **Zone 3** Label **SEA RESCUE**

  Channel Name:

  1 – PT GILES LNK

  2 – PT GILES RPT

  3 – PT GILES TLKRND

  4 – ADELAIDE LNK

  5 – ADELAIDE RPT

  6 – ADELAIDE TLKRND

All the above channels are scanned when **scan** is selected.

27MHz Marine Channel Assignments

Channel	Frequency (MHz)	Usage
68	27.680	Commercial, calling ship-ship, ship-shore
72	27.720	Professional fishing, calling ship-ship, ship-shore
82	27.820	Professional fishing, calling ship-ship, ship-shore
86	27.860	Distress, safety and calling (supplementary to 27.880)
88	27.880	Distress, safety and calling
90	27.900	Non-commercial, calling ship-ship, ship-shore
91	27.910	Non-commercial, calling ship-ship, ship-shore
94	27.940	Non-commercial, calling ship-ship, ship-shore
96	27.960	Non-commercial, calling ship-ship, ship-shore
98	27.980	Rescue etc, calling ship-ship, ship-shore

Table 6: 27MHz Marine channel assignments

VHF MARINE CHANNEL ASSIGNMENTS

Intl Channel Number	Aust Channel Number	Frequency (MHz)		Use
		Tx	Rx	
2	2	*156.10	160.70	Pubic Correspondence, Port Operation
3	3	156.15	160.75	Pubic Correspondence, Port Operation
4	4	156.20	160.80	Pubic Correspondence, Port Operation
5	5	*156.25	160.85	Pubic Correspondence, Port Operation
6	6	156.30	156.30	Intership Safety
7	7	156.35	160.95	Pubic Correspondence, Port Operation
8	8	156.40	156.40	Commercial
9	9	156.45	156.45	Commercial. Non Commercial
10	10	156.50	156.50	Commercial
11	11	156.55	156.55	Commercial
12	12	156.60	156.60	Port Operation
13	13	156.65	156.65	Navigational
14	14	156.70	156.70	Port Operation
15	15	156.75	156.75	Environmental
16	16	156.80	156.80	Distress, Safety and Calling
17	17	156.85	156.85	
18	18	156.90	161.50	Commercial
19	19	156.95	161.55	Port Operation
20	20	157.00	161.60	Port Operation
21	21	157.05	161.65	Port Operation
22	22	157.10	161.70	Port Operation
23	23	*157.15	161.75	Public Correspondence
24	24	*157.20	161.60	Pubic Correspondence
25	25	*157.25	161.85	Pubic Correspondence
26	26	*157.30	161.90	Public Correspondence
27	27	*157.35	161.95	Pubic Correspondence
28	28	*157.40	162.00	Pubic Correspondence
60	60	*156.025	160.625	Pubic Correspondence, Port Operation
61	61	156.075	160.675	Pubic Correspondence. Port Operation
62	62	*156.125	160.725	Pubic Correspondence, Port Operation
63	63	156.175	160.775	Port Operation, Commercial
64	64	156.225	160.825	Pubic Correspondence, Port Operation
65	65	156.275	160.875	Pubic Correspondence. Port Operation
66	66	156.325	160.925	Pubic Correspondence, Port Operation
67	67	'156.375	156.375	Supplementary distress and safety
68	68	156.425	156.425	Non Commercial
69	69	156.475	1 56A75	Non Commercial
70	70	#		(Operation Prohibited)
71	71	156.575	156.575	Non Commercial
72	72	156.625	156.625	Non Commercial
73	73	156.675	156.675	Port Operation
74	74	156.725	156.725	Port Operation
75	75	#		Guard Channel (Operation Prohibited)
76	76	#		Guard Channel (Operation Prohibited)
77	77	156.875	156.875	Commercial
78	78	156.925	161.525	Non Commercial
79	79	156.975	161.575	Port Operation
80	80	157.025	161.625	Port Operation
61	81	157.075	161.675	Port Operation
82	82	157.125	161.725	Port Operation, Public Correspondence
83	83	157.175	161.775	Pubic Correspondence
84	64	*157.225	161.825	Pubic Correspondence
85	85	*157.275	161.875	Public Correspondence
86	86	157.325	161.925	Public Correspondence
87		*157.375	161.975	Public Correspondence
	87A	157.375	157.375	Non Commercial
88	88	*157.425	162.025	Public Correspondence

Table 7: VHF Marine channel assignments

NOTES: 'Allocated Seaphone Channels.
Operation is prohibited on Channels 70,75 and 76.

RADIOS

GENERAL

Radios play a vital role within the Jet Boat Service.

The aim of the radio is to provide a quick and efficient means of obtaining equipment or help which would otherwise not be possible without some loss of time.

It is very important to look after the radio equipment in the craft as someone's life may depend on the radio working.

Each boat is fitted with communications equipment that will allow the crew to contact a vast array of resources. These include UHF, VHF Marine and 27MHz VHF radios. Details of radios and how to use them are shown overleaf.

EMERGENCY ANTENNA

If your VHF antenna is damaged or falls in the water, a temporary antenna can be made as follows:

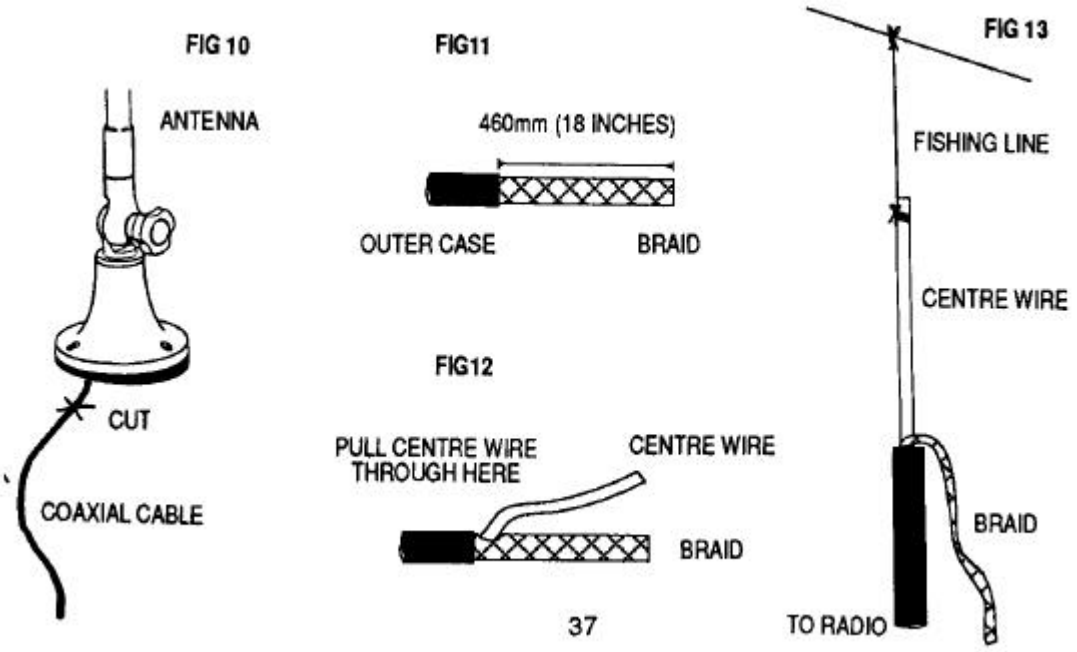


Figure 9: Emergency antenna

1. Cut the coax cable from the antenna so that as much cable as possible is retained. (Fig. 10)
2. Cut around the black outer case about 450mm (18 inches) from the end of the coax, and remove that section of casing. (Fig. 11)
3. Spread the braid where it protrudes from the casing and pull the centre wire through the gap. Pull the centre wire all the way through. (Fig. 12)
4. Fold the braid back against the coax and arrange the cable vertically using string or fishing line with the centre conductor as high as possible and away from any metal. (Fig. 13)

SLSA UHF

Motorola MCS2000

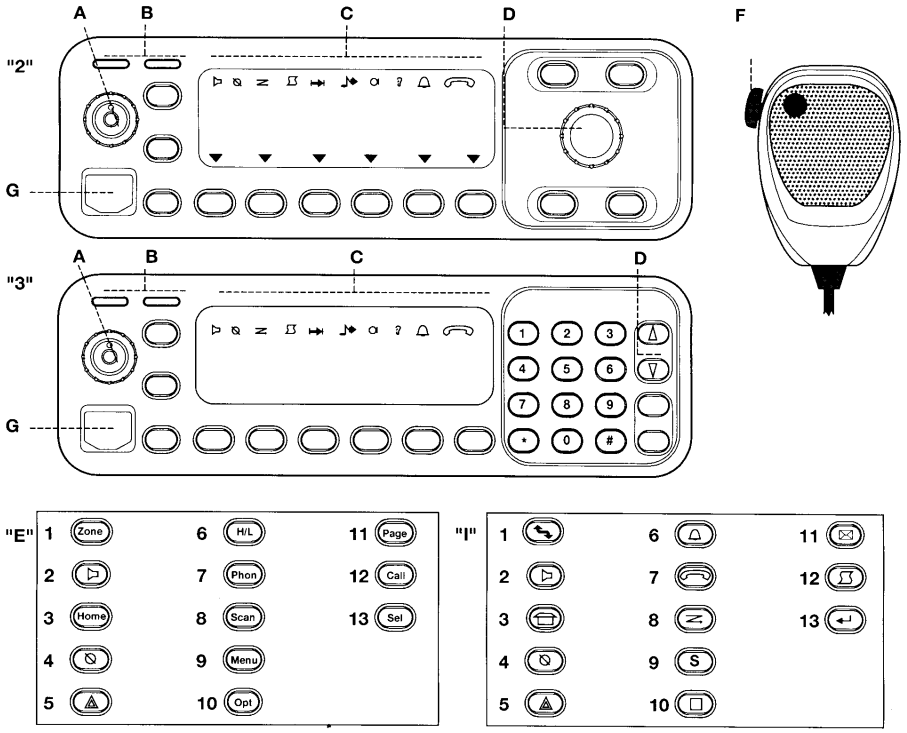


Figure 10: Motorola MCS 2000 controls and functions

Button Functions

- **Scan** – When this button is pressed and the chevron is displayed, the radio scans the preset channels within the current zone.
- **Home** – When this button is pressed, the radio will change to Zone LIFESAVIN Ch 3.
- **Zone Up** – Changes to the next zone up.
- **Zone Down** – Changes to the next zone down.
- **Channel Up** – Changes to the next frequency up within a zone.
- **Channel Down** – Changes to the next frequency down within a zone.

ICOM RMK1

27 MHz AM Marine Transceiver

This radio is made by Standard Communications Pty Ltd, and is a GME Electrophone GX294 transceiver, and has the following features:

- Front mounted speaker with water resistant Mylar cone
- Interference Suppression Circuit (ISC)
- Dual Watch (DW)
- Channel 88 recall
- Miniature microphone plug
- Ultra bright LED display
- Superior receiver performance
- Designed specifically for marine use
- Spare fuse holder
- Built-in speech processor circuitry
- Isolated earth chassis

Controls and Functions

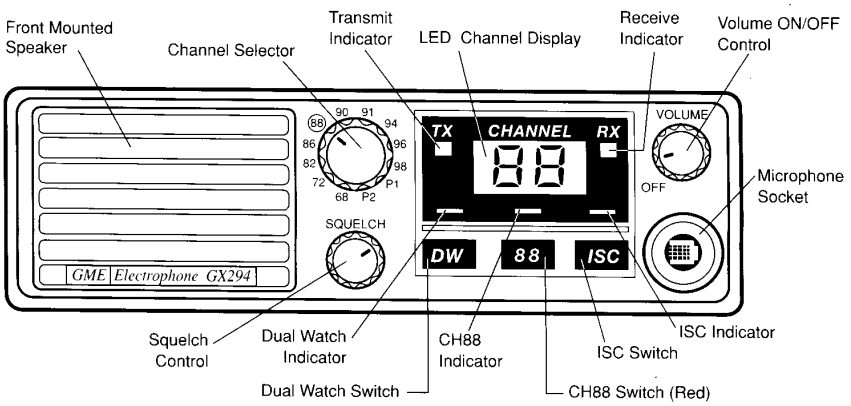


Figure 11: GME Electrophone GX295 controls and functions

- **Volume On/Off.** Rotate the Volume control knob clockwise past the click to turn the GX294 ON. Adjust the volume control for a comfortable listening level.

- **Squelch Control.** The squelch control is used to eliminate any annoying background noise when there are no signals present. To adjust the squelch, first rotate it fully counter-clockwise until the background noise is heard. Then advance the squelch control clockwise until the noise just disappears. The receiver will now remain quiet as long as there are no signals present, but an incoming signal will override the squelch and be heard in the speaker. As the control is advanced further clockwise, the squelch signal is progressively increased and stronger incoming signals are needed to override it. To receive extremely weak signals or to disable the squelch, simply turn the control fully counter-clockwise.

- **Channel Selector.** Select the required channel by rotating the channel selector clockwise or counter-clockwise. The selected channel is displayed on the LED channel display. Note that if full strength sunlight is falling on the channel display it may be hard to see. In this case refer to numbers around the channel selector knob.

- **ISC Switch.** The ISC switch activates an extremely effective Interference Suppression Circuit (Noise Blanker). When selected, the ISC combines with a built-in Automatic Noise Limiter (ANL) to almost totally eliminate electrical impulse interference, allowing clear reception of weak signals even under the noisiest electrical conditions. When the ISC switch is selected, the red LED indicator above it lights.

- **Channel 88 Switch.** The channel 88 switch allows instant selection of the Distress and Calling frequency 27.88 MHz. When selected, 88 appears in the channel display and the red Channel 88 LED above the button lights up. Pressing the 88 switch again returns the GX294 to the latest selected channel.

    - The channel 88 switch can be used to provide instant switching between the calling channel (88) and a local channel as follows:

        1. Select the local channel by rotating the channel selector switch (e.g. channel 94).

        2. Press the “88” button in. Channel 88 will be displayed and the red channel 88 LED will light.

        3. Now, whenever you are called on channel 88 and you wish to go back to the local channel, simply press the “88” button to release the switch. When you have finished your conversation, press the “88” button again to return to channel 88.

- **Dual Watch Switch.** The Dual Watch Switch allows the DX294 to monitor channel 88 AND any other selected channel. Any signals received on channel 88 will take priority over signals on the selected channel.

    - When the DW switch is first selected, the DW indicator LED above the button lights up and the selected channel is displayed. Then, every two seconds, the receiver quickly switches to channel 88. if there are no signals on channel 88, the receiver immediately returns to the selected channel. If a signal appears on the selected channel, it will be heard, but the receiver will continue to switch to channel 88 every two seconds and a brief interruption to the signal will be noticed each time.

    - If any signal is found on channel 88, the receiver will stop switching and will remain on channel 88 for as long as the signal is present. During this period the red channel 88 indicator LED will flash. When the signal has gone, the receiver will begin Dual Watching again.

    - Pressing the Push to talk (PTT) button on the side of the microphone causes the GX294 to transmit on the selected channel.

- **RX Indicator.** A green LED which lights while the GX294 is in the receive mode and extinguishes in the transmit mode.

- **TX Indicator.** A red LED which lights only when transmitting.

- **DW Indicator.** A red LED which lights when the Dual Watch function is selected.

- **Channel 88 Indicator.** A red LED which lights when the 88 switch is selected. It also lights and flashes when channel 88 is active in the Dual Watch mode.

- **ISC Indicator.** A red LED which lights when the ISC function is selected.

- **Microphone Socket.** The microphone attachment on the GX294 is a unique arrangement which utilises a six-pin telephone-style plug and socket. This provides superior cord grip strength and a low profile installation. The cord entry is then sealed against moisture by a rubber grommet.

- **LED Channel Display.** The LED channel display shows the currently selected channel.

- **Transmitting.** To transmit, press the PTT button on the side of the microphone. Hold the microphone 2-6 cm from your mouth and slightly to one side, so that your voice does not project directly into the microphone. Speak at normal voice level.

    - The GX294 has a built-in speech processor circuit which automatically controls the average level of your transmitted voice for greater clarity and better “penetration” under poor signal conditions. It is not necessary to raise your voice or shout into the microphone.

VHF MARINE TRANSCEIVER

GME Electrophone GX558

Features

This radio is made by Standard Communications Pty Ltd, and is a GME Electrophone Model GX558 VHF Marine transceiver, and has the following features:

- All channel memory storage
- Full memory scanning with skip and hold
- Permanent memory
- Instant Channel 16 emergency override
- Dual Watch function with Channel 16 priority
- Soft touch keypad
- High/low transmit power
- Fully splashproof keypad
- Frequency update option
- Optional remote station
- Liquid crystal display
- Panel lighting in three levels
- Channel 87A

Controls and Functions

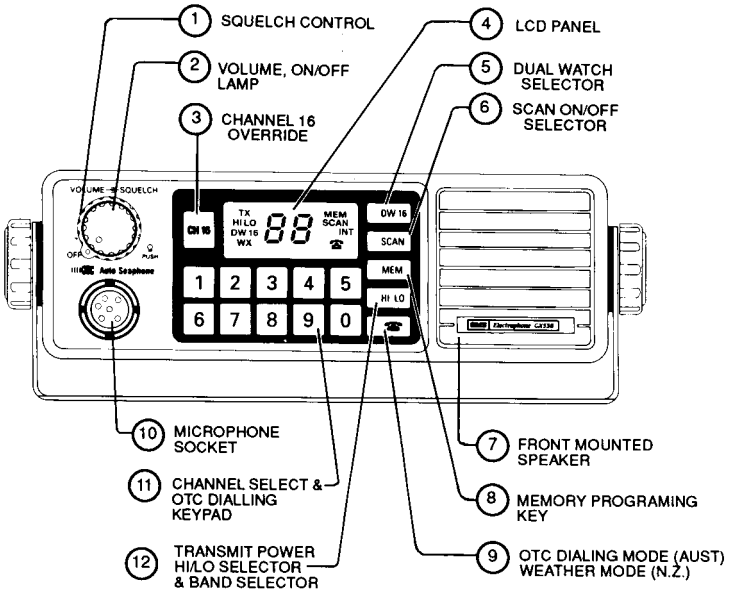


Figure 12: GME Electrophone GX558 controls and functions

1. **Squelch Control.** Turning the squelch control clockwise quiets the receiver when there are no signals present and allows a quiet standby operation. It functions only in the receive mode and does not affect the receiver volume or the transmitted signal.
2. **Volume On/Off Lamp Control.**

Volume ON/OFF – Rotate clockwise past the "click" to turn the transceiver on. Continue to rotate clockwise to increase the volume level from the speaker.

DIM CONTROL – Press the volume control inwards to control the panel lighting for night use. The lights operate in a cycle – OFF/DIM/FULL/OFF.

3. **Channel 16 Override.** Pressing CH 16 at any time causes the transceiver to go immediately to Channel 16. (Channel 16 is the emergency safety and calling channel). Selecting Channel 16 cancels all other modes including SCAN and OTC DIALLING modes. Transmitter output power is automatically set to maximum.
4. **LCD Panel.** The Liquid Crystal Display (LCD) panel displays the selected channel number and indicates which function or mode has been selected. This type of display can be easily read, even in direct sunlight. For low light or night viewing, panel lights are provided which light the display internally.
5. **Dual Watch Selector.** Pressing DW 16 allows you to monitor both Channel 16 and a channel selected by the numeric keypad. "DW 16" is displayed on the LCD panel. Signals appearing on Channel 16 will take priority over those on the selected channel.
6. **Scan ON/OFF Selector.** Press SCAN to activate the scanning mode. This causes the GX558 to scan any channels that are programmed into the memory. Scan will pause when a signal appears on one of the channels and will not continue until the channel is clear. During this time the signal can be heard.
7. **Front Mounted Speaker.** The powerful front mounted speaker projects the sound forward for maximum volume and clarity.
8. **Memory Programming Key.** The MEM key is used to store channels in the memory. It can also be used to remove channels that have been previously stored. When scanning, the MEM key can also be used to skip over a busy channel.
9. **Weather Channel Selector.** (NZ versions only).

   OTC Auto Dialling Mode Selector. (Australian versions only).
10. **Microphone Socket.** The microphone plug should be inserted into this socket and the outer sleeve tightened. The microphone must be inserted to activate the speaker. Alternatively, a telephone style handset can be plugged into the socket. The receiver audio will be transferred to the handset's earpiece.
11. **Channel Selector and OTC Dialling Keypad.** During normal operations, the numeric keypad is used to enter the channel number. Any legal channel can be entered by pressing the channel number digits in sequence. Channels 1 to 9 should be prefixed with a zero.
12. **Hi/Lo Key.** The HI LO key has two functions:

    Power Output. A momentary press of the HI LO key causes the transmitter power output to be set to either HIGH power (25 watts) or LOW power (1 watt). The power output will toggle between HIGH (HI) and LOW (LO) power with alternate presses of the key.

    Band Selector. Pressing and holding the HI LO key for about 1.5 seconds will cause the GX558 to change from the AUSTRALIAN VHF marine channel allocation, to the INTERNATIONAL VHF marine channels. "INT" is displayed in the LCD panel when the INTERNATIONAL band is selected. Press and hold again to return to the AUSTRALIAN channels.

    Power is automatically reset to HIGH after a channel change or a mode change.

Operation

Receive Operating Procedure

1. Ensure the 13.8 Volt power source, 50 Ohm antenna and microphone are correctly connected.
2. Adjust the squelch control fully counterclockwise.
3. Rotate the volume control clockwise past the "click" and advance it to a comfortable listening level.

Squelch

The squelch control is used to eliminate any annoying background noise when there are no signals present.

To adjust the squelch. turn the squelch control clockwise until the background hiss just disappears. At this point the receiver will remain quiet when there are no signals being received, but an incoming signal will overcome the squelch action and be heard from the speaker. As the control is advanced (in a clockwise direction) the squelch action is progressively increased and stronger incoming signals are needed to overcome it. To receive extremely weak signals or to disable the squelch, simply turn the squelch control fully counterclockwise.

Selecting Channels

Channels are selected using the numeric keypad on the front panel.

Press any two keys to enter a valid two-digit channel number. A high beep will be heard at each key press. Single digit channel numbers should be prefixed with a zero, e.g.:

- to select Channel 24, press **2**, then **4**. **24** is displayed.
- to select Channel 2, press **0**, then **2**. **2** is displayed.

The first digit entered will flash on the display. At this point, the second digit must be entered within three seconds. If entered correctly, the channel number selected will be displayed and the GX558 will operate on that channel.

If the second number is **NOT** entered within the correct time, the radio will assume a single digit channel number was required and will select that channel (on the condition that it is a valid channel number.) For example, entering **2** will, after three seconds, assume **0** **2** was required, and Channel 2 will be selected.

If the channel number selected is **NOT** a valid channel, a low beep will be heard (indicating an incorrect entry), and the radio will return to the last correctly selected channel.

NOTE: When the channel is selected, HIGH transmit power will automatically be selected **unless LOW power is mandatory on the selected channel**.

Channel 16 Override

Press **CH 16** to immediately select the Distress, Safety and calling Channel 16.

Pressing **CH 16** will cancel all other modes and functions, including OTC DIALLING and scanning, and the GX558 will go straight to Channel 16. High transmit output power is selected automatically.

Dual Watch Function

The Dual Watch function will allow the GX558 to monitor Channel 16 **AND** any other selected channel. Any signals received on Channel 16 will take priority over signals on the selected channel.

1. Enter the channel number you wish to use, e.g. to select Channel 26 press **2** **6**. 26 will displayed in the LCD Panel.
2. Press **DW 16** "DW 16" will also be displayed in the LCD Panel.
3. Your GX558 will now operate on Channel 26, but will continue to monitor Channel 16 every two seconds.

If there are no signals present on either channel, the selected channel number will be displayed along with "DW 16".

If a signal appears on the selected channel, the signal will be heard, but the display will flash **16** every two seconds indicating that it is still monitoring Channel 16, and a brief interruption to the signal will be noticed at each time. This will continue for as long as the signal is present and for a further five seconds after the signal has gone (this allows the radio to hold the channel during short breaks in the conversation). The display will then return to the selected channel.

If at any time a signal appears on Channel 16, the receiver will immediately "lock" onto Channel 16 and **16** will be displayed. The receiver will remain on Channel 16 for as long as a signal is present,

and for a further five seconds after the signal has gone. The display will then return to the selected channel and Dual Watching will resume.

NOTE: When Dual Watching, any transmissions you make will be on the selected channel. If you need to reply to a call on Channel 16, press **CH 16** to exit the Dual Watch mode and go immediately to Channel 16.

Selecting Display Brightness

The LCD Panel and keypad can be lit to enable them to be easily read at night. The light is controlled by pressing the VOLUME knob inwards. Each press will change the light from OFF to DIM, to BRIGHT, and back to OFF again.

When the radio is first turned on, the light is OFF.

1. Press the VOLUME knob ONCE. The display and keypad will be lit at half brightness.
2. Press the VOLUME knob again. The display and keypad will be lit at full brightness.
3. Press the VOLUME knob again. The light will be extinguished.

Transmitting

To TRANSMIT, press the PTT button on the microphone. Hold the microphone 2-6cm from your mouth and slightly to one side, so that your voice does not project directly into the microphone.

Whenever the PTT button is pressed, the “TX” indicator in the LCD panel will appear.

Channel 16

Channel 16 is used for calling purposes or emergency use only. When contact has been established on Channel 16, you must switch to a working channel to continue your conversation. You should always monitor the channel before initiating a call.

When calling, identify your vessel name and your callsign.

Power Output

It is good practice to use low power output whenever possible. Using HIGH power unnecessarily may cause interference to other people’s communication.

Setting Transmitter Output Power

Alternate presses will select HIGH or LOW transmitter output power. When your GX558 is first turned on, or when a channel is selected, HIGH power is automatically selected.

1. To select LOW power, press **HI LO** momentarily. A high beep will be heard and “LO” will appear in the LCD display.
2. To reselect HIGH power, press **HI LO** again. A high beep will be heard and “HI: will appear in the LCD display.

When HIGH power is selected the transmitter output power is 25 Watts, reducing to 1 Watt on LOW power.

IMPORTANT NOTE: Some channels may be designated LOW power only. Your GX558 will automatically select LOW power on these channels and will not accept any attempt to select HIGH power.

Programming Memory

Use **MEM** to store selected channels in the memory or remove unwanted channels from the memory. Those channels stored in the memory can be “scanned” for signals when required, using the **SCAN** function. The memory is large enough to store **ALL AVAILABLE CHANNELS** if you so require. Channels programmed into the memory will remain indefinitely until removed using the **MEM** key.

Storing Channels

(i) Select the required channel using the numeric keypad.

(ii) Check that **MEM** is NOT displayed in the LCD panel. This confirms that the channel is not in the memory.

(iii) Press and hold **MEM** for about half a second until a high beep is heard.

(iv) "MEM" should now be displayed in the LCD panel indicating that the channel is now stored in the memory.

Removing Channels

(i) Select the channel you wish to remove, using the numeric keypad.

