2018

INTERNATIONAL CREW COURSE NOTES

POWER & SAILING VESSELS UP TO 24 METERS / ACTIVE CREW MEMBER

(IYT PASSPORT TRAINING PROGRAMME MODULES 1-11)

International Yacht Training

WORLDWIDE

Revised January 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 Flotilla Skipper 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

Professional Courses

VHF-SRC 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
MCA/IYT Master of Yachts Inshore Power

Diveboat Courses
IYT Dive Boat Crew
IYT Diveboat Operator

Commercial-Tactical-Rescue
Marine Police Powerboat Operator –Crew
Marine Police Powerboat Operator –Coxswain
Marine Police Powerboat Operator –Commander
Fast Rescue Boat
Inshore Master < 80gt.

We also offer instructor courses for all levels of training.

PREFACE

Introduction

Welcome to the wonderful world of boating and sailing. Now that you have taken the first step towards learning a new pastime and skill, we hope that it will lead to rewarding, safe and fulfilling adventures on the water.

Many years ago, IYT recognised the need for a standardised approach to yacht training globally and has successfully established a partnership programme offering IYT courses through a network of existing and established recreational sailing and motor yacht training schools around the globe. The model has been enthusiastically embraced by a growing number of countries and schools.

Our commercial Master of Yachts Certificates of Competency and recreational Yachtmaster Certificates have gained international acceptance. The Company offers over 38 nautical courses to both professional and recreational yachtsmen and women, and the quality positioning of the Company's training has resulted in stand-alone approval of certifications by a growing number of administrations such as the British Maritime & Coastguard Agency (MCA) and the Dept. of Transport, Ireland, amongst others.

The IYT Training Programme

The IYT recreational programme allows a candidate to learn and develop the skills needed to run a power or sailing boat, from absolute beginner up to Yachtmaster Ocean. It is designed to be infinitely modular, the modules are structured to guide the complete novice from beginner to an internationally recognised and safe standard of competence.

The modules can be taken singularly or in groups, depending on the time available to the candidate, (i.e. evenings, weekends or a full week). The objective is to allow the theory modules to be achieved by classroom training (perhaps during the winter months), with the practical components completed at a later date, or for the theory and practical courses to be run as a complete stand- alone course.

(It is suggested that all the modules of a particular course should be completed within a maximum of two years in order to keep the content fresh in the candidates' mind).

The IYT professional programme offers professional training to those who wish to make a career out of yachting. A growing number of international maritime authorities require Professional Certificates of Competency or COC's, as required for operators of commercial Yachts and Superyachts such as:

Small Powerboat and RIB
Master of Yachts Inshore
Master of Yachts Coastal
Master of Yachts Limited (to 150 miles offshore)
Master of Yachts Unlimited

Please see www.IYTworld.com for further information on professional courses.

Module Completion / Certification

The International Crew certificate requires the completion of all course modules 1 through 11 before being awarded the International Crew, Certificate of Competency.

The IYT VHF-SRC Marine Communications certificate requires the completion of module 12 before being awarded the International Bareboat Skipper Certificate of Competency, OR, the candidate must hold a recognised VHF Radio operator certificate from another recognised issuing authority.

The International Flotilla and Bareboat Skipper certificate requires the completion of all course modules 13 through 25 before being awarded the International Flotilla or Bareboat Skipper Certificate of Competency.

The "depth of knowledge" required for the theory portion of the International Flotilla Skipper Certificate is the same as required for the International Bareboat Skipper Certificate, therefore the course material is exactly the same for both.

For International Flotilla Skipper – no prerequisite sea time is required for this certificate, however, it is not a beginner's course. Sea time while training for the flotilla skipper certificate will be considered toward certification and experience.

For International Bareboat Skipper - candidates must prove they have acquired the 200 miles and 10 days at sea as skipper or chief mate to obtain the International Bareboat Skipper Certificate of Competency. The school principal or instructor will order the appropriate certificate for your level of experience.

The International Certificate of Competency (ICC) may also be awarded to candidates who hold the International Bareboat Skipper provided the course has been taken at an IYT school authorised to complete this level of training. The ICC is mandatory for chartering in some areas of the European Union. The ICC is a qualification stating that an individual is competent to meet the standards required by the United Nations Economic Commission for Europe, Inland Water Committee (UN ECE IWC) Resolution 40. The ICC is required in most European

Countries in order to operate a pleasure craft up to 24 meters in both inland and coastal waters.

An Inland Waters Endorsement (CEVNI) is required to operate vessels in inland waterways and canals throughout Europe. To receive this endorsement, the candidate may take the E learning CEVNI Course and examination at www.IYTworld.com which is a theory examination on Inland waterways, navigation and safety.

ICC endorsements will be discussed further in the International Bareboat Skipper course or further information is available at www.IYTworld.com.

- **A substantial part of the training will rely on the "hands on" practical application of the theory modules.**

Course Objectives

The objective of the course is for the student to develop the knowledge and skill sets to competently operate as a member of a crew and to understand the basic theory and practical application of nautical terminology, safety, vessel checkout, basic rope work, refueling, man-overboard procedures, capsizing, swamping, sinking, anchors, anchoring and running aground and responsibilities of the crew.

As with all IYT courses, the depth of knowledge increases as student's progress through the various levels of training.

Important Notice

This book is generic in content. The contents of these notes are designed to be general in nature and when chartering in different locations, should be accompanied by local charts, local cruising guide, tidal information, local navigation rules and local sources of weather information.

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

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.

Publication information

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CANADA

TABLE OF CONTENTS

Module 1 INTRODUCTION TO YACHTING & NAUTICAL TERMINOLOGY

1.1 Key Objectives

THE OBJECTIVE OF THIS MODULE IS TO INTRODUCE THE STUDENT TO YACHTING AND 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. IT IS IMPORTANT FOR THE STUDENT TO MEMORIZE THE TERMINOLOGY SO IT WILL BECOME SECOND-NATURE WHEN CREWING OR SKIPPERING A BOAT.

1.2 Introduction to Yachting

Welcome to the wonderful world of boating and sailing. Now that you have taken the first step towards learning a new pastime and skill, we hope that it will lead to rewarding, safe and fulfilling adventures on the water.

Every human activity has its own unique language and this is true of boating and sailing. A number of nautical terms may already be familiar to you as there are a large number of nautical terms used in everyday language, for example, "anchored to the spot" or "taken aback".

As you progress through the IYT Training Program, the volume of the terminology will expand with the knowledge gained. As an aid to understanding the terminology, a comprehensive "Glossary of Terms" has been included as an Appendix at the rear of these notes.

With boating and sailing being an international pastime, and English being the language of the sea, it is essential to use the correct terminology to communicate quickly and effectively with other seafarers. This avoids misunderstandings in the execution of a maneuver or, more critically, in the event of an emergency. As the course progresses, you will be introduced to additional nautical terminology.

1.3 Safety Briefing

It is important to know where all safety items are stored on any vessel you are on and also how to use them.

Lifejackets

- There should be at least one lifejacket per person on board every boat, including small sizes for any children.
- A life jacket is designed to keep an unconscious person afloat by turning them on to their back and keeping their head above the water.
- There are many other forms of buoyancy aids but these are mainly used for water skiers, dinghy sailors etc. to give additional buoyancy should you end up in the water.
- Buoyancy aids are NOT lifejackets and will not keep your head above water if unconscious.

Flares (Distress Signals)

Four basic types:

- Red parachute - used to attract the attention of distant vessels.
- Red hand-held - used at night and produce a bright red light for around 40 seconds.
- White hand-held - used to alert other vessels to the risk of collision.
- Orange smoke - used during the day and produce a plume of orange smoke for around 40 seconds.

Life Raft

A life raft is a small inflatable survival craft kept in either a hard plastic canister or a soft valise which should be accessible in the event that the crew need to evacuate the boat in an emergency.

First Aid Kit

Every vessel however small should carry a basic first aid kit. There should also be a First Aid Manual for reference. At least one member of the crew should have some form of training in first aid from a recognized training authority. First aid kits should be in a waterproof container and have the ability to float.

Fire Extinguishers

There are 4 main types:

- Dry powder for extinguishing fires involving gases.
- Carbon Dioxide (CO2) for electrical fires.
- Water for cooling or combustion fires.
- Foam for extinguishing burning liquids such as paint, oil, gasoline, fats, thinners etc.

Safety Harnesses

- Mainly used on sailing vessels,
- safety harnesses are worn by crew members when on deck in bad weather, at night or if the crew member feels safer with one on.
- The harness comprises webbing shoulder straps and a waist band which are adjustable, with a tether of rope or webbing which has a karabiner clip on both ends.

Location and Use of "Heads"

“head” is the marine terminology for toilet.

There essentially are two types of heads.

- A manual head where the operator uses a pump to flush seawater in through the head and to pump out the contents either into a "holding tank" (a tank where the contents are stored until emptied) or overboard.
- An electric head does the same job by using an electrically operated pump instead of a manual pump

Bilge Pumps

Even in the most sophisticated yacht there is always an accumulation of water, 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.

- Manual pump – crew can manually pump water overboard
- Electric pump – press a switch to pump water overboard
-

Cooker (Range Top and Oven)

Cooking on most vessels is by means of gas, usually propane. Of prime importance when using a gas cooker is safety. Gas is heavier than air and if left switched on, the gas will accumulate in the bilges and be a potent explosive if triggered by an electrical short or other igniter. These are the basic rules for using a gas stove on a yacht which will be covered in greater depth in further modules.

Battery selector switch

Most yachts will have two sets of batteries, one set will be for engine starting and the other for all other electric systems. There will be a main battery switch, which should at a minimum, allow the 2 banks to be switched off to preserve battery power when the vessel is unoccupied.

Cabin Lights

Electricity is a sparse commodity on most small boats which use battery power. On larger boats power is often derived from a generator. It is important to remember that lights and other electrical systems should only be used when necessary and should always be turned off when not in use to conserve battery power.

General Housekeeping Rules

One of the most important aspects of living on board a vessel is the need to be extremely tidy.

There is restricted storage space available for the multitude of items that are required to be carried, and that may need to be found easily and quickly.

Personal items should be packed in a soft sports type bag (not a hard suitcase which cannot be rolled up and stored easily) and then should be "stowed" in "lockers" upon arrival on board.

The size of storage on a vessel will depend on the hull type and size, but even on all but the largest boats it is important to be selective about what personal gear is brought on board.

Suitable Clothing

Weather conditions can vary from extremely hot to very cold and wet. It is important to dress correctly and thus minimize the effects of heat and cold. In a warm climate the sun is very powerful and when combined with the glare from the water can debilitate a person very quickly. Protection should include a hat, sunglasses, cotton shirt with collar (and possibly long sleeves), cotton shorts or long pants, and plenty of sunscreen. It is easy to get sunburned, and may be more than just uncomfortable, and in extreme circumstances can require medical attention. Dehydration happens easily on the water so do not forget to drink lots of water and try to stay in the shade wherever possible.

In a cold climate the "layer" principal can be used to great effect, and even in warmer climates it can get cold at night on the water. Multiple layers of suitable clothing is more beneficial

than single heavy items of clothing, because each layer traps heat so the flow of heat out from the body is kept to a minimum. With the addition of wet or foul weather waterproof clothing good protection can be made against the effects of both the cold and wet. A good hat and waterproof footwear will round off the attire.

Suitable Footwear

It is recommended that good nonslip deck shoes are worn to protect feet against the presence of multiple objects on deck such as cleats. For cold and wet conditions, waterproof seaboots are highly recommended.

Effects of Heat and Cold

High humidity and heat can lead to heat exhaustion, it is advisable to drink plenty of water, wear appropriate clothing offering protection to both head and body, use sunglasses and use a sun block or sunscreen to protect parts of the body exposed to sun or drying winds.

Seasickness

It may take a little while for a person to get their "sealegs" that is, acclimated to the motion of a boat. There are a number of travel sickness products on the market including sea sickness pills, wrist bands and chemical patches. The best prevention is to watch the horizon and remain as active as possible such as steering the boat.

Do's and don'ts aboard a boat

Do:

- Tell the captain if you are taking any medication, also if you react to any common medications as he will need to know in the event of an emergency.
- Keep all your personal gear tidy and stowed.
- Make sure you put every item away after use in the same place you found it, this is essential so that everyone else can find it if needed. On many boats there will be a diagram in a prominent place showing the location of all the different pieces of safety and survival equipment.
- Be tolerant as a vessel is small and it is easy to become annoyed over small things.

Never:

- Leave lights on, it drains the batteries.
- Waste water, it is limited in supply.
- Throw anything overboard when alongside, in a marina or anchorage and refer to the disposal of garbage placard posted onboard.

1.4 Passage Planning

A Passage Plan is an outline of the trip that you intend to make, together with all the relevant information that you will require during the passage, such as weather conditions, tides, hazards to navigation, lights, experience of the crew etc. Information for a passage may be obtained from a number of different sources which will be outlined further as the training program progresses.

Charts

A nautical chart gives detailed information to enable safe navigation at sea from departure point to arrival point.

It is an outline of the land area and includes harbors, bays, reefs, underwater hazards and other navigation information.

A position on a chart is measured in terms of latitude and longitude, and distance is measured in nautical miles.

Charts can either be in a paper or electronic format.

Effects of Tides and Currents

Tides and currents are movements of water which will carry the boat in the direction of their flow, this may either help or hinder the speed of your passage. It is important to obtain as much information as possible about tidal conditions when undertaking a coastal passage.

Weather Forecasts

Weather forecasts give an indication about approaching weather conditions and may be obtained from a variety of different sources. It is very important to understand future weather because decisions about whether to leave on a passage or to alter the destination will be made based on the weather forecast.

Courses

A course is the direction that a boat is steered and is indicated by compass degrees. There are 360°. For example a boat traveling East will be on a heading of 90 degrees, or South on a heading of 180 degrees.

Safe Passage

It is imperative that all precautions are taken to ensure a safe passage. This includes everything that we have discussed to this point.

Lookout and things to Watch for

While making way at sea , it is required by law that someone must keep at watch at all times. Other vessels, boats and ships, floating debris, whales and containers.

Keeping Track of Progress

Unlike being on land, there are no landmarks while out of sight of land. A boat is required to keep a record of progress during a voyage. This is usually in the form of a ships logbook and includes such information as time, distance travelled, speed, compass course, tides, currents and any other relevant information that pertains to safe navigation. It is easier to navigate while in sight of land as known landmarks can be used for cross bearings. However, one must take into accounts areas that are susceptible to fog.

When, after all this careful preparation you get to execute the passage, make sure that you keep track of your progress and monitor all the important factors.

- Time: Are you making the speed that you planned for? Going too fast could be as bad as going too slow. You don't want to arrive before the tide has risen sufficiently for you to get into the harbour.
- Fuel: Monitor consumption if it is higher than expected do you still have sufficient reserve or will you have to start planning a refueling stop? Don't hesitate to refuel if you have any doubts about you range.
- Crew: How are they coping with the conditions, is the watch system working? Are people eating well, sleeping, being affected by seasickness?
- Position: Are you where you should be? Don't just steer the course; plot your position on a regular basis.
- Systems: Oil, fluid and water levels need to be checked as well as bilge's inspected on a regular basis.
- Weather: One of the things that can creep up on you if you ignore it is the weather. Keep monitoring every forecast as the weather can change suddenly sometimes with disastrous consequences but, with a few hours warning of the impending change, precautions can be taken.

Practical Subjects

Your instructor will discuss and practically demonstrate the following:
Rope work
Short Passage- for power
Short passage -for sail

1.5 Types of Vessels

FIGURE 1-2 CABIN CRUISER

A cabin cruiser is a motor yacht designed for living aboard and can have single or multiple engines.

FIGURE 1-1 SAILBOAT

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

FIGURE 1-3 ROWBOAT WITH OARS

FIGURE 1-4 FISHING TRAWLER

A fishing trawler is used for fishing in coastal waters and can come in various sizes.

FIGURE 1-5 SPEEDBOAT / DAY FISHING BOAT

Recreational day fishing boat or speedboat. Sometimes referred to as a bass boat.

