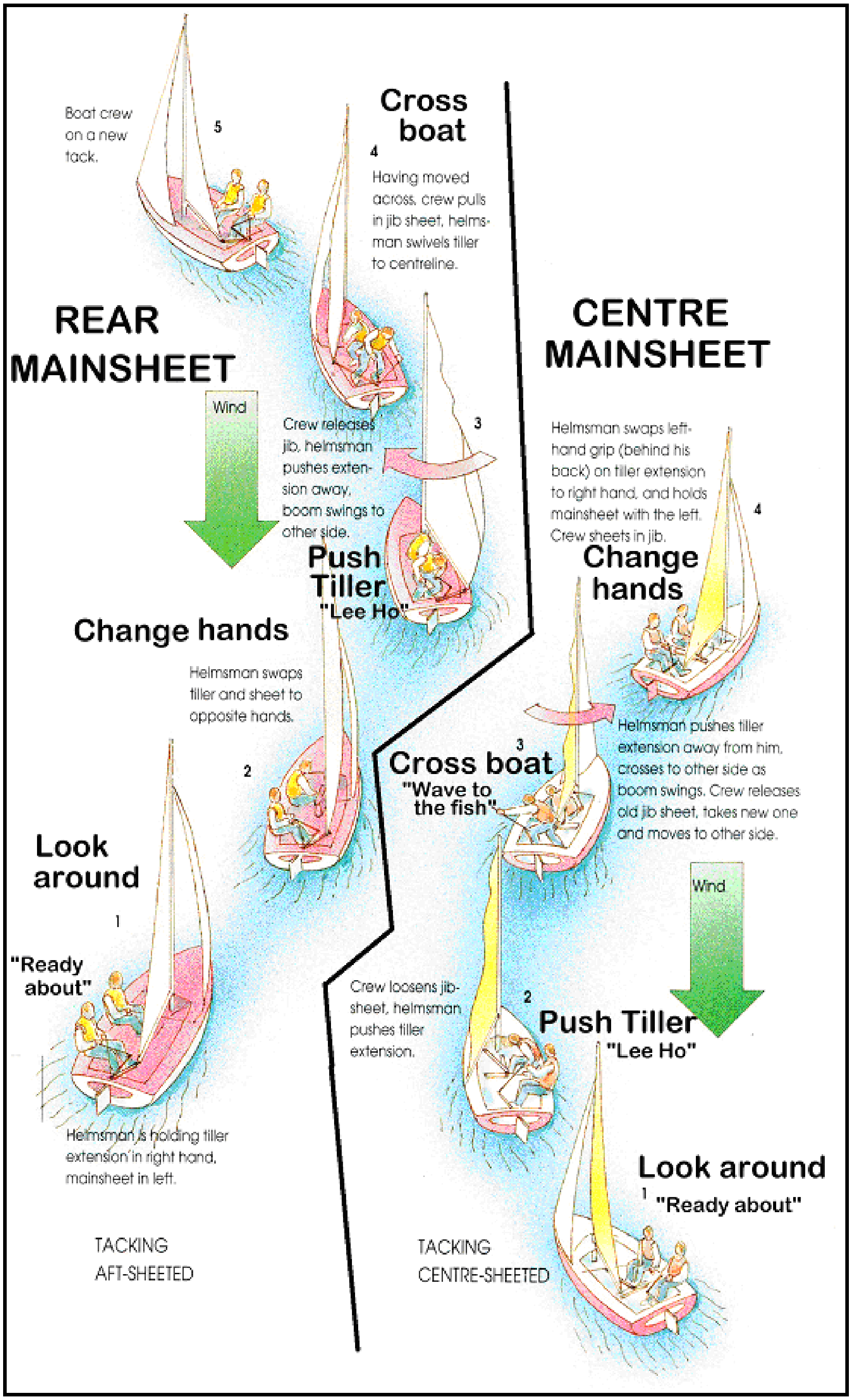
RYA Courses

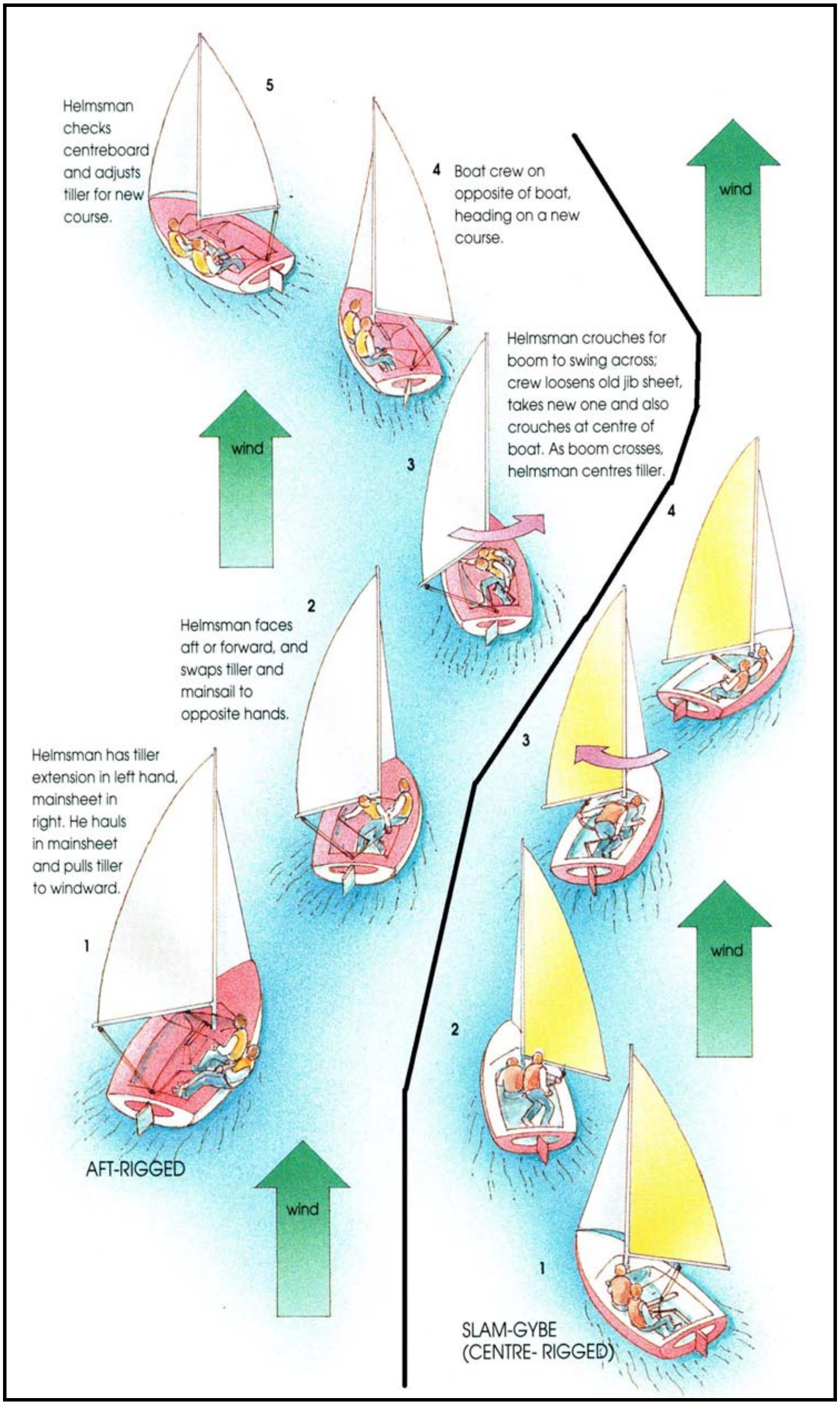
Training Resources

2007

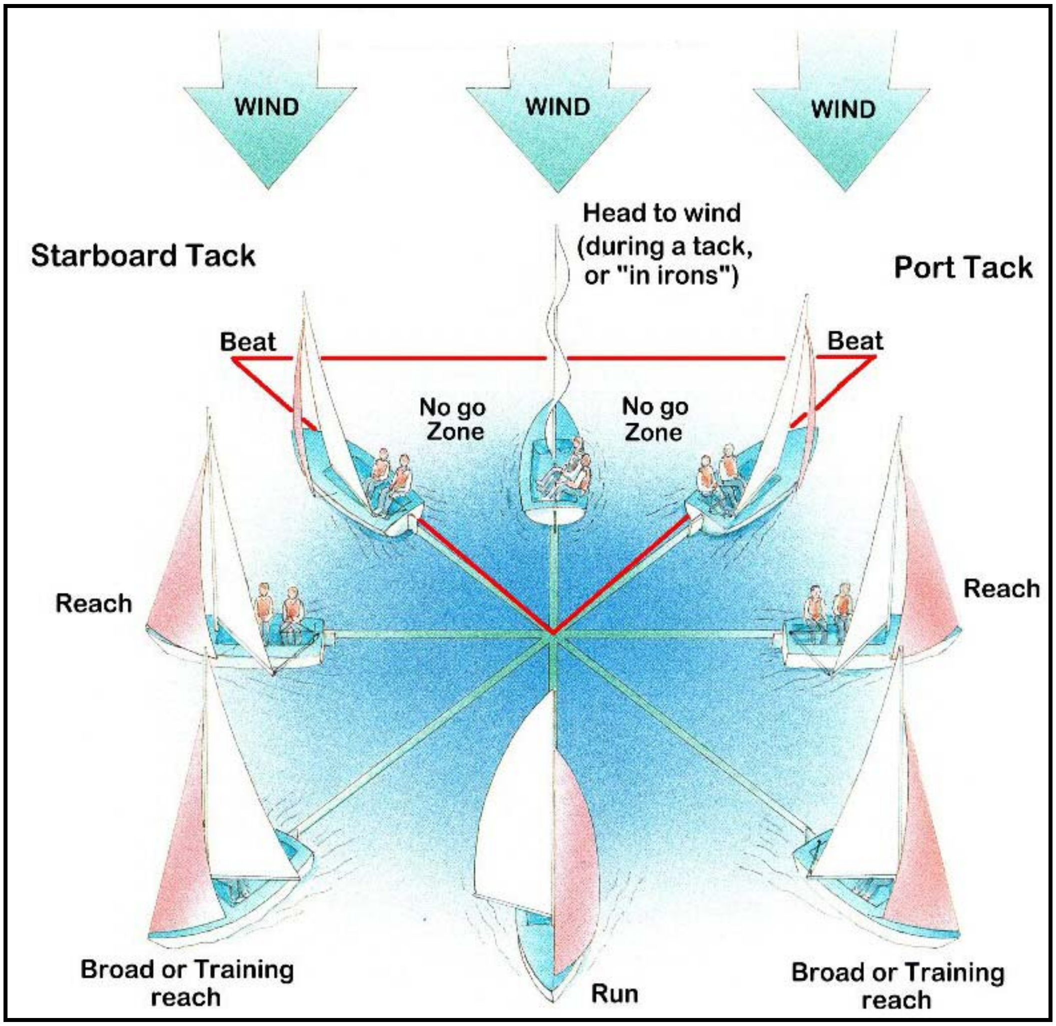
1 TACKING


REAR MAINSHEET
Boat crew on a new tack.
5
Cross boat
4
Having moved across, crew pulls in jib sheet, helmsman swivels tiller to centreline.
Wind
Crew releases jib, helmsman pushes extension away, boom swings to other side.
3
Push Tiller
"Lee Ho"
Change hands
Helmsman swaps tiller and sheet to opposite hands.
2
Look around
1
"Ready about"
Helmsman is holding tiller extension in right hand, mainsheet in left.
