2018

SMALL POWERBOAT & RIB MASTER
&
ICC 10 METER POWER

2018 VERSION

MCA Recognised Course for Commercial Certificate of Competency
Master of Small Power Boat or RIB <15m in length <20nm from Safe Haven and
International Certificate of Competency <10M Power

Canadian General Standards Board Approved: ISO 9001:2015 Quality Management System

Maritime & Coastguard Agency

Training course recognised by the MCA

International Yacht Training
WORLDWIDE

Created December 3, 2018

LIST OF IYT COURSES

Recreational Courses

Dinghy Sailing - Bronze Level – Start Sailing
Dinghy Sailing – Silver Level – Safe Sailing
Dinghy Sailing – Gold Level - Independent Sailing
Dinghy Sailing – Platinum Level – Perfected Sailing
International Yacht Racing
Introduction to Yachting
International Crew Power or Sail
International Bareboat Skipper Power or Sail
VHF Radio Operator
Personal Watercraft Operator (PWC)
Small Powerboat & RIB Master (MCA Approved)
Powerboat Skipper
Navigation Master
Weather Master
International Certificate of Competency <10m Power Coastal
International Certificate of Competency <10m Power Coastal & Inland
International Certificate of Competency <24m Power Coastal
International Certificate of Competency <24m Power Coastal & Inland
International Certificate of Competency <24m Sail & <10m Power Coastal
International Certificate of Competency <24m Sail & <10m Power Coastal & Inland
International Certificate of Competency PWC Coastal
International Certificate of Competency PWC Coastal & Inland
Yachtmaster Coastal Power or Sail
Yachtmaster Offshore Power or Sail
Yachtmaster Ocean
IYT Commercial Tender License

Professional Courses

VHF Radio Operator
Small Powerboat & RIB Master (MCA Approved)
Superyacht Crew
Professional Superyacht Hospitality
Superyacht Chef
STCW Elementary First Aid
STCW Basic Fire Prevention & Fire Fighting
STCW Proficiency in Maritime Security Awareness
STCW Personal Survival Techniques
STCW Personal Safety & Social Responsibilities
Master of Yachts Coastal/Mate 200 Tons
Master of Yachts Limited

Master of Yachts Unlimited
Master of Yachts Inshore < 80gt.

Diveboat Master Courses

Diveboat Coxswain
Diveboat Mate
Diveboat Master
Diveboat Operator Specialist (DOS)

Commercial-Tactical-Rescue

Marine Police Powerboat Operator –Crew
Marine Police Powerboat Operator –Coxwain
Marine Police Powerboat Operator –Commander
Fast Rescue Boat
Inshore Master < 80gt.

We also offer instructor courses for all levels of training.

PREFACE

The certificates you will/may receive after successful completion of this course,

- **IYT's MCA Approved Small Powerboat & RIB Master**, allows operation of a craft up to 15 meters, driven by outboard/s, no HP Limit, without accommodation and up to 20 miles from a safe haven. It complies with the MCA's Small Commercial Vessel Code for Boat Handling & Communications.

- **"VHF-SRC Course Completion Certificate" –** this may be used as proof of sufficient knowledge to obtain an IYT / MCA 10m Power ICC. It is not a "certificate of competency".

- **IYT / MCA 10m Power International Certificate of Competency -** Provided the school with which this course has been untaken is approved by IYT to order ICCs for their candidates, the candidate will be entitled to this additional certificate.

    - One must be at least 16 years of age to receive an ICC certificate as stated in the IMO's Resolution 40 Annex I under "Requirements" heading.

While every effort has been made to insure their accuracy, they are designed to be accompanied by additional materials that contain local navigation knowledge, sources of weather information, local tides, currents and weather conditions as applicable to the area of operation.

This course will introduce students to the basics of small power boats or dinghies and rigid inflatable boats (RIB), rules of the road, safety on board, engine checks, maintenance and various boat handling skills. The objective of the course is to develop the skills and gain the knowledge to safely handle small boats or dinghies. Whether simply spending a day out on a lake or bay, or crossing an ocean, there is no substitute for safety, common sense and a good foundation of knowledge.

A substantial part of the training will rely on the "hands on" practical application of the theory modules which will be taught by your practical instructor.

Amendments

Amendments and updates to the Publication will be published as and when necessary. Edition number and date will be noted on the footer of each stage.

Any comments or suggestions for this document should be directed to International Yacht Training. Please e-mail: support@IYTworld.com or telephone Canada +1 778-477-5668.

Publication information

At the end of each chapter this is a series of questions that are designed to prepare you for the final ICC written examination. It is important that you memorise the answers to these questions to the best of your ability.

If any copyright images or content have been posted in these notes in error, please inform us via e mail support@iytworld.com and they will be removed immediately with our apologies.

Publication Authority

International Yacht Training Worldwide
Suite 482, 9-3151 Lakeshore Road
Kelowna, British Columbia, V1W3S9
CANADA

TABLE OF CONTENTS

Module 1 INTRODUCTION TO NAUTICAL TERMINOLOGY

1.1 Key Objectives

THE OBJECTIVE OF THIS MODULE IS TO INTRODUCE THE STUDENT TO NAUTICAL TERMINOLOGY THAT IS USED ON A DAY-TO-DAY BASIS. IT IS A VAST SUBJECT AND THERE IS ENOUGH NAUTICAL TERMINOLOGY TO FILL AN ENTIRE BOOK.

1.2 Types of Vessels

CABIN CRUISER

A motor yacht designed for living aboard and can have single or multiple engines.

RIB (RIGID INFLATABLE BOAT)

A lightweight high-performance boat often used for rescue and/or transporting guests ashore from cabin cruisers and superyachts.

SAILBOAT

A sailing vessel is a boat that is driven by the power of the wind and may be fitted with an auxiliary engine.

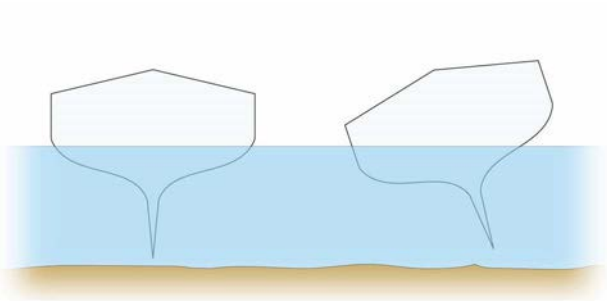
1.3 Sailing Vessels

SAILING DINGHY

A sailing dingy is a small boat with a center keel, mainsail (sometimes a jib sail) and is steered using a tiller/rudder. The wind is the only means of propulsion.

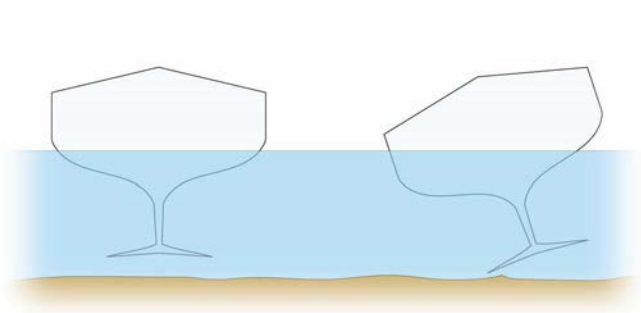
SLOOP

A sail boat with a single mast and a fore-and-aft rig (sails).



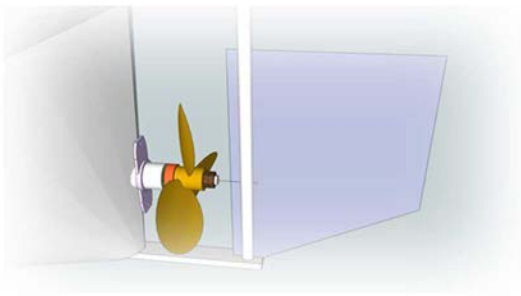
FIN KEEL (SAILBOAT)

A fin keel is a projection from the bottom (hull) of a vessel to give it additional stability and is generally made of lead.



WING KEEL (SAILBOAT)

Winged keels are generally found on sailboats that sail in shallow waters. They are only of benefit for yachts sailing upwind where stability and the ability to produce side force are important and where the depth of the water is

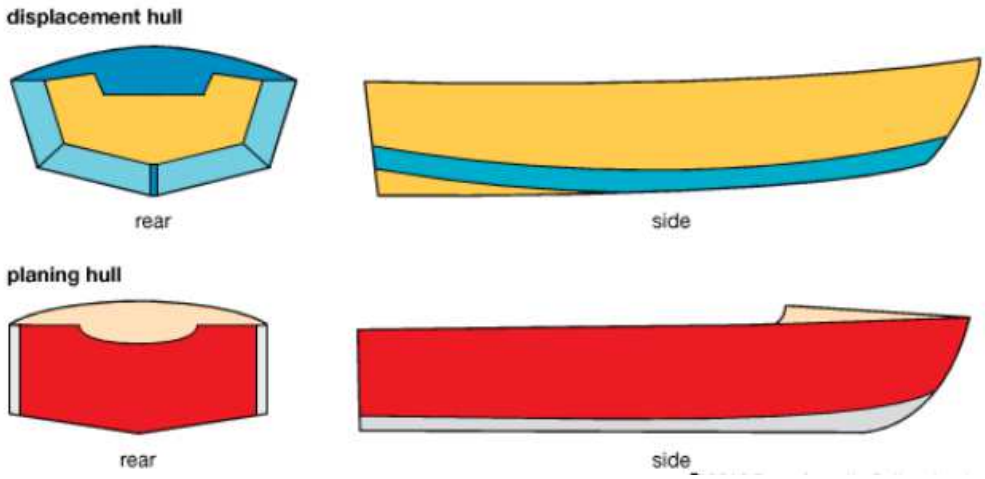


RUDDER

A rudder is a primary control surface used to steer a ship, boat, submarine or hovercraft.

1.4 Hull Types

The "hull" is the bottom of the boat. There are many types of vessel with an assorted combination of hull and engine configurations.

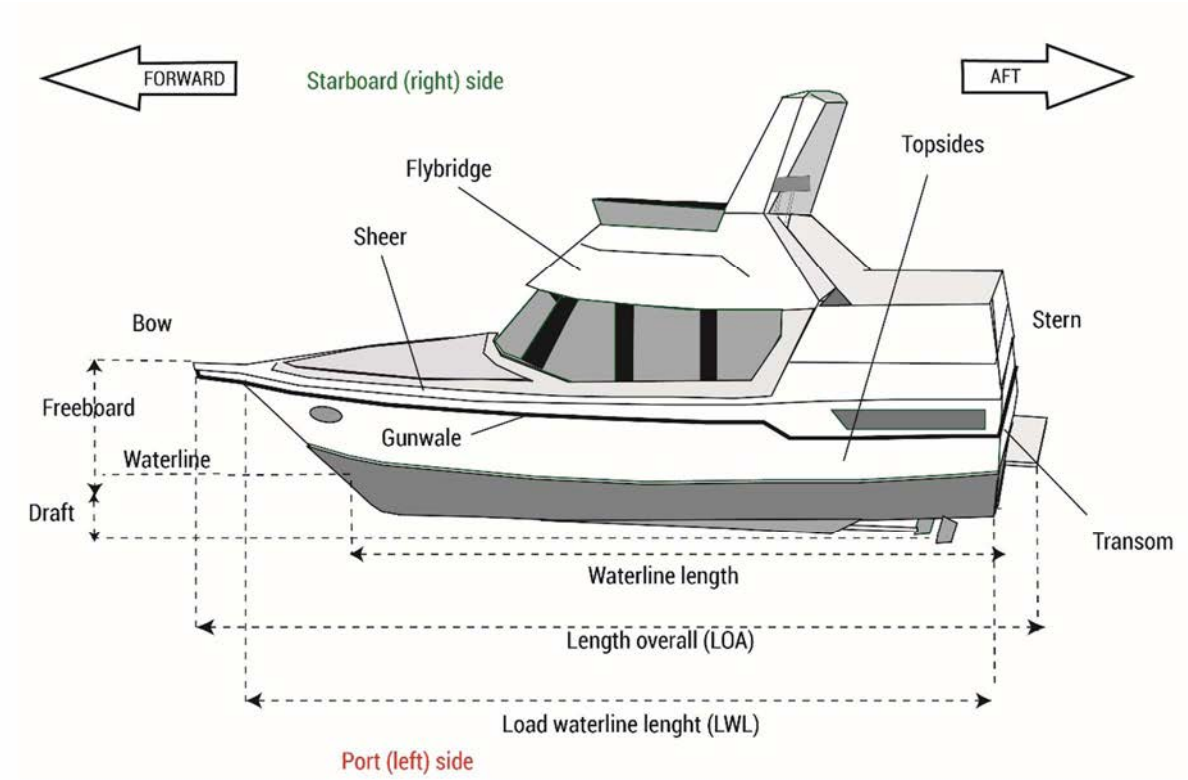


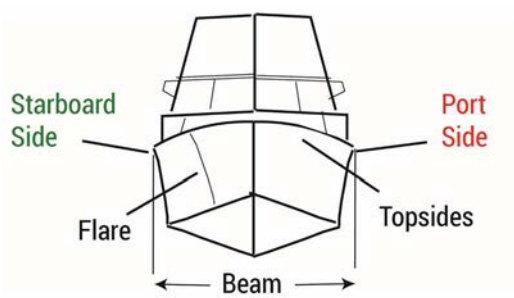
HULL TYPES

Displacement hulls are designed to power through the water. They are mostly found on sailing boats and trawler type boats. The advantages of a displacement hull are lower power requirements than a planning hull, allowing a longer cruising range and increased load carrying ability.

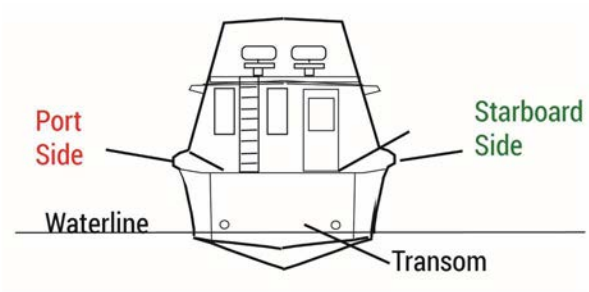
Planing hulls are designed to glide on the water's surface as the boat's speed increases. The advantages of a planing hull are shorter journey times, but the disadvantage is the power needed to get a boat onto the "plane" and the amount of fuel required to do so.

Parts of a Vessel and Nautical Terminology





POWERBOAT FROM BOW



POWERBOAT FROM STERN

1.5 General terms to define a vessel

Length overall (LOA) - The overall fore and aft length of the hull.

Waterline - The line where the surface of the water reaches on the hull.

Load waterline length (LWL) - The fore and aft length of the hull measured at the waterline.

Beam - The width of a vessel at its widest point.

Freeboard - The height of the side of a vessel above the water.

Draught - The depth of the lowest part of the vessel in the water.

Design waterline – The waterline when a boat is at its recommended gross load capacity.

Keel - A weighted projecting fin fixed on the centerline of a vessel which provides stability and reduces sideways drift.

Gross Tonnage (GT) - is a measurement of a ship's overall internal volume. Gross tonnage is calculated by measuring a ship's volume and applying a mathematical formula. 100 cubic feet is 1 gross ton.

Operate – to control the speed and course of the boat.

The area of the vessel that is below the waterline is painted with a special paint which inhibits growth of weed and shell fish and is called "antifouling paint".

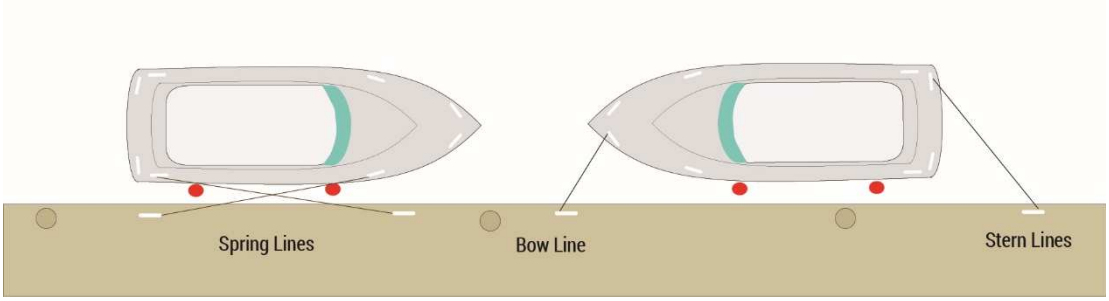
1.6 Deck Equipment and Fittings

CLEAT

A cleat is a device device attached to the deck and boat for securing a line

FAIRLEADS

A fairlead is a device to guide a line, rope or cable around an object, out of the way or to stop it from moving laterally. Typically, a fairlead will be a ring or hook.



DOCKING DIAGRAM / CLEATS ON DOCK AND BOAT

Docking Lines - required to secure a vessel properly are:

- Bow line. A line that is lead forward from the bow of the boat.
- Stern line. A line that is lead aft from the stern of the boat.
- Spring lines. One line leads from the bow of the vessel aft of midships to the dock and one from the stern of the vessel lead forward of midships to the dock. These stop the boat moving fore and aft and should be taut.

FENDERS

In boating, a fender is a bumper used to absorb the kinetic energy of a boat or vessel berthing against a jetty, quay wall or other vessel. Fenders are used to prevent damage to boats, vessels and berthing structures.

MOORING BUOY

A mooring buoy is anchored to the lake or sea floor and is used to secure a vessel for short stays.

POWERBOAT FOREDECK

The foredeck is the deck area in front of a mast on a sailboat or in front of the cockpit on a motorboat

POWERBOAT PULPIT

On most boats there is usually a metal frame around the bows called the "pulpit".

HATCH

An opening in the deck that gives access to the space below.

BIMINI ON POWERBOAT

A bimini is a canvas canopy to shade an area of deck or cockpit from the sun.

WINDLASS FOR HAULING ANCHOR

A windlass is a winch which is positioned on the foredeck and used for hauling in anchor chain and rope. They can be either manual or electric.

ANCHOR

A device attached to rope or chain which is lowered to the seabed to hold a vessel in place.

CONSOLE

The steering console is where the steering wheel, instrumentation and throttle control are located.

THROTTLE CONTROL

The throttle control/transmission control selects forward, neutral and reverse gears and controls propeller speed.

ANCHOR LOCKER

The anchor locker is where the anchor and anchor chain and rode (line) is stored.

THRU-HULL FITTING

Thru hull fittings are designed to allow water to pass through them from inside a boat, such as the sinks, toilets and for engine water cooling.

WATER PUMP

Water is delivered on small vessels to taps or faucets which have a pump attached. This may be a simple hand pump on the faucet or a foot pump located beneath the sink. On larger vessels the water system is pressurized by means of an electric water pump. This pressurized container is called an accumulator and prevents the water pump from activating every time a faucet is switched on.

ELECTRIC & MANUAL BILGE PUMPS

BILGE FLOAT SWITCH

On all boats there is an accumulation of water at the bottom of the boat, and sometimes oil and other liquids accumulate in the lowest part of the vessel known as the bilge. There are two types of bilge pumps, manual and electric, that are used to pump out this water.

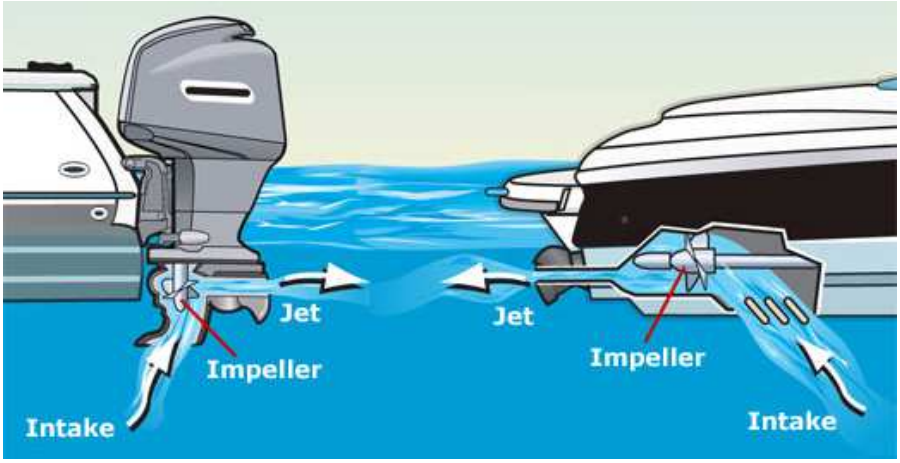
Manual pump - mounted so that a crew member can manually pump overboard any water which has accumulated in the bilges.

Electric pump - operated by pushing a switch and does the same job as a manual pump. Often bilge pumps are operated by a float switch, this works on a simple principal that when the water rises the float on the switch rises which turns on the pump.

1.7 Engine & Drivetrains

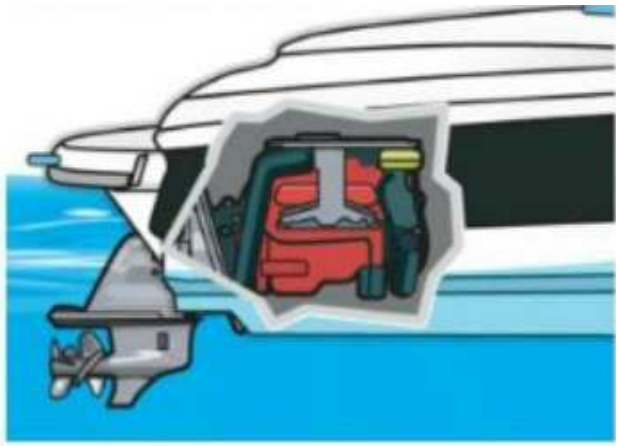
Outboard motors are by far the most popular type of motor for small craft. They are a demountable self-contained unit available in 2 stroke or 4 stroke configurations with a wide range of power/size applications. Easily removed for maintenance, storage and cleaning, they have the ability to be raised/tilted hydraulically or manually for shallow water operations.

An **inboard motor** is a marine propulsion system for boats. As opposed to an outboard motor where an engine is mounted outside the hull of the craft, an inboard motor is an engine enclosed within the hull of the boat, usually connected to a propulsion screw by a driveshaft.

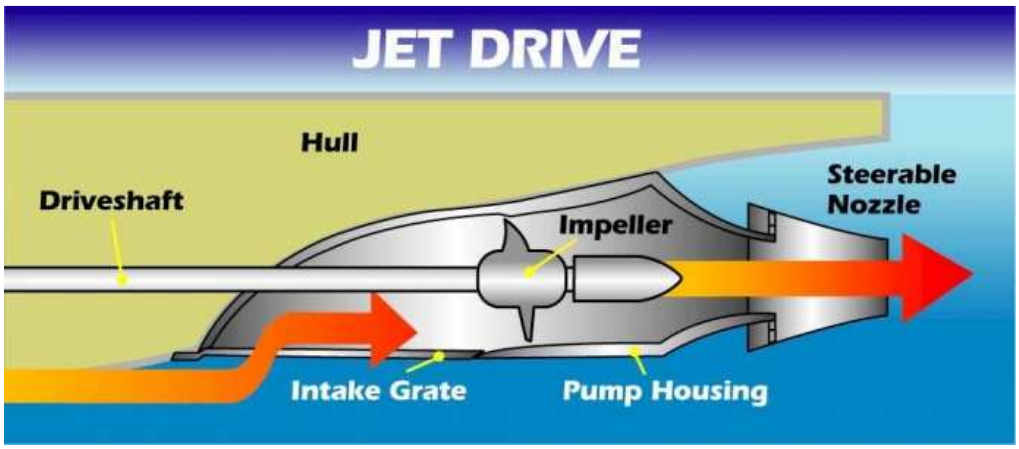


OUTBOARD (LEFT) & INBOARD (RIGHT)

A **sterndrive** or "inboard/outboard" is a form of marine propulsion which combines inboard power with outboard drive. The engine sits just forward of the transom while the drive unit (outdrive or drive leg) lies outside the hull.

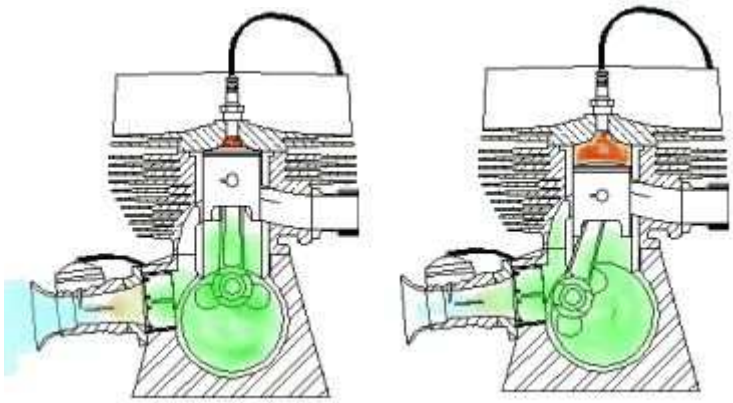


STERNDRIVE (INBOARD/OUTBOARD)



JET DRIVE

A **jet drive** is a propulsion system that does not have propellers, which are a potential danger to people in the water and to marine life. Jet drives are usually inboard engines that take in water that flows through a pump powered by an impeller. The water is then discharged at high pressure through a nozzle propelling the boat forward. The nozzle swivels to provide steering to the boat. All personal watercraft use jet drives.



2 STROKE ENGINE DIAGRAM

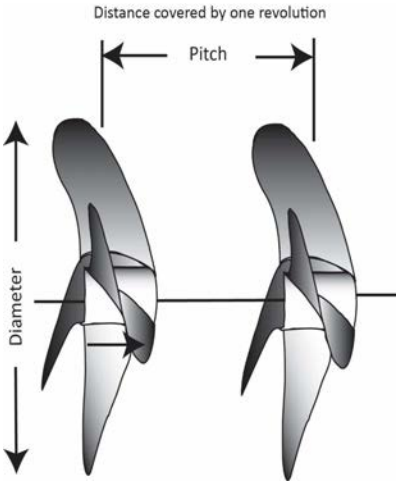
A two-stroke, or two-cycle, engine is a type of internal combustion engine which completes a power cycle with two strokes (up and down movements) of the piston during only one crankshaft revolution. This is in contrast to a "four-stroke engine", which requires four strokes of the piston to complete a power cycle.

PETROL OUTBOARD ENGINE

A petrol engine (known as a gasoline engine in North America) is an internal combustion engine with spark-ignition, designed to run on petrol (gasoline).

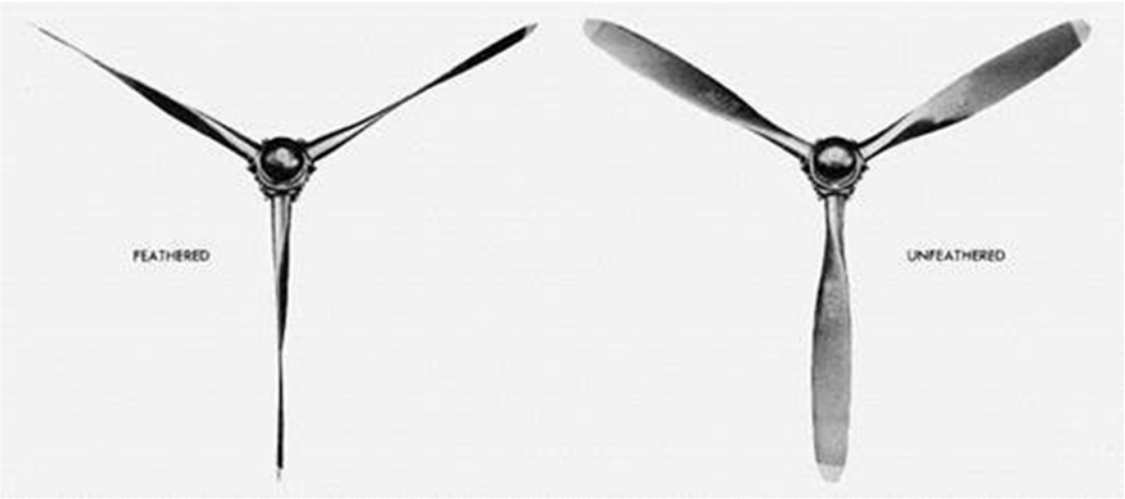
MARINE DIESEL ENGINE

The diesel engine (also known as a compression-ignition or 'CI' engine) is an internal combustion engine in which ignition of the fuel that has been injected into the combustion chamber is initiated by the high temperature which a gas achieves when greatly compressed (adiabatic compression). This contrasts with spark-ignition engines such as a petrol engine (gasoline engine) or gas engine which use a spark plug to ignite an air-fuel mixture.



PROPELLERS

A power driven vessel requires an engine or engines to drive a “propeller” commonly known as a “screw” which is a rotating device with a number of different “blades”, from 2 to 5 depending upon hull type and performance requirements. Propellers are classed by 3 different features- “hand”, “diameter” and “pitch”. For example a 3 bladed prop may be R 10” x 28” which means it will turn “right hand” or clockwise in forward gear, has a diameter of 10 inches and the pitch (the angle that the blades are set) is 28 inches which is the (theoretical) distance the prop would travel in one rotation.



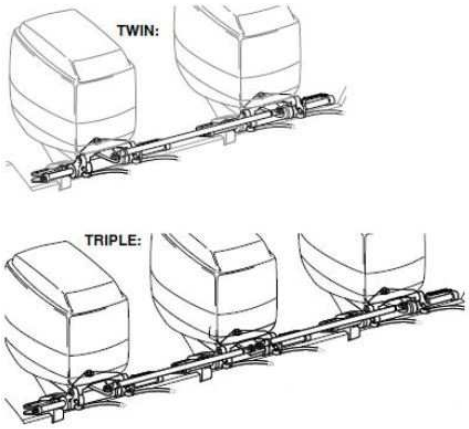
FEATHERING PROPELLERS

Feathering the propellers is changing the propeller blade by angling the blades parallel to airflow or water flow.

1.8 Inflatables and RIBS

KILL CORD

A kill Cord is an engine cut-out device, one end of which is attached to a switch near the throttle and the other to the driver's wrist. In the event of the helmsman falling overboard this device will stop the engine.



MULTIPLE OUTBOARD ENGINES

Outboard engines can be easily removed for maintenance, storage and cleaning they have the ability to be raised/tilted hydraulically or manually for shallow water operations. They are attached to the transom (stern) of a boat.

Boats may have more than one outboard engine.

1.9 Instruments and Electronics

Not all vessels will be equipped with all the instruments discussed below. There are many different types and makes of instruments but the information they relay is the same.

The Magnetic Compass

The compass is perhaps the most important instrument on a boat. It is essential for navigation when out of sight of land, during the hours of darkness and at times of restricted visibility, e.g. fog, rain etc. where the compass is used to steer pre-determined magnetic courses. A hand-bearing compass is also used for some position fixing techniques which will be covered in greater detail in a further module.

GIMBALLED COMPASS

HAND-BEARING COMPASS

How does a Compass work?

A magnetic compass is an instrument used to find direction. All magnetic compasses operate on the same principle; the compass is simply a circular card, graduated with 0º - 360º (degrees) marked on its circumference and supported on a pivot point in a sealed bowl filled with a water/alcohol mixture which dampens or slows the movement of the card on the pivot. Two or more bar magnets are attached to the underside of the card, aligned to the north/south (0º - 180º) axis of the card. The bar magnets in the instrument follow the magnetic lines of force that circle the earth and the compass card "north point" will always point to the north magnetic pole. (These lines of force are generated by the earth's magnetic field).

The compass is "gimbal" mounted which means that no matter how the vessel heels/rolls or pitches the compass card will remain level.

GIMBALLED COMPASS

Compass Direction

When a vessel is traveling through the water, the direction it is heading is known as the "course". In order to help determine the direction of travel, a vessel will use a compass which is divided into 360º (degrees) and points to the magnetic north pole. Any object may be described in terms of a "compass bearing" from the vessel, such as another vessel sighted at 45 degrees off the starboard bow where zero degrees represents magnetic north.

Depth Sounder

DEPTH SOUNDER

A depth sounder determines the depth of water beneath a vessel. The equipment comprises of a transmitter with a digital or pictorial display screen close to the helm, and a transducer sensor mounted through the vessels hull near the bottom of the hull. The transmitter sends pulses through the transducer, which picks up the returned pulse after it has “bounced” off the sea floor. The time the returning echo takes to return is interpreted by the transmitter, which displays the water's depth on the screen.

BAROMETER

Barometer

A barometer is an instrument which indicates the atmospheric pressure. A single reading of barometric pressure gives no worthwhile information, it is the rate of change of pressure that is important in itself and this can only be gained from a series of readings, hence the importance of recording barometer pressure on a regular basis in the boat's log book. A "barograph" is available which records the pressure variance either on paper charts or electronically.

GPS SYSTEM

Log

The log is an instrument for measuring the vessel’s speed through the water. Boat speed is usually measured in “knots” (nautical miles per hour, which is approximately 2000 yards per hour). One "knot" is approximately 1.15 statute miles. The navigator uses this to determine how far the vessel has traveled and to estimate likely arrival time at the destination.

HANDHELD GPS

GPS (Global Positioning System)

GPS is a global navigation system using radio signals from a transceiver which communicates with a number of satellites and automatically computes the

vessels location, heading and speed. The transceiver will have a display mounted close to the helm. There is a digital read-out of the vessel's speed and position (Latitude and Longitude) together with additional information for use by the navigator. The GPS receiver may have a charting function or may be connected to a "Chart Plotter" which will show the position of the vessel graphically on a chart displayed on the screen.

Relative Direction

When on board a vessel, there are correct ways of describing the location of surrounding objects. These are known as "relative bearings" and are based on the direction of the object in relation to the vessel. For example, an object directly in front of the vessel is referred to as "dead ahead" and one directly behind as "dead astern". Any object at 90 degrees to the vessel is known as "abeam". This can be abeam to port or abeam to starboard.

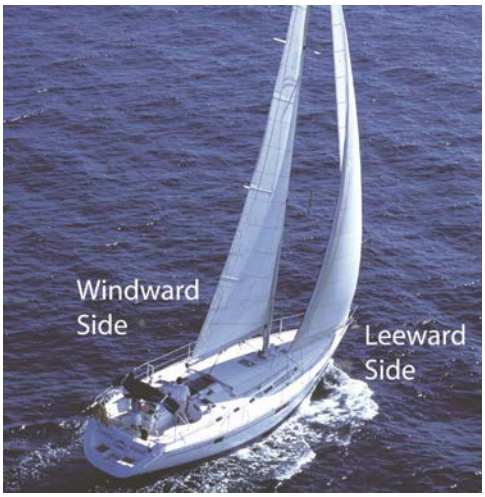
Wake

A wake is the region of disturbed water flow caused by a vessel passing through the water. Generally speaking, the faster a boat travels the larger the wake it produces. (except in the case of planning hulls which ride on top of the water)

1.10 Windward/Leeward

On a vessel, reference is made to the direction from which the wind is blowing relative to the vessel, the side of the vessel from which the wind blows is known as the "windward" side, whilst the opposite side is known as the "leeward" side.

WINDWARD & LEEWARD - POWER



WINDWARD & LEEWARD - SAIL

1.11 Knowledge Review

1. Name 4 types of vessels or boats.

2. What system of propulsion is used on a PWC?

3. Describe:
    a. Length Overall (LOA)
    b. Freeboard
    c. Stern
    d. Bow
    e. Draught
    f. Port
    g. Starboard
    h. Keel
    i. Operate
    j. Cleats
    k. Fairleads
    l. Springline
    m. Pulpit
    n. Foredeck
    o. Thru Hull Fitting
    p. Kill Cord
    q. Relative Direction

4. What is the function of a rudder?

Module 2 INTRODUCTION TO PERSONAL SAFETY EQUIPMENT

2.1 Key Objectives

THE OBJECTIVE OF THIS MODULE IS FOR ALL CREW MEMBERS TO HAVE A THOROUGH UNDERSTANDING OF THE IMPORTANCE OF LIFEJACKETS AND ALL OTHER PERSONAL SAFETY EQUIPMENT, ITS OPERATION AND CORRECT STOWAGE.

2.2 Life Jackets / Personal Flotation Devices (PFDs)

1) There should be at least one lifejacket per person on board every vessel. The sizes of lifejackets must be correct for each size passenger, including appropriate small sizes for any children.

2) A life jacket is designed to support a person's weight with their head turned upward with nose and mouth above the water. **They must be readily accessible at all times and must not be locked away in cupboards or lockers.**

3) **Wearing a PFD or lifejacket at all times when boating is the highest safety priority in preventing boating deaths. Not wearing a PFD could cost you your life. Test your flotation device as per manufacturer's instructions.**

4) **There are many different types and designs of lifejackets. SOLAS lifejackets are the most internationally accepted.** Unlike other lifejackets, all SOLAS lifejackets are equipped with a whistle, a light and reflective tape and come in two sizes, over 32kg (70 lbs) and less than 32kg (70 lbs).

5) SOLAS, which stands for Safety of Life at Sea is a convention that was introduced by the International Maritime Organisation (IMO) after the sinking of the Titanic in 1912.

6) The jacket is placed over the wearer's head and is then tied or clipped around the front and sides. The buoyancy may be provided by a solid material that has extremely buoyant properties, or by CO2 or a combination of both. Some CO2 filled jackets have an automatic inflation device which inflates when the lifejacket is submerged in water. To ensure correct size and buoyancy, all crew should test them

SOLAS APPROVED LIFEJACKET

in the water either by holding onto a swim platform or entering the water from a beach.

Only a lifejacket will turn an unconscious person face-up in the water, a PFD will not do this.

INFLATABLE LIFEJACKET

ADULT STANDARD LIFEJACKET

A standard type lifejacket will turn most unconscious wearers face up in the water and come in two sizes:

- Over 40 kg (88 lbs)
- Less than 40kg (88 lbs).

POUCH TYPE LIFEJACKET

AUTOMATIC INFLATING LIFEJACKET

These can be inflated by mouth or by pulling the toggle that activates a CO2 gas cartridge inflation system.

These inflate automatically when immersed in water. They may also be inflated manually by pulling the toggle. **They are not permitted for sports such as water skiing where they may get saturated as this will cause the jacket to inflate.**

2.3 Buoyancy Aids or Personal Flotation Device (PFD)

Buoyancy aids are designed to provide buoyancy but **will not turn an unconscious person upright** or provide as much support as a lifejacket. They are mainly used for watersports such as windsurfing, dinghy sailing, water skiing and kayaking. They are best suited to inland waterways, coastal operations and calm waters where there is a good chance of quick recovery. They are useful on smaller vessels where bulky life jackets may be impractical. Generally, they are the most comfortable for continuous wear and are available in many colors and styles. All PFDs must be kept in operable condition by regular checks and maintenance.