(ii) Note that "MEM" should be displayed, confirming that the channel is currently in the memory.

(iii) Press and hold **MEM** for about half a second until a low beep is heard.

(iv) "MEM" should no longer be displayed indicating that the channel is no longer in the memory.

Scanning

The SCAN function allows you to scan a group of channels stored in the memory. Your GX558 will scan at a rate of five channels every second. The channel numbers will be displayed as they are scanned.

Whenever a signal appears on one of the memorised channels, scanning will pause on that channel and the signal will be heard. The receiver will remain on that channel for as long as a signal is present, and for a further five seconds after the signal has gone (this allows the radio to hold the channel during short breaks in the conversation.) The radio will then resume scanning.

1. Set the Squelch control.
2. To start scanning, press **SCAN**. A high beep will be heard and "SCAN" will be displayed. The memorised channel numbers will now appear in the display as they are being scanned.

NOTE: If there are no channels programmed in the memory, a two-tone beep will heard and the **SCAN** command will be ignored. In this case refer to the section on PROGRAMMING the memory.

3. To skip over a busy channel, press **MEM**. The receiver will move off that channel and resume scanning.
4. To HOLD on a channel either:
   - press **SKIP HOLD** on the microphone, or
   - press the PTT button on the microphone.
5. To resume scanning when the channel has been held, either:
   - press **SKIP HOLD** on the microphone, or
   - press **MEM**.

The receiver will resume scanning.

6. To exit the SCAN mode, either:
   - press **SCAN** to return to the last selected channel, or
   - press CH 16 to go to Channel 16, or
   - press the numeric keypad to manually select a channel.

Checking Which Channels are in Memory

The following method can be used to identify which channels are stored in the memory:

- Rotate the squelch control fully counterclockwise. The receiver hiss will be heard in the speaker.
- Press **SCAN** . If there are no channels stored in the memory a two tone beep will sound, and the scan command will be ignored.

If there are channels stored in the memory a high beep will sound, **SCAN** will be displayed along with a channel number. The displayed number will be one of those stored in memory.

- Press **MEM** to reveal any other channels in the memory.

Each press of **MEM** will reveal the next channel. Continue until all memorised channels have been revealed.

- When you have finished, press **SCAN** again to exit the SCAN mode, and readjust the Squelch Control.

Selecting Australian or International Bands

When operating within and around Australian waters, specific channels or frequencies have been allocated for specific uses. However, when operating outside this area, an International frequency allocation has been accepted.

The GX558 has both allocations installed as standard, but will automatically select the Australian mode when turned on.

- To select the International Band, press and hold **HI LO** for about 1.5 seconds.

Initially, the radio will beep and the transmitter power will change – continue holding the **HI LO** key down until a second beep is heard. **INT** will be displayed indicating the radio is in **INTERNATIONAL** mode. You should now reselect the required transmitter power if necessary.

- To return to the **AUSTRALIAN** channels, press and hold **HI LO** again. **INT** will disappear after the second beep.

Channel 87A

Channel 87A, as used by the Australian Yachting Federation, is installed in the GX558 as Channel 87 in the Australian band.

If normal Channel 87 is required, select the International band and enter Channel 87 in the usual way.

ICOM IC-M45A

Features

Dual Watch and Tri-Watch Functions

Convenient functions that allow you to monitor the distress channel while receiving a channel of your choice (dual watch); or monitor the distress channel and another channel while receiving a channel of your choice (tri-watch).

Large, Easy-to-Read LCD

The IC-M45A's function display is easy to read and shows operating conditions at a glance. Backlighting and contrast can be adjusted to suit your preferences.

"Smart" Microphone

Operating channel and transmit output power level settings are easily selectable via the supplied microphone.

Panel Description

Front Panel

⊇ **Channel Up/Down Switches [▲UP]/[▼DN]**

- Push to select

⊄ **Scan Switch [SCAN • TAG]**

- Push to start/stop scanning (scan type can be selected in SET mode.)
- Push for 1 sec to toggle the tag setting for the displayed channel.

⊂ **High/Low Power Switch [H/L • DIM]**

- Toggles between high and low output powers.
- While pushing, push the [UP/DN] switches to adjust the display backlighting.
- While pushing, push [SCAN] for 3 sec to clear all tag channels.

⊆ **Channel Switch [CH/WX • DUAL]**

- Push to toggle between regular channel mode and weather channel mode (while in regular channel mode, push [H/L] + [CH/WX] to change channel groups).
- Push for 1 sec to start/stop dual (tri) watch (use SET mode to select dual or tri-watch in advance).

∈ **Channel 16 Switch [16 • 9]**

- Push to select channel 16.
- Push for 1 sec to select the call channel (channel 9 by default). Note that each group can have its own call channel programmed.
- Push for 3 sec (when a call channel is selected) to enter call channel write mode (channel indication flashes).

∉ **Squelch Control [SQUELCH]**

- Rotate clockwise to eliminate audio noise.

∠ **Power/Volume Control [PWR/VOL]**

- Turns power ON and OFF and adjusts the audio output level.

Microphone

⊇ **Channel Up/Down Switches [▲UP]/[▼DN]**

- Select an operating channel in the selected channel group (these switches can be used instead of the transceiver's [UP/DN] switches).

∅ **High/Low Power Switch [HI/LO]**

- The same function as the transceiver's [H/L] switch – toggles between high and low output powers (pushing this key at power ON turns the microphone keys ON/OFF).

Function Display

1 Transmit Indicator - Appears while transmitting.

2 Busy Indicator - Appears when receiving a signal or when [SQUELCH] is rotated too far clockwise.

3 Channel Indicator - Shows the operating channel.

4 Tag Channel Indicator - Appears when the selected channel is set as a tag channel.

5 Dual Watch Indicator - Appears and flashes during dual watch operation.

6 Tri-watch Indicator - Appears and flashes during tri-watch operation.

7 Scan Indicator - Appears and flashes during scan operation.

8 Duplex Indicator - Appears when the selected channel is a duplex channel.

9 Call Channel Indicator – Appears when the call channel is selected.

10 Weather Alert Indicator – **ALT** appears when a weather alert function is turned ON.

11 Mode Indicators:

- **USA** shows that USA channels are selected
- **CAN** shows that Canadian channels are selected
- **INT** shows that international channels are selected
- **WX** shows that weather channels are selected.

12 Low Power Indicator – Shows that low output power is selected.

Basic Operation

Power ON

1 Rotate [PWR/VOL] clockwise to turn power ON (all display indicators appear briefly. Channel 16 is automatically selected).

2 Operate the transceiver as indicated in the following sections.

Low Voltage Indicator – When "b" appears and flashes, there is a DC power source problem. In this case, check your vessel's battery and DC power cable.

Channel Selection

Channel 16 – Channel 16 is the distress channel. It is used for establishing initial contact with another station and for emergency communications. Channel 16 is monitored during dual/tri-watch. While standing by, you are required to monitor Channel 16.

Call Channel – The call channel is used to store your most often-used channel for quick recall. In addition, the call channel is monitored during tri-watch. The default setting for the call channel is channel 9 which is for leisure boat use. A separate call channel can be set for each channel group (USA, CAN and INT).

US, Canadian and International Channels – There are 57 US, 57 Canadian and 57 international channels. These channel groups may be specified for the operating area.

1 Push [CH/WX] to select a regular channel (if regular channels (USA, CAN or INT) are already selected, this step is not necessary).

2 Push [UP/DN] to select a channel (**DUP** appears for duplex channels).

3 To change the channel group, while pushing and holding [H/L], push [CH/WX] simultaneously (US, Canadian and international channels can be selected in sequence).

Weather Channels – There are 10 weather channels. These are used for monitoring the NOAA (National Oceanographic and Atmospheric Administration) satellite weather broadcasts.

Weather Alert Function – NOAA broadcast stations transmit a weather alert tone before important weather announcements.

- When the weather alert function is ON, the **ALT** indicator appears briefly on the display.
- When the alert signal is received, **ALT** flashes with an alert tone and then weather announcements start.
- This function is activated when a weather channel is selected or during any scan.

Receiving

1 Rotate [PWR/VOL] to turn power ON.

2 Rotate [SQUELCH] fully counterclockwise.

3 Adjust [PWR/VOL] to a suitable listening level.

4 Rotate [SQUELCH] clockwise until the audio noise disappears.

5 Select a channel. When a signal is received:

- the squelch opens,
- audio is emitted from the speaker, and
- **BUSY** appears in the function display.

6 When an interrupting signal is received, rotate [SQUELCH] deeply clockwise.

Dual/Tri-Watch Functions – These functions allow you to conveniently check the distress channel (Channel 16) or, both the distress channel and leisure call channel (Channel 9 – programmable) while receiving another channel. When receiving a signal on one of these channels, the transceiver stops on the channel until the signal disappears.

Depending on your preference, select dual watch or tri-watch in advance on **SET** mode. Dual watch is the default setting.

Transmitting

1 Select an operating channel.

2 Push [H/L] to select a transmit output power:

- **LOW** appears when low output power is selected.
- High power cannot be selected on some channels.

3 Push and hold the [PTT] switch to transmit. "TX" appears.

4 Speak into the microphone at your normal voice level. (Do not hold the microphone too closely to your mouth or speak too loudly. This may distort the signal.)

5 Release the [PTT] switch to receive.

IMPORTANT: In order to maximise the readability of your transmitted signal, pause for a moment after pushing [PTT], hold the microphone 15-20cm from your mouth, then speak into the microphone at an even, normal voice level.

Scan Function

The transceiver has a high speed scan function for standing by on utility signals. The scan speed is 8 channels/sec (except when the weather alert function is in use).

Two scan types are available:

- **normal** scan (scans all tag channels in sequence), and
- **priority** scan (checks channels 16 while scanning).

These scans can be selected in **SET** mode.

Scan operation

1 Select the desired channel group (USA, CAN, INT or WX) channels with [H/L] + [CH/WX] (or [CH/WX] only for weather channels). When the weather alert function is in use, select the desired WX channel in the display, then perform the above step.

2 Push [SCAN] to start scanning:

- **SCAN** appears and flashes in the function display.
- 16 appears during priority scan.

3 To stop the scan, push [SCAN] again.

- **SCAN** disappears.

Scan resume timer – when a signal is detected, scan pauses until the signal disappears or resumes after pausing 5 sec, according to the SET mode setting.

Confirming tag channels – while operating scan, push [UP] or [DN]. Only tag channels are selected. Stop pushing [UP] or [DN] to resume scan.

Weather alert function – when this function is turned **ON**, the selected weather channel is checked during scan.

Call Channel Programming

Pushing **[16 • 9] for 1 sec selects the call channel (channel 9 by default), however you can program your most often-used channels in each channel group for quick recall.**

1 While pushing and holding [H/L], push [CH/WX] one or more times to select the desired channel group (USA, CAN, INT) to be programmed.

2 Push [16 • 9] for 1 sec to select the call channel of the selected group (CALL **and the call channel number appear).**

3 Push [16 • 9] for 3 sec to enter call channel write mode (call channel and channel group to be programmed flash).

4 Push [UP] or [DN] to select the desired channel.

5 Push any switch to automatically program the selected channel (the transceiver returns to normal operation).

Display Backlighting

The function display and switches can be backlit for better visibility under low light conditions. While pushing [H/L • DIM], push [UP] or [DN] to adjust the backlighting (backlighting can be set to one of four intensities or **OFF**).

SET Mode

Entering SET Mode

SET mode is used to customise operation of the transceiver to suit your operating needs.

To enter SET mode

1 While pushing [16], turn power **ON**. Keep pushing [16] until the initial SET mode display appears. **SET** mode is selected.

2 To exit **SET** mode, turn power **OFF** then **ON** again.

To select an item

There are five items in **SET** mode that may be adjusted to suit your operating needs.

1 Select **SET** mode as above.

2 Push [16] to select an item, then push [UP/DN] to set the condition for the item.

SET Mode Items

Beep Tones - This item sets the transceiver's confirmation beep tones (when pushing a switch) ON or OFF.

Normal/Priority Scan – This item sets the scan function to normal or priority operation.

Weather Alert – This item sets the weather alert function ON or OFF.

Scan Timer – This item sets the scan timer ON or OFF.

- Scan timer OFF - Scan pauses on a signal until the signal disappears, and resumes 3 sec after that.
- Scan timer ON – Scan pauses on a signal and resumes 5 sec later.

Dual/Tri-Watch – This item sets the [CH/WX • **DUAL] switch to activate dual watch or tri-watch.**

Troubleshooting

Problem	Possible Cause	Solution
No power comes on.	• Power cord not connected properly. • Blown fuse.	• Check the power cord connection. • Check the polarity of the power connection, then, replace the fuse.
No sound comes from the speaker.	• [SQUELCH] is rotated too far clockwise.	• Rotate the [SQUELCH] counterclockwise to a suitable position.
No beeps sound even when a switch is pushed.	• Beep function is turned OFF.	• Set beeps to ON in SET mode.
Sensitivity is low and only strong signals are heard.	• [SQUELCH] is rotated too far clockwise. • Antenna feedline or the antenna connector solder has poor contact or is short circuited.	• Rotate [SQUELCH] counterclockwise to a suitable position. • Check, and if necessary, replace the feedline or solder the antenna connector again.
Transmitting is impossible or high power cannot be selected.	• Transmission is restricted on some channels.	• Change channels.
Desired channel cannot be selected.	• Different channel group is selected.	• Push [CH/WX] + [H/L] to select the desired channel group (USA, INT or CAN)
No display backlighting.	• Backlight function is turned OFF.	• While pushing [H/L • DIM], push [UP/DN] to select the desired brightness.
Scan does not start.	• No "TAG" channels are programmed.	• Set channels to be scanned as "TAG" channels.

Table 8: ICOM IC-M45A VHF Marine radio troubleshooting guide

DOCUMENTATION

TRAINING LOG SHEET

JRB CREW APPLICATION FORM

POWER CRAFT INJURY REPORT FORM

SECTION 2 – JET RESCUE BOATS

LIFESAVER 1

GENERAL DESCRIPTION

HULL

Length	6.85m
Beam	2.4m
Height	1.8m
Draught	0.4m
Weight	2100 kg
Crew	4

Table 9: Lifesaver 1 hull

MOTOR

Type	Turbo diesel
Make	Volvo Penta
Model	TAMD42A/WJ
Power	230hp (170kW)
Fuel	Diesel
Fuel capacity	195 litres
Speed	35 knots
Radius of action	4 hours

Table 10: Lifesaver 1 motor

JET UNIT

Type	Single stage mixed flow
Make	Hamilton
Model	HJ213
Stages	Single

Table 11: Lifesaver 1 jet unit

INSTRUMENTS AND CONTROLS

Steering	Hydraulic
Throttle	Cable-operated hand & foot
Thrust deflector	Hydraulic
Tachometer	Analogue
Oil pressure	Analogue
Alternator charge	Analogue

Engine hours	Digital
Compass	Liquid damped Silva
GPS	NAVMAN Tracker500

Table 12: Lifesaver 1 instruments and controls

RADIOS

UHF	Motorola MCS2000
27MHz Marine	GME Electrophone GX294
VHF Marine	GME Electrophone GX558

Table 13: Lifesaver 1 radios

PRE-LAUNCH CHECKLIST

Open engine cover (should already be open!)

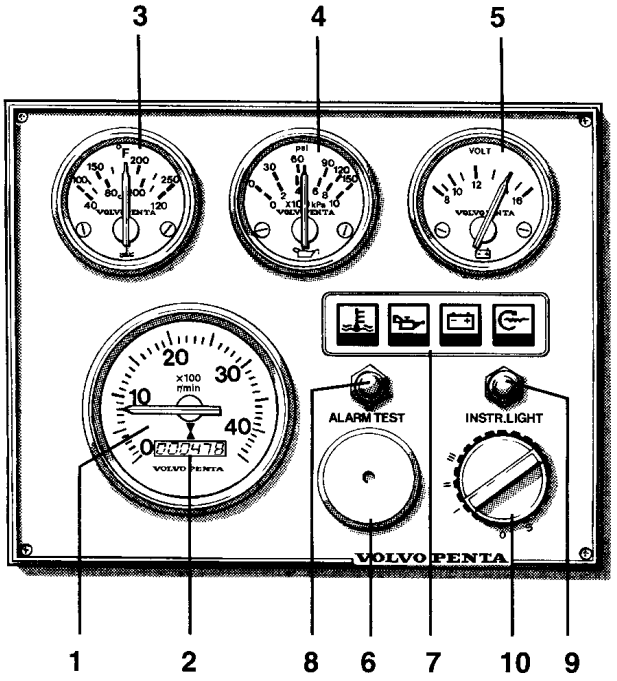
Check for fuel leaks (visually

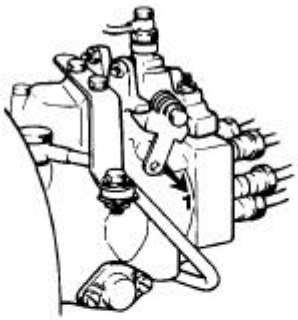
Select appropriate battery, and switch on

Switch on blowers

MOTOR

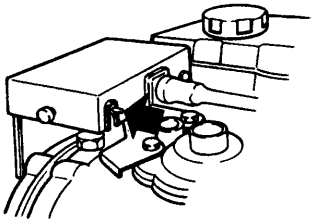
Main panel





Emergency stop

A diesel engine is not dependent on a power supply for its operation. Should a serious electrical fault occur, the engine can continue to run but the normal stop function of the ignition switch is inoperative. Emergency stopping of the engine can always be done by pulling the injection pump lever (1) backwards.



Automatic fuse

An automatic fuse may have tripped if the engine cannot be started or if the instruments display 0 readings. If this is the case, reset the fuse using the button. Always investigate the cause of overloading.

LAUNCHING

Bungs are fitted

Raise engine cover

Blowers on

Thrust control in neutral

Steering centred

Warm up motor

Secure all fenders inboard when leaving pier or dock facility. Nothing will make you look more like an inexperienced boater than to run your boat across the water with your fenders flopping outboard.

RECOVERY CHECKLIST

LIFESAVER 2

GENERAL DESCRIPTION

Hull

Length	5.85m
Beam	2.4m
Height	1.8m
Draught	?
Weight	1800kg (2240kg on trailer)
Crew	3

Table 14: Lifesaver 2 hull

Motor

Type	Marinised petrol
Make	Volvo Penta marinised Chevrolet 350 V8 (5.8 litre)
Model	AQ271C
Power	280hp (208kW)
Fuel	Lead Replacement Fuel
Fuel capacity	175 litres
Speed	35 knots
Radius of action	3 hours

Table 15: Lifesaver 2 motor

Jet Unit

Type	Single stage mixed flow
Make	Hamilton
Model	HJ212
Stages	1

Table 16: Lifesaver 2 jet unit

INSTRUMENTS AND CONTROLS

Steering	Hy Drive (Hydraulic)
Throttle	Foot (Cable)
Thrust deflector	Split (Cable)
Tachometer	Analogue
Oil pressure	Analogue
Alternator charge	Analogue
Engine hours	Digital

Compass	Liquid damped
GPS	NAVMAN Tracker500i

Table 17: Lifesaver 2 instruments and controls

RADIOS

UHF	Motorola MCS2000
27MHz Marine	GME Electrophone GX294
VHF Marine	GME Electrophone GX558

Table 18: Lifesaver 2 radios

Steering

Steering is performed using the helm shown below. It is hydraulically operated. The boat responds as a car does – when moving forward, turn the helm left or right to turn the boat to port or starboard respectively. When travelling astern, however, steering differs from that of a car – it continues to turn the bow whichever way you turn the helm.

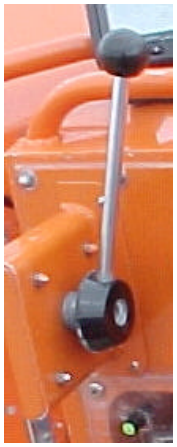
Throttle

The throttle is operated in the same way as a car's accelerator – it is mounted on the floor, and is worked using the toes of the right foot.

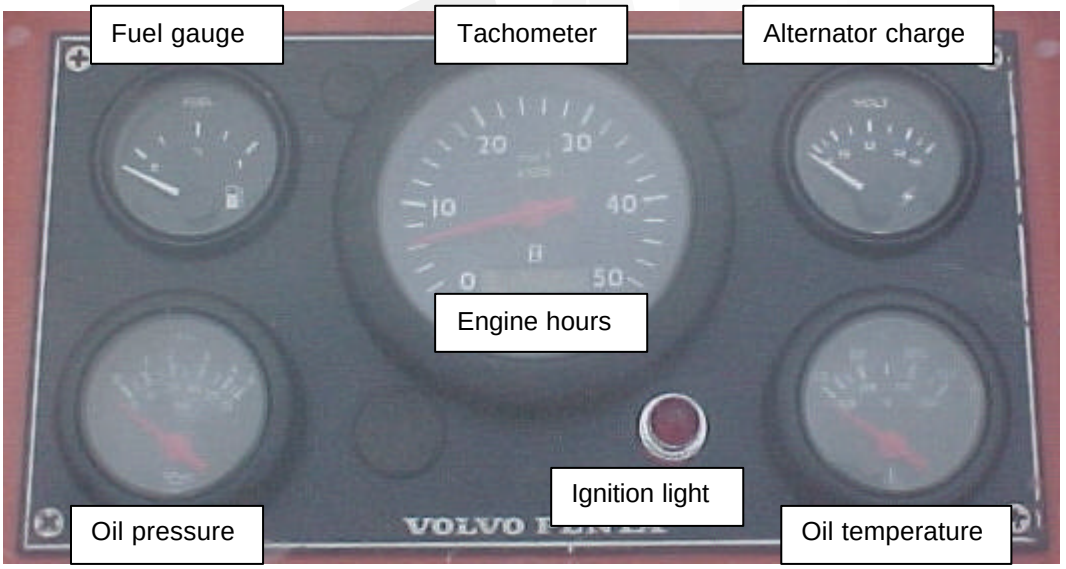
Thrust Deflector

The thrust deflector (or "bucket") control is a manually operated lever mounted to the left of the steering wheel. It pulls or pushes a cable that in turn raises or lowers the thrust deflector respectively over the waterjet.

The photo shows it in the forward position – neutral (or "zero speed") is just below horizontal, while reverse is pointing about 45 degrees towards the deck.



Engine Instruments



Tachometer

The tachometer shows engine revolutions in units of 100. This means that the current indication would be just over 600 revolutions. If the needle is on the first mark after the 30, it would show 3200 revolutions (normal cruise position).

Oil Pressure

This gauge displays the oil pressure within the motor in units of . Normal operating pressure is .

Oil Temperature

The oil temperature gauge gives an indication of how hot the motor is, in particular the oil within it. Normal operating oil temperature is .

Alternator Charge

In normal operation, the alternator charge needle should show between 12 and 14 volts. This means the alternator is charging the batteries, not drawing on them.

Fuel Gauge

The fuel gauge should be used as a rough guide when trying to determine how fuel is remaining. Drivers should take note of the engine hour reading at the start of the patrol, the sea and wind conditions, and the way in which they have been driving to make a more detailed estimate.

Engine Hours

To view the engine hours, the ignition switch must be on. This number is used to verify the previous log reading at the start of each patrol, and recorded at the end of each patrol. It also provides a useful (but rough) guide to fuel consumption. This varies depending on conditions, driver's ability, speed, etc.

Ignition Light

When the battery switch is on, and the black ignition switch is on, the ignition light will glow red, indicating that the motor can be started.

Compass

The compass is a liquid-damped type mounted directly in front of the driver's position. It can be illuminated when the boat's instrument and navigation lights are switched on.

Electrical Switches

Instrument and Navigation lights

GPS

The GPS switch provides power to the NAVMAN Tracker500i.

Radios

Tripping this switch provides power to the three radios in the boat.

Blowers

Bilge pump

Motor

PRE-LAUNCH CHECKLIST

Open engine cover

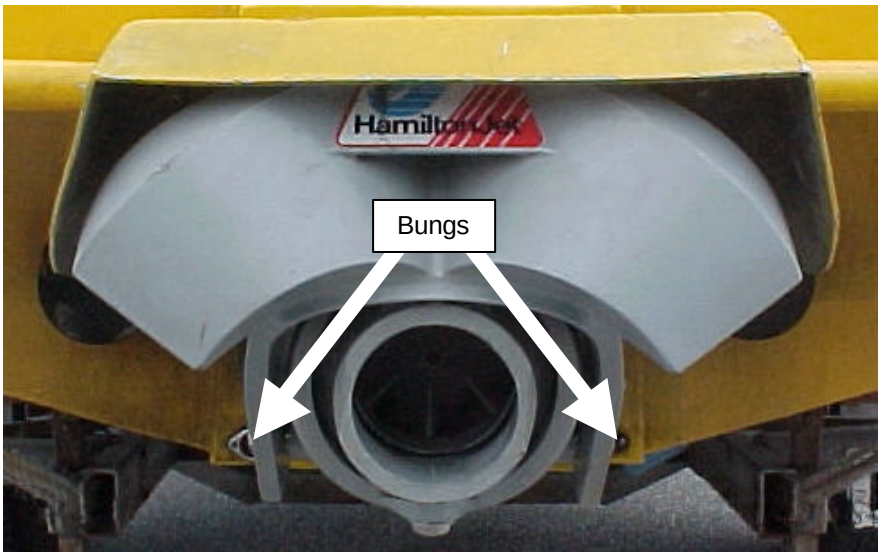
Check for fuel leaks

Select appropriate battery, and switch on

Switch on blowers

LAUNCHING

Bungs are fitted



Raise engine cover

Blowers on

Thrust control in neutral

Warm up motor

Secure all fenders inboard when leaving pier or dock facility. Nothing will make you look more like an inexperienced boater than to run the boat across the water with your fenders flopping outboard.

EQUIPMENT LOCATIONS

FORWARD HATCH

Handheld pyrotechnics (orange smoke and red flares)

Oxy-Viva

First Aid Kit

Stiffneck collars

Tool kit

Jumper leads

Admiralty chart

PORT LOCKER

Spotlight

Binoculars

Handheld compass

Strobe

Chemical light (cyalume) sticks

De-watering fluid

STARBOARD LOCKER

Spotlight

Bungs

CENTRE CONSOLE

Lifejackets

Tow rope

Bucket and lanyard

Sea anchor

Underwater tow rope

Mask and snorkel

Fins

Diver's knife

RECOVERY CHECKLIST

LIFESAVER 3

GENERAL DESCRIPTION

HULL

Length	
Beam	2.4m
Height	
Draught	
Weight	
Crew	4

Table 19: Lifesaver 3 hull

MOTOR

Type	Turbo diesel
Make	Yanmar
Model	6LP-STE
Power	300hp (221kW)
Fuel	Diesel
Fuel capacity	195 litres
Speed	
Radius of action	

Table 20: Lifesaver 3 motor

JET UNIT

Type	Single stage mixed flow
Make	Hamilton
Model	HJ241
Stages	1

Table 21: Lifesaver 3 jet unit

INSTRUMENTS AND CONTROLS

Steering	Hy Drive (Hydraulic)
Throttle	Cable-operated hand & foot
Gear lever	Cable-operated hand
Thrust deflector	Twin duct type (Hydraulic)
Boost	
Tachometer	Analogue

Oil pressure	Analogue
Alternator charge	Analogue
Engine hours	Digital
Compass	Riviera Liquid damped
GPS	NAVMAN FISH400

Table 22: Lifesaver 3 instruments and controls

RADIOS

UHF	ICOM RMK1
27MHz Marine	GME Electrophone GX294
VHF Marine	ICOM IC-M45

Table 23: Lifesaver 3 radios

PRE-LAUNCH CHECKLIST

Open engine cover

Check for fuel leaks

Select appropriate battery, and switch on

Switch on blowers

LAUNCHING

Bungs are fitted

Raise engine cover

Blowers on

Thrust control in neutral

Warm up motor

Secure all fenders inboard when leaving pier or dock facility. Nothing will make you look more like an inexperienced boater than to run your boat across the water with your fenders flopping outboard.