TACKING AFT-SHEETED
CENTRE MAINSHEET
Helmsman swaps left-hand grip (behind his back) on tiller extension to right hand, and holds mainsheet with the left. Crew sheets in jib.
4
Change hands
Helmsman pushes tiller extension away from him, crosses to other side as boom swings. Crew releases old jib sheet, takes new one and moves to other side.
3
Cross boat
"Wave to the fish"
Wind
Crew loosens jib-sheet, helmsman pushes tiller extension.
2
Push Tiller
"Lee Ho"
Look around
1
"Ready about"
TACKING CENTRE-SHEETED

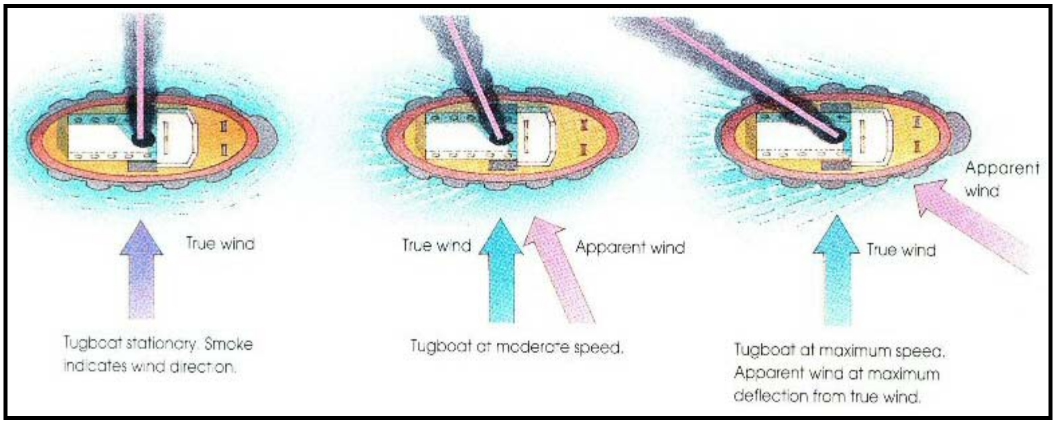
2 GYBING


5
Helmsman checks centreboard and adjusts tiller for new course.
4 Boat crew on opposite of boat, heading on a new course.
wind
Helmsman crouches for boom to swing across; crew loosens old jib sheet, takes new one and also crouches at centre of boat. As boom crosses, helmsman centres tiller.
wind
3
4
2
Helmsman faces aft or forward, and swaps tiller and mainsail to opposite hands.
3
Helmsman has tiller extension in left hand, mainsheet in right. He hauls in mainsheet and pulls tiller to windward.
wind
1
2
AFT-RIGGED
wind
1
SLAM-GYBE (CENTRE- RIGGED)

