Food and Agriculture Organization of the United Nations

Safety at Sea for Small-Scale Fishers

Boat Basics

Training Notes

2022

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ADDITIONAL TRAINER INFORMATION

This additional information is designed to support the presenter of this course.

Additional resources are suggested throughout the document, and it is recommendedthat the trainer utilise these materials in order to gain a sound understanding of the topic.

Trainer Task:
Tasks that are required to be completed by the trainer before the course begins will be included under this title.

Useful resource:

Additional information, resources, and further reading will be included throughout this booklet. It is important for the trainer to take the time to do further reading and become comfortable with the material they are teaching.

Attendee Task:
Role playing, activities and other interactive tools will be suggested under this title. Encouraging open dialogue through the course is essential.

Slides 3 - 8 – Terminology

Term	Meaning
Hull	Body of the boat
Bow	Front of the boat
Stern	Back of the boat
Port	Left side when you're facing the bow
Starboard	Right side when you're facing the bow
Note: there are no right or left sides on the water, only PORT and STARBOARD. These sides are **determined when facing the bow** and are fixed no matter what heading you have.	

Term	Meaning
Beam	Widest point of the hull
Keel	Bottom centre of the boat
Transom	The back section of the boat that connects the port and starboard sides
Gunwale	Raised sides of the boat
Draft	The vertical distance between the waterline and the bottom of the hull
Propeller	A rotating device paired with the engine to propel the boat through water

Term	Meaning
Inboard	Engine mounted within the hull
Outboard	Engine mounted on the outside of the transom
Rudder	Primary control surface under water that controls steering
Tiller	Horizontal bar attached to the rudder post and used for steering
Steering Wheel	Control mechanism attached to the rudder post and used for steering
Super Structure	Additional structure on top of the vessel
Single screw	Boat with one propeller
Twin screw	Boat with two propellers

Term	Meaning
Going ahead / headway	In a forward's direction
Forward	Towards the front of the boat
Going Astern / Sternway	Behind the boat or going backwards
Aft	At, near or towards the back of the boat
Thrust	Force of the boat moving through the water

Useful resource: https://www.boatsafe.com/boating-glossary-terms/

Slides 9 – 12 - Propellers

A propeller is a machine that moves you through a fluid (liquid or gas) when it turns. They work in the same way as a screw. To push a screw into a wall, you apply a turning force onto the head of the screw. The spiral groove on the screw converts this turning force into a pushing force – which drives the screw into the wall.

Propellers usually have two to four twisted blades poking out at different angles from a central hub / shaft which is spun around by an engine or motor. Just like a screw, the angles of the blades (or spiral grooves) will determine how quickly it will move forward when pressure is applied.

Useful resource: http://www.killcaremarina.com.au/commonly-asked/61-about-propellers

The rotation of the central shalt creates the torque (or energy) to turn the blades of the propeller. The rotation of the blades causes the boat to move forward through the water which is referred to as thrust. As highlighted – the number, shape and positioning of the blades will determine how much thrust can be generated.

Propellers can be either left or right handed. When viewed from the aft, a right handed propeller will rotate clockwise, while a left handed propeller will rotate anti clockwise. Most single engine boats have a right hand propeller on them.

Propellers do tend to rotate on its vertical axis in addition to the forward or backwards motion. Understanding this additional motion is essential when manoeuvring in small spaces.

When moving forward, right handed propellers will push the stern of the boat to the starboard (therefor pushing the bow to port) creating an anticlockwise motion unless the motion is corrected. A left hand propellers will produce greater thrust to the port side at the stern, creating a clockwise motion.

When moving in reverse, the effect is opposite and much greater.

All propellers rely on a smooth flow of water for maximum efficiency.

The direction of the vessel travel is controlled depending on the type pf engine. Outboard engines are a solid unit that can be rotated – simply put – the direction of the engine will determine the direction of travel.
Inboard engines rely on the use of a rudder- a vertical blade like appendage that is placed in the centre of the discharge flow. The current of water rushing by produces pressure on the rudder blade which controls the directing of the boat moving in the water.

Rudders are only effective when the boat moves through the water.