BUOYANCY AID OR PFD

Inflatable PFD's are ideal for dinghy sailing and sailing vessels that require unhindered movement for hoisting and lowering sails and the use of winches. These are preferred by sailing yachtsmen and women throughout the world, especially when yacht racing. These require regular inspection, especially the CO2 cartridge as it will need to be replaced from time to time (see manufacturer's guidelines).

2.4 Children's Lifejackets and PFD

Ensure that children's lifejackets or PFS are specifically designed for use by children. A child's lifejacket or PFD should have the following:

- An extra-large collar to support the head.
- A safety strap that fastens between the legs which prevents it from slipping over the child's head.
- A grab handle/strap on the collar.
- Reflective material

Children's life vests have a crotch strap on them to prevent them from rising over the child's shoulders and it is imperative that this strap is fastened prior to entering the water.

Remember that a PFD should never be considered a flotation device suitable as substitution for adult supervision. The lifejacket or PFD must fit the child properly.

CHILDREN'S LIFEJACKET

CHILDREN'S PFD

2.5 Maintaining Lifejackets and PFD

Boaters must be responsible for regular care and maintenance of lifejackets and PFDS.

Care of Lifejackets and PFD

- Inspect regularly, checking buckles, straps and zippers. If ripped or damaged they must be replaced immediately.
- They should be air-dried out of direct sunlight or direct heat source.
- When not in use, store in a dry well-ventilated area onboard.
- Do not store in the proximity of chemicals or petrol (gasoline).
- Never use as cushions or fenders as this can damage and make less effective.
- For PFDS see the owner's manual for specific care instructions.

How to Clean Lifejackets and PFD

- Use mild soap and water
- Rinse thoroughly
- Never use solvents, strong detergents or gasoline
- Air dry out of direct sunlight or direct heat source.

2.6 Safety Harnesses

Mainly used on sailing vessels, safety harnesses are worn by crew members when on deck in bad weather, at night and by request of the skipper. The harness comprises a webbing shoulder strap and waistband which are adjustable, and a tether of rope or webbing (usually about 2 to 3 meters long) which has a carabineer clip on both ends. The crew member clips on to strong points onboard the vessel or onto a "jack stay" which runs along the deck of the vessel from bow to stern and is usually made of webbing or steel cable.

SAFETY HARNESS

2.7 Horseshoe Buoy / Ring Buoy or Lifebuoy

These are type 4 personal flotation devices and are lightweight, highly visible and are throwable in the event of a man overboard situation. They are designed to be thrown to a conscious person in the water to assist in keeping them afloat while the vessel manoeuvres to recover the person. All vessels that venture offshore should be equipped with at least one.

HORSESHOE BUOY

They will generally have reflective tape attached for night visibility and a buoyant heaving line attached to pull the person in the water back onboard.

RING BUOY

2.8 Lifesling & A Heaving Line

This is another type of throwable man-overboard (MOB) recovery device. It is normally attached to the stern rail or transom of the vessel. Commonly used aboard sailing vessels, they are deployed by opening the bag and throwing the sling into the water. Forward momentum of the vessel will draw out a long line. The vessel is then maneuvered in a wide circle around the MOB enabling the person to grasp the line and work their way back to the boat. The person places the sling under their arms and when ready, the crew will pull the line in and pull the person back on board. Getting the person back on board may require the lowering of a swim ladder or may require the use of a winch or halyard.

LIFESLING

2.9 Immersion Suit

Immersion suits are used in extreme cold weather and are used when abandoning ship. They are designed to be worn over your clothes and cover your entire body (except for your face) and can sustain life in very cold temperatures thus avoiding hypothermia. They do not need to be carried on board vessels in warmer climates or where thermal protection is unnecessary.

IMMERSION SUIT

2.10 Buoyant Heaving Line

A buoyant heaving line is used to rescue a man overboard. It is usual for the heaving line to be equipped with a weighted plastic shell at one end which enables it to be thrown with less difficulty. It is recommended that buoyant heaving lines be 15 meters in length for craft under 24 meters in length. They must be readily accessible at all times in case of emergency.

BUOYANT HEAVING LINE

2.11 Safety Brief / Suitable Clothing

Before heading out on a boat it is important to wear suitable clothing and footwear for the type of boat you will be operating and the weather conditions that you are likely to encounter.

WATERPROOF CLOTHING

In colder climates it is very important to wear multiple layers of clothing, with gloves and a hat to retain your body heat.

Waterproof clothing is essential if sailing offshore or operating in big seas where sea spray is a constant event.

Warmer or tropical climates will require staying cool and covering bare skin with light clothing and a hat where excessive sunshine is a problem. Sun screen, lip balm, sunglasses and plenty of drinking water are essential to prevent dehydration & heatstroke. Heatstroke is a serious condition and its symptoms include vomiting, nausea, dizziness, weakness, fatigue and muscle cramps. Treatment includes removing excessive clothing, cooling the body down with cold water, placing icepacks under the arms and groin to reduce body temperature. It is essential to drink lots of water as heatstroke also causes dehydration.

Suitable footwear is required with sailing shoes recommended for their grip and to prevent stubbing toes against deck hardware. Waterproof (preferably lined) boots are a must for the colder wet weather conditions.

2.12 Knowledge Review – Personal Safety Equipment

1. What is the difference between a lifejacket and a PFD?
2. What is the highest safety priority in preventing boating deaths?
3. When is it not permitted to use automatic inflating lifejackets?
4. What needs to be fitted to a child's lifejacket to prevent it from rising over the child's shoulders?
5. How do you take care of lifejackets and PFDs?
6. How do you clean a lifejacket?
7. Name the 4 types of personal flotation devices.
8. How long should a heaving line be for a vessel <24m?
9. What is an immersion suit?
10. What is recommended when boating in hot weather?

Module 3 INTRODUCTION TO BOAT SAFETY EQUIPMENT

3.1 Key Objectives

THE OBJECTIVES OF THIS MODULE ARE FOR ALL CREW MEMBERS TO HAVE A THOROUGH UNDERSTANDING OF THE IMPORTANCE OF BOAT SAFETY GEAR, ITS USE AND FUNCTION AND THE IMPORTANCE OF KEEPING IT IN GOOD WORKING ORDER.

3.2 Life Rafts

Life rafts must be inspected annually to keep in date.

Life rafts are generally used on vessels that travel offshore (out of sight of land) and can come in many different sizes and types depending on the number of passengers aboard the vessel, and the climate in the region they are operating. They come in various sizes such as 4, 6 ,8, 12, 24, 72 man capacities depending on the size of the vessel and must be inspected annually. They are only to be used when a vessel is sinking and there is no other choice but to abandon ship.

CANISTER LIFE RAFT

VALISE LIFE RAFT

Canister type life rafts can be seen on most passenger vessels and ferries and are secured to points around the deck and will automatically inflate when they are launched. It is important that crew become familiar with the procedures for launching life rafts before heading out on a voyage.

Valise type life rafts are soft containers and are generally kept in storage (aboard a vessel) when not in use and are secured to the deck before undertaking a voyage. Every life raft has survival equipment included in it.

A **hydrostatic release** is a device that that can be attached to a life raft so that it will automatically deploy in the event of a sudden sinking. If it is not possible to deploy the life raft manually, at a depth of approx. 5 meters, the hydrostatic release will automatically inflate the life raft allowing it to float free. It is mounted between the life raft and the cradle which holds it and must be replaced every two years.

HYDROSTATIC RELEASE

3.3 Pyrotechnic Distress Signals (Flares)

Flares are used to attract attention in the event of emergencies at sea. They should always be stored in a watertight container and located in a cool, dry, accessible area. All distress equipment must be kept in full working order.

You may be required to carry specific types of flares onboard your vessel depending on:

- Size and type of boat
- The body of water on which you are operating

Examples:

- If at sea or on a waterway where you may be further than one nautical mile from shore.
- Generally, you are not required to carry flares if you are operating on a river, canal or lake if less than one nautical mile from shore.

Types of Approved Flares

There are four basic types of flares.

Type A: Parachute Flare

- Easily seen from water, land and air
- Emits a red light

Type B: Multi-star Flare

- Easily seen from water, land and air
- Emits a red light

Type C: White Hand-Held Flare

- Not as easily seen from afar but effective for pinpointing your position
- Emits a red light

Type D: Orange Smoke Flare

- Highly visible during daylight hours
- Gives off orange smoke

FLARES

There are also ***White Hand-Held Flares*** which burn bright white and are used to alert other vessels to the risk of collision.

WHITE HAND-HELD FLARE

Using Flares

1) All flares and pyrotechnic distress signals must be approved for use and are usually valid for only a few years from their date of manufacture. You must check for expiration dates and ensure those you have onboard have not expired.

2) Flares should always be used with caution and kept out of reach of children. Always follow the manufacturer's instructions before using a flare. The instructions are always visible on the casing.

3) It is illegal to test or discharge a flare if it is not being used for an emergency situation. Additionally, you should only dispose of flares in an approved manner. Contact the manufacturer or local law or fire agency for proper disposal procedures.

FLARES - LEFT TO RIGHT - TYPE A, TYPE B, TYPE C, TYPE D

Type A: Parachute Flare

To discharge this aerial flare, read the manufacturer's instructions. Hold away from body and pull the release mechanism. When launched, this red-light flare reaches a height of approximately 300 m and burns for at least 40 seconds. This type of flare can be seen from water, land and air.

Type B: Multi-star Flare

This is also an aerial flare. This device fires two red stars to a height of approximately 100 m. To discharge read the manufacturer's instructions and trigger the flare from a hand-held position. This type of flare will burn for four to five seconds and be visible from water, land and air.

Type C: Hand-Held Flare

This type of flare is designed for hand-held use and is not highly visible from a distance. Because of its limited visibility, this flare is most effective when used to help rescuers pin-point your location once they are nearby. To discharge read the manufacturer's instructions, hold downwind and away from your body and trigger the flare. This flare will burn intensely for at least one minute.

Type D: Smoke Flare

This type of flare is most effective for daytime use. Hand-held or floating type smoke flares will discharge intense orange smoke for at least three minutes. To discharge read the manufacturer's instructions, pull the release mechanism and hold the flare upright or toss it into the water.

3.4 Fire Extinguishers

Fire extinguishers are highly recommended and sometimes mandatory onboard any boat with a motor, and any one of the following:

- Closed compartments where portable fuel tanks may be stored.
- Closed living and cooking spaces
- Permanently installed fuel tanks.
- Enclosed engine compartments

Boaters should mount a fire extinguisher in an easily accessible location where it can be quickly retrieved in case of emergency.

Fire Extinguisher Rating System

FIRE RATING SYSTEM

Fire extinguishers are rated using a system of letters and numbers. The classes explained and depicted here are for United States. Class letters are assigned to the different types of fire, but these differ between territories. There are separate US, European, and Australian standards. You should research the rating system in your region to ensure you have the correct class for your vessel.

Designed for use on:
Class A – water / combustible solid materials such as wood and paper
Class B – combustible liquid fires including gas, oil and grease
Class C - Electrical fires

The number identifies the amount of agent (material that puts the fire out) that is inside the extinguisher. The higher the number, the greater the amount of fire-fighting agent in the device. For example, a Class 3 extinguisher can extinguish a larger fire than a Class 2 extinguisher.

In general, fire extinguishers on boats will be either a dry powder or foam that smothers the fire or CO2 which starves the fire of oxygen. It is recommended that one of the crew members complete a basic firefighting course from a recognized training authority.

There are four main types of fire extinguishers:

- Water – use on ordinary combustibles (class A)
- Dry powder/chemical – use on multi-purpose (class A, B, C)
- Carbon Dioxide (CO2) use as smothering agent for gas, liquid and electrical fires (class B, C)
- Foam – use as smothering agent for flame inhibition (class A, B)

Ensure that the fire extinguisher you choose meets the requirements for the size and type of your boat. Remember, even if your boat is equipped with an automatic extinguishing system, you must still carry portable fire extinguishers.

Fire Extinguishers require annual inspection to keep in date.

3.5 Fighting a Fire

Boat fires can be caused by a number of things including engine malfunctions, galley fires or insufficient ventilation of an enclosed engine compartment.

If a fire does occur, you can reduce the severity of an emergency by:

- Having the mandatory fire-fighting equipment onboard
- Ensuring the equipment is maintained regularly and is easily accessible.
- Ensuring you and your passengers understand what to do and do so quickly and effectively.

Abandoning ship:
If you need to abandon ship due to a fire, ensure that:

1) All passengers are wearing lifejackets.
2) Signal for assistance as soon as possible using VHF radio, phone, flares or air horn.
3) Launch liferaft (if applicable).
4) Jump into the water on the windward side of the boat so the boat does not drift down on top of you.
5) Make sure all passengers are present and accounted for.

How to use a fire extinguisher

Remember the acronym "P.A.S.S." which is the method to fight a fire onboard.

PULL
Pull the safety pin on the handle of the fire extinguisher.

AIM
Aim at the base of the flames.

SQUEEZE
Squeeze the handle

SWEEP
Sweep the fire by spraying from left to right in a sweeping motion.

Ensure the extinguisher is suitable for the type of fire you are trying to put out. Stand at a safe distance from the source of the flame.

Important Tips Regarding Fire Extinguishers

- Use an extinguisher designed for marine use.
- Use an extinguisher with an external gauge which includes the condition of the charge.

- CO2 type extinguishers should be weighed annually and re-filled when they have diminished to less than 90% capacity.
- If using CO2 type extinguishers in an enclosed area proceed with caution as they utilize colourless, odorless gases that displace oxygen.
- Always use a fire extinguisher to put out electrical fires or flammable liquid fires. Never use water as it will spread the fire as water conducts electricity.

Maintenance of Fire Extinguishers

Monthly inspections are required to keep fire extinguishers in good working order. When inspecting a fire extinguisher, you should do the following:

- Check the gauge to ensure the extinguisher is fully charged
- Check the seals and hoses and replace any that are cracked or broken
- Turn the extinguisher upside down and shake at least once per month to prevent the agent from clumping.

FIRE EXTINGUISHER GAUGE

Fuel Burning Appliances

It is important to understand that gas fumes, leaking propane and butane are heavier than air and will flow into the lower portions of your boat. These fumes are hard to remove and are highly explosive.

Follow these safety procedures when using butane and propane:

- Use fuel-burning appliances only in well-ventilated areas
- Secure gas cylinders, portable appliances and heaters so that unexpected movement will not result in a leak
- Always attend to open-flame heating, cooking or refrigeration systems
- Install fuel burning equipment according to manufacturer's instructions

3.6 Basic First Aid Kit

FIRST AID KIT

Every vessel should carry a first aid box and a first aid manual for quick reference. The longer the voyage to be undertaken, the more comprehensive the first aid kit should be. Any crew member taking prescription medications should make sure they have an adequate supply.

Contents of a first aid kit will include items such as: various size bandages and gauze pads, aspirin, antiseptic wipes, motion sickness tablets, insect bite cream, alcohol swab pads, tweezers, synthetic gloves, eyewash, antibiotic cream, and many other items depending on the size of the first aid kit.

3.7 Watertight Flashlight

WATERTIGHT FLASHLIGHTS

There are many different types of watertight flashlights. There should be multiple flashlights on-board every vessel and every crew member should carry a pocket flashlight at night. The power of a flashlight is measured in candlepower and some rechargeable flashlights produce up to 15 million candlepower.

A flashlight qualifies as a navigation light on non-powered vessels <7m.

3.8 Sound Signalling Devices / Air Horns/whistles

AIR HORN

Due to their very loud noise, usually around 105 – 115 decibels, these are essential to catch the attention of other boat users who are not maintaining a lookout or if in danger at sea. Whistles are also recommended and are a standard feature on a SOLAS lifejacket. All distress equipment must be kept in full working order.

During a fire an axe can be used to cut away parts of a burning vessel which can be thrown overboard.

3.9 VHF Marine Radio

The Very High Frequency (VHF) radio is a transmitter and receiver combined in one instrument called a "transceiver". When a message is sent from one transceiver it can be received by another provided they are within range and tuned to the same channel or frequency. Both transceivers MUST be tuned to the same frequency to enable a conversation to take place. VHF radios are an essential piece of equipment in the event of on-board emergencies. Uses also include weather and Coastguard information as well as routine ship to ship communication.

They are also used to transmit Mayday, Pan- Pan and Securite information. A "Mayday" call is used when danger is imminent, a "Pan-Pan" is used when a vessel has a problem, but danger is not yet imminent and a "Securite" call is used to alert other vessels to hazards of navigation. Radios can be "fitted" to the vessel or can be "handheld" devices.

VHF F

3.10 Bailer or Bucket

A bailer or bucket is used to remove water from the inside of a boat and can also be used to fight fires if necessary.

Vessels over 24m generally require 2 buckets painted red.

BAILER

3.11 Oars or Manual Propelling Device

In case of an engine breakdown in a small vessel or dinghy, it is imperative to have a set of oars to row yourself to shore or out of harms' way.

OARS

3.12 Swim Ladder or Re-boarding Device

Swim ladders are designed to allow easy re-boarding after swimming or in the event of a man-overboard. Most charter yachts are equipped with a swim ladder that can be accessed from the water.

A re-boarding device cannot be part of a propulsion unit (i.e. do not stand on engine housing or drive train to board boat)

SWIM LADDER

3.13 Binoculars & Night Vision Binoculars

Binoculars are an essential part of boat safety equipment. If you have one, a night vision device can greatly enhance navigating at night. If you operate in an area of recurring fog or limited visibility it is highly recommended that you invest in such a device.

NIGHT VISION

NIGHT VISION MONOCULAR

3.14 Bilge Pumps, Electric and Manual

Bilge pumps are used to remove water from the lowest part of the inside of your vessel, known as the "bilge. These pumps can be either manual, or electrically driven from the battery of your boat. Some electric bilge pumps will turn on automatically by a floatation device if the water rises above a certain level. An additional bilge pump "switch" is usually located near the cockpit of a vessel. When using a manual bilge pump, be sure that the hose is long enough to reach from the bilge over the side of your vessel.

MANUAL & ELECTRIC BILGE PUMPS

BILGE PUMP SWITCH EXAMPLES

3.15 Wooden Plugs for Thru-hull Fittings

Most vessels sink because of broken hoses, clamps or rusted out thru-hull fittings. Thru-hull fittings are generally fitted below the waterline and are intakes and outlets for water to cool the inboard engine, operate the air conditioning, bilge pumping and black and grey water discharging. It is recommended that boat owners tether a wooden plug to each thru- hull so they are ready to hammer into place in the event of failure or leakage. Plugs come in many different sizes and are readily available at most marine stores.

WOODEN PLUGS FOR THRU-HULL FITTING

3.16 Battery Selector Switch

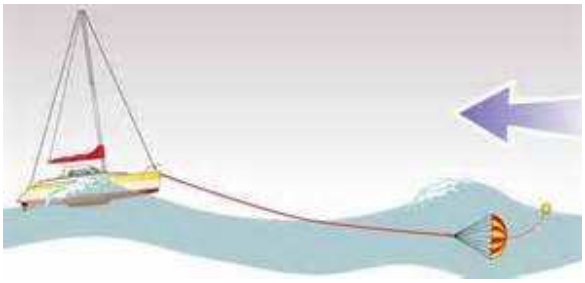
A battery selector switch is used to isolate different sets of battery banks on a vessel. For instance, on most vessels over 15m there will be one battery specifically for starting the engine and another set of batteries to run the navigation lights, electronics, radio etc. While the engine is running, the alternator will charge both sets of batteries. It is important to select "off" when leaving a vessel for any length of time to prevent battery discharge.

BATTERY SELECTOR SWITCH

3.17 Sea Anchors and Drogues

In the event of a breakdown or engine failure at sea, vessels have a natural tendency to turn themselves "beam on" to the sea which causes the vessel to roll violently in the waves. This is both dangerous and uncomfortable.

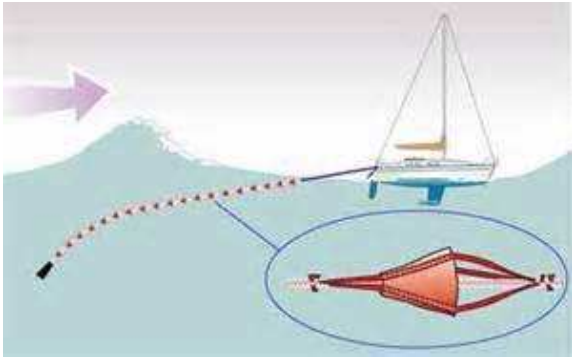
A **sea anchor** resembles a small parachute and is streamed on a line from the bow of the boat. The boat will be blown downwind from the sea anchor (which creates drag) and this will pull the bow of the boat into the wind which stabilises the vessel. It is important to use as much line as possible when using a sea anchor.



SEA ANCHOR

During strong following seas, the wave action on the stern of a vessel can cause the vessel to constantly "yaw" which will push the boat from side to side. To prevent this, a **drogue** is dragged behind a vessel (attached to the stern) which will act as a brake and assist in maintaining the boats course. It will however reduce the speed of the vessel but will allow for a greater level of stability and comfort.

FIGURE 3-1 DROGUE



DROGUE EXAMPLE

3.18 Ditch Bag

A ditch bag, also known as a survival or abandon ship bag, is a highly visible, water proof, positive flotation bag that is used to store important items in the event that you have to abandon ship and get into a life raft. While life rafts are equipped with basic survival equipment, you have a greater chance of survival if you have prepared your ditch bag in advance. Some items are essential while others are personal needs or preferences. It is entirely up to the skipper and crew of a vessel to decide which items they would like to place in a ditch bag depending on:

DITCH BAG

- How far offshore they will be travelling
- The weather/climate conditions they are likely to encounter
- How many crew are on board the vessel

Contents of a ditch bag could include:

- EPIRB
- SART
- Handheld VHF radio
- Cell phones (if within signal range)
- Selection of flares and smoke signals
- Waterproof flashlight (with extra batteries)
- Whistle
- Signal mirror
- Additional water
- Emergency food rations
- Spare spectacles
- Personal medications
- Solar blanket
- Sunscreen & chap stick
- Bailer Pen & paper in waterproof bag (to keep a log)
- Binoculars
- Sunglasses
- Mask and snorkel (in case bottom of life raft needs to be repaired).
- Fishing line and hooks

ABANDON SHIP BAG

- Knife
- First aid kit
- Patch kid for life rafts
- Blankets/ warm clothing
- Survival at sea handbook
- Passports (in waterproof bag)
- Sea sickness tablets
- Toilet paper in waterproof bag (personal hygiene)
- Hand bearing compass
- Cash

FIRST AID KIT

3.19 Anchors

Anchor
An anchor can be used during an engine failure emergency or during bad weather to keep you from drifting towards obstacles.

Anchor Types
Choosing the right anchor depends on the size and weight of your boat and the characteristics of the waterway bottom you generally operate on (i.e. Sand, rock or mud). Larger anchors are recommended for adverse conditions and are equipped with a shackle pin should have a locking device. Below are 4 common types.

Fisherman Anchors **-** These are non-burying with one arm that penetrates the bottom. They are best used for rocky bottoms.

Fluke or "Danforth" Anchors – These have pointed flukes that dig into the ground. They are best used for grass and mud bottoms.

Plough Anchors – These anchors function like a farmer's plough. These anchors are generally good in all bottoms, but not exceptional in any.

Bruce or "Claw" Anchors – These are popular for small boats because they set easily and tend to maintain their hold during changes in wind and tide. They are best used in most waterway bottoms.

FISHERMAN ANCHOR

FLUKE OR "DANFORTH" ANCHOR

PLOUGH ANCHOR

BRUCE ANCHOR

Always remember to securely attach the end of your anchor line to the bow of the boat and securely attach the outboard end of the anchor line to the anchor.

You may want to use multiple anchors in tidal streams or in strong winds.

3.20 Knowledge Review – Boat Safety Equipment

1. What is the function of a liferaft?
2. What is a hydrostatic release?
3. What is an abandon ship/ditchbag?
4. Name 10 items an abandon ship bag might contain?
5. What is a VHF Radio?
6. Name the 4 types of flares
7. What is a smoke flare used for?
8. How many classes of fire extinguisher are there?
9. How often should a fire extinguisher be inspected?
10. Name 6 items you would find in a first aid box
11. A flashlight qualifies as a navigation light on what size vessel?
12. What is an airhorn used for?
13. When would oars be used?
14. What is a re-boarding device?
15. What are wooden plugs used for?
16. What is a battery selector switch?
17. What are sea anchors and drogues used for?
18. Name 6 spare parts that may be stored aboard a vessel
19. What is a nautical chart?
20. What is the importance of navigation lights?
21. Name 3 different types of anchors

Module 4 VESSEL CHECKOUT – DOCUMENTATION, CHARTS, NAUTICAL PUBLICATIONS, FLAGS, EQUIPMENT & GENERAL

4.1 Key Objectives

THE OBJECTIVE OF THIS MODULE IS TO COVER THE NECESSARY PAPERWORK AND DOCUMENTATION REQUIRED TO OPERATE A VESSEL, NAUTICAL PUBLICATIONS TO BE CARRIED, THE USE OF FLAGS, THE NECESSARY SAFETY CHECKS, MAN-OVERBOARD EQUIPMENT, SPARE PARTS, TOOLS AND HOUSEKEEPING ITEMS THAT ARE REQUIRED BEFORE UNDERTAKING A VOYAGE.

4.2 Registration / Ships Papers

VESSEL REGISTRATION

Every vessel has registration/ownership papers that proves the ownership of the vessel and its port of registry. These are sometimes required by Port State Control/Marine Police, Customs or Immigration to prove that the boat belongs to whom it says it does, and to prove that it has not been stolen.

It is best to keep all important documents in a waterproof bag in case you need to abandon ship.

4.3 Passports / Visas

If chartering or travelling to a foreign country, it is imperative that all crew and guests have their passports (in date) with all necessary visas if applicable. Be sure to check in advance with the country that you will be visiting to find out which visas you may require. Visitor's visas can sometimes take several weeks to process so be sure to check well in advance of your planned trip.

The master of every boat must furnish Immigration with a list of passengers and a crew list upon arrival in a foreign port. The vessels crew list should consist of name, nationality, passport number and date of birth of each crew member.

Fees for both customs and immigration authorities are usually charged in the local currency which you should plan to have in advance.

Cruising permits may also be required in many countries to cruise their territorial waters. A fee will also be charged for the permit.

4.4 Insurance Papers

It may be necessary to produce insurance papers in the event of an accident at sea. Personal liability insurance is also a good idea due to the amount of accidents that occur at sea.

4.5 Nautical Qualifications or Certificates of Competency (COC)

Most countries will require some form of "proof of competency" in order to skipper a vessel. In Europe, most countries will require an "International Certificate of Competency or ICC". IYT students who successfully complete the ICC course and examination will automatically obtain an ICC without further study or examinations.

It is always a good idea to make sure that the skipper of the vessel is adequately qualified and experienced to command the size and tonnage of the vessel they will be operating. Remember, your life is in the skipper's hands! The "operator" is also known as the skipper.

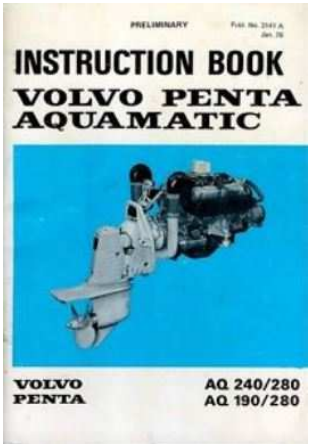
It is very important to check with local authorities to find out what level of certifications they will require for the size and type of vessel that you will be operating.

4.6 VHF Radio Operators License & Radio Equipment License

Most countries will require proof that you can safely operate a VHF radio and some countries require that the radio set itself is actually licensed. Check with your local administration.

Equipment Manuals

Most vessels will carry equipment manuals issued by the vessel's manufacturer such as engine, generator, water maker, refrigerator, electronics, heads, etc.



4.7 Nautical Charts

Nautical charts are essentially maps of sea areas showing coastlines and their prominent features, depths, objects in, on and under the water and include many other pieces of useful information. They are intended primarily for use by mariners to assist in route planning, pilotage and navigation, as well as to find information concerning the depth of water, hazards to navigation, aids to navigation, channels, anchorage areas, harbours, tides, water levels, magnetic variation and information on currents. Many maritime nations have agencies that publish charts which are readily available through marine supply stores.

NAUTICAL CHART

4.8 Nautical Publications

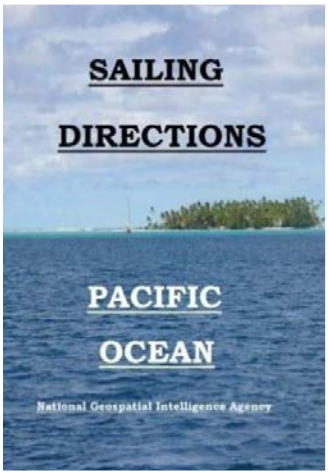
There are several nautical publications that should be carried on your vessel depending on the length of the voyage you intend to undertake and the area you intend to travel in. The main publications are:

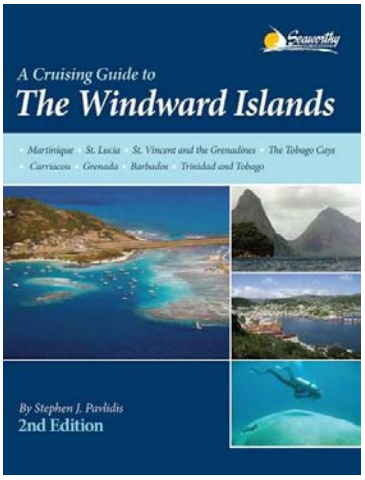
Cruising Guide or Sailing Directions

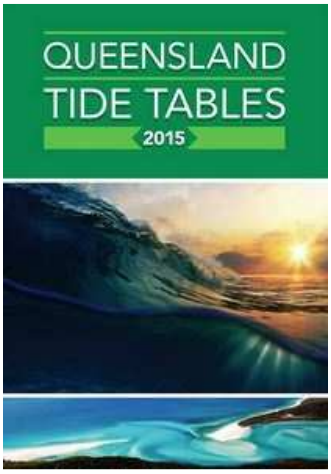
The "Cruising Guide" contains extremely valuable information about anchorages, local weather conditions, navigation channels, fishing spots, GPS waypoints, planning tips and local information about shopping, car rental and everything needed for planning a safe and fun trip. They are available for most regions of the world.

Tide Tables

Tide tables provide daily times and heights of high water and low water for a given area. The tables are published in various forms such as paper-based tables or on the internet.

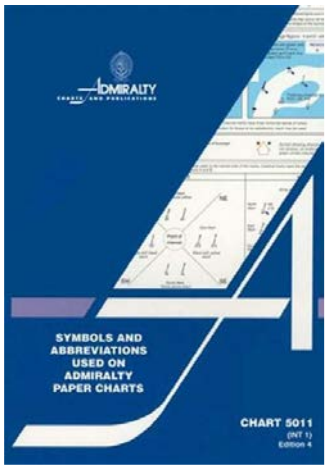






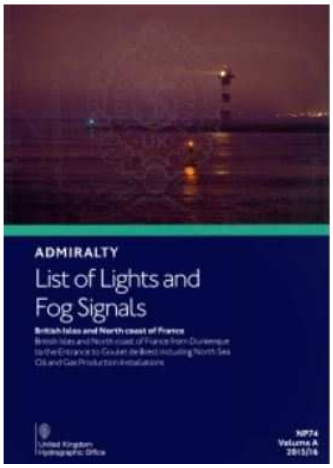
Symbols and Abbreviations for Nautical Charts

This book contains explanations of all the symbols, abbreviations and terms needed to interpret nautical charts.



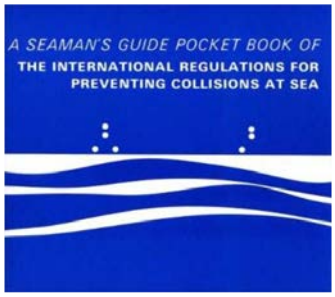
List of Lights

The "List of Lights"""" is a publication describing lighthouses and other aids to navigation such as lighted buoys, approaches to channels, information on storm signals, signal stations, approaches to harbours, radio beacons and fog signals.



Colregs

Colregs are the collision regulations and are sometimes referred to as the "Rules of the Road" or the "International Regulations for the Prevention of Collisions at Sea". They set out the "rules of the road" or navigation rules to be followed by ships and other vessels at sea to prevent collision between two or more vessels. They may also refer to inland waterways which are subject to their own navigation rules. Different countries may have different rules for inland waterways so always check that you are carrying the correct publication for the country you are in.



Flags and Flag Etiquette

There are only a few flag rules that recreational boaters need to be aware of although most ships will carry a complete range of signal flags containing every letter of the alphabet and every numeral. A vessel will generally fly the flag of the **country of registration** on the stern of their vessel to identify its country of origin. A flag should not be flown if it is torn or tattered and should be replaced. If at anchor or in harbour, it is generally lowered at sunset and raised at sunrise.

COUNTRY OF REGISTRATION FLAG ON STERN

A **courtesy flag (or ensign)** is flown by a visiting vessel in foreign waters as a sign of respect and is generally smaller than the flag of registration and will be flown on the starboard side of the vessel.

COURTESY FLAG ON STARBOARD

The **Q flag (or customs flag)** is a yellow square and is flown on the port side of a vessel when entering a foreign port or harbour. It indicates that the vessel requires customs clearance. In some countries, crew are not allowed to disembark from a vessel until a customs official arrives to clear your vessel and issue you with a "customs clearance document". Once you have cleared customs you may then remove the Q flag. It is important to check with the local authorities in the port you are visiting.

CUSTOMS Q FLAG

A "diver down" flag or scuba flag indicates that there is a diver in the water in the vicinity of the vessel and the vessel should be given a wide berth and to steer clear when passing it. There are two flags that indicate that a

diver is down. The red and white flag has become the most internationally recognised and the signal flag "A" is most common in Europe and the British Commonwealth.

DIVER DOWN FLAG

DIVER DOWN "A" FLAG

The observance of strict rules of etiquette in boating today is practically standardized throughout the maritime world and all the rules governing ceremonies and routine aboard yachts and in yacht clubs have a distinct reason for their existence. The observance of strict rules of etiquette in yachting, as in everything else, has been found conducive to pleasant relations between yachtsmen and the foundation of all rules of this kind is courtesy. Boating is fun and all who take part in the sport, whether they are owners of outboard runabouts or huge motor yachts, are expected to be fully conversant with the principles of proper conduct.

4.9 Equipment & General Checks

A series of checks should be carried out before every trip or voyage and it is important to know that all equipment is in good working order. It is also important that all vessels carry spare parts necessary for the safe operation of their size of vessel, and enough tools to make any minor repairs that may be required. Checking tools, spares and safety equipment is a good opportunity to introduce the location of this equipment to new crew members and as a reminder to those who have been on board before.

Before each boating season, it is imperative that the boat is serviced by trained professionals and is kept in a seaworthy condition at all times.

4.10 Hull & Rig Checks

- Tool Kit
- Hull Checks
- Engine Checks
- Engine Spares
- Rigging Checks (sailboats)

Tool Kit:

A socket set
Open and box wrenches
Screw driver set
Crescent wrench
Pliers
Vise grips
Hammer
Assorted Allen wrenches
Wire cutters/strippers
Utility knife
Hacksaw
Spanner wrench (to remove oil filters)
Spark plug wrench

TOOL KIT

Hull Checks:

Check the condition and operation of the following:

- Location and condition of through hull fittings.
- Through hulls and sea-cocks operate easily, hoses in good condition, hose clamps fitted (double)
- Spare hose clamps should be carried (two or three of each size).
- Through hull plugs attached to each sea-cock.
- Bilges are clean and dry, bilge pumps operational.
- Grab rails, life-lines in good condition.
- Hull cracks or damage.

MANUAL BILGE PUMP

ELECTRIC BILGE PUMP

THRU HULL FITTING

Engine Checks

Check the condition and operation of the following:

- Engine warning lights and alarms working.
- Emergency stopping of runaway engine, fuel cut off, etc.
- Steering and shift mechanisms in good condition.
- Interior spaces are well ventilated.
- Run the blowers for several minutes before starting to clear the engine space of any vaporized fuel.
- Fuel supply full, estimate a reasonable margin of safety approx. 1/3 tank.
- Fuel system free of leaks.
- Engine oil and transmission fluid levels correct.
- Cooling water full.
- Electrolyte level in the battery full.
- Belt tension correct and in good condition with no wear and tear.
- Check all hoses, especially fuel.
- Prop shafts clear – no engine room materials left out of place.
- Stern gland and stuffing box, seal secure.
- Bilge free of fuel vapors and excess water.
- Steering and shift mechanisms in good condition.
- Throttle cable not sticking or binding.

Engine Spares

Check to make sure you have the following:

- Oil filters
- Belts
- Water impellers
- Lubrication oil
- Transmission fluids
- Hose clamps, assorted, two or more of each size
- Engine hoses
- Flexible fuel line
- Air filters
- Engine drain plugs
- If gasoline/petrol engine - spare spark plugs
- Fuel filters
- Water filters
- Engine oil
- Fuel container
- Tie wraps

ENGINE SPARES

- Electrical tape
- Assorted nuts, screws & bolts
- Impellers

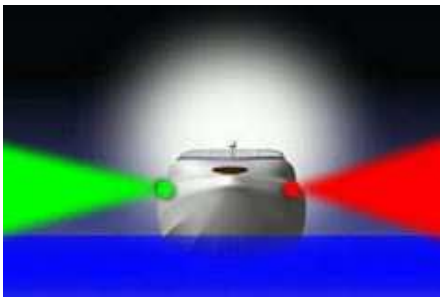
Rigging Checks – Sail boats (discuss with skipper)

- Check the condition and operation of the following:
- Sail wardrobe for the intended voyage and conditions expected.
- Standing rigging, no kinks, broken strands, especially at rigging screw terminals.
- Rigging screws unfrozen and in good condition.
- Mast, boom and mast fittings.

4.11 Navigation Lights & Electronic Equipment

Check the condition and operation of the following:

- Depth finder, GPS, Log, VHF radio, Depth Sounder and other electronics are working
- Radio: call the local coastguard or marina office and ask for a radio check
- All navigation lights working



NAVIGATION LIGHTS

Between sunset and sunrise and during any period of reduced visibility (fog or heavy rain) you are required to use navigation lights. If operating a non-powered craft with no fixed navigation lights, you must have a watertight flashlight or lantern which emits a white light.