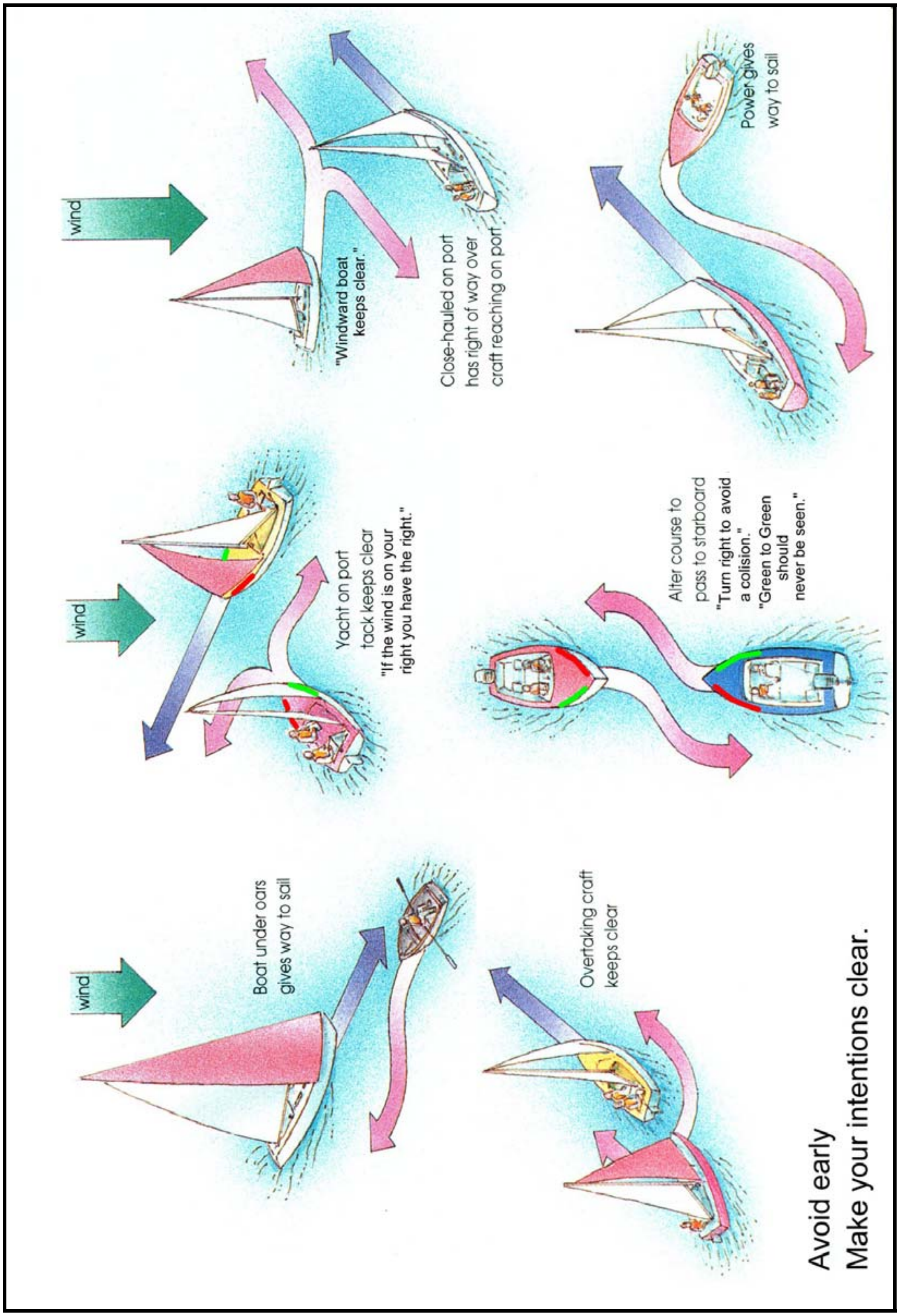
3 Points of Sailing



4 Apparent Wind



5 RULES OF THE ROAD



6 KNOTS

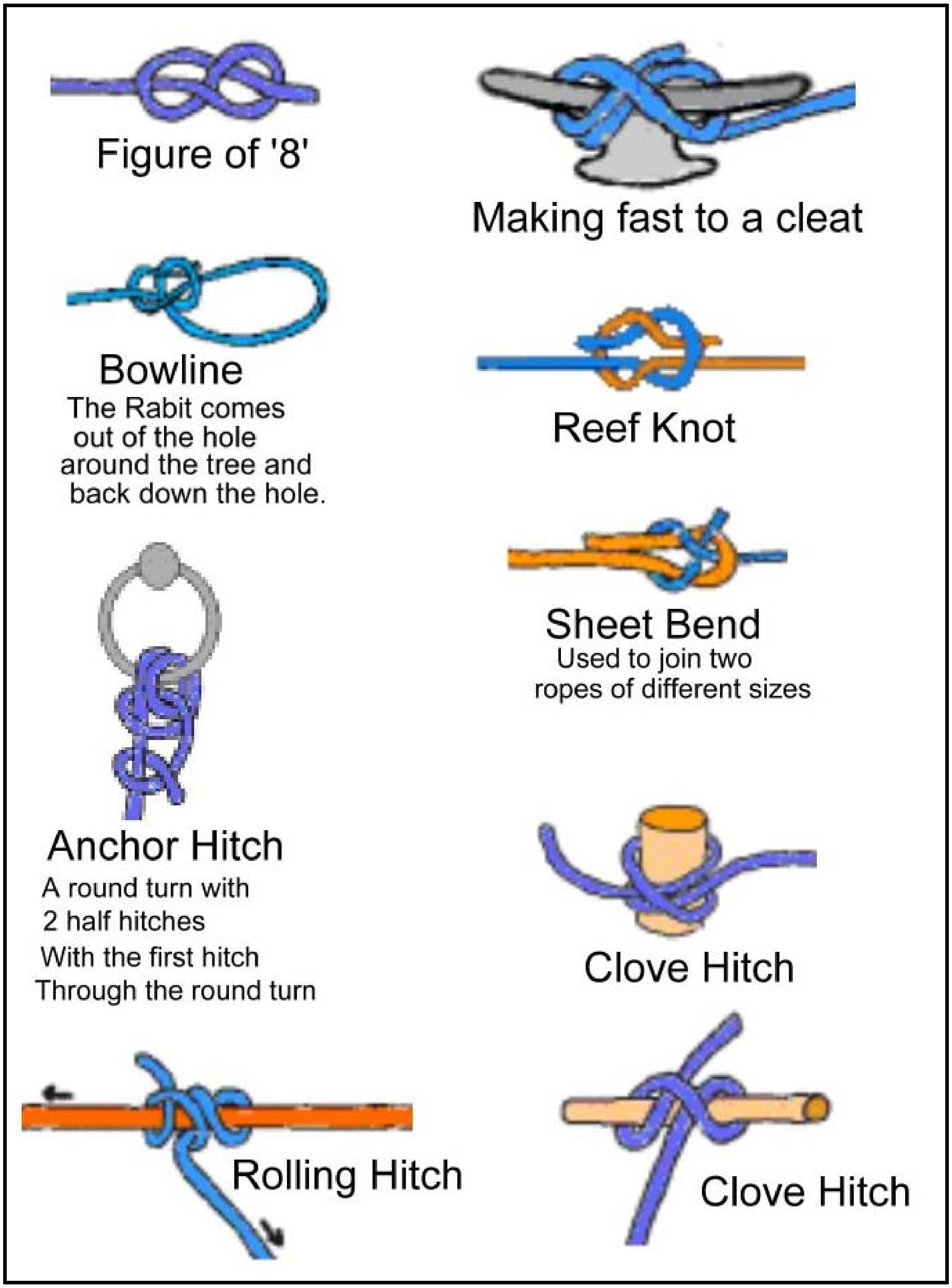


Figure of '8'
Making fast to a cleat
Bowline
The Rabit comes out of the hole around the tree and back down the hole.
Reef Knot
Sheet Bend
Used to join two ropes of different sizes
Anchor Hitch
A round turn with 2 half hitches
With the first hitch Through the round turn
Clove Hitch
Rolling Hitch
Clove Hitch

7 BOUYAGE

3.2 IALA BUOYAGE

IALA Buoyage System (Region A)

International buoyage is harmonised into a single system (region A includes all of Europe).

(1) **Lateral Marks**: are used in conjunction with a direction of buoyage, shown by a special arrow on the chart. Around the British Isles the general direction is from SW to NE in open waters, but from seaward when approaching a harbour, river or estuary. Where port or starboard lateral marks do not rely on can or conical buoy shapes for identification, they carry, where practicable, the appropriate topmarks. Any numbering or lettering follows the direction of buoyage, evens to port and odds to starboard.

In Region A, port-hand marks are coloured red, and port-hand buoys are can or spar shaped. Any topmark fitted is a single red can. Any light fitted is red, any rhythm. Starboard-hand marks are coloured green, and starboard-hand buoys are conical or spar shaped. Any topmark fitted is a single green cone, point up. Any light fitted is green, any rhythm. In exceptional cases starboard-hand marks may be coloured black.