RECOVERY CHECKLIST

SECTION 3 – GENERAL SEAMANSHIP

TOWING DISABLED VESSELS

Check to make sure your boat cleats are through-bolted and that a "backing plate" (hardwood or metal) is used. Check periodically to make sure the nuts and bolts holding your cleats are tight. This will be crucial if you ever need to be towed, or if you are tied to a pier or anchored in rough water.

Don't tow another boat unless you are sure that your cleats and his will take the load and are through bolted with a backing plate. When a cleat is pulled free under strain, it becomes a lethal missile to anyone standing in its path.

A towline should be one that is quickly tied, easily adjusted, and easily cast off. Metal fittings on the towline or bridle can become lethal missiles if the line breaks, so don't use them. (They can also sink the line into the prop if not properly tended.)

Use a bridle for towing, unless your boat is equipped with a special towing bit or samson post on the centerline and forward of the rudder. The bridle can be attached to your aft cleats if they can be trusted, or to the boat's lifting hardware which you'll usually find bolted to the transom. The length of the bridle should be about 3 times the width of your boat.

When you're heaving a line to another boater or someone ashore, tie one end of the line to a rail or something else on or in the boat, making sure its not underfoot or in danger of getting in the way. With practice, you should be able to toss an unweighted, coiled line about 50 feet.

POWER BOATS

Approach small craft into the wind and/or tide so as not to be blown/drift onto the craft and causing unnecessary damage to either vessel.

Prepare the towing bridle and attach the tow rope. Have the boat raise their anchor if down. Make a slow pass to the boat, the crew throwing the tow rope to the other craft. After the rope has been secured, proceed to tow the boat at a sensible speed back to shore. It will be necessary to shorten the tow rope when approaching the Marina or boat ramp. This will give better control in a cramped or tidal situation. Ensure persons remaining on board a towed boat wear lifejackets. Observe the towed boat at all times.

A smaller towing vessel with a line connected to a single stern cleat will have little, if any, maneuverability. The pull exerted by the vessel being towed will either rip the cleat off of the stern, whipping it back towards the vessel being towed at high speed, or will dip the stern of the towing vessel under water, swamping it. You'll notice that commercial towing vessels have a tow bitt located at the centerline of the boat at least a third of the way forward, if not further forward. The tow bitt allows the towing vessel to pivot while under a strain. The tow bitt also provides a strong point of connection for the tow line and allows the helmsman to quickly lengthen or shorten the towline to compensate for changing conditions.

We are assuming that you, someday, will either tow another boat or will need to be towed by a non-commercial tower. Because towing is inherently dangerous, you want to ensure that your tow will be as safe as possible. An improperly rigged tow boat can cause damage and injury. Let's review some basic towing procedures and rigs:

1. The best point of connection to the towed vessel is the bow ring down by the waterline. However, most boats over 30' don't have one. You, therefore, will need to construct a bridle. The purpose of a bridle is twofold: a) to spread the strain of the tow over two or more attachment points and b) to minimize yawing. The easiest way to make a bridle is to take two of your dock lines, tie the tow line to the spliced eyes using a bowline and run the ends through your bow chocks or hawseholes (with chafing gear) to your bow cleats. A second option is a single line with a " bowline on a bight" tied in its center. You can, of course, use a simple overhand knot to make the loop but you may never get it untied. The length of the bridle legs should be at least equal to the width of your vessel plus the distance from the chocks to the bow. A word of caution here: if your bow cleats are not fastened to the deck with through-hull bolts and back plates, they are liable to rip off during a long tow or in rough seas. If they don't have back plates, then you must take a couple of turns on the cleats and continue the lines aft to your stern cleats or, if on a sailboat, to the mast. The additional connection point will help absorb some of the shock. The bridle rig itself should be stronger than the tow line. If anything is going to break, you want it to be the tow line.

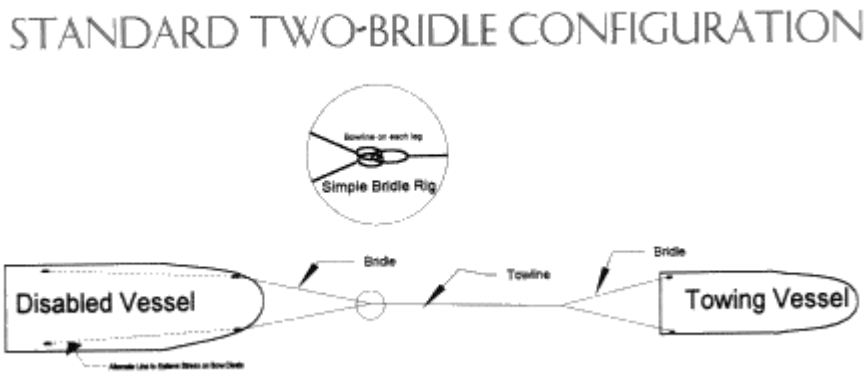


Figure 13: Standard two-bridle configuration

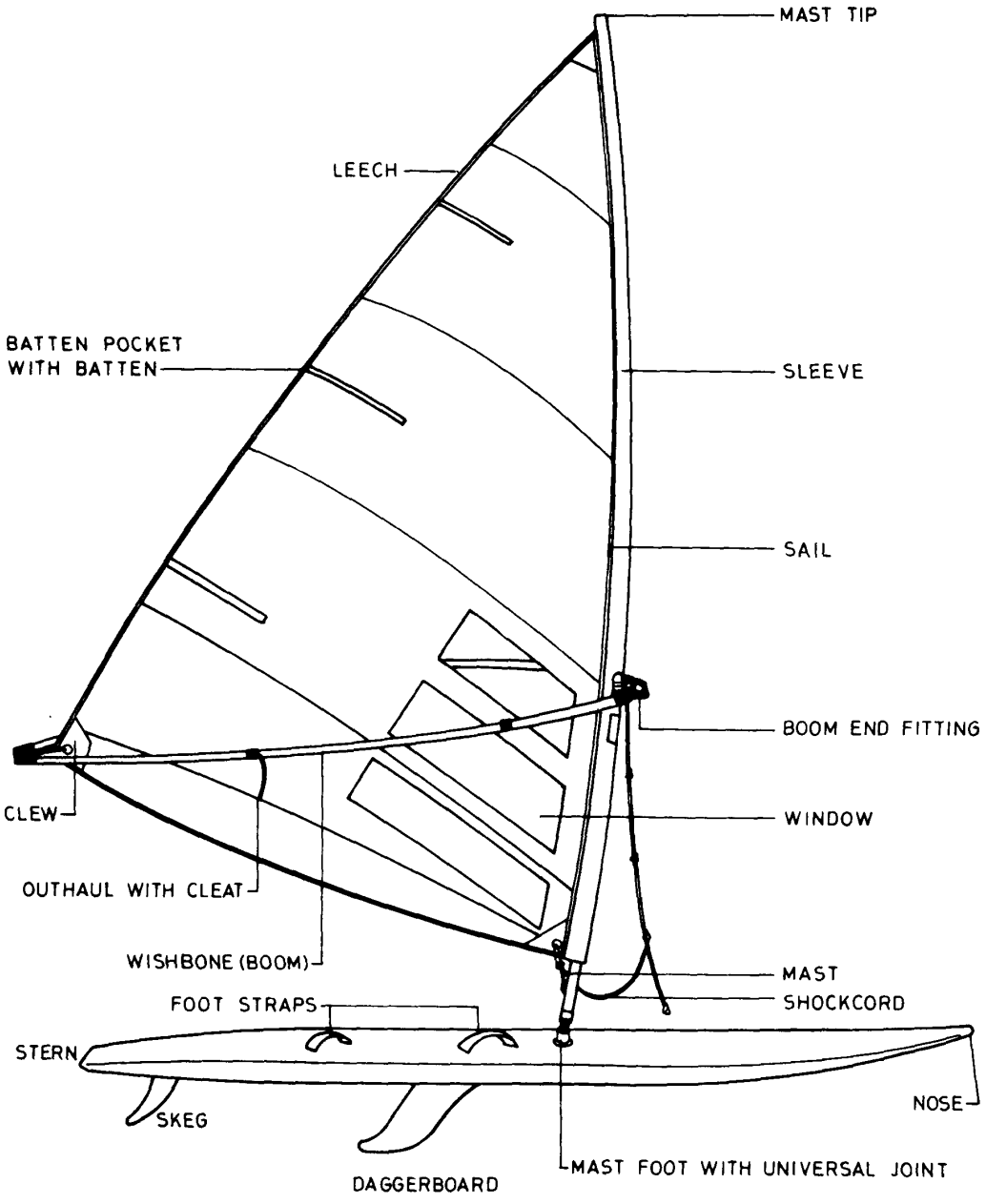
2. The tow line itself should be strong enough for the job at hand and be capable of some stretch. Double-braided nylon is the traditional choice. There are, however, a number of synthetic ropes now available that combine high strength with some elasticity (and they float). If possible, avoid twisted nylon. If twisted nylon breaks while fully stretched, it will whip back and hurt somebody. The tow line should be long enough so that there is catenary (dip in the line) during the tow. The length should be adjusted so that both vessels are "in step" - both riding up and down waves at the same time, not one going down a wave while the other is shouldering up a wave. The longer the tow line, the easier the ride. The easier the ride, the less stress applied to the hardware. Three or four hundred feet of tow line is typically used when towing a thirty foot to fifty foot vessel in from offshore - sometimes more. Very few boats keep five hundred feet of synthetic tow line stored on board. You probably will need to use your anchor line as a tow line. Anchor line is typically twisted nylon - the worst stuff to use. If this is the case, use as long a towline as possible and keep your head down.
3. A bridle should be used on the stern cleats of the towing vessel as well if there is no tow bitt.
4. Plan the tow before connecting. Communication is critical during hook up and during the tow itself. Pick a channel on your VHF to be used for primary communications. Make sure everyone understands what will happen. Establish the person-in-charge on each vessel and the person in charge of the tow. Plan the transfer and connection of the lines. If the seas are anything other than calm, don't try to come directly alongside the other vessel to toss them the towline. There are enough problems already. The safest way to transfer line is to attach a fender on the end and another about 50 feet up (or use life jackets), let out about 150 feet of line, make a run behind the disabled boat and then run parallel to it. The line will come up to the disabled vessels stern where it can be snagged with a boat hook. Just be sure that the towline doesn't get entangled in the props of either boat and be prepared to let out slack.. The second choice is the use of a heaving line tied to the towline.
5. Periodically check the lines for chafing and check the hardware for signs of excess stress. When checking the rigging, ensure that no one stands in direct line of, or straddles, the tow line. As mentioned, if the line snaps, it will whip forward and backward, severely injuring anyone in its way.
6. Watch your speed. The tow should not exceed seven knots. A higher speed will put excessive strain on both vessels and the towing apparatus.
7. When you get in protected waters, shorten the tow line for maximum maneuverability. Be careful, however, as the vessels will not both slow at the same rate. You don't want the disabled vessel overrunning the towing vessel. The towing vessel should control the rate of speed decrease and must ensure that the tow line doesn't get wrapped in his prop(s).
8. Once near the dock, go very slowly. This is usually where the damage occurs. Work with, not against, the wind and current. Try to use a face dock for landing.

SAIL BOATS

PERSONAL WATERCRAFT

When preparing to tow a Personal Watercraft, make sure the air vent in the front cowling is covered. Water from your wake can enter, and sink the disabled PWC. Connect the towline to the trailer eye, and if the operator is aboard, have him/her shift their weight as far back as possible. Consider a "hip tow" in calm waters in tight quarters, and in rough seas, bring the operator on board the towing vessel.

SAILBOARDS



MAIN FEATURES OF A TYPICAL SAILBOARD

Figure 14: Main features of a typical sailboard

OVERTURNED BOATS

When approaching overturned boats, do so slowly and from astern as there may be persons in the water around the boat.

Ropes, etc. will contribute to a dangerous situation.

Rescue all persons as required from a safe distance.

Ensure all persons are accounted for. If not, radio for immediate assistance.

Persons may be trapped inside the overturned hull. Care must be exercised performing this task. Both crewperson and diver should swim to the hull with mask, snorkel, flippers and knife. A torch is useful to give better light. The diver checks inside and the crewperson stands by to assist if the diver gets into any difficulty. The diver may use scuba equipment to check the hull. He must, however, have a lifeline to the JRB and have the assistance of the crewperson.

SEARCHING

Last season, JRBs were called upon many times to be involved in searches. Most were for swimmers close into the shoreline but there were occasions when the JRBs had to travel further out for missing windsurfers and catamarans. The following are some basics on search pattern formats and how a search area is decided upon.

Much has been written and standardised on the subject of Marine Search and Rescue but what is here are the basics that a driver should consider if called into a search and then how to conduct a search of a given area with maximum efficiency in minimum time. By adapting it to each set of circumstance sand using common sense, it could apply to both inshore and offshore work.

FACTORS AFFECTING SEARCH AREA

1. Known accuracy of target location (Datum Point)

- Initial sightings
- Second or subsequent sightings
- Continued visual contact - target still in sight - constant updated status is provided en route to the search area.

2. Size and shape of search area

- Inshore
- Beyond break
- Between groins
- Offshore

3. Number and type of search units:

- JRB,
- Helicopter,
- IRBs,
- Beach Patrol, and
- Fixed Wing Aircraft.

4. Nature of target

- Active - person alive and signalling
- Passive - unconscious person
- Shape/size:
  - person:
    - Adult
    - Child
  - vessel (IRB etc)
  - windsurfer
  - catamaran
- Number of people involved
- Colour of target e.g.
  - wearing a shirt
  - a life jacket

5. Weather conditions

- Rain squalls - reduced visibility
- Sea state - search in calm seas in easier than rough seas
- Wind
- Tide and current drift

6. Time factors

- Available fuel reserves
- Approaching darkness
- Crew fatigue (long searches)
- Elapsed time from sighting to arrival of search units at search area.

Obviously if a beach patrol has visual contact your task is easier.

Once visual contact is lost the task becomes harder and other factors, especially the time since the last sighting and movement of the target, must be considered.

COMMON SEARCH TERMINOLOGY

Term	Definitions
DATUM	The most probable location of survivor
DATUM (or DRIFT) LINE	The projected or estimated line or path of the target from the last known Datum Point. This is worked using all the known information.
LKP	The last known position of the target
POSSIBILITY AREA	Where the target could possibly be. This is usually a fairly large area. If something is seen at Burleigh Hill then the possibility area could include an area of say a one kilometre radius from Burleigh Hill.
PROBABILITY AREA	Where the target probably will be. All available information is calculated to give a reduced area where the target probably will be and where the greatest change of finding the target will be. (Datum Point or Datum Line will be in this area).
SAR	Search and Rescue
SARU	Search and Rescue Unit
TRACK LINE:	Each leg of the search pattern
TRACK SPACING:	The width or distance between each leg.

EXAMPLE (Assumed times and distances only)

A swimmer is seen in difficulty at Currumbin Creek entrance. He is lost sight of and five minutes later he is seen 500 metres North of the first location and then lost sight of. A JRB is activated from the North and arrives in the area ten minutes after the initial sighting and five minutes after the second sighting.

Consider this information which should have been gathered in transit to the location:

1. Target of a swimmer
2. Seen off Currumbin Creek 10 minutes previously
3. Last sighting was 5 minutes before your arrival in the area and was 500 metres North of the first sighting.

From this it would be reasonable to assume that the swimmer is travelling northward at a rate of 100 metres each minute. Therefore, after ten minutes he would be 500 metres North of the second sighting or 100 metres North of the first sighting.

The possibility area is anywhere from Currumbin Creek to one kilometre North. Ten (10) minutes have elapsed from the first sighting and he is travelling North at 100 metres per minute.

Using this information, the Datum Point is one kilometre North of Currumbin Creek. The possibility area to be searched is dependent on any possible error in determining the Datum Point and could be anything up to 500 metres each side of the Datum Point.

Start a search North of the projected probable location of 1 kilometre North of Currumbin Creek and work back.

There would be no point in first travelling to Currumbin Creek and working North.

As elapsed time increases the probability area needs to expand as the many variables have greater effect. It could be likened to an increasing funnel.

There is a further point to consider however.

Is the second sighting the same swimmer seen in the first sighting?

Whoever is co-ordinating the exercise, most probably Gold Coast Command, should use other resources to check this point. E.g.. an IRB from Currumbin could check the location of the first sighting an IRB from Palm Beach could check the second sighting location and the JRB involvement in the exercise can proceed on the assumption there is only one swimmer.

After consideration of the initial high probability area proceed to a point in advance of this estimated position of the target and work back.

UNDERWATER SIGNALS

Signals Between Boat and Diver

The following signals can be made using the diving tow rope, and interconnected life line or floating buoy line. Signals cannot be made on a slack line, therefore any slack must be taken up before signalling.

Signals on lines are one of two kinds:

1. PULL - A steady heave on the line.
2. BELL - A sharp quick tug on the line.

All rope signals should be preceded by an “ATTENTION” signal which is ONE PULL and must be acknowledged by ONE PULL by the receiver.

All conveyed messages must be repeated by the receiver back to the caller.

From Boat to Diver

ONE PULL	To call attention. Are you OK? Diver must acknowledge by one pull.
TWO PULLS	Am sending down a rope’s end (or other item as previously arranged - e.g.. tools, etc.)
THREE PULLS	You have come up too far. Go down slowly until we stop you (one pull).
FOUR PULLS	Come up.
FOUR PULLS + FOUR BELLS	Come Up. Hurry up.

From Diver to Boat

ONE PULL	To call attention. Made bottom.
TWO PULLS	Send me down a rope's end (or other item as pre-arranged).
THREE PULLS	I am going down.
FOUR PULLS	May I come up?
FOUR PULLS & TWO BELLS	I want to come up. Assist me up.
SUCCESSION OF PULLS (more than four)	Emergency Signal. Pull me up immediately

When the diver gives FOUR PULLS to signify he wishes to surface; the boat crew should maintain a slight tension on the two line so that the diver knows that he is well clear of the boat before surfacing.

SEARCH PATTERNS

Search patterns are designed to cover an area in relation to each set of circumstances with maximum efficiency in minimum time.

If you are involved in a search offshore with other rescue groups they should adopt a formal search pattern.

Four main patterns are described.

TRACK LINE SEARCH

- Could apply when a Club IRB calls in its location and is returning to the Club but does not arrive.
- Mainly used if you are near the location and can attend quickly.
- Search is run along a known or intended track.
- Used when vessel assumed to be on track and survivors are capable of signalling.

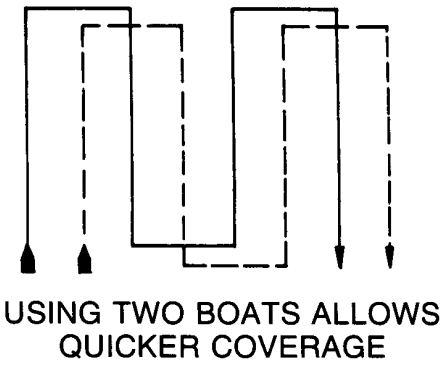


Figure 15: Track line search

PARALLEL TRACK SEARCH

- Used when Datum is unknown or has a large error.
- Each track is run parallel to the intended or assumed path of target.
- Provides coverage of a large area.
- Best used when you are fairly sure that the target has maintained its track, or has a fairly accurate draft line.

- Commenced at edge of search area.

CREEPING LINE SEARCH (ZIG ZAG PATTERN)

- Used for a square or rectangular area.
- Gives immediate coverage of area. (If a target's probable location is assumed, this can cover that area quickly dependant on the size of the probability area).
- Used for a large area where datum is unknown or has a large error.
- Very effective to search back to a target estimated to be travelling towards you.
- Commenced at edge of Search area.

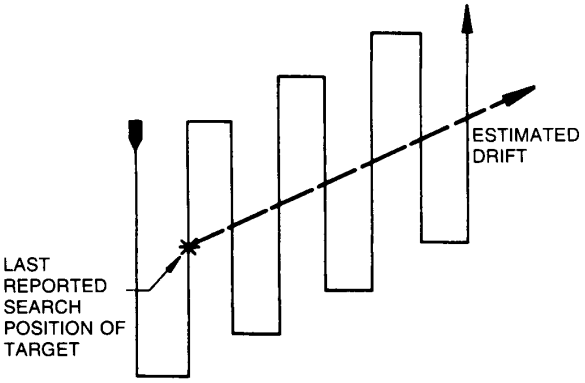
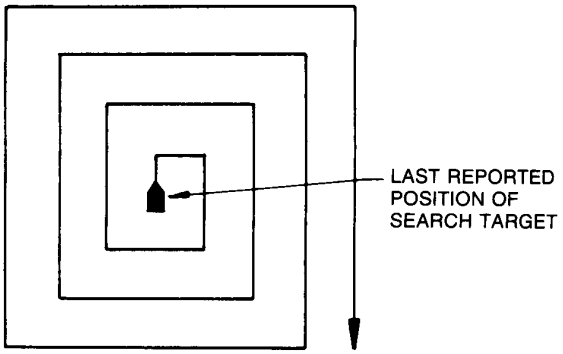


Figure 16: Creeping line search pattern

SQUARE SEARCH

- Accurate Datum Point known.
- Short time elapsed from first sighting.
- SRU on location.
- Use of a survivor locates and further information that there are other targets in the water.
- Commenced at Datum Point.
- Datum - the most probable location of survivor.
- Each pattern needs to be applied to each set of circumstances.
- If the target location is known fairly accurately, the square search could apply best allowing for the drift of the object. As the target drifts the SRU will also drift.



SQUARE SEARCH PATTERN

Figure 17: Square search pattern

If the actual location is now known and you are working on an assumed high probability area then a parallel track search or creeping line search could apply best.

A combination of patterns to cover an area quickly and efficiently could be used. This depends on the number of available SRUs.

Realise that when working in inshore conditions there are difficulties associated with formal patterns but the principles can be adapted to cover an area efficiently and to establish a high probability area when visual contact is lost.

Other factors to consider are:

- The distance or spacing between each track or leg.
- The length of each track.
- The experience of the crew/crew fatigue.

If you are searching for a person in the water then track spacing needs to be smaller as compared to a search for a vessel.

Track length is effected by the size of the probability area which is determined by all the available information.

If an object or person is sighted by a crew member, until it is seen by the driver, a good method of holding visual contact is for the person to direct the driver to it by what is called the clock position and estimated distance. Take 12 o'clock as being straight ahead. If something is seen directly to the right then it would be called as 3.00 o'clock, 200 metres. As the craft comes around towards it until the driver sees it, the next call could be 12 o'clock, 200 metres. If you see something, keep looking at it and try not to loose sight.

Don't be afraid of making a mistake because you're not sure if you saw something or not. If you think you have seen something, take a look at it. It may be the real thing and save somebody's life.

CONCLUSION

Much has been written and standardised about searches and search patterns. Not all applies to SLSA work, especially inshore. Remember the basics of the target changing location because of wind, tide etc and to search a wider area than where the target is last seen. The patterns shown here have been used to cover an area in a minimum of time for maximum efficiency.

In our role, time is often important and could mean the difference between life and death.

NAVIGATION

NAVIGATION AIDS

Never tie up to buoys or other navigation aids. It is dangerous, and it is illegal.

Don't play chicken with buoys or other navigation aids. The markers may be sitting atop a rock pile, or the buoy chain may be angled your way because of wind or current. Also, if you happen to graze (mark) a buoy, damage it, or move it off station with your wake, you will cause great peril to other boaters who depend on them for safe navigation.

Stay well clear of large vessels in restricted channels. Cargo ships, river tows, barges, and other large vessels are very restricted in their ability to stop and turn. Some heavily loaded ships in strong currents take miles to stop, even with engines full astern. So give them room!

COASTAL NAVIGATION

Chart Work

Accurate chart work is the basis for good navigation.

Before going to sea, a course is plotted on a chart noting bearings, distances and expected times for each leg of the trip. While at sea, position is fixed at regular intervals and the course adjusted when necessary. This is safe, sensible practice. It is a 'general safety obligation' of the person in control of the vessel and applies to both large ships and smaller recreational craft.

Some important points to note about working with charts are:

1. Latitude and longitude scales are divided into minutes and then tenths of minutes (seconds are not used on charts). So a latitude may be given as 34°28.5' and this should be able to be determined from the scale on the side of the chart.
2. When determining distances on the chart use **only** the latitude scale on the side of the chart.
3. Remember one minute of latitude equals one nautical mile.

1 minute of latitude = 1 nautical mile = 1.852 kilometres

4. Transfer distances to the latitude scale **directly beside** the chart area from which the distance was lifted. Make this a habit. It is good practice as the latitude scale is **not constant**. The effect of the Mercator projection, from which most nautical charts are produced, is to stretch the scale slightly at higher latitudes. This is because the angle at the centre of the earth increases towards the poles and the cylinder of the projection, when unwrapped from around the spherical earth, distorts the latitude scale.
5. Take care to read the chart details carefully and note whether soundings are in **fathoms** or **metres**.
6. A chart is always ***true.*** A compass course is always ***magnetic***. Be sure to take account of these two facts in your chart and navigation work. Conversions must be done correctly.
7. Some charts will have more than one compass rose displayed. This is because variation (declination) is not constant. It is changing continuously and it varies from place to place. We say that the Queensland coast has a variation of 11° easterly, but this is just an approximate value. In the Torres Strait variation is approximately 5° easterly. Always use the compass rose closest to the area you are working in and be sure to note the variation details on that compass rose and apply them consistently to your bearings.
8. Variation (declination) changes continuously because the magnetic north pole is moving around. It was drifting away from the geographic (true) North Pole and so our charts for the Queensland coast showed variation as "……, *increasing* x minutes annually". The magnetic north pole is now drifting back towards the geographic pole and variation is now "……, *decreasing* y minutes annually" in Queensland. If the chart you are working from is very old, the variation statement cannot possibly be correct. Variation cannot keep increasing, or decreasing, indefinitely. Current chart information is published fortnightly by the Australian Hydrographic Service RAN in the form

of 'Notices to Mariners'. These are available from Maritime sections of Queensland Transport or on the websites http://www.transport.qld.gov.au/marine or http://www.hydro.navy.gov.au

9. For formal chartwork the following symbols are used:

⊙	Fixed Position (FP)
△	Estimated Position (EP)
+	Dead Reckoning Position (DR)

Fixing Position

There are a number of ways to fix the position of a vessel at sea depending on the circumstances. The Mathematics A course tends to concentrate on coastal navigation and the main methods for coastal position fixing are covered well in the majority of Mathematics A textbooks. I will give a brief summary of each with an example. The remaining part will be concerned with less well-known methods and those applicable to the open sea.