FIGURE 1-7 SPORTFISH BOAT

A sportfish boat is a power vessel rigged for sport game fishing with long poles reaching upwards known as outriggers which are used for passing fishing lines through when trawling.

FIGURE 1-6 SUPERYACHT

A superyacht is a yacht which is owned by a private individual or a corporation and is crewed by professional crew, who live onboard full time and are paid a salary.

FIGURE 1-10 CRUISESHIP

A cruise ship is a passenger ship used for pleasure voyages and can carry thousands of passengers. They travel the globe and offer passengers a wonderful opportunity to visit places that one would not normally visit.

FIGURE 1-8 OIL TANKER

An oil tanker (petroleum tanker) is a merchant ship designed solely for the transportation of oil. Many oil tankers have double hulls to prevent an oil spill in the event of a collision.

FIGURE 1-11 CONTAINER SHIP

Container ships are cargo ships that carry all of their load in truck-size containers. In bad weather, containers sometimes fall off these ships and are a hazard to navigation and small boats and yachts.

FIGURE 1-9 RIB (RIGID INFLATABLE BOAT)

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

FIGURE 1-13 DHOW

A dhow is a type of sailing vessel used by Arabs on the east African, Arabian and Indian coasts. They have been in use for thousands of years.

FIGURE 1-12 CANOE

A canoe is a slender open boat tapering to a point at both ends propelled by paddles.

FIGURE 1-15 KAYAK

A kayak has a light framework, pointed ends and is made watertight by having a flexible closure around the waist of the occupant. It is propelled with a double-bladed paddle.

FIGURE 1-14 JET SKI
(PERSONAL WATERCRAFT / PWC)

A water-jet propelled boat or craft, ridden like a motorcycle which has a safety lanyard so that the engine will shut down if the operator falls off.

1.6 Sailing Vessels

FIGURE 1-16 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.

FIGURE 1-17 SLOOP

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

FIGURE 1-18 BERMUDA-RIGGED KETCH

A sailing craft with two masts.

FIGURE 1-19 SCHOONER

A schooner is a type of sailing vessel with fore-and-aft sails on two or more masts, the foremast being no taller than the rear mast(s).

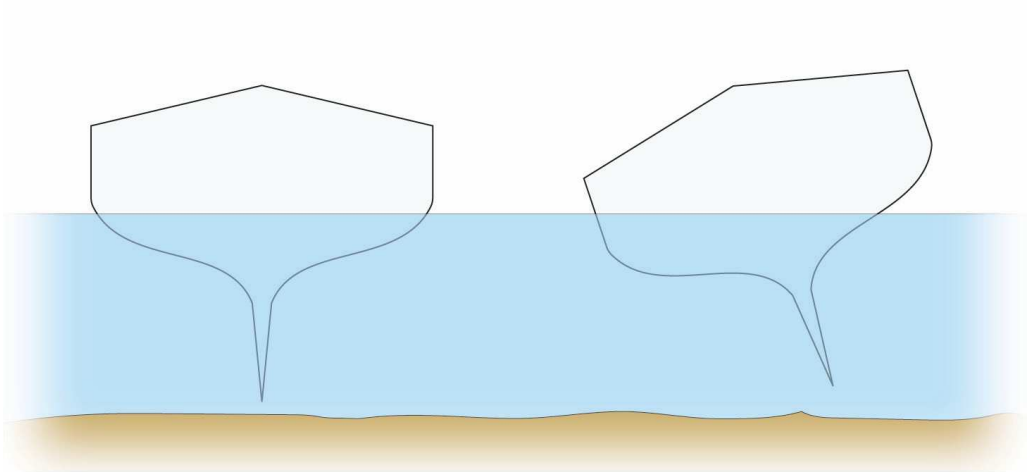


FIGURE 1-19 FIN KEEL (SAILBOAT)

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

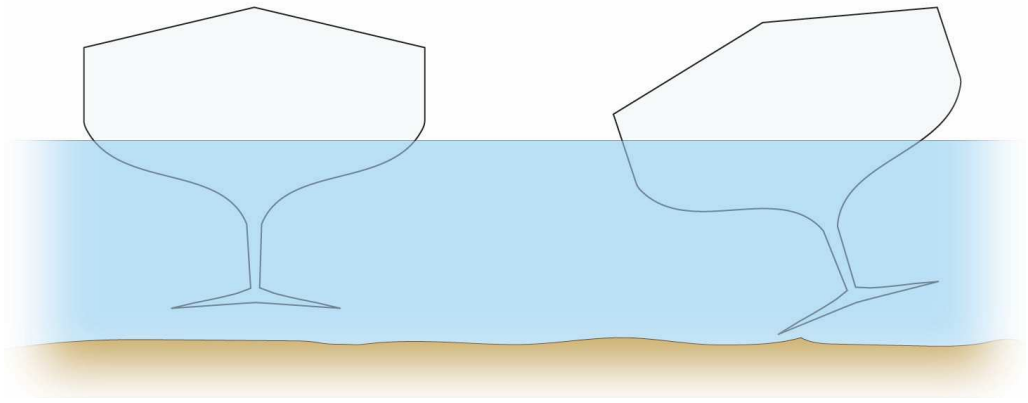


FIGURE 1-21 WING KEEL (SAILBOAT)

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 limited.

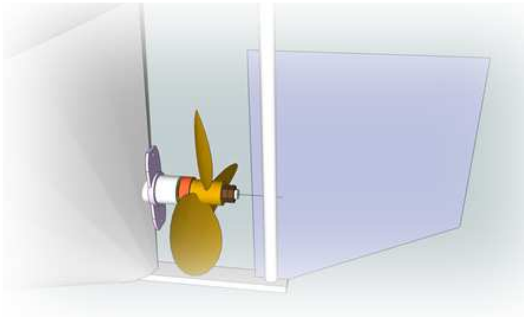


FIGURE 1-21 RUDDER

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

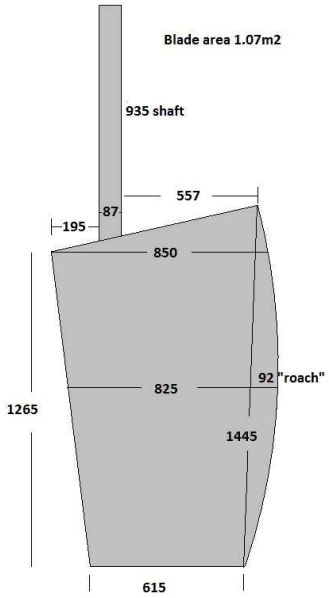


FIGURE 1-20 SPADE RUDDER

FIGURE 1-22 TRANSOM HUNG RUDDER

A spade rudder has an elongated shape. Most often found on sailboats

FIGURE 1-24 FRACTIONAL RIG

A fractional rig on a sailing vessel consists of a foresail, such as a jib or genoa sail where the forestay does not reach all the way to the top of the mast.

FIGURE 1-23 MASTHEAD RIG

A masthead rig on a sailing vessel consists of a forestay and backstay both attached at the top of the mast.

FIGURE 1-25 BACKSTAY

Backstays support the mast on cruising yachts. A backstay runs from each lateral corner of the stern to the top of the mast.

FIGURE 1-26 FORESTAY (HEADSTAY)

On a sailing vessel, a forestay, sometimes just called a stay, is a piece of standing rigging which keeps a mast from falling backwards. It is attached either at the very top of the mast, or in fractional rigs between about 1/8 and 1/4 from the top of the mast. The other end of the forestay is attached to the bow.

1.7 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.

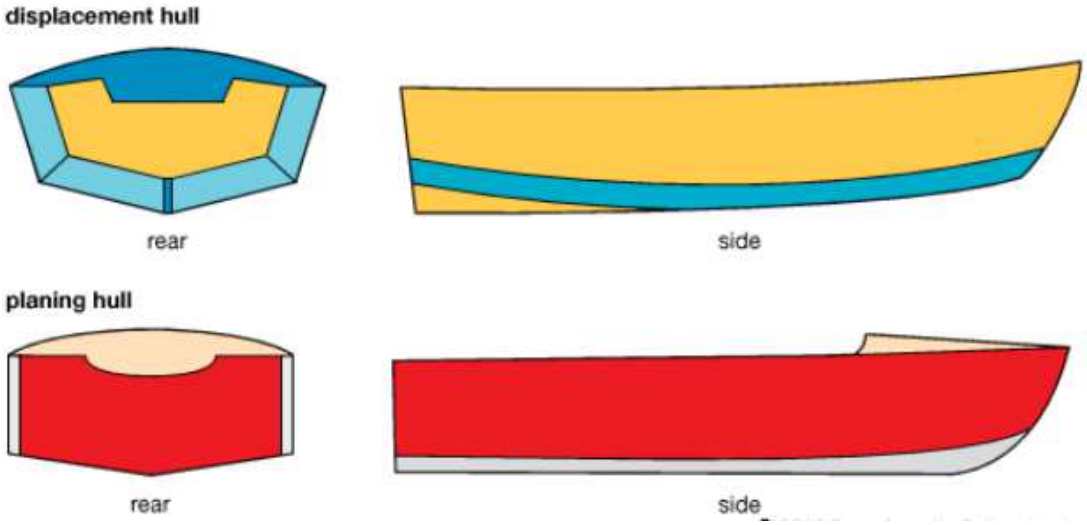


FIGURE 1-27 HULL TYPES

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.

1.8 Power Vessel Hull Shapes

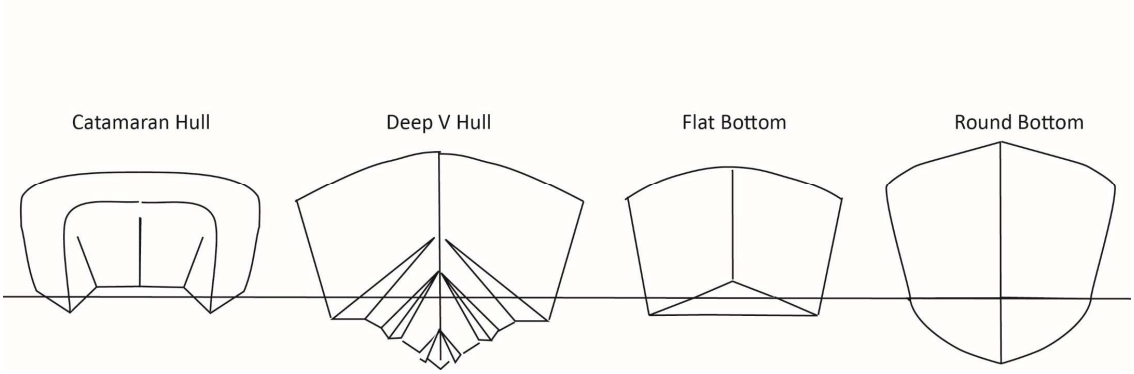


FIGURE 1-28 POWER VESSEL HULL SHAPES

Catamaran (Multihull)
Catamarans, trimarans, pontoon boats and some house boats use a multi-hull design. The wide stance provides greater stability. A catamaran needs a wide turning circle due to its wide beam. They can be power or sail boats.

Deep V Hull
The V bottom tends to have a sharper entry into the water which provides for a smoother ride in rough water. They are slower than planning hulls as they travel through the water rather than above it. Many runabouts use the V -bottom design, they do however roll and bank in sharp turns and beam seas.

Flat Bottom Hull
These boats are generally less expensive to build and have a shallow draft (the part of the boat that's under the water). They can get up on plane easily but unless the water is very calm they tend to give a rough ride because of the flat bottom pounding on each wave. They also tend to be less stable and require careful balancing of cargo and crew. They are good for fishing in lakes and rivers but not recommended in heavy weather or high seas.

Round Bottom
These move easily through the water, especially at slow speeds. They do, however, tend to roll unless they are outfitted with a deep keel or “stabilizers”.