4.12 Safety Equipment

- Check all safety equipment is in date
- Heavy line with life buoy
- Fire extinguishers.
- Signal flares and other signaling devices with current expiration dates.
- Life jacket suitable for each person on board, readily accessible, in good condition.
- MOB equipment and throwable flotation easily accessible to helmsperson.
- Flashlight and extra batteries.
- Horn or sound signaling device.
- Bell.
- Comprehensive first aid kit, including sunscreen, pain relievers and any special medications for the crew.
- Bailer or manual water pump

- Sufficient foul weather gear, warm clothing & safety harnesses for all crew
- Anchors.
- Anchor lines in good condition ready to use, bitter end made fast.
- Boat hook.
- Mooring lines and fenders appropriate for the vessel.

Ignition protection

Keeping sparks and flammable vapors apart is vital on a boat, and many boaters fail to consider all the hazards. Careless gasoline storage, improper locker venting, and use of power tools that can spark a flame may lead to explosions resulting in injury and damage to the vessel.

Using ignition protected fuses, fuse blocks, circuit breakers, switches, and motors in critical areas is a good idea. Ignition protected devices are designed in such a way that:

- **they won't ignite a surrounding air-fuel mixture** if there is an explosion inside them
- **they can't reach a high enough surface temperature** or generate enough spark to ignite an air-fuel mixture.

Follow the guidance below to help keep your boat safe.

Know your fuel sources.

It’s easy to think that there’s nothing to worry about if your boat has a diesel engine. Your starting motor does not need to be ignition protected, and neither does the circuit protection in the engine space. But if the gasoline for your dinghy’s outboard is stored in the same compartment as a non-ignition protected device, your vessel is at risk. A non-ignition protected starter could provide the spark that ignites the vapors from a leaky gas can cap. Other fuel sources include vapors from propane or gasoline, propane bar-b-que bottles, gasoline tanks, and fuel joints and fittings.

Know your ignition sources.

Anything that produces or can produce a spark or flame, intentionally or otherwise, is a potential ignition source. Circuit breakers, starters, alternators, and distributors, and open flames are obvious, but exploding fuses, switches, household outlets, and power-tool motors are possibly just as hazardous.

4.13 Housekeeping Items

- Taps or faucets working as necessary
- Fresh water in the tanks and also carry some extra bottled water for emergencies
- Propane gas including spare bottle, in outside locker with drain.
- Sewage holding tanks (also called black water) should be emptied, along with grey water tanks. (grey water is water stored from washing dishes and showers etc.)
- Heads flushing or pumping as necessary
- Ample food and water for the voyage intended.

4.14 Dinghy (if applicable)

Check the condition and operation of the Following:

- Stowed properly.
- Inflatable in working order.
- Paddles or oars.
- Outboard motor maintained and stowed properly.
- Spares.
- Safety equipment etc. for dinghy.
- Additional fuel properly stowed

4.15 Float Plan

A float plan is a voyage itinerary and includes the basic details of your intended voyage. If on a long voyage, it is recommended that you check in daily to report your position. File a float/passage plan with a responsible person ashore (or your local Coastguard), with your intended destination and estimated time of arrival and any additional information that accurately describes your vessel such as length, color, make, model and number of persons aboard with instructions as to when to call for assistance. Be sure to cancel/terminate your float plan when you reach your intended destination to avoid unnecessary search and rescue operations for you.

4.16 Departing the Marina or Dock

- Disconnect all power cords and water lines.
- Instruct passengers and crew to keep limbs inside the vessel when maneuvering.

- Release and stow all lazy dock lines.
- Sound proper whistle (horn) signals.
- Remove last dock lines.
- Appoint one crewmember to be the "roving fender". If it looks like the vessel will touch the dock they should drop the fender into the gap between the vessel and the dock to protect the hull. Especially keep watch on the corners of the dock. If the vessel is caught by a wind gust and blown onto the corner, the impact with the corner can cause serious hull damage.
- After clearing the dock area, take in all lines and fenders; keep lines clear of the propeller.
- Proceed slowly using just enough power to maintain control whenever leaving or returning to a dock.
- Make sure to avoid all swimmers, divers, snorkelers, canoes and kayaks.
- Avoid specific hazards such as dams, rapids, white water, high waves and strong tides.

Remember to always consult your local maritime authority or coastguard for information on the safety equipment required for your vessel. This may vary from country to country and with the different lengths or capacity of boats.

4.17 Knowledge Review

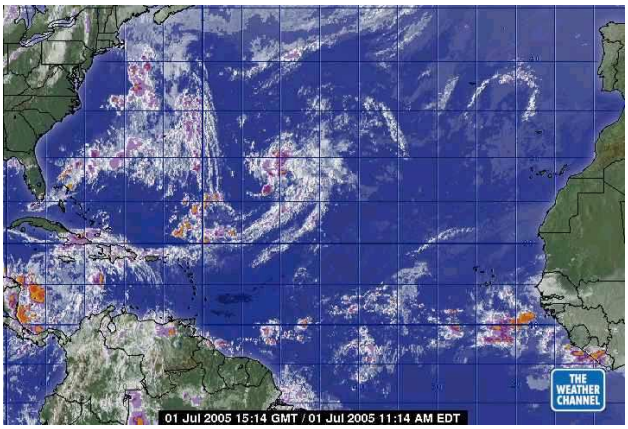
1. Why are registration papers important?
2. What is a "Certificate of Competency"?
3. What information is contained on a nautical chart?
4. Name some nautical publications that should be carried aboard a vessel.
5. What are the COLREGS?
6. What is a courtesy ensign and when is it flown?
7. What are the two types of "diver down" flags?
8. What is the "Q" flag?
9. What are the 5 main requirements for taking over a vessel?
10. Name as many of the important hull checks as you can.
11. Name as many of the important engine checks as you can.
12. What is the importance of navigation equipment and checking navigation lights?
13. List all safety equipment that must be on board for a safe voyage.
14. Name the general vessel equipment and housekeeping items that should be checked during a vessel take over.
15. What are the actions required for departing a marina?

Module 5 INTRODUCTION TO WEATHER

5.1 Key Objectives

THE OBJECTIVE OF THIS MODULE IS TO GIVE A BASIC UNDERSTANDING OF WEATHER AND THE IMPORTANCE OF OBTAINING WEATHER FORECAST PRIOR TO A VOYAGE.

Meteorology is the study of weather, which is caused by the movement or transfer of energy occurring with the movement of air in the atmosphere. Meteorology is a vast and very complex subject, it is worth bearing in mind that some of the most powerful computers in the world are designed to assist in the forecasting of weather, such is the complexity and difficulty involved.



However, of great importance to everyone who ventures out on the water is to obtain a weather forecast for the duration of the proposed trip. The result of obtaining such a forecast will dictate to the mariner whether to sail or not to sail.

The information that is important to know is wind speed, direction and strength, visibility and what may reduce this such as rain, fog, smoke, mist, etc., wave height, air temperature, barometric pressure, sun strength, and the likelihood of tropical storms or hurricanes must also be considered.

Sources of Weather Information

There are many sources of weather information available to the mariner, however, it is imperative to get an overall picture upon which to base your decision to sail. Below is a partial list of sources, and depending on where you are in the world, other sources may be available.

- Internet
- Radio (both VHF and commercial radio)
- Television
- Marina Offices

- Port Authority Offices
- Coastguard Organizations
- Meteorological Office
- Newspapers
- Weather fax

To Go or Not to Go / Sail or Not to Sail

Once the forecast has been received the decision to go or not to go will have to be made. If in doubt err on the side of caution and postpone the trip. Having decided to make the passage, weather updates can be received over the radio from Coastguard stations or Marine radio offices or via weather fax. One should plan to receive these updates on a regular basis throughout the passage, preferably twice daily, especially during the North Atlantic hurricane season and the South Atlantic cyclone season.

Module 6 BASIC VHF-SRC MARINE COMMUNICATIONS

6.1 Key Objectives

THE OBJECTIVE OF THIS MODULE IS TO TEACH CANDIDATES HOW TO EFFECTIVELY OPERATE A VHF RADIO.

6.2 Introduction

In 1912 the sinking of RMS Titanic changed the way the world regarded maritime safety. The event was the catalyst for the formation of the international treaty for Safety of Life at Sea (SOLAS). Over the years SOLAS has introduced minimum guidelines that flag states must comply. In particular Chapter IV of SOLAS V requirements deals with Radio Communications equipment.

Internationally Marine Communications are controlled by the international Maritime Organisation (IMO) and are advised by the International Telecommunications union (ITU). They developed the Global Maritime Distress and Safety System (GMDSS) an internationally agreed upon set or safety procedures, types of equipment and communication protocols to increase safety and make it easier to rescue distressed boats and aircraft. The GMDSS requirements are laid down in Chapter IV of SOLAS.

Whilst not all vessels are bound to carry GMDSS equipment, it is recommended that they should at least carry some form of radio communications in case of distress and danger. Mobile or Cell phones are readily available nowadays and have their uses but should not be relied on alone when at sea. Coverage can be extremely limited off shore and would not prove effective in the case of an emergency.

Accuracy of Information

Whilst this course aims to teach as accurately as possible the International scope of each topic covered, it is impossible to list all differences for every country. It is the duty of all marine VHF operators to know and understand any local laws and procedures required by their own flag state when operating marine communications equipment registered in that state.

6.3 Licensing

Licensing Requirements

In accordance with the most recent 2012 edition of International Radio Regulations (2012):

- All Marine Radio equipment (Including portable equipment) must carry a license issued in an appropriate form and in conformity with the provisions of International Radio Regulations by or on behalf of the government of the country to which the equipment or station is subject.
- All Marine Radio equipment using frequencies and techniques for GMDSS shall be controlled by an operator holding a certificate issued or recognized by the government to which the station is subject.

Attaining a VHF license through an agency that is IMO and ITU approved should allow the operator to use VHF equipment globally, but it is always prudent to check specific local requirements to ensure you are following all applicable rules and regulations (Both National and International. The figure below shows some examples of such agencies:

VARIOUS VHF AGENCIES

This IYT course is the Very High Frequency (VHF) Short Range Certificate (SRC) and follows the World Radio Conference (WRC) 2012 syllabus guidelines. It is recognized by the Republic of the Marshall Islands. It is the outcome of the WRC that revises the Radio Regulations. For most coastal operations this SRC will be more than sufficient but if the vessel you are working with operates commercially offshore; more advanced certification in radiotelephony may be required. This will be further explained in the next chapter.

The Long-Range certificate covers Medium Frequency (MF) and High Frequency (HF) equipment and is outside the scope of this course.

6.4 Maritime Mobile Band

Maritime Mobile Band

The ITU refers to the Marine VHF Frequencies between 156.0 and 162.025 MHZ as the Maritime Mobile Band. This frequency band is split into a number of channels, which can be accessed by the operator.

Simplex and Duplex

Marine VHF mostly uses Simplex transmission, where communication can only take place in one direction at a time. A transmit button (presell) on the set or microphone determines whether it is operating as a transmitter or receiver.

Some channels are Duplex where communication can take place in both directions simultaneously when the equipment on both ends allows it. This would be similar to a normal landline telephone call where both parties can speak at the same time.

It is important to note that for Full Duplex operation, both the radio channel needs to be Duplex and also the radio equipment used, otherwise the transmission will be semi Duplex or Simplex.

International channels

There are a number of international channels with distinctive purposes. There is the likelihood that there may be additional local channels for these purpose that will vary from country to country.

- **Channel 16** is the international VHF distress frequency. It is used for distress, urgency and traffic safety.

- **Channel 70 DSC** (**Data communications only – NO Voice**) is used to establish initial contact between stations for distress, urgency and safety traffic. Following an alert by Digital Selective Calling (DSC), communications are then carried out by radio using voice. This will be explained in detail later in the course.

- **Channel 13 - Bridge to Bridge** - is set aside under GMDSS. It will normally be monitored by commercial vessels if a danger of collision exists.

- **Channel 80.** International Marina channel. Since marinas are not fitted with Channel 16 the initial call must be made on Channel 80.

- Other International Channel types:

  - **Inter-Ship Channels** These channels are for communications between ship stations.

  - **Port Operations and Ship movement.** Allocated by international agreement, they are assigned to a user, such as port or oil terminal where safe movement of ships is important.

- **Public Correspondence.** Rarely used nowadays, these channels have been set aside, by international agreement for making calls to the public telephone network. Calls made on these channels are known as "link calls"

6.5 Maritime Safety Information (MSI) Broadcasts

As soon as a meteorological (weather) or navigational warning is issued an announcement is made on Channel 16. This will direct listeners to a working channel where further information is given. In addition to warnings, regular (normally 3 hour) weather forecasts are announced on Channel 16 and transmitted on working channels. Consult your local almanac for channel and timing information.

6.6 Emergency Position Indicating Radio Beacon (EPIRB)

Emergency Position Indicating Radio Beacon (EPIRBs) are transmitters which aid in the detection and location of craft in distress. Essentially, they interface by radio signal with an international satellite system for Search and Rescue authorities (SAR). Once they are activated, either by immersion or manually, they transmit a distress signal which is detected by satellites, informing authorities of the distress situation. In the case of modern (406 MHz) EPIRBs they transmit digital signals and provide SAR organisations with both an identification of the distressed vessel and its position to within 100 meters, anywhere in the world. This allows SAR aircraft and vessels to come swiftly to the aid of the distressed vessel. The figure below shows typical examples of EPIRB equipment.

EPIRB RADIO EQUIPMENT

6.7 VHF DSC Radio Equipment

Transmitter, Receiver, Transceiver, Antenna

A VHF radio set consists of a transmitter and receiver combined in one instrument, usually called a transceiver. The transmitter is the part that can send a radio signal and the receiver is the part that receives a radio signal from another transmitter. When you speak into the microphone the sounds of your voice are converted by the transmitter into radio waves, or signals, which are then transmitted (sent out) from the transmitter through an antenna or aerial.

VHF RADIO TRANSCEIVER

A receiver can pick up these radio signals through its antenna and convert them back into intelligible sounds which are heard coming from the radio speaker.

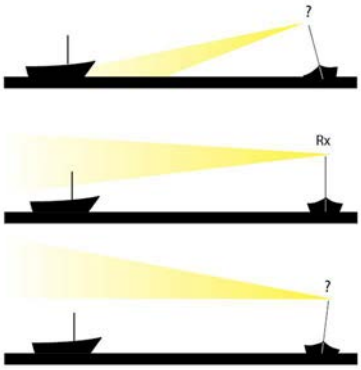
Antenna types

There are generally two types of antennas used in Marine communications. Each type has its own advantages and disadvantages:

High Gain Antenna: A spotlight has its beam focused into a narrower beam to make the light shine further. In much the same way an antenna can be designed so that it focuses the radio signal thus transmitting it further.

This type of antenna is called a high gain antenna but, because the beam is narrow, the antenna must remain reasonably upright and directed towards its target receiver.

A high gain antenna is therefore only really suitable for a motor boat rather than a sailing boat which will operate at an appreciable angle of heel most of the time.



HIGH GAIN ANTENNA

Unity Gain Antenna

Aerials for sailing boats are usually 'Unity Gain' types, in other words they are designed without any gain. Sailing boats have the advantage of a high mast on which to mount their

antennas and gain range in this way; the wide angle of the signal from an aerial without any gain reduces the risk of broken or interrupted transmissions.

Range

VHF radio waves travel in a straight line, but the surface of the earth is curved; therefore, the maximum range between two VHF transceivers will depend on the height of the transmitting aerial and the height of the receiving aerial. Essentially the maximum range of a VHF signal is known as '**line of sight'**. Without the antennas "*seeing*" each other the stations will not be able to communicate. Increasing power will not increase range where the antennas are not in this line of sight.
The higher the aerial the greater the range, which is why coast radio stations put their aerials on hilltops. In the same vein a sailing boat, with the higher aerial location, would likely have a greater VHF radio range than a motor boat.

Frequency

Radio transmitters send out their signal on a precise carrier frequency and only a receiver tuned exactly to the same carrier frequency will receive that signal. The frequency selected is usually indicated on the radio by a pointer against a printed scale or by a digital readout. In order to find the frequencies used by a specific station, a publication listing radio stations will have to be consulted.
More sophisticated radio receivers may allow frequency information for a number of regularly used stations to be inputted into its memory, so that by just pressing a marked button the radio receiver automatically switches to the desired frequency. If the radio has this facility you can also switch from one frequency to another by simply pressing the correctly marked button.

6.8 Makes of VHF Equipment

There are a large number of manufacturers producing different types and models for both the recreational and commercial markets. Each unit has different controls and layouts but essentially the functions of the controls on all types are similar. It is important that every crew member or anyone using VHF should be familiar with the specific radio's operation and the manufacturers' guidance. The radio set shown in **Error! Reference source not found.** below is a typical DSC enabled VHF transceiver which has all the international channels fitted.

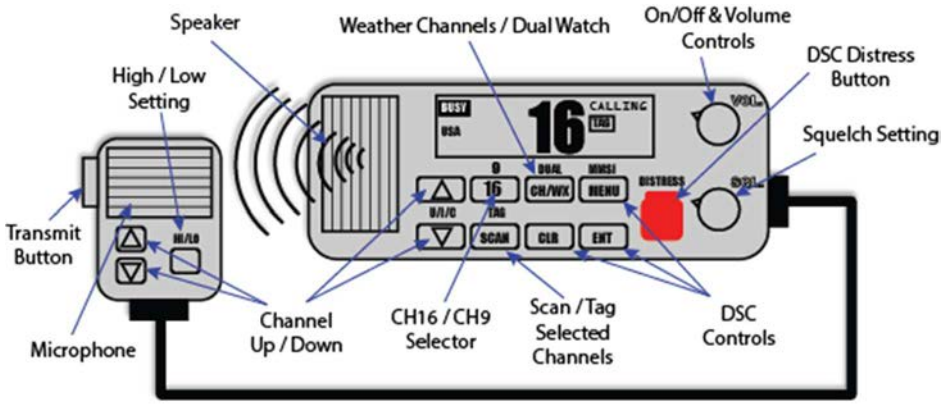
NOTE

Vessel Owners and operators should ensure the radio set is in compliance with any local and international regulations. Not all VHF radios are built to the same standard.

DSC ENABLED VHF RADIO

6.9 VHF/SRC Controls

The figure below illustrates a typical front panel set up of a VHF radio.



TYPICAL DSC ENABLED VHF RADIO CONTROLS

On / Off / Volume:

- The set is switched on and off by turning the on/ off knob; this also controls the volume of sound from the speaker. Adjusting the volume increases or decreases the sound coming from the speaker; it does not increase or decrease the power output from the transmitter.

DSC Distress Button:

- The red DSC Distress Button is found on sets fitted with Digital Selective Calling (DSC) It should be protected in some way to prevent accidental activation. When activated it will send out a pre-defined distress data message. DSC is covered in greater detail later on.

Squelch:

- The 'squelch' control increases or decreases the sensitivity of the receiver. In practice the set is switched on and the squelch control is adjusted until continuous loud background noise is heard.
- The squelch control is then turned back slightly until the background noise disappears; at this setting the receiver is tuned to its optimum sensitivity allowing it to pick up signals within range.

Channel (CH):

- The "Arrow Up" and "Arrow Down" Buttons are used to select the required channel. The channel selected is indicated by the number displayed in the screen of the set. Some sets use digital keypads, similar to the keypad on a calculator, to select the required channel.

Channel 16 (Distress/Safety/Calling):

- As a safety feature most modern sets automatically select channel 16, Distress and Safety channel, when first switched on. The set illustrated has a channel 16 selector button. It is usually the bright red button next to the volume control. Pressing this button will automatically select channel to 16 at full power.

Dual Watch (DW):

- Channel 16 is the Distress, Safety and Calling channel so it makes sense to listen to this channel at all times; in fact, it is a legal requirement for commercial shipping to do so. However, it is often desirable to be able to listen in to another channel at the same time; for example, Channel 13 in order to hear Bridge to Bridge Calls from other vessels in the area. A dual watch facility allows you to listen to both channels 16 and any one other channel at the same time. To use dual watch, select the channel you wish to listen to, say channel 13, and then press the DW button. The receiver will then switch momentarily from channel 13 to channel 16 and back to 13 again and will repeat this cycle continuously until the dual watch is switched off. If the receiver detects a signal on CH 16 it will lock on to that channel when in dual watch mode.

High/Low – (H/L):

- The maximum power output from a VHF set allowed by law is 25 Watts. Most of the time a much lower output is quite sufficient, such as when talking to another boat, which is close by. Virtually all fixed VHF sets can (in theory) transmit at the legal maximum power of 25 Watts and they also have a switch, which reduces the power output to 1 Watt for close range communications. The power level will be displayed on the screen; 'HI' indicates 25 Watts and 'LO' indicates 1 Watt. Simply pushing the button marked 1/25 or H/L changes the power output. Handheld VHF Radio power settings are typically 1 and 5 Watts.

NOTE

This only affects the power output when transmitting and has no effect on the set's ability to receive signals.

HI power should ONLY be used when calling distant stations or in emergency. Using low power is a courtesy, so other distant users are not overwhelmed by your signal. Additionally, this allows users who have an emergency to enable their message to be transmitted successfully.

Transmit (TX):

- TX is 'shorthand' for transmit. When you are transmitting some sets show a little red light to confirm that the set is transmitting. ('RX' is shorthand for receive).

Microphone (MIC):

- The lead from the microphone cable is plugged in to the socket marked 'MIC'.

Antenna Connection:

- This is the socket into which the aerial lead is connected. On no account press the transmit button on a radio without an aerial connected because serious, or irreparable, damage to the transmitter may result if you do. You may also experience a RF burn which can be painful.

GPS Connection:

When connected to a GPS the use of the DSC Channel 70 Alarm button transmits not only the Distress Alert data message but also the position of the vessel.

6.10 Digital Selective Calling

Digital Selective Calling is a radio data paging system that is used to automate distress alerts sent over VHF, MF and HF radio systems. Ch70 is the international DSC Data channel.

The DSC systems utilise digital processing techniques combined with narrower receiver bandwidths. This provides a better signal to noise ratio compared with voice transmissions resulting in increased range of data messages over VHF voice transmissions.

There are several types of DSC equipment available. This course deals only with Class D DSC which is specifically designed for recreational vehicles. Class D equipment includes a dedicated channel 70 receiver, so you will never miss a DSC call.

DSC is used to establish initial contact between stations. Rather than just a general indication that the sending station is in distress, the DSC system allows for greater information to be transmitted including:

- Priority of Call – DISTRESS, URGENCY, SAFETY or ROUTINE
- Address – i.e. All Ships or single Ship or station

- Identification of ship in distress using MMSI number (see below)
- Position of ship in distress
- Nature of Distress- Sinking, Fire, Medical etc.

Maritime Mobile Service Identity (MMSI) Number

All DSC equipment is programmed with a unique nine-digit identification number, known as a Maritime Mobile Service Identity (MMSI). The MMSI is sent automatically with each and every DSC transmission made.

Each MMSI number consists of a country designation code called Maritime Identification Digits (MID). Normally 3 digits.

6.11 Handheld VHF Radios

Small hand-held portable VHF transceivers are readily available; their operation is similar to that of the fixed set explained above including DSC functions if fitted.

Handheld radios such as **Error! Reference source not found.** above have a self-contained, rechargeable battery and an aerial connected directly to the top of the set.

The maximum power output is normally between 1 to 5 Watts; any more power would make no difference to the range of the set due to the low antenna height.

HANDHELD VHF RADIO

Most hand-held radios have the full range of channels, various different methods being used to select them.

Usually the battery pack is removable allowing a fully charged spare to be carried. Some sets have provision for an external microphone to be fitted. Nowadays most hand-held radios are waterproof.

Chargers suitable for mains and 12-volt systems should be supplied with the set; never let the batteries remain flat for any length of time or they may not recharge.

A hand-held radio is useful on a small boat and makes an ideal back up for the larger boat. In the case of an emergency a hand-held radio will allow communications from the life raft or dinghy.

The regulations and licensing requirements for hand held radios are the same as for fixed sets; remember it is the vessel that is licensed, not the radio.

6.12 Phonetic Alphabet and Numerals

Phonetic Alphabet

When spelling a word during a message the following pronunciation (Table 2 Phonetic Alphabet below) should be followed.

TABLE 1 PHONETIC ALPHABET		
Letter	Word	Pronounced as
A	Alpha	AL FAH
B	Bravo	BRAH VOH
C	Charlie	CHAR LEE or SHAR LEE
D	Delta	DELL TAH
E	Echo	ECK OH
F	Foxtrot	FOKS TROT
G	Golf	GOLF
H	Hotel	HOH TELL
I	India	IN DEE AH
J	Juliett	JEW LEE ETT
K	Kilo	KEY LOH
L	Lima	LEE MAH
M	Mike	MIKE
N	November	NO VEM BAH
O	Oscar	OSS KA
P	Papa	PAH PAH
Q	Quebec	KEH BECK
R	Romeo	ROW ME OH
S	Sierra	SEE AIR RAH
T	Tango	TANG GO
U	Uniform	YOU NEE FORM or OO NEE FORM
V	Victor	VIK TAH
W	Whiskey	WISS KEY
X	X Ray	ECKS RAY
Y	Yankee	YANG KEY
Z	Zulu	ZOO LOO

Phonetic Numerals

Numbers too have pronunciation for use when transmitting using the pronunciation listed below in Table 3 below:

TABLE 2 PHONETIC NUMERALS	
Numeral	Spoken as
1	WUN
2	TOO
3	TREE
4	FOW ER
5	FIFE
6	SIX
7	SEV EN
8	AIT
9	NIN ER
0	ZERO

NOTE:

When reading out numbers read phonetically digit by digit:

> *Example: "and I expect to arrive at Miami, - I spell: Mike India Alpha Mike India, (Miami) , - at One Five Zero Zero tomorrow afternoon". (1500).*

Decimal Numbers should be stated digit by digit with any decimal points stated as "Decimal" NOT "Point".

Examples:
23 = TOO, TREE
NOT Twenty Three.
2.3 = TOO, DECIMAL, TREE
NOT 2 Point Three

6.13 Correct Radio Operation Procedure

To use the VHF, correct procedure should be used to reduce the time of communications to a minimum:

1. Switch the VHF on,
2. Select the required channel (Usually channel 16 is used to initiate contact and then once this is established both stations move to a "working channel" to complete their call).

3. Adjust squelch control.
4. Ensure channel is not in use. Listen for any transmissions to ensure you will not interrupt another station.
5. Plan what you want to say in advance.
6. Press the microphone transmission switch.
7. Speak clearly into the microphone, with the microphone directly in front of the mouth. If you are on deck or on the fly bridge, ensure the microphone is shielded from the wind before you start transmitting.
8. Keep the message as brief as possible.
9. Complete the message with the word "OVER".
10. Release the transmission switch
11. Wait for a reply. If no reply, wait at least 2 minutes before calling again. General guidelines state that you can call 3 times at2 minute intervals.

For example, a typical call and move to a working channel might be:

Caller: "Misty, Misty, Misty this is this is Motor Yacht Ruma, Motor Yacht Ruma¸ Motor Yacht Ruma"

Reply: "Motor Yacht Ruma, this is Misty."

Caller: "Misty, switch to six-eight."

Reply: "Received, Ruma, switching to six-eight."
Both vessels switch to Channel 68 (USA)

Caller: "Misty this is Motor Yacht Ruma and then the conversation continues until it is completed with the word "**OUT**"

After the communication has ended, both vessels should return to Channel 16.

If reception conditions are bad, the names of the calling and called boats may be repeated not more than three times. The person on board Misty will normally recognize their own boat quickly but might have difficulty catching the name of the calling boat; for this reason, the name of the calling boat can be repeated not more than three times. If a boat has a particularly odd or difficult name it may be better to use the boat's call sign rather than her name.

In the event of no reply, wait three minutes before repeating the call again. If the receiving boat is not sure if they are being called, they should wait and see if called again.

Note:
If your station is registered with an MMSI number, it is good practice to include it in your transmission such as in the example below:

Radio exchange with MMSI number.

Caller; *Hello Planet Earth, Planet Earth, Planet Earth*
THIS IS Major Moto, Major Moto, Major Moto
MMSI Number 123 456 789
OVER

Radio Checks

It is a good idea to perform a radio check before departing safe harbour. Common responses can be ”Loud and Clear” or “5 by 5” for a good transmission. For an unclear transmission you may hear “loud, but a lot of static” or “5 by 3”.

The response with numbers indicates the quality and loudness of the received signal. It was a system that is relevant to analogue communications but not so relevant to modern digital communications.

The first number 1-5 is an answer to the question *How Do you read me?*
With 1 being unreadable and 5 being perfectly clear.

The second number 1-5 is an answer to the question “how strong is my signal?” With 1 being weak and 5 being very loud.

NOTE:
When using a Handheld, ensure the antenna is in a vertical position for maximum range.

The specific sequence for radio transmissions will vary slightly around the globe but all follow the same basic guidelines. It is a good idea to listen to multiple VHF communications in a new area before contacting a local station to avoid unnecessary confusion and / or a delayed response.

DSC Routine Calling Procedure / Specific Station Calling

Routine individual calls to other DSC equipped vessels or coastal stations are relatively straightforward.

Before a caller can contact another station using DSC it is essential that the caller use the number (MMSI) of the station being called just as one would do with a radio pager.

On many DSC radios a memory or directory is available to store the name and MMSI of frequently called numbers or favourites.

- The caller selects the channel on which the voice communications are to be carried out. Note that with DSC you select the MMSI number of the station you are calling.
- Then transmit the message digitally on Channel 70.
- The other vessel receives an audible alert indication the caller's MMSI and proposed channel on which voice communication is desired.
- When acknowledged, some radios will automatically change to the voice channel pre-selected for communication, and voice communication can begin, without having to manually select the working channel.

Repeating a Routine call

The DSC call will trigger an audible tone at the called DSC radio if it is turned ON.

If an acknowledgement is not received, it may be that the called station in not turned ON, or the operator is not available to answer the call. If ON, most DSC radios will log and display a message indicating a call had been received and an acknowledgement is requested. Some DSC radios also have a built in 5-minute delay before a second attempt may be repeated.

6.14 Distress Messaging

Emergency Radio Communications – Distress Calls (MAYDAY)

The Procedure words used for a Distress Calls are "MAYDAY" stated 3 times at the beginning of the message.
"MAYDAY MAYDAY MAYDAY"

The Distress signal "MAYDAY". comes from the French "m'aidez", which means "help me".

A Distress signal is the most important transmission that can be made and has priority over all other radio transmissions. Nothing is allowed to interfere with a Distress message.

Due to the importance given to this type of message it's meaning is defined clearly and this definition must be understood.

Distress defined:

"the distress signal indicates that life or vessel (ship, aircraft, or vehicle) is threatened by grave and imminent danger and requests immediate assistance."

The key words are GRAVE AND IMMINENT. If these two conditions are not simultaneously fulfilled the situation does not justify the sending of a distress message. The skipper, or person in charge, decides whether a situation is both grave and imminent. It is accepted practice to use MAYDAY in cases of man overboard.
The distress procedure is in two sections:

- **Distress call** is transmitted on VHF Channel 16, using high power (25watts).

- This is followed by the **Distress message** which must include the vessel's position, given first, as accurately as possible, either in latitude and longitude or as a bearing and distance FROM a known feature. For example, "position 2miles east from Port Everglades".

A position as a bearing and distance from a landmark or location might alert someone nearby that they are close to the distressed vessel faster than having to first plot the latitude and longitude on a chart. The bearing should be in the 360° notation from True North and be that of the position *FROM* the mark.

Example 1: "my position is two seven zero degrees from Battery Point Lighthouse two decimal eight miles."

The nature of the distress is given next so that the rescue services know what assistance is needed. The number of people on board is the next most important piece of information so that the rescuers will know how many people to search for in the event of the crew being unable to remain together. If there is sufficient time, give any other information that may be relevant. Finally finish with the word "over".

A useful acronym to remember to help formulate the distress message in the correct order once the Distress call has been transmitted is **MIPDANIO**.Table 4 below shows how the acronym **MIPDANIO** is broken down for simple message formation:

TABLE 3 MAYDAY MESSAGE STRUCTURE (MIPDANIO)

M	***MAYDAY***
I	***IDENTITY*** *(THIS IS) followed by MMSI number*
P	***POSITION*** *(AS ACCURATE AS POSSIBLE)*
D	*NATURE OF* ***DISTRESS*** *(SINKING,FIRE ETC)*
A	***ASSISTANCE*** *REQUIRED*
N	***NUMBERS*** *ON BOARD*
I	*ANY OTHER* ***INFORMATION***
O	***OVER***

examples of MAYDAY messages:

MAYDAY EXAMPLE 1

EXAMPLE 1

Calling All Stations (CH16) :

MAYDAY X3 THIS IS Station Calling X3 MAYDAY X1 Station Calling X1 MMSI (if registered) Distress Message Additional Information OVER	MAYDAY, MAYDAY, MAYDAY THIS IS Cayman Sun, Cayman Sun Cayman Sun MAYDAY, Cayman Sun Our Position is (19'22.165N, 081'25.240W) Sinking quickly We require Immediate Assistance 12 souls aboard We are a 50foot flat top vessel with blue canopy All souls are wearing lifejackets and abandoning the vessel OVER

MAYDAY EXAMPLE 2

EXAMPLE 2

Calling All Stations (CH16) :

MAYDAY X3 THIS IS Station Calling X3 MAYDAY X1 Station Calling X1 MMSI (if registered) Distress Message Additional Information OVER	MAYDAY, MAYDAY, MAYDAY THIS IS Cayman Sky, Cayman Sky Cayman Sky MAYDAY, Cayman Sky We are currently moored to Round Rock dive site at the north end of seven mile beach Boat will not start Medical Emergency Onboard, suspected heart attack We Require Immediate Assistance 22 souls aboard We are a 50foot Cabin Cruiser, V-hull Dive Vessel CPR and O2 are currently being administered OVER

DSC Distress Messages

With DSC (Digital Selective Calling) it is accepted practice to send out a DSC Distress Alert message before the standard verbal distress call and message. This allows all stations in range to be aware of the MAYDAY in the time it takes to press and hold the Distress button. The DSC Alert once acknowledged by a coast station can then be followed by the verbal MAYDAY message. The figure below shows the DSC button behind the small Red Cover

DSC RED BUTTON

Making a DSC Distress Call

There are two methods of sending out a DSC Distress call; **Non-Designated** and **Designated**:

- **Non-Designated**: By pressing and holding the special "DISTRESS" button for five seconds, a DSC radio will automatically send a generic Distress call and message to all coast stations and other DSC equipped vessels in the immediate area.

- **Designated**: By pressing and releasing quickly the "DISTRESS" button a selection of 10 designations will appear on the screen. Select one of these items from list below. Press and hold the special "DISTRESS" button for five seconds. The DSC radio will then automatically send a designated Distress call and message to coast stations and other DSC equipped vessels in the immediate area. This method gives instant notification of what assistance might be required.

    - Abandoning Ship
    - Fire or explosion
    - Flooding
    - Collision
    - Grounding
    - Listing
    - Sinking
    - Disabled
    - Adrift
    - Piracy or attack
    - Man Overboard

As all radios might not have DSC, mariners should follow up their DSC transmission with a MAYDAY call and message on VHF Channel 16 to ensure maximum awareness in the immediate vicinity.

To further enhance safety, interfacing a GPS with the DSC is highly recommended to ensure that the vessel's accurate position is transmitted.

If GPS interface is not possible, the operator is required to input a position manually at frequent intervals (at least every 4 hours).

This automated distress message provides information regarding the identity of the vessel, nature of the distress, and location of the vessel. In addition, it sounds an alarm at other DSC equipped stations.

Receiving the Distress Call

The International Regulations state: *"The Obligation to accept Distress calls is absolute in the case of every station without distinction, and such messages must be accepted with priority over all other messages, they must be answered, and the necessary steps must immediately be taken to give effect to them".*

A coast station which receives a DSC distress alert will immediately send an acknowledgement. The sending device will then both stop repeating the alert and tune to the designated channel for the distress message to be sent. Ships receiving a distress alert who are outside coast station range or do not receive an acknowledgement are required to relay the distress alert by any means to land.

Note: that some radios on commercial vessels have the ability to turn off a distress vessel's DSC Distress call by responding digitally, however, they should not do so unless they are advised to by the Coast Guard or a Rescue Coordination Center.

On receiving a Distress alert, do the following:

- Record time and all information into the ship's log.
- Continuously record all information heard and inform the most senior member of the crew.
- Maintain a close watch on Channel 16 for a coast station to acknowledge the MAYDAY.
- If no station acknowledges the MAYDAY after 4 minutes and the message is repeated, you MUST transmit a MAYDAY RELAY.

If no digital acknowledgement is received, it is likely the shore station will respond by voice as in the figure below.

MAYDAY RESPONSE

EXAMPLE 3

Responding to a MAYDAY (CH16)

MAYDAY X1 Station In Distress X3 THIS IS Station Calling X3 RECEIVED MAYDAY X1 OVER	MAYDAY Cayman Sun, Cayman Sun, Cayman Sun THIS IS Cayman Sky, Cayman Sky, Cayman Sky RECEIVED MAYDAY OVER

To Be immediately followed by communications regarding the responding vessels current location, speed and ETA to the vessel in Distress.

MAYDAY Relay

A MAYDAY RELAY is used when:

- The station in distress is not able to send a message itself.
- A non-verbal Distress signal is observed (See Chapter 9)
- You hear a MAYDAY but are not in a position to render assistance and do not hear an acknowledgement of the message within 4 minutes.

NOTE:
A Class D VHF radio does not allow you to RELAY a MAYDAY using DSC. Instead you can send out an Urgency Alert which will alert other stations and switch their VHF to Channel 16 in order to receive a verbal MAYDAY RELAY.

MAYDAY RELAY

EXAMPLE 4

MAYDAY RELAY (CH16) :

MAYDAY RELAY X3 THIS IS Station Calling X3 MAYDAY X1 Station In Distress X1 MMSI (if registered) Distress Message Time (optional) OVER	MAYDAY RELAY, MAYDAY RELAY, MAYDAY RELAY THIS IS Cayman Sky, Cayman Sky, Cayman Sky MAYDAY Cayman Sun Vessel 1 mile west of North West Point Sinking quickly Requires Immediate Assistance 12 souls aboard Vessel is a 50foot flat top with blue canopy All souls are wearing lifejackets and abandoning the vessel OVER

Radio Silence (See-Lonce MAYDAY)

The station controlling Distress traffic may declare radio silence to avoid any interference with important messages regarding the search and rescue efforts. An example is shown below.