For coastal fixes the selected features for bearing observations **must** also be marked on the chart being used.

Fix by cross bearings

This fix requires visible landmarks (at least two but three is better) from which to take bearings. The back-bearings are calculated and adjusted for variation (and deviation if necessary). Lines are drawn on the chart from the landmarks so that they intersect at a common point. It is more usual for there to be a small error and the resulting intersection to form a small triangle called a **'cocked hat'**. Position can be taken to be the centre of the cocked hat. The time of this position fix is noted on the chart.

Example: At 8.00a.m. the eastern tip of Spot Island is sighted at 336°M, a lighthouse is at 101°M and the end of a jetty at 044°M. Variation is 11° easterly. Fix the position of the vessel on the chart.

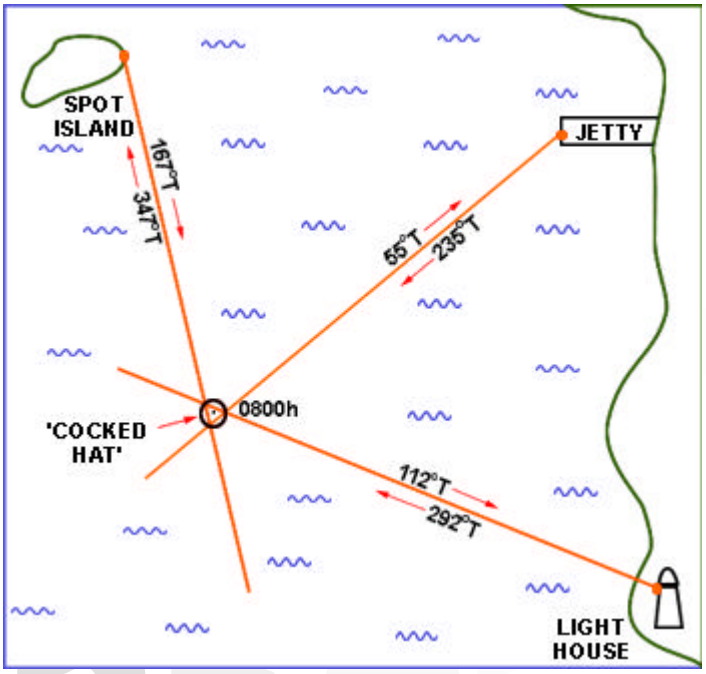
First convert the bearings to true bearings before plotting them on the chart. Always remember the compass reads *magnetic* but the chart maps *true*.

336°M = 347°T

101°M = 112°T

044°M = 055°T

Fix by Cross-Bearings

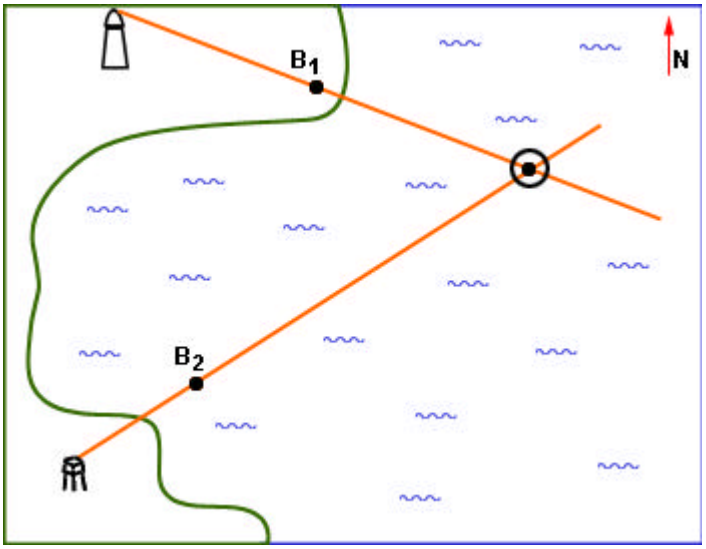


Transit Fix

This method of fixing position relies on the fact that if a vessel observes two features directly in line then the vessel must also lie on that same line, called a **transit line**. It is possible to have a two-transit fix when the vessel is able to observe yet another two features on a direct line with itself. The two-transit fix will fix the position of the vessel at that time.

Example: A yacht observes a beacon (B_1) and the lighthouse in line at 12.30p.m. At this time a second beacon (B_2) and a lookout tower on the coast are also observed to be in line. Use this information to fix the position of the yacht on the chart at 12.30p.m.

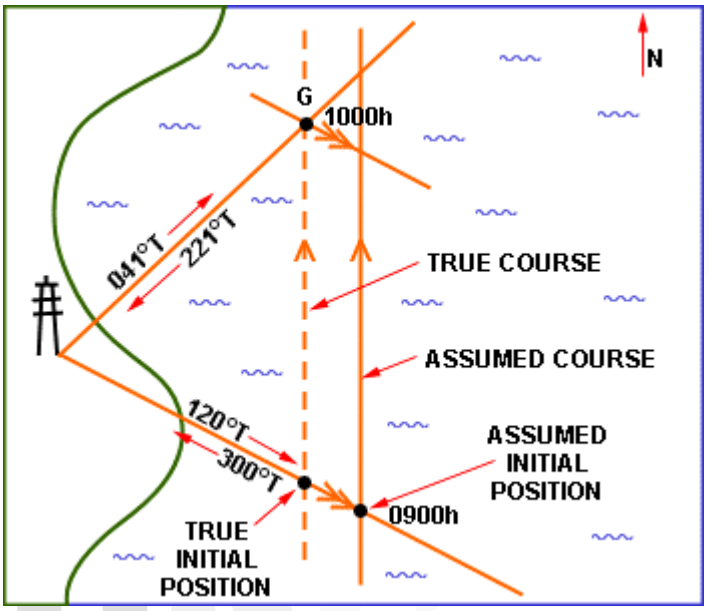
A TWO-TRANSIT FIX.



Running Fix

This method of fixing position is used when there is only **one** visible feature to be observed. Bearings are taken to the feature at two separate times (perhaps an hour apart). These bearings and an assumed course are plotted on the chart. The distance traveled in the hour between readings is marked on this assumed course line. By transferring the original bearing line to this marked point, a true position (point G on the diagram) is determined.

Example: C. Saylor notes that the bearing of his cabin cruiser to the base of a radio tower is 289°M at 0900h. He is traveling due north at 12 knots. At 1000h the bearing to the radio tower is 210°M. Use the given information to fix the position of the boat at 10:00 a.m. What was the true position of the boat at 9:00 a.m.?

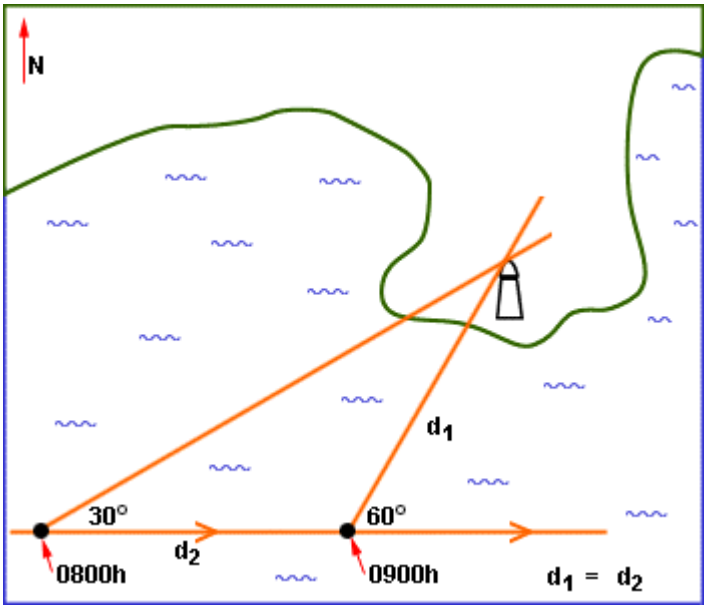


Doubling the Angle on the Bow

This is a form of running fix that takes advantage of the properties of an isosceles triangle.

Example: A vessel is following a course of 090°T at a speed of 10 knots. The log was read when a lighthouse was bearing 030°T on the bow, and again when it was 060°T on the bow (double the first angle). What was the distance of the vessel from the lighthouse when the second bearing was taken?

DOUBLING THE ANGLE ON THE BOW



d_2 = speed × time

= 10 × 1

= 10 n.miles

distance from the lighthouse is 10 n.miles

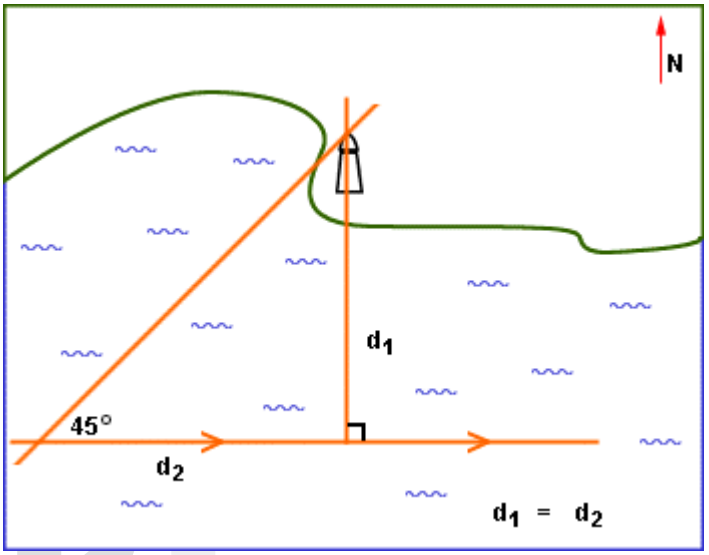
= d_1

Note: This fix requires the initial bearing to be less than 45°.

The Four Point Fix

This type of fix uses the same principle as 'doubling the angle on the bow' but the angles used are specifically 45° and 90°. It is called a 'four point' fix because 45° is four points on the bow (a circle of 360° is divided into 32 points of 11.25° each - refer to 'Boxing the Compass').

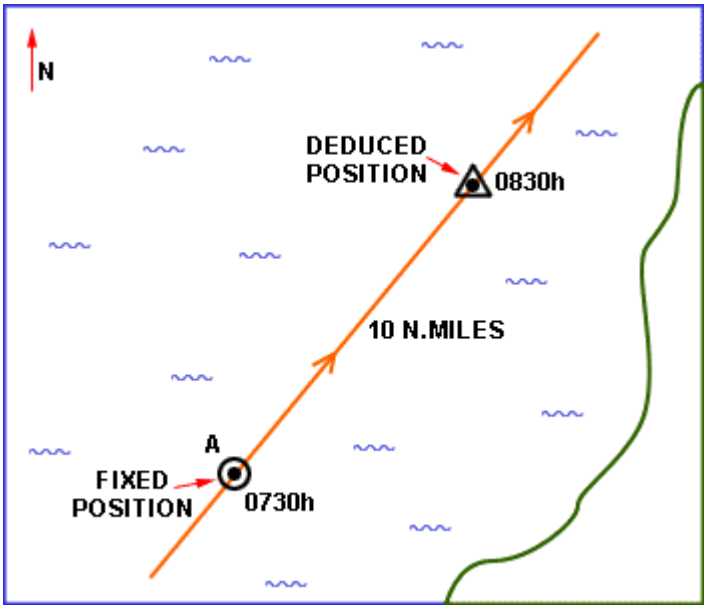
FOUR POINT FIX



Dead Reckoning

This is a method of fixing position which is, at best, an estimate of the vessel's position based on information gathered earlier. It is a deduced position used when navigators are unable to sight visible features due to distance from the coastline. A known fixed position (a circle with a dot in it) at a recorded time, the intended course and distance traveled in a given time period are used to determine the deduced position (a triangle with a dot in it).

Example: A vessel traveling at 10 knots on a course of 035°T is at point A at 0730h. Estimate its position at 0830h.

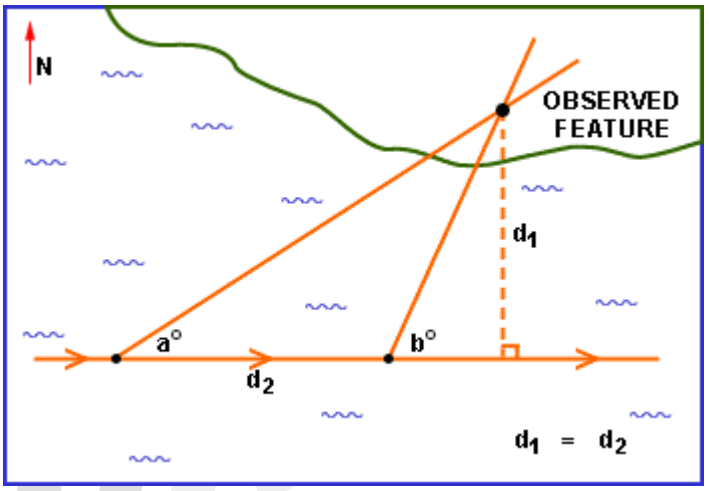


Did you Know?

- "Dead reckoning" is derived from "ded. reckoning" which is "deduced reckoning" abbreviated.

Fix by 'Special Angles'

This fix requires mariners to know some special pairs of angles (a° : b°) that give the distance run between bearings as equal to the distance abeam (abeam = when the feature is at 90° to the intended course) as shown in the diagram below.



These pairs of angles are:

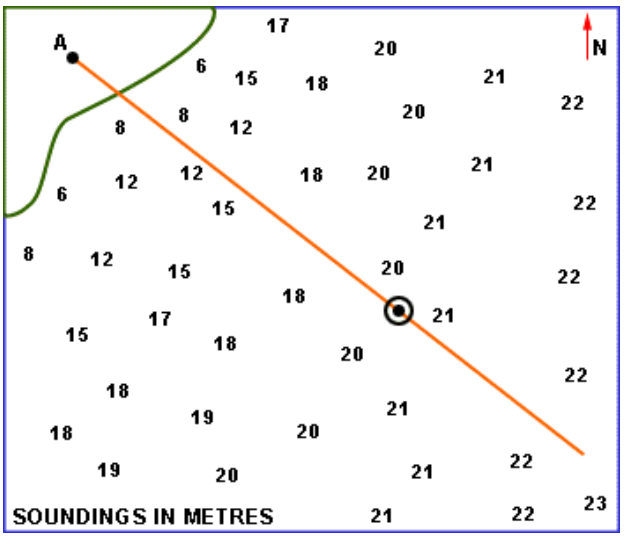
16° : 22° **21° : 32°** **25° : 41°** **32° : 59°** **37° : 72°** **40° : 79°**

This fix offers an opportunity for an application question. It is unseen and relates to the practiced techniques in 'doubling the angle'. There are some interesting angles involved in constructing the diagram accurately. See the sample question given in the assessment section.

Extract from a Norie's Table.

Fix by a Bearing and Soundings:

This method of fixing position requires one bearing to be taken and a position line plotted on the chart at that bearing. Assuming the ocean floor is not too rugged or too uniform, a sounding can be taken and compared to those shown on the chart. The vessel will lie on the position line at the recorded sounding.



Example: Fix the position of a vessel in 20.5 metres of water that has taken a bearing of 318°M to feature A on the coast.

Fix by GPS

A fix by GPS (Global Positioning System) requires little effort from the navigator. The GPS equipment when turned on, returns information of position on the earth's surface, altitude, speed and direction of travel, and time. This information is transmitted from a number of the 24 satellites orbiting the earth. GPS is covered later in Satellite Navigation Systems.

Speed is often very important in calculations for navigation. Speed is measured in **knots**.

1 knot = 1 nautical mile per hour

Speed = Distance X Time

Did you Know?

- Knots were originally measured by a line on a reel with knots tied at intervals. The line had a gadget on the end that doesn't let water through. It was let out over the stern of the ship. When the first knot passed over the stern a 14-second hourglass timer was started. At the end of the 14 seconds the number of knots having passed over the stern was the speed of the ship in knots. (I have viewed a video where this method is shown in use with the actual film footage in 1929. The video is 'The Sea and Australia' produced by The Navy League of Australia. See the Resources section for more details)

TAKING BEARINGS ON A SMALL BOAT

By: Bill McNiel

Accurate bearings are critical to small boat positioning. Small boat's freeboards and shallow drafts greatly increase the ratio of drift to advance when underway and the possibility of dragging anchor.

Following are methods for taking bow-on, compass, hand bearing compass and relative bearings. I will also discuss use of the three-arm protractor for plotting lines of position (LOPS) obtained from bearings.

The simplest bearing to take is the bow-on bearing. The operator aims the vessel's bow at a landmark or an object on the water and reads the compass direction. The resulting reading is a compass bearing. The accuracy of this method can be greatly improved by providing sights on the vessel that are parallel to the keel and in the normal line of sight of the helmsman. Simple items to use are a vertical line of tape or heavy thread attached to the windshield and a pop rivet or golf tee placed vertically near the steering station.

Where the steering compass is mounted on a small boat may limit the skipper's ability to take bearings over the ship's compass. When the compass is used to obtain compass bearings, be sure to use the deviation for the boat's heading at the time of the bearing to convert the bearing to true before plotting.

My experience with hand bearing compasses is mixed. Soon after we acquired a 24-foot outdrive sport fisherman, my wife gave me a beautiful hand bearing compass. Three years later, after many attempts to compensate it, several lost contests because of bad positioning and plenty of reverified chart corrections, it became a conversation piece. On a cruise across Corpus Christi Bay, a sailing member of another squadron demonstrated his latest high-tech "hockey puck" hand bearing compass as he sat on the motor box. He was taking bearings on a charted tower. None of his bearings crossed within a mile of our obvious location, which we verified by another technique. Otherwise, I have had excellent results with my hand bearing compass on sailboats and my current 21 foot

outboard sport fisher. I recommend compensating and trying before you buy. They're great devices when they work!

I hope you've gained some ideas for broadening the use of your small boat. In closing, I'll paraphrase the old joke about getting to Carnegie Hall. If someone asks, "How do I get to a safe harbour?" the reply is "Practice, man, practice."

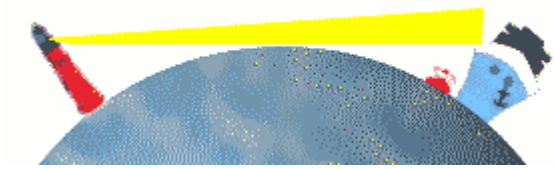
HOW TO CALCULATE THE DISTANCE TO THE HORIZON

Have you ever been out on a leisurely cruise and suddenly wondered, "How far it is to the horizon?" Or maybe your destination is a port that has a lighthouse and you wonder "How far away will I be when I see the lighthouse?" (Well, you're in luck, even if you are a sick unit that thinks of these sorts of things - so are we.) We have the answer! Of course you can find tables that do the calculation for you in numerous navigation books, almost every book which talks about passagemaking, the Coast Pilot, almanacs, etc. But what if you didn't have any of these references onboard? How could you calculate the distance to the horizon or the "distance off" if you know the height of an object?

It's simple, really. If you want to know the distance to the horizon you simply have to know your height of eye. That is the distance that your eyes are off the surface of the water. If you're in a jon boat, that would probably be about three feet (if you are sitting like you should be in a jon boat). Of course if you were in a jon boat you probably wouldn't care how far the horizon was. Anyway, I digress. If you are on the tuna tower of a sport fishing boat you may be 15, 20, 25 feet above the surface of the water.

Once you know your height of eye you simply plug that into the following formula:

1.17 times the square root of your height of eye = Distance to the horizon in nautical miles



For example, if your height of eye was 9 feet above the surface of the water, the formula would be:

1.17 times the square root of 9 = Distance to the horizon in nautical miles.

Figure 18: Calculating distance to the horizon

1.17 * 3 = 3.51 nautical miles

If you want to calculate the distance at which an object becomes visible, you must know your height of eye and the height of the object. You then do the same calculation for your distance to the horizon and the object's distance to the horizon and add the distances together. For **example**:

You have the same height of eye of 9 feet so your distance to the horizon is still 3.51 nautical miles. You're approaching a port that has a lighthouse that is shown on your chart to have a height of 81 feet. Using the same formula you would find that 1.17 times the square root of 81 (**1.17 * 9) = 10.53 nautical miles (the light house can be seen 10.53 nautical miles over the horizon)**

By adding the two together: 3.51 + 10.53 = 14.04 nautical miles, you should be able to see the lighthouse when you are 14.04 nautical miles away.

INTERNATIONAL CODE FLAGS OR SIGNALING FLAGS

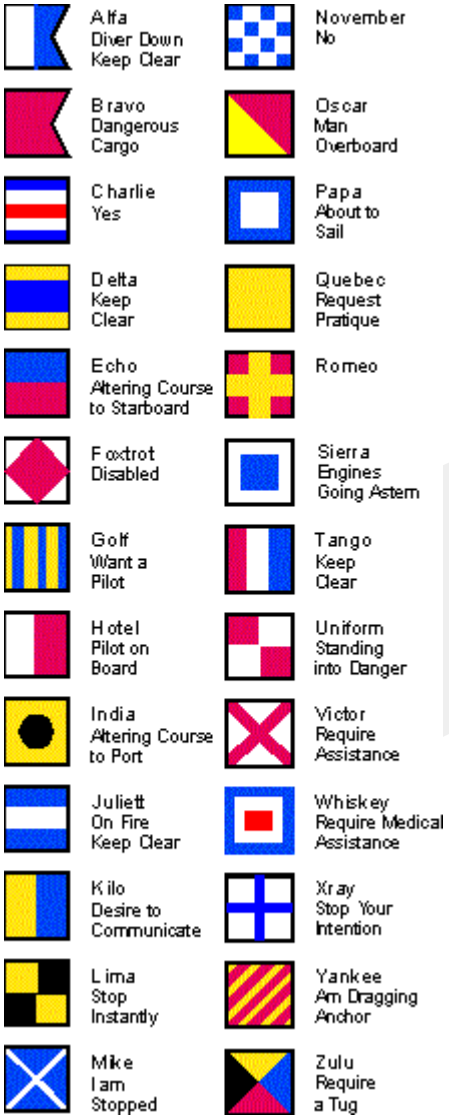


Figure 19: International code flags

Although you may never see them displayed except at fleet parades, around naval installations, and areas with heavy international shipping traffic, International code flags are used to signal between two ships or between ship and shore. Also called signaling flags, they are a set of flags of different colors, shapes and markings which used singly or in combination have different meanings. The flags include 26 square flags which depict the letters of the alphabet, ten numeral pendants, one answering pendant, and three substituters or repeaters.

Only a few colors can be readily distinguished at sea. These are:

- red,
- blue,
- yellow,
- black, and
- white;

and these cannot be mixed indiscriminately. You will notice, for clarity, the flags shown are either red and white, yellow and blue, blue and white, or black and white; besides plain red, white, and blue.

- One-flag signals are urgent or very common signals (see meanings below).
- Two-flag signals are mostly distress and maneuvering signals.
- Three-flag signals are for points of the compass, relative bearings, standard times, verbs, punctuation, also general code and decode signals.
- Four-flags are used for geographical signals, names of ships, bearings, etc.
- Five-flag signals are those relating to time and position.
- Six-flag signals are used when necessary to indicate north or south or east or west in latitude and longitude signals.
- Seven-flags are for longitude signals containing more than one hundred degrees.

SOME USEFUL TWO LETTER SIGNALS

AC - I am abandoning my vessel.	**JL** - You are running the risk of going aground.	**QU** - Anchoring is prohibited.
AN - I need a doctor.	**LO** - I am not in my correct position: *used by a light vessel.*	**QX** - I request permission to anchor.
BR - I require a helicopter.	**NC** - I am in distress and require immediate assistance.	**RU** - Keep clear of me; I am maneuvering with difficulty.
CD - I require immediate assistance.	**PD** - Your navigation lights are not visible.	**SO** - You should stop your vessel instantly.
DV - I am drifting.	**PP** - Keep well clear of me.	**UM** - the Harbour is closed to traffic.
EF - SOS/MAYDAY has been canceled.	**QD** - I am going ahead.	**UP** - Permission to enter Harbour is urgently requested. I have an emergency.
FA - Will you give me my position?	**QT** - I am going astern.	**YU** - I am going to communicate with your station by means of the International code of signals.
GW - Man overboard. Please take action to pick him up.	**QQ** - I require health clearance.	**ZL** - Your signal has been received but not understood.

Table 24: Some useful two-letter signals

EMERGENCIES

INTERNATIONAL DISTRESS SIGNALS

The following signals are internationally recognised and indicate distress and need of assistance. Use of these signals except for the purpose indicated is prohibited.

1. Rockets or shells, throwing red stars fired one at a time at short intervals.
2. A signal made by radio or by any other signalling method consisting of the **…---…** group in the Morse Code.
3. A signal sent by radio consisting of the spoken work - “Mayday”.
4. A square flag having above or below it a ball or anything resembling a ball.
5. A rocket parachute flare or a hand held flare showing a red light.
6. A smoke signal giving off orange-coloured smoke.
7. Slowly and repeatedly raising and lowering arms outstretched to each side.
8. A rectangle of international orange material with a black letter V; or
9. A black square and circle
10. A dye marker.
11. The International Code Signal of Distress indicated by NC.
12. Continuous sounding of sound signalling equipment - “SOS”.
13. EPIRB (Emergency Position Indicating Radio Beacon).
14. Oar with cloth on end.

If an aircraft or helicopter is close by, do NOT shine a light directly at it to get the pilot's attention, regardless of how much trouble you think you're in. Also, do not shoot a flare in the direction of an approaching aircraft or helo. You can easily blind the pilot, and if you do, your troubles will just be STARTING. Hand-held, automotive type flares work best when you're trying to get the attention of an aircraft which is in your immediate vicinity.

DISTRESS PROCEDURES

SAFETY EQUIPMENT

Flares (smoke, para, day/night)

Flares are required to be carried in vessels operating in open waters. In case of trouble, these can be your only means of indicating assistance is required. They are also essential for showing your location to a search vessel. Flares should always be stored in a waterproof container, and in speed boats, endeavour to store them where they don’t receive too much pounding in rough conditions. Always replace them before the expiry date, for out of date flares can be unreliable. If you don’t know how to use them, make yourself familiar with their operation even though you can’t let one off just to see how it works. **ONLY FIRE A FLARE IN AN EMERGENCY.** (Check the instructions before use).

“V” Distress Sheet

EPIRB

The Maritime Rescue Co-ordination Centre (MRCC), part of the Australian Maritime Safety Authority (AMSA), is Australia's designated maritime search-and-rescue co-ordination centre. It is on standby day and night to organise a response to any maritime emergency.