1.9 Parts of a Vessel and Nautical Terminology

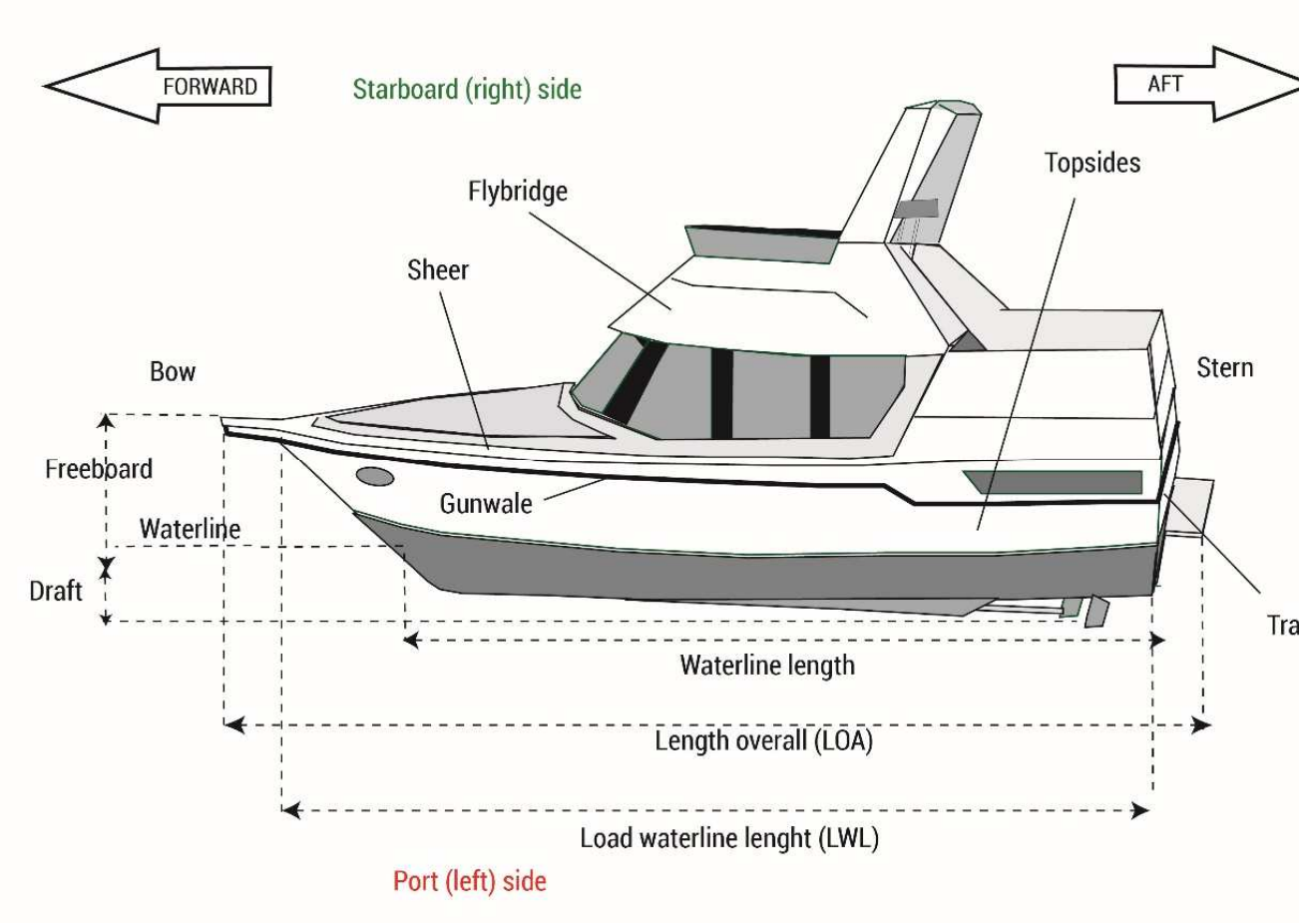


FIGURE 1-29 PARTS OF A VESSEL AND TERMS

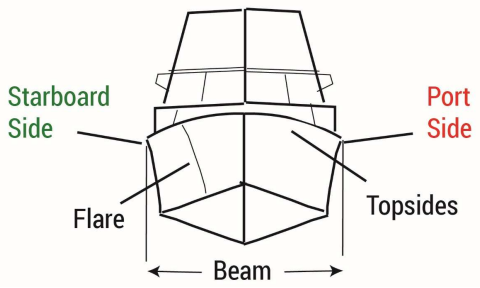


FIGURE 1-30 POWERBOAT FROM BOW

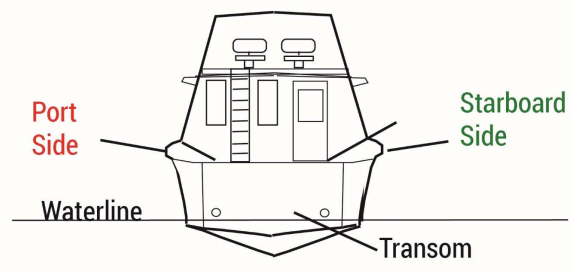


FIGURE 1-31 POWERBOAT FROM STERN

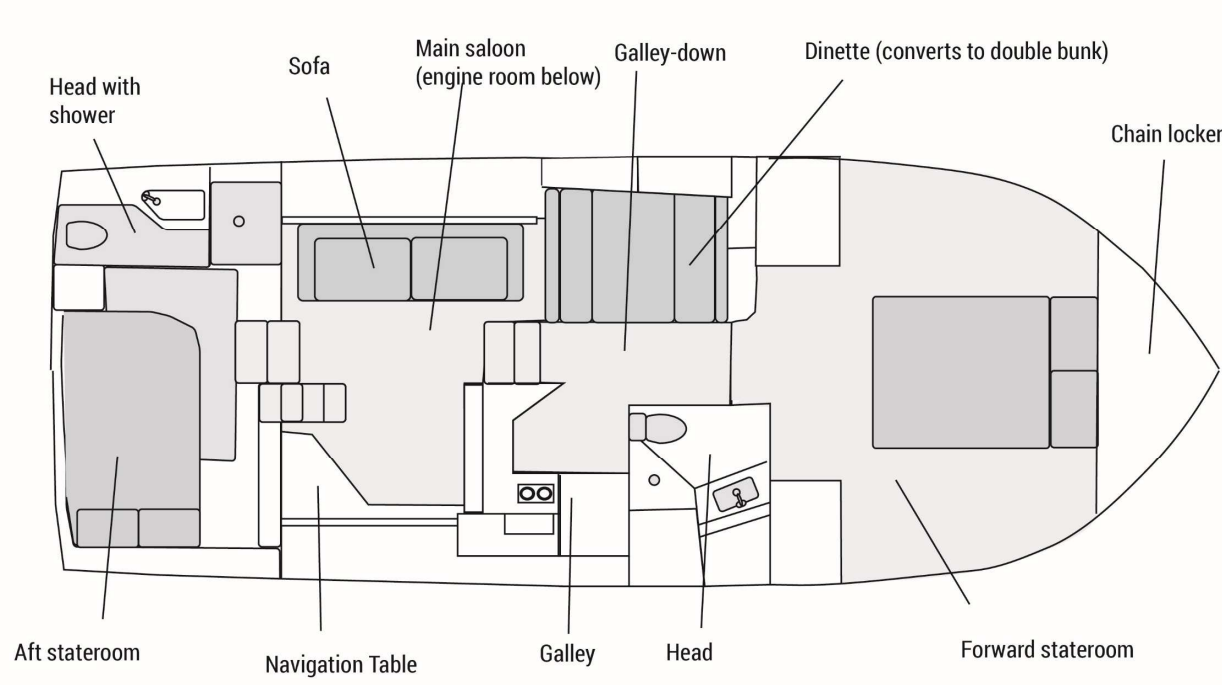


FIGURE 1-33 POWERBOAT DIAGRAM

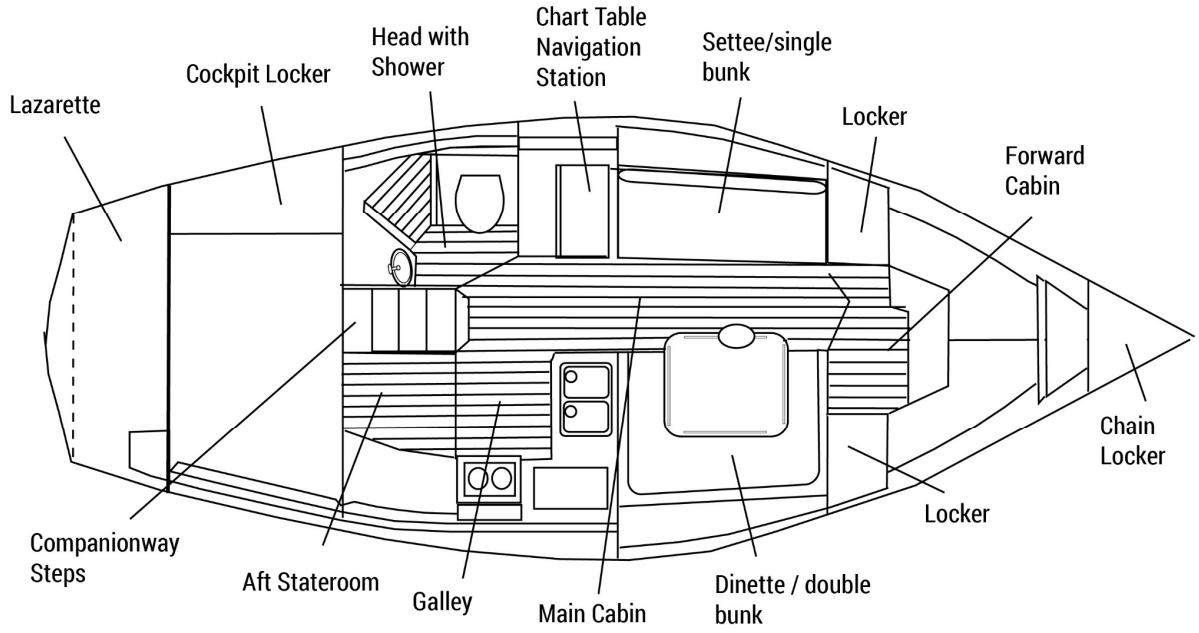


FIGURE 1-32 SAILBOAT DIAGRAM

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".

1.10 Deck Equipment and Fittings

FIGURE 1-35 CLEAT

A cleat is a device for securing a line to a deck or dock. The line secures the boat against a dock.

FIGURE 1-34 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.

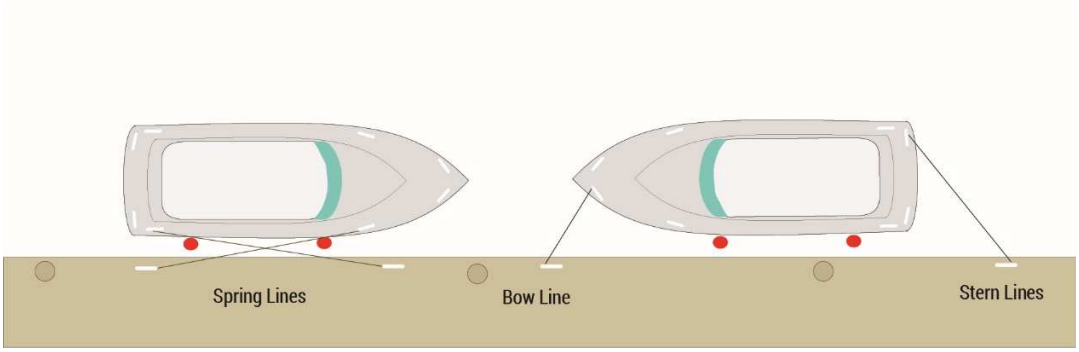


FIGURE 1-36 DOCKING DIAGRAM / CLEATS ON DOCK AND BOAT

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.

FIGURE 1-37 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.

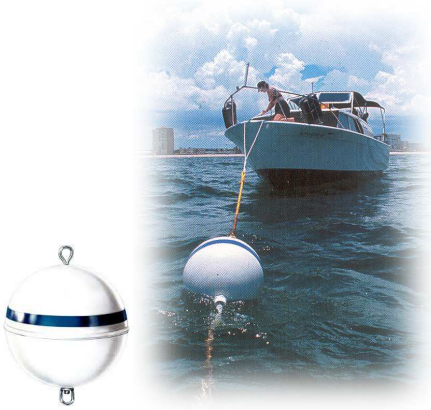


FIGURE 1-38 MOORING BUOY

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

FIGURE 1-39 STANCHION

On deck there will generally be a protective rail to prevent a person falling overboard. These are generally wire ropes attached at the bow and stern and supported at intervals by upright metal poles called "stanchions".

FIGURE 1-40 POWERBOAT PULPIT

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

FIGURE 1-41 SAILBOAT STERNRAIL

On most boats there is usually a metal frame around the stern called the “sternrail”.

FIGURE 1-42 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

FIGURE 1-43 COACH ROOF

The raised part of the deck to create headroom below decks.

FIGURE 1-45 GRAB RAILS

Rails attached either to the coach roof or inside the cabins for holding on to while at sea.

FIGURE 1-44 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. (mostly found on sailboats)

FIGURE 1-46 TOE RAIL

A low timber or metal strip running around the outer edge of the deck to assist the crew in maintaining a foothold.

FIGURE 1-47 COCKPIT

A self-draining recess in the after part of a vessel.

FIGURE 1-48 COMPANIONWAY (SAILBOAT)

FIGURE 1-49 COMPANIONWAY SUPERYACHT (POWER)

A Companionway is a stairwell giving access from the deck to the cabin.

FIGURE 1-50 WASHBOARDS

These are boards used to seal off the companionway to prevent the entry of water in heavy weather.

FIGURE 1-51 HATCH

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

FIGURE 1-55 BOWSPRIT

A bowsprit is a spar which projects from the bow of some boats to allow headsails to be secured further forward.

FIGURE 1-54 DODGER ON SAILBOAT

A dodger is a demountable cover, rigged over the companionway and the forward end of the cockpit to protect the crew from wind and water spray.

FIGURE 1-53 BIMINI ON SAILBOAT

FIGURE 1-53 BIMINI ON POWERBOAT

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

FIGURE 1-56 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.

FIGURE 1-57 ANCHOR

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

FIGURE 1-58 VENTILATORS

Ventilators are movable devices fixed to the deck to carry fresh air below without permitting the entry of water.

FIGURE 1-59 CONSOLE

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

FIGURE 1-60 THROTTLE CONTROL

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

FIGURE 1-61 TILLER

A tiller can be used to steer small boats. It is attached to the rudder.

FIGURE 1-63 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.

FIGURE 1-62 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.

FIGURE 1-64 ELECTRIC & MANUAL BILGE PUMPS

FIGURE 1-65 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.

1.11 Accommodation

In a vessel, the floor is known as the "cabin sole", the walls are "bulkheads" and the ceilings are "deck heads".

FIGURE 1-66 SALOON AND GALLEY

This is the living room on board a boat and will consist of seating and possibly contain music, TV and an entertainment center. The larger the boat the more lavish the equipment and fittings are likely to be.

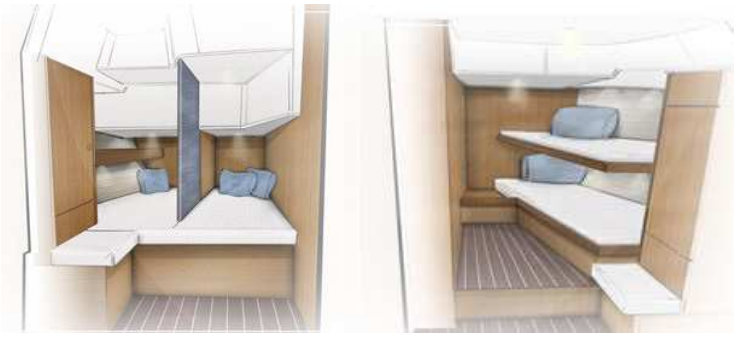


FIGURE 1-67 CABIN OR STATEROOM

These are the “bedrooms” and may consist of a single "bunk" or bed, to king size suites on supervachts.

FIGURE 1-69 DINETTE

The dining area of the boat may be simply a small table with bench seating to a full scale dining room setting on a large yacht.

FIGURE 1-70 GALLEY

The kitchen on a vessel and the equipment contained will depend on the size of the yacht and the number of crew it carries.

FIGURE 1-68 FOREPEAK

The forepeak is the space forward in the bow of the boat. Usually sleeping accommodation or sometimes used as storage for sails, tools, etc.

FIGURE 1-71 ANCHOR LOCKER

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

1.12 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.

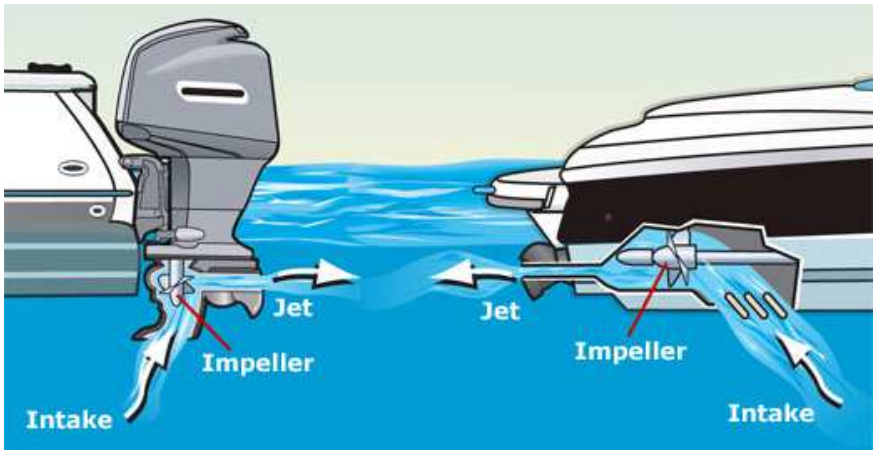


FIGURE 1-72 OUTBOARD (LEFT) & INBOARD (RIGHT)

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.

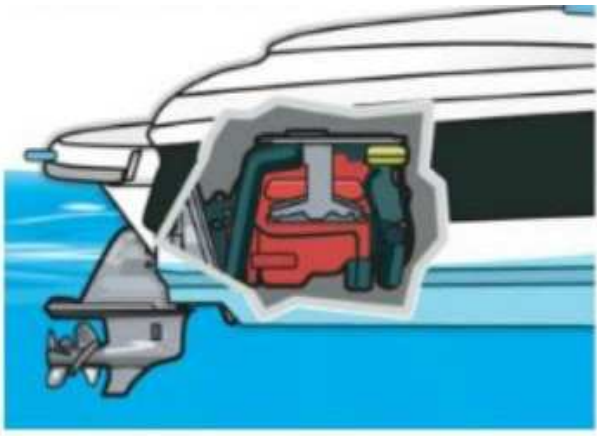


FIGURE 1-73 STERNDRIVE (INBOARD/OUTBOARD)

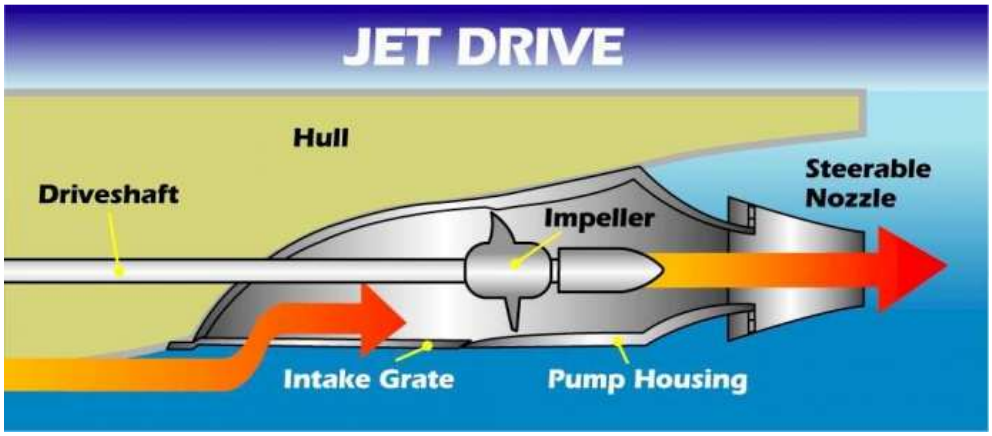


FIGURE 1-74 JET DRIVE

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.