IMPOSING RADIO SILENCE

EXAMPLE 5

Imposing Radio Silence (CH16) :

MAYDAY X1 All Stations X3 THIS IS Controlling Station X3 MAYDAY X1 Station In Distress X1 MMSI (if registered) SEELONCE MAYDAY Time (GMT / UT) OUT	MAYDAY All Stations, All Stations, All Stations THIS IS Port Security, Port Security, Port Security MAYDAY Cayman sun SEELONCE MAYDAY Time 1345UT OUT

Restricted Working (Pru-Donce)

The station controlling Distress traffic may end radio silence but require restricted use of channels due to the possibility of further distress traffic. The figure below shows an example message.

MAYDAY RESTRICTED WORKING

EXAMPLE 6

Restricted Working (CH16) :

MAYDAY X1 All Stations X3 THIS IS Controlling Station X3 MAYDAY X1 Station In Distress X1 MMSI (if registered) MAYDAY PRUDONCE Time (GMT / UT) OUT	MAYDAY All Stations, All Stations, All Stations THIS IS Port Security, Port Security, Port Security MAYDAY Cayman sun MAYDAY PRUDONCE Time 1410UT OUT

End Of Radio Silence (See-Lonce Fee-Nee)

The station controlling Distress traffic removes any form of radio silence or restricted working, allowing communications to resume as normal. The figure below shows an example message.

END OF RADIO SILENCE

EXAMPLE 7

End of Radio Silence (CH16) :

MAYDAY X1 All Stations X3 THIS IS Controlling Station X3 MAYDAY X1 Station In Distress X1 MMSI (if registered) SEELONCE FEENEE Time (GMT / UT) OUT	MAYDAY All Stations, All Stations, All Stations THIS IS Port Security, Port Security, Port Security MAYDAY Cayman sun SEELONCE FEENEE Time 1500UT OUT

Cancelling A Distress Call

If a DSC Distress call is transmitted in error, then it should be cancelled using the procedure in figure below:

CANCELLING AN ACCIDENTAL DSC DISTRESS MESSAGE

Accidental Distress Messages

If a Distress Alert is sent using DSC allow the transmission to complete the first time. If there is no acknowledgement, switch off the equipment to prevent another transmission then switch the equipment back on and transmit using Channel 16:

All Stations X3
THIS IS
Station Calling X3
MMSI (if registered Position)

Distress Message sent in error
Cancel Distress Alert sent at Time (UT)
OUT

6.15 Urgency and Safety Messaging

Urgency Message Protocol

The Procedure words used for an Urgency Message are "PAN-PAN" stated 3 times at the beginning of the message. The figure below shows the structure of a PAN PAN message:

PAN PAN STRUCTURE

Priority of Information

Identity of Station

Your Position
(Coordinates or specific landmarks)

Nature of Distress

What Assistance is required

Number of persons aboard

Other information that may be helpful

The purpose of an Urgency message is to communicate to all stations in the area that you have a serious problem and require assistance.
It is common for vessels to be unsure if they should send an Urgency message (PAN-PAN) or a Distress message (MAYDAY). The important difference is that a Distress message is defined by "Grave and Imminent Danger requiring immediate assistance". An Urgency message is anything less than that.

For example, if a vessel has lost all power and is drifting but is not yet in danger of running aground or colliding with another vessel it would most likely send an Urgency Message. However, if the vessel is drifting toward shore and will run aground shortly, causing severe damage and possibly serious injury to the crew, it would send a Distress message.
Urgency messages are commonly sent to "All Stations" asking for assistance, but it is also common practice to contact a specific station such as the local Coastguard or Search and Rescue service if available.

Transmitting a DSC Urgency Alert:

If you have a DSC VHF radio, then initiate the Pan Pan message with an Urgency Alert prior to the Urgency message:

- Select the "All Ships" function
- Specify the working channel as 16.
- The Urgency alert will be transmitted on Channel 70 along with your MMSI number
- Wait briefly to allow the other vessels to change to Channel 16 (or specified channel)
- Broadcast your urgency message using standard VHF procedures preceded by the PAN PAN, PAN PAN, PAN PAN prefix.

As in a Distress situation, the Urgency requires cancellation when concluded.
The figure below gives an example of an urgency Pan Pan message.

EXAMPLE PAN PAN MESSAGE

EXAMPLE 1

Calling All Stations (CH16) :

PAN-PAN X3 All Stations X3 THIS IS Station Calling X3 MMSI (if registered) Urgency Message Additional Information OVER	PAN-PAN, PAN-PAN, PAN-PAN All Stations, All Station, All Stations THIS IS Cayman Sun, Cayman Sun Cayman Sun We are 1 mile west of North West Point We have lost all power and are drifting West We require a tow back to Georgetown anchorage 10 souls aboard We are a 50foot flat top vessel with blue canopy OVER

6.16 Safety Messages

The Procedure word used for a safety message is "SECURITE" being stated 3 times at the beginning
of the message. "SECURITE SECURITE SECURITE", "Pronounced: SAY_CURE_EE_TAY"

The purpose of a safety message is to communicate urgent information to all stations in the area, typically regarding navigational or meteorological warnings.

These messages are most commonly sent from a shore-based station but can also be sent by vessels at sea if there is significant reason to do so.

CAPSIZED VESSEL

For example, if there is a large submerged object drifting in a heavy traffic area it would be prudent to communicate the sighting with all other vessels in the area to avoid a collision.

Transmitting a DSC Safety Alert

The Safety signal indicates that a station has an important message to transmit concerning an important navigational aid or a meteorological warning.

To transmit a DSC Safety Alert:

- Select the All Ships function
- Specify a working channel other than 16, such as 06
- The Safety alert will be transmitted on Channel 70
- Wait briefly to allow other vessels to change to the specified channel
- Broadcast your safety message using standard VHF procedures which are preceded as usual by the SECURITE, SECURITE, SECURITE prefix.

The figures below script some samples of SECURITE messages. Follow through each one in turn to ensure you understand the procedure.

SAMPLE SECURITE MESSAGE

EXAMPLE 1

From a Coast Station (CH16) :

SECURITE X3	SECURITE, SECURITE, SECURITE
All Stations X3	All Stations, All Stations, All Stations
THIS IS	THIS IS
Station Calling X3	Dover Coastguard, Dover Coastguard
Safety Message	Dover Coastguard
OUT	Urgent Weather Warning Listen on Channel 67
	OUT

EXAMPLE SECURITE MESSAGE 2

EXAMPLE 2

From a Vessel Sighting a hazard (CH16) :

SECURITE X3	SECURITE, SECURITE, SECURITE
All Stations X3	All Stations, All Stations, All Stations
THIS IS	THIS IS
Station Calling X3	Cayman Sky, Cayman Sky Cayman Sky
Safety Message	We have sighted a large submerged tree drifting south from Jackson point terminal
OUT	OUT

EXAMPLE SECURITE MESSAGE 3

EXAMPLE 3

From a Vessel operating within narrow waterways (CH09) :

SECURITE X3	SECURITE, SECURITE, SECURITE
All Stations X3	All Stations, All Stations, All Stations
THIS IS	THIS IS
Station Calling X3	Cayman Sky, Cayman Sky Cayman Sky
Safety Message	We are Outbound on the new river approaching little Florida, any concerned traffic contact Cayman Sky
OUT	Standing by on Channel 09
	OUT

6.17 International Distress Signals

The following signals used or exhibited either together or separately, indicate distress and need of assistance:

- A gun or other explosive signal fired at intervals of about a minute
- A continuous sounding alarm with any fog-signaling apparatus
- Rockets or shells, throwing red stars fired one at a time at short intervals
- A signal made by radiotelegraphy or by any other signaling method consisting of the group . . .- - -. . . (SOS) in the Morse code
- A signal sent by radiotelephony consisting of the spoken word “Mayday”
- The International Code Signal of distress indicated by Flags NOVEMBER and CHARLIE.
- A signal consisting of a square flag having above or below it a ball or anything resembling a ball
- Flames on the vessel (as from a burning tar barrel, oil barrel, etc.)
- A rocket parachute flare or a hand flare showing a red light
- A smoke signal giving off orange-colored smoke
- Slowly and repeatedly raising and lowering arms outstretched to each side
- The radiotelegraph alarm signal
- The radiotelephone alarm signal
- Signals transmitted by emergency position-indicating radio beacons
- Approved signals transmitted by radio communication systems, including survival craft radar transponders

The use or exhibition of any of the foregoing signals except for the purpose of indicating distress and need of assistance and the use of other signals which may be confused with any of the above signals is strictly prohibited.

6.18 Knowledge Review

1. What triggered the formation of SOLAS?
2. Which Channel is reserved for International Distress, Urgency and Safety?
3. Which Channel is only to be used for digital data transmissions?
4. What do the initials EPIRB stand for?
5. Which type of VHF antenna is best suited to a motor boat?
6. Which factors determine the range of a VHF Radio transmission?
7. Describe the correct operation of squelch
8. What does Dual Watch enable the operator to do?
9. Explain the purpose of the DSC Distress button.
10. Explain why having a GPS connected to a DSC is important?
11. Memorize the Phonetic alphabet.
12. Practice by reading out your home address using Phonetic letters and numerals.
13. Prepare a simple radio message containing at least 3 prowords and practice communicating with a friend or colleague.
14. Describe how you can call a specific station using DSC.
15. Define in what circumstances should a MAYDAY message be transmitted.
16. State the two components of a MAYDAY transmission.
17. Prepare a simple MAYDAY message using the MIPDANIO acronym.
18. Describe the advantage of using DSC to initiate a Distress message.
19. Recall 5 of the 10 DSC designations.
20. Prepare a MAYDAY RELAY message for the distress message used in Qu 2 above.
21. Recall what should be done in the event of an accidental distress message transmission.
22. Which message is to be used for Urgent situations that are not yet in grave and imminent danger?
23. Prepare a simple PAN PAN message and practice reading out loud.
24. Describe how a DSC urgency alert would be transmitted.
25. What is the Morse code signal for distress regardless of the means it is sent from?
26. If you have no other means available to raise an alarm other than your person, what could you do?
27. State 5 other international signals of distress.

Module 7 BASIC ROPEWORK

7.1 Key Objectives

THE OBJECTIVE OF THIS MODULE IS TO ENSURE THAT CANDIDATES CAN DEMONSTRATE THE ABILITY TO TIE BASIC KNOTS AND KNOW THE CORRECT PROCEDURE FOR SECURING A BOAT TO A DOCK BY TYING LINES TO CLEATS.

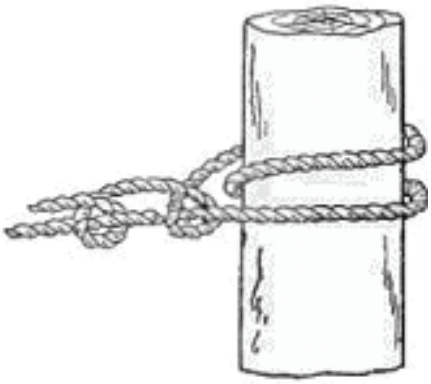
7.2 Types of ropes, care & maintenance of ropes

There are many ropes used for a variety of reasons aboard a boat and particularly on a sailboat. Each rope (or line as they are called) has a specific name and a specific function. There are lines for tying a boat to a dock and lines for hoisting and adjusting sails. There are a number of different colors, thickness, makes and lengths each designed for a single purpose. The larger the boat is, the larger the lines will need to be to attach the boat to the dock or for the hoisting of heavy sails.

7.3 How to tie knots

The correct selection of the right type of knot, bend, or hitch for any job is essential to prevent it undoing as well as having the ability to be readily untied when required. Knots, Bends, and Hitches are all ways of fastening one or more ropes together or for attaching a rope to an object such as a spar or ring.

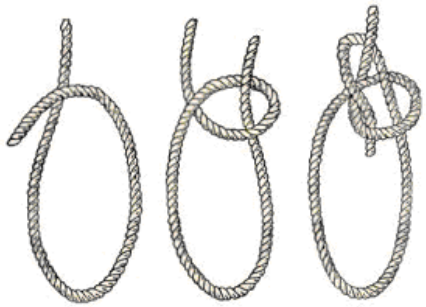
The following selection of knots, bends and hitches and their purpose are adequate for most requirements on a yacht.



ROUND TURN & TWO HALF HITCHES

Round Turn and Two Half Hitches is mainly used for securing to a post or ring. The round turn creates friction, which allows the load to be held while the 2 half hitches are made.

Bowline creates a fixed loop in the end of a rope. It is a secure knot that is unlikely to slip or untie itself and has the advantage of being relatively easy to untie even after being under load. Used for a number of applications such as creating a loop in a dock line of for attaching sheets to a sail.



BOWLINE KNOT

Figure of Eight is a stopper knot used to prevent the end of a rope running out through a block or fairlead. It is easy to undo and is mostly used on the ends of sheets, halyards and deck lines.

FIGURE OF EIGHT KNOT

Sheet Bend is used to join together 2 ropes.

Reef Knot is used mainly for fastening reef ties when shortening sail. Because it will undo easily if the load is not constant it should never be used to join two ropes together, especially if the two ropes are of different diameters. A better knot to join two ropes is the “sheet bend’ or “double sheet bend” described below. An improperly tied reef knot is known as a “granny knot”.

REEF KNOT

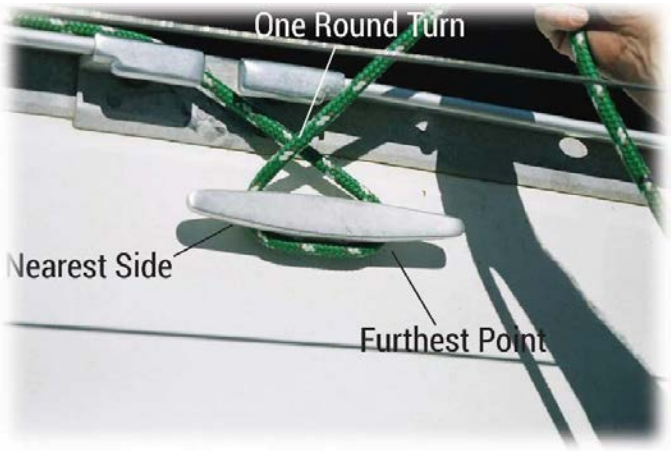
Clove Hitch

A clove hitch may be difficult to untie after being under heavy load and is usually used for tying the painter of a dinghy to a bollard or attaching fenders to lifelines.

CLOVE HITCH

Securing to a Cleat

The rope should be led to the back of the cleat and a full turn taken around the base. This will hold the load. The second step is to make two figures of eight turns around the cleat finishing with another full turn around the base of the cleat. The general rule for securing a line to a cleat is "nearest side, furthest point, one round turn."



SECURING TO A CLEAT

7.4 Coiling Line

Ropes and lines should always be coiled neatly so that they are easy to access and use when needed quickly. Properly coiled lines allow the rope to run freely and not become kinked; it is also more easily stowed.

With stranded rope, always coil with the lay, and for the more common right lay rope, this will be by coiling clockwise using a slight twist about half a turn, in the direction of lay as each coil is formed. When coiling a braided rope which has no lay less twist must be used.

COILING LINE SEQUENCE

7.5 Knowledge Review

1. What causes ropes to deteriorate?
2. Know how to properly coil a line.
3. Know how to secure to a cleat.
4. Know all the various types of knots and their uses.

- It is very important to practice tying knots, so you are familiar with them when you need to secure a boat to a dock or mooring buoy. Practice this with your skipper until you have managed the correct procedure.

Module 8 REFUELING

8.1 Key Objectives

THE KEY OBJECTIVES ARE TO ENSURE THAT CANDIDATES UNDERSTAND THE CORRECT RE-FUELING PROCEDURES AND THE SAFETY MEASURES THAT NEED TO BE UNDERTAKEN TO MINIMISE THE RISK OF FIRE.

The best place to refuel your vessel is at the local marina. Marina staff are aware of the precautions that need to be taken in order to prevent a fuel spill, and how to deal with them should they arise.

8.2 Refueling Procedures

The procedures that need to be followed are as follows:

- Secure the vessel to the dock.
- Shut down all engines and electrical systems.
- Extinguish all naked flames including cigars and cigarettes.
- Only those involved in refuelling should be on the vessel.
- Do not smoke near the refuelling area.
- Have a fire extinguisher on hand in case it is needed.
- Avoid overflowing the tanks.
- Clean up any spillage with absorbent cloths and dispose of properly.
- If your vessel is gasoline powered, run the engine room blower for several minutes before starting the engine.
- Fill all additional fuel containers on shore and never aboard the boat.
- Close all windows and ports to prevent fumes entering the boat.
- Before starting the engine, make sure it is in neutral and all divers and swimmers are clear of the prop.

Get to know the fuel range of your boat, and never trust a marine fuel gauge, they are nearly always wrong.

8.3 Planning

Plan ahead to ensure you never run out of fuel or oil. This is the number one cause of boater distress. You should always be sure to plan your requirements and carry enough fuel and oil.

As a general practice you should use the rule of thirds when considering the amount of fuel required:

- 1/3 out
- 1/3 back
- 1/3 in reserve

8.4 Knowledge Review

1. Name 6 precautions that need to be undertaken before refueling a vessel.
2. What is the recommended general practice when considering your fuel requirements?

Module 9 MAN-OVERBOARD PROCEDURES

9.1 Key Objectives

THE KEY OBJECTIVES OF THIS MODULE ARE TO UNDERSTAND THE PROCEDURES TO BE UNDERTAKEN TO RETRIEVE A MAN-OVERBOARD. THIS MODULE IS DESIGNED TO BE A "PRACTICAL" MODULE REQUIRING THE ACTUAL PRACTICE OF THE PROCEDURES OUTLINED IN THIS THEORY MODULE.

9.2 Man overboard (person overboard) emergency

Over 40% of all boating fatalities are the result of people falling overboard. Getting struck by the boom is the number one cause of man overboard accidents on sailboats.

All boats should be prepared with the knowledge and equipment to rescue someone who has fallen overboard.

- Ensure that the emergency equipment is properly maintained and readily accessible.
- Practice overboard rescue techniques with your passengers (using a bucket) and make them aware of their responsibilities in this event.
- Practice maneuvering your pleasure craft to properly position your boat so that you're ready to perform an overboard rescue.
- Be aware of the water surface and weather conditions as well as condition of the person being rescued.

9.3 Rescuing a Person Overboard - General

- Shout "man overboard" reduce speed and prepare to turn around

- Assign another person onboard to keep a lookout for the person overboard and continuously point to their location in the water.

- Immediately throw a bright colored buoyant item overboard (such as a cockpit cushion or lifejacket) to increase their visibility in the water and mark their approximate position.

- In limited visibility, look at the compass for the course you were steering when the person fell overboard
  .
- Put the wheel hard over towards the side where the person fell. This will take the stern of the vessel and the propellers away from the person in the water.

- Turn to about 60 to 70 degrees from your course and then put the wheel hard over to the other side.

- Come back on to the reciprocal of your original course. For example, if you were steering 105 degrees then you would come back onto 285 degrees this will put you on course straight back towards the person.

- Carefully manoeuvre the boat, turning the bow into the wind and in a downwind position from the victim. This is because you want the person overboard to drift towards your boat, not move away from the boat.

- Once the person is alongside, put engine into neutral or shut down the engine to avoid injury to the victim from the propellers.

- Use one of the following rescue techniques to retrieve the victim:
  - Reaching Assist
    - Move to the side of the boat and keep your weight low
    - Use the reaching assist to pull the victim to the side of the boat and assist them back into the boat.

  - Use a Buoyant Heaving Line
    - Throw the heaving line so that it lands behind the victim
    - Slowly pull the line towards you so the victim can grab onto it
    - Pull the victim to the side of the boat and assist them back into the boat
  - Use a Life Ring
    - Ensure the life ring is secured to the boat with a line
    - Throw the life ring so that it lands behind the victim
    - Slowly pull the line toward you so the victim is able to grab onto it
    - Pull the victim to the side of the boat and assist them back into the boat

It is important to note that a rescuer should never jump into the water in an attempt to rescue the victim (unless they are unconscious) because if the victim is panicking and thrashing around they could pull the rescuer under water.

9.4 Man Overboard – Powerboats

Note: Under instruction, the candidate will demonstrate good practical understanding and application of MOB procedures.

MAN OVERBOARD POWER
PHOTO BY JOHN ROUSMANIERE & PHIL COWLEY

9.5 Cold Water/Weather Survival Gear

If operating in cold conditions, you should always use cold weather/water protection gear. You should wear multiple layers of dry, light clothing and a water or wind proof outer layer as well as a lifejacket or PFD. Gear designed for cold environments offers better protection from the elements and can delay the effects of hypothermia.

WET SUITS

Traps and heats water against the body and should be used with a flotation device.

DRY SUIT

Remains dry on the inside and should be used with a flotation device.

IMMERSION SUIT (OR SURVIVAL SUIT)

Should be used in extreme conditions when abandoning a vessel. It works as a full body flotation device.

EXPOSURE COVERALL

Insulated suit to protect from hypothermia

Always know how the equipment you choose works in water. Test the equipment in a warm swimming pool or calm water to ensure it works properly in the event of an emergency. Choose the appropriate cold weather/water protection gear for your voyage.

9.6 Knowledge Review

1. What is the cause of 40% of all boating fatalities?
2. What s is the number one cause of man-overboard on sailboats?
3. Describe the procedure for rescuing a man-overboard for power and sail vessels
4. What criteria do you need to take into account when considering a man-overboard rescue?
5. Describe 4 types of cold weather survival gear

Module 10 CAPSIZING, SWAMPING AND SINKING

10.1 Key Objectives

THE OBJECTIVES OF THIS MODULE ARE TO GET THE CANDIDATE TO UNDERSTAND THE SERIOUSNESS OF CAPSIZING, SWAMPING OR SINKING AND THE ACTIONS TO BE TAKEN IN THE EVENT OF SUCH AN OCCURANCE.

10.2 Definitions

According to the "Safety of Life at Sea" (SOLAS) convention, all mariners are obligated by law to render assistance to any vessel that is in distress whether from capsizing, fire, swamping, grounding or sinking, as long as they do not endanger their own crew, passengers or vessel.

CAPSIZED VESSEL

Capsizing is when a vessel is turned upside down in the water, yet the vessel still remains afloat due to the air trapped inside the hull, or if the buoyancy built into the vessel causes the hull to remain afloat.

Swamping is when a vessel is filled with water that comes in over the sides or bow/stern of a vessel, yet the vessel remains upright.

Sinking is when a boat disappears below the water and sinks to the bottom of the sea or lake.

SWAMPING

SINKING

Capsizing usually occurs when heavy weather is encountered. This is most likely to happen when hit by a large wave on the beam of the vessel causing the center of gravity to shift to the point of what is called "vanishing stability" and the vessel will overturn. It can also be caused by the wake of a large vessel as it passes by.

Another way that a vessel can capsize is to "turn turtle". This generally occurs when the bow of the vessel buries into a wave and the stern flips over the bow. Capsizing is a very frightening experience and it

can cause injury and/or death. Passengers are most likely to survive if wearing lifejackets.

- If you cannot stop your vessel from sinking, try swimming to safety if close to shore. If not, stay with your vessel until help arrives and if possible climb on top of it, it is much easier to spot an overturned vessel in the water that a swimmer. Climbing onto the overturned hull will avoid the onset of hypothermia (if in cold water) and will increase your visibility to other boaters.

- A hull will generally stay afloat for a very long time. If you do capsize, confirm that all passengers are all present and accounted for, determine if other craft are in the area that may help, and if possible try to find your air horn or flares for signalling.

Swamping generally occurs when large waves overtake the bow, stern or sides of the vessel and fill the boat with water or if the hull is punctured by a log or sharp object in the water. It is far more likely to occur if a vessel is overloaded with too many passengers or weight. It can also occur from a burst thru hull fitting. As with capsizing, it is most likely to occur during heavy weather. As with all hull leaks or flooding, start bailing or pumping the water out as fast as possible and head for shore. If possible, transfer your crew and passengers to another vessel. Make sure all passengers are wearing lifejackets and have your signalling devices ready if they are needed.

Sinking is the worst-case scenario for a vessel. It can occur from capsizing, swamping or hitting an object in the water such as a log, whale or container. When a boat sinks there is nothing to hold onto for buoyancy and will leave the passengers on their own in the water or in their liferaft. If close to shore, stick together and swim to safety. If your vessel is equipped with a liferaft, the golden rule is to "never leave your vessel unless you have to <u>step up</u> into a liferaft".

Grounding is running aground and can happen very easily in areas that have a high tidal range. It is imperative to keep a close eye on your navigational charts and stay within the deeper water channels if in doubt. If you do run aground on a falling tide, make sure that the hull has not been punctured and wait until the tide turns. If you run aground at high water, you may need to seek towing assistance. Lighten up the boat if possible by getting the passengers or crew onto another vessel. Make sure that everyone is wearing a lifejacket and have a radio and signalling device ready.

To avoid any of the above scenarios from taking place it is imperative that you get a marine weather forecast before leaving shore. Getting caught in bad weather can be avoided by getting regular forecasts and "if in doubt, do not venture out". Having safety equipment ready, an abandon ship bag and life jackets for all passengers will help to increase your chances of rescue and survival.

Leaks

If there is water accumulating in the hull of your boat, take the following actions:

1. Determine whether the passengers and the vessel are in danger.

2. If the craft is moving bring it to a complete stop (this will reduce water pressure against the hull and reduce the speed at which water is entering the boat). Turn on the bilge pump (if equipped) and identify the source of the leak or flooding.

3. Stop the hull leak if possible. The use of tapered wooden plugs, a hull patch kit, towel, rag or other malleable material may work.

4. Attempt to remove accumulations of water. You can remove water by using a hand-held bailer, manual pump or bilge pumping system. You should use a device that suits the circumstances and the type of craft (your craft should be equipped with appropriate bailing devices as stipulated by the Small Vessel Regulations.)

5. If necessary, signal your need for help using a recognized distress signal.

Remember: You should always carry the tools and materials needed to temporarily stop hull leaks or flooding.

These include:

- Tapered wooden plugs
- Hull patch kit
- Towels, rags or other malleable material

WOODEN PLUGS FOR THRU-HULL FITTING

10.3 Knowledge Review

1. What are the differences between capsizing, swamping and sinking?
2. Name 3 things that could cause a boat to swamp
3. What is the "point of vanishing stability"?
4. When is a boat most likely to capsize?
5. What is the main cause of capsizing of capsizing, sinking or swamping?
6. What safety precautions can be taken for all of the above?

Module 11 ANCHORS, ANCHORING AND RUNNING AGROUND

11.1 Key Objectives

THE OBJECTIVES OF THIS MODULE ARE TO UNDERSTAND THE MOST COMMON TYPES OF ANCHORING, ANCHORING PROCEDURES AND WHAT TO DO IN THE EVENT OF A GROUNDING.

Anchors hold best in soft bottoms such as sand and mud, but will also hold in hard sand, shingle or pebbles. Smooth rock and weed are not good for holding. The Fisherman is probably the best for holding in rock. On vessels >10M it is best to carry two anchors of different types. The anchor line is called "rode" or "warp". The rode may be line (nylon warp or fiber rope), chain, wire rope or a combination of line or wire rope and chain. The end of the rode that is attached to the boat is known as the "bitter end".

Whichever type of anchor is used to hold the vessel without dragging, a horizontal pull along the seabed must be created. **This requires the correct amount of scope; at least 5 times the maximum depth of water for chain and at least 7 times the maximum depth for rode. This means that in 3m of water, you would lower 15 feet of chain or 21m of chain and rode. Scope** is defined as the ratio of length of anchor line in use, to the vertical distance from the bow of the vessel to the bottom of the water. Larger boats generally carry all chain while smaller boats are more likely to carry a short length of chain attached to a nylon warp.

ANCHOR WITH RODE AND CHAIN

11.2 Anchors and Your Boat

Anchors uses

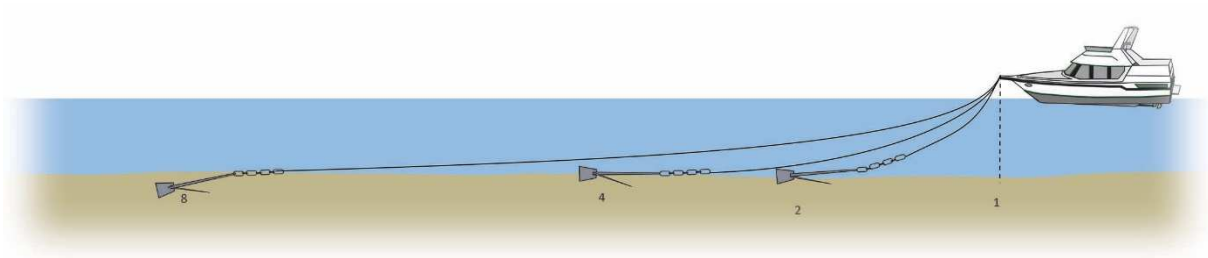
- In event of a breakdown
- During severe weather
- Non-emergencies such as stopping to swim or an overnight stay

Anchoring

It is important to understand that it is not the anchor alone that holds the vessel in place but the combined effect of both anchor and chain. The anchor fixes the chain to the seabed and the weight of the chain and the friction of it on the seabed hold the vessel in place. One of the most important considerations is the depth of water and one must remember that it will change according to the tide. The procedure requires a minimum of two people, one to work the anchor gear and the second to steer the vessel.

How to anchor the boat

1) Make sure that one end of the anchor line is securely fastened to the vessel, the other end is securely fastened to the chain and the chain is shackled to the anchor.
2) Slowly lower the anchor over the bow or side of the boat until it touches bottom. (Never throw the anchor over the side of the boat).
3) Make a mental note of the length of line used for the anchor to reach bottom, operate the engine in reverse and let out an additional 5-10 times more anchor line than the depth of the water and securely fasten to the boat.
4) At only 2x and 4x depth, the anchor can dig in but there is too much upward pull on the anchor line. At a length of 5 to 10 times the water's depth, the rope lies flat on the bottom and pulls the anchor in deeper.

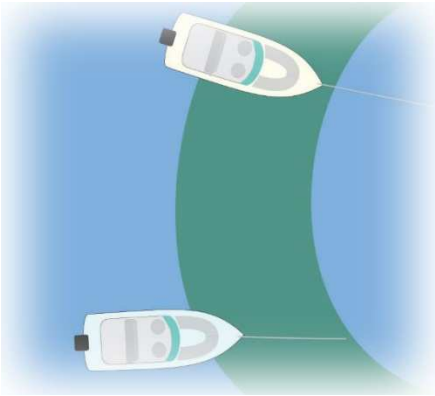


Choosing landmarks

Once the anchor is set, choose two fixed landmarks on the horizon and occasionally check your position in relation to the landmarks to ensure that you are not drifting.

Swing

Never secure the anchor to the stern of the craft. If the wind changes direction, your boat will swing with the stern into the wind. Smaller boats can be easily swamped by waves crashing over the back of the boat.



ANCHOR SWING

Right of swing

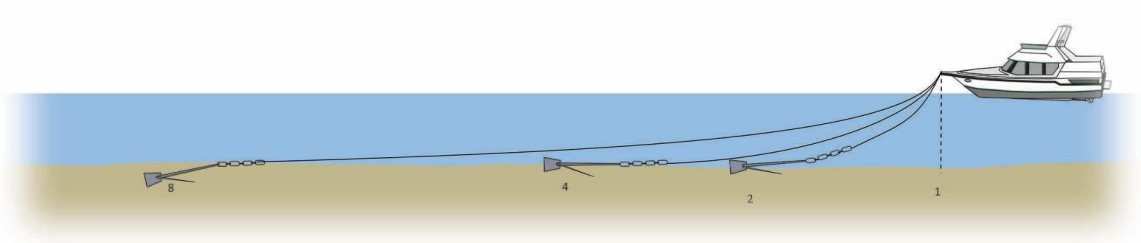
If you are preparing to set anchor in an anchorage among other boats, remember that the first craft into anchorage has the 'right of swing'. Other boats may 'swing' with changes in wind direction or current. Always allow for another craft's right of swing and anchor well clear of it.

Retrieving the anchor

To retrieve the anchor, slowly pull on the anchor line, move the boat forward until the anchor frees itself from the bottom and is hanging directly downward, bring the anchor onto the vessel and fasten securely.

Scope

Scope is defined as the ratio of length of anchor line in use to the vertical distance from the bow of the vessel to the bottom of the water. The scope of chain or warp will vary with conditions, the type of anchor, and size and type of boat but, if the anchor is dragging, more warp should be let out.



SCOPE

Setting the Anchor.

1) ***Do not anchor in prohibited areas, for example: where there are submarine cables, (these are underwater electrical or communication cables and will be marked on a nautical chart).***
2) Do not anchor on old shipwrecks as this will likely snag you anchor (these will also be marked on a nautical chart.

3) Having established the depth of water at high tide in the location you wish to anchor, you will prepare to lay out your anchor and chain.
4) Examine the way vessels on the other moorings are lying, this will help you evaluate the best place to anchor. Vessels will either be lying head to wind or if the current is stronger heading into the current.
5) If the anchorage is crowded, it is best to plan to anchor among vessels that are similar to your own, power boats and sailing boats have different characteristics in the way they lie at anchor and it best to swing with a similar group of vessels.
6) Remember the vessel will swing on its anchor so you need room between you and other vessels to allow your boat to possibly swing through 360 degrees.
7) Drop your anchor and rode according to the depth of water you are in (remember your scope ratio). When the anchor hits the bottom, the chain will momentarily slacken
8) Once the anchor is on the bottom go astern slowly and at the same time pay out the rode until you reach the length you decided to use.
9) At this point, when you stop paying out, the anchor chain will become taught and run forward from the vessel at a shallow angle, close to horizontal.
10) You should feel the vessel slow as the chain becomes taught, take the engine out of gear and the boat should move forwards until the chain is hanging close to vertical from the bow.
11) Once the vessel has settled, take compass bearings from objects that you can clearly define, or take a reading from the GPS if fitted.
12) Repeat the last process after a period of time, the figures should match reasonably closely. Even if the vessel turns with the wind or current to head in a different direction these bearings should remain constant.
13) If there are large changes in the bearing, the anchor is dragging and will have to be reset.

Beach Anchoring

In order to ensure that your vessel does not drift away on a rising tide it is common practice to anchor the dinghy on the beach as shown.

BEACH ANCHORING

11.3 Kedging

Kedging is a method of getting a boat which has run aground back into deeper water. The method is to take the anchor in your dinghy and drop it into deeper water. You can then use the anchor windlass to pull the boat toward the anchor in order to refloat the boat. This process is repeated until such time as the boat is in deep water and is referred to as kedging.

11.4 Fouled Anchor

If the seabed is covered with debris, the anchor can become fouled and difficult to retrieve. It may require "driving over the anchor" (with the engine in gear) in an effort to release it and in some instances (if the water is shallow enough), it may be necessary to dive down to unsnag it. A trip line can be fastened to the anchor so that the crown can pull it up. There is a hole or ring on most anchors for the attachment of such a line. The other end of the line may be attached to a small buoy (which has the advantage of marking the position of your anchor).

11.5 Running Aground (groundings)

Problems

Unintentional groundings may occur with or without warning. A disabled vessel may drift ashore if the anchors fail to hold her and there may be time to prepare. A grounding due to errors in navigation may occur without warning.

All crew on board should be wearing lifejackets. If the vessel is disabled, it is almost certain that a call for towage may be required. If the vessel starts to break up after grounding, it will be necessary to abandon her, and preparations should be made in advance, even if the chances of having to do so appear slim.

- After grounding, the situation must be assessed.
- The position of the vessel must be ascertained.
- Where possible, a full internal inspection should be carried out to assess the damage to the vessel.
- Soundings must be taken all round the outside of the vessel to establish how much of the vessel is aground and how hard aground.
- There is no point in trying to refloat the vessel if she is so badly damaged that she will sink as soon as she reaches deep water. It would be better to keep her firmly aground and not grinding on the bottom and doing further damage. Much will depend on the state of the sea, the anticipated weather and the type of bottom.
- The decision to call for assistance or to try to refloat the vessel without assistance will be affected by all the above factors. If she is reasonably intact and not too firmly

aground, it may be possible to refloat her by removing weight such as a dinghy, pumping water tanks and removing stores.

- Before any attempt is made to refloat, the operation should be carefully planned. If possible, anchors should be placed to seaward by the vessel's dinghy. A careful survey of the proposed track of the vessel into deep water should be made using the dinghy. These may also be useful in towing the vessel.
- If possible, a diver's inspection should be carried out to check for damage and especially to check the rudders and propellers.
- Any repairs to the hull should be completed before trying to move the vessel. Obviously, the best time to start the operation is on a rising tide, soon before high water. If the main engines cannot be used, it is almost certain that assistance will be required.

If you run aground:

- Make sure that all your crew are safe and free of injury and are wearing lifejackets.
- Check your position, if the navigator knew where he was, then the vessel would probably not have run aground. Consider holding the vessel in position with anchors.
- Monitor the situation and make regular checks on all compartments.
- Take soundings around the vessel to determine the nature of the ground on which the vessel lies and how much of the vessel is actually aground.
- Assess the degree of risk and this will depend on many factors, including the present weather and the forecast, the state of the tide and the amount of damage found. Divers may be required to make more a detailed inspection.
- Arrange outside assistance, this may involve a Mayday, a Pan Pan or a call to arrange a tow.
- Passengers and crew may have to be taken off.

Solutions:

- If you have run aground at low water, the vessel will refloat as the tide rises.
- Seek assistance from a passing vessel if at all possible.
- Determine if she will survive the tow to a safe port or if extra water pumps will be needed.
- If necessary, use your VHF radio to call a local towing company.
- If a tow is engaged to pull the vessel off, then good communications are essential between vessel and tow, together with an agreed plan of action.
- In order to secure the tow, bearing in mind the strain on the towing gear in such an operation, it is worth considering using the heavy towing gear from the towboat. Give some thought as to how the line is to be secured aboard.
- It may be useful to lay out an anchor to assist. Timing, weather, the state of the tide and daylight will effect this.

- Determine where the nearest port is that will have the necessary facilities to make repairs

11.6 Knowledge Review

1. When would you use an anchor?
2. What is scope?
3. How much scope would you use if using just chain?
4. How much scope would you use if using rode and chain?
5. Describe the sequence for setting an anchor
6. What is swing?
7. Who has the “right of swing”?
8. Describe the sequence for retrieving an anchor?
9. What is fore and aft anchoring?
10. What does kedging mean?
11. How would you retrieve a fouled anchor?
12. List the problems associated with running aground
13. What safety measures should you take if you run aground?
14. What solutions are open to you if you run aground?