Port Hand marks
Light: red
Rhythm: any

Navigable channel

Direction of buoyage

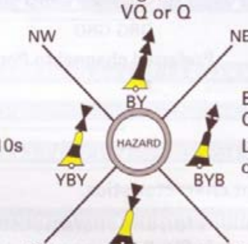
Starboard Hand marks
Light: green
Rhythm: any

(2) **Cardinal marks**: are named after the quadrant in which the mark is placed, in relation to the danger or point indicated. The four quadrants (north, east, south and west) are bounded by the True bearings NW-NE, NE-SE, SE-SW and SW-NW, taken from the point of interest. The name of a cardinal mark indicates that it should be passed on the named side. For example, a NCM (situated in the quadrant between NW and NE from the point of interest) should be passed on its north side; an ECM on its East side, and so on.

A cardinal mark may indicate the safe side on which to pass a danger, or that the deepest water is on the named side of the mark, or it may draw attention to a feature in a channel such as a bend, junction or fork, or the end of a shoal.

Their lights are white, and are either VQ or Q. VQ lights flash at a rate of 80 to 159 flashes per minute, usually either 100 or 120, and Q flash at a rate of between 50 to 79 flashes per minute. A long flash is one of not less than two seconds duration.

NORTH CARDINAL
Light:
VQ or Q



WEST CARDINAL
Light: VQ (9) 10s or Q (9) 15s

EAST CARDINAL
Light: VQ (3) 5s or Q (3) 10s

SOUTH CARDINAL
Light: VQ (6) + L Fl 10s or Q (6) + L Fl 15s

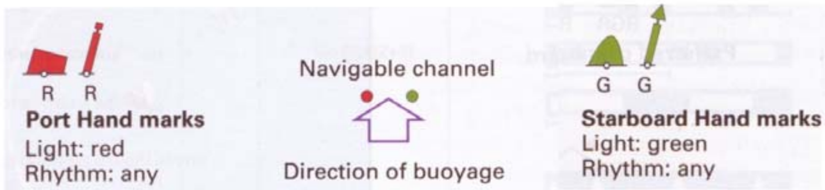
(3) **Isolated danger marks**: are placed on or above an isolated danger such as a rock or a wreck which has navigable water all around it. Any light is white, flashing twice.

(4) **Safe water marks**: indicate that there is navigable water all round the mark, and are used for mid-channel or landfall marks. Buoys are spherical, pillar with spherical topmark, or spar shaped, and are coloured with red and white vertical stripes. Any topmark fitted is a single red sphere. When lit, any light is white – either occulting, isophase, or Morse code (A), or showing a single long-flash every 10 seconds.

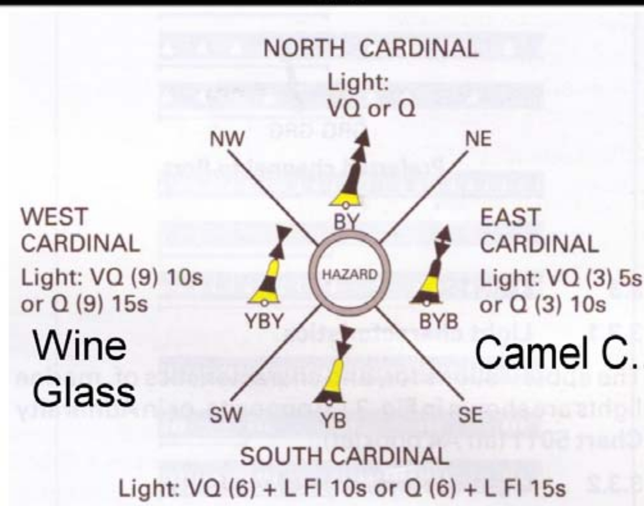
(5) **Special marks**: do not primarily assist navigation, but indicate a special area or feature (e.g. spoil grounds, exercise areas, water-ski areas, cable or pipeline marks, outfalls, Ocean Data Acquisition Systems (ODAS), or traffic separation marks where conventional channel marks may cause confusion). Special marks are yellow, and any shape not conflicting with lateral or safe water marks. If can, spherical or conical are used they indicate the side on which to pass. Any topmark fitted is a yellow X. Any light fitted is yellow, and may have any rhythm not used for white lights.

New dangers (which may be natural obstructions such as a sandbank, or a wreck) are marked in accordance with the rules above, and lit accordingly. For a very grave danger one of the marks may be duplicated.

8 COSTAL BUOYAGE



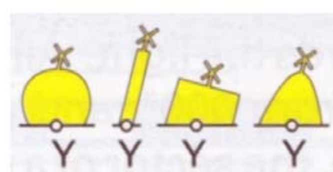
In Europe the convention is to buoy as entering the port.
Be careful in some places the direction changes i.e. In the Menai Straigts where the direction of buoyage reverses at Caernarfon.
Also in America & the Caribean the buoyage direction is reversed. It is best to check.