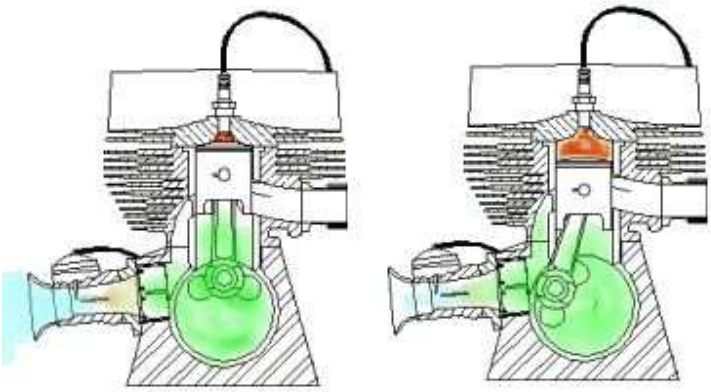


FIGURE 1-75 2 STROKE ENGINE DIAGRAM

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.

FIGURE 1-76 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).

FIGURE 1-77 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.

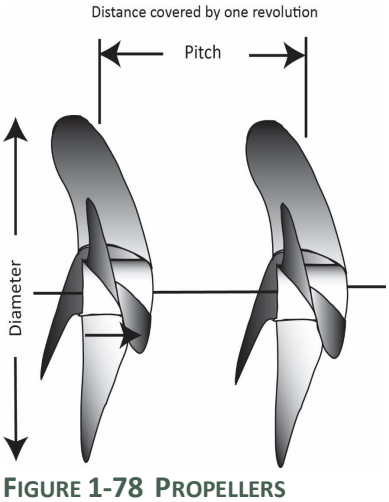


FIGURE 1-78 PROPELLERS

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.

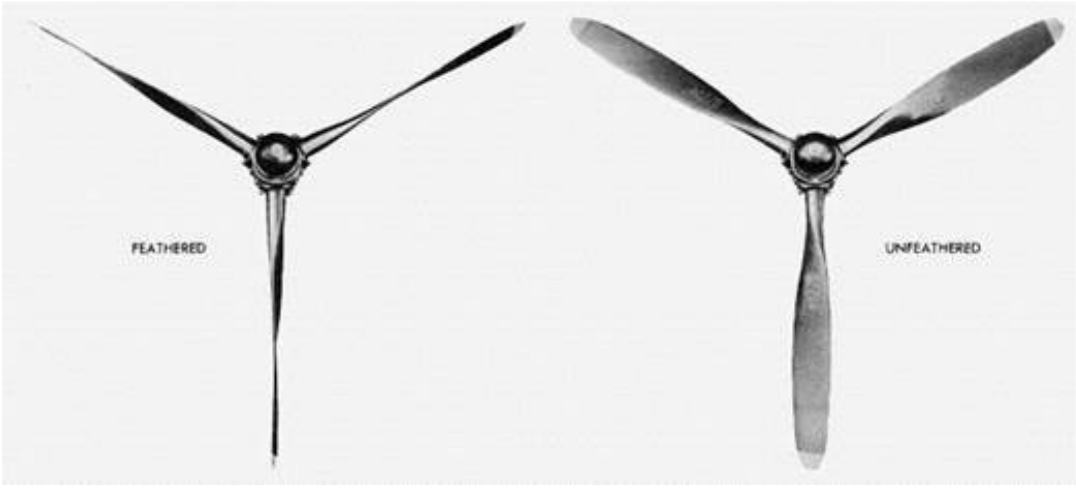


FIGURE 1-79 FEATHERING PROPELLERS

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

1.13 Inflatables and RIBS

FIGURE 1-81 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.

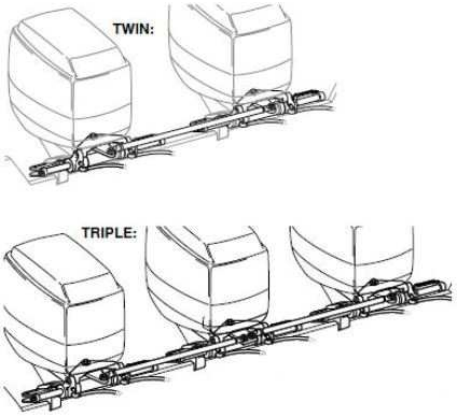


FIGURE 1-80 MULTIPLE OUTBOARD ENGINES

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.

1.14 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.

FIGURE 1-83 GIMBALLED COMPASS

FIGURE 1-82 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.

FIGURE 1-84 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

FIGURE 1-85 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

FIGURE 1-86 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.

FIGURE 1-87 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.

FIGURE 1-88 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.

Radar

Radar is used to detect another vessel or object, and show the "range" (distance) and bearing to the object. Detection is achieved by transmitting a short burst of electromagnetic energy so that it can strike an object, reflect back, and be detected by the receiver. The data is then processed and displayed on a screen mounted close to the helm.

FIGURE 1-89 RADAR SCREEN

FIGURE 1-90 RADAR REFLECTOR

FIGURE 1-91 SPINNING RADAR DOME

A radar reflector is a device fitted to boats to ensure they are seen on radar screens. Boats made of fibreglass or wood do not reflect the radar pulse very well which can result in collisions during limited visibility.

The spinning radar on a boat is a unit that usually sits at the highest part of the structure. It scans the horizon to pick up any radio magnetic signals from objects within range over a 360-degree pattern.

Information from the radar dome is transmitted to the radar screen in the wheelhouse.

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.

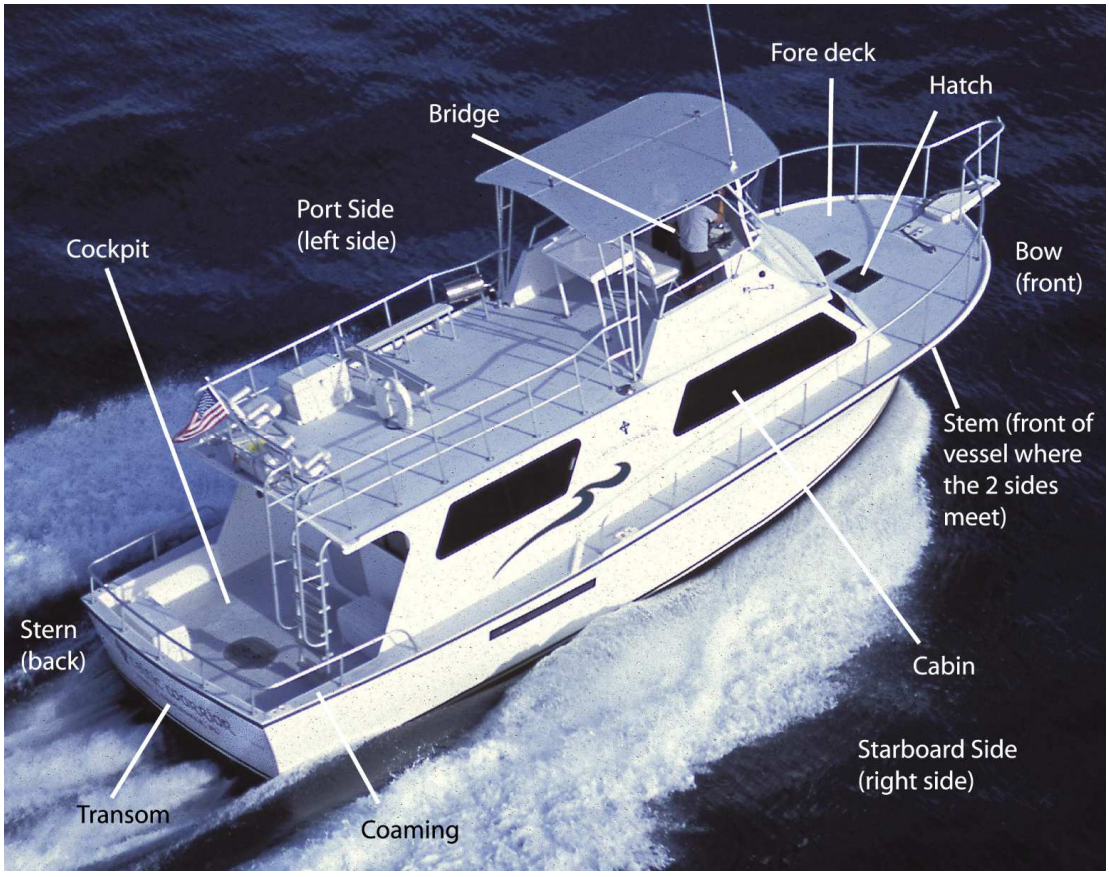


FIGURE 1-92 PARTS OF A HULL AND VESSEL

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 planing hulls which ride on top of the water)

1.15 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.

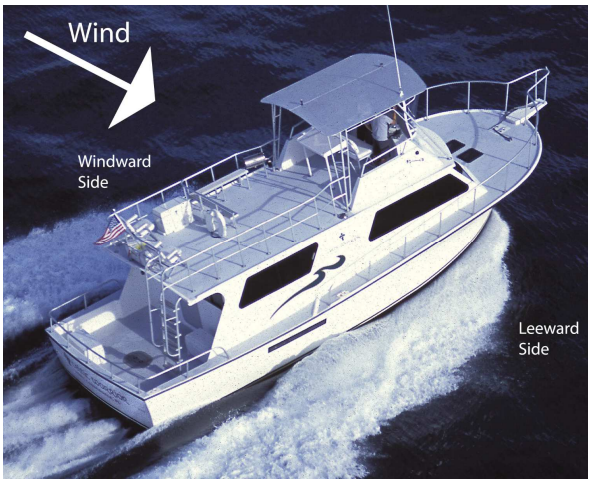


FIGURE 1-93 WINDWARD & LEEWARD - POWER

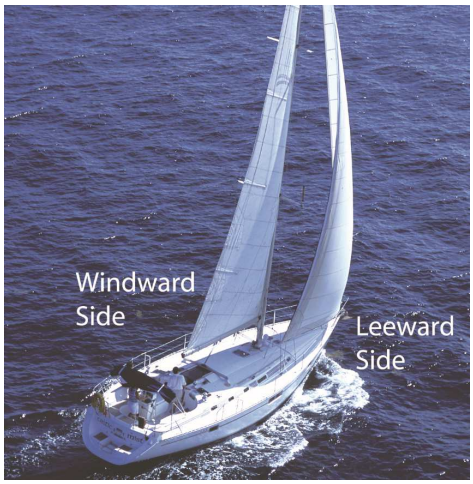


FIGURE 1-94 WINDWARD & LEEWARD - SAIL

1.16 Introduction to Collision Regulations

Basic collision regulations (rules of the road)

All activities on the water are governed by a set of international regulations. These regulations are known as the INTERNATIONAL REGULATIONS FOR PREVENTING COLLISIONS AT SEA, (1972). This set of regulations runs to many pages and the full text is beyond the scope of this module, we will however discuss the most important sections.

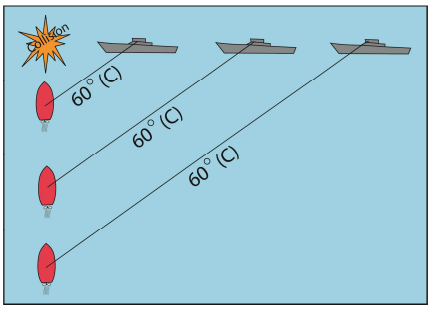
Steering & sailing rules
This section defines what action must be taken by vessels to avoid collisions under specific circumstances.

One of the most important of all the Rules is Rule 5 which is given here verbatim:
"Rule 5. Lookout
Every vessel shall at all times maintain a proper lookout 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

Vessels shall at all times proceed at a safe speed taking into consideration visibility, traffic density, maneuverability of the vessel, background lights at night and sea state.

Determining if risk of collision exists



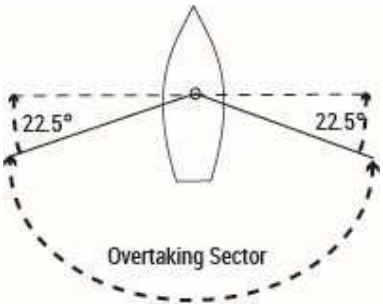
Vessels shall use all available means to determine if risk of collision exists. Risk of collision shall be deemed to exist if the compass bearing of an approaching vessel does not appreciably change; risk of collision may sometimes exist with a large vessel, a tow or a vessel at close range even if the bearing does change appreciably. 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 when in a Channel

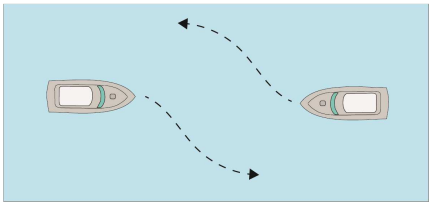
When in a channel all vessels should stay to the right hand or Starboard side, as near to the outer limit of the channel as is safe and practicable (Rule 9)

Overtaking



Any vessel overtaking any other vessel shall keep out of the way of the vessel being overtaken. A vessel is deemed to be overtaking if she is coming up with another vessel from a direction more than 22.5° abaft her beam. In other words at night time only the stern light of the vessel being overtaken would be visible.

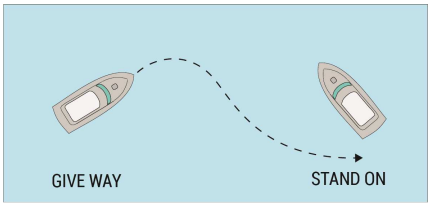
If a vessel is in any doubt as to whether she is overtaking she must assume that she is overtaking and act accordingly.



Power driven vessels meeting head on

When two power driven vessels are meeting head on both are required to alter course to starboard.

Power driven vessels crossing



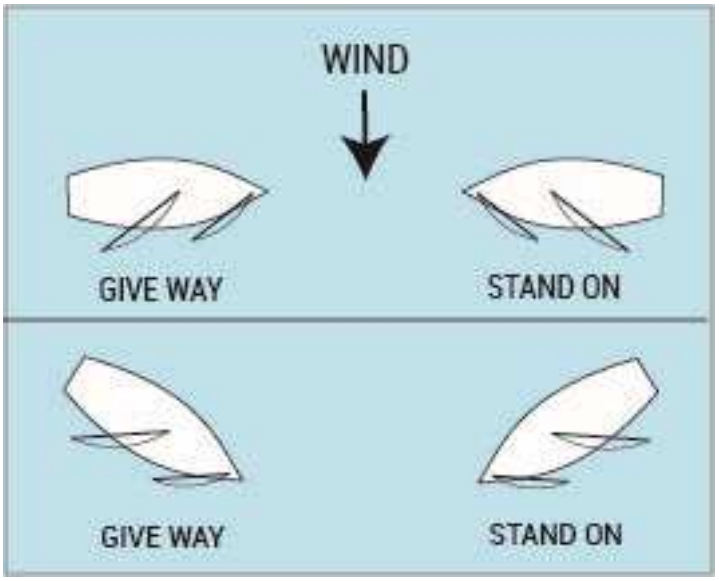
When two power driven vessels are crossing, or converging, and risk of collision exists the vessel which has the other on her own starboard side must give way.

The give way vessel must not 'give way' by crossing ahead of the other vessel.