Module 12 SMALL POWERBOATS & RIGID INFLATABLE BOATS (RIBS)

12.1 Key Objectives

THE OBJECTIVE OF THIS MODULE IS TO FAMILIARISE THE CANDIDATE WITH SMALL POWERBOATS AND RIB'S, THE VARIOUS TYPES, ENGINES, GENERAL OPERATING, LAUNCHING, RECOVERY, BEACHING, FAULT FINDING, STABILITY, RECOVERY, TOWING AND CRASH STOPS.

12.2 Types – Advantages and Disadvantages

Small powerboats, sailboats and rigid inflatable boats are commonly called dinghies, but should not be confused with sailing dinghies. These vessels are designed for short passages between harbours and boats at anchor or taking guests to and from the beach. Designs vary in shape and size.

	ADVANTAGES	DISADVANTAGES
Wood & Fiberglass	Mostly puncture resistant	When coming alongside another vessel they can scratch the hull.
Inflatable	They will not damage vessels when coming alongside as they are flexible	Can be easily punctured by reefs or sharp objects.

INFLATABLE DINGHY

RIGID DINGHY

SMALL POWERBOAT DINGHY

12.3 Inboard Motors

Only large dinghies (10 passengers or more) tend to have inboard engines and are very heavy to lift and tend to be expensive to purchase. Due to their weight they are more popular on superyachts which have special "hydraulic cranes" to lift them onto davits on board deck.

12.4 Jet Drives

JET DRIVE

- Jet drive dinghies have the same propulsion system as a jet ski's or personal watercraft. They have no propellers; therefore, they are safer to use around swimmers.

- A disadvantage of jet drives is that they can easily suck in plastic bags, debris or jellyfish which will shut down the motor.

12.5 Outboard Motors

SINGLE OUTBOARD ENGINE

The outboard motor is fitted to the transom of the dinghy either by means of a stern bracket and clamps or on larger dinghies by bolts and nuts. There is a tilt mechanism, which may be either manual on small engines or electric on larger ones. This allows the engine to be raised when in shallow water or when launching.

- Most outboard engines are fuelled by petrol/gasoline and may be 2 stroke or 4 stroke. A 2 stroke engine has oil mixed into the petrol/gas tank (newer engines have a separate oil reservoir and pump which mixes the oil and petrol/gas before injection). 4 Stroke engines are petrol/gasoline driven with a separate oil lubrication system.

- 2 stroke engines are generally cheaper than 4 stroke engines. 4 stroke engines generally run smoother, quieter and are more environmentally friendly.

MULTIPLE OUTBOARD ENGINES

12.6 Steering / Propellers

- Smaller outboards steer the boat by turning the whole motor using the attached tiller, which is fitted with a "twist-grip" type throttle control.

- On RIBs and larger vessels controls, are center console mounted. Steering is normally wheel controlled through hydraulic rams or cables and steers just like a car.

STEERING WITH A TILLER

12.7 Ventilation & Cavitation

- If air is drawn onto the blades of a rotating prop it will lose grip, causing a sudden rise in the RPM and loss of speed. This may cause "cavitation", which is the loss of effective propeller thrust. This phenomenon also has a corrosive effect on the blades. Stainless blades, being sturdier and thinner are less affected.

- One other effect of the propeller is that it produces stern thrust as well as a sideways "paddle-wheel effect" and will swing the bow of the boat to port or starboard depending on the hand of the propeller and whether the boat is moving forwards or astern. This effect is called "prop-walk". Most single screw motors turn clockwise when viewed from astern.

CORRODED PROP DUE TO CAVITATION

12.8 Pre-Launch Procedures

1. Check that the outboard motor is firmly clamped or bolted to the transom and the safety cable/chain is connected to a strong point on board.

2. Stow safety, signaling and PFD equipment, where it will not be in the way but is readily available if needed.

3. Fuel tank should be full and positioned safely to assist in overall stability.

4. Anchor and warp should be checked for utility and 'bitter end' for security. (Make sure the end of the anchor line is tied on!)

5. Make sure the drain hole bungs are in place.

6. Take adequate personal supplies of food and water for the duration of the voyage.

Fueling (see Re-fueling section)

Ensure you know whether you are dealing with a 2 stroke of 4 stroke engine before fueling. There should be no naked flames when fueling, i.e. smoking. Keep a fire extinguisher handy. Avoid overfilling and make sure there is good ventilation.

12.9 Engine Starting & Stopping

Pre-Start Checks:

1. Ensure the fuel tank is full, shake the fuel tank to mix the contents (where applicable).
2. Check fuel lead is connected.
3. Prime the engine by squeezing the primer bulb.
4. Check the engine is firmly secured.
5. Check the tilt mechanism is locked in the 'run' position.
6. Ensure the kill cord is connected.
7. Put gear shift into neutral.
8. If the engine is cold, use choke, be careful not to over-choke and flood the engine.

Starting the Motor

KILL CORD

1. Do not start the motor unless you know how to stop it! The stop device is usually a red button that is pushed and held until the motor stops. Can also be a key operated mechanism much like a car ignition or the kill cord. (consult your manual)

2. Check that the motor is securely mounted, and water intake is submerged so that cooling water is pumped around the motor.

3. Connect the fuel line, open the breather vent on the fuel tank and pump the bulb to prime the system. (bulb will become firmer)

PRIMER BULB

4. Make sure kill cord/cut out device is in place and gear lever in neutral. Use choke if starting from cold. Gear lever on side has three positions forward, neutral and reverse.

5. With the throttle position on 'start' either pull the starter cord firmly until motor starts or turn ignition key for electronic starting.

THROTTLE CONTROL

6. If motor fails to start after a few pulls open choke and try again. Be careful of back-elbowing an unsuspecting crewmember! As soon as the motor fires, push in the choke and ease the throttle.

7. Check for cooling water circulation. Do not engage gears at high RPM.

12.10 Fault Finding

Sometimes an outboard motor will not start for simple reasons, however, with larger and more modern engines utilizing electronics all but the very simplest problems will need to be dealt with by a qualified mechanic.

Common reasons for an outboard not to start are:

POSSIBLE CAUSE	WHAT TO CHECK
No Fuel Flow	Check for fuel in the tank
	Check fuel line is properly connected and primed. Some tanks have a rubber hand squeeze pump in the fuel line for priming the engine.
	Clean fuel filter in power head.
Kill Cord	Make sure is connected
	Not turning over? Check battery, battery switch and all electrical connections.
	Check fuses.
	Remove and check spark plugs.

12.11 Dinghy Stability and Handling

- Crew or passengers must take great care when entering or leaving a dinghy and be aware that their weight and position in the vessel affects its stability.

- Before casting off from the yacht or the dock the helmsman should make sure that he is satisfied with the distribution of weight in the dinghy both in the port to starboard plane and also fore and aft as this will affect stability.

- Weight distribution may be changed according to sea conditions and speed, especially if the dinghy is capable of getting up on the 'plane', which may require weight forward to assist.

DINGHY STABILITY / ENSURE BALANCE OF PASSENGERS

- Before departure, all passengers should be aware of the location of all lifejackets (if they are not wearing them) and all safety equipment and how to use it.

- A safety briefing should be conducted for all passengers including what to do in the event of an emergency.

- Once in the dinghy, passengers should sit down and hold on.

- To preserve stability, passengers and any other items should be placed to spread the load evenly, both from side to side and fore and aft. *For example, if there are four passengers and the crewmember in charge of the dinghy, traditionally known as "the helmsman" then they should sit two and two evenly with the helmsman at the stern to operate the outboard and steer.*

- Being low in the water, the visibility for the helmsman is not good and passengers must take care not to obscure his vision.

- If the helmsman is satisfied with the trim, he/she should ensure that all crewmembers or passengers are seated and holding on before casting off.

- Acceleration should be applied smoothly and evenly, and the speed adjusted to the conditions and to safety requirements.

- The helmsman should always ensure that proper control of the vessel is maintained at all times. On larger dinghies/RIBs (with fixed equipment) it is advisable to keep one hand on the wheel and the other on the throttle at all times.

- When throttling back to come off the plane this should be done smoothly to ensure that the stability of the dinghy is not compromised.

- The boat should be allowed to slow before going into neutral and should never be taken from full speed ahead to going astern.

12.12 Beaching

- If there are big breakers or a deep swell, do not try to beach the vessel. It can be an unnerving and dangerous experience. It is relatively easy in calm seas with little swell or breaking waves near the beach.

- The type of shoreline will also have to be considered, smooth sand will present few problems, however, rocky coastlines will need to be treated with respect to avoid puncturing the boat.

- Approach with controlled speed, shift weight aft to raise the bow. Have someone at the bow looking out for rocks/coral heads. When getting close to the beach, tilt your outboard up 1/3 of the way, then kill the engine and coast onto the beach.

- If the approach is wrong and the desired effect is not achieved one of the crew will have to jump in the water to pull the dinghy ashore. Before leaving the beach, pull the dinghy above the water line and tie it to a tree, a rock or anchor it on the beach as shown.

- When launching it will be necessary to carry/drag it down the beach until it is floating. Initially one may have to row or paddle until the water is deep enough to lower the outboard back to its normal operating position and start the motor.



Approach with controlled speed, someone at bow as lookout, tilt outboard engine up 1/3


Kill engine and coast to beach, crewmember to pull line & anchor/boat to beach, secure anchor onto beach.

BEACHING SEQUENCE

12.13 Dinghy Equipment

This is very dependent on the size and intended use of the dinghy, ideally it should have the following:

- Lifejackets
- Flashlight, this will be also used at night as a navigation light. If the dinghy is less than 7m (20') in length it is not required to have the standard navigation lights. (Check local regulations)
- Sufficient oars or paddles, in addition to an outboard motor, if fitted.
- A bailer.
- Compass
- A painter (bowline) of sufficient length.
- Whistle or equivalent sound signal.
- A first aid kit.
- A boat hook
- A knife or small hatchet.
- A portable fire extinguisher.
- Flares
- Anchor and line.
- VHF radio, most conveniently a hand-held.
- GPS
- Tool box
- Binoculars

12.14 Trailer Launch

Safety/Preparation

- Driving and reversing a trailer should be practiced in a safe and open environment until the operator feels comfortable enough to attempt a slip-launch under the critical gaze of fellow boaters!

- Maneuver the trailer to launch position. How far the trailer is reversed into the water depends on the size/weight of the vessel, the gradient and the availability of helping hands.

- The rear of the boat needs to float so that it can be pushed or driven off the trailer. If possible keep car wheels out of the water.

- On a shallow gradient lower the trailer jockey wheel and use an extension bar or a length of rope attached between the tow ball and the trailer. This will enable the load to be reversed further into the water. Make sure the winch cable is attached to the boat while carrying out this maneuver. Slippery ramps can cause the towing vehicle to slide into the water!

- To prolong their life, allow time for trailer bearings to cool down before immersing in water.

- Make sure the vessel's bungs are in place and there is no damage to hull during transit.

BUNG PLUG

- Disconnect and remove trailer lights, boat cover etc. If the ramp is steep, the boat may enter the water rapidly, be prepared, and keep control of the hand winch at all times.

- Whether using power or hand winch… launch slowly!

- Painter should be attached to prevent boat floating away when launched. Inspect launch mechanism and winch cable for wear and fraying.

- Protective footwear is recommended; there may well be sharp objects, broken glass, stones etc. on ramp. Expect ramp to be slippery, especially at low tide.

- Ensure that the slipway/launch-point selected is suitable and appropriate to accommodate your trailer and vessel and make sure you have everything you need on board prior to launching. It may be easier to stow prior to launching.

- Check in advance that there is enough water for launch and recovery at convenient times. Are conditions safe for launching? Strong winds, especially on-shore winds can make launching hazardous.

TRAILER WINCH

TRAILER LAUNCH SEQUENCE

12.15 Trailer Recovery

- The preferred method of recovery is to drive the boat on to the pre-positioned trailer. The alternative is to slip over the side of the boat in shallow water and guide the boat gently over the rollers. Hook the cable to the D-ring winch point and crank up.

- On approach, tilt the engine up so as not to ground the propeller. The trailer should be partially submerged to allow the boat to be driven or manually guided and floated on for easy recovery.

- Use fresh water to flush the engine cooling system (see owner's manual) and wash the boat and trailer especially after use in salt water as corrosion will occur.

- Great care must be taken when around trailers, winches and hitches and ramps. All launch and recovery operations should be carried out slowly, safely and under control. Beware of rapidly spinning winch handles they can break bones!

- Reconnect trailer lights and check function, replace cover and make fast. Remove loose items, which may be lost in transit. Before commencing tow make sure boat is secure in its cradle and the hitch is connected according to manufacturer's recommendations.

12.16 Emergency / Crash Stops

A crash stop should only be used in an emergency such as a man overboard situation. Always warn the crew prior to performing a crash stop.

There are two methods:

1. Throttle back to neutral and turn the boat to either port or starboard and present the beam of the boat to the wake.

2. Throttle back to neutral while watching the stern carefully, throttle ahead as the wake arrives.

12.17 Towing

- Picking up a tow requires care and communication. Picking up the tow is usually best achieved by crossing ahead of the vessel to be towed depending on what proves most practical. Weather conditions, manpower and maneuverability of the boat will also dictate the manner of the transfer.

- When towing, bear in mind that the tow will have little or no steerage, therefore all turns should be gentle. You can easily turn inside of your tow, colliding with it or picking up the towline in your propeller.

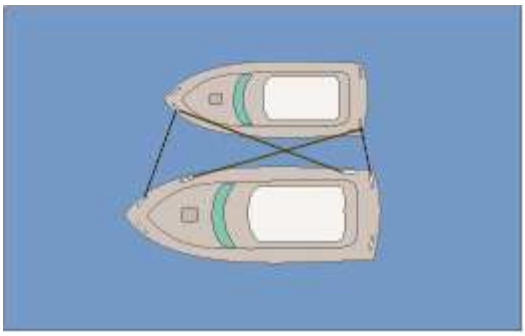
- When bringing the towed craft alongside a rescue vessel, quay wall, etc. remember that the tow cannot give a kick astern to stop, so use wind and tide to best effect.

Towing Procedure

1. Attach towline to vessel to be towed.
2. Approach 90 degrees or possibly 45 degrees.
3. Tow attached to strong point on tow boat – ideally a bridle.
4. Set scope of towline.
5. In enclosed waters, tow should be kept as short as possible.
6. In open waters tow should be lengthened according to sea conditions.
7. Commence gently taking up the strain.
8. Crewman watches tow at all times.
9. Towed vessel weight should be kept aft and steered if rudder is available.

At night the correct navigation lights should be displayed for towing operations.

Towing Alongside



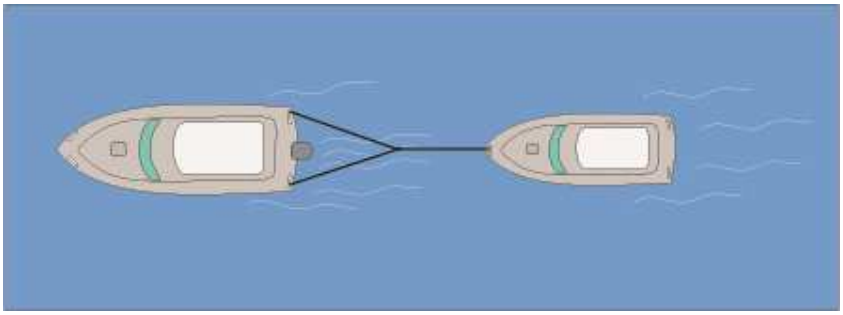
TOWING ALONGSIDE

The purpose of a side tow is to maneuver the disabled boat in confined areas.
Pre-rigging the line for the side tow (this is done by a second crewman while the disabled boat is in stern tow).

1. Attach bowline to bow and sternline to stern of disabled boat
2. Attach springlines fore and aft to disabled boat
3. Manoeuvre slowly and cautiously to destination.

Bridle Towing

In the case of outboard motors, it is always best to rig a "bridle" for towing. This will prevent the towing vessel from being pulled from side to side by the uneven distribution of the weight of the vessel being towed. To rig a bridle, attach a short line from both aft cleats as shown. The towing line is then attached to the center of the bridle thus reducing the probability of catching the towing line in the propeller.



BRIDLE TOWING

12.18 Knowledge Review

1. Explain the different types of dinghy and their advantages and disadvantages.
2. Explain the different types of motors and generally how they work.
3. Explain ventilation, cavitation, steering and propellers.
4. Know how to start and stop the engine and all the checks that must be made.
5. Understand stability on a dinghy.
6. Explain how to beach a dinghy.
7. Explain towing procedures and types of towing manoeuvers.
8. Explain how to launch from a trailer and recover using a trailer
9. Explain how to crash stop.

Module 13 BOAT HANDLING UNDER POWER

13.1 Key Objectives

THE OBJECTIVE OF THIS MODULE IS TO GET THE STUDENT TO UNDERSTAND HOW TO HANDLE A BOAT WHILE UNDERWAY TAKING INTO ACCOUNT THE EFFECTS OF WIND, TIDE AND CURRENTS. DEPARTURE FROM A DOCK, AND ARRIVING AT A DOCK.

It is very important to understand the limitations of your vessels maneuvering ability whether under sail or power, so make sure to practice.

Most propellers on yachts are "right hand" that is to say, they turn clockwise when seen from astern. This will have the effect of swinging the stern to starboard and the bow to port when going ahead. When going astern the opposite happens. The stern swings to port and the bow to starboard. Additionally, when going astern the flow of water over the rudder created by the propeller is less efficient and thus will affect the yachts responsiveness to the helm this also means that the vessel will be more susceptible to the "paddle-wheel" or "transverse thrust" effect when going astern.

13.2 The Effects of Wind, Tide and Current

- The effects of wind, tide and current will influence power driven vessels. Many cabin cruisers have substantial superstructures, and shallow draughts meaning little lateral resistance under the water.

- Wind pressure on these can act as virtual sails and cause the yacht to be blown off course. The same effect can happen to sailing yachts with their sails completely furled there is still pressure on the rig that can push the yacht off course.

- If going upwind the wind can push on the bow of the vessel and cause it to change direction. Likewise, the flow of the tide and currents will need to be considered when holding a course, both in terms of the leeway caused and also the effect on the vessel's speed through the water.

- Another point to be aware of is that a vessel has no brakes, its momentum can carry it quite a long way. The only way to slow it down is to engage reverse if one is going forward and vice versa.

- When maneuvering a vessel under power particularly in confined spaces we need to keep all of the above in mind. For example, assuming a right-hand propeller, it is best to make a right hand turn to maximize the effect of the propeller.

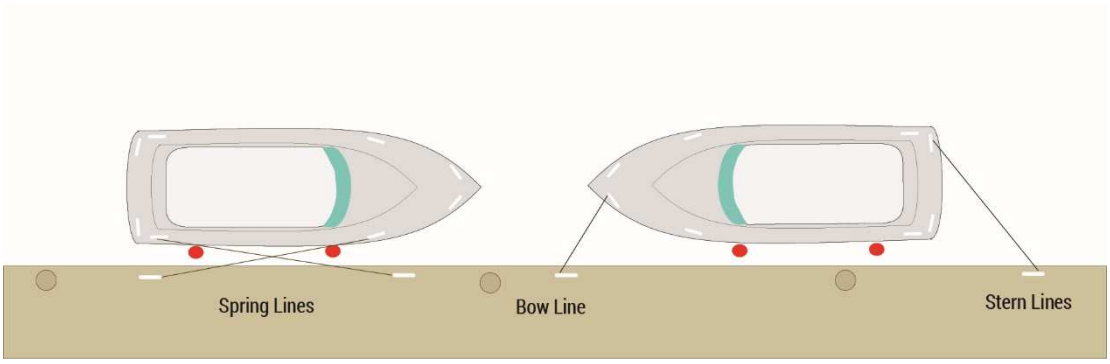
13.3 Alongside

FAIRLEADS & CLEATS

Deck Equipment & Fittings

Docking Lines (revision) - required to secure a vessel properly are:

- Bow line. A line that is lead forward from the bow of the boat.
- Stern line. A line that is lead aft from the stern of the boat.
- Spring lines. One line leads from the bow of the vessel aft of midships to the dock and one from the stern of the vessel lead forward of midships to the dock. These stop the boat moving fore and aft and should be taut.



DOCKING DIAGRAM / CLEATS ON DOCK AND BOAT

13.4 Coming Alongside (wharf or dock)

1. Steer the boat into the dock at an angle of around 20 to 30 degrees with just sufficient way on the vessel to have good control.

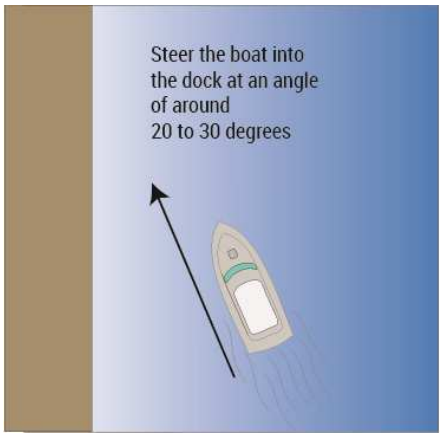
2. One should approach upwind if possible. Coming in to a moored or anchored boat should be relatively easy as the vessel will probably be lying "head to wind".

3. When the bow is close to the wharf put the engine in neutral and then reverse, as this is done, it will have the twofold effect of stopping the boat and the reverse thrust will tuck the stern in neatly alongside.

4. Have your mooring line prepared in advance and crewmember designated to step ashore and tie up the vessel.

5. Where there are mooring lines attached to the dock it may be easier to have the crewmembers who step on to the dock pass those lines to people on deck.

Small boats are quite susceptible to the effect of wind and current and will generally make a fair amount of leeway, careful course and speed corrections may have to be made by the coxswain to counter leeway effects.



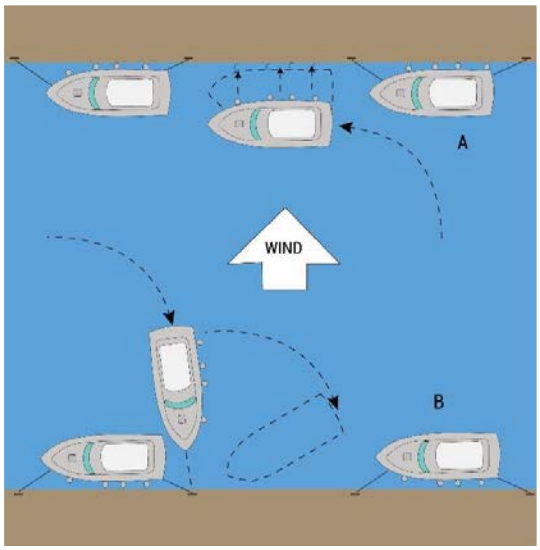
COMING ALONGSIDE A DOCK

Arrival at a Dock

Always have lines and fenders prepared.

In situation **A**, the vessel is positioned in the gap by nosing into the space and allowing the wind to push the vessel alongside.

In situation **B**, with the vessel being blown off the dock, approach the dock bow first, attach a bowline and with the rudder/engine to port, gently go astern which will gradually pull the stern into the dock.

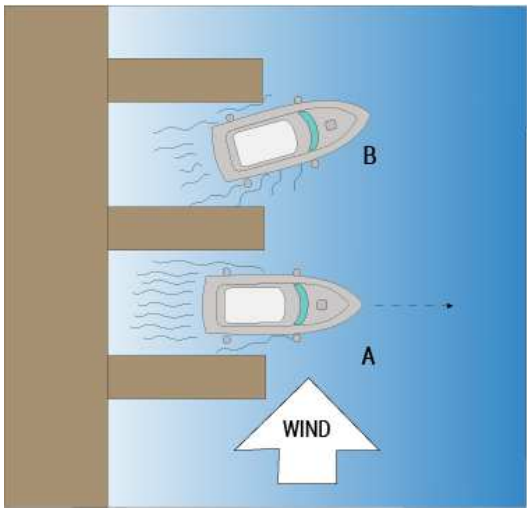


ARRIVAL AT DOCK

13.5 Handling Skills

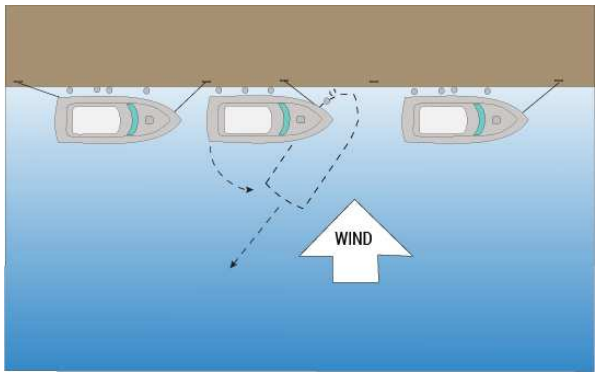
Departure from Dock

Before departing a dock make sure the engine is running smoothly. In this instance with a cross wind, the vessel must be given enough power to exit the dock quickly. (Boat A), or else the wind will blow the boat on to the dock (Boat B). Remove the spring lines, slip bow and stern lines together.



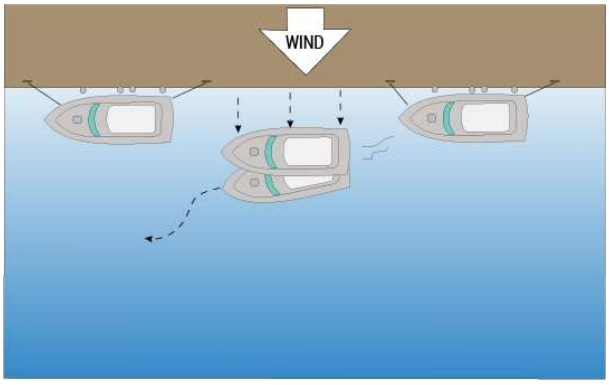
DEPARTURE FROM DOCK WITH CROSSWIND

With a wind blowing the vessel onto the dock, slip all lines except the forward spring, power gently ahead to kick the stern out. Slip the spring and motor astern into the channel.



DEPARTURE FROM DOCK WITH WIND BLOWING ONTO DOCK

With the wind blowing the vessel off the dock, slip all lines except the stern line. The bow will be blown out into the channel. When clear, the stern line can be slipped.



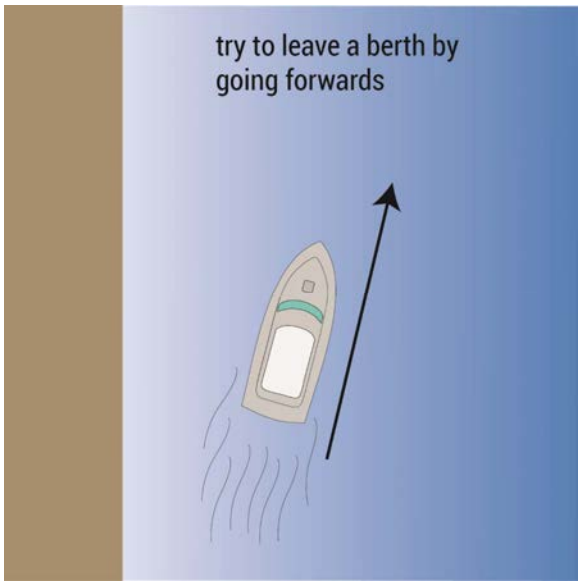
DEPARTURE FROM DOCK WITH WIND BLOWING OFF DOCK

13.6 Clearing (wharf or dock)

- Whenever possible you should try to leave a berth by going forwards though this will always be dependent on the wind and current at the time.

- The order in which you untie your mooring lines is dependent on the wind and current. If the wind is coming from ahead or off the dock hold the yacht on the aft spring line to stop her drifting back onto any vessel astern, the wind will take the bow out and once clear you can leave the dock.

- Conversely if the wind or current is astern you will swing out on the bow spring until the stern is clear and then you can go astern to clear the berth.



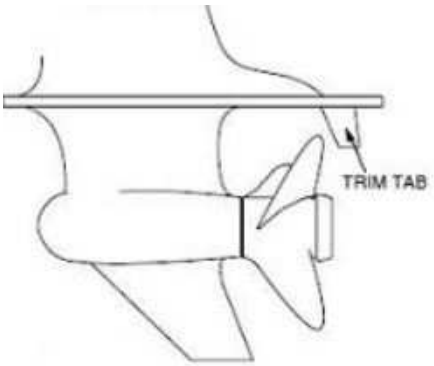
CLEARING A DOCK

13.7 Multiple Engines

- If a boat is fitted with multiple engines one will be less concerned with the "paddle wheel" effect. This is because the propellers will be arranged so they turn in opposite directions. One will not need to use the wheels as much and one can steer the vessel by using the balance between the engines. The vessel can often be turned in its own length by having one engine ahead and the other astern.

- When running under normal operating conditions it is important to ensure that the thrust from the engines is balanced. This will produce a very neutral helm where very little or no rudder angle is required to keep the vessel on course. This has the added benefit of minimizing friction and giving the best fuel consumption. The best way to ensure engine balance is to run the engines at the exact same RPM (revolutions per minute).

- Power vessels are often fitted with "trim tabs". These flaps on the stern of the boat are designed to help the boat run level. As increasing amounts of power are fed into the vessel the bow will rise. This is necessary so that the vessel will eventually start to plane, that is: to skim on the surface of the water rather than pushing through it. However, the vessel can become unstable with the bow riding high so by applying the trim tabs, the bow will be forced down and the vessel will run flat on the water. The trim tabs can also be adjusted to keep the vessel level in the port / starboard plane as well.



TRIM TAB

- When slowing a vessel, coming down off the plane, it should be done gradually otherwise the vessels stern wave which can be traveling faster than the boat, will rise up and swamp the stern. If the vessel must be stopped quickly in an emergency, turn the boat through ninety degrees as the power is cut, the motion will be unpleasant but at least the risk of taking on water and being swamped will be minimized.

13.8 Vessel Handling Skills

Traveling at Speed (Planing)

PLANING BOAT

- Always prepare your crew for any rapid changes of speed or direction.
- Make a full appraisal of the surrounding area and be alert for waves and wash generated by other vessels as well as yours.
- Keep a good lookout at all times.

Most of the power output of the engine will be needed to get the boat on "the plane". This is the most efficient use of hull design. When 'on the plane' ease back on the throttle to conserve fuel. Speed must be monitored constantly and adjusted to the proximity of traffic and conditions. A displacement or semi-displacement hull will not be able to plane, as top speed is limited by waterline length and hull design.

- Do not try to plane the boat in rough seas.
- Make good use of 'trim tabs' if fitted to achieve efficiency in speed and fuel consumption.
- Do not engage in reckless manoeuvres.
- Keep a good lookout and be mindful of submerged objects.

A small wash may be safely crossed as long as all on board are holding on. A large wash needs some careful consideration. Slow down to a speed that allows for control to raise the bow and cross the wash at an angle of about 45 degrees. Adjust speed through wash to keep bow up. Resume safe operation once through the wash.

High Speed Turns

- Make sure the crew are aware of your intentions, have plenty of space and good throttle control.
- Look out for wash, traffic and possible submerged obstructions. Do not turn so sharply that the prop starts to ventilate (suck in air) and lose grip.
- Careful throttle management and situational awareness is paramount.

- Trim down before starting to turn to maintain grip on the water.

- Do not exceed design limitations of the hull or motor(s).

Heavy Weather Operations

- It is important to match your speed to sea conditions, this often means slowing down.

- Generally speaking, waves are generated by wind and tend to come from the same direction. (there are important exceptions to this e.g. wind against tide/current which can make for a 'bumpy' ride)

- Driving upwind/up wave usually means 'trim' down with controlled power, ease throttle at the top of the wave to ensure you do not 'drop off' the wave. Gently accelerate down the back of the wave speeding up sufficiently to raise the bow as the trough is reached. Drive up the wave towards the next crest.

- Meet each wave as it comes, where possible avoid steep and breaking waves.

- Wavelength determines the level of speed and comfort. In short seas, the helmsman has little time to react to adjust the throttle, so it may be easier to drive at an angle of 30 – 45 degrees to the wave front. This method may allow you to increase speed using a zig-zag course towards your destination.

- Large, breaking beam seas can potentially capsize a small boat. Steer a course between breakers and if you are caught on the downwind side of a breaker steer and power over the crest or turn away and try to outrun the breaker.

- Following seas can be most dangerous to small vessels. If a breaking wave catches the stern the confused water will adversely affect the props ability to grip the water. The following wave then will turn the vessel abeam thereby making capsize almost inevitable.

- Match the vessel speed to the waves to avoid being overrun. If the vessel is going too fast down the face of a wave there is a danger of burying the bow causing the vessel to slow and pivot the vessel abeam causing it to be swamped or to capsize. Sometimes, if surfing down a wave it may be prudent to put the engines in reverse to avoid burying the bow into the oncoming wave.

- Sandbar/Harbour Bar Large following seas at restricted/shallow entrances should be avoided. As the water shoals the waves get higher and confused, breaking more violently.

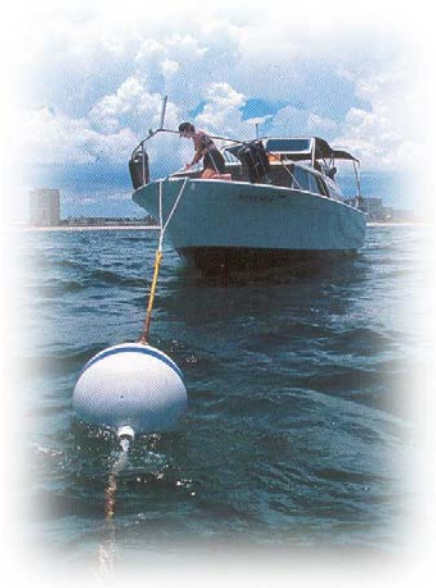
13.9 Engine failure

Engine failure or multiple engine failure can lead to very hazardous situations at sea. The most common causes are insufficient fuel or contaminated fuel. If such an event occurs, it is essential to be equipped with a cellphone, VHF or SSB radio (depending on your distance offshore) in order to call for assistance. You should also have your signalling devices ready if you need to attract the attention of other boaters. It is imperative that engines are serviced and maintained regularly to avoid engine failure. Thorough checks of fuel levels, oil levels and filter cleanliness are essential. A comprehensive tool box should be carried at all times to repair any faults should they arise.

13.10 Single engine handling

It is important that boats fitted with a single engine are regularly serviced and maintained to avoid engine failure. Vessels with one engine do not have the same handling characteristics of multi-engines so due care and attention should be taken when docking or berthing.

13.11 Picking up mooring buoy



Mooring is tying up to an object in the water, such as a mooring buoy.
Approach mooring buoy slowly and if possible into the wind, waves or current, whichever is strongest, when close, select reverse gently to stall forward momentum. Select neutral, pick up mooring painter and secure to the deck. When leaving, use reverse to back off the buoy to keep propeller away from the line. REMEMBER that a boat has no brakes. Many authorities strongly discourage the use of anchors for environmental reasons and will provide 'mooring fields' for use by small craft.

13.12 Knowledge Review

1. Describe how tide and current affect a vessel when docking?
2. Describe the procedure for coming alongside a dock or wharf
3. Describe the procedure for departing a dock or wharf
4. Describe how you would dock – with the wind
5. Describe how you would dock – against the wind
6. Describe the affect that multiple engines have on a vessel
7. What are “trim tabs?
8. Describe how to get a vessel “up on a plane”
9. What precautions would you take during high speed turns?
10. Describe 6 conditions to take into considerations during heavy weather preparations.
11. What would you do in the event of engine failure?
12. Describe the procedure for picking up a mooring ball

Module 14 SHORT PASSAGES – HEAVY WEATHER, RESTRICTED VISIBILITY & NEGOTIATING HARBOUR ENTRANCES

14.1 Key Objectives

14.2 Heavy weather preparations, line squalls

THE OBJECTIVE OF THIS MODULE IS TO GIVE THE CANDIDATE THE INFORMATION REQUIRED TO PREPARE FOR HEAVY WEATHER TACTICS FOR SHORT PASSAGES AND ACTION IN RESTRICTED VISIBILITY AND NEGOTIATING HARBOUR ENTRANCES.

Preparations for Heavy Weather

Preparations for heavy weather should be made well in advance of the incoming weather system. It is important to:

- Close all hatches, put washboards and hatch covers in place
- Close seacocks
- Hoist radar reflector
- Secure all loose items on deck and below
- Make sandwiches or easy to prepare food
- Don heavy weather apparel, safety harnesses and lifejackets
- Appoint lookouts as visibility can be significantly reduced
- Plot position accurately, manoeuvre away from a lee shore ·
- On sailboats, reduce sail and prepare trysail or heavy weather sails
- Head for a safe haven if heavy weather persists or is likely to continue

Leeshore

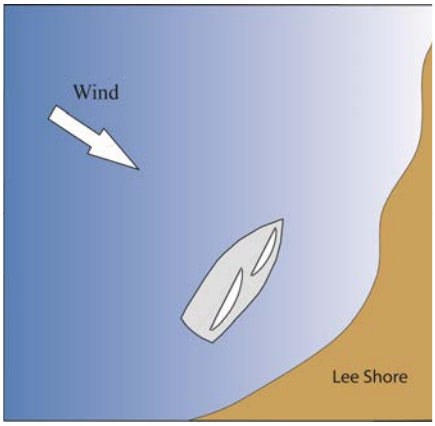


FIGURE 17-1 LEESHORE

- In rough weather there is always the danger of a leeshore on to which the wind is blowing, and the seas breaking.
- A boat will be safer offshore in deeper water.
- Often, what appears to be a safe harbour requires an approach to a leeshore. This can result in large rolling waves at the entrance to the harbour which can cause a boat to "surf" down the waves out of control.
- Under such circumstances it may be wise to stay offshore until the weather calms down or to find an alternative harbour or safe refuge.

Line Squalls

- A line squall during daylight hours is visible as a darkening line across the sky which sometimes contains short bursts of intensive rain and a sudden and dramatic increase in wind speed.
- They are generally short lived but can be severe and sometimes frightening during their short lifespan.
- Preparations for a line squall are the same as for heavy weather and it is always better to err on the side of caution in the event that you encounter one. This is especially important at night time when they may not be as noticeable against a dark sky.

Heavy Weather Tactics

Be prepared in the event of a strong wind warning, and make sure that your vessel is big enough to handle the tides, waves and weather that is associated with this.
Preparations for heavy weather should be undertaken as listed above. However, when heavy weather is approaching it is always best to head for a safe haven if at all possible.

Sea Anchors

FIGURE 17-2 SEA ANCHOR

Another option for both powerboats and sailboats is the deployment of a sea anchor. This is usually a canvas or web type bag which looks like a small parachute and is deployed off the bow of the boat using the anchor rode to keep the bow into the swell. This is the safest position for small power boats as a heavy beam sea can capsize a boat quite easily. For maximum benefit, a sea anchor should always be deployed with enough rode to reach the crest of the oncoming wave.