Useful resource: https://www.tor.cc/articles/propwalk.htm

Slides 13 – 19 - Handling

Understanding how their boat handles in the water is essential for any captain and crew. Multiple factors will effect the way in which a vessel handles, such as:

- The type of hull the vessel has
- The wind and weather conditions
- The currents the vessel is exposed to

Hull Types

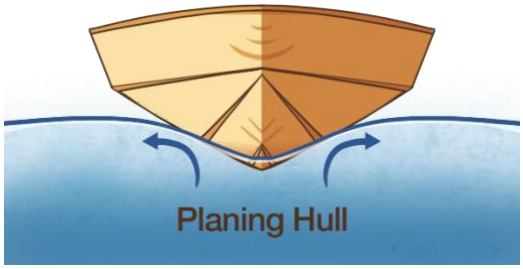
There are two basic hull types:

Displacement Hulls

Boats with displacement hulls move through the water by pushing the water aside and are designed to move with very little propulsion.

- When the boat is in the water, some water is displaced to make way for the boat. If you could weight that water, it would equal the weight of the boat.
- When loaded, sets low in the water.
- Used in vessels that travel at lower speeds.
- Usually used in load carrying vessels
- More stable.

Planing Hull:



Boats with planning hulls are designed to rise up and glide on top of the water when enough speed is supplied.

- When stationary or traveling at low speeds, these will act as displacement hulls.
- When enough power is supplied, they will rise to the surface of the water and glide across it.
- Most small power driven vessels have planing hulls which allow them to travel more rapidly.
- Less stable

Useful resource: https://www.topnotchmarine.com/boat-hull-types/

Useful resource: https://www.boaterexam.com/boating-resources/boat-hull-types-designs.aspx

Wind and weather conditions

- Flat bottomed / planing hulls handle well in light winds, but will struggle in anything more.
- Planing hulls handle less comfortably in rough weather due to sitting on top of the water and being susceptible to the force of the wind.
- Displacement hulled vessels are less affected by wind, but due to their low speed capability, they are less agile, so may not be able to zig zag around breaking waves.
- Displacement hulls handle more comfortably in rough weather.

Currents

It is important to understand the different factors that influence the movement of the water the vessel will operate in.

The **tide** is the flow of sea water in to and out of shore, due to the pull of gravity and the moon.

A **current** is a horizontal flow of water through the ocean.

Currents are determined by a number of factors such as:

- The wind
- Water density
- Water temperature
- The tides
- Sea floor features
- Earth rotation

All currents have a **set** and a **drift**. Set is the true direction towards which the current flows, and the drift is the speed at which it flows. Both of these will affect the handling of the vessel and the speed at which it is able to travel.

Handling characteristics

The way a boat handles will therefor be determined by the design of the vessel, and the conditions both above and below the vessel.

Key points include:

- The deeper the draft (such as in the case of a displacement hull) the more effect from the current.
- The effect of the current is greater than the effect of the wind on displacement hulls. Water is denser than air – so a half knot cross current may have more effect on a displacement hull than a 15 – 20 knot wind.
- The more structure above the water, the more effect from the wind.
- The effects of the wind is greater than the current on planning hulls.

Attendee Task:

In small groups, draw a diagram to demonstrate your understanding of the effects of currents and wind on planing vs displacement hulls. Take turns to explain your diagrams to the group.

Slides 20 - 25 – Mooring Lines, Fenders and Anchoring

Mooring Lines

Bow to Stern Mooring Table

Term	Meaning
Bow Line	Stops the bow from moving backwards
Bow Breast	Stops the bow from moving outward from the dock.
After Bow Spring	Stops the boat from moving forward.
Forward Stern Spring	Stops the boat from moving back.
Stern Breast	Stops the stern from moving out from the dock.
Stern Line	Stops the stern from moving forward.

Fenders

Boat fenders are objects that are hung over the vessels side, designed to protect the hull from impact.

For larger vessels, the specifics of what number and type of fenders are required are more complex, but for smaller vessels, the requirements are less specific.

- Ball fenders and cylindrical fenders are the most common types.
- Cylindrical / long fenders offer great versatility and can be used both vertically and horizontally.
- Ball fenders provide point of impact protection and rolls easily to move the point of contact along with the hull.
- The general rule of thumb is – boats smaller than 10m require 2 fenders for each side, while boats over 10 meters should have 3-4 fenders per side.

Useful resource: https://www.anchoring.com/blogs/anchoring/how-to-choose-the-best-boat-fender-type-number-location-and-more

Anchoring

Anchors are designed to dig into the sea bed and hold a boat in position. This allows crew to temporarily secure the vessel and prevent it from drifting into rocks or the shore, or moving away from the desired area.

Anchors work by penetrating the surface of the seabed, creating suction. In some cases it may be necessary to ‘set’ the anchor, by applying tension to the anchor rope (This is done by putting the vessel in reverse) causing the anchor to dig deeper into the seabed.