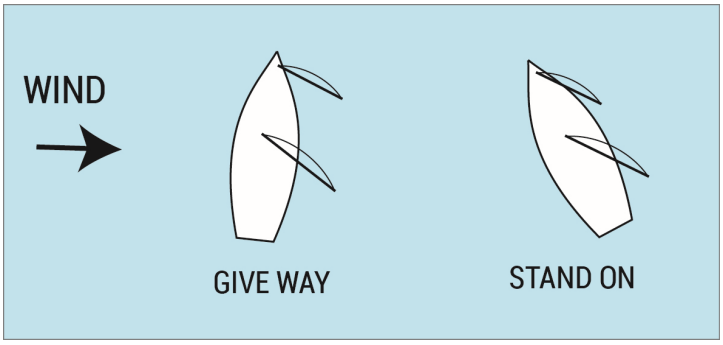
Sailing Vessels

When two sailing vessels are approaching one another, so as to avoid risk of collision, one of them shall keep out of the way of the other as follows:

1. when each has the wind on a different side, the vessel which has the wind on the port side shall keep out of the way of the other. In other words a sailing boat on port tack gives way to a sailing boat on starboard tack. A sailing vesssel with the wind coming over the port side is said to be on port tack, when the wind is coming over the starboard side the vessel is said to be on starboard tack. The main sail indicates visually which tack the vessel is on as it will be carried on the opposite side to the side over which the wind is blowing.

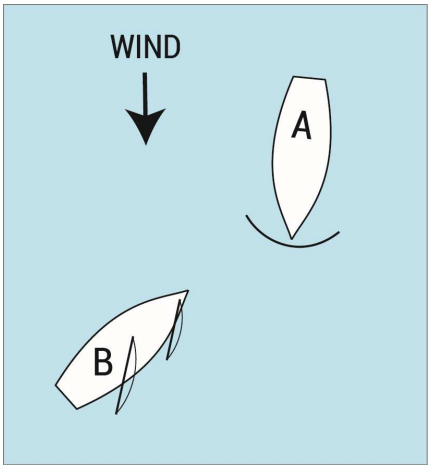


2. When both have the wind on the same side, the vessel which is to windward shall keep out of the way of the vessel which is to leeward;



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

In this diagram the yacht B, on port tack, cannot see which side the mainsail of the other boat, A, is being carried on as it is obscured by the large headsail.



To fully understand the rules it is necessary to read through them carefully, and like any legal document is open to interpretation and every situation is different. If in any doubt, give way, it's usually the safest thing to do.

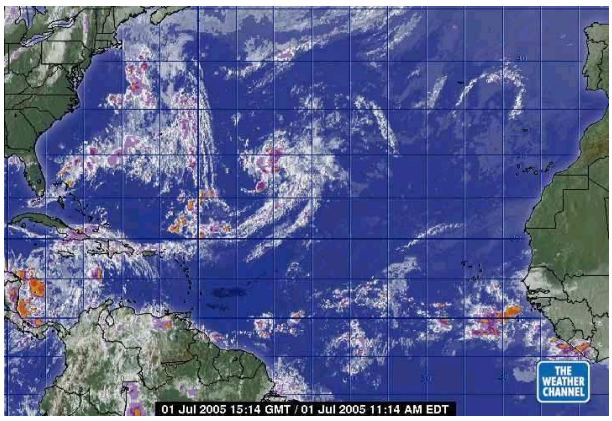
Power meeting Sail

A power-driven vessel underway shall generally keep out of the way of a sailing vessel (Rule 18)

This rule must be treated with respect and intelligence, for example, in various harbors around the world the working boats like ferries have a right of way under a "local rules" exemption to the general rules in the regulations. Equally if you are in a sailboat and see a large cargo ship in front of you flying a black barrel shaped object at it's mast this means that it is "constrained by draught", or in other words can only go down the deep water channel into a harbor, and cannot get out of your way.

1.17 Introduction to Weather

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 taken into account.

Meteorology will be covered in greater detail in further modules.

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
- Meterological 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.

1.18 Introduction to Ropework

Ropes are used for a number of purposes on board a vessel, particularly on a sailing vessel. There are a number of different types of rope, each will be used for a different purpose. They will last a long time if looked after properly. If the rope has been stored badly, it will be

weakened and it will deteriorate in use. Misuse and incorrect handling will hasten this process. Contact with chemicals, gasoline/petrol/paint etc. cause serious damage to ropes and salt water has an adverse effect on them. Man made fiber ropes are badly affected by ultra-violet radiation and require protection from direct tropical sunlight. Ropes should be inspected and condemned if there are obvious defects such as broken strands, kinks or signs of rot.

Ropes should regularly be taken ashore and washed in fresh water and dried. Salt crystals harden the rope and their abrasive action shortens their life.

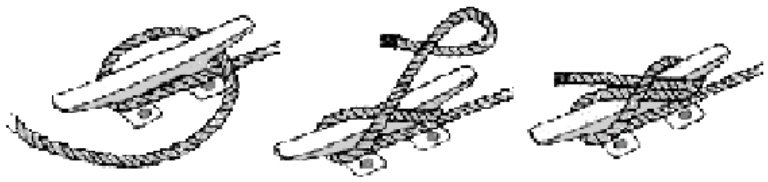
Coiling a Line

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.

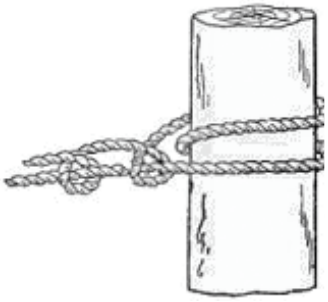
Securing to a Cleat

The rope should be lead 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 figure 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."



How to tie most common knots or secure to a post

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.

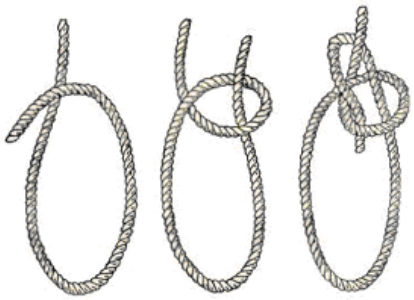


Figure of Eight is a stopper knot used to prevent the end of a rope running out through a block or fairlead. It is easy to undo and is mostly used on the ends of sheets, halyards and deck lines.

See further sections for more information on 'knots' ,how to tie and purpose of each.

1.19 Knowledge Review

1. Name 8 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. Draft
    f. Port
    g. Starboard
    h. Keel
    i. Operate
    j. Cleats
    k. Bulkheads
    l. Windward
    m. Leeward
    n. Radar Reflector
    o. Fairleads
    p. Springline
    q. Pulpit
    r. Sternrail
    s. Foredeck
    t. Grabrails
    u. Washboards
    v. Winch
    w. Tiller
    x. Thru Hull Fitting
    y. Kill Cord
    z. Relative Direction
    aa. Barometer
    bb. Companionway

4. Name 4 different types of hulls.

5. What is a forestay?

6. What is the function of a rudder?

Module 2 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

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 lifejacket at all times when boating is the highest safety priority in preventing boating deaths. Not wearing a lifejacket could cost you your life. Test your lifejacket 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

FIGURE 2-1 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. *Personal Flotation Devices (PFDs) and Buoyancy Aids, covered in the next section, will not.*

FIGURE 2-2 INFLATABLE LIFEJACKET

FIGURE 2-3 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).

FIGURE 2-5 POUCH TYPE LIFEJACKET

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

FIGURE 2-4 AUTOMATIC INFLATING

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.**

Inflatable lifejackets 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).

2.3 Buoyancy Aids / Personal Flotation Device (PFD)

Buoyancy aids, in some areas also known as personal flotation devices (PFD), 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.

FIGURE 2-6 BUOYANCY AID OR PFD

2.4 Children's Lifejackets and PFDs

Ensure that children's lifejackets and PFDs 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 lifejackets and PFDs have a crotch strap on them to prevent them from rising over the child's shoulders. 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.

FIGURE 2-7 CHILDREN'S LIFEJACKET

FIGURE 2-8 CHILDREN'S PFD

2.5 Maintaining Lifejackets and PFDs

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

Care of Lifejackets and PFDs

- 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 PFDs

- 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.

FIGURE 2-9 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 manoeuvers to recover the person. All vessels that venture offshore should be equipped with at least one.
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.

FIGURE 2-10
HORSESHOE BUOY

FIGURE 2-11 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 manoeuvered 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.

FIGURE 2-12 LIFESLING

2.9 Man Overboard Pole

FIGURE 2-13 MAN OVERBOARD POLE

An MOB pole is a fiberglass pole typically used on cruising or racing sailboats. It is attached upright to the stern of a vessel, usually about 2 meters long and can be quickly released from its Velcro strap and thrown into the water as soon as someone has fallen overboard. It has a flag and/or a light on top which can easily be spotted from a distance, (especially in heavy seas) and helps to lead the vessel back to the position where the person has fallen overboard. It also lets other vessels know that there is a person in the water. In some instances, it may be attached to the horseshoe or ring buoy. It is especially useful in areas of fast flowing currents as it will drift at the same speed as the person in the water thus making it easier to find them.

2.10 EPIRB (Emergency Position Indicating Radio Beacon)

FIGURE 2-14 EPIRB

An EPIRB is a self- contained, waterproof, transmitter used to alert search and rescue services in the event of an emergency at sea. They are generally used on vessels that travel far offshore and out of sight of land. When activated, it transmits a signal via satellite, to a land based rescue co-ordination center who will organise rescue services via helicopter or nearest available lifeboat or ship.

They have a built in GPS which allows rescue services to locate you within 50 meters. They will transmit for approx. 36 -48 hours and have a flashing light on top. They are generally activated when the life raft has been deployed and where there is a serious threat to the survival of the crew. They are manufactured in various shapes and sizes.

2.11 SART (Search and Rescue Transponder)

FIGURE 2-15 SART

A radar SART is a self- contained waterproof transponder intended for emergencies at sea. The radar SART is used to locate survival craft or life raft by creating a series of “dots“ on a vessels radar display when it comes within range of the signal (usually within 8 nautical miles).
It has a built in battery and can transmit for 36 – 48 hours.

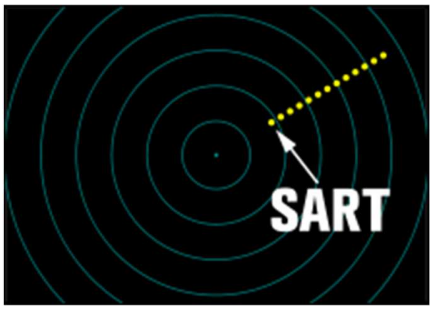


FIGURE 2-16 A MOCK-UP RADAR TRACE FROM SART

A mock-up radar trace from a SART transponder, shows the location of the transponder in the trace.

2.12 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.

FIGURE 2-17 IMMERSION SUIT

2.13 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.

FIGURE 2-18 BUOYANT HEAVING LINE

2.14 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.

FIGURE 2-19 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.

2.15 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. What is an EPIRB?
9. What is a SART?
10. How long should a heaving line be for a vessel <24m?
11. What is an immersion suit?
12. What is recommended when boating in hot weather?

Module 3 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 ALL 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, such as 4, 6 ,8, 12, 24, 72 man capacities depending on the size of the vessel, type of liferaft, the number of passengers aboard and the climate in the region they are operating. They are only to be used when a vessel is sinking and there is no other choice but to abandon ship.

FIGURE 3-1 CANISTER LIFE RAFT

FIGURE 3-2 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. *This subject will be covered in much greater detail in the IYT STCW Personal Survival Course.*

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.

FIGURE 3-3
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: Hand-Held Flare

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

Type D: Smoke Flare

- Highly visible during daylight hours
- Gives off orange smoke

FIGURE 3-4 FLARES

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

FIGURE 3-5 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.

FIGURE 3-6 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 Class)

FIGURE 3-7 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.

FIGURE 3-8 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

This subject will be covered in much greater detail in the IYT STCW Personal Survival Course.

3.6 Basic First Aid Kit

FIGURE 3-9 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

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.

FIGURE 3-10 WATERTIGHT FLASHLIGHTS

3.8 Sound Signalling Devices / Air Horns/whistles

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.

FIGURE 3-11 AIR HORN

3.9 Radar Reflector

Small vessels do not always show up on the radar of large ships and can therefore run the risk of being run over especially at night and in low visibility. A radar reflector increases the "signature" on a radar screen and should be used in fog, restricted visibility, heavy rain, high seas and at night. They should be mounted as high as possible on a vessel for maximum effect.

FIGURE 3-12 RADAR REFLECTORS

3.10 Axe

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

FIGURE 3-13 AXE

3.11 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.

This subject will be covered in much greater detail in the IYT VHF Operators Course.

FIGURE 3-14 VHF RADIO & HANDHELD VHF RADIO

3.12 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.

FIGURE 3-15 BAILER

3.13 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.

FIGURE 3-16 OARS

3.14 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)

FIGURE 3-17 SWIM LADDER

3.15 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.

FIGURE 3-18 NIGHT VISION BINOCULARS

FIGURE 3-19 NIGHT VISION MONOCULAR

3.16 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.

FIGURE 3-20 MANUAL & ELECTRIC BILGE PUMPS

FIGURE 3-21 BILGE PUMP SWITCH EXAMPLES

3.17 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.

FIGURE 3-22 WOODEN PLUGS FOR THRU-HULL FITTING

3.18 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.

FIGURE 3-23 BATTERY SELECTOR SWITCH

3.19 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.

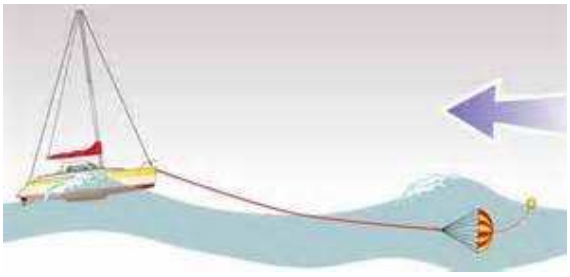


FIGURE 3-24 SEA ANCHOR

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 3-26 DROGUE

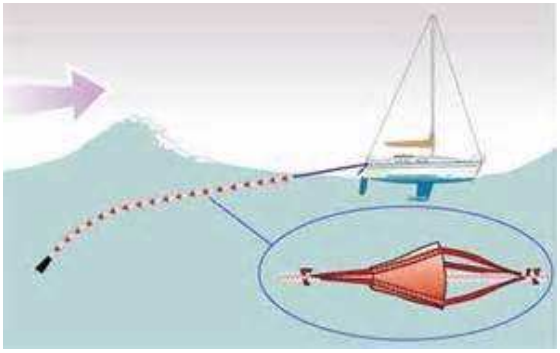


FIGURE 3-25 DROGUE EXAMPLE

3.20 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:

FIGURE 3-27 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:

FIGURE 3-28 ABANDON SHIP BAG

- 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

- 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

FIGURE 3-29 FIRST AID KIT

This subject will be covered in much greater detail in the IYT STCW Personal Survival Course.

3.21 Anchors and Anchoring

This subject will be covered in greater detail in Module 10

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.

FIGURE 3-31 FISHERMAN ANCHOR

FIGURE 3-32 FLUKE OR "DANFORTH" ANCHOR

FIGURE 3-30 PLOUGH ANCHOR

FIGURE 3-33 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.

3.22 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 reboarding 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 AND 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

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.

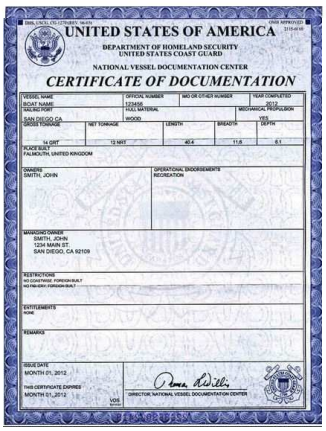

UNITED STATES OF AMERICA
DEPARTMENT OF HOMELAND SECURITY
UNITED STATES COAST GUARD
NATIONAL VESSEL DOCUMENTATION CENTER
CERTIFICATE OF DOCUMENTATION

FIGURE 4-1 VESSEL REGISTRATION

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. To operate a boat in Canada, Canadians require a "Pleasure Craft Operator Card or PCOC". A pleasure craft is any vessel used for recreational purposes and is not used for carrying paying passengers or goods.

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

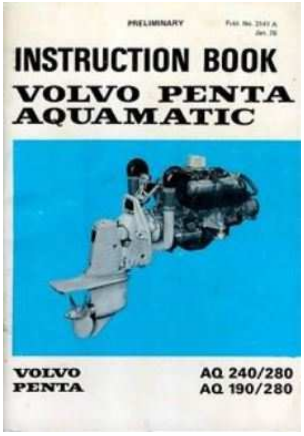
Most countries will require proof that you can safely operate a VHF radio and some countries require that the radio set itself is actually licensed. Check with your local administration.