When coastal cruising it is important to get regular weather forecasts allowing enough time to reach a safe haven in the event of incoming heavy weather.

Drogues

DROGUE

During strong following seas, the wave action on the stern of a vessel can cause the vessel to constantly "yaw" which will push the boat from side to side. To prevent this, a **drogue** is dragged behind a vessel (attached to the stern) which will act as a brake and assist in maintaining the boats course. It will however reduce the speed of the vessel but will allow for a greater level of stability and comfort.

Ice and Ice Accretion

ICE ACCRETION

Ice accretion is the process whereby a layer of ice will build up on a vessel when exposed to freezing rain or sea spray or from super cooled fog or cloud droplets. The weight of ice can become quite substantial and must be removed as soon as possible. Failure to do so can result in the vessel becoming top-heavy and likely to turn over in the event of a beam sea. Melting ice packs can flow down rivers during the spring season and become serious hazards to navigation.

14.3 Action in Restricted Visibility

Fog

Air reaches its "dew point" when it saturated with water at a certain temperature. When the temperature drops below dew point fog can occur. It usually occurs when the land cools at night and the moisture laden air can drift across coastal regions for several miles offshore. When the sun rises, it usually burns off the fog by raising the dew point. It can also disperse when warm dryer air raises the temperature.

Fog can be very disorientating as visibility can often be reduced to just several yards. It is important to make the following preparations:

- Immediately obtain an accurate position of where you are.
- Check your chart and steer a course to keep you clear of any obstructions, navigation hazards, shipping channels or traffic separation schemes.
- Avoid constantly altering course as this makes accurate navigation difficult.
- Monitor your VHF and if in a shipping lane a "securite" should be broadcast giving the vessels current location.
- Note all other vessels in the area.
- Turn on radar and all available electronic navigation equipment.
- Hoist a radar reflector as high as possible
- Slow your boat speed so you can stop quickly in an emergency or alter course as necessary.
- Appoint a lookout to watch and listen for other shipping.
- Have white flares close to hand.
- Don lifejackets and know the location of your life raft and all safety equipment.
- Maintain silence.
- Sound the fog signal with your boats air horn (one long blast every two minutes).
- If close to a marked channel, stay outside the channel but close to the buoy.

14.4 Negotiating a Harbour Entrance

When approaching any harbour entrance, it is essential to be aware of all other vessels entering and leaving the harbour. Larger vessels may be restricted in their ability to manoeuvre or constrained by draught and it is important to know your light, sound and day shapes as covered in the collision regulations. Be aware of all traffic approaching from behind and make sure to stay on the Starboard side of the channel.

- Prepare your pilotage plan in advance.
- Have ample crew on deck to assist you if required.

- Have your VHF radio switched on and close at hand.
- Prepare dock lines and fenders for arrival at the dock. It is always a good idea to have your anchor ready.
- In the event of an engine failure should you need to anchor to avoid collision or grounding.
- At night time, make sure your navigation lights are on and working.
- Hoist your radar reflector as high as possible.
- If approaching a leeshore, great care must be taken to control the vessel while entering a harbour entrance due to the possibility of large rolling waves at the entrance. In extreme circumstances such as this or when crossing a sandbar at an entrance, it is best to deploy a sea anchor off the stern of the boat to slow down the boat and avoid surfing.

14.5 Collision Regulations on Passage

It is important on all voyages to maintain a proper lookout at all times. Make sure your crew have a basic understanding of the collision regulations and if in doubt always call the skipper. Allow sufficient time for collision avoidance if you feel there may be a problem.

Any action to avoid collision should be made in sufficient good time with due regard for good seamanship. Any alteration of course or speed shall be large enough to be readily apparent to another vessel observing visually or by radar. Avoid a succession of small alterations of course and or speed. Make sure to avoid changing course into the path of another vessel.

14.6 Preparing a Short Passage Plan

Reference Materials/Information for Planning

It is essential to all boat skippers and navigators to understand the importance of preparing a passage plan for any voyage they are about to undertake. An appraisal of information must be made before a detailed plan can be drawn up. This includes:

- Charts containing sufficient detail to show navigation marks, known hazards and any other specific information that is appropriate for each part of the intended voyage.

- Where possible, a Reeds Nautical Almanac (or similar) for the appropriate area and current year should be consulted. This will contain a list of lights and navigation marks, tidal information for the ports in the area, current and tidal atlases, traffic separation schemes, list of appropriate radio signals, harbour radio and other useful information.

- A local cruising guide giving information on locations of fuel, fresh water, pump out stations, supermarkets, hospitals and other information as appropriate to the voyage.

- Vessels intending to go beyond 5 miles from any coastline should carry a minimum level of navigational publications and the operating manuals and maintenance instructions for all navigation aids, engines and equipment on board.

Passage Plan Headings for Consideration:

- Date: does the timing coincide with adverse tropical weather systems
  - Weather: do I have access to local weather information
  - Charts: are current small and large scale charts available for the area.
  - Distance: what is the length of total passage and of each leg.
  - Boat speed: what is a reasonable average boat speed to expect.
  - Passage time: how much time should be allowed for the total / each leg.
  - Tidal information: what are the tidal restrictions, direction of flow, strong currents, overfalls, time of high and low water at points of departure and arrival.
  - Port information: what do I know about berthing, provisioning, medical care, fuel
  - Harbours of refuge: shelter from adverse or changing weather, access or tidal restrictions.
  - Navigation marks: buoys and light characteristics and sequence.
  - Documents: boat registration papers, radio license (if applicable) insurance, passports for all crew, return tickets (if applicable).
  - Watch schedules: how will the watch routine be handled during day / night hours.

Decide What Tactics to Use

In deciding what tactics to use to implement your passage plan, the following factors should be considered:

- The number of crew onboard
- The experience and qualifications of the crew
- The reliability and condition of the boat's navigation equipment
- Estimated times of arrival at critical points for tidal heights and rates of flow
- Weather conditions especially areas prone to fog
- Daytime or night time passing of danger points
- Traffic conditions especially in busy harbours or thoroughfares

Having considered all of the above, the skipper must decide if any of the conditions introduce an unacceptable hazard to the safety of his vessel and crew or indeed if the passage should be undertaken given certain prevailing conditions. Consideration should also be given to the requirement of additional deck or engine room personnel if deemed appropriate.

Selecting an Anchorage

Selecting a suitable anchorage is important for both the safety of the vessel and the comfort of its crew. The factors to be taken into consideration are:

- Wind speed and direction to determine the suitability of the anchorage. Winds generate swells which can be most uncomfortable to anchor in.
- Tide and current information will ascertain if there is too much flow to anchor safely
- Navigational access to the anchorage is important in busy shipping areas and during heavy weather.
- Depth of water will determine the amount of rode required, make sure you have sufficient depth under the boat at low tide to prevent grounding.
- Type of holding (sand, shale, rock, turtle grass or mud) will determine what type of anchor to use.
- Number of boats at anchor will determine if there is sufficient room to anchor and swing without risk of collision.

It is always best to arrive at an anchorage in daylight hours to have sufficient time to thoroughly research the best position to anchor in

Navigation on Short Passages

- On the chart, draw in the ground tracks from start to finish, avoiding dangers by a safe margin, and taking advantage of navigation marks and lights wherever possible. These tracks are not courses to steer; specific tidal work will usually be done just before the passage starts.
- From the distances and the expected average speed of the boat decide how long the passage will take and how much of the passage will be completed within your daily time schedule. Note harbours or anchorages which may suit for overnight stops.
- Circle clearly any hazards on the chart which are not easily noticed.
- Look for headlands or other areas which may have strong tides or overfalls, these may dictate that you pass at a specific time relative to high, or low, water.
- Note any harbours that may be used as harbours of refuge in an emergency. It may not be possible to enter these harbours under all conditions so note carefully any shelter or tidal restrictions these harbours may have.
- If you are using GPS or Loran, note the latitude and longitude of waypoints you intend to use. Check these carefully as it is only too easy to make mistakes when writing them out
- Check whether the track passes through traffic separation schemes
- If there is a tidal consideration, such as lock gates at your destination, it may be necessary to work backwards from this consideration in order to decide the time of departure. There is not much point in arriving 20 minutes after the lock gates have shut.

- Check which harbours have fuel and water available. The fuel consideration is of considerable importance to motor yachts. Always plan so that you have a reasonable amount of fuel in reserve and remember that adverse conditions may increase fuel, consumption dramatically. Check whether fuel, water, etc., is available on the dock.
- When deciding how long you will travel each day consider the stamina and experience of the crew and the sea-worthiness of the boat. Remember that cruising is supposed to be relaxing and enjoyable, not a test of superhuman endurance.
- If a passage is expected to take longer than about 15 or 16 hours, it is advisable to work out a suitable watch schedule.
- Decide the provisioning of basic food and water supplies.

Most important of all try to maintain a flexible approach to the whole plan as conditions may be adverse on the day; trying to complete a passage against difficult conditions can spoil a holiday and put you and your crew under a lot of pressure.

Delegation of Responsibilities to Crew

Boating is team work and requires input from all crew members for the safe and enjoyable running of the vessel.

- Each crew member should be fully aware of the location and uses of all safety equipment on board including but not limited to lifejackets, life rafts, fire extinguishers, flares, ditch bag, VHF radio, horseshoe buoy, throw ring, and lifesling.
- It is important on every vessel that crew understand what their duties will be and that they are sufficiently experienced and trained to undertake such duties.
- Crew should also know the safe operational procedures and location for the heads, stove, heater, engine, generator, tool box and other on-board equipment.

14.7 Knowledge Review

This is a practical subject for which we do not consistently include a Knowledge Review. However, due to the nature of the material covered and its importance it has been included

1. What preparations for heavy weather should be made?
2. Understand leeshore, line squalls and heavy weather tactics.
3. Understand what the Beaufort Wind Scale is and general description, wind speed and wave height for each level.
4. Understand what must be done in fog conditions to navigate safely and keep all crew and passengers safe.
5. Understand how to negotiate a harbour entrance.

Module 15 INTRODUCTION TO CHARTS & CHART INFORMATION

15.1 Key Objectives

THE OBJECTIVES OF THIS MODULE ARE TO FAMILIARISE THE STUDENT WITH CHARTWORK INSTRUMENTS, CHART INFORMATION AND SYMBOLS, LATITUDE AND LONGITUDE, NAVIGATION TECHNIQUES, PLOTTING TECHNIQUES, TIDES, CURRENTS, AND COURSE TO STEER.

The cautious navigator takes every opportunity that presents itself to find his position and plot it on a nautical chart. Even with the advent of modern electronic navigation aids, a regular check by traditional methods should be made. Obviously weather conditions will dictate how regular these fixes should be; fog, low visibility and bad weather are some examples when the time between fixes should be reduced.

NAUTICAL CHART

15.2 Charts

- Charts are essentially maps of sea areas showing coastlines and their prominent features,
- Depths, objects in on and under the water, hazards to navigation, aids to navigation, channels, anchorage areas, harbours, tides, water levels, magnetic variation and information on currents.
- They are intended primarily for use by mariners to assist in route planning, pilotage and navigation
- In addition to charts there are a number of other publications required by the navigator.

15.3 Chart Publications

BA charts are published by the Hydrographic Office of the British Ministry of Defence and are available from approved chart agents.

U.S. charts are published in Washington, D.C., by the National Oceanic and Atmospheric Administration (NOAA) by the Department of Commerce.

Small Craft Charts

1) Charts intended specifically for use aboard small craft, often called 'yachtsmen's charts' are produced by various chart publishers. For example, International Sailing Supply of Punta Gorda (Florida) publish their chart #62 of New York Harbour which is a reproduction of portions of NOAA chart #12327.

2) Yachting charts are generally made to fold into a convenient size and have discarded information which the publishers do not consider of use to the small boat navigator.

3) These charts may also use different colors to indicate land, sea, drying areas and so on. Many of these charts are produced on waterproof and tear proof paper which has obvious advantages, but erasing pencil lines can be a problem.

4) Yachting charts often include very useful "chartlets" of harbours and anchorages together with their approaches. (chartlets are expanded views of certain sections of the charts). Some may have also had useful information such as pilotage/buoyage notes printed on the reverse side.

5) Be sure to check your marine chart for local hazards that may impede the operation of a vessel.

Suppliers

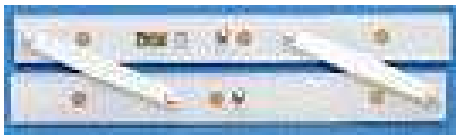
Charts are available from chart agents and nautical book stores worldwide; most chandlers can also supply a limited number of local charts for the immediate area.

15.4 Chartwork Instruments and Information

The practical navigator does not require expensive equipment to work effectively. The basic needs are as follows:

Pencils - 2B pencils should be used for chartwork to avoid scoring the surface of a chart and to allow navigational marks to be easily erased... Mechanical pencils work well as they do not require sharpening.

Parallel Rules - Used to measure courses, bearings, lines of position etc. by reference to a compass rose printed on a chart. Worked by walking or rolling (depending on type) the rule across the chart to/from compass rose. These are not very accurate in a rolling sea or in bad weather – **(not recommended)**

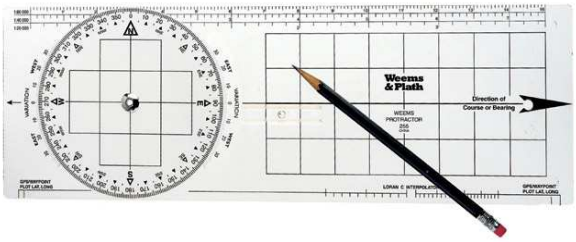


PARALLEL RULES

Dividers - Used to measure distances (in nautical miles from the latitude scale.). A classroom school type is adequate, but the single-handed brass type makes life easier.

DIVIDERS

Breton Type Plotter - **(preferred instrument)** this comprises a circular protractor mounted on a rectangular base, all made of plastic. The protractor is marked in degrees and incorporates a grid for easy alignment. The rectangular part acts as the ruler.



BRETON PLOTTER

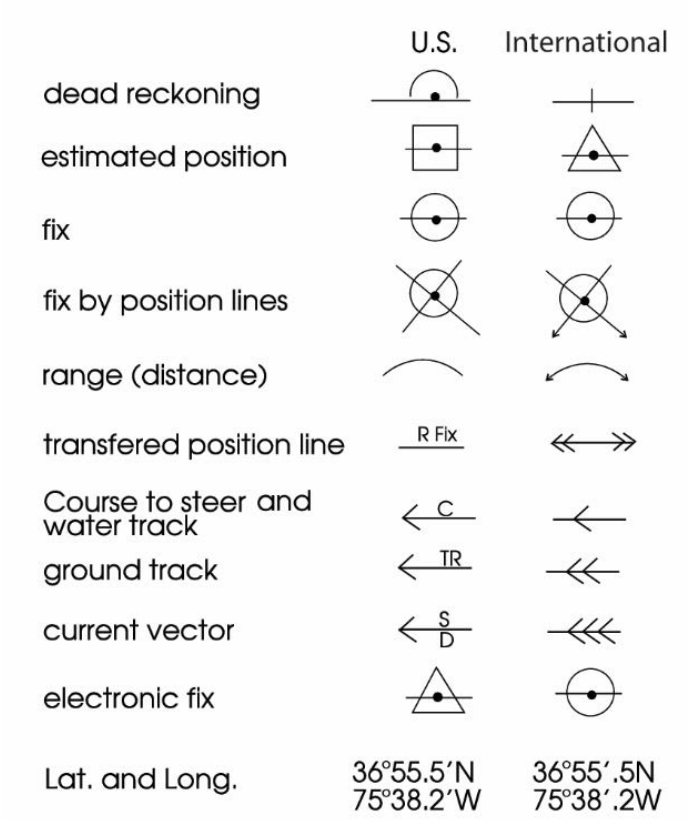
This type of plotter eliminates the need for the compass rose on the chart, can be used on rough surfaces, and on any size vessel. This is the most accurate of plotters having a correction factor of 1º.

Using a chart, parallel rules or plotter/protractor and dividers, the most basic navigational problems can be solved. It is possible to determine the position (latitude and longitude) of a given point on the chart, plot a position on the chart whose latitude and longitude are known, plot a course from one point to another, plot bearings and lines of position and measure and mark off distances.

Other useful items include a notebook, pencil sharpener and eraser.

Chart Work Symbols

Symbols used in chart work convey meanings of themselves. Different symbols are used for the U.S. than the rest of the world.



Scale

The scale to which the chart is drawn is important as it indicates how much detail is included. Large-scale charts are used when more detail is required, for example harbour charts which show a small area in great detail. Smaller scale charts are used when detail is less important and show a larger area in less detail. As the scale of the chart increases, a smaller area is shown with more detail. **It is best to use the largest scale of chart available.**

Distances are measured using the latitude scale of the chart, with one minute of latitude being equal to one nautical mile.

Great care must be taken when moving from one chart to another, **be aware that the "new" chart may have a different scale.** It is a common mistake to mark off the wrong distance because of a change in scale between two charts.

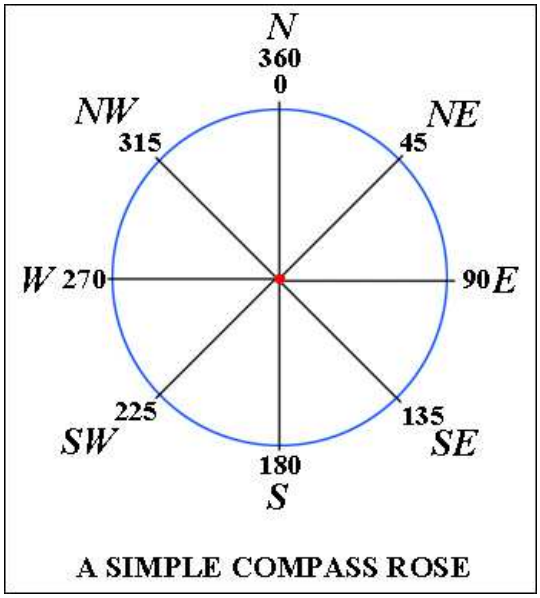
Heights and Depths

Soundings (or depths) will be shown in either feet, fathoms or meters, where 1 fathom = 6 feet. In the USA, the standard of measurement will be imperial rather than metric. The measurement will be marked on the title block and on the upper/lower margins,

"SOUNDINGS IN FATHOMS" or SOUNDINGS IN FEET" European and some other charts are likely to be metric - these will be marked on the title block and on the upper/lower margins, "SOUNDINGS IN METERS".

"Special Notes, Cautions and Warnings"

These will list certain features, dangers and other information in the area covered by the chart and which the navigator must make him/herself aware for safe passage making.



SIMPLE COMPASS ROSE

North/Compass Rose

True North is always at the top of the chart and South is always at the bottom. This may vary however with strip charts and chart books. The compass rose is printed in several locations on the chart and the outer ring shows true degrees from 000º to 359º whilst the inner ring shows magnetic degrees from 000º to 359º. The difference between the two is the variation (at the time printing). In the center of the rose the variation is noted along with the annual change.
(this will be covered in more detail on the practical course).

Tidal Diamonds

Tidal Diamonds are symbols on British Admiralty Charts that indicate the direction and speed of tidal streams.

The symbols consist of a letter of the Roman alphabet in a rhombus, printed in purple ink. On any particular chart each tidal diamond will have a unique letter starting from "A" and continuing alphabetically.

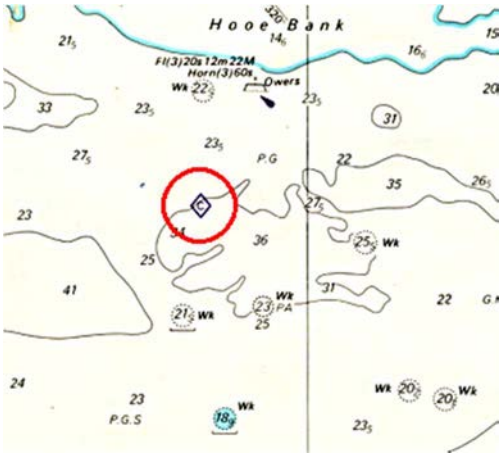


FIGURE 19-1 TIDAL DIAMOND

Chart Symbols and Abbreviations

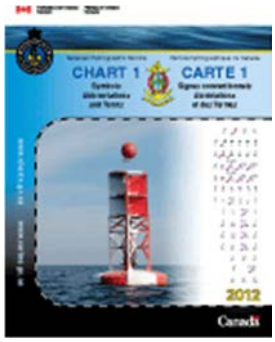


Chart symbols and abbreviations can be found in booklets issued by various hydrographic offices in the U.K. it is NP 5011 (UK) or Chart No 1(Canada and USA) This publication illustrates all the symbols and abbreviations in use on most nautical charts.

(Where possible the symbols used are common sense.
E.g. the symbols for a church ….looks like a church…!)

Chart Information

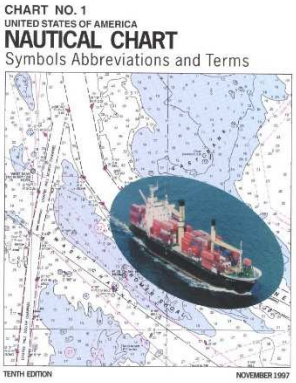


CHART NO. 1 (U.S.A.)

Title & Number - Charts are titled and numbered according to the area they cover, such as Vancouver Harbour- Falmouth to Plymouth - English Channel - New York Harbour - Port Everglades.

Anything colored yellow is dry land and its height is measured from mean high water springs (MHWS).

Anything colored green is land, which covers and uncovers with the tides. Drying heights (underlined) are measured from C.D. (chart datum) or L.A.T. (Lowest astronomical tide) up to MHWS.

Anything blue or white shows the soundings below low water.

(With Tidal height there will nearly always be more depth than charted)

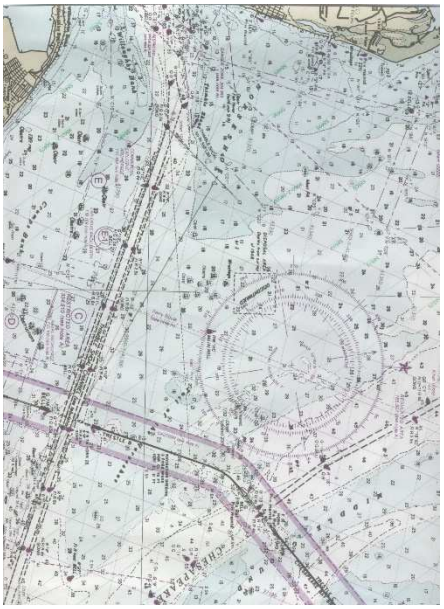
CHART INFORMATION EXAMPLE

Soundings

Fathoms, feet, or metric. Generally noted below the name of the chart.

Cautions

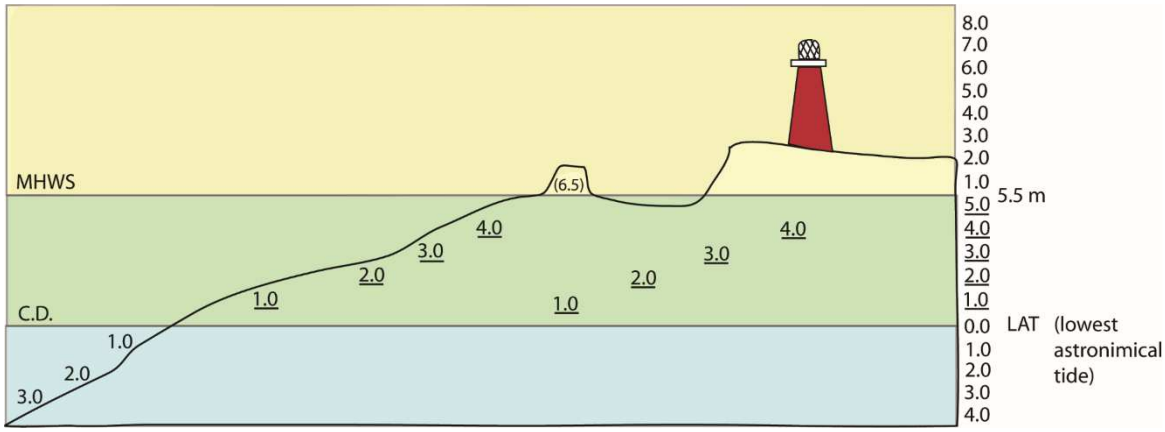
Cautions draw the attention of the user to navigational instructions, hazards and dangers. Such as:
Traffic separation scheme.
Restricted area.
Firing ranges.
Historic wrecks.
Radio reporting points etc.
ALWAYS READ THE CAUTIONS BEFORE USING THE CHART



TRAFFIC SEPARATION SCHEME

Colors and Levels

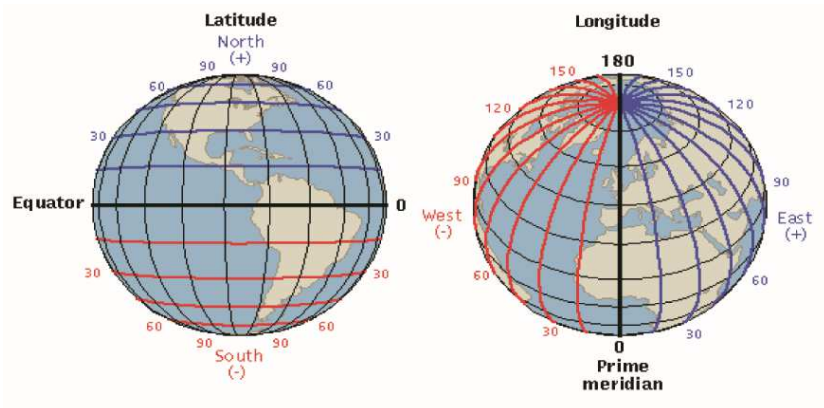
Charts are laid out in the form of a grid, much like land maps, and these co-ordinates enable the navigator to identify a position anywhere on the earth's surface.



COLORS & LEVELS

Latitude

The imaginary lines which run East / West on the earth's surface are called Parallels of Latitude and are graduated from zero degrees at the equator to 90 degrees at the North Pole and 90 degrees at the South Pole.



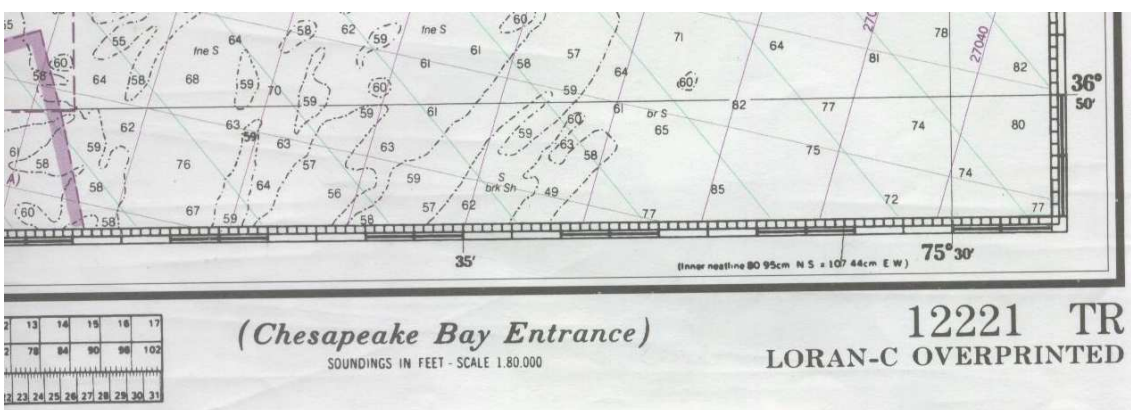
LATITUDE & LONGITUDE

<u>Never use the longitude scale at the top or bottom of charts to measure distance</u>.

Longitude

The lines, which run North/South from the poles, are called Meridians of Longitude. Longitude is measured East /West (0º - 180º) from the Internationally agreed 0º or "Prime Meridian" which runs through the Old Royal Observatory building in Greenwich, London, England. Positions are given in either "east" or "west" of Greenwich

Measuring the angular distance between two points on the surface and a point at the center of the earth derives both latitude and longitude.



Time

Time is always expressed using the 24-hour clock format and not "am/pm". Confusion is avoided in this way. The day starts at 0000 hours (midnight) and progresses through the day to 2400 hours (midnight again).
E.g. 1.00 am is expressed as "Oh one hundred", 5.20 am as "Oh five twenty", 1.00 pm as "Thirteen hundred" and 5.20 pm as "Seventeen twenty". The use of the word 'hours' after the numbers is incorrect, e.g. say "fifteen twenty" not "fifteen twenty hours".

TWENTY FOUR HOUR CLOCK

Speed

In nautical terminology speed is expressed in knots, where 1 knot is one nautical mile per hour. Remember, one knot equals one nautical mile per hour, therefore you would say that the speed of an object is "one knot" it is never expressed as "one knot per hour". One nautical mile = 1.1 statute mile.

Currents

Currents are the horizontal movements of water from any cause, such as tidal phenomena, prolonged wind activity or river flow. A boat moving through still water where there is no current will be traveling at the same speed and direction over the bottom. When this same boat moves into a body of water that is affected by a current, its speed and direction of travel over the bottom will change.

Effects of Wind, Tide & Current

Generally, the strongest element affecting a power boat (due to a shallow draft) is wind but close attention will have to be paid to the effect of tide or current on the vessel.

Tides or currents will also have an effect. Pointing upstream will allow greater control but will slow the approach. Conversely, motoring downstream will increase speed over the bottom but may have a detrimental effect on steerageway. Adequate allowances will have to be made once the combination of stream and wind are evaluated.

15.5 Navigational Techniques

Dead Reckoning Position (DR)

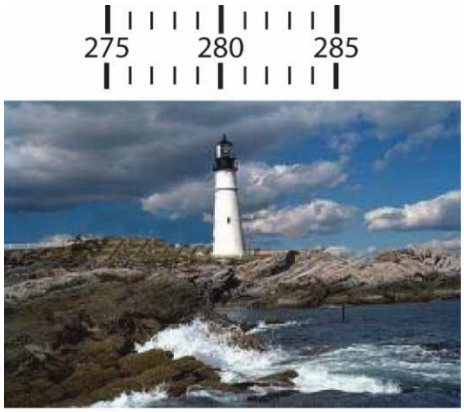
- It is not always possible to fix the boat's position at regular intervals, because suitable objects from which to take bearings may not be available.

- In this case the navigator will keep a log of courses steered and distances traveled to enable an approximate position to be maintained however the result will not be as accurate as a fix.
- **When "course steered" and "distance traveled" are taken into account, the position arrived at by this method is called a Dead Reckoning Position** (DR) from deduced reckoning. It is shown on the chart by a dot on the course line with a half circle around it, alongside which is written the time and the log reading in brackets.
- To "work up" a DR position, the plot must be started from a known position. The course steered, converted to true, is plotted and the distance traveled is marked on the line.
- The accuracy of any DR position is only good if there is no current, tide or wind setting the vessel off course, the distance log is accurate and the course steered is accurate.

Compass Bearings

The main source of position lines is by a compass bearing of a known object ashore or fixed navigational mark. These are usually obtained with the use of a hand-bearing compass, used away from any magnetic influence on the vessel. Write down the bearings as they are taken, and the time and the distance shown on the ship's log. The bearings must then be converted to true before they can be plotted on a chart using the true compass rose and parallel ruler or a plotter.

Bearings can be taken of anything or object that is conspicuous and marked on the chart, such as lighthouses, buoys, beacons, TV antennae, chimneys, water towers, conspicuous buildings and also islands, hills and headlands that are easily identified.



Take a bearing of a light house using a hand bearing compass. In the picture the bearing to the light house from your position on the boat is 280° (C).

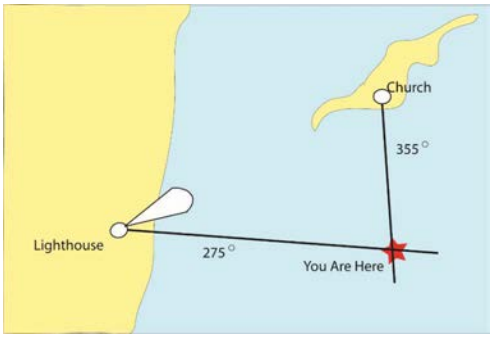
TAKING A BEARING

Line of Position (LOP)

A position line is a line (drawn on the chart) somewhere on which the vessel's position lies. On its own, a single LOP cannot give the vessel's exact position, other information is required, but a single LOP, when plotted on a chart, can confirm that you are/are not close to a point of danger.

Fixes

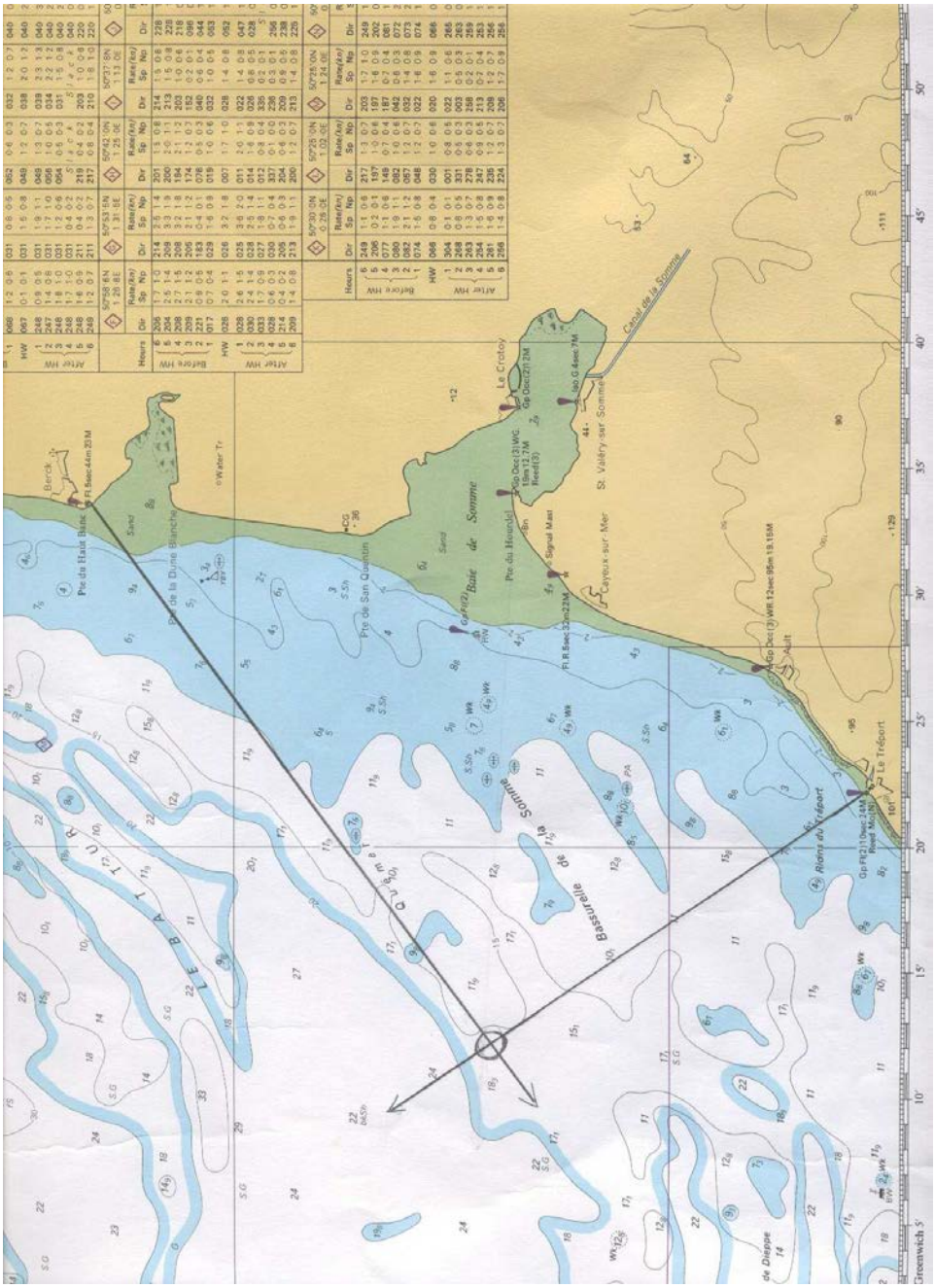
A fix is a reasonably accurate determination of a vessel's position. It requires two or more LOPs, derived from simultaneous compass bearings, crossing each other to establish the position of the vessel fairly accurately. However, a fix that uses only two position lines is not as accurate as one that uses three. It is preferable always to take compass bearings of three different objects when possible.



BASIC FIX

Two Point Fix

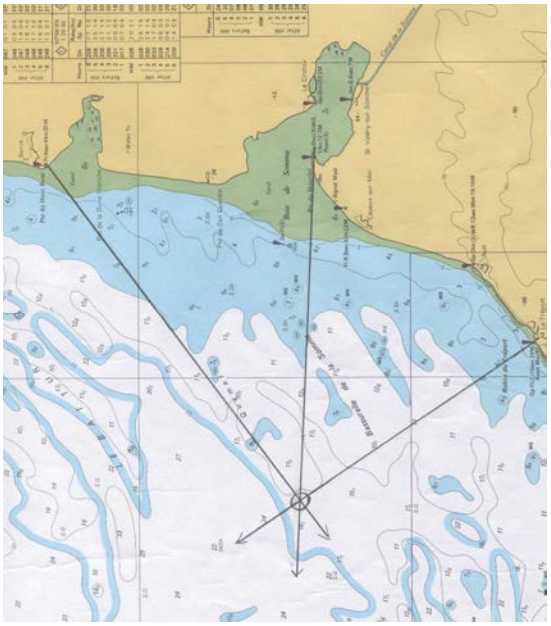
The point of intersection of two simultaneous bearings of two charted objects (LOPs) gives a reasonable fix of the position of the vessel.



TWO POINT FIX

Three Point Fix

Better than a two-point fix for reliability, the third LOP gives greater accuracy or highlights an error in one or both of the other LOPs. If the three LOPs coincide closely it indicates a reasonably accurate fix.

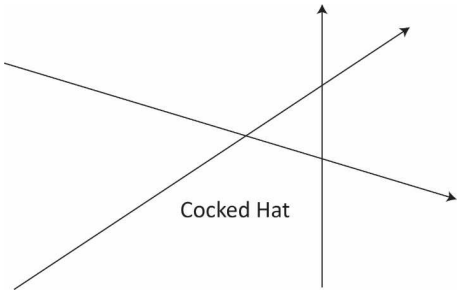


THREE POINT FIX

Cocked Hat

When a three-bearing fix is plotted the result will often be a triangle. In the event that the cocked hat, as it is known, is small, it is customary to take the position at the center point of the triangle. When the cocked hat is large, good navigation practice dictates that the navigator should assume his position to be that which is closest to the point of danger. If it is a very large cocked hat the bearings should be re-taken if possible.