The Black section shows where the points are

Isolated Danger

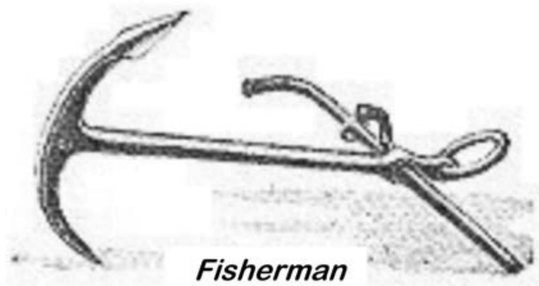
Safe Water



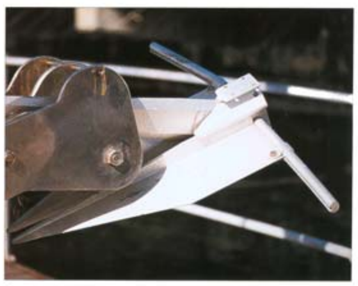
Special Marks

9 ANCHORS

Plough (CQR)



Fisherman

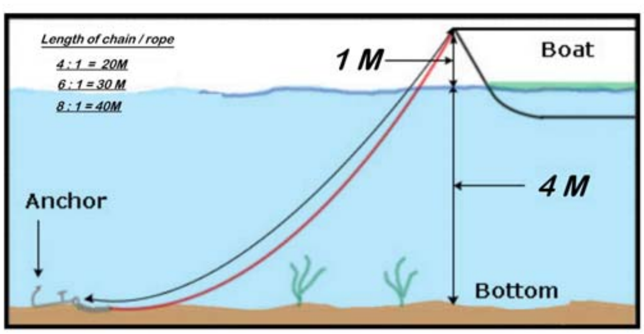


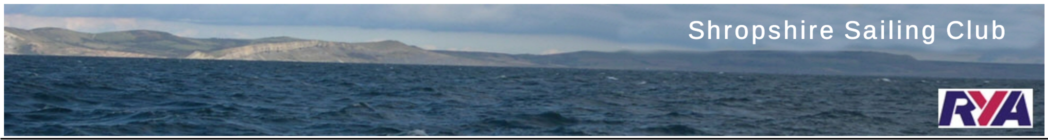
Danforth

Mushroom

Bruce

Grapple





10 COLD WATER IMMERSION

Cold water immersion has an immediate and severely debilitating effect on the body. Cold water shock results in a variety of problems, predominant among these is gasping for air. This can result in the inhalation of water and subsequent choking. Additional effects include loss of coordination, muscle spasm, disorientation, hyperventilation, and even possible cardiac arrest. Any of these effects can make it difficult, sometimes impossible for a sailor to swim. Cold water immersion is often a sudden, serious, and potentially deadly situation.

It seems that many sailors just don't realize how cold the water they are sailing in really is, or how quickly they can succumb to its effects. Generally speaking, immersion in water with a temperature of less than 10°c can produce the effects noted above.

10.1 Cold Shock

Cold shock occurs when rapid cooling of the skin triggers a cluster of heart and breathing responses. The cardiac responses include an increase in heart rate of 40 -50%, and an increase in cardiac output of 60 - 100%, which combined with vasoconstriction of the extremities results in an average blood pressure increase to 175/93. Although a substantial strain on the heart, these changes are not likely to be a problem for a healthy, fit person but may be dangerous for those with underlying heart disease or hypertension (there have been cases of apparently near instant cardiac arrest on cold water immersion).

10.2 !!Gasp!!

Sudden immersion in cold water results in an involuntary (that means you can not stop it, and yes, that means all of us) gasp, followed by 1 - 3 minutes of involuntary (yes, that still means all of us) hyperventilation. Specific data are: 2.0 litre gasp in 26°c water and 3.0 litre gasp in 10°c water (i.e. nearly your entire lung volume), and in 10°c water a 600 - 1,000 percent increase in ventilation (air in and out) in the first minute. This hyperventilation results in a profound lowering of blood carbon dioxide levels and raising of blood pH levels, which causes a large risk of ventricular fibrillation ("cardiac arrest"), muscular tetany (cramps), and cerebral vasoconstriction which starves the brain of oxygen, causing disorientation and confusion.

These effects, coupled with changes in lung mechanics caused by the pressure of water on the abdomen and chest result in subjective feelings of inability to breathe and panic typically lasting 1 - 3 minutes. Most importantly for survival of a capsized dinghy sailor is a sharp reduction of maximal breath holding, for example - in one study from a mean of 45 seconds pre-immersion to a mean of 9.5 seconds on immersion in 41o water, with one subject averaging less than one second breath holding upon immersion. It is easy to see how these effects of gasp, hyperventilation, and impaired breath holding would result in prompt catastrophe upon a fall into choppy water or a capsize.