4.7 Crew List / Logbook

It is always a good idea to have a crew list on board your vessel with personal information of all your crew such as name, address and contact information for next of kin (in the event of an accident) and their doctor's name and contact information in the event that one of your crew is on medication. This information may also be written into the vessel's logbook. These can be purchased at most marine supply stores.

4.8 Equipment Manuals

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



4.9 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.

FIGURE 4-2 NAUTICAL CHART

4.10 Nautical Publications

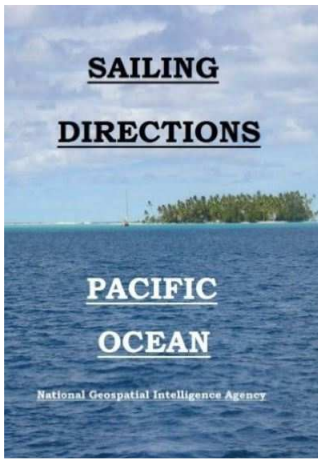
There are several nautical publications that should be carried on your vessel depending on the length of the voyage you intend to undertake and the area you intend to travel in. The main publications are:

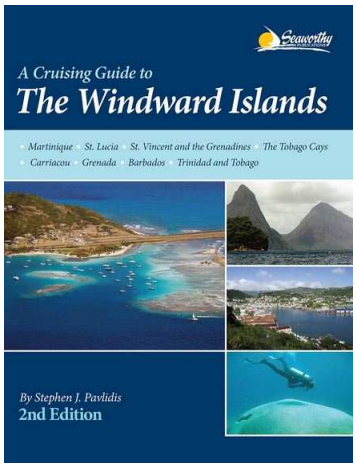
Cruising Guide or Sailing Directions

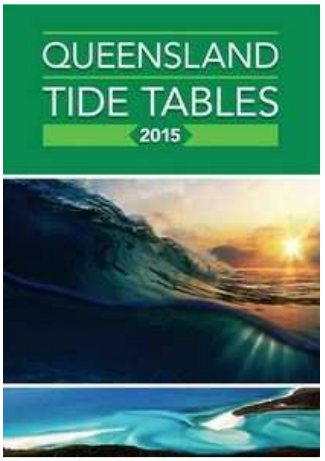
The "Cruising Guide" contains extremely valuable information about anchorages, local weather conditions, navigation channels, fishing spots, GPS waypoints, planning tips and local information about shopping, car rental and everything needed for planning a safe and fun trip. They are available for most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

Tide Tables

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

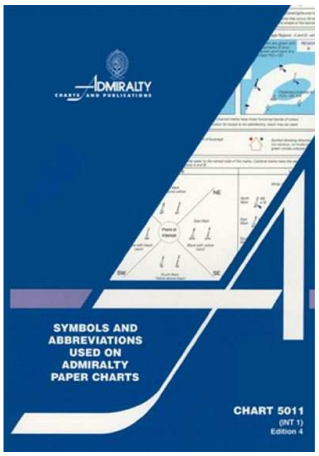






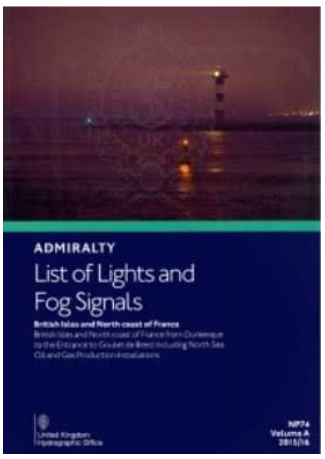
Symbols and Abbreviations for Nautical Charts

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



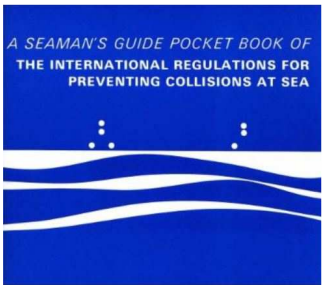
List of Lights

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.

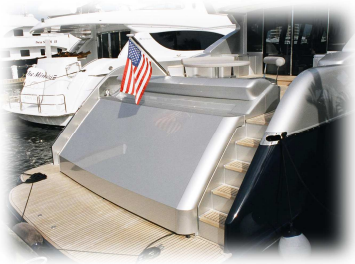


FIGURE 4-3 COUNTRY OF REGISTRATION FLAG ON STERN

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.

FIGURE 4-4
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.

FIGURE 4-5 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.

FIGURE 4-7 DIVER DOWN FLAG

FIGURE 4-6 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.

4.11 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.

4.12 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

FIGURE 4-8 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.

FIGURE 4-11 MANUAL BILGE PUMP

FIGURE 4-10 ELECTRIC BILGE PUMP

FIGURE 4-9 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
- Electrical tape
- Assorted nuts, screws & bolts
- Impellers

FIGURE 4-12 ENGINE SPARES

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.

4.13 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

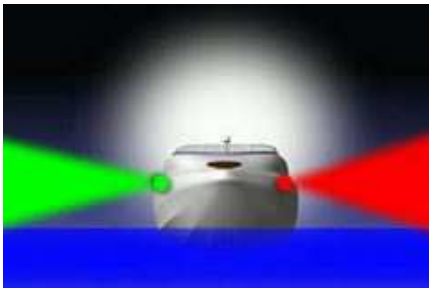


FIGURE 4-13 NAVIGATION LIGHTS

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.

4.14 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.

4.15 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.

4.16 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

4.17 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.

4.18 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.

4.19 Knowledge Review – Vessel Checkout

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

Module 5 BASIC HANDLING SKILLS

5.1 Key Objectives

THE OBJECTIVE OF THIS MODULE IS TO RELAY BASIC INFORMATION REGARDING HOW SAILS WORK, USE OF WINCHES, TYPES OF SAILS AND BASIC SAILING VESSEL HANDLING SKILLS. THEORY PORTION APPLIES TO SAIL ONLY. PRACTICAL COVERS POWER & SAILING VESSELS.

5.2 Sails and Sail Handling

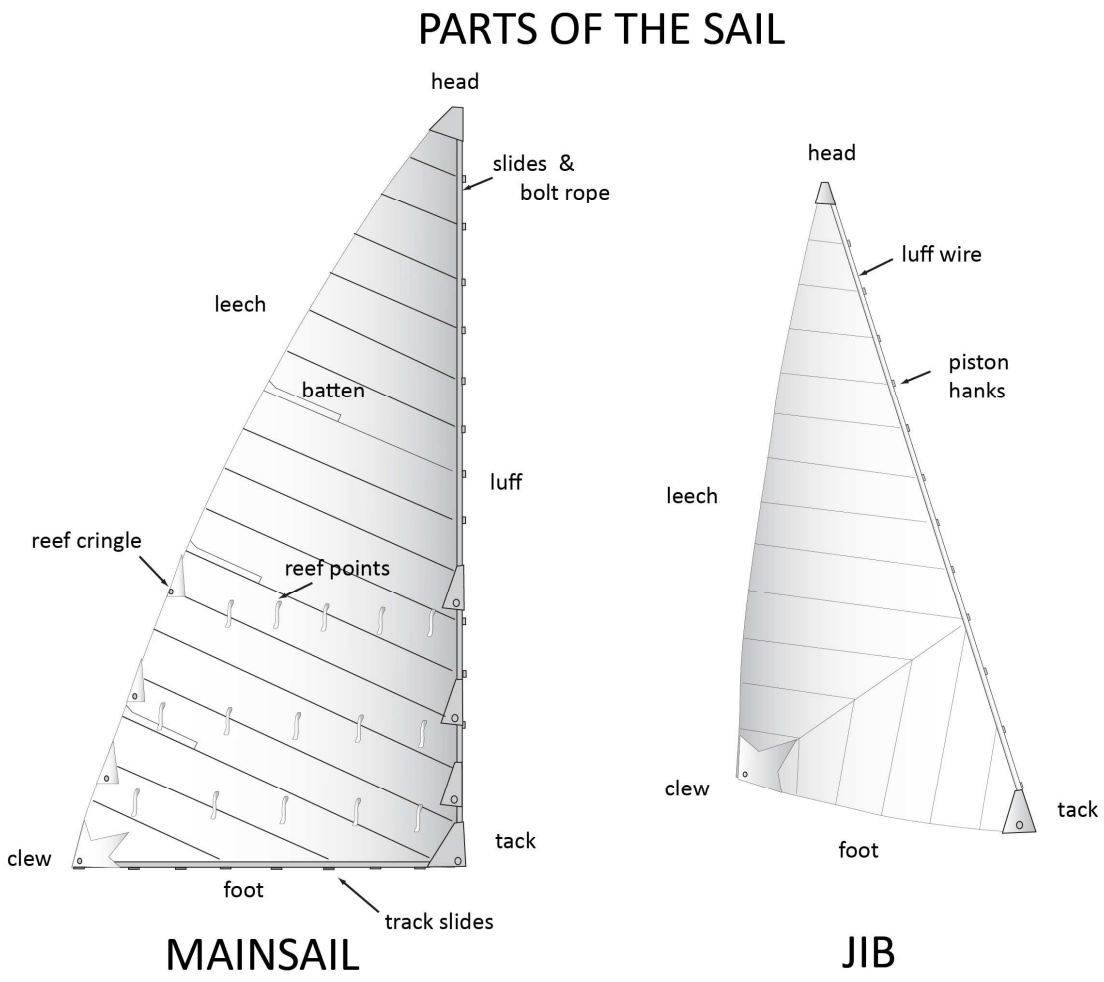
How Sails Work

Very simply stated, sails work when the wind flows over the sails (effectively an aerofoil, like an aircraft wing) thus creating a driving force which moves the yacht through the water. The wind acts on each sail creating two basic forces; the "lift" from the aerodynamics of the sail and sideways drift. The lift causes forward movement of the boat through the water and the sideways drift causes leeway. These two factors generate the aerodynamic forces which interact with the underwater part of the hull and the keel and the water in which it is immersed to produce forward motion of the hull.

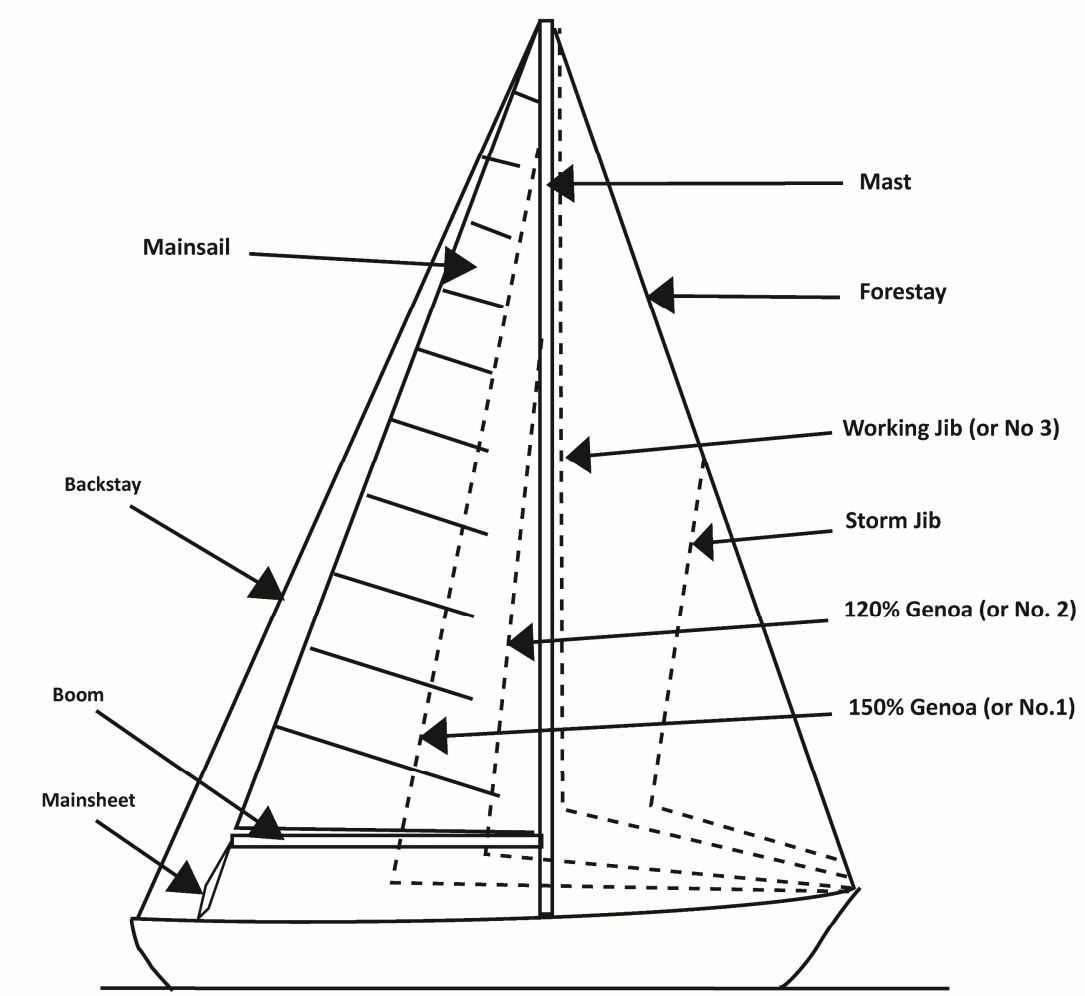
Parts of the rigging, standing and running

Standing rigging is the fixed parts of the rigging that hold the mast in place.. They are the forestay, backstay and sidestay.

Running rigging refers to the lines and sheets that adjust the angle of the sails to the wind.



Most modern sailing yachts use what is called a **"Bermudan Rig"** or "Sloop Rig" where the sails are triangular in shape. The top corner of the sail is the head, the bottom corner of the leading or forward edge of the sail is the **"tack"** and the rear corner the **"clew"**. The three sides of the sail are the leading edge called the "luff", the back edge is the **"leech"** and the bottom of the sail is the **"foot"**.



Sloop Sail Plan

The simplest rig commonly seen on yachts has one mast. There is a single sail in front of the mast called a **"jib"** or a **"headsail"** attached to the **"forestay"** which is part of the standing rigging; and a second sail the "mainsail" that is hoisted up a track in the mast while its foot is attached to the horizontal spar on the back of the mast called the "boom". The foot of the mainsail may either be in a track on the boom or just attached by the corners in which case it is called **"loose footed"**.

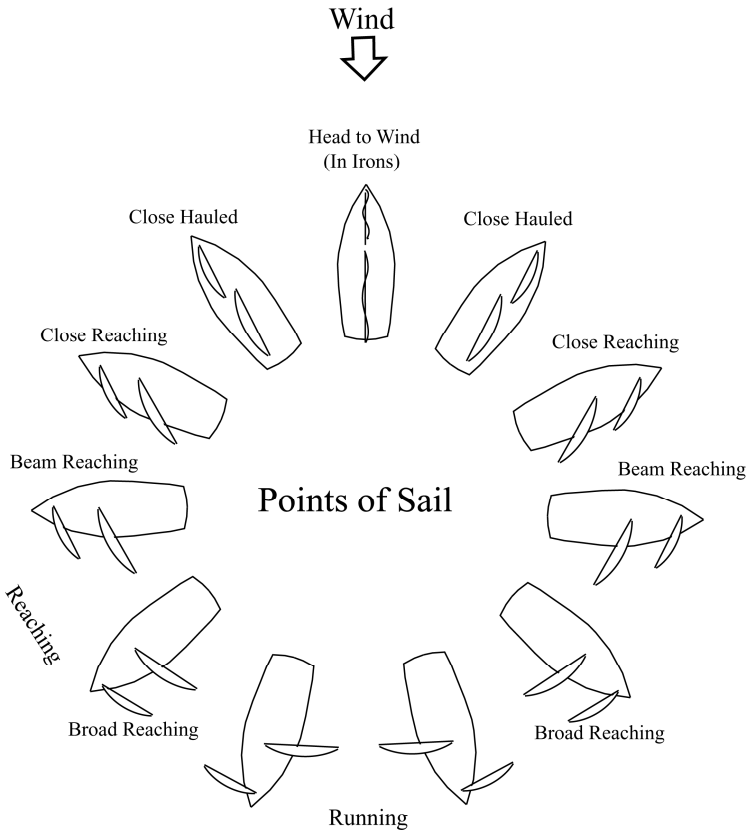
The mainsail often has **"battens"** or stiffeners sewn into pockets in the sail to help support it's shape, these can either be just at the trailing edge "leech" of the sail or can extend right across the sail. Having full length battens that extend right across the sail helps the sail hold the shape better.