Except in the most favorable conditions, a cocked hat is most likely to be the result due to one or more LOPs not being accurate or as a vessel continues its movement forward, the LOP will change.



COCKED HAT

Planning a Fix

Identify all objects on the charts and then identify those same objects on the land.
Make sure that the object you are looking at is the object you plan to use on the chart.
Write down the bearings as they are taken.
Take the bearings as quickly as possible. The bearings on the beam should be taken last because their angle will change more rapidly. The angle between bearings should be at least 40º and less than 120º; the best angle of cut is about 90º for a two-point fix and about 60º for a three-point fix.

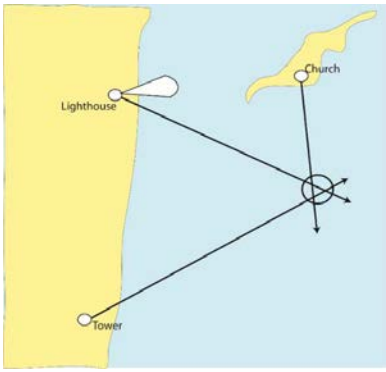
TAKING BEARING WITH HANDHELD COMPASS

Running Fix

- A running fix is used when only one object for a fix is visible.
- It is obtained from two separate bearings taken of the same object, combined with the direction and distance traveled by the vessel.
- It is only as accurate as the information that goes into plotting it - in particular, the vessel's course and speed.
- If there is a large amount of current and leeway present, then the running fix's accuracy is greatly reduced, although allowance for both can be made.

Procedure for a Running Fix

- Take and plot a LOP from the single object, note the time, the log reading and the course being steered.
- Wait until the bearing of the object has changed at least by 30º or more, then take and plot a second LOP, note the time, the log reading.
- On the chart, from anywhere on the first LOP, transfer the first LOP in the same direction and distance traveled between the times of the two bearings. The point at which the transferred LOP cuts the second LOP is the fix.

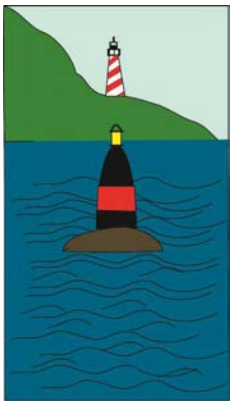


RUNNING FIX
(SHOWS THE COCKED HAT)

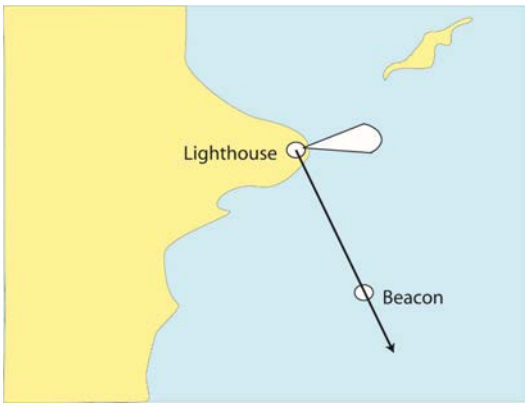
Other Sources of Position Lines

Transit lines

A range or transit where two identifiable objects on the chart line up, the vessel must be positioned on this line, and this may be crossed with one or more other LOPs to give a fix.



TRANSIT (AS SEEN FROM BOAT)



TRANSIT (AS PLOTTED ON THE CHART)

15.6 Knowledge Review

1. What are “small craft” charts?
2. Name some chart work instruments you would use.
3. Why is the Bretton Plotter the preferred navigational instrument?
4. What are the 3 measurements of depth that you might find on a nautical chart?
5. Name 10 items that a nautical chart contains?
6. What are “special notes, cautions and warnings”?
7. What is a compass rose?
8. What is a tidal diamond?
9. What is listed in “chart symbols and abbreviations”?
10. What is the difference between latitude and longitude?
11. Describe what is meant by the 24 hour clock?

Module 16 INTRODUCTION TO TIDES

16.1 Key Objectives

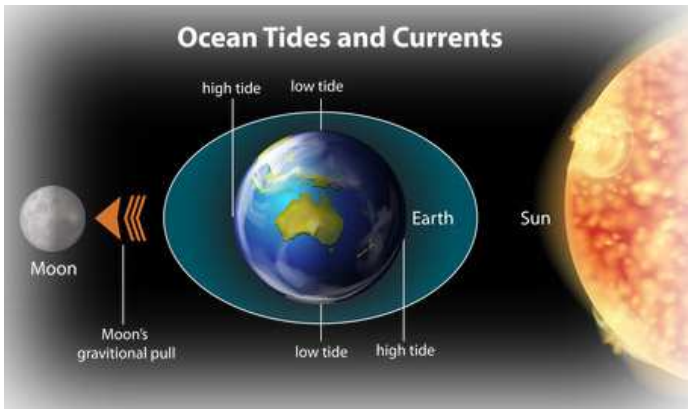
THE OBJECTIVES OF THIS MODULE ARE TO GIVE THE CANDIDATE AN UNDERSTANDING OF TIDES AND CURRENTS AND THEIR CAUSES. IT ALSO COVERS TIDAL DEFINITIONS, TIDAL HEIGHTS AND DEFINITIONS OF TERMS.

16.2 Tides

- The navigator requires a detailed knowledge and understanding of tides in order that they may be used to help in making a safe and secure passage.

- Tides have two significant effects for the navigator, and these changes constantly. They are **depth of water** and the **speed of horizontal flow**.

- In most places there are two tidal cycles every day, comprising two high tides and two low tides, and this phenomenon is known as a semi diurnal tide. A few places have only a single tidal cycle each day, this is known as a diurnal tide. Still fewer places have a combination known as mixed tides.



- Tides are the vertical rise and fall in the sea level brought about by the movement of the earth, moon and sun and the effect of the gravitational attraction between these bodies.

- In effect the combined gravitational pull of the sun and moon causes a “tidal wave” to revolve around the earth. Tides originate in the open waters of the earth’s seas and oceans but are only noticeable and significant close to shore.

- Tidal currents are the horizontal flow of water that result from the "tidal wave" meeting landmasses and shallow areas and are easily observed along beaches, bays, sounds and rivers.

Cause of tides and currents

- Tides result from the differences between centrifugal forces and gravitational forces of mainly the moon and earth. (However, to a lesser extent the sun also exerts gravitational pull).

- Although the mass of the moon is only a tiny fraction of that of the sun, it is much closer to the earth and its pull is about twice as powerful. As a result, tides are mainly lunar.

- This gravitational pull from the moon "pulls" the surface of the sea towards it causing a "bulge". As the moon rotates around the earth the gravitational pull causes the water to bulge, the resulting wave is then carried around the earth. On the opposite side of the earth the moon's gravitational pull is diminished, which allows the water to move away from the earth causing a second bulge.

- Tidal rhythm therefore is generally in tune with the rotation of the moon around the earth. Since this "lunar day" is 24 hours and 50 minutes, the two high and two low waters each day occur about 50 minutes later than the corresponding tides of the previous day.

- In the course of any one lunar month, the sun, moon and earth are lined up twice, technically, in conjunction. The new moon is when the order is sun, moon, earth and full when the order is sun, earth, moon. In both cases, the suns gravitational pull lines up with that of the moon, which results in higher tidal ranges called "spring tides".

- Similarly, twice during the course of a lunar month, the relative positions of the moon and sun are at 90º to each other. In this instance the sun counteracts to some extent the pull of the moon, which results in lower tidal ranges called neap tides.

Spring tides produce higher high water and lower low water, whilst neap tides produce lower high water and higher low water. Because of the greater volume of water moving between high and low water, the rate of flow of the current is much greater during a spring tide. Calculating this rate of flow will be dealt with in later modules.

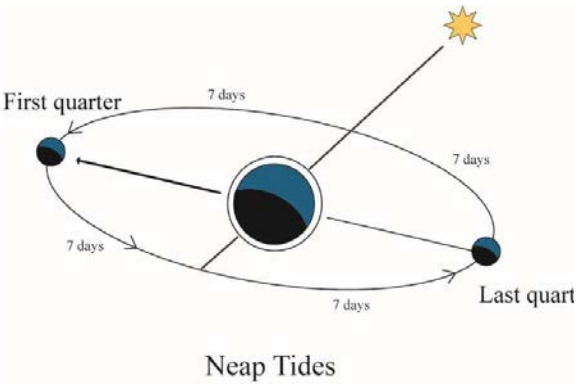


FIGURE 20-1 NEAP TIDES

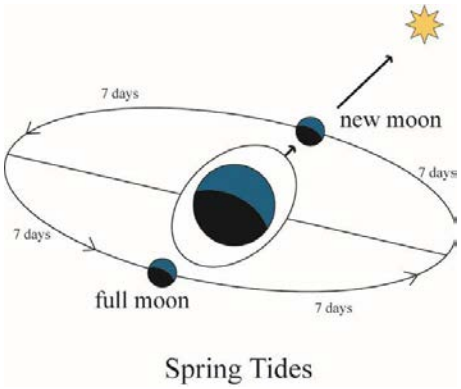


FIGURE 20-2 SPRING TIDES

16.3 Knowledge Review

1. What influence does the moon have on tides?
2. What is a semi diurnal tide?

Module 17 INTRODUCTION TO BUOYAGE

17.1 Key Objectives

THE OBJECTIVE OF THIS MODULE IS TO UNDERSTAND THE IMPORTANCE OF THE INTERNATIONAL BUOYAGE SYSTEM WITH PARTICULAR REFERENCE TO IALA REGIONS A & B AND WHAT THIS MEANS FOR THE NAVIGATOR, & THE USE AND IDENTIFICATION OF CARDINAL MARKS.

The International Association of Lighthouse Authorities (IALA) controls the buoyage system internationally and sets out these rules and regulations.

There are two main systems or regions. So, depending on where you are sailing or navigating you must know which system is in use. This is because, unfortunately, the systems are not standardised, and, in fact, the systems used in Regions A and Zone B are often opposite.

IALA Region A - covers Europe and most of the world (except as noted in Zone B below)

IALA Region B - covers North and South America, Japan, Korea and the Philippines and the Caribbean.

The IALA system involves the use of two major buoyage systems, Lateral and Cardinal.

- **Lateral marks** indicate the edges of a channel.
- **Cardinal marks** indicate the direction of safe navigation at a dangerous spot.
- **Safe water marks** indicate the deep water and open end of a channel.
- **Special marks** indicate administrative areas, such as speed restrictions or water-skiing areas.
- **Isolated danger marks** indicate a hazard to shipping.
- **Emergency Wreck Marking Buoy** is a new buoy introduced in 2006, marking a new wreck. It replaces the double cardinal or lateral marks (IALA Recommendation O-133).

Each type of mark has a distinctive colour, shape and possibly a characteristic light.

17.2 Lateral System (IALA regions A & B)

The lateral system uses coloured buoys and beacons to guide boats through channels and past dangers.

To help ensure safety and to clearly mark out obstacles and hazards that exist both in and under the water, there exists an internationally agreed sets of marks and lights.

Region A (IALA A) covers all of Europe and most of the rest of the world. The most important is that which deals with the **"direction of buoyage" which defines on which side of a channel the Lateral or Channel Buoys or Marks are placed.**

Under IALA A, red buoys or marks are on the left-hand side of the channel as you enter a port when proceeding in from the sea.

Under IALA B red buoys or marks are on the right-hand side of the channel when proceeding in from the sea i.e. going into a harbour (red right returning). These Lateral or Channel Marks define the limits of the navigable water across a channel. It is not wise to attempt to pass between a channel mark and the shore behind unless you have local knowledge of the depth of the water and any hazards in the location.

Marks can either be a buoy floating in the water or a pole set into the rocks or sea bed which will be painted in the correct colour and carry the required shape at the top.

CAN SHAPE MARK

CONE SHAPE MARK

For IALA A:
Port Marks are Red in colour, flash a red light at night and are Can Shaped and indicate the left hand (port) side of the channel.
Starboard Marks are Green in colour, flash a green light at night and are Cone Shaped and indicate the right hand (starboard) side of the channel.

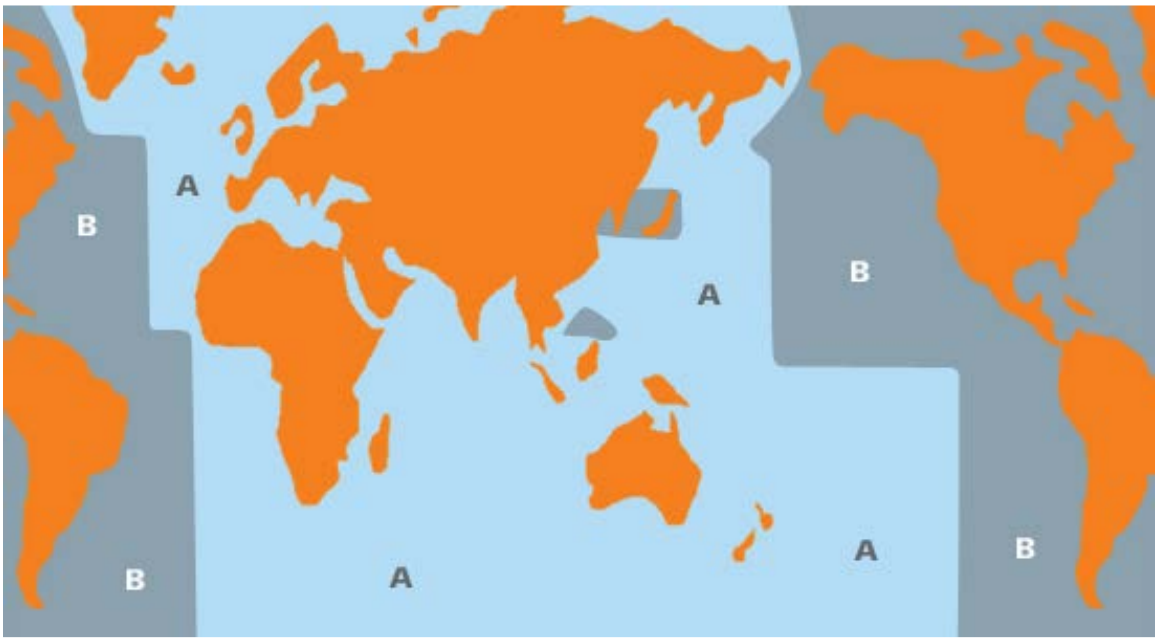
For IALA B:
Port Marks are Green in colour, flash a green light at night and are Can Shaped and indicate the left hand (port) side of the channel.
Starboard Marks are Red in colour, flash a red light at night and are Cone Shaped and indicate the right hand (starboard) side of the channel.

IALA Zone A
Port marks are red, can shaped and may have a red flashing light of any rhythm.
Starboard marks are green , cone shaped and may have a green flashing light of any rhythm
"Is there any red port left"

IALA Zone B
Port marks are green, can shaped and may have a green flashing light of any rhythm.
Starboard marks are red, cone shaped and may have a red flashing light of any rhythm
"Red right returning"

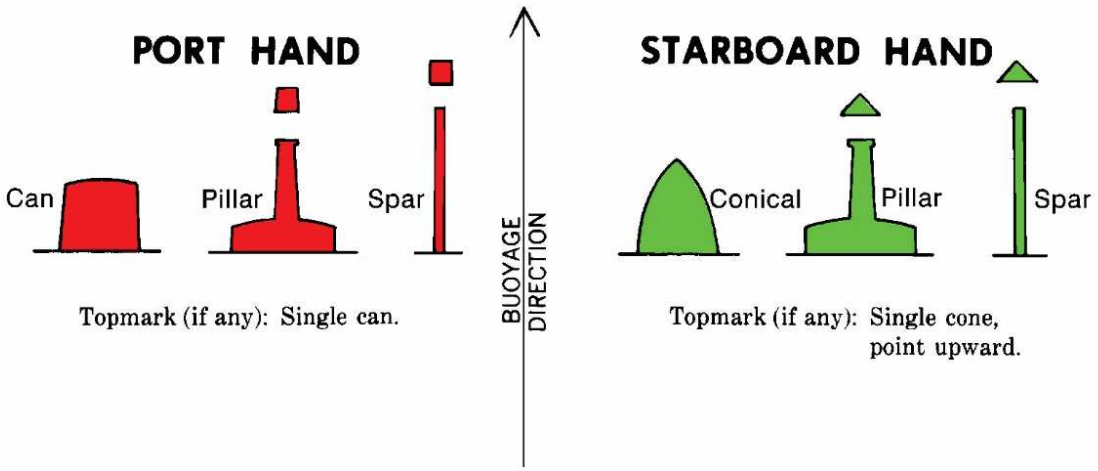
Both IALA Zone A & Zone B
Thankfully the mark shapes are consitent for both zones!
Port marks are square/can shape or have a can shape topmark
Starboard marks are conical or have a conical shaped topmark

LATERAL MARKS

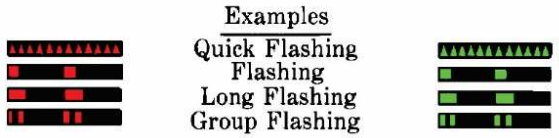


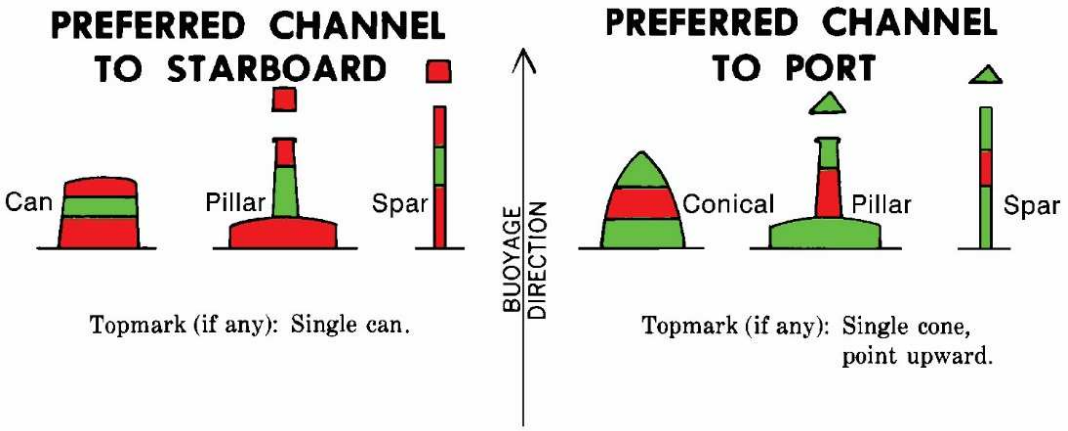
IALA A AND B

IALA MARITIME BUOYAGE SYSTEM
LATERAL MARKS REGION A



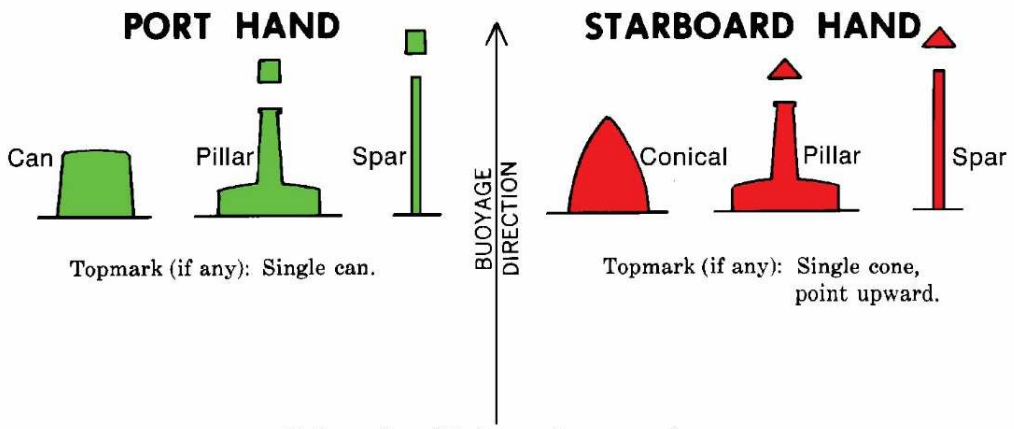
Lights, when fitted, may have any phase characteristic other than that used for preferred channels.



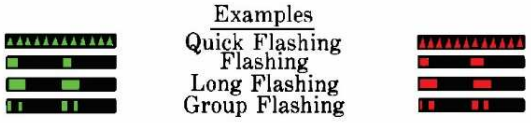


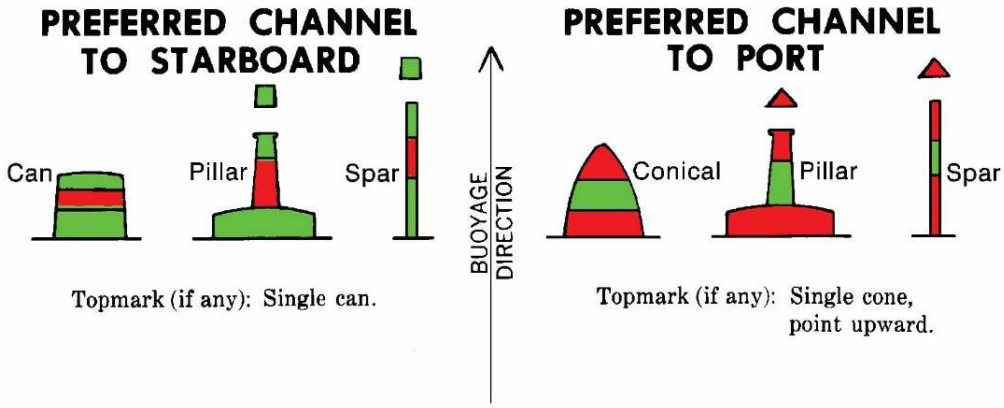
Lights, when fitted, are composite group flashing Fl (2 + 1).

IALA MARITIME BUOYAGE SYSTEM
LATERAL MARKS REGION B



Lights, when fitted, may have any phase characteristic other than that used for preferred channels.





Lights, when fitted, are composite group flashing Fl (2+1).

17.3 Marks Common to both IALA Regions A and B

Isolated Danger Mark

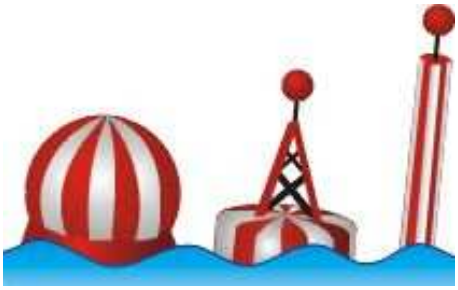
Isolated Danger marks indicate a point of potential hazard, are Red and Black in Colour, have two round black balls at the top and flash a white light in a group.

The light is WHITE and exhibits 2 quick flashes at intervals of 5 seconds.

ISOLATED DANGER MARK

Safe Water Mark

Safe Water marks are red and white vertical stripes whereas other striped marks have horizontal stripes.



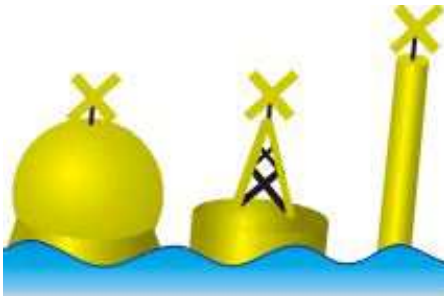
SAFE WATER MARK

Used to indicate the end/start of a channel, open, deep and safe water lies ahead. It may also be used to indicate the start and end of a buoyed section of a narrow channel, or a line of these buoys can be used to mark a safe route through shallow areas. Sometimes known as a Fairway Buoy, the colour is red and white vertical stripes with a top mark of a red ball.

The light is WHITE and may either flash Morse code “A”, occulting, Isophase or long flash every 10 seconds (L Fl 10s) [2].

Special Mark

Special marks are yellow in color and display a yellow light if lit. They are not intended to assist in navigation but rather to alert the mariner to some special feature such as: spoil areas, Pipelines, Traffic Separation Schemes, jetties or naval exercise areas.



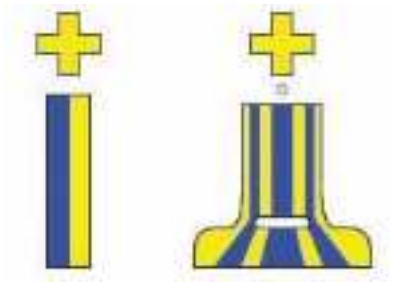
SPECIAL MARK

Placed to indicate the boundary of an obstruction, administrative area such as a speed limit, water skiing or mooring area, or to highlight other features such as outfall sewerage pipes. The mark is yellow in colour with a yellow X top-mark.

The light is YELLOW and consists of one quick flash with intervals of 5 seconds.

Wreck Buoy

Used to temporarily indicate a wreck until the wreck is cleared or permanent marks are set up. The colour is blue and yellow indicating that there is a serious danger existing and the mariner must keep clear.



WRECK BUOY

The light is an alternating BLUE AND YELLOW flashing sequence. This may be made even more distinctive when a group of wreck buoys are deployed around a wreck site and the flash characteristics are synchronized to all show the same flash/eclipse cycle at the same time by utilizing an integral timer.

17.4 Cardinal Buoyage System

Cardinal Marks (rare in U.S. waters) indicate the safe side to pass a hazard. E.g. a North Cardinal Mark indicates that a vessel should pass to the north of the marker. Each Cardinal Mark has a unique pattern, color scheme and is defined by a white flashing light.

Buoys or marks used to indicate the position of a hazard and the direction of safe water/ safety as a cardinal/compass direction relative to the hazard by:

- Indicating that the deepest water is an area on the named side of the mark
- Indicating the safe side on which to pass a danger

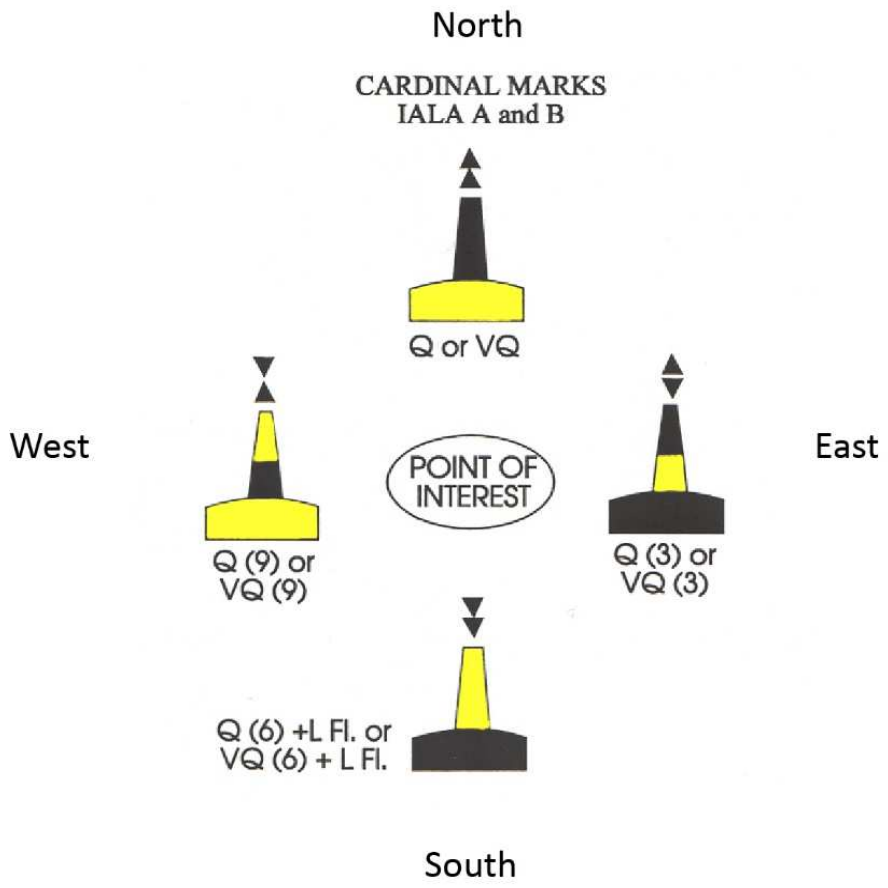
Each cardinal mark indicates one of the four compass directions by:

- The direction of its two conical top-marks
  N - both point up,
  S - both point down,
  W - towards each other (Wine glass/Waist shape - W)
  E - away from each other, bases together (Egg shape - E)

- The colour pattern of black and yellow stripes, which follows the orientation of the cones - the black stripe is in the position pointed to by the cones (e.g. at the top for a north cardinal, in the middle for a west cardinal)

- The distinctive WHITE flashing light characteristics, quick or very quick flashes. The pattern indicates the direction of the cardinal point with a number of flashes based on the clock face position which corresponds to the direction of the cardinal point.
  N - continuous flashes
  E - 3 flashes
  S - 6 flashes (plus 1 long flash to help make it easily distinguished from West
  W - 9 flashes

MARK	MARK COLOUR	DIRECTION OF TRIANGLE	LIGHT AND FLASH
North Cardinal	Black over Yellow	Triangle point up	Continuous flash
East Cardinal	Black/Yellow/Black	Triangle point away	Flash in a group of 3
South Cardinal	Yellow over Black	Triangles point down	Flash in a Group of 6, followed by 1 long flash
West Cardinal	Yellow/Black/Yellow	Triangle points in	Flash in a Group of 9



CARDINAL MARKS IALA A & B

Q (9)	This indicates quick flashing flight 9 times
VQ (9)	This indicates very quick flashing flight 9 times
Q (6) + L Fl.	This indicates quick flashing light 6 times and a long flash

17.5 Knowledge Review

1. What does IALA stand for?
2. What countries/regions are covered in IALA regions A & B?
3. What are the fundamental and most important differences between IALA Regions A & B?
4. What is an isolated danger mark, describe its appearance.
5. What is a safe water mark, describe its appearance.
6. What is a special mark, describe its appearance.
7. What is a wreck buoy, describe its appearance.
8. Describe the appearance s of North, South, East and West cardinal marks.
9. What are the flashing sequences for each cardinal mark?
10. On which side of a cardinal mark should you keep clear?

Module 18 INTRODUCTION TO COLLISION REGULATIONS

18.1 Key Objectives

THE OBJECTIVE OF THIS MODULE IS TO GET THE STUDENT TO UNDERSTAND THE IMPORTANCE OF THE INTERNATIONAL COLLISION REGULATIONS, LIGHTS, SOUNDS AND SHAPES AND SAFE OPERATION IN RESTRICTED VISIBILITY.

The International Regulations for preventing collisions at sea were agreed upon by a conference of the International Maritime Organization (IMO) and are usually referred to as the "COLREGS". It is not necessary to know all of the Rules off by heart but a thorough knowledge of the COLREGS is essential.

18.2 Part B of the COLREGS - Steering and Sailing Rules

Section I – Conduct of Vessels in any condition of visibility

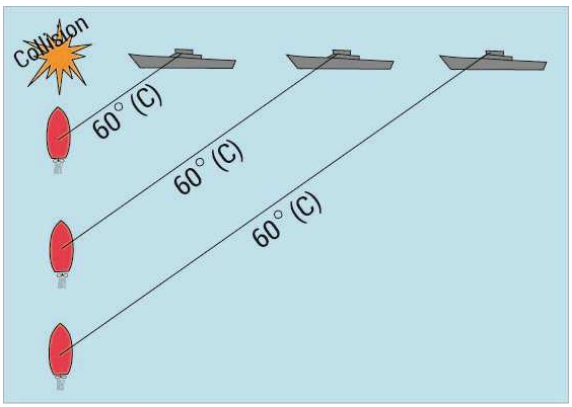
Application "Rule 4"
Rules in this section apply to any condition of visibility.

Lookout "Rule 5" (one of the most important of all the rules)
Every vessel shall at all times be responsible for maintaining a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision."

Safe Speed "Rule 6"
Vessels shall at all times proceed at a safe speed taking into consideration visibility, traffic density, manoeuvrability of the vessel, background lights at night, state of the wind, sea, current, and proximity of navigational hazards.

Risk of Collision "Rule 7"

Vessels shall use all available means to determine if risk of collision exists. Risk of collision shall be deemed to exist if the compass bearing of an approaching vessel does not appreciably change; risk of collision may sometimes exist with a large vessel, a tow or a vessel at close range even if the bearing does change appreciably.



RISK OF COLLISION - RULE 7

If there is any doubt, risk of collision shall be deemed to exist.

Assumptions shall not be made on the basis of scanty information, especially scanty radar information.

Action to Avoid Collision "Rule 8"

Any action taken to avoid collision shall be positive, made in ample time and with due regard to good seamanship. A change of direction and/or speed shall be large enough to be obvious to the other vessel - avoid small successive changes in speed and/or direction.

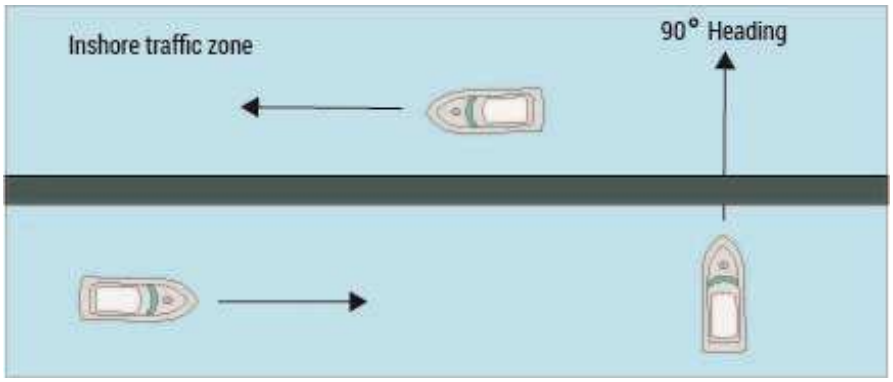
The most important rule for avoiding collision is to **maintain a proper lookout at all times** by watching, listening and all other means possible such as radar or binoculars. It is imperative that when you first encounter another vessel, the question needs to be asked "is there any risk of a collision?". Every vessel is required to travel at a safe speed which means that proper and effective action can be taken to stop the boat within a safe distance or to manoeuvre while maintaining control of the vessel.

Narrow Channels "Rule 9"

Vessels should keep as close as practical to the starboard side of a channel or fairway. A vessel less than 20 meters, a sailing vessel or a fishing vessel shall not impede the passage of a vessel that can only safely navigate within a narrow channel or fairway.

"Rule 10" - Traffic Separation Schemes (TSS)

Traffic separation schemes have been set up in area where there is a heavy concentration of shipping. They are designed to act in similar fashion to a divided highway by separating the opposing flows.



TRAFFIC SEPARATION SCHEMES - RULE 10

Use the TSS and always use correct lane, join at shallow angle, cross at 90° heading.
Do not use inshore zone without local knowledge.

Vessels should:

- proceed in the appropriate traffic lane in the general direction of traffic flow for that lane.
- keep clear of a traffic separation line or separation zone.
- normally join or leave a traffic lane at the termination of the lane, but when joining or leaving from either side shall do so at as small an angle to the general direction of traffic flow as practicable.
- avoid crossing traffic lanes but if obliged to do so shall cross on a heading as nearly as practicable at right angles to the general direction of traffic flow.
- vessels of less than 20 meters in length, sailing vessels and vessels engaged in fishing may use the inshore traffic zone.
- A vessel may use an inshore traffic zone when en route to or from a port, offshore installation or structure, pilot station or any other place situated within the inshore traffic zone, or to avoid immediate danger.
- A vessel shall avoid anchoring in a traffic separation scheme or in areas near its terminations.
- A vessel engaged in fishing shall not impede the passage of any vessel following a traffic lane.

Section II – Conduct of vessels in sight of one another

"Rule 11" - Application – Stand on / Give way

Rules in this section apply to vessels in sight of one another. (Which vessel shall "stand-on" and which should "give-way")

'Give Way', 'Stand On'
If risk of collision exists between two vessels correct application of the Rules will require one vessel to give way and confer right of way to the other vessel. The vessel required to give way is called the Give Way vessel and the vessel with right of way is called the Stand On vessel; both vessels have specific responsibilities under the Rules.

Action by Give Way vessel
The Give Way vessel shall take early and substantial action to keep clear.

Action by the Stand On vessel
The stand on vessel must maintain her course and speed. The stand on vessel may, however, take action to avoid collision by her maneuver alone, as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action in compliance with these Rules.

When, from any cause, the vessel required to keep her course and speed finds herself so close that collision cannot be avoided by the action of the give-way vessel alone, she shall take such action as will best aid to avoid collision.

"Rule 13" - Overtaking

Any vessel overtaking any other shall keep out of the way of the vessel being overtaken. A vessel shall be deemed to be overtaking when coming up with another vessel from a direction more than 22.5 degrees abaft her beam, that is, in such a position with reference to the vessel she is overtaking, that at night she would be able to see only the stern-light of that vessel but neither of her sidelights. When a vessel is in any doubt as to whether she is overtaking another, she shall assume that this is the case and act accordingly.

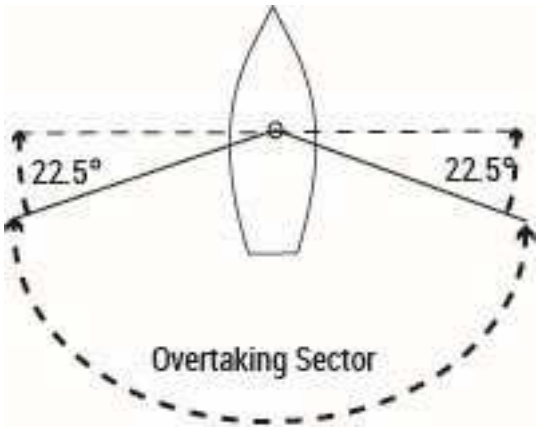


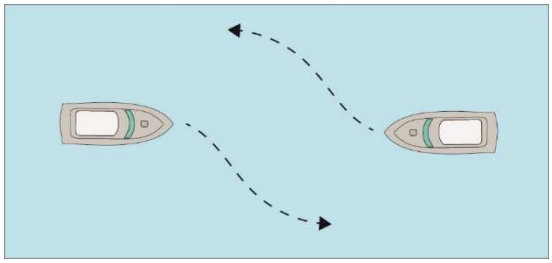
FIGURE 21-1 OVERTAKING SECTOR - RULE 13

Assume overtaking vessel if more than two points abaft the beam, or any doubt. Always keeps clear, until past & clear.