In a maritime emergency, time can be critical. The quicker the search area is identified and rescue co-ordinated, the more likely a successful rescue will be accomplished.

There are a number of ways that search-and-rescue authorities can be alerted, including radio distress calls, distress flares and overdue vessel reports.

One simple and effective alerting and locating device, already carried in the life rafts of ships and by many yachtsmen and commercial fishermen, is the **Emergency Position Indicating Radio Beacon (EPIRB).**

An EPIRB is a compact, buoyant, self-contained radio transmitter which, when activated, continuously emits a distinctive radio signal for a minimum of 48 hours.

From now on, space age technology can take much of the search out of search and rescue. Australia's decision to participate in the international satellite aided search and rescue system, known as **COSPAS/SARSAT**, has greatly improved the chances of early detection of EPIRB signals and thus improved the chances of saving lives.

By accurately locating the source of the EPIRB signal, the system also reduces the number and the flying time of search aircraft.

Satellites now supplement the existing arrangements whereby overlying aircraft listening out on the aviation international **VHF distress frequency 121.5 MHz, or the military distress frequency of 243 MHz**, report any EPIRB signals they hear. EPIRBs can now be detected and located even if they are activated in areas remote from air routes.

As soon as an EPIRB is detected, whether by satellite or aircraft, the Maritime Rescue Co-ordination Centre co-ordinates the response operation using appropriately equipped aircraft to home-in to the distress beacon.

FIRE

HEAVY WEATHER

If caught in a storm, turn your craft into the wind and secure all loose objects and rigging on deck, close or cover all hatches and openings, and put on a PFD. Also, make sure distress signals and life rafts are readily accessible.

If caught in heavy weather, make sure everyone on board is wearing a life jacket. If offshore, jot down your current location. Reduce speed. Turn toward the wind and approach waves at about 45 degrees. Stay low in the boat. Keep away from all metal objects and electronic gear.

If you'd like to know where the approximate center of a low pressure area is located (the source of most unstable weather), face the wind and extend your left arm out from your body about 100 degrees (a little further toward your back than sideways). You'll be pointing at it. If most storms generally approach your local area from the south, west, or southwest, for example, and your arm is pointing in that direction, you can be pretty certain the low is moving in your general direction. On the other hand, if you're pointing northwest, north, northeast, east, or southeast, the low is probably skirting you, or has already passed. You can then take appropriate action. This method of approximating the center of a low pressure area is called "Buys-Ballot's Law".

MAN OVERBOARD (MOB)

Practice man-overboard drills with your crew and/or family members. The drill should go something like this... Yell loudly to alert everyone on board if someone goes overboard, and toss something floatable overboard immediately. Have someone assigned to point at the MOB and keep pointing until the helmsman says its OK to stop pointing. Sound five or more short blasts on the horn (the danger

signal) to alert other boats in the area. Approach the MOB upwind or upcurrent slowly until your boat is in a retrieval position, and then shut off the engine. Bring the MOB into the boat over the stern. Practicing this simple drill can save a life.

Wear suitable protective clothing and a lifejacket preferably fitted with reflective tape and a light. **REMEMBER** that if you do go over the side, at night or in bad weather, there is a high probability that you will not be recovered.

When you first discover that someone has fallen overboard, the most important thing to remember is DON'T PANIC!

If the person is on a lifeline, stop the boat immediately and then recover them using the lifeline/harness as necessary.

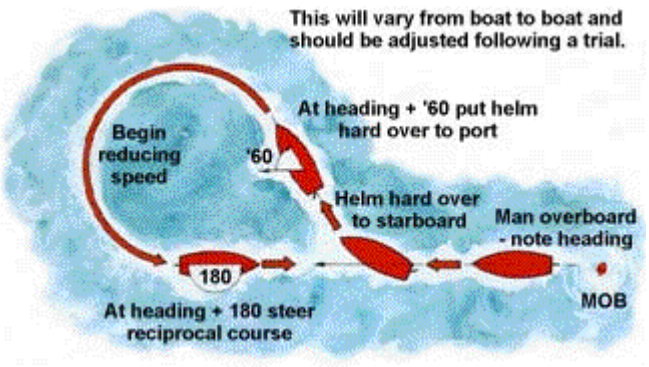
If you are well prepared and have practiced the drill regularly, you will automatically know how to react.

MOB Check List

- Immediately throw a lifebuoy and attachment overboard.
- Raise the alarm by shouting: " MAN OVERBOARD" (Even if you are the only one left aboard, shouting "man overboard" may provide reassurance to the person in the water).
- If there are others on board, instruct a crew member to watch the person in the water and point continuously.
- Start your recovery manoeuvre. You may have to lower your sails and start you engine - beware of loose sheets fouling the propeller.
- If possible note your position - most navigational aids have a MOB function - it may prove vital if contact is lost with the person in the water. **REMEMBER** the MOB function records where the person fell overboard - he/she will drift away with the tide.
- If you are the only person remaining on board, do not leave the deck as you may become disorientated and loose sight of the person in the water.
- During the hours of darkness, a white parachute flare, which will pick up the retro reflective tape on clothing/lifejacket, can be used to illuminate area.
- If you cannot see the person in the water. or have any doubt about your ability to recover him/her, send a mayday call on your VHF radio.

If you can see the person in the water clearly, a simple 180 degree turn is the quickest.

If you lose sight of the casualty, due to poor visibility, or heavy weather and sea state, the 'Williamson turn' is a good way to get on to a reciprocal course which will take you back down your track:



- Put your helm hard over to the starboard and add 60 degrees to your course. When the compass is reading course + 180 degrees, steer a reciprocal course and the casualty should be ahead of you.

- In heavy weather the reciprocal course may bring the sea astern, in which case a short approach head to sea may be more appropriate once the turn has been completed.
- Do not waste time while the boat is turning to approach the person in the water - prepare for the recovery as it is too late when they are alongside.
  - Which side will you approach?
  - Have a heaving line ready
  - Wear a lifejacket and lifeline; if you don't, you may get pulled on top of the person in the water.
- The initial approach to the person in the water will vary depending on weather/sea conditions and the type of boat. Let the weather help rather than hinder - stop unwind and drift down.
- If you are concerned about drifting onto the person in the water, bring your stern into the wind. If you're not confident with your boat handling skills, or if it looks likely that the boat could come down on top of the person in the water, throw them the heaving line and pull them alongside to a safe place for recovery.

SHARK ATTACK

MASS RESCUE

4WD VEHICLES

GENERAL HANDLING

On Bitumen

- As a general rule, 2WD can be selected for most conditions. The vehicle can be driven as any other manual, privately-owned vehicle, with the exception that it is bigger and heavier than most.
- 4WD should only be selected when reversing down the boat ramp with the boat on the trailer in preparation for launching. Similarly, when retrieving the boat, 4WD should be selected prior to backing down the ramp – this will assist in providing traction when driving back up with the boat on the trailer. Once the vehicle is on the flat, 4WD should be de-selected, as otherwise, "axle windup" may occur, as well as causing faster-than-normal wear on the tyres.

On Sand

- Sand is a very unpredictable surface, in most cases it is soft and has no bottom. This means that if traction is lost and the wheels start spinning, they will keep spinning and dig deeper until the suspension has stretched to its maximum. At this stage, the differential and under-body are usually touching the ground making it virtually impossible to remove that vehicle under its own steam.
- Four wheel drive should always be engaged before entering a difficult section rather than in the middle of it.
- Most vehicles may require low range for the extra power required because of the increased resistance between the tyre and ground. Usually, 2nd or 3rd is a good gear.
- Momentum is more important than speed. Turning corners too sharply will cause the wheels to dig in.
- Do not change gears while travelling through soft sand. Choose your gear before proceeding. If the vehicle starts to spin and stop, do not keep digging the vehicle in - reverse back over your tracks to compress the sand, and then try again.
- For inclines, take a run up and as the wheels start to spin, back off slowly on the accelerator to regain traction. (This will take some practice to get the exact combination).
- Vehicles should never be driven onto the waterline.
- The underside needs to be well rinsed each time it is immersed in water during a launch or recovery.

LAUNCHING

As mentioned earlier, 4WD should be selected prior to reversing down the ramp with the boat in tow. Once this has been accomplished, the crew driving the vehicle rinse down the vehicle and trailer, secure the vehicle, and place the keys on top of the right hand front shock absorber.

EQUIPMENT

Communications

Each vehicle is fitted with a UHF radio tuned to, among other frequencies, Surf Lifesaving SA. Its details are recorded with the associated boat that it tows.

Safety

Each vehicle is fitted out with a First Aid Kit.

RECOVERY CHECKLIST

The checklist used for vehicles after recovery of boats is straightforward. It is simply to make sure the vehicle is ready for immediate use if called out. This means it must be serviceable, refuelled and clean.

REFUELLING

VEHICLE

Refuelling of the vehicle normally occurs at a service station. Remember to switch off any radios or mobile phones when refuelling. Also, make sure you know where the vehicle's fire extinguisher is located and how to operate it.

When filling petrol cans at a service station, always remove the petrol can from the vehicle and make certain that the can is grounded before filling. Several fires have occurred at service stations as a result of customers filling metal portable petrol containers (petrol cans) placed on plastic surfaces, such as the bed of a ute with a plastic bed liner. The insulating effect of the plastic surface prevents the static charge generated by the petrol flowing into the petrol can from grounding. As static charge builds it can create a static spark between the petrol can and the fuel nozzle. When the spark occurs in the flammable range in the petrol vapour space near the open mouth of the petrol can, fire occurs.

BOATS

Several things to remember if petrol is spilled into the bilge:

- Do NOT operate the bilge exhaust blower. It can't remove liquid and could make matters worse by creating a more explosive petrol/air mixture.
- Evacuate anyone near the boat.
- Be sure the vapor-proof master battery switch is OFF so that no electrical equipment can start automatically.
- Notify the marina or service station management. If a professional manager is not available to take control of the situation, notify the Fire Department.
- Open all doors and hatches to encourage evaporation.
- The automatic bilge pump bypasses the battery switch. The pump should be disabled *IF IT CAN BE DONE SAFELY*. You can disable the pump by placing a weight on the float switch, or by raising the pump above the fluid level.
- Arrange for a mechanic or salvage contractor to remove the fuel.

Before refueling **built-in** fuel tanks, close all doors, windows, and hatches. Following the refuelling operation, open up the boat and ventilate all spaces, especially the bilges and engine compartment. Check for fumes and inspect for water, oil, and fuel leaks. If your boat has a blower, run the blower for a few minutes before starting the engine.

Inspect fuel tanks annually. Pay particular attention to bottom surfaces that may have been in contact with bilge water.

Refuelling Summary

Before Refuelling

- Fill portable tanks on dock.
- Secure boat to dock.
- Locate fire extinguisher.
- Close hatch, doors and ports.
- Switch off battery.
- Refrain from smoking.
- Shut down engines.
- Ground petrol nozzle.
- Don't top off tank.

After Refuelling

- Replace fuel tank cap.
- Clean up any fuel spillage.
- Open hatches, doors, ports.
- Ventilate bilge blower for at least four minutes before starting engine.
- Use your nose to check for petrol odors.

DIESEL HAZARDS IDENTIFICATION

Effects of Overexposure

- Respiratory irritation, dizziness, nausea, loss of consciousness.
- Prolonged, repeated skin contact may result in skin irritation or more serious skin disorders.
- Low viscosity material-if swallowed may enter the lungs and cause lung damage.

Note: This product contains polycyclic aromatic hydrocarbons, some of which have been reported to cause skin cancer in humans under conditions of poor personal hygiene, prolonged repeated contact, and exposure to sunlight.

- Toxic effects are unlikely to occur if good personal hygiene is practiced.

First Aid Measures

Eye Contact

- Flush thoroughly with water.
- If irritation persists, call a doctor.

Skin Contact

- Remove contaminated clothing.
- Dry wipe exposed skin and cleanse yourself with waterless handcleaner and follow by washing thoroughly with soap and water.
- For those providing assistance, avoid further contact to yourself or others.
- Wear impervious gloves.
- Launder contaminated clothing separately before reuse.
- Discard contaminated articles that cannot be laundered

Inhalation

- Remove from further exposure.
- If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance.
- If breathing has stopped, assist ventilation with bag-valve-mask device or use mouth-to-mouth resuscitation.

Ingestion

- Seek immediate medical attention.
- Do not induce vomiting.

Note to Physicians: Material if aspirated into the lungs may cause chemical pneumonitis. Treat appropriately.

Fire-Fighting Measures

Extinguishing Media

Foam, dry chemical, CO2 and water fog.

Special Fire Fighting Procedures

- Use water to cool fire-exposed containers.
- If a leak or spill has not ignited, use water spray to disperse the vapours and to protect personnel attempting to stop leak.
- Water spray may be used to flush spills away from exposures.

- Prevent runoff from fire control or dilution from entering waterways, sewers or drinking water supply.

Special Protective Equipment

For fires in enclosed areas, firefighters must use self-contained breathing apparatus.

Accidental Release Measures

Notification Procedures

- Report spills as required to appropriate authorities such as the local Environmental Health Officer or Fire Brigade.
- If spills are likely to enter any drain, waterway or groundwater, contact the Area Water Authority. In case of accident or road spill, contact the Police and Fire Brigade and, if appropriate, the Area Water Authority.

Procedures if Material is Released or Spilled

- Contain and adsorb on suitable chemical absorbent material, etc.
- Shovel up and dispose of at an appropriate licensed waste disposal site in accordance with current applicable laws and regulations and product characteristics at time of disposal.

Environmental Precautions

Prevent spills from entering storm sewers or drains and contact with soil.

Handling and Storage

Handling

- Harmful in contact with or if absorbed through the skin.
- Avoid inhalation of vapours or mists.

Storage

- Store in a cool area.
- A flammable atmosphere can be produced in storage tank headspaces even when stored at a temperature below the flashpoint.
- Monitor and maintain headspace gas concentrations below flammable limits.
- Ensure that there are no ignition sources in the area immediately surrounding filling and venting operations.
- Avoid sparking conditions.
- Ground and bond all transfer equipment.

Exposure Controls/Personal Protection

Ventilation

- Use in well ventilated area.
- Ventilation desirable and equipment should be explosion proof.

Respiratory Protection

No special requirements under ordinary conditions of use and with adequate ventilation.

Eye Protection

If splash with liquid is possible, chemical type goggles should be worn.

Skin Protection

- Impervious gloves MUST be worn.
- If contact is likely, oil impervious clothing must be worn.

Exposure Limits

This product does not contain any components which have recognized exposure limits.

LEADED PETROL HAZARDS IDENTIFICATION

Effects of Overexposure

Eye irritation, respiratory irritation, dizziness, nausea, loss of consciousness.

Skin Irritation

Studies (sponsored by API) conducted in the U.S. examining the mortality experience (causes of death) of distribution workers with long-term exposure to petrol have not found any petrol-related health effects. Case reports of chronic petrol abuse (such as petrol sniffing) and chronic misuse of petrol as a solvent or as a cleaning agent have reported a range of neurological effects (nervous system effects), sudden deaths from cardiac arrest (heart attacks), hematologic changes (blood effects) and leukemia. These effects are not expected to occur at exposure levels encountered in the distribution and use of petrol as a motor fuel.

NOTE: This product contains lead compounds. Lead can be a cumulative poison.

First Aid Measures

Eye Contact

- Flush thoroughly with water.
- If irritation persists, call a doctor.

Skin Contact

- Wash contact areas with water.
- Remove contaminated clothing.
- Launder contaminated clothing before re-use.

Inhalation

- Remove from further exposure.
- If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance.
- If breathing has stopped, assist ventilation with bag-valve-mask devise or use mouth-to-mouth resuscitation.

Ingestion

- Seek immediate medical attention.
- Do not induce vomiting.

Note to Physicians: Material if ingested may be aspirated into the lungs and can cause chemical pneumonitis. Treat appropriately.

Fire-Fighting Measures

Extinguishing Media

Carbon dioxide, foam, dry chemical, water fog.

Special Fire Fighting Procedures

- Evacuate area.
- For large spills, fire fighting foam is the preferred agent and should be applied in sufficient quantities to blanket the petrol surface.
- Water spray may be used to flush spill away from exposures, but good judgement should be practiced to prevent spreading of the petrol into sewers, streams or drinking water supplies.
- If a leak or spill has not ignited, apply a foam blanket to suppress the release of vapours.

- If foam is not available, a water spray curtain can be used to disperse vapours and to protect personnel attempting to stop the leak.

Special Protective Equipment

For fires in enclosed areas, firefighters must use self-contained breathing apparatus.

Unusual Fire and Explosion Hazards

EXTREMELY FLAMMABLE.

Vapour accumulation could flash and/or explode if in contact with open flame.

Accidental Release Measures

Notification Procedures

- Report spills as required to appropriate authorities such as the local Environmental Health Officer or Fire Brigade.
- If spills are likely to enter any drain, waterway or groundwater, contact the Area Water Authority.
- In case of accident or road spill, contact the Police and Fire Brigade and, if appropriate, the Area Water Authority.

Procedures if Material is Released or Spilled

- Eliminate all ignition sources.
- Runoff may create fire or explosion hazard in drain system.
- Contain and adsorb on suitable chemical absorbent material, etc.
- Shovel up and dispose of at an appropriate licensed waste disposal site in accordance with current applicable laws and regulations and product characteristics at time of disposal.

Environmental Precautions

Prevent spills from entering storm sewers or drains and contact with soil.

Handling and Storage Handling

NEVER SYPHON PETROL BY MOUTH.

PETROL SHOULD NOT BE USED AS A SOLVENT OR AS A CLEANING AGENT.

- Use non-sparking tools and explosion-proof equipment.
- Avoid contact with skin.
- Avoid inhalation of vapours or mists.
- Use in well ventilated area away from all ignition sources.

Storage

Drums must be grounded and bonded and equipped with self-closing valves, pressure vacuum bungs and flame arresters.

Store away from all ignition sources in a cool area equipped with an automatic sprinkling system.

Outside or detached storage preferred.

Storage containers should be grounded and bonded.

Exposure Controls/Personal Protection Ventilation

Use in well ventilated area with local exhaust ventilation.

Ventilation required and equipment must be explosion proof. Use away from all ignition sources.

Respiratory Protection

Approved (AS1716) respiratory protective equipment must be used when vapour or mist concentrations are unknown or exceed the Worksafe Exposure Standards.

Eye Protection

If splash with liquid is possible, chemical type goggles should be worn.

Skin Protection

Impervious gloves should be worn. Good personal hygiene practices should always be followed.

UNLEADED PETROL HAZARDS IDENTIFICATION

Effects of Overexposure

- Eye irritation, respiratory irritation, dizziness, nausea, loss of consciousness.
- Skin irritation.
- Studies (sponsored by API) conducted in the U.S. examining the mortality experience (causes of death) of distribution workers with long-term exposure to petrol have not found any petrol-related health effects. Case reports of chronic petrol abuse (such as petrol sniffing) and chronic misuse of petrol as a solvent or as a cleaning agent have reported a range of neurological effects (nervous system effects), sudden deaths from cardiac arrest (heart attacks), hematologic changes (blood effects) and leukemia. These effects are not expected to occur at exposure levels encountered in the distribution and use of petrol as a motor fuel.

First Aid Measures

Eye Contact

- Flush thoroughly with water.
- If irritation persists, call a doctor.

Skin Contact

- Wash contact areas with water.
- Remove contaminated clothing.
- Launder contaminated clothing before re-use.

Inhalation

- Remove from further exposure.
- If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance.
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- Avoid inhalation of vapours or mists.
- Use in well ventilated area away from all ignition sources.

Storage

- Drums must be grounded and bonded and equipped with self-closing valves, pressure vacuum bungs and flame arresters.
- Store away from all ignition sources in a cool area equipped with an automatic sprinkling system.
- Outside or detached storage preferred.
- Storage containers should be grounded and bonded.

Exposure Controls/Personal Protection

Ventilation

- Use in well ventilated area with local exhaust ventilation.
- Ventilation required and equipment must be explosion proof.
- Use away from all ignition sources.

Respiratory Protection

Approved (AS1716) respiratory protective equipment must be used when vapour or mist concentrations are unknown or exceed the Worksafe Exposure Standards.

Eye Protection

If splash with liquid is possible, chemical type goggles should be worn.

Skin Protection

- Impervious gloves should be worn.
- Good personal hygiene practices should always be followed.

TRAILERS

GENERAL

The weight that you are trailing will make your towing vehicle less responsive in many respects. Speeding up, slowing down and all maneuvers will require more time to accomplish. Leave more room between you and a vehicle in front of you to make sure you can stop should they brake suddenly.

Make sure your side view mirrors are large enough to provide an unobstructed rear view on both sides of the vehicle.

Remember that the turning radius is much greater. Curbs and barriers must be given a wide berth when turning corners. Backing a trailer can be somewhat tricky but with practice you should be able to accomplish the task in a minimum amount of time. The trailer will turn in the opposite direction of the car; take it slowly and try to avoid oversteering. Prior to operating on the open road, practice turning, backing up, etc. on a level, empty parking lot.

PRE-LAUNCH CHECKLIST

This checklist differs slightly for each trailer, so refer to each boat's trailer checklist for their relevant details. In general, however, they are similar. This means you need to check:

- all tyres for wear,
- the wheel bearings for sloppiness,
- that safety chains are correctly and securely fitted,
- the main connection is secure,
- the boat is attached to the winch post securely via winch cable and shackled,
- the trailer brakes are working,
- that the reversing brake is engaged/disengaged, and
- all the trailer lights are functioning.

LAUNCHING

Most trailer-boaters don't pay nearly as much attention to their trailer as they do to their boat. If you have brakes on your trailer, check the brake fluid level periodically. Have your bearings inspected annually, and packed or replaced when necessary. And at least once a year, tighten all bolts and other trailer hardware.

Cross the safety chains under the trailer tongue before hooking them to your hitch or frame. If the tongue disengages in transit, it will drop down on the crossed-chain "cradle", and may keep the tongue from dipping to the roadway.

A good trick for practicing backing a trailer is to put your hand on the BOTTOM of the steering wheel. Move your hand to the left, the trailer goes left. Guess what happens when you move your hand to the right?

Make sure the electrical connections to the lights and brakes are operating.

And before you back a trailer into the water, unplug the lights. It'll help save the bulbs. Just don't forget to plug them back together before you take off again.

Inspect the trailer bearings and grease them as needed. If you use "bearing buddies", make sure they're tight on the axle and filled (but not over-filled" with grease. Overfilling can blow the inner bearings out of their housing.

Always stay in your car while you launch your boat. No driver means no access to the brake pedal, which activates the brake on all four wheels. The parking or hand brake only sets the rear wheels.

Carry spare bulbs for your trailer lights.

LAUNCHING LIST

- Do initial launch preparations away from the ramp so as not to impede launching for others.
- Fit the drain plugs (bungs).
- Disconnect the trailer wiring. Remove tie down straps and again check the drain plugs.
- Make any equipment adjustments necessary and check the drain plugs.
- Drive to the ramp and back the boat and trailer down the ramp, keeping the tow vehicle's wheels out of the water.
- Set the hand brake, shift into 1st, and wait and listen for instructions from the boat driver.
- Someone should get aboard the boat, turn on the blower, look for water entering the boat, sniff the bilge and start the motor.
- Make sure you have attached a bow line to the boat, then release the winch and disconnect the winch line.
- You should be able to launch the boat with a slight shove or by backing the boat off the trailer under power.
- Return the towing vehicle to the parking lot as soon as the boat is launched so the next person in line may proceed, then rinse vehicle and trailer down.
- Move the boat to an area away from the ramp to load additional equipment and passengers (if necessary).

RECOVERY

The steps for retrieving the boat are essentially the reverse of launching and you should keep in mind being courteous of others launching and retrieving.

- Unload the boat away from the ramp if possible.
- Back the trailer into the water, again keeping the tyres of the tow vehicle at water's edge, not in the water.
- Maneuver the boat carefully onto the submerged trailer, attach a bow line and shut off the engine.
- Winch the boat onto the trailer and secure it.
- As you drive up the ramp, pause at the top to remove the drain plugs to allow water to drain from the bilge.
- Drive the trailer and boat out of the ramp for cleanup, reloading, securing equipment and safety check.

DOCKING

UNDOCKING PLAN

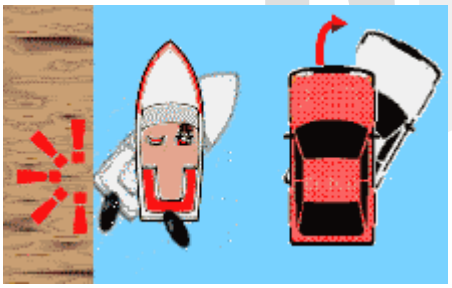
Prior to getting underway, you should implement an undocking plan with the help of your passengers. You should consider the traffic in the area, the direction of wind and current and the depth of the water.

Do not assume that everyone onboard has the same boating experience that you have or that they can read your mind. Be specific and give direction if you ask for their help. Telling a passenger to attach a spring line means nothing if that person doesn't know the meaning of the term, which line to use and where (and how) to tie it.

Make sure that your engines have run for a few minutes and that they are warmed up before casting off lines. (Long idle periods are not recommended.) Also, check the oil pressure and other items on your pre-departure check list prior to leaving the dock.

When the wind or current is pushing your boat away from the dock the procedure is simple.

1. Cast off lines and pull in fenders as the wind blows you away.
2. When clear and safely away from the dock and other boats, shift to forward and depart at idle speed.
3. Be careful to make sure you have been pushed safely away and that the stern will not hit the dock as you motor forward and turn.

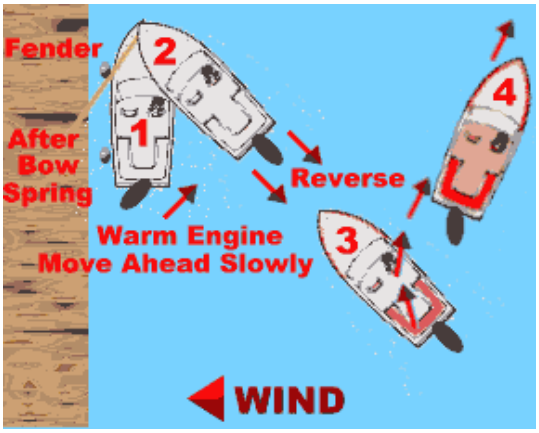


Remember: A boat does not steer like a car, it pivots on its axis at a point approximately one-third to one-fourth back from the bow when moving forward.

If the wind or current is pushing your boat toward the dock you will have to do some extra planning.

Figure 20: Casting off

1. Cast off all lines except an after bow spring line. This line will keep you from moving forward and allow the stern to pivot away from the dock. (see illustration)
2. You may want to use a fender forward to cushion the bow of the boat against the dock.
3. Turn the motor or rudder to the direction necessary to push the stern away from the dock.
4. Shift into forward at idle speed. Slowly, very slowly.
5. The stern will swing away from the dock. When it is clear of all obstacles and traffic, cast off the spring line and back away from the dock.
6. When you are safely away, shift to forward and idle away from the dock.