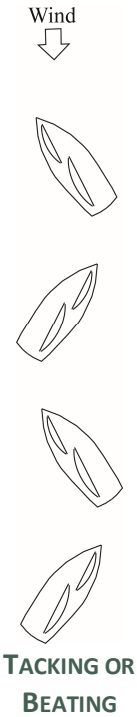
A **"jib"** becomes a **"genoa"** as soon as the clew of the sail passes the mast. A 120% genoa means that 20% of the sail is past the mast and a 150% genoa means that 50% of the sail area is past the mast.

Points of sail and sailing terms

The angle that the wind makes towards the boat dictates how the sails are set to gain maximum performance. Each of these angles and settings are known as a **"Point of Sail"**.

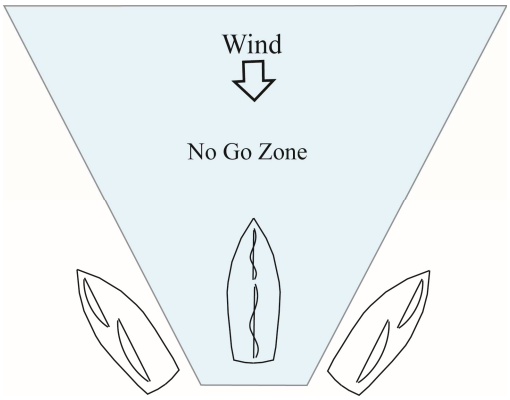
A sailing boat cannot sail directly towards (into) the wind. The wind just passes equally down both sides of the sails and there is no **"lift"** (drive forward). In this situation the vessel is stopped dead in the water this is called being **"in irons"**.





TACKING OR BEATING

The closest to the wind a boat can efficiently sail is about 40 degrees either side of the wind's direction, effectively this area is a **no go zone**. This closest point of sail is known as close hauled. Therefore to sail towards a destination from where the wind is blowing, a boat must **"tack"** or zigzag called **"beating"**).



To tack or **"go about"** the vessel changes from one tack to the other by steering the bow through the wind.

When sailing as close to the wind as possible the point of sail is known as **"close hauled"**. The sails themselves will be **"sheeted"** in tight (pulled in). To establish the closest point to the wind that the yacht can sail, the helmsman, as he turns the yacht upwind watches the front edge, or luff, of the headsail until it starts to flutter, this is called "luffing"; once he sees this happening he should ease gently away from the wind. If he turns further upwind then the whole sail will start to flog back and forth and eventually the yacht will stall and come to a stop.

As the boat moves away from the wind, or **"bears away"**, the sails will be let out a little and the point of sail becomes a **"close reach".**

Bearing away still more and easing out the sails a little more the boat reaches the point of sail known as a **"Beam Reach"** (when the wind is over either beam at 90º or half way down the boat). The sails will be about half way out at this stage. This is the most comfortable and controllable point of sail and is also, for most yachts, the fastest.

Further away from the wind again, the sails should be about 2/3rds out, the point of sail is known as a **"broad reach"**, this is when the wind comes from either quarter.

The last point of sail is known as a **"dead run"** or **"running before the wind**" is when the wind is blowing directly from astern and the sails are all the way out.

To go further away from the wind the wind must pass across the stern of the boat. This is called a **"gybe"**; that is to let the sails change sides by putting the stern through the wind.

"Starboard Tack" is when the wind comes over the starboard side; **"Port Tack"** is when the wind comes over the port side.

Shackles

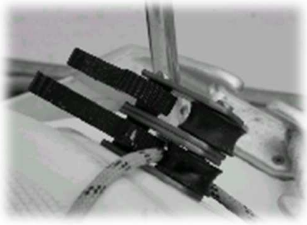
Shackles are a "U" shaped device for attaching for example a halyard (the line that hoists the sail) to a sail. They come in 3 basic forms. The most common is with a screw in pin. Some have a captive pin which is pushed and turned or a snap shackle which is operated by pulling a pin.

Blocks

Blocks come in different sizes and with up to 4 "sheeves" (wheels that are grooved to take rope). Rigging a line through a series of blocks gives a mechanical advantage allowing that line under load to be more easily handled. For example blocks are normally used on a sailing vessel for the main sheet.

Cam cleats, Rope Clutches and Jam Cleats

Used for securing a line under load but that can be quickly and easily released.



CAM CLEATS

LOCKING CLEATS

JAM CLEAT

Mainsheet traveller

The Mainsheet traveller is used to adjust the angle of the mainsail to the wind by moving the boom to port or starboard.

Boom topping lift

The boom topping lift is used to secure the boom in position above deck when the mainsail has been furled.

Mainsheet

The Mainsheet is used to adjust the tension of the mainsail relevant to the wind direction.

Use of Winches

Of primary importance are "Winches" which are mechanical devices giving extra power for handling these ropes under load. Some yachts also have electrical winches.

Winches provide the extra power necessary to pull in rope under load such as halyards and sheets. Winches often have two or even three speeds provided by internal gearing, giving an increase in power for the same effort applied to the winch handle.

In addition to the fittings described above which will be found on all types of vessels, a sailing vessel will have additional fittings which are designed to enable the crew to use the mast, spars and rigging to harness the power of the wind. Under full sail, even with only a light wind, huge forces are created by the sails and rigging which require fittings to allow the crew to control the sails efficiently.

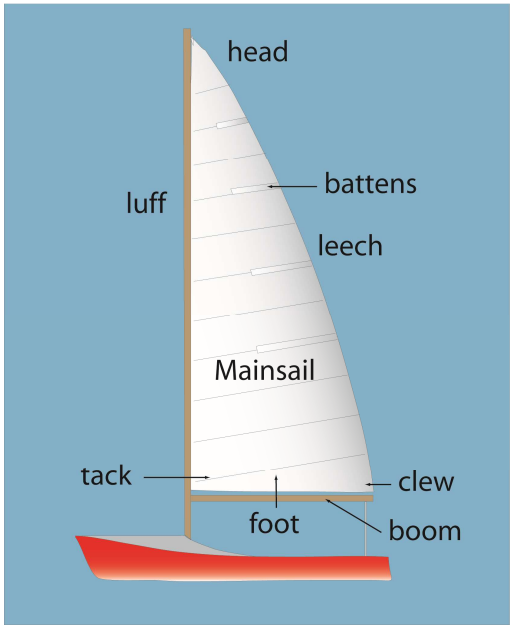
Most winches have a star shaped hole in the top of the winch into which the star shaped head of the handle is fitted. There is often a locking arrangement to hold the handle securely in the top of the drum.

Self Tailing Winch and sequence of how to operate

It is imperative when operating a winch to be aware of safety issues. It is recommended that jewelry such as rings and necklaces be removed when operating winches as sheets can carry excessive loads. Many have actually crushed fingers due to lack of care in operating winches.

Types of Sails

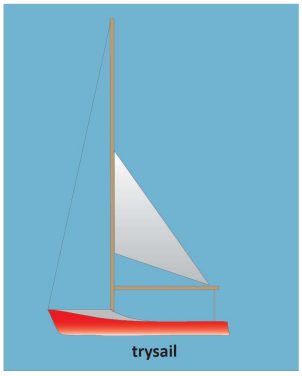
Traingular sails are the most commonly used sails and will be the focus of this section. This sail configuration is known as a **"Bermuda"** or **"Sloop"** rig.



The **Mainsail** is the large sail situated behind the main mast or the sail that is attached to the boom. It is tensioned by an outhaul at the end of the boom.

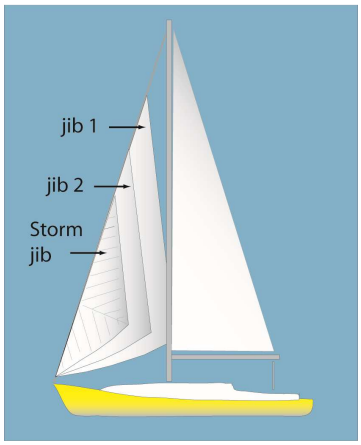
The **leech** can be stiffened by battens inserted into the batten pockets.

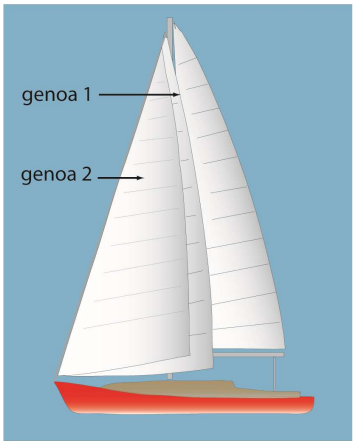
In stormy weather a **trysail** may be used instead of a mainsail. This is a very strong sail made of very thick canvas specifically for bad weather.



A **headsail** is the sail (such as a jib) located immediately in front of the main mast. It is attached to the forestay.

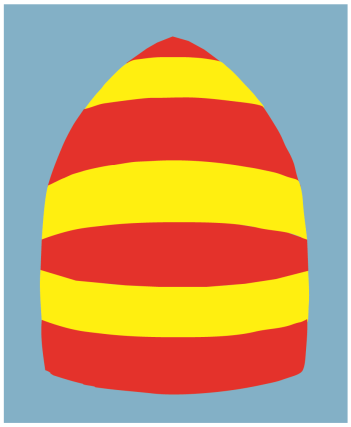
Headsails vary in size to allow the optimum sail area for most conditions. For example, jibs and genoas (see diagrams)



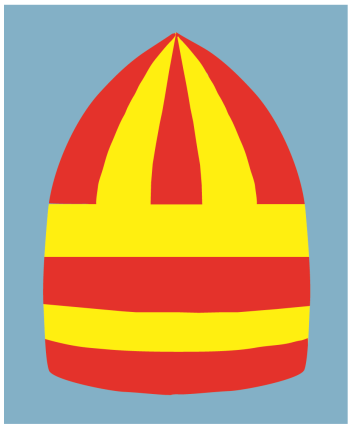


The Spinnaker is the largest sail on a boat. It is a very light headsail used when sailing downwind (running), or on a broad reach. Just like the main, the top of the spinnaker is the head, and the bottom is the foot. The luff is the windward edge, and the leech is the leeward edge.

Spinnakers have various designs, which are determined by the design of the cloth panels: vertical (radial), horizontal, star, and tri-radial. The tri-radial cut is a combination of the remaining three, and is the most universal of them, with good handling and power characteristics. The radial head cut is a lighter weather sail, the star cut is a good strong wind reaching sail, and the horizontal cut is also a good light wind sail.



HORIZONTAL CUT



RADIAL HEAD CUT

TRI-RADIAL CUT

Sails and Sail Handling

As the wind increases the boat gradually becomes overpowered. This makes the boat hard to handle and so the amount of sail carried will need to be reduced. This sail reduction is carried out progressively as the wind increases.

The rule for reducing sail is to do it sooner rather than later, if left too late the vessel will be harder to control as conditions worsen.

On a sloop rigged vessel, usually the first reduction will be to change from a large number 1 genoa (diagram) to smaller number 2 genoa. The next reduction will be to take in a reef in the main. A reef will require the sail to be partially lowered and attached to the boom by a series of ties.

The sail reduction process is continued with reductions of headsail and main as the wind strengthens. Once the wind becomes too strong to carry double or triple reefed mainsail and number 4 jib there are 2 storm sails which can be rigged to allow some progress to be made in very strong winds.

These are the Storm jib, which is a very toughly constructed triple sewn, small jib attached to the fore stay and a trysail. The main sail can be replaced by a storm trysail.

Where boats are equipped with a roller reefing system, it is possible during heavy weather to reduce the sail area by rolling in the headsail. The same applies to mainsails that have an in-mast or in-boom roller furling system.

Sail Materials and Construction

Originally sails were made of canvas and cotton. As man made fabrics became available these natural fibers were replaced by polyester, known as Dacron. This has now been eclipsed by more modern materials such as Mylar, Kevlar and Spectra.

The advantages of modern materials are their strength, weight and ability to create a better shape.

Sail construction will depend on the type of sail and material used. However, generally the head, luff and tack are all reinforced to allow cringles to take big loads. The remainder of the sail will usually be panels of sailcloth sewn together, double stitched. The panels will be aligned to maximize the finished sail shape.

5.3 Handling Skills – Sail or Power – Practical Module

Instructors will practically demonstrate various handling skills for either power or sailing vessels depending on the certification type.

Sailing vessel handling skills

Under sail

- Steering, tacking, gibing, turning upwind/downwind, luffing up, bearing away, trim
- Sail a triangular course
- Sail a compass course
- Heaving to, lying ahull
- MOB, anchoring, pick up a mooring buoy

Under power

- Steer a compass course
- MOB, anchoring, pick up a mooring buoy

Power vessel handling skills

- Multi engines
- Use of bow thrusters, trim tabs
- High and slow speed turns, turning in restricted space
- Crash stops and Williamson turns
- Man Overboard, anchoring, pick up a mooring buoy

5.4 Knowledge Review

1. What is ‘standing rigging’?
2. What is ‘running rigging?
3. What are the parts of the mainsail?
4. What are the parts of the jib sail?
5. Explain the points of sail.
6. Explain tacking (or beating)
7. What is the ‘no go zone’?
8. What are shackles used for?
9. What are blocks?
10. What are cleats and what are the different types of cleats?
11. Where are these sails located on the boat:
    a. Mainsail
    b. Headsail
    c. Spinnaker

Module 6 BASIC ROPEWORK

6.1 Key Objectives

THE OBJECTIVE OF THIS MODULE IS TO ENSURE THAT ALL CREW MEMBERS 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.

6.2 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.

Rope can be made of hemp or of synthetic fibers such as nylon or rayon. It can last a long time if properly cared for. Leaving rope soaked in water or in direct sunlight will deteriorate it quickly. Contact with chemicals, gasoline, salt or corrosive substances will shorten its lifespan. Ropes should be regularly checked for wear and tear and discarded if there are signs of broken strands or rot. Ropes used in salt water should occasionally be washed in fresh water as salt crystals can harden the strands and cause damage.

Man-made fiber ropes are affected by ultra-violet radiation and require protection from direct tropical sunlight. Ropes should be inspected and condemned if there are obvious defects such as broken strands, kinks or signs of rot.

6.3 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 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.

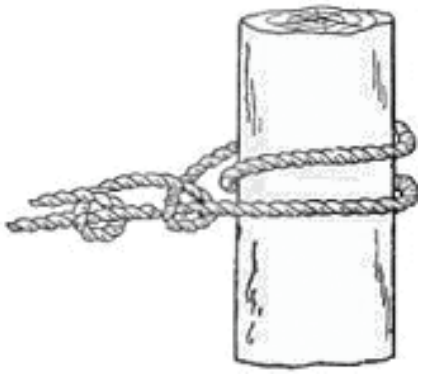


FIGURE 6-1 ROUND TURN & TWO HALF HITCHES

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.

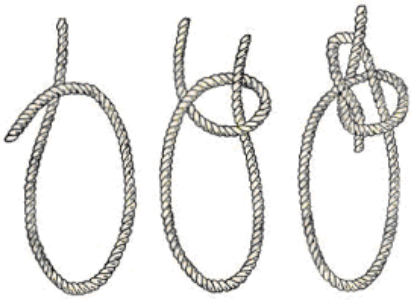


FIGURE 6-2 BOWLINE KNOT

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 6-3 FIGURE OF EIGHT KNOT

Rolling Hitch is used for a number of purposes where a load on one rope needs to be transferred to another, for example when load need to be taken off a winch with an overriding turn.