"Rule 14" Power driven vessels meeting head on

When two power driven vessels are meeting head on both alter course to starboard.

Both turn to starboard.



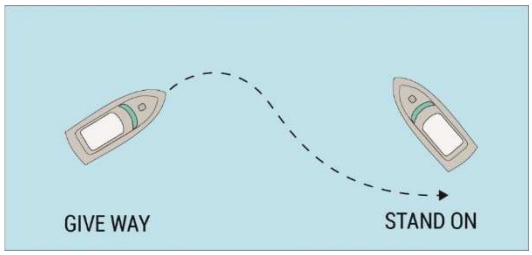
POWER VESSELS MEET HEAD ON -RULE 14

"Rule 15" Power driven vessels crossing

When two power driven vessels are crossing, or converging, and risk of collision exists, the vessel which has the other on her own starboard side must give way.

The give way vessel should avoid crossing ahead of the other vessel if possible.

Give way to vessel on your starboard side, Stand on for vessel on your port side.



POWER VESSELS CROSSING – RULE 14

"Rule 16" - Action by give-way vessel

The give way vessel, is required, if possible, to take early and substantial action to keep well clear.

"Rule 17" – Action by stand-on vessel

The stand on vessel should maintain course and speed.
The stand on vessel may however take action to avoid collision by her manoeuvre alone, as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action in compliance with these Rules. If the vessel required to keep her course and speed finds herself so close that collision cannot be avoided by the action of the give-way vessel alone, she shall take such action as will best aid to avoid collision.

1. FIRST STEP STAND-ON,
2. MAY ALTER (Not to port for a vessel to port), WHEN DOUBT OF OTHER VESSEL KEEPING CLEAR
3. MUST KEEP CLEAR, WHEN ACTION OF GIVE WAY VESSEL'S ACTION ALONE CANNOT AVOID COLLISION.

"Rule 18" - Responsibilities between Vessels

A power-driven vessel underway shall keep out of the way of:

- a vessel not under command;
- a vessel restricted in her ability to manoeuvre;
- a vessel engaged in fishing;
- a sailing vessel.

A sailing vessel underway shall keep out of the way of:

- a vessel not under command;
- a vessel restricted in her ability to manoeuvre;
- a vessel engaged in fishing.

A vessel engaged in fishing when underway shall, so far as possible, keep out of the way of:

- a vessel not under command;
- a vessel restricted in her ability to manoeuvre.

Any vessel other than a vessel not under command or a vessel restricted in her ability to manoeuvre shall, if the circumstances of the case admit, avoid impeding the safe passage of a vessel constrained by her draft.

"Rule 19" - Conduct of vessels in restricted visibility

This Rule applies to vessels not in sight of one another when navigating in or near an area of restricted visibility.

- Every vessel shall proceed at a safe speed adapted to the prevailing circumstances and conditions of restricted visibility.
- A power-driven vessel shall have her engines ready for immediate maneuver.
- Every vessel shall have due regard to the prevailing circumstances and conditions of restricted visibility.

A vessel, which detects by radar alone the presence of another vessel shall determine if a close-quarters situation is developing and/or risk of collision exists. If so, she shall take avoiding action in ample time, provided that when such action consists of an alteration of course, so far as possible the following shall be avoided:

- an alteration of course to port for a vessel forward of the beam, other than for a vessel being overtaken;
- an alteration of course towards a vessel abeam or abaft the beam.

Every vessel which hears the fog signal of another vessel forward of her beam (unless it has been determined that risk of collision does not exist) shall:

- reduce speed to minimum
- if necessary take all way off
- navigate with extreme caution until danger of collision is over.

ALWAYS GO AT A SAFE SPEED, ALL VESSELS KEEP CLEAR – THERE IS NO STAND-ON VESSEL IN RESTRICTED VISIBILITY

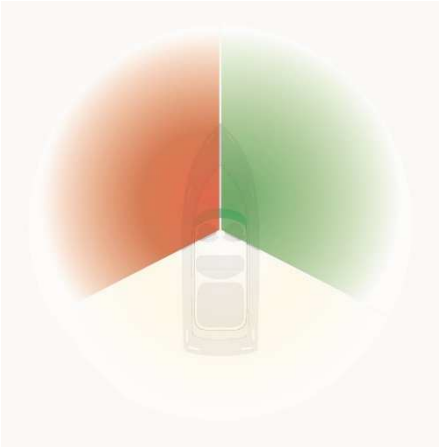
AVOID ALTERING TOWARDS VESSEL ABEAM OR ABAFT BEAM,

AVOID ALTERING TO PORT FOR VESSEL FORWARD OF BEAM

18.3 Part C - Lights

Safe Operation in Restricted Visibility

It is imperative to take great care when operating a vessel at night or during periods of restricted visibility. Remember to proceed at a safe speed.



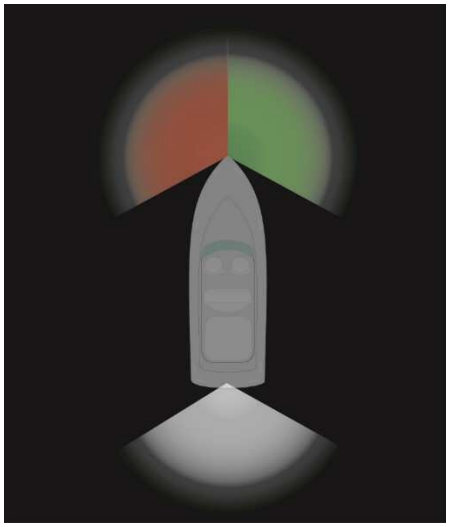
Reduced visibility

Navigating at Night

The rules for navigating are the same for night and day, however, at night or in restricted visibility you must determine the speed, position and size of other vessels based on their navigation lights.

The following factors require specific navigation lights:

- The size of the vessel
- If it is power or sail
- If it is underway or at anchor



Night

NAVIGATION LIGHTS

Lights using combinations of white, red, green and yellow colors are used at night to convey information regarding a vessel's:

- Direction of movement
- Method of propulsion
- Size

Additional lights are used to indicate if the vessel is:

- Towing
- Fishing
- Not Under Command
- Restricted in Ability to Maneuver
- Constrained by Draft
- Aground
- At anchor

When attempting to decipher the meanings of a vessel's lights try breaking the lights down into sections by identifying the basic lights and then concentrate on the lights that remain.

Usually the most important decision is whether risk of collision exists; if risk of collision does exist it is obviously necessary to work out details of the other vessel before deciding on the correct course of action.

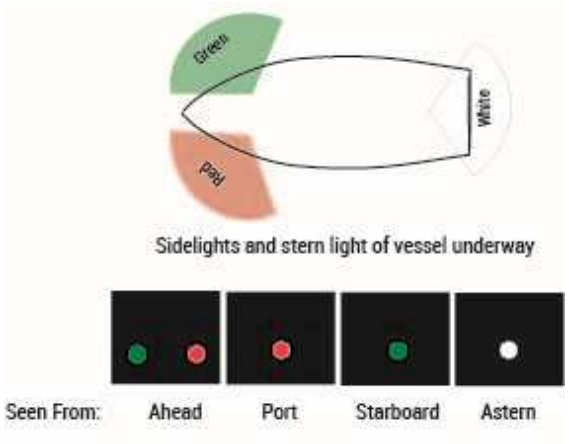
Perhaps the best sequence is to decide the vessels':

1. Aspect (ahead, astern, port, starboard)
2. Propulsion (i.e. under power, under sail, being towed)
3. Length
4. Other information (i.e. towing, fishing, Restricted in Ability to Maneuver, Not Under Command, etc.)

Side lights and stern light

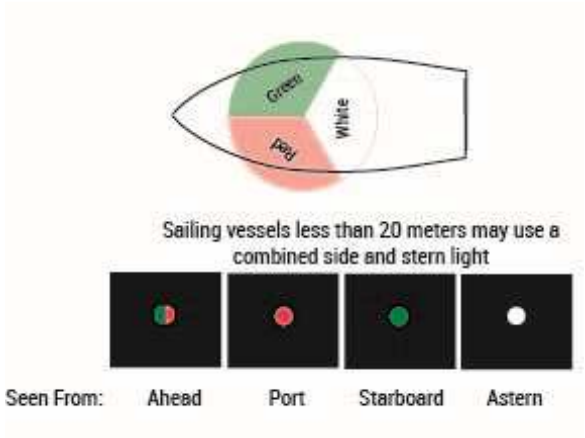
A sailing vessel underway (not at anchor, or made fast to shore, or aground) shows three basic lights, two sidelights and a stern light:

- a green light on the starboard side
- a red light on the port side
- a white light at the stern



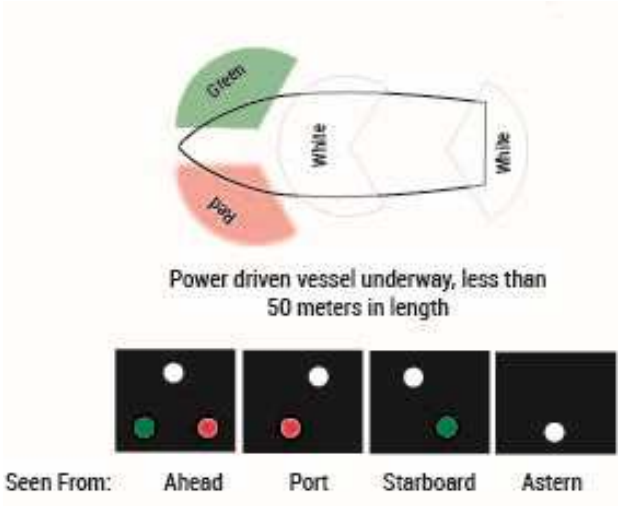
SIDE & STERN LIGHTS

Or a sailing vessel less than 20 meters (65 ft.) in length may combine side and stern lights in one lantern carried at or near the top of the mast. Note that this combined lantern must not be used when the yacht is using her auxiliary engine.



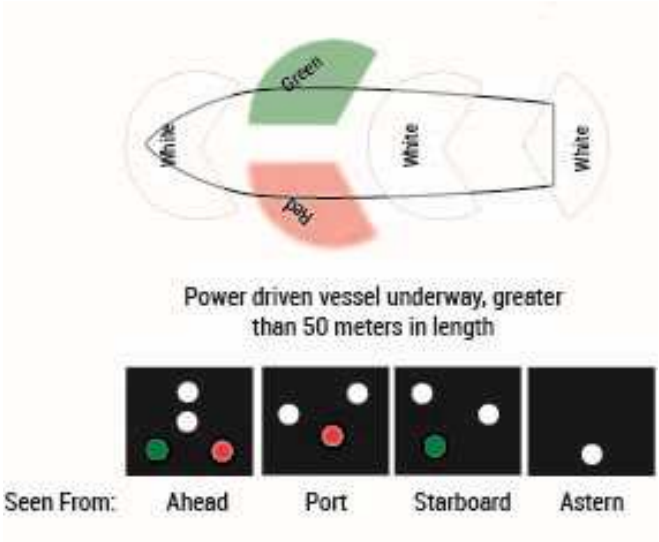
SIDE & STERN LIGHTS

A power-driven vessel underway less than 50 m (164 ft.) in length shows a white masthead light above the sidelights. A masthead light covers the same arc as the sidelights combined. Also, a white stern light.



SIDE & STERN LIGHTS

A power-driven vessel underway greater than 50 m in length shows a white masthead light forward and a second masthead light behind and higher than the forward masthead light.



SIDE & STERN LIGHTS

Vessels at Anchor

A vessel at anchor, less than 50 m in length, must show an all-round white light where it may best be seen.

A vessel at anchor, greater than 50 m in length, must show in the fore part an all-round white light and a second all round white light at or near the stern which is lower than the forward light.

If a vessel at anchor is greater than 100 m in length she shall use available lights to illuminate her deck.

VESSELS AT ANCHOR LIGHTS

18.4 Knowledge Review

1. Define the following: vessel, power driven vessel, sailing vessel, vessel engaged in fishing, vessel not under command, vessel restricted in ability to maneuver, vessel aground, vessel constrained by draft, vessel not underway.
2. Describe what restricted visibility means
3. What are the COLREGS?
4. What action should you take to avoid collision?
5. What is a traffic separation scheme? how should you cross it?
6. What is the difference between a stand on and a give way vessel?
7. What is the rule when two vessels meet head on?
8. Describe “conduct in restricted visibility”.
9. What color are starboard, port, stern, bow and masthead lights?

Module 19 RESPONSIBILITIES, CARE OF THE ENVIRONMENT, PROVISIONING & HOUSEKEEPING

19.1 Key Objectives

THE OBJECTIVE OF THIS MODULE IS TO UNDERSTAND YOUR RESPONSIBILITIES AS CREW OR SKIPPER, THE EFFECTS OF ALCOHOL, WHEN TO CALL THE SKIPPER IF ACTING AS CREW, PROTECTING THE MARINE ENVIRONMENT AND PROVISIONING AND HOUSEKEEPING RULES.

19.2 Rested and Alert Crew

For safety reasons it is important that the skipper and crew are rested, sober and alert. Regular periods of rest and a healthy diet will ensure that all members of the crew will be able to maintain a proper watch and be alert to the needs of the vessel in changing conditions.

The effects of fatigue, alcohol and drugs are:

- slow mental process including the following:
  - visual perception
  - decision making
  - mental calculations
- reduced reaction time for simple and complex tasks
- diminished judgement/ errors of omission
- slower / lower productivity
- decreased morale resulting in lack of motivation
- poor communications
- sleeping on watch
- reduced motor skills, blurred vision and possible loss of balance
- If consuming alcohol in cold climates- accelerated hypothermia as alcohol lowers the body's resistance to cold
- If consuming alcohol in hot climates- dehydration (see first aid module)

In certain countries (such as Canada) it is prohibited to operate a vessel when under the influence of alcohol. (if boating in a foreign country, check with local authorities before heading out as there may be regulations concerning the amount of alcohol you can carry on a vessel and rules for how much alcohol your crew may consume). Drinking alcohol and not wearing a lifejacket could be a lethal combination.

40% of accidents at sea are related to alcohol and drugs. Consuming drugs or alcohol may put your life and the lives of others at risk, so don't drink and drive!

19.3 Navigational Duties / Responsibilities of Crew

During the course of any voyage the crew should:

- maintain a proper lookout (sight and sound) at all times
- maintain a continuous record of:
  - speed
  - direction
  - position
  - positions of other vessels and hazards (Charts and Logbook)
- The crew also needs to:
  - maintain an effective radio watch.
  - safeguard against pollution and protect the environment.
- Crew members are required to:
  - respond in a timely and efficient manner to all instructions and orders of the skipper.
  - maintain a watch.
  - help in the general running of the vessel.
  - Steer a compass course as requested by the skipper.
- Practice personal safety by:
  - checking all of the personal safety equipment to ensure it is in good working order.
  - ensuring clothing is adequate and having foul weather gear as appropriate for weather conditions.

19.4 When to Call the Skipper

The skipper is responsible at all times for operational safety of the vessel and the welfare of the crew, even when asleep or down below. The skipper will generally have specific instructions as to circumstances (often written in the log book) when he/she requires the crew to call him on deck. The general rule is if you have ANY doubt whatsoever alert the skipper immediately.

19.5 Protecting the Marine Environment

It is an offence to put oil, garbage or other pollutants into the water. Check with your local authorities about the discharge of sewage in your area (often referred to as blackwater) Use pump out facilities as required.

- Keep your bilge clean, do not pump oily water overboard.
- Use biodegradable bilge oil dispersing solutions in place of detergents or toxic cleaning products.
- Do not pump sewage (blackwater) overboard, use a holding tank (the discharge of blackwater is an offense in certain waters).
- Bring your garbage home.
- Observe local and federal sewage regulations.
- When fueling, do not “top up” tanks, clean up any excess spillage.
- Watch your wake and prop wash, protect the shoreline from erosion.
- It is your responsibility to clean up and report pollution to the authorities when you see it.
- It is your responsibility to clean up boat-coat sandings and scrapings, cross contamination of invasive species and report incidents of same to the authorities.
- Some countries allow grey water (water from showers and kitchen sink) to be discharged directly overboard, check with local authorities first.

19.6 Provisioning and Housekeeping Considerations

- Prior to leaving port for a trip or voyage, sufficient food for three meals a day with snacks, soda and soft drinks, bottled water, tea, coffee, long life milk, etc. should be provisioned for.
- There should then be a reserve of provisions added to the required food and stores on board in the event of adverse weather, unforeseen delays or a need to deviate

course in the event of responding to a distress or having an incident on board (medical emergency etc.).

- Note any special food requirements of the crew and any food allergies.
- Check availability of fresh water at ports en route and at the destination before departure
- Ensure there are proper medical supplies onboard and that the crew carry any medications they may require.
- Ensure there is plenty of propane gas for the stove and spare propane tanks.
- Additional canned meats, vegetables and fruits should be carried in the event that the cooker breaks down or the propane supply is depleted.

19.7 Cooking While Underway

Cooking while underway poses an interesting challenge.

- During rough or extreme weather or situations when the boat is rolling or pitching, it is recommended not to attempt cooking hot food due to the likelihood of burning yourself or a fellow crew member.
- If you know that bad weather is on the way, it may be better to prepare sandwiches or foods that can be eaten without likelihood of spillage.
- In order to facilitate cooking while you are underway, cookers or stoves are generally held in place by a gimbal which allows the cooker to swing, yet remain stable when the boat rolls.
- Pots are held in place by attaching “fiddles” around them which help to hold them in place and prevent them from falling off the stove or spilling on the cabin sole.

19.8 A Balanced Diet

Provisioning should be planned to incorporate foods included in a balanced diet. All diets should include:

- proteins (meats, eggs, dairy products, soy products and legumes)
- carbohydrates (fruits, vegetables and grains)

The daily recommended portions differ from one person to another based on age, sex and physical activity. For instance, the U.S. Government has introduced "My Pyramid" which recommends the daily portion of vegetables, fruits, grains, proteins, beans and dairy.

A proper diet is extremely important to counteract the effects of heat, cold and seasickness. These can become critical factors when on open water.

GLOSSARY OF TERMS

A

Aback	Sail sheeted so that the wind fills the "back" of the sail.
Abeam	At right angles to the side of the boat.
Aboard	Situated on the boat.
Adrift	A boat drifting without being propelled.
Aft	At or towards the stern or behind the boat.
Aground	A boat whose keel is touching the bottom.
Amidships	Towards the center of the boat.
Apparent wind	The wind aboard a moving boat.
Astern	Behind the stern of the boat.
Athwartships	Across the boat from side to side.

B

Backstay	The standing rigging running from the stern to the top of the mast, keeping the mast from falling forward.
Back	1. To Sheet a sail to windward and fill the back of the sail and thus stop the boat or propel it backwards. 2. In the case of the wind - to shift counter clockwise from its previous direction.
Bail	To empty the boat of water.
Ballast	Weight in the keel of a boat that provides stability.
Barometer	An instrument that measures air pressure, an aid to forecasting the weather.
Batten	A thin wood or fiberglass slat that slides into a pocket in the leech of a sail, helping to maintain an aerodynamic shape.
Beam	The width of a boat at its widest point.
Beam reach	(Point of sail) Sailing in a direction at approximately 90º to the wind.
Bear away	To "fall off" or head away from the wind.
Bearing	The direction from one object to another expressed in compass degrees.
Beating	A course sailed up wind.
Below	The area of a boat beneath the deck.
Bend	To attach a sail to a spar or a headstay or to attach a line to a sail.
Bight	A loop in a line.
Bilge	The lowest part of the boats interior where water on board will collect.
Bitter end	The end of a line.
Blanket	To use the sail or object to block the wind from filling a sail.
Block	A pulley on a boat.

Boat hook	A pole with a hook on the end used for grabbing hold of a mooring or retrieving something that has fallen overboard.
Boat speed	The speed of a boat through the water.
Boltrope	The rope that is sewn into the foot and luff of some mainsails and the luff of some jibs by which the sails are attached to the boat.
Boom	The spar extending directly aft from the mast to which the foot of the main sail is attached.
Boom vang	A block and tackle system, which pulls the boom down to assist sail control.
Bottom	The underside of a boat.
Bow	The forward part of the boat.
Bow line	A line running from the bow of the boat to the dock or mooring.
Bow Spring	A line running from the bow of the boat parallel to the dock or mooring that stops the boat from moving forward along the dock.
Bowline	A knot designed to make a loop that will not slip and can be easily untied.
Breastline	A short line leading directly from the boat to the dock.
Broach	An uncontrolled rounding up into the wind, usually from a downwind point of sail.
Broad reach	(Point of sail) Sailing in a direction with the wind at the rear corner (the quarter) of the boat. Approximately 135º from the bow of the boat.
Bulkhead	A wall that runs athwart6ships on a boat, usually providing structural support to the hull
Buoy	A floating navigation marker.
Buoyancy	The ability of an object to float.
Bulwark	A solid side wall, often about waist high, from the outside edge of the deck to prevent someone falling overboard.
Burdened vessel	The vessel required to give way for another boat when the two may be on a collision course.
By the lee	A sailboat running with the wind coming over the same side of the boat as the boom.

C

Cabin	The interior of the boat
Can	In the U.S. an odd numbered green buoy marking the left side of the channel when returning to harbour.
Capsize	To tip or turn a boat over.
Cast off	To release a line when leaving a dock or mooring.
Catamaran	A twin hulled vessel with a deck or trampoline between the hulls.
Catboat	A boat with only a mainsail and an unstayed mast located at the bow.
Centerboard	A pivoting board that can be lowered and used like a keel to keep a boat from slipping to leeward.
Centerline	The midline of the boat running from bow to stern.

Chafe	Wear on a line caused by rubbing.
Chainplates	Strong metal plates which connect the shrouds to the boat.
Channel	A (usually narrow) lane, marked by buoys, in which the water is deep enough to allow a vessel safe passage.
Chart	A nautical map.
Charter	To rent a boat.
Chock	A guide mounted on the deck through which docklines and anchor rode are run.
Chop	Rough, short, steep waves.
Cleat	A nautical fitting that is used to secure a line.
Clew	The lower aft corner of a sail. The clew of the mainsail is held taut by the outhaul. The jib sheets are attached to the clew of the jib.
Close hauled	(Point of sail). The point of sail that is closest to the wind, when the sails are hauled close to the centerline of the boat.
Close reach	(Point of sail) Sailing in a direction with the wind forward of the beam (about 70º from the bow).
Coaming	The short protective wall that surrounds the cockpit or hatch.
Cockpit	The lower area of the deck in which the steering and sail controls are located.
Coil	To loop a line neatly so it can be stored, or a reel of line.
Come about	See tack.
Companionway	The steps leading from the cockpit or deck to the cabin below.
Compass	The magnetic instrument which indicates the direction in which the boat is headed.
Compass rose	The circles on a chart which indicate the direction of true and magnetic north.
Course	The direction in which the boat is being steered.
Crew	Besides the skipper, anyone on board whom helps run the boat.
Cunningham	A line running through a grommet a short distance above the tack of the mainsail which is used to tension the luff of the main.
Current	The horizontal movement of water caused by tides, wind and other forces.
Cutter	A single masted boat rigged with both jib and staysail.

D

Daysailer	A small sailboat.
Dead downwind	Sailing in a direction straight downwind.
Deck	The mostly flat area on top of the boat.
De-power	To reduce the power in the sails by: 1. Luffing, pointing the boat too close to the wind so that the sails are unable to draw power. 2. Easing the sheets so that the sails flutter.

3. Stalling. Sheeting the sails in so hard that the airflow over them stalls.

Dhow	The generic name of a number of traditional sailing vessels with one or more masts with lateen sails used in the Red Sea and Indian Ocean region.
Dinghy	A small sailboat or rowboat.
Displacement	The weight of the boat; therefore the amount of water that it displaces.
Dock	The quay or pontoon where a boat may be tied up OR the act of bringing a boat alongside to rest alongside.
Dockline	A line used to secure a boat to the dock.
Dodger	A canvas protection in front of the cockpit of some boats that is designed to keep spray off the skipper and crew.
Downhaul	A line used to pull down on the movable gooseneck on some boats to tension the luff of the mainsail. The cunningham has the same function.
Draft	The depth of a boat's keel from the water's surface.

E

Ease	To let out a line or sail.
Ebb	An outgoing tide.

F

Fairlead	A fitting that guides sheets and other lines in a way that reduces friction and therefore chafe.
Fairway	The center of a channel.
Fake (flake)	Lay out a line on the deck using large loops to keep it from becoming tangled.
Fall off	(See also head down & bear away) Alter course away from the wind.
Fast	Secured.
Fathom	A measure of the depth of water. One fathom equals six feet.
Fender	An inflated rubber or plastic bumper used to protect a boat by keeping it from hitting the dock.
Fend off	Push off.
Fetch	The distance of open water to windward between the shore and the boat
Fid	A tapered spike used to open the lay of a rope when splicing.
Flood	An incoming tide.
Following sea	Wave pattern hitting the stern of the boat.
Foot	The bottom edge of the sail.
Fore	Forward.
Forepeak	An accommodation or storage area in the bow below the deck.
Foresail	A jib or genoa.

Forestay	The standing rigging running from the bow to the mast top and to which the foresail is secured.
Forward	Towards the bow.
Fouled	Tangled.
Fractional rig	When the forestay is attached to the mast some distance below the top.
Foul weather gear	Water resistant clothing.
Freeboard	The height of the hull above the water's surface.
Full	Not luffing.
Furl	To fold or roll up a sail.

G

Gaff	On some boats, a spar along the top edge of a four sided fore and aft sail.
Genoa	A large fore sail whose clew extends aft of the mast.
Give way vessel	The vessel required, by the regulations, to give way in a collision situation.
G.M.T	Greenwich Mean Time. The time at the prime meridian in Greenwich, London, England. Now referred to as Universal Time Coordinated U.T.C.
Gooseneck	The strong fitting that connects the boom to the mast.
Great Circle	A line drawn on a chart which is accurate over a long distance, a section of the Earth which intersects the center of the Earth.
Grommet	A reinforcing ring set in a sail.
Ground tackle	Collective term for the anchor and rode (chain and line).
Gudgeon	A fitting attached to the stern into which the pintles of a rudder are inserted.
Gunwale	(gunnel) The edge of the deck where it meets the topsides.
Gybe	See jibe.

H

Halyard	A line used to raise or lower a sail.
Hank	A snap hook which is used to secure the luff of a foresail to the forestay.
Hard a-lee	(also Helms a-lee, lee oh, lee ho) The call given to the crew that will initiate the action of tacking.
Hard over	To turn the helm or tiller as far as possible in one direction.
Hatch	A large covered opening in the deck.
Haul in	to tighten a line.
Head	Top corner of a sail OR the toilet on a boat.
Headboard	The small reinforcing board affixed to the head of a sail.
Headed	A wind shift which causes the boat to head down or causes the sails to be sheeted in.

Heading	the direction of the boat expressed in degrees.
Head down	To fall off, changing course away from the wind.
Head off	See head down.
Head up	To come up, changing course towards the wind.
Headsail	A jib, genoa attached to the forestay.
Headstay	See forestay. The standing rigging running from the bow to the top of the mast.
Head to wind	When the bow of the boat is dead into the wind.
Headway	Forward progress.
Heave	To throw.
Heave to	To hold one's position in the water by using the force of the sails and the rudder to counteract each other.
Holding ground	The seabed or bottom ground in an anchorage.
Hove to	A boat that has completed the process of heaving to with its aback, its main trimmed and its rudder positioned to hold the vessel close to the wind.
Heavy weather	Strong winds and large waves.
Heel	The lean of the boat caused by the wind.
Helm	The tiller.
Helmsman	The person responsible for steering the boat.
Hull	The body of the boat, excluding the rig and sails.
Hull speed	The theoretical maximum speed of a sailboat determined by the length of its waterline. The formula is 1.4x the square root of the waterline length in feet.

I

Inboard	Inside of the rail of the boat.
In irons	A boat that is head to wind and unable to move or maneuver.

J

Jackstay	A wire or webbing strap attached at the front and back of a vessel along the deck to which a safety harness line may be clipped.
Jib	The small forward sail of a boat that is attached to the forestay.
Jibe	See also gybe. To change the direction of the boat by steering the stern through the wind
Jibe oh	The command given to the crew when starting a jibe.
Jiffy reef	See slab reefing. A quick reefing system allowing a section of the mainsail to be pulled down and tied to the boom.
Jury rig	An improvised temporary repair.

K

Kedge	A smaller anchor than the main or bower anchor. Often used for maneuvering or kedging off.
Kedge off	To use an anchor to pull a boat into deeper water after it has run aground.
Keel	The heavy vertical fin beneath a boat that helps keep it upright and prevents it from slipping sideways in the water.
Ketch	A two masted sailboat on which the mizzen (after) mast is lower than the mainmast and is located forward of the rudderpost.
Knockdown	A boat heeled so far that one of its spreaders touches the water.
Knot	one nautical mail per hour.

L

Land breeze	A wind that blows over the land and out to sea.
Lash	To tie down.
La.	To sail a course that will clear an obstacle without tacking.
Lazerette	A storage compartment built into the cockpit or deck.
Lazy sheet	The windward side jib sheet that is not under strain.
Lead	To pass a line through a fitting or block.
Lee helm	The boats tendency to turn away from the wind.
Lee shore	Land which on the leeward side of the boat. A potential danger because the wind will be blowing the boat towards it.
Leech	The after edge of a sail.
Leeward	The direction away from the wind that is the direction that the wind is blowing to.
Leeward side	The side of the boat or sail that is away from the wind.
Leeway	The sideways slippage of the boat in a downwind direction.
Lifeline	Rope or wire supported by stanchions, around the outside of the deck to help prevent crew members from falling overboard.
Lift	The force that results from air passing by a sail or water past a keel that moves the boat forward and sideways, OR a change in the direction of the wind which allows the boat to head up.
Line	A rope.
LOA	The maximum Length Overall fore and aft along the hull.
Lubber line	A line on a magnetic compass to help the helmsman steer the correct course.
Luff	The leading edge of a sail, OR the fluttering of a sail caused by aiming too close to the wind.
Lull	A decrease in wind speed for a short duration.
LWL	The length fore and aft along the hull measured at the waterline.

M

Magnetic	In reference to the magnetic north rather than true north.
Mainmast	The taller of two masts on a boat.
Mainsail	The sail hoisted on the mast of a sloop or cutter or the sail hoisted on the mainmast of a ketch or yawl.
Mainsheet	The controlling line for the mainsail.
Marlinspike	A pointed tool used to loosen knots.
Mast	The vertical spar in the middle of a boat from which the mainsail is set.
Masthead	The top of the mast
Maststep	The fitting in which the foot of the mast sits.
Mizzen	The small aftermost sail on a ketch or yawl hoisted on the mizzenmast
Mizzenmast	The shorter mast aft of the main mast on a ketch or yawl.
Mooring	A permanently anchored ball or buoy to which a boat can be tied.

N

Nautical mile	Standard nautical unit of distance, equal to one minute of arc of the Earth's latitude or 6080 feet.
Navigation rules	Laws established to prevent collisions on the water.
No-go zone	An area into the wind in which a sailboat cannot produce power to sail.
Nun	A red even numbered buoy marking the right side of a channel when returning to port. Nuns are usually paired with cans.

O

Offshore wind	Wind blowing off (away from) the shore and out to sea.
Offshore	Away from or out of sight of land.
Off the wind	Not close-hauled.
On the wind	Sailing up wind, close-hauled.
Outboard	Outside the rail of a boat.
Outhaul	The controlling line attached to the clew of a mainsail used to tension the foot of the sail.
Overpowered	A boat that is heeling too far because it has too much sail up for the amount of wind.

P

Painter	The line attached to the bow of a dinghy.
Pay out	To ease a line.
P.F.D.	Abbreviation for Personal Flotation Device such as a life jacket.
Pinching	Sailing too close to the wind.

Pintle	Small metal extension on a rudder that slides into a gudgeon on the transom. The gudgeon/pintle fitting allows the rudder to swing back and forth.
Point	To steer close to the wind, OR a compass point equals 11¼ degrees. Compass annotation used before headings were referred to in 360º notation.
Points of sail	Boats direction in relation to the wind - i.e., close hauled, reaching etc.
Port	The left hand side of the boat when facing forward, OR, a harbour, OR, a window in a cabin on a boat.
Port tack	Sailing on any point of sail with the wind coming over the port side of the boat.
Prevailing wind	Typical or consistent wind direction.
Puff	An increase in wind speed.
Pulpit	A guardrail at the bows of a vessel.

Q

Quarter	The sides of the boat near the stern.

R

Rail	The outer edges of the deck.
Rake	The angle of the mast.
Range	The alignment of two objects that indicate the middle of a channel.
Reach	One of the several points of sail across the wind.
Ready about	The command given to the crew to prepare to tack.
Ready to jibe	The command given to the crew to prepare to jibe.
Reef	To reduce the area of a sail.
Reeve	To pass a line through a ring or block.
Rhumb line	A straight line drawn on a Mercator chart, which intersects all meridians at the same angle. Accurate enough for courses of less than 600 miles. For great distances a Great Circle route is used.
Rig	The design of a boat's masts, standing rigging and sail plan, OR, to prepare a boat to go to sea.
Rigging	The wires and lines used to support and control sails.
Roach	The sail area aft of a straight line running between the head and clew of a sail.
Rode	The line and chain attached from the boat to the anchor.
Roller-furling	A mechanical system to roll up a headsail around the headstay.
Rudder	A vertical blade attached to the bottom of the hull which is used to steer the boat.
Run	Point of sailing when the wind is coming from dead astern.
Running rigging	The lines used to control the sails.

S

Sail ties	Lengths of line or webbing used to secure sails when they are dropped or to secure the unused portion of a reefed sail.
Schooner	A two masted boat whose foremast is the same height or shorter than its mainmast.
Scope	The length of anchor rode paid out in relation to the maximum depth of water.
Scull	To propel a boat with a single oar fixed in a notch through the transom.
Scupper	A cockpit or deck drain.
Sea breeze	A wind that blows from the sea onto the land.
Seacock	A valve which opens and closes a hole used as an intake or discharge from the boat.
Secure	The make safe or tie down.
Set	The direction of the current, OR, to trim the sails.
Shackle	A metal fitting at the end of a line used to attach the line to a sail or another fitting.
Shake out	To remove a reef.
Sheave	The wheel inside a block or fitting over which the line runs freely.
Sheet	A line used to control a sail by pulling it in or easing it out.
Shoal	An area of shallow water.
Shroud	Standing rigging at the side of the mast.
Singlehanded	Sailing alone.
Skeg	A vertical fin in front of the rudder.
Slab Reefing	See Jiffy reef. A quick reefing system allowing a section of the mainsail to be pulled down and tied to the boom.
Sloop	A single masted sailboat with mainsail and headsail.
Sole	The floor in a cockpit or cabin.
Spar	A pole used to attach a sail on a boat, for example the mast, the boom or a gaff.
Spinnaker	A large down wind headsail not attached to the head stay.
Splice	The joining of two lines together by interweaving their strands.
Spreader	A support strut extending athwartships from the mast used to support and guide the shroud from the top of the mast to the chainplate.
Spring line	A dockline running forward or aft from the boat to the dock to keep the boat from moving fore or aft.
Squall	A fast moving short intense storm.
Stanchions	Stainless steel or aluminum supports at the edge of the deck which hold the lifelines.
Standing rigging	The permanent rigging of a boat, including the forestay, backstay and shrouds.

Starboard	The right hand side of the boat when looking forward from the stern.
Starboard tack	Sailing on any point of sail with the wind coming over the starboard side of the boat.
Stay	A wire support for a mast, part of the standing rigging.
Staysail	On a cutter, a second small inner jib attached between the bow and the mast. Any sail which is attached to a stay.
Steerage Way	The minimum speed of the boat through the water that allows the rudder to function efficiently.
Stem	The foremost tip of the boat.
Stern	The aft part of the boat.
Stern Spring	A line running from the stern of the boat parallel to the dock or mooring that stops the boat from moving backward along the dock.
Stow	To store properly.
Swamped	Filled with water.

T

Tack	To alter course so as to cause the bow of the boat to pass through the eye of the wind, OR, the forward lower corner of a sail.
Tackle	A series of blocks and line that provide a mechanical advantage.
Tail	To hold the end of a line so as to keep it under tension on a winch.
Telltales	Short lengths of yarn or cloth attached to the sails which indicate when the sail is properly trimmed.
Tide	The rise and fall of water level due to the gravitational effects of the sun and the moon.
Tiller	A long handle attached to the rudder which is used to steer the boat.
Toe rail	A low rail around the outer edge of the deck.
Topping lift	A line used to hold the boom up when the mainsail is lowered or stowed.
Topsides	The sides of a boat between the waterline and the deck.
Transom	The vertical surface of the stern.
Trim	To adjust the sail controls to create optimum lift from the sails.
Trimaran	A three hulled vessel.
True wind	The actual speed and direction of the wind as you would feel when standing still.
Tune	To adjust the boats standing rigging.
Turnbuckle	A mechanical fitting (a bottlescrew) attached to the lower ends of stays allowing the standing rigging to be adjusted.

U

Underway	A boat that is not attached to the ground by either anchor or mooring lines is said to be underway.
Upwind	Towards the direction of the wind.

USCG	United States Coast Guard.
U.T.C.	Universal Time Coordinated. The modern term for Greenwich Mean Time, this is the standard reference time which is used internationally for navigational information.

V

Vang	See boom vang.
Veer	A clockwise change in the wind direction.
Vessel	Any sailboat, powerboat or ship.

W

Wake	Waves caused by a boat moving through the water.
Waterline	The horizontal line on the hull of a boat where the surface of the water should be.
Weather helm	The tendency of the boat to head up towards the wind, this increases as the sailboat becomes overpowered.
Weather side	See windward side.
Whip	To bind together the strands at the end of a line.
Whisker pole	A pole temporarily mounted between the mast and the clew of the jib. Used to hold the sail out and keep it full when sailing down wind.
Winch	A deck-mounted drum with a handle offering mechanical advantage when used to trim sheets. Winches may also be mounted on the mast to assist with raising sails.
Windward	Towards the wind.
Windward side	The side of the boat closest to the wind.
Wing-and-wing	Sailing downwind with the jib set on the opposite side to the mainsail.
Working sails	The mainsail and the standard jib.
Working sheet	The leeward sheet that is under tension.

Y

Yawl	A two masted vessel on which the mizzenmast is mounted aft of the rudderpost.

Head Office
9-3151 Lakeshore Road
Kelowna, British Columbia
V1W3S9
Canada
info@iytworld.com
+1 778-477-5668