Once you are clear of the dock, stow lines and fenders so they will not be in the way or pose a tripping hazard. Be sure to control speed when leaving the dock and check for other boats, swimmers or other obstacles.

Figure 21: Casting off against the wind

DOCKING PLAN

Before approaching the dock, one end of the docking lines should be secured onboard; fenders readied and speed reduced.

If the wind is onshore (blowing toward the dock), the boat is brought to a position parallel to the dock and about two feet off. The wind will blow the boat in. It can then be secured by bow, stern and spring lines.

If the wind is offshore (blowing away from the dock), you should approach the dock at a 20 to 30 degree angle. A bow line is passed ashore and secured. In boats with an outboard, or inboard/outboard engine, the engine is turned towards the dock and put in reverse. This will bring the stern into the dock. The boat can then be secured with the stern line.

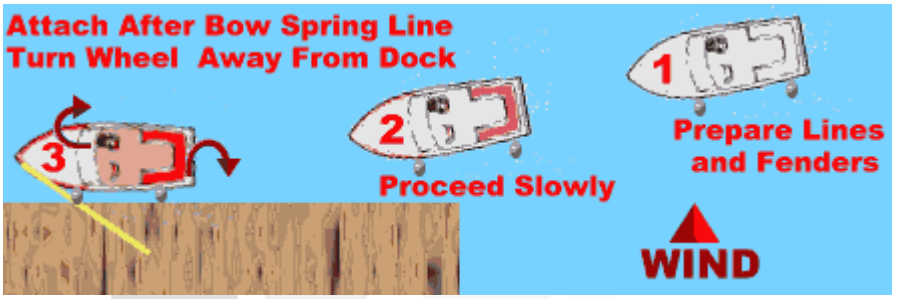


Figure 22: Docking plan

The procedure is different for boats with inboard engines. The rudder will be used to bring the stern in. To push the stern in using the rudder, attach an after bow spring to keep the boat from moving forward. With the engine idling forward, turn the wheel away from the dock as illustrated below. Since the boat cannot move forward and the rudder is pushing the stern in, the boat will pin itself against the dock while you secure the other lines. All maneuvers are more easily accomplished if the boat has twin engines, rather than a single engine. (This will also work for outboards and I/Os.)

Docking Summary

Before you approach a pier, make certain that everybody on board knows what they're supposed to do. If it's just sit still and stay out of the way, tell them that. There's nothing more risky to fingers, hands, arms, and even heads than to have everybody in the boat reaching overboard to grab a hold of the pier or a piling to "help you out".

A good boater approaches a dock or slip at clutch speed and in full control, regardless of wind or current conditions. Running up to a pier at half throttle, and slamming the engine in reverse to stop is a sign of poor boat handling skills. All maneuvers in and around other boats, piers, and docks should be done slowly and skillfully.

Don't approach a dock at high speed. Throttle down gently to keep your craft under control. Decide whether you will dock on port or starboard, put out the fenders, break out docking lines and ready the boat hook. Tell each crew member what specific chore he or she is to do.

Docking technique is determined by whichever is stronger at the moment, the wind or the current. This can be determined from the way in which anchored boats in the immediate vicinity are lying and from flags which show the direction and the strength of the wind.

The simplest method is to head into the wind or current so it will help you stop as you come in. Wise boat owners bring their boat to dead stop a few lengths away from the dock. This allows an opportunity to observe the combined effect of wind and current.

When tied to the weather side of the dock, or when the current is pushing you onto the dock, use both your engine and a bow line to get underway. Cast off the stern line. Turn the wheel towards the dock to swing the stern forward with a fender to cushion your bow if it hits the dock. Proceed ahead for a few revolutions dead slow. This should kick the stern a safe distance away from the dock. When completely clear, head out to open water.

When tied to the leeward side of the dock, use an oar or a boat hook to simply push off. The wind or current will carry you far enough out for a safe departure.

ALONGSIDE IN A HEADWIND

— by Charles T. Low, author of ***Boat Docking***
— for Boat Safe [1998 March]

A high windage boat, trying to come alongside in a 25 knot headwind, has a problem — call it a *challenge*, if you're more positively minded.

The way to accomplish it is to accept that it won't be easy. Know your boat, and its handling well, and practice in lesser winds first. Have your lines and fenders organized in advance, pay attention, and be careful.

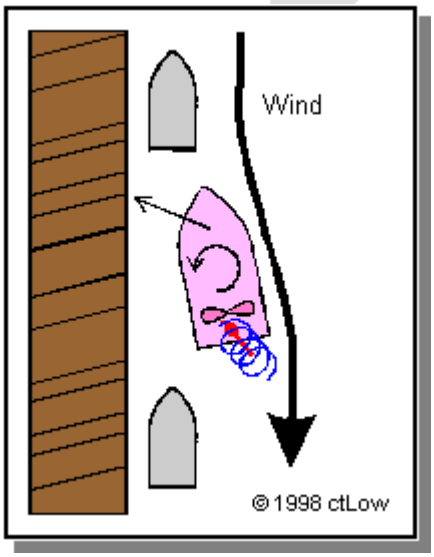
These pieces of advice are fairly general. A more specific one would be: "Take it slowly," except that to be more realistic it has to be: "Take is as slowly as *possible*." This is because the wind demands that the boat have very strong "steerability", and this steering authority comes i) from motion through the water, and ii) from keeping the power on. So, you may have to maintain more speed up than you would like, although, on the plus side, the head wind will slow you down a little too.

This is a very dynamic docking. Things change quickly. You have to do two contradictory things: i) think well ahead *and* ii) throttle and steer very actively, moment by moment.

What's the Problem?

The trouble arises for several reasons. Firstly, a headwind *yaws* the boat. This turning force varies by boat, being relatively mild and slow with a low-profile displacement hull sporting a substantial external keel, but tenacious and rapid for a planing hull boat. But in almost any boat, the wind tries to blow the bow "off".

Furthermore, if the wind turns the boat a little to port, for example, then the whole hull becomes an inclined plane, and some of the wind's force now pushes it *laterally* (also to port, in this instance).



So, now we have a boat turning *and* drifting sideways. The skipper's best response is to turn to starboard, perhaps adding in extra engine power to improve steerage. But notice now which way the propeller's discharge current is pushing the boat: **to port**.

It doesn't take long, under these circumstances, to use up your maneuvering room, and come crashing heavily into the dock with the port bow. By the time you're halfway through this disastrous maneuver, you're already beyond the point of no return. You can probably see it coming, and yet can't do a thing about it.

Let's say you have the skill to hold the boat directly head to wind. This would avoid the whole problem, except that you have to turn *into* the slip eventually, and once you turn, the wind may take over.

Figure 23: Alongside in a headwind

What's the Solution?

Not to despair: it gets easier after the first few (thousand) times. Once you realize what's actually going on, and that the boat's behavior is neither random nor capricious, you can handle the situation better.

Stay very focussed. A difficult docking such as this does not necessarily require lightning reflexes (although they help!), but it does demand intense mental concentration.

When you turn (or when the *wind* turns you), **turn very little,** and **straighten out early.**

Stay ahead of your boat in your thinking. Don't wait until the wind has reduced your options to nil. You really have to *anticipate* what's going to happen next. There just isn't time to make observations, assess them, plan a response and then begin to carry it out.

A little extra speed through the water often helps the hull to track straighter, less susceptible to "wind yaw", and it affords you better steerage. The speed, however, is definitely a two-edged sword. The faster you go the faster things happen. The faster you go the harder it is to get the boat stopped. While you're in reverse gear, putting the brakes on, as it were, your steering ability may be precarious, so in this sense it's good to go as slowly as possible. In the real world, you'll have to find the optimal speed by experience and experimentation, and on balance it will probably be a little faster than bare idle speed.

If you're ever caught off guard by a wind such as this, remember that you can do "power practicing". Try a few simulated dockings out on the open water, before coming into the harbor, and then drive back and forth past the slip a few times. You'll get a quick course on how your boat handles in the present conditions. On your "final" approach, turn a little too little rather than a little too much. It's much easier to extricate yourself from a failed docking if the boat is upwind and head to wind, whereas if you get blown on an angle into the boat abaft, there is no elegant way out.

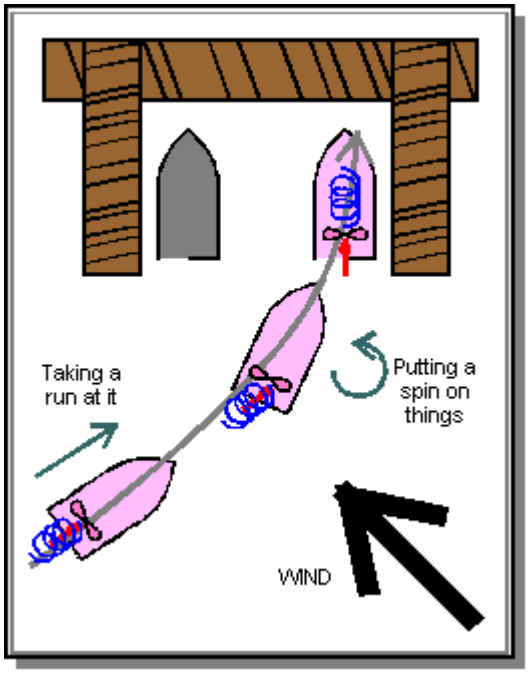
Conclusion

There is no conclusion to boat docking. In the unlikely event that we ever think we have headwind dockings completely licked, we'll find ourselves docking in a new boat which handles differently, or in a shifting wind, or in one which is one or two points off the bow. We will realize yet again, with joy and eagerness, that there will be many future opportunities to hone and refine our close quarters maneuvering skills.

BOAT DOCKING IN A QUARTERING WIND

— by Charles T. Low, author of ***Boat Docking***
— for Boat Safe [1998 April/May]

Kindly overlook any apparent self-aggrandizement if I describe one of my more successful dockings. Rest assured that I am only human, and that I have also had my own share of humbling close quarters encounters, which you will never hear about!



Those of you who have been following this column will, by now, recognize the familiar refrains of some of the basic principles which underlie all docking maneuvers. It is the "**timing, vigor and duration**" of these maneuvers which vary, docking in a quartering wind being no exception. It is difficult to show, in a diagram, how different this is from docking in calm weather. The "crabbing", angled track through the water, to compensate for the wind, the more decisive use of engine power, the unavoidable *speed* with which everything happens — all of these are very unlike the similar maneuver on a windless day, and yet on paper the distinctions appear much more subtle than they really are.

Doing it well involves understanding (even if "only" intuitively) something about hulls (and their interactions with water and air), rudder steering, propeller steering (asymmetrical thrust), and angular and linear momentum, among other things.

Figure 24: Docking in a quartering wind

The quartering wind docking holds a special place in my heart. Years ago, during research for the book, a dockhand complimented my docking. "Best I've seen today!", he said, feelingly. It seemed significant at the time because, firstly, I am arguably a little klutzy. Furthermore, it was late in the

afternoon, so I was by no means the first boater he had helped in that day. I thought, "*Yes*, this is beginning to work better!"

The assigned berth would have us docking on the starboard side in a starboard quartering wind — certainly not easy, especially in a high-windage boat. The problem that everyone there had been having that day was that, as a boat slowed to a stop, the wind would send it skittering off sideways before its crew could step ashore or attach lines to hold it in place. It would not have been pretty, and was probably quite exasperating for the marina staff who had seen it fumbled too many times that day.

I just circled around a few times, back and forth past the slip, feeling how the boat and I were handling that day in that wind, and giving myself time to formulate a plan. My crew and passengers pushed me a little, wanting me to act more quickly and decisively. The dockhand was waiting — and waiting — unaware, as yet, that his patience was about to be rewarded.

Lesson Number One

There is no need to rush, unless the boat is sinking or is on fire (*or two boats are vying for the last open slip*).

Keeping up the momentum: From here on in, this docking is a momentum (and/or "momentous") exercise. This particular technique (there are others, of course) entails taking a *gentle(!)* run at it. (Make sure your lines and fenders are organized first!) Now, as you slow to a stop, thereby losing the ability to steer to the boat, all won't be lost because you have *pre*-steered. Notice the angled approach, establishing momentum which will, to some degree, continue your upwind, dockwards, sideways journey towards the dock, against the wind, even without further throttle or rudder control. Also, just before shifting into neutral or reverse gear (as the occasion demands), give the boat a little spin — it will continue to yaw, and slide the boat into a parallel orientation with the dock.

It all amounts to a spinning skid into position, and it requires some practice and experience to get it right. I have found that the practice goes better if one has some idea where to start — book learning and water time going hand in hand.

It was still a struggle to get the first two lines on smartly, but at least we got close enough to the dock, without hitting, that the dockhand could grab a rail and the crew could step ashore and start to tie up.

Conclusion

Every docking is different. Learning the principles is great, and learning the "*timing, vigor and duration*", out on the water, builds confidence and makes your love of boating even more blissful.

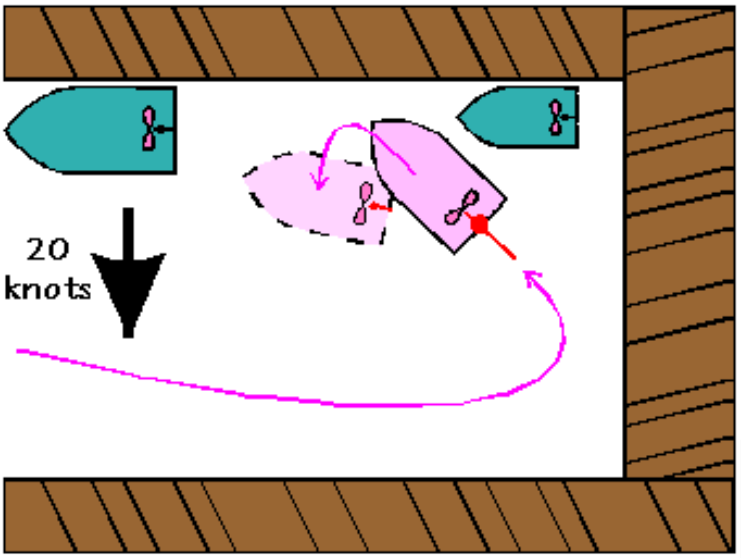
DOCKING BROADSIDE TO THE WIND

by Charles T. Low, author of ***Boat Docking***

This particular docking confounded me more than any other, in the "early days," and so I would like to present it to you now, as my second ***Boat Docking*** article for Boat Safe (The Online Safe Boating Course), for December 1997.

Docking in an "off-the-dock" wind, when done well, brings praise even from experienced marina dock hands — the converse brings back several memories which, at best, I find embarrassing. The extra challenge of this specific situation, as illustrated, is that a long angled run at the slip is not possible, making an already difficult maneuver even more invigorating!

As usual, planing hull power boats suffer wind effects more than others, but I have also seen exactly this docking defeat moderately experienced skippers in *displacement* hull boats (even full-keeled sailboats). Docking into a brisk wind, let's say something like 20–25 knots, stretches *everybody's* skills.



The problem arises because, to do this docking, you must, eventually and inevitably, slow down and turn the boat broadside to the wind. The moving mass of air will then blow you away from the dock, and itself will also turn the vessel. Your options for countering the wind quickly dwindle, because boats cannot propel themselves sideways (ignoring, for now, twin screw effects, bowthrusters, etc.), and you may have very little steering ability as the boat loses headway.

Figure 25: Docking broadside to the wind

The diagram shows where the boat actually goes, and it bears no resemblance whatsoever to where you want it to go! The situation seems hopeless — let's see how to get around it.

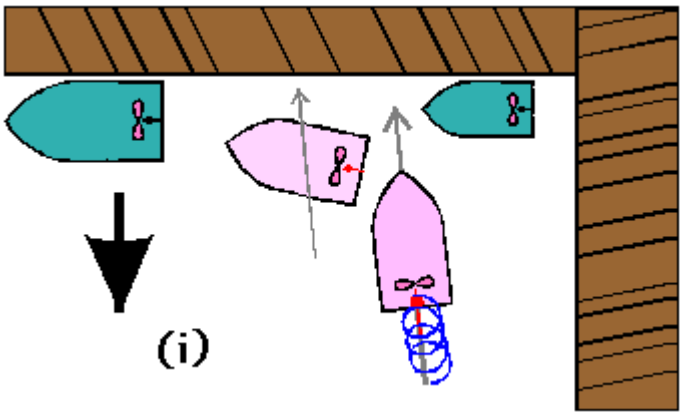
Firstly, it does get better with practice and experience. Be prepared to invest the hours, developing and improving that intangible feel for your boat — in this situation, you're going to need it! Some of the factors and constituents of that "feel" comprise the discussion which follows.

More specifically, notice, in the diagrams which follow, that the boat approaches the dock much more to one side of the slip (the outside side of the turn) than if there were no wind. This is because you will use power, in forward gear, as you turn, to control the boat, and that will move the boat ahead, in its slip. So, starting off to the side makes allowance for this.

Also, the initial approach is made almost perpendicular to the dock, keeping the effects of the wind (especially the turning effect) to a minimum until the very last moments, and for the same reason the turn is done relatively late, with the hull already very close to the dock.

The maneuver will require very positive control of the vessel, necessitating, at times, vigorous (but brief) use of steering and throttle. Consequently, it must be done skillfully and attentively, firmly but smoothly.

Momentum



I talk a lot about momentum, "the great unsung hero of the difficult docking." When thinking about docking into the wind, consider the concept of throwing your boat at the dock, using a spinning motion to skid and slide the vessel into its slip, against the wind.

You generate the "throw" by (i) taking a little run at it, and/or(ii) by giving a firm but gentle surge of power as you begin your final turn. The gray arrows, in the illustration, show the momentum which you develop, and which persists (for a while) after the boat has turned.

Figure 26: Maintaining momentum (i)

Now, done just right, the boat will slide into its slip with a rotary motion, coming to a stop at exactly the right spot. “Done just right” — that phrase covers a multitude of sins! Don’t get carried away (figuratively or literally)! Take a little run, and use power gently.

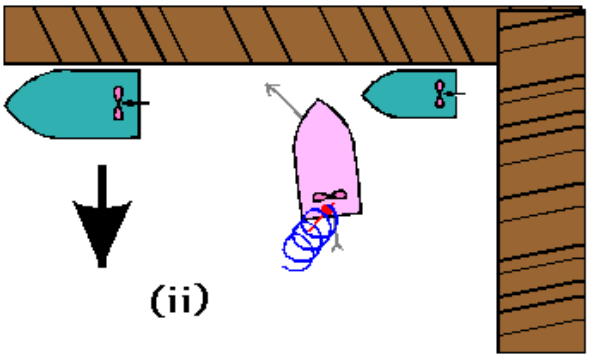


Figure 27: Maintaining momentum (ii)

If in doubt, underdo it — better to err on the side of not coming in closely enough than of crashing into the pier or into nearby boats. If it requires several attempts to dock your boat, as you learn how your vessel handles that day under those specific conditions, fine. Don’t let anybody rush you (the most likely culprit being yourself)!

Play the Wind

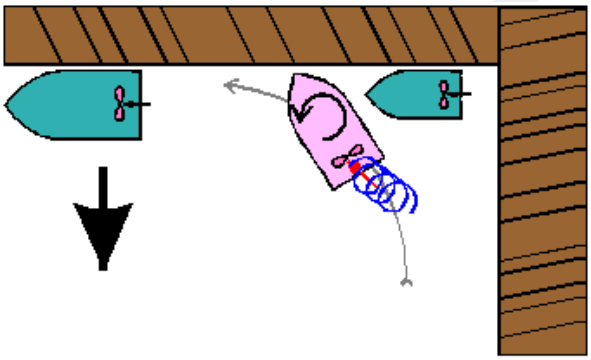


Figure 28: Play the wind

At the other end of the spectrum, you can finesse your boat into position by starting out virtually stopped in the water, and then by playing with the wind. We know that as the turn begins, from a “head-to-wind” orientation, the wind will catch the bow and complete the turn for you.

It often does this in a big hurry, too, and leaves you still some distance from the dock, blowing away as you turn. You counter this with power, with the rudder (or outdrive) often somewhere near center. Let the wind turn you. Encourage it to do so. You can’t fight it, so co-operate with it. Constantly adjust the throttle and rudder, as necessary, to keep the bow very close to the dock, and pay attention, because this all happens very quickly.

Combination Therapy

In the real world, the two aforementioned techniques often blend seamlessly into one. Using them in combination allows you to commit not quite so much momentum to the maneuver, so you can go a little more slowly, and yet still have enough speed to achieve that final, sideways slide against the wind, in to the dock.

Forward Thinking

This maneuver only works well when making headway in forward gear. Very few boats steer well enough in reverse to allow control in a twenty knot crosswind. (If yours does, I would like to hear about it!)

The bow blows off downwind, more so as you try to steer the stern more vigorously towards the dock, and I know of no way (short of throwing lines ashore) to swing it back upwind again.

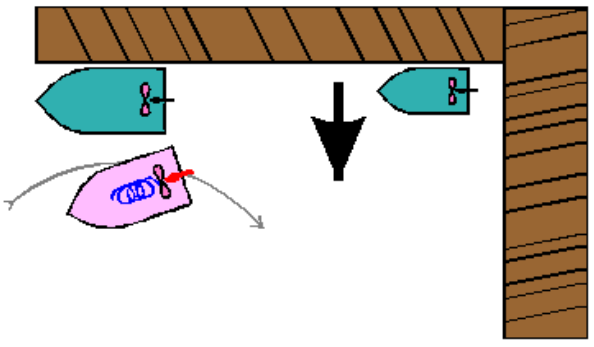


Figure 29: Forward thinking

That Secure Feeling

Don't relax until you get that boat secured! A significant broadside wind will have it scooting back into open water before you can say "Yassir, pass me that hawser." If you're short-handed for crew, you may only have time to get one line on before the vessel starts its downwind drift, so you have to have your mind and your equipment organized in advance, and know which line you're going to use!

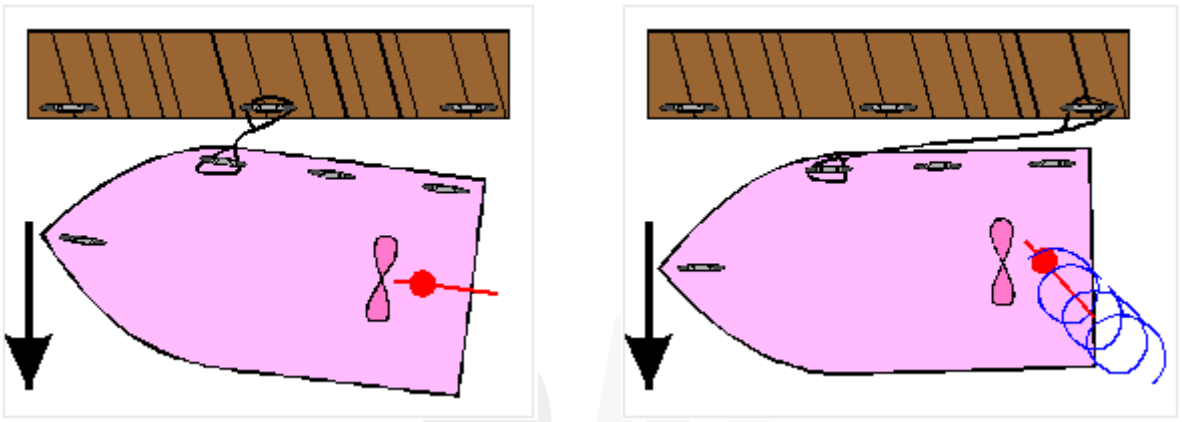
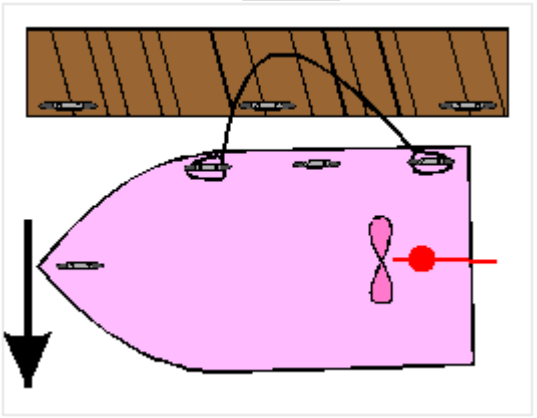


Figure 30: That secure feeling

You have several options. The simplest consists of one amidships breast line, quickly cleated. Remove it as soon as you have your longer lines positioned and adjusted. Or, use a spring line along with engine power to hold you against the dock while getting the rest of your lines on — an after bow spring, with the engine in forward gear and the rudder turned away from the dock, works beautifully, but involves a bit more work and risk (and time, of which there may be very little) than the amidships breast.



My favorite is the "Low-line," a double spring, one end attached at the stern and the other near the bow. It can be used with power, but even without it you can take the middle of the line ashore and use it to move the vessel ahead or astern or to pull in on either end — all of this with only the one line. You may have to cleat it off, somewhere in the middle, and do it fairly briskly if the wind is strong.

Figure 31: Low-line

You may, then, be able to leave it there, performing the function of two spring lines, and adding bow and stern lines, as usual. Whatever you do, you must do quickly. The force of the wind broadside on even a medium-size small craft often surprises even experienced boaters.

Caveats

The timing, vigor and duration of these maneuvers is critical, and they are learned only on the water. The boat will very likely need to be handled very forcefully, often requiring emphatic steering and throttling, so be careful. If it goes wrong, it can go very wrong. Consider simply docking the other way around, end for end, if this is easier. If you feel that you must turn the boat around, then do it later, by any of various methods, at your leisure. Don't be stubborn about docking a certain way, or even about using that particular slip, if the conditions are too difficult.

Conclusion

There are many things, in life, that we know better than to do into the wind. Sometimes, however, in docking our boats, our only choice is an upwind dockage, and it ranks right up there among the more difficult close quarters maneuvers we have to face. We have covered a few of the concepts and

techniques to help cope with this challenge. The skills which you will teach yourself and practice will also stand you in good stead in many other boating maneuvers, both in close quarters and on the open water. Practice in lighter winds, and build up to whatever your safety and your comfort level allows, but do practice: becoming more competent and confident in close quarters can only enhance the overall enjoyment you get from boating.

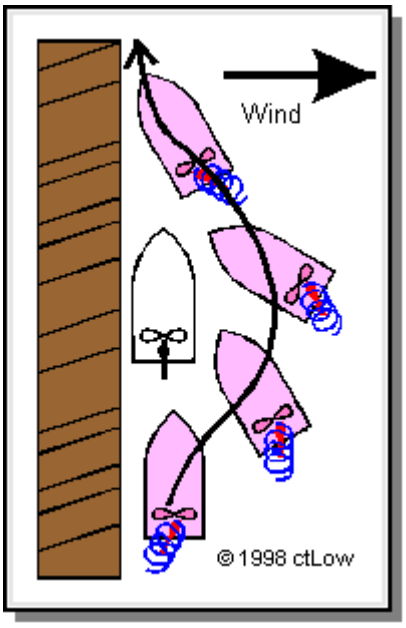
AROUND AN OBSTACLE IN A CROSS WIND

— by Charles T. Low, author of ***Boat Docking***
— for Boat Safe [1998 July/August]

This docking, like one presented here recently, recalls a pleasant memory, not only because it went well, but also because it so alarmed my sister-in-law. She recovered, and we are still friends, although I should not have so enjoyed her brief panic.