In normal situations however, the following guidelines can be applied:

- When anchoring, lower the anchor to the bottom and let the vessel go astern until enough line is let out.
- Sufficient line is normally three times the depth of the water. Increasing to five times in bad weather.
- Always anchor by the bow. Anchoring a small boat (or vessel not equipped for it) by the stern can cause the vessel to flood.
- There should always be a length of chain between the anchor and the anchor line – this cushions the vessels motion, helps the flukes to dig in to the sea bed and prevents the anchor line chafing on the bottom.
- Consider tides, winds (and possible wind changes) and the amount of room required to keep the vessel away from hazards.
- Always ensure the anchor line is attached to the boat before dropping the anchor.

Securing lines

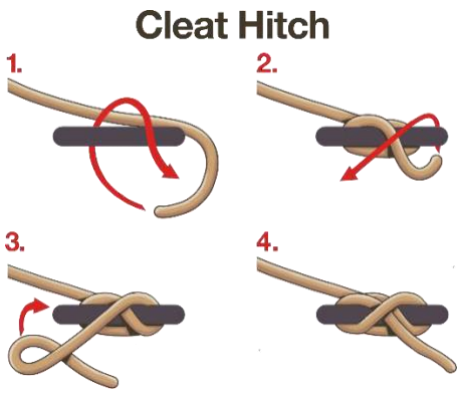
There are many types of knots that can be used when securing your vessel to the dock (or anything else), but knowing which knot to use in different situations can be beneficial.

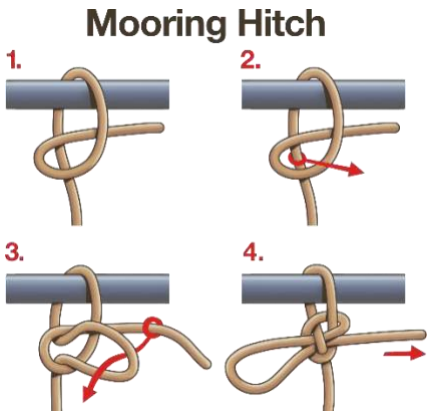
Useful resource: https://www.netknots.com/rope_knots/boating-knots

Basic boating knots include the **Cleat hitch** and the **Mooring Hitch.**

The cleat hitch is one of the most utilized mooring knots, making it quick and easy to secure the vessel to a cleat on a dock.

The mooring hitch is a great temporary knot. It holds fast under load but can be released instantly at the pull of the free end.





Trainer Task:

Source the material needed to practise various knots in the session. This could include blocks of wood with cleats attached, poles or sticks to tie things too, and lengths of rope.
Practice the knots so you are familiar with tying them and demonstrating how to tie them.

Attendee Task:

Using material provided by the trainer, practice tying both types of knot.
Are there other knots you frequently use? Discuss the pros and cons of each technique and demonstrate the method used to tie them to the class.

End of Session Worksheet

Answer the following questions by circling the correct answer.

If you do not understand any of the questions, please ask your trainer for clarification.

1. Which is your PORT side?
a. Your right side
b. Your right side when facing the bow
c. Your left side
d. Your left side when facing the bow

2. Thrust can be defined as:
a. a boat with two propellers
b. an engine mounted on the outside of the transom
c. the force of the boat moving through the water
d. behind the boat or going backwards

3. Which of the following influence how much thrust a propeller can create?
a. size of the blades
b. shape of the blades
c. number of blades
d. all of the above

4. Most single engine boats have
a. right handed propellers
b. left handed propellers

5. Unless corrected, when moving forward, a right handed engine will produce
a. a clockwise motion
b. an anticlockwise motion
c. a straight line.

6. The following are characteristics of a displacement hull
a. sits high in the water when loaded, displaces water, usually slower.
b. sits on top of the water, more stable, faster
c. sits on top of the water, less stable faster
d. sits low in the water, slower and more stable.

7. Which of the following has a greater effect on planing hulled vessels.
a. the wind
b. the current

8. The action of the after bow spring line is:
a. to stop the boat moving backwards
b. to stop the boat moving outward from the dock
c. to stop the boat moving forward.

9. How many fenders are recommended for smaller vessels under 10m?

a. as many as possible
b. two fenders each side.
c. one ball and cylindrical fender
d. 3-4 fenders per side

10. Which of the following knots can be released instantly with the pull of the free end?

a. A mooring hitch
b. A cleat hitch.