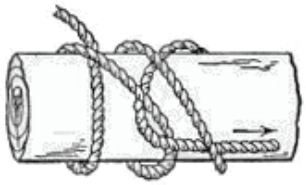


FIGURE 6-4 ROLLING HITCH

Sheet Bend is used to join together 2 ropes.

Double Sheet Bend is used to join together 2 ropes but is more secure and works better if there is a difference in the thickness of the two ropes.

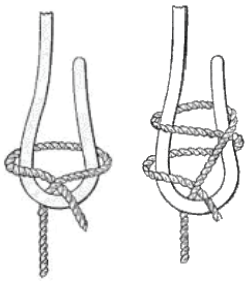


FIGURE 6-5 SHEET BEND & DOUBLE SHEET BEND

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”.

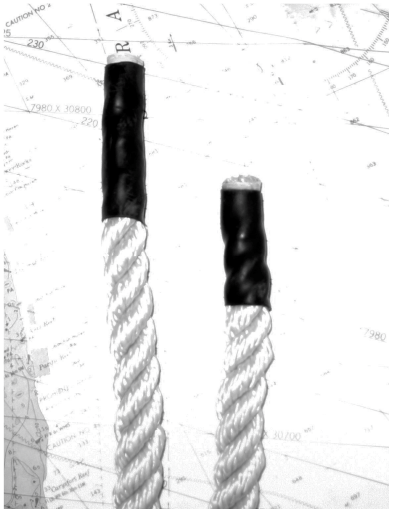
FIGURE 6-6 REEF KNOT

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.

FIGURE 6-7 CLOVE HITCH

Whipping and splicing

Loops or “eyes” may be formed in a rope by means of an “eye splice”. To protect the ends of ropes and to prevent them fraying a “whipping” is applied. These topics will be covered in future modules.



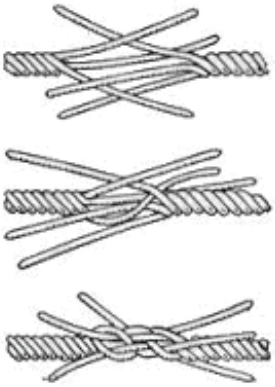


FIGURE 6-8 WHIPPING

Securing to a Cleat

The rope should be lead 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 figure 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."

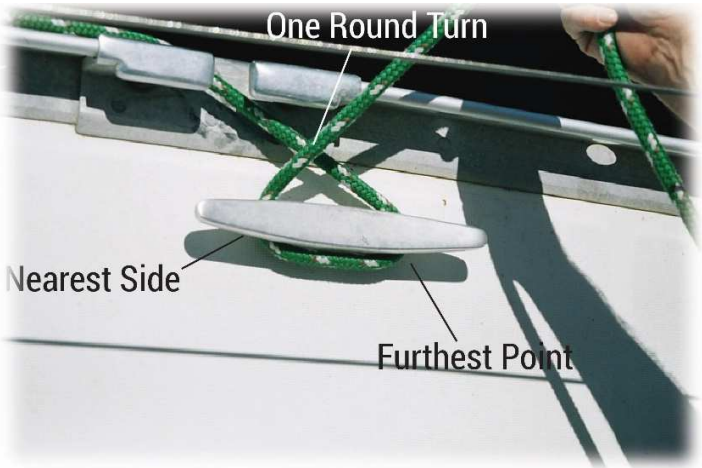


FIGURE 6-9 SECURING TO A CLEAT

6.4 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.

FIGURE 6-10 COILING LINE SEQUENCE

6.5 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 7 REFUELING

7.1 Key Objectives

THE KEY OBJECTIVES ARE TO ENSURE THAT THE CREW 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.

7.2 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.

7.3 Refueling a Personal Watercraft (PWC)

Follow the appropriate refueling procedures as listed previously with the following additions:

- Check the fuel/water separator and if necessary remove any water before fueling.
- Certain PWC's require pre-mixing of oil and gasoline before fueling so do so in a separate container.
- If the PWC is oil injected, make sure the oil reserve tank is full with the recommended oil from the manufacturer.
- Make sure the fuel selector switch is off when fueling and remember to turn it back on before restarting the engine.

7.4 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

7.5 Knowledge Review

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

Module 8 MAN-OVERBOARD PROCEDURES

8.1 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.

8.2 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 manoeuvering 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.

8.3 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 manoeuver 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.

8.4 Man Overboard - Sailboats

Despite what other nautical training associations may tell you, there is no one "correct" procedure for rescuing a man overboard while under sail or power.

The following need to be taken into consideration when deciding which procedure is best for you and your crew:

1) Is the person in the water wearing a lifejacket?
2) Is the boat flying a spinnaker?
3) What are the weather conditions?
4) Is it daytime or nighttime?
5) How big are the seas?
6) What is the visibility like?
7) What is the water temperature?
8) How many crew are on deck?
9) How experienced are the crew on deck?
10) Does the sailboat have an auxiliary motor?
11) Has the person been knocked unconscious?
12) Are they wearing survival clothing?
13) How heavy is the victim?

The reasons for this are as follows:

1) If the person is wearing a lifejacket then they will be visible from a distance and less likely to panic, if they are not, reaction time will need to be a lot faster.

2) If the boat is flying a spinnaker, it is imperative that this sail is taken down before anything else happens. This is a very powerful sail and can cause a lot of damage if gybed and it will be very difficult to get back to the person in the water in a timely fashion without removing this sail first.

3) If the weather conditions are reasonably calm it will be much easier to turn the boat around and retrieve the victim, not so in rough conditions.

4) If it is daytime, visibility will be much better than nighttime and easier to spot the victim in the water, if nighttime, reaction time will need to be much faster.

5) If there are big seas with high waves, it is far easier to lose sight of the victim.

6) If visibility is restricted due to fog or heavy rain, it will be much harder to keep the victim in sight.

7) If the water temperature is high (such as Caribbean or Mediterranean), the victim can survive afloat for days. If the water is cold, you will have far less time to react.

8) If you are alone on deck, you will need to get the crew topside immediately to help you.

9) If the crew are experienced and have practiced man overboard procedures, they will be far more likely to respond positively and without delay.

10) If the sailboat has an auxiliary engine, it should be started immediately so as the boat can be maneuvered without the need for sails.

11) If the person has been knocked unconscious, it may be necessary for another crew member to grab a life ring and jump overboard to assist the unconscious person. This will of course depend on water temperature, sea state, visibility, whether they are wearing a lifejacket etc.

12) If the victim is wearing survival clothing, they are less likely to panic and can survive longer in the water.

13) If the victim is an adult and there are only children on board, hauling a wet person back on board can be a very difficult task. If close to shore, it is possible to get the victim to hold on to the side of the boat while you motor into shallow water where the person can stand or get back on board under their own strength.

Getting the victim back onto the deck is another issue, some modern sailboats have a boarding ladder on the “sugar scoop” at the stern which is easy in light weather, however in a heavy swell this could be dangerous as the boat may rise and fall a substantial distance. Winches can be used to recover a man overboard on either a sailboat or powerboat.

FIGURE 8-1 MAN OVERBOARD SAIL – APPOINT LOOKOUT
PHOTO BY JOHN ROUSMANIERE & PHIL COWLEY

FIGURE 8-2 MAN OVERBOARD SAIL - APPROACHING VICTIM
PHOTO BY JOHN ROUSMANIERE & PHIL COWLEY

FIGURE 8-3 MAN OVERBOARD SAIL - TOSS LIFE SAVING FLOAT OBJECT
PHOTO BY JOHN ROUSMANIERE & PHIL COWLEY

FIGURE 8-4 MAN OVERBOARD SAIL - RETRIEVE VICTIM USING LIFESLING
PHOTO BY JOHN ROUSMANIERE & PHIL COWLEY

8.5 Man Overboard – Powerboats

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

FIGURE 8-5 MAN OVERBOARD POWER
PHOTO BY JOHN ROUSMANIERE & PHIL COWLEY

8.6 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.

FIGURE 8-7 WET SUITS

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

FIGURE 8-6 DRY SUIT

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

FIGURE 8-9 IMMERSION SUIT (OR SURVIVAL SUIT)

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

FIGURE 8-8 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.

8.7 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 9 CAPSIZING, SWAMPING AND SINKING

9.1 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.

9.2 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.

FIGURE 9-1 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.

FIGURE 9-2 SWAMPING

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.

FIGURE 9-3 SINKING

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 offer assistance, 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 step up 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.

9.3 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 10 ANCHORS, ANCHORING AND RUNNING AGROUND

10.1 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.

FIGURE 10-1 ANCHOR WITH RODE AND CHAIN

10.2 Anchors and Your Boat

Anchors uses

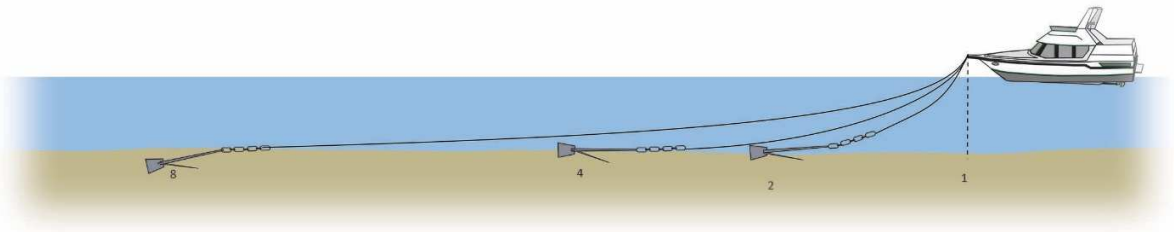
- In event of a breakdown
- During severe weather
- Non-emergencies such as stopping to swim or an overnight stay

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.

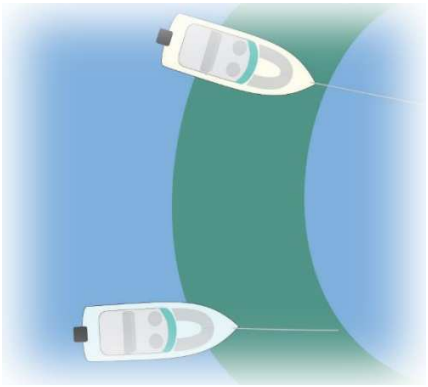


FIGURE 10-2 ANCHOR SWING

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.

This subject will be covered in much greater detail in the IYT Bareboat Skipper Course.

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.

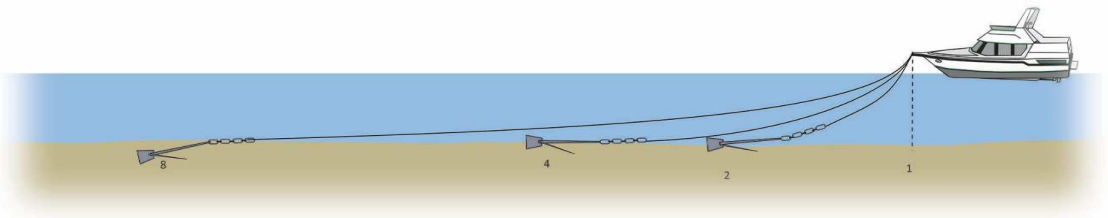


FIGURE 10-3 SCOPE

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

FIGURE 10-4 BEACH ANCHORING

10.3 Laying a Second Anchor

Sometimes it is necessary to lay a second anchor to reduce the swing or yaw of the boat due to tidal stream or strong wind, especially in a confined anchorage (the boat is then technically said to be moored). Unfortunately, not all boats, lie at the same angle in identical conditions. Some will lie more to wind and some more to tidal stream.

One method of laying two anchors is to lead both from the bow, the heaviest one in the direction of the strongest tidal stream and the other in the opposite direction. This method is only suitable for a strong tidal stream with little or no wind. In calm conditions both anchors can be led out over the bow, the heaviest one laid towards the strongest tidal stream.

Anchoring fore and aft is not normally suitable for a small boat as it induces too much strain in a cross-tide or a strong cross wind. In can however be useful in narrow channels.

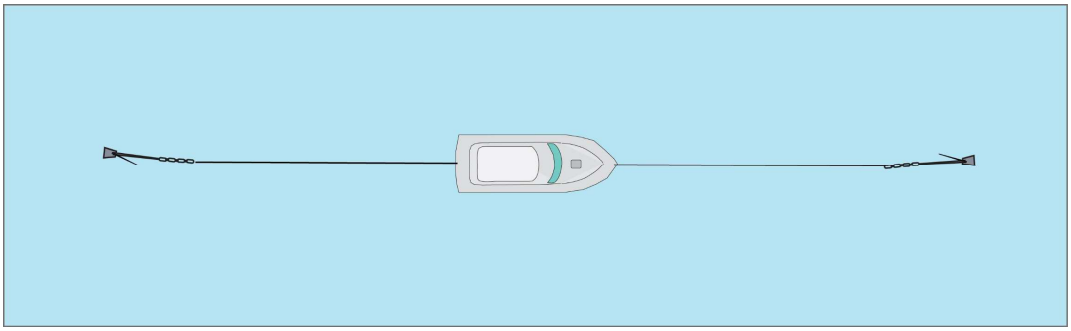


FIGURE 10-5 FORE AND AFT ANCHORING

Another way is to position the two anchors well forward from the bows, with not too wide an angle between them. This method is used when expecting strong winds.

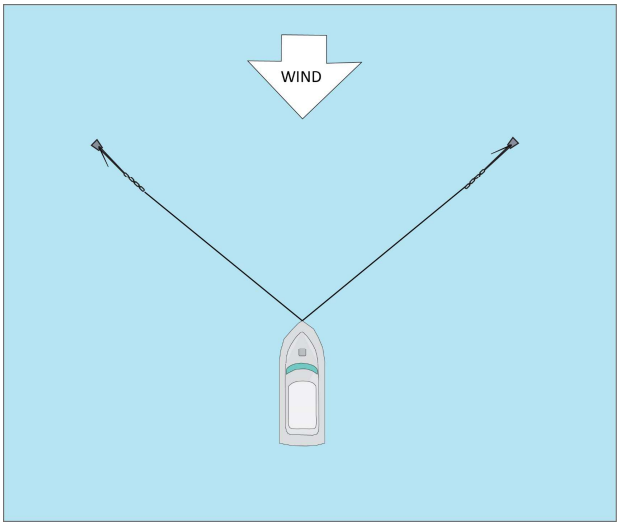


FIGURE 10-6 LAYING SECOND ANCHOR

10.4 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.

10.5 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).

10.6 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 make preparations. 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

10.7 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. When would you lay a second anchor?
10. What is fore and aft anchoring?
11. What does kedging mean?
12. How would you retrieve a fouled anchor?
13. List the problems associated with running aground
14. What safety measures should you take if you run aground?
15. What solutions are open to you if you run aground?

Module 11 RESPONSIBILITIES OF THE CREW, CARE OF THE ENVIRONMENT, PROVISIONING & HOUSEKEEPING

11.1 Key Objectives

THE OBJECTIVE OF THIS MODULE IS TO UNDERSTAND YOUR RESPONSIBILITIES AS A CREW MEMBER, THE EFFECTS OF ALCOHOL, WHEN TO CALL THE SKIPPER, PROTECTING THE MARINE ENVIRONMENT AND PROVISIONING AND HOUSEKEEPING RULES.

11.2 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!

11.3 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.

11.4 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.

11.5 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.

11.6 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.

11.7 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.

11.8 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.

11.9 Knowledge Review

1. What are the effects of fatigue?
2. What are the responsibilities of a navigator/ watchkeeper?
3. When should you call the skipper?
4. List 6 obligations for protecting the marine environment
5. When would you alert the captain of issues he/she should be made aware of?
6. What should you take into consideration when provisioning a boat?
7. What factors would you take into consideration when cooking at sea?
8. Why is it important to have a balanced diet?

TABLE OF FIGURES

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 athwartships 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.

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