Why should she have been concerned at all? Well, if you haven't been there, sitting in a 20 knot cross wind, seeing what happens when you untie the boat, it can be hard to visualize. The short version of the story is that the wind sends the vessel scooting off sideways very briskly, and then vigorously resists any compensatory attempt you make to turn the bow back upwind.

Worse still, notice the direction of the propeller's discharge current as you hold the rudder (or outboard or outdrive) hard over. This jet of water also pushes you *away* from the dock, and very soon you're nowhere near where you want (and need) to be.



It is perfectly acceptable to walk the boat forward by hand, using its railings and lines, pulling it around the obstructing vessel. Alternatively, just accept that this docking is impossible, and maneuver the boat out into open water, from whence to make a more conventional approach.

Nonetheless, this day, when the marina staff asked me to move my boat, I did so from the helm, using throttle and rudder, making a short turn around the in-between boat, after which my sister-in-law was able to breathe again.

Here's the Trick

Forget about where the bow of the boat is pointing. At slow speeds trying to make a sharp turn in this beam wind, the hull will very definitely *not* track straight through the water. Relinquish any concept of fore and aft; accept and embrace that the maneuver will consist of sideways sliding and skidding.

Figure 32: Around an obstacle in a crosswind

Secondly, all of your attention and effort, at the start, must be directed at getting the boat to turn. Do not wait to see what the boat will do, and then react to it — there isn't time. Start from a premise of over-reaction, and then be prepared to back off a little, if necessary. More concretely, right from the beginning, have the rudder hard over, and give a firm shot of engine power (just hard enough and long enough to do the job, however hard and long that may be).

You Must be Decisive

Right off the bat, work very hard to get the boat turning. Combating the wind effects, in this situation, is not a casual exercise, and will require very positive and forceful control of your vessel.

But be Careful!

The use of such strong rudder and engine power, necessary though it may be, can lead to trouble. Get to know your boat in gentler weather before attempting the rough stuff — your margins for error here are quite small!

Next, notice the very high angle that the boat is turned to. It's not quite ninety degrees, but it's close! Look at the diagram and analyze it for a moment and think about where the wind will send the boat if

you just point the bow (more intuitively but incorrectly) along the shallower line of its actual intended trajectory.

Different boats handle differently, and as always it depends on whether you steer with a rudder or a propeller (outboards and stern drives), on whether you have an external keel (and what type), and on whether you have a heavy displacement hull or a light planing one, among other things. But the general principles apply widely to almost any design of boat. You have to know your vessel, and while I trust that reading about docking here will help, ultimately we learn by experience and practice.

Let me add that I really do regard this maneuver as impossible if attempted in reverse gear. It must be done by going ahead, not astern.

Conclusion

This isn't the only obstacle I have overcome in my life, and not the only time I've ever been broadsided. But this was a rare serendipity: doing a difficult docking well while harmlessly frightening my sister-in-law. Still, my wish for myself, and for you, is that your dockings will be possessed of more finesse and less drama, so that your hull and your interpersonal relationships will both remain unscathed.

MY HOME DOCK

— by Charles T. Low, author of ***Boat Docking***
— for Boat Safe [1998 January]

My home dock, assigned by my friend, the local Harbour Master, has, by virtue of its difficulty, made me a better boater. I have no choice but to try to hone my skills on every docking. The 'HM' expresses no interest in my anxiety level (or my crew's), nor in how many close calls we have had — as long as I actually *can* get in and out, then he is happy, and for the finesse which this has added to my technique I am grateful.

Any committed boater will, after a few seasons berthed at this dock, have mastered probably 90% of the basic close quarters maneuvering skills, through nothing more than experience and the survival instinct, assuming that he or she does not shy away from *gradually* more challenging winds.

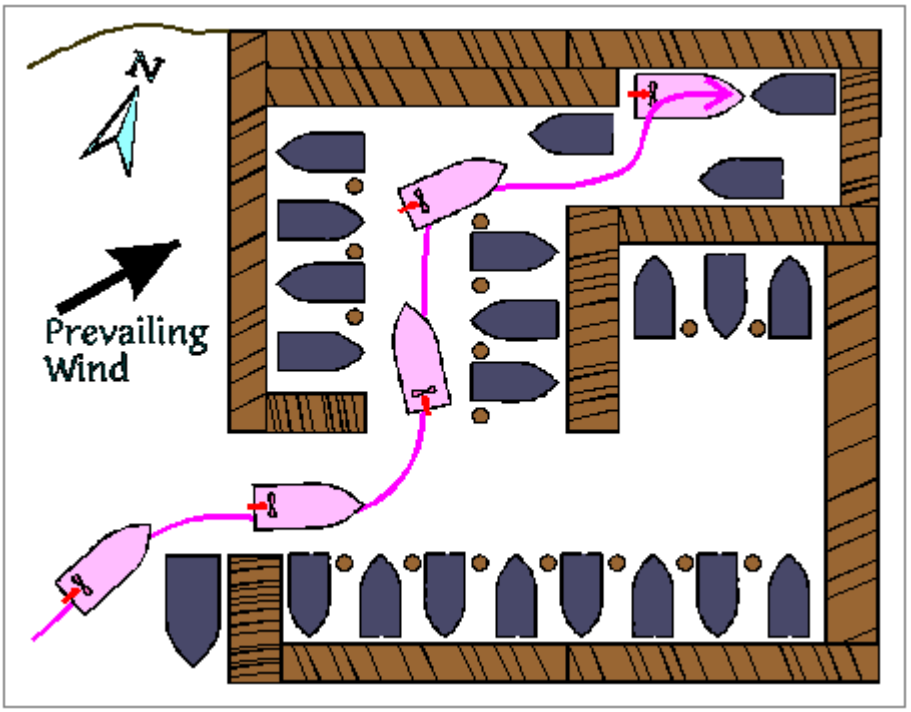


Figure 33: Docking in a confined marina

Step Number One

Make sure no one is *leaving* the harbour just as you try to enter. There isn't enough space for two boats to pass and still allow adequate maneuvering room. It can, however, be difficult to discern another boat in motion when you yourself have some 'way on', through the tangle of masts and pilings, so be careful.

Step Number Two

The next, and probably least significant conundrum of this docking entails that first turn to port, to head more or less north, between the two rows of docked boats. The prevailing wind tends to push the boat through a much wider arc than available space permits. We overcome this using the same techniques as for the more exacting maneuvers coming up in a few moments.

The boat must go very *slowly*, often coasting, more rarely even using reverse gear to take off headway. **Slower speeds allow sharper turns.** Start the turn *early*, knowing that the boat slides and skids as it yaws. If you start *too* early, flattening the curve out presents little difficulty, whereas the converse, starting too late, may leave you out of room.

Also for reasons of having reserve space in which to perform maneuvers, start on the *out*side, *up*wind side of the turn; if this causes an internal contradiction, then make your best compromise.

Now that you have slowed down and are about to make the turn, you may need to give the boat a little shove, with the wheel hard over, using more engine power than available at just idle speed. The extra power gives you 'steering authority'. Use it briefly, in short spurts, lasting usually only a few seconds at most, adjusting throttle and steering moment by moment as needed. Don't use too much, but certainly don't use too little — in a strong wind, especially, a boat may require considerable force to persuade it to turn.

Step Number Three

Back off on the power as soon as possible, and make your way between the two rows of boats. You may have to *over-rotate*, sometimes by a surprising amount, to compensate for the gradually dissipating momentum which wants to make the boat skid wide through the turn, and to counteract the force of the wind, which is now more or less abeam.

Step Number Four

The next corner to negotiate is just the same as the first, except worse. Quarters are getting closer, and a novice or unskilled boater may, even though he felt comfortable making the first turn, now experience unease, even though the general principles have not changed.

My boat's stern swings to port, in reverse gear, due to 'asymmetric propeller thrust'. A minority of boats have sterns which swing to starboard. The phenomenon goes by several names, one of which is 'walking'. Anyway, right here, about to make the second turn, vaguely towards the east, I more often actually *do* use reverse gear to slow the boat down, and the propeller walk helps to start the boat turning. Sometimes, I will even begin to make a little sternway, which also helps prepare the boat to make that very short, sharp turn to starboard.

Step Number Five

By this stage, I need not say that getting through a narrow gap, and then turning the boat sharply into its deep alcove, with many other boats tied up nearby, and the wind howling, is not a trivial exercise. It's still all the same as the first two turns, except that each one gets more gut-wrenching.

Three Final Points

1. There is quite often a point of no return, a place beyond which there is no practical way to go into reverse gear and back out into open water. Close quarters, wind, reverse gear — these can be an impossible combination. The higher the wind, the earlier on this point is; occasionally, and also depending on the wind's direction, even entering the harbour commits me irrevocably to completing the docking. It is very helpful to have some idea where this 'no return' point is! Rarely, in very heavy weather, the intended slip may be simply inaccessible — better to know about it while there are still options!

2. I don't *always* drive the boat right into its slip. Sometimes, I'm content just to get a *part* of it, usually the bow, in close to the dock, and from there I or a crew member can take a few long lines ashore to control both ends of the boat and haul it in manually. In certain adverse winds, I will even dock up initially on the south side, *across* from my slip, occasionally needing to rest against another boat there (using lots of fenders). Then, I throw a line or two across to 'my' side, walk around, and haul the boat over. This is much more elegant than crashing around, and even the guy who 'wrote the book' absolutely has to know his own and his boat's limitations.
3. If it's completely calm, I may back in, but that doesn't happen very often. Usually, I go in forwards, as I have been describing, and then, in preparation for my next departure, turn the boat around end for end by hand ('winding ship'), using a simple, effective system of lines.

Conclusion

Close quarters maneuvering has no conclusion. I find this docking easier in October than I did in May, and I hope and expect to find it easier in ten years than I do now. It's never perfect, and I'm always learning. As I gain ever more experience, it gets easier at least partly because I work at it harder (although, when you love boating as I do, 'work' isn't quite the right word), giving closer attention and a more concentrated focus to the details of close quarters maneuvering.

STERN TO

— by Charles T. Low, author of ***Boat Docking***
— for Boat Safe [1998 February]

Stern to docking has many advantages over docking with the bow in towards land. In many boats, it's just easier to load gear and get on and off from the cockpit than over the bow. Although docking this way is commonly done, it's also common to see it *not* done, and not only for reasons such as protecting the rudder from grounding or hitting the dock, important though that is.

There are many reasons for not docking stern to, but one of the main ones is that it is difficult! I propose, in this short essay, to demonstrate why it is not more straightforward. You might pick up some tips which will help you to maneuver your boat backwards into its slip, or you may at least understand better when to try it and when not!

There is no shame in behaving prudently, and prudence often means doing things the easier way, or, more accurately, the more *possible* way. Most of us, even those who routinely dock stern to, have experienced dockages or weather in which even docking bow in stretched our skills and strained our cool reserve. I won't belabor this further, but even though it seems self-evident, remember to dock stern to only if you *can*.

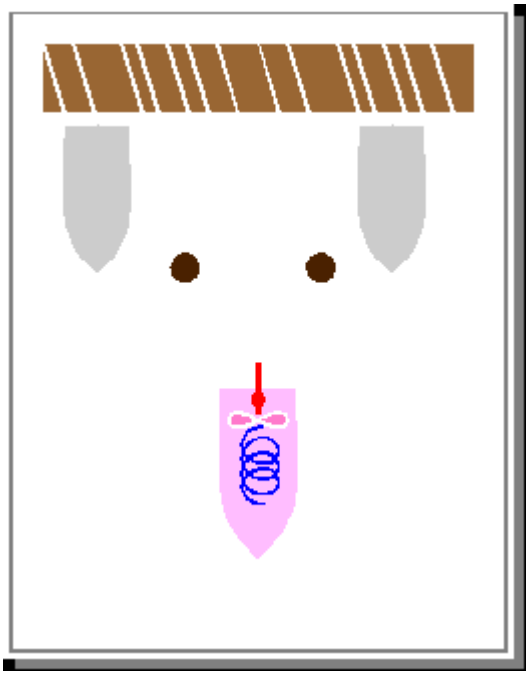


Figure 34: Docking backwards

Why Does it Have to be so Hard?

Many, but not all, boats steer poorly in reverse. There are many reasons for this, including very little water flow over the rudder, asymmetric propeller thrust (the sideways force exerted by the propeller, especially in reverse gear), which renders sternway steerage almost impossible in some boats, and the simple dynamics of the hull-water interaction, which work much better when making headway. If a wind is blowing, it frequently compounds reverse steerage problems, and a vessel which can be controlled in a fresh breeze when making headway may become less predictable when making sternway.

A simple trick to counteract asymmetric thrust is to use the propeller as minimally as possible. Get the boat moving astern just barely enough to enable the rudder to steer, and then go into neutral and *drift* backwards. It doesn't work for every boat, but it does for many.

Twin Screws

Having and using the effects of twin screws can be a real boon under these circumstances. Even twin screws have limitations, but some vessels with them can even be made to walk sideways against a wind, given an experienced operator. I am going to leave the details for another time, and assume for the moment that you have a single-engine boat, as currently do I.

Contrariness

Another problem to overcome is that of “contrary motion and propulsion” — in this instance, I'm talking about using forward gear while you're still going backwards. Forward gear is commonly used when making sternway (briefly enough to allow the vessel to continue movement astern), firstly because steering is so much better in forward gear than in reverse (in many boats), and secondly as a means of putting on the brakes!

However, it gets more complicated than that because the concepts and techniques for “contrary steering” are completely different depending upon whether you're making sternway and then putting the boat into forward gear, or making headway and putting the boat into reverse gear. Again, I think it's too much to get into all of the niceties just now — we may get around to it eventually, and it's all in the book, but at least know that there's something to know!

Figure 35: Going forward to go backwards

Inboard or Outboard?

For steerage astern, would you rather have an inboard or an outboard engine? (Inboard/outboards are classed with outboards in terms of their steering mechanics.) Well, both propulsive designs have advantages and disadvantages, and for every boater who is sure he or she knows which one is best, another has a considered and differing position. In this instance, however, I vote for the outboard, because being able to actually swing the propeller itself from side to side affords better reverse gear steerage (acknowledging that there are always exceptions) than does a rudder. Do not construe this to mean that I prefer inboards, or outboards, or rowboats, or anything. My comments relate very narrowly to docking stern to.

Keels

Even more to the point, would you rather have a boat with or without a substantial external keel? As usual, there are pros and cons. For example, sometimes a full keel exacerbates the effects of asymmetric propeller thrust. Just as often, however, it allows the hull to track straight and true, and to tolerate a cross wind better, so in general, a boat with a keel will back into a slip better.

What to do?

One solution for all of these things, as I mentioned above, is simply not to do it! Go in forwards. Many boating experts *never* dock stern to, or they maneuver the boat only partly into its slip, and walk it the rest of the way in by hand. However, without going into all of the technical details, some of which have been discussed in this space before and some of which are planned for the future, another approach is to learn more about your boat. Practice backing into slips, starting in calm weather some place where there is lots of room for error. My hope is that it will be more rewarding and less frustrating for you if you at least know what you're up against, and why the boat doesn't just back up in a straight line when you engage reverse gear.

So, when practicing sternway boat steering, consider all of the things we have touched upon: poor reverse steerage, asymmetric propeller thrust, adverse hull dynamics, wind, and contrary motion and propulsion. If you ever get it all figured out, please let me know, because I think you will be the first — this can be tricky, and I have met no one (myself definitely included) who couldn't still hone their skills a little more.

Conclusion

With practice and training, most boaters find that they rebel against their boats' idiosyncrasies less and less, and learn to anticipate them and actively *use* them more and more. The boat may not back up in a straight line, but you will learn how it *does* behave, and how it *does* respond to control inputs, and you will increase the likelihood of joining the elite club of “stern-to dockers”.

STATION KEEPING

Charles T. Low, author of ***Boat Docking***
for Boat Safe [1999 October]

"Keeping station" refers to holding a position in the water - not moving relative to the land - and here we're talking about staying still without being secured to a dock or anchored to the bottom. We hold the boat in place by piloting it *at* (not "to") a certain spot without making any "way", and unless there is absolutely no wind or current, station keeping requires very active and positive control of your vessel.

It's a little bit like balancing a pencil on its tip, or like hovering a helicopter - much more difficult than just *moving* the thing somewhere! As such, it ranks right up there in the advanced category of close quarters maneuvering skills, and makes a very good exercise for familiarizing yourself with your boat's slow speed handling characteristics.

Why it presents such a challenge will become apparent as we go along. But first, consider why to bother with station keeping in the first place. Any number of scenarios can present themselves. Commonly, you need to wait for someone else to clear a slip, or just for other boats to get out of your way, before you proceed along the next leg through the marina to or from your dock. You may need to stop and talk to someone on shore. You may be involved in search and rescue, in which case there are many times when the helmsman's job is just to hold still (and often, under these circumstances, it's in a storm, at night, nearby to rocks and other vessels, and with rescuees, rescuers and debris in the water).

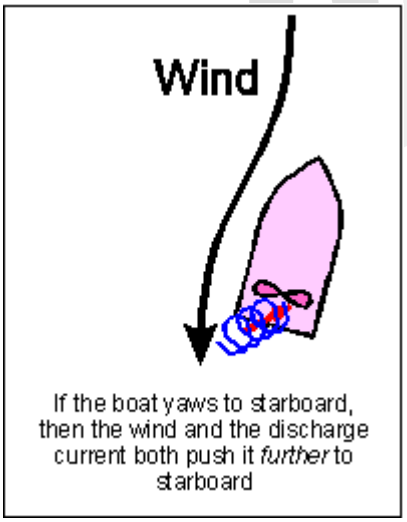
Even if the conditions are extremely calm, remember that you are still considered to be "under way" (albeit with "no way on"), and are responsible for the handling of your boat. Keep a close watch all about you, and be prepared to get moving promptly should circumstances so dictate. Bear in mind that a boat which appears to be motionless second by second still may stray quite far minute by minute. My personal preference is to remain very close to the helm, and to leave the engine running.

There will be other times when the conditions are active enough that keeping station will not be practical. In heavy weather, even if you can't control the boat enough to hold it still, you can probably keep circling or doing figures of eight. If there's not enough room to do even that, then you likely shouldn't be there at all anyway

Station keeping rule number one and only

Stay aligned with the wind. (Or, stay aligned with the current, and if there are both then figure out the best compromise.) The wind will try to slide a boat sideways in the water, not only pushing it along but also yawing it broadside. The boat's propulsion is only fore and aft, so the only way to maintain control of your vessel is to keep yourself lined up with the wind.

The wind will constantly try to blow the bow off to one side or the other. Once out of alignment, you might think, you will simply steer yourself back onto your desired heading. "Simply", however, is not quite the right word, because once you begin to turn off the wind the whole side of the boat becomes an inclined plane. Now the moving air mass not only pushes it down wind, but laterally too!

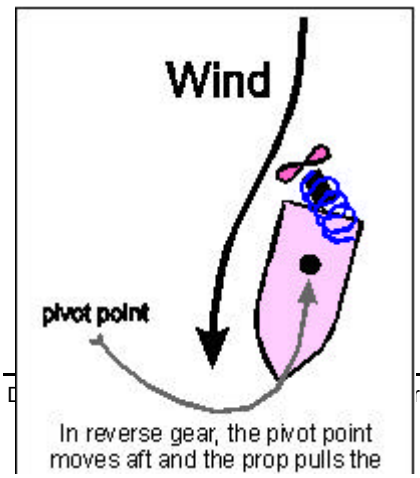


It gets worse. Let's say that you're starting off head to wind, and the wind has you yawing clockwise (viewed from above). The boat now is not only being pushed astern but also to starboard. Clearly, you apply forward propulsion and steer to port. However, at first, the thrust of the propeller's discharge current *also* pushes the boat further to starboard.

This dilemma, of what amounts to very sensitive steering when head to wind at slow speeds, is never more apparent than when the speed is so slow that it's zero. About all you can do about it, when keeping station, is to pay attention and catch any yawing early. With practice, most of us will be able to hold our boats almost directly into the wind for as long as we care to. It may however, require us to be in forward gear much of the time.

Figure 36: Hovering facing the wind

This is fine except that now, in forward gear for much of the time, we begin to make headway. Making headway is not keeping station, and this is why I made the implication earlier that in really heavy weather we had better leave station keeping to those who have received extensive professional training in specially designed craft. In moderate winds, however, the remedy is to pop into and out of forward gear, just enough to maintain alignment without starting to move appreciably forward through the water. (The vagaries of steerage in *reverse* gear preclude its use, when head to wind, except for light airs and the most benign of boats.)



Doing this well requires experience. Your reflexes have to be sharp, and it certainly helps to know your boat well enough to be able to *anticipate* what it's going to do next. It's a matter, as has been said in this space often before, of honing the "timing, vigor and duration" of the various control inputs. It connotes having a feel for your boat, and while reading about it here surely can accelerate your progress and focus your thoughts, there is no way to get that feel except by practicing and rehearsing, out on the water. (There's nowhere I would rather be, anyway!)

Let’s back up for a moment

Another way around this seeming impasse is to go *stern* to wind. This won't work in all boats, because many are simply not adequately steerable in reverse gear, especially with no way on. Because of this, the default technique remains head to wind. But for those boats which *can* steer well enough in reverse (more likely an outboard or an I/O than a straight-shaft inboard), there are at least two advantages. First is that the propulsive force of the propeller's discharge current is often considerably weaker in reverse gear than in forward. Thus, you will likely make less sternway against the wind than you would make headway in forward gear. So, you can stay in reverse gear more of the time, using it to steer (if that works in your boat).

Figure 37: Hovering stern to wind

Secondly, in reverse gear the vessel's pivot point moves aft. So, even though the wind still and always exerts a yawing force on the boat, attempting to put it broadside to the direction of air flow, this will be mitigated to some extent, in reverse gear, by the aft-displaced pivot point, which lets the bow tend more to weathervane down wind. The swiveling discharge current, as you steer, also pulls the boat back on course, rather than pushing it off as was described above for forward gear. We're no longer so much balancing a pencil from the bottom as hanging it from the top. In short, given the right boat, steering may be easier stern to wind.

Don't change that station!

Station keeping is another one of those many close quarters maneuvering topics in which absolutely everything you know about slow speed boat handling comes into play and contributes to your successful piloting.

Close quarters maneuvering is about always improving, and this applies to station keeping just as much as, if not more than, to other boat handling skills. This is no place for coasting! As such, one of the very best indicators of your progress is your ability to make your boat just hold still.

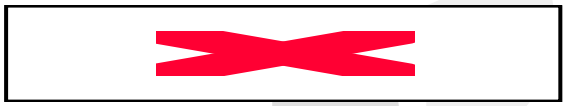
ROPES, KNOTS AND ANCHORAGE

ABOUT ROPES

There are some basic rules about caring for ropes and associated tackle. These include no standing on ropes, no dropping of clips, crabs, shackles

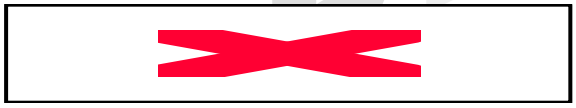
There are many materials used today to make line (ropes are on shore, line is afloat). The most popular is nylon. It is strong, holds up well to the weather and stress, and coils nicely without too much kinking. Line is also made from natural fibers like cotton and hemp (manila), and other synthetic fibers such as dacron, kevlar, spectra, technora, and polypropylene. Nylon three strand is the preferred line for docklines, since it stretches sufficiently to dampen the sharp shocks of wave action and wind against your cleats. Dacron doesn't stretch as much, and is used for sailboat running rigging and other applications where you don't want stretch to interfere with your sets. The big advantage of polypropylene line is that it floats. Therefore, it is appropriate for ski lines or other applications where you want to be able to see the line on top of the water.

Line is constructed in two basic ways, although there are variations on the theme. The first is "3 strand" line.



Three strand twisted line can be "laid" right or left, and should always be coiled with the lay of the line. If you hold a length of 3 strand right-hand laid twisted line at arm's length and eyeball it, you will see the wrap of the line twisting to the right.

The other construction type is braided line.



Braided line can be single or double braided, and in both cases the line is braided around a central core. This type of line does not stretch to the degree that twisted line does, and is more difficult to splice. However, it goes through a pulley or block very well because of it's rounded shape, and is stronger than its equivalent size twisted line.

Whichever lines you choose to use, make sure they are kept out of the sun when not in use, clean, unfrayed, and coiled neatly. Don't leave knots in a stowed line for long periods of time. Protect the line from chaffing, and replace the line at the first sign of wear.

KNOTS

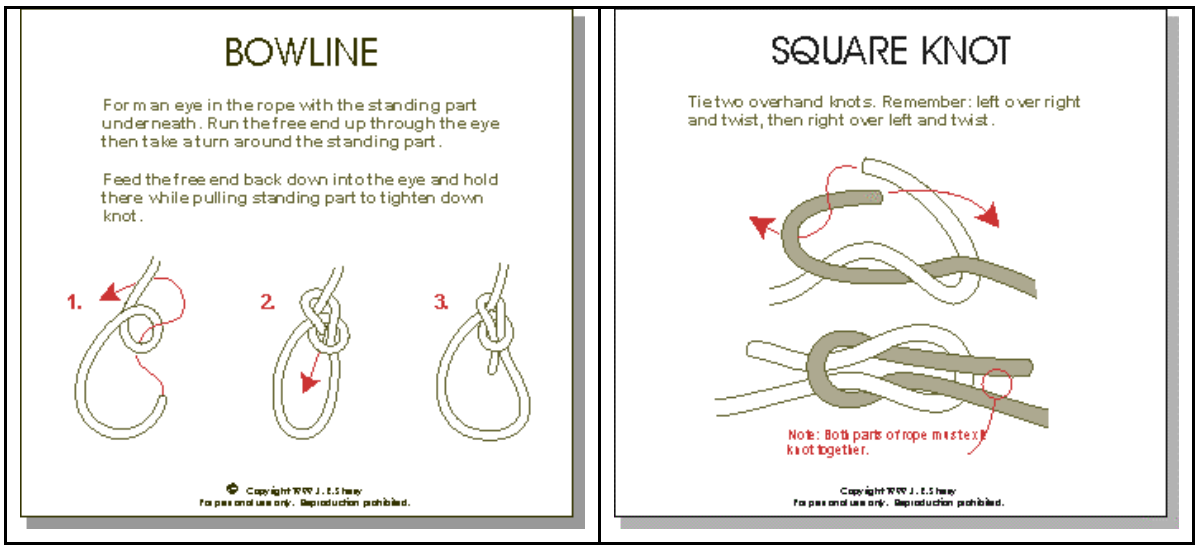


Figure 38: Bowline

Figure 39: Square, or reef, knot

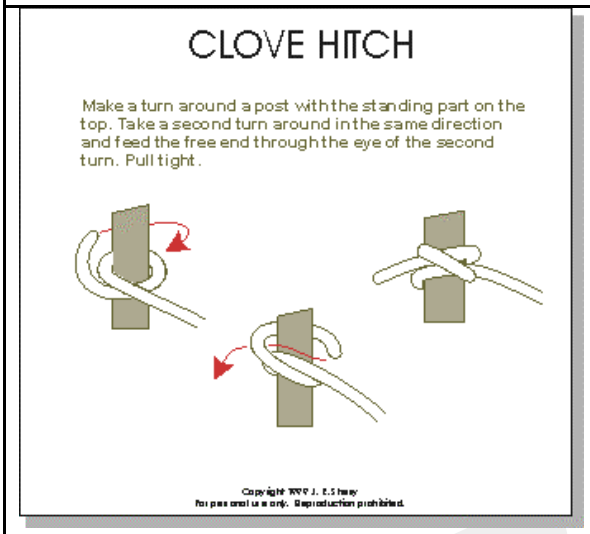


Figure 40: Clove hitch

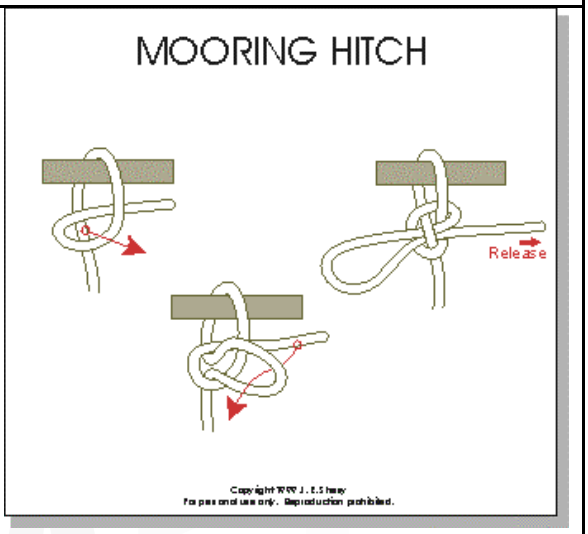
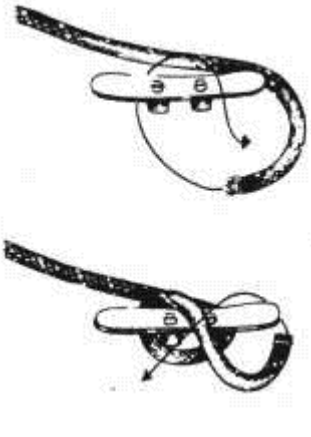
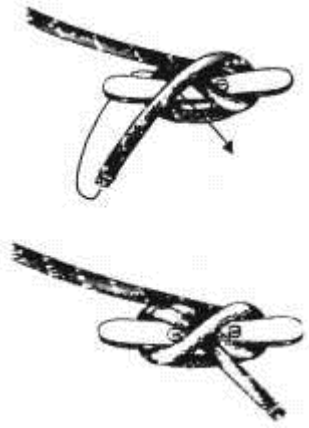


Figure 41: Mooring hitch

Cleat Hitch



1. Make more than one and a half figures of eight before securing the hitch.
2. The last turn should lead in the same direction as the standing line.



3. The hitch is secured by running the last turn back under the crossing line. (see drawing).
4. Pull tight. It can be relied on to hold itself firmly.

Figure 42: Cleat hitch

LASHINGS

SPLICES

WHIPPING

Common Whipping

Lay the twine in a loop on the rope with a loop on the rope with a loop going beyond the end. Hold this down with the left thumb. Then wind the twine tightly round the rope working toward the end (A) {don't go over the free end of the loop}. After 6 or 7 turns, bring in the free end of the loop (C) and then pull steadily in the direction of the arrow until all is securely within the whipping. The length of a whipping is from 1/2 inch to 1 inch according to the thickness of the rope.

Sailmaker's Whipping

Unlay 2 or 3 inches of the rope. Put loop of twine round middle strand. Relay the rope. Wind long end of twine round and round working towards the end of the rope. When the whipping is long enough, slip the loop back over the end of the strand it goes round and pull steadily and firmly on the short, unused end. Then bring the end up so that it serves the third strand. Tie off the ends with a reef knot in between the strands on top; the knot will then be hidden. This makes a very neat whipping if done carefully. Keep everything tight.

KNOT STRENGTHS

So, how strong is a knot...Knot very!

According to the U.S. Coast Guard in their *Boat Crew Seamanship Manual COMDTINST M16114.5B* (27 Feb, 1998) common knots lose much of the line's strength. The following table is from the above manual.

Knots or Splice	Percent of Line Breaking Strength Lost	Percent of Line Breaking Strength Remaining
Square	46	54
Bowline	37	63
Round Turn	30-35	65-70
Timber Hitch	30-35	65-70
Clove Hitch	40	60
Eye Splice	5-10	90-95
Short Splice	15	85

ANCHORS AND ANCHORING

Types

At some point in your boating career you will probably want to anchor. You may want to stop and fish, swim, have lunch or stay overnight. A second reason to drop anchor may be to control the boat if bad weather is blowing you ashore or if your engine has quit and the wind and current are pushing you into shore or other boats.

The first step in anchoring is to select the proper anchor. In spite of claims to the contrary there is no single anchor design that is best in all conditions. On most pleasure boats the three anchors you will find most are the fluke or Danforth type, the plough and the sea anchor.

REMEMBER: A bucket can be used as a makeshift sea anchor for a small boat.

Figure 43: Danforth anchor

Danforth

This type of anchor is most commonly used by small craft and is recommended. A small light anchor has excellent holding power and can be easily handled in a small boat.

Figure 44: Plough anchor

CQR or Plough

Can by used in small craft, however, more suitable for larger heavier vessels. Both the above anchors have good holding power so if used on reef they may never come up. Use a grapple when anchoring on reef. The flexible prongs will straighten when sufficient pull is applied and released. Many Danforths and other types of anchors remain on the bottom in reef area.

Figure 45: Sea anchor	**Sea Anchor or Drogue** If you plan to go boating offshore or on an extended trip, a sea anchor can be a valuable piece of equipment. Sea anchors, when set, will slow your drift and keep the bow of your vessel into the wind and waves. This is essential and also provides more comfortable conditions when drifting in choppy seas.

Anchor Rode

Anchors also must have something to attach them to the boat. This is called the anchor rode and may consist of line, chain or a combination of both. The whole system of gear including anchor, rode, shackles etc. is called ground tackle.

The amount of rode that you have out (scope) when at anchor depends generally on water depth and weather conditions. The deeper the water and the more severe the weather the more rode you will put out. For recreational boaters let it suffice to say that at a minimum you should have out five to eight times (5 to 1 scope for day anchoring and 6 to 8 to 1 for overnight) the depth of the water plus the distance from the water to where the anchor will attach to the bow. For example, if you measure water depth and it shows four feet and it is three feet from the top of the water to your bow cleat you would multiply seven feet by six to eight to get the amount of rode to put out

Adequate scope is necessary if your boat is to be anchored safely. Scope is the ratio of the length of the anchor line to the distance from the bow chocks to the bottom. Satisfactory scope is generally considered to be a ratio of 7 to 1. If you anchor in 10 feet of water, you should pay out 70 feet of rope.

Remember also that a rising tide will change the scope. If the distance becomes 15 feet to the bottom, you should pay out another 35 feet of rope.

Points to consider

- Select an area that offers maximum shelter from wind, current, boat traffic etc.
- Pick a spot with swinging room in all directions. Should the wind change, your boat will swing bow to the wind or current, whichever is stronger.
- Determine depth and bottom conditions and calculate the amount of rode you will put out. If other boats are anchored in the area you select, ask the boat adjacent to the spot you select what scope they have out so that you can anchor in such a manner that you will not bump into the neighboring vessel.
- Anchor with the same method used by nearby boats.
- If they are anchored bow and stern, you should too. If they are anchored with a single anchor from the bow, do not anchor bow and stern.
- Rig the anchor and rode. Check shackles to make sure they are secured with wire tied to prevent the screw shaft from opening.
- Lay out the amount of rode you will need on deck in such a manner it will follow the anchor into the water smoothly without tangling.
- Cleat off the anchor line at the point you want it to stop. (Don't forget or you'll be diving for your anchor.)
- While reversing on a set anchor, keep a hand on the anchor line, a dragging anchor will telegraph itself as it bumps along the bottom. An anchor that is set will not shake the line.
- When the anchor is firmly set look around for reference points in relation to the boat. You can sight over your compass to get the bearing of two different fixed points (house, rock, tower, etc.) Over the next hour or so, make sure those reference points are in the same place. If not you're probably dragging anchor.
- Begin anchor watch. Everyone should check occasionally to make sure you're not drifting.

- With the bow to the wind or current in the spot you have selected, stop the boat and slowly start to motor back. Lower the anchor until it lies on the bottom then slowly let out the rode as the boat drifts back. Backing down slowly will assure that the chain will not foul the anchor and prevent it from digging into the bottom. When all the anchor line has been let out, back down on the anchor with engine in idle reverse to help set the anchor.

Figure 46: Setting the anchor

- Retrieve the anchor by pulling or powering forward slowly until the anchor rode hangs vertically at the bow. Cleat the line as the boat moves slowly past the vertical. This will use the weight of the boat to free the anchor and protect you from being dragged over the bow. Once free, raise the anchor to the waterline. Clean if necessary and let the rode dry before stowing away.

Here are some (more) basic anchoring guidelines:

- Pick your anchorage carefully. If there are other boats nearby, you will need to "guess" at their potential swing. A boat on a mooring will have very little swing but a yacht at anchor may have considerable "scope" out and may swing widely. A shallow draft boat will be more affected, usually, by the wind whereas a deep draft boat will be more affected by the current.
- Put your bow into the wind or current (whichever is having the greatest affect on your boat, power up slowly to or just beyond where you want your anchor to lie and check your forward motion with your reverse gear. Double check to ensure that the bitter end of your anchor line is attached to something sturdy on the boat. Most experienced boaters have watched at least one anchor with a few hundred feet on line disappear over the bow because they forgot to secure the end.
- Don't throw the anchor - it will probably get tangled. Release it by holding on to the chain or line, making sure that the chain and line are free, and dropping the anchor off the bow. If your anchor line was properly coiled, it will "pay-out" smoothly.
- Once you see slack in the line, feed out the proper amount of scope as the boat drifts back. Hopefully, you've got your anchor line marked at 25' increments. Average "recommended" scope is somewhere around 7 to 1 or 8 to 1 - that means that if you are in 20 feet of water you will want to pay out between 140' and 160' of line. You also want to take into consideration the distance between the water line and the bow cleat and also any depth increase because of tides. If the tide may come in another 4 feet and your bow cleat is 3 feet above the water, you are, effectively, in 27 feet of water and would need to pay out around 200' of line. Up to 15 to 1 scope may be necessary in strong winds or currents.
- Once the scope is out, secure the line (cleat and chock) and "back down" on the anchor keeping your bow into the wind/current. Idle speed is usually sufficient to make the anchor "bite" into the bottom and "set."
- Put the engine in neutral and get your "bearings." Find two points on each beam that form a natural "range" or line and a third either ahead or astern from which you may be able to judge distance. They can be other anchored boats, rocks, buoys or points on land. Sit there for a few minutes to make sure that none of the angles or distances to these points change. Any change would indicate that you are dragging and need to reset your anchor or pay out more scope - or both.

Stowing

When raising the anchor, make sure you lay the line back in the anchor compartment by flaking the line carefully on itself so that when it's time to drop the anchor again, the line will leave the compartment without tangling. Once you get to the chain, lay it over the rope, then carefully place the

anchor itself on top. Try to wedge it in reasonably so that it doesn't bash around the compartment when you're in rough seas, as it can cause considerable damage to the hull.

NIGHT OPERATIONS

Remember, a general rule is that the more lights you see on a vessel at night, the larger it is and the more you should try and avoid it.

Carry spare light bulbs of the kind and type for all your navigation light fixtures, and know how to change them. Having navigation lights on your boat that don't work is considered the same as not having navigation lights on your boat.

If you are out at night, and see another boat's red light but not the green light, you are in a "give-way" position. This means that you must slow, turn, stop, or make whatever other maneuver is necessary to stay out of that boat's way. If you see both the red and green light, you are meeting the other boat head-on. If you see only the white light, you are running up the stern of the other boat, or that boat is at anchor, or it may be a sailboat under sail. If you see the green light and not the red, you have the right-of-way. But remember, right-of-way is of little solice if there is a collision, so avoid collision at any cost. Night boating is deceptive...reduce speed and be careful.

Equipment to be carried fitted tightly in the boat:

- Spot lights,
- Dolphin torch,
- Lights for life jackets (cyalume sticks),
- Space blankets,
- Reflector tape,
- Siren/horn,
- Deck lights (red interior),
- Compass,
- Blacked-out radio aerial, and
- EPIRB.

WEATHER

Lots of excellent information is available about weather on the Bureau of Meteorology web site (http://www.bom.gov.au). In addition, the Bureau produces a worthwhile booklet called "Wind, Waves, Weather", which is part of a Boating Weather Series of booklets. Each state office has a book that focuses specifically on local marine weather conditions.

WINDS

Winds flow in order to more evenly distribute heat between the equator and polar regions. Wind direction and speed are determined by the patterns of highs, lows and fronts seen on weather maps and by local effects such as sea-breezes and thunderstorm downdrafts. When the isobars (lines of equal pressure) around highs and lows become more closely spaced, then winds increase. That is, the higher (or tighter) the pressure gradient, the stronger the wind speed.

Stronger wind speeds are associated with tropical cyclones, deep lows and cold fronts. Sudden squalls are associated with thunderstorms, heavy showers or the passage of a cold front or low pressure trough and can happen in clear skies (e.g. the Southerly Buster in NSW). The very strongest winds are caused by tropical cyclones, deep mid-latitude low pressure systems and tornadoes/water spouts.

DEFINITIONS AND TERMINOLOGY

- ***Wind speed*** mentioned in forecasts and coastal observations refers to the average speed over a 10-minute period at a height of 10 metres above the surface. It is given in knots. A knot (kn) is equal to a speed of one nautical mile per hour. *Note: 10 knots = 18.5 km/h and 10 km/h = 5.4 knots.*
    - **Gusts may be up to 40 per cent stronger than the average speed.**
- A ***squall*** is an abrupt and large increase of *wind speed* with a duration of the order of minutes which diminished rather suddenly.
    - ***Strong wind:*** 25 to 33 kn;
    - ***Gale force:*** 34 to 47 kn;
    - ***Storm force:*** more than 47 kn;
    - ***Hurricane force*** (used for tropical areas only)***:*** more than 63 kn ***(remembering these are all ten-minute averages).***
- ***Wind Direction*** is given in the 16 compass points and is the direction the wind is coming from.
- ***Wave height*** is vertical distance between the top of crest and bottom of trough.
- ***Wind (or sea) waves*** are generated by the local prevailing wind and vary in size according to the length of time a particular wind has been blowing, the fetch (distance the wind has blown over the sea) and the water depth.
- ***Swell waves*** are the regular longer period waves that were generated by the winds of distant weather systems. There may be several sets of swell waves travelling in different directions, causing a confused seas state.
- ***Sea state*** is the combination of wind waves and swell.
- The ***wave and swell heights*** described in Bureau observations and forecasts refer to 'significant wave heights' which represent the average of the highest one-third of the waves. Some waves will be higher and some lower than the significant wave height. **The probable maximum wave height can be up to twice the significant wave height.**
- ***King/Freak waves*** can occur when wind waves and/or a combination of swell waves join to produce a very high wave. These can be even higher than the probable maximum wave height, and can result from the added influence of currents, tides, distant weather systems and shape and depth of the seabed.

- ***UTC*** (Universal Time Coordinate): time references in warnings for high seas are given in UTC. Australian Eastern Standard Time is UTC + 10 hrs. Western Standard Time is UTC + 8 hrs.

BEAUFORT SCALE

Beaufort Number	Description	Wind speed range		Effect of wind on deep water	Effect of wind on land	Significant wave height range (m)	
		Knots	Km/hr			Lower limit	Upper limit
0	Calm	0	0	Sea is like a mirror.	Smoke rises vertically.	-	-
1	Light air	1-3	1-5	Ripples are seen.	Smoke follows wind but wind vanes are still.	-	<0.1
2	Light breeze	4-6	6-11	Small wavelets with glassy appearance form.	Leaves rustle, wind is felt on face and wind vanes move.	0.1	0.2
3	Gentle breeze	7-10	12-19	Large wavelets form and crests begin to break.	Leaves, small twigs are in constant motion and light flags extend.	0.2	1
4	Moderate breeze	11-16	20-28	Small waves with whitecaps form.	Dust and loose paper is raised and small branches move.	1	2
5	Fresh breeze	17-21	29-38	Moderate waves with many whitecaps form.	Small leafy trees begin to sway and inland waters form crested wavelets.	2	3
6	Strong breeze	22-27	39-49	Large waves start to form foam crests are widespread and some spray is evident.	Large branches are set in motion and whistling is heard in overhead wires.	3	4
7	Near gale	28-33	50-61	Sea heaps up and foam from breaking waves is blown in streaks along the wind.	Whole trees sway and there is little difficulty in moving against the wind.	4	6
8	Gale	34-40	62-74	Moderately high waves break and form well-defined streaks, known as spindrift.	Twigs break from trees and there is difficulty walking.	6	8
9	Strong gale	41-47	75-88	Large waves form, crests roll over, spray affects visibility and dense wind streaks appear.	Structural damage may occur in buildings and installations.	8	10
10	Storm	48-55	89-103	Very large waves with long overhanging crests tumble and sea is chaotic with dense white appearance.	Rarely experienced inland, but trees can become uprooted and severe structural damage in buildings may occur.	10	13
11	Violent storm	56-63	104-117	Small/medium sized ships are temporarily hidden by waves, wave crests blown into froth and visibility is heavily impaired.	Very rarely experienced, but when it does occur, it is accompanied by widespread damage.	13	16
12	Hurricane	over 63	over 117	Air is filled with foam/spray and visibility is severely impaired.	Widespread damage occurs.	16	>16

MARINE FORECASTS AND WARNINGS

Routine coastal waters and high seas forecasts and warnings are produced by the Bureau of Meteorology and broadcast by Telstra marine radio. They are also available from a variety of other sources.

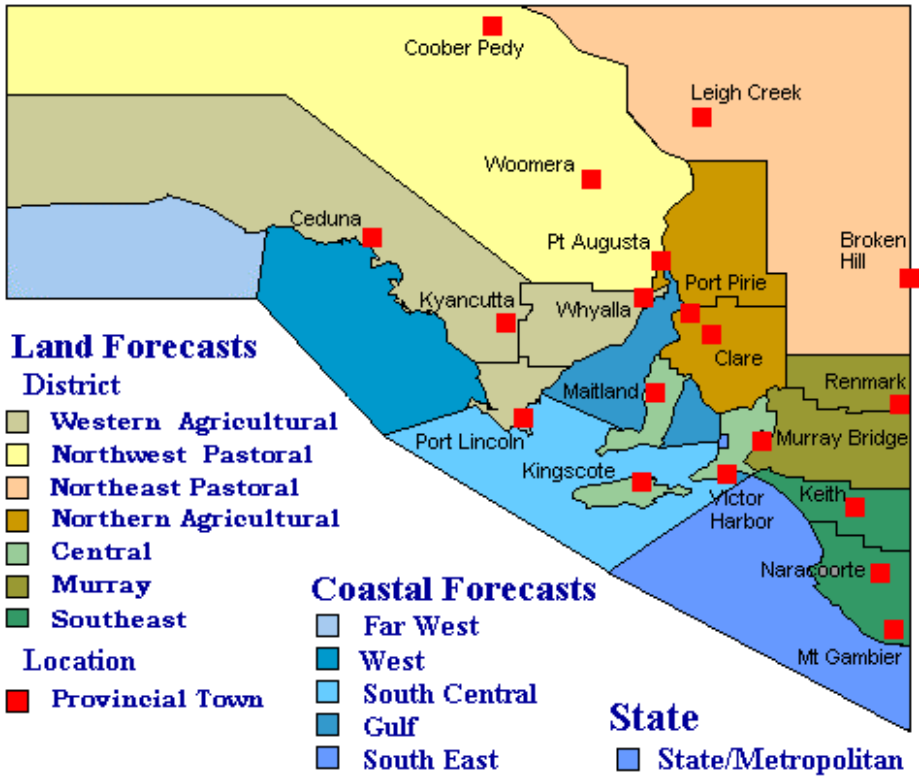
Routine Coastal Waters Forecasts are for areas within 60 nautical miles of the coast (see map for coastal waters sections). They are issued by Regional Forecasting Centres in each capital city several times daily and monitored continuously for changes which may occur.

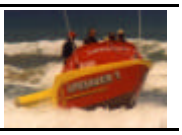
Routine High Seas Forecasts are issued twice daily by the Regional Forecasting Centres in Perth, Darwin, Brisbane and Melbourne for the areas beyond the coastal waters surrounding Australia.

Warnings for Coastal Waters are issued whenever strong winds, gales, storm or hurricane-force winds are expected. The initial warning attempts to provide a 12 to 24-hour lead-time and warnings are renewed every 6 hours.

Warnings to Shipping on the High Seas are issued whenever gale, storm or hurricane-force winds are expected. The initial warning attempts to provide a 12 to 24-hour lead-time and warnings are renewed every 6 hours.

NOTE: *Australian and International practice refers to weather system positions for marine use in DEGREES and TENTHS of a degree. For example 25.4 South is the latitude of twenty five decimal four degrees south, NOT twenty five degrees four minutes south. To convert the decimal to minutes, multiply by 60, i.e. 0.4 degrees = 24 minutes.*





FORECAST & WARNING DELIVERY SYSTEMS

Coastal Marine Radio

Telstra operates marine radio transmitters around the Australian coastline with marine (Coastal and High Seas) forecasts and warnings broadcast at scheduled times on the following frequencies: **2201, 4426, 6507, 8176, 12365 kHz, and VHF Channel 67** *(Some centres only. Check with Telstra for details)*

Broadcast schedules can be obtained from the Bureau's Weather By Fax and Internet services or from Telstra's Customer Service Centre on 1800 810 023. When a weather warning is issued it will be broadcast when first received, and then at scheduled broadcast times.

Public Broadcast Radio/TV Stations

The Bureau distributes coastal waters forecasts and warnings to the ABC and commercial networks (both city & country stations). Broadcasting of these varies between stations.

Recorded Telephone Services

The Bureau operates a number of recorded services via Weathercall for coastal waters forecasts and warnings. Call costs for 1900 services are 77c per minute (including GST) - higher from mobile and public phones. Check your local telephone directory, dial 1900 926 113 or poll Weather By Fax on 1902 935 254 for a list of your local numbers. Services are:

- **Local Waters Forecasts:** Supplied for capital city boating.
- **Severe Weather Warning Service:** Marine and land based warnings.
- **Marine Forecasts:** Full coastal waters forecasts and latest actual reports.

Bureau of Meteorology Marine Weather Radio Broadcasts

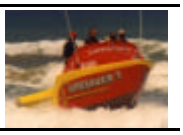
The Bureau of Meteorology issues radio bulletins of marine weather forecasts, warnings and coastal observations over Telstra Australia's coast radio station network on HF/MF frequencies for the high seas and coastal waters. Bulletins for coastal waters are also broadcast on VHF channels over Telstra's Seaphone network.

Broadcasts are also made via Inmarsat satellite, as part of the international Maritime Safety Information broadcast service to shipping, under the Global Maritime Distress and Safety System (GMDSS). Inmarsat-C communications equipment is required for these broadcasts to be received.

HF Voice & VHF Coastal Waters Weather Warnings Broadcast Schedule

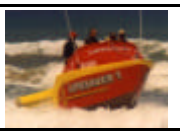
Broadcasting Station	**Coastal Areas**	**Times** (Local Standard Time)
Melbourne (VIM)	Victoria/Tasmania/South Australia	48 minutes past each odd hour

Note: Warnings are included in the scheduled weather broadcast and on receipt in both HF voice and VHF transmissions.

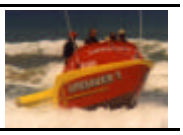


GLOSSARY

Term	Definition
"V" distress sheet	Orange plastic sheet with a large black "V", which, when displayed, indicates that people on board require assistance. Normally used to signal to aircraft. Internationally recognised distress signal.
27MHz	Radio operating on 27MHz wavelength – normally tuned to channel 16/88
Aerial	See **Antenna**
Ahead	To go forward, or in front of the boat.
Amidships	Nozzle centred
Antenna	
Astern	To go backward, or behind the boat.
Bow	Front of the boat.
Bucket	See **Thrust deflector**
Crew	Person, or persons, assisting the driver in the operation of the boat.
Deck	Floor of the boat.
Diver Below Flag	Internationally recognised flag that warns of divers operating in the area.
Driver	Person responsible for driving the boat, and in charge of the **Crew**.
Duckboard	Flat plate attached to the outside of the transom at the back of the boat.
Emergency	
EPIRB	Emergency Position Indicating Rescue Beacon
Fender	Inflated rubber tube attached to **Gunwale**. Designed to protect boat from damage when coming alongside another boat or jetty.
Flare	Hand held pyrotechnics used for signalling in day or night in the event of an emergency. Varieties – smoke, flare or parachute flare.
GPS	Global Positioning System – satellite navigation system.
Gunwale	Sides of the boat.
Horn cleat	
Jet intake	Screened opening that allows water to be drawn into the **Jet unit**, while filtering out foreign objects.
Jet unit	The propulsion system that allows the boat to move forward, backward or from side to side.
JRB	Jet Rescue Boat
Lanyard	Any cord attached to an object that will allow that object to be made fast to another fixed object.
Motor	Petrol or diesel fuelled engine that drives the **Jet unit**, which in turn propels the boat.
Painter	A line attached to bow and/or stern of the boat, used to make it fast when coming alongside.



Term	Definition
Port	Left side of boat when looking towards the front of the boat.
Sand anchor	
Scupper	Hinged flap set into the **Transom** that allows water to drain off the **Deck** over the **Duckboard**.
Shackle	
Ski rope	
Starboard	Right side of boat when looking towards the front of the boat.
Stern	Back of the boat.
Strobe	High intensity flashing distress beacon
Thrust deflector	Control that deflects the boat's thrust forward, downward or behind the boat
Towing bridle	
Transom	
UHF	Ultra High Frequency radio
VHF	Very High Frequency radio
Waypoint	A position such as a fishing spot, favourite anchorage, dive location and trip destination that can be saved in the GPS's memory.
Mark	A temporary waypoint.
Route	Two or more waypoints that can be linked in sequence in the GPS to form a route.
Leg	A leg is the division of a route between waypoints.



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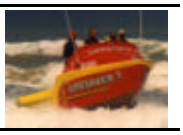

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