10.3 How cold is cold water?

Not, apparently, all that cold. The maximal hyperventilation response is reached at , and near maximal gasp was reached at 11°c. These are summertime water temperatures in some of the Northeast, and at the beginning of the season temperatures can easily have fallen to 5 ° c by March. This information is not meant to scare people, but to caution them.

10.4 First, buy some protection

No, not that protection, this is about Safe Sailing, not Safe S*x, but wearing the right stuff can still make a big difference. That means a wetsuit or drysuit. Protecting the front of the torso and back of the chest will have the most profound effect on moderating the respiratory responses, while protecting the extremities has the greatest benefit in moderating the cardiac responses. Most of these responses are worsened by head immersion, which also markedly hastens the progression of hypothermia (if you manage to survive the cold shock), so head protection is important. Since both cold shock and later hypothermia inhibit effective swimming, wearing a buoyancy aid is essential to keeping the head out of water and prolonging survival.

10.5 Make mine dry, very dry

In the wetsuit/drysuit debate I readily admit that I am a dry suit chauvinist, finding a drysuit much more comfortable. For the prevention of cold shock a well fitting wetsuit will be more than adequate, provided it is truly well fitting and substantially slows the contact of cold water with your torso. If loosely fitting, with overgenerous neck and arm openings there may still be a sufficient gush of frigid water to trigger these cold shock responses. Even with a well fitted wetsuit many find that first cold water flush unpleasant, and for long term survival in cold water a drysuit with appropriate insulation can be 2 -3 times more effective in staving off hypothermia.

11 TIDES

The tides are driven by Gravity – The force discovered by Isaac Newton, he said that there is an attractive force between two masses the size of this force is linked to the distance between them and their masses. So if you put two children on a lake in two toppers they will be drawn together by an invisible force until they collide.

The earth is a huge mass we are smaller masses but quite close together so the force for us is quite strong. Us, apples, toast, rain etc. are all pulled towards the ground.

There are two other large masses that we see regularly; the Moon a large lump of Rock and the Sun a very large ball of hot burning gasses. These although a long way also exhibit a force, too small for us to feel but enough to drag the huge mass of the oceans about, we see this as tides. The amount the tides move varies between the big or spring tides when the moon and the Sun are both pulling in the same direction and small or Neap tides when they are pulling at right angles. See the Diag.

11.1 Where are you most likely to come across tides? On the sea.

In the morning you pull your boat a small distance down the beach and off you go, when you get back the tides gone out and you have to drag your boat miles up the beach or conversely when it's the other way around and the tide has come in and your launching trolley has floated off.

11.2 How do you know how high the tide's going to come up the beach?

If you look along a beach you can usually see a faint line between hard & soft sand (not so easy on a shingle beach) often with bits of seaweed & wood along it. This line can indicate where the last high tide reached, but as I have said tides get bigger & smaller so you may know where the last high tide came to but that's gone you really need to know where the next one will be. The best bet is to invest in a local tide table, these can usually be bought locally, are posted on notice boards (most sea based sailing clubs publish them in their sailing programmes,) from these you can get the time of high and low water and the size of tide, this is either published as a height at low and high water or just a single figure the height of high water, by looking at these you can tell if the tides are getting bigger or smaller and the time of high water.

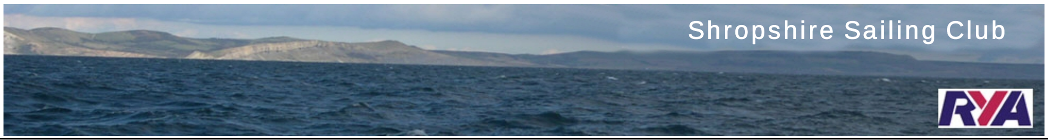
The best thing in a new area is to be with your boat at high tide then you know where the tide reaches, it is possible to calculate the height the tide will reach but this is quite complicated and not easy to judge on a sloping beach. I cover that further on. I tend to make sure my boat is pulled up beyond those around me and I will pull it further up if a strong onshore wind blows up.

11.3 Do not rely on the "Oh well it did not reach my boat last night" approach.

Do not have your boat closest to the water for a quick get away in the morning, you may find that in the morning it has wondered off on an adventure or more usually the launching trolley is buried.

When the tides are increasing rapidly they can come as much as 0.5 meters higher especially if backed up by a fresh wind and low pressure. 0.5 meters more height can move the high tide a long way up the beach. A surprising number of people get court out.

During sailing events you can usually tell the lake sailors they often leave there boats very near the high tide mark – less distance to pull them in the morning, and often are surprised to find their boats have nearly floated off in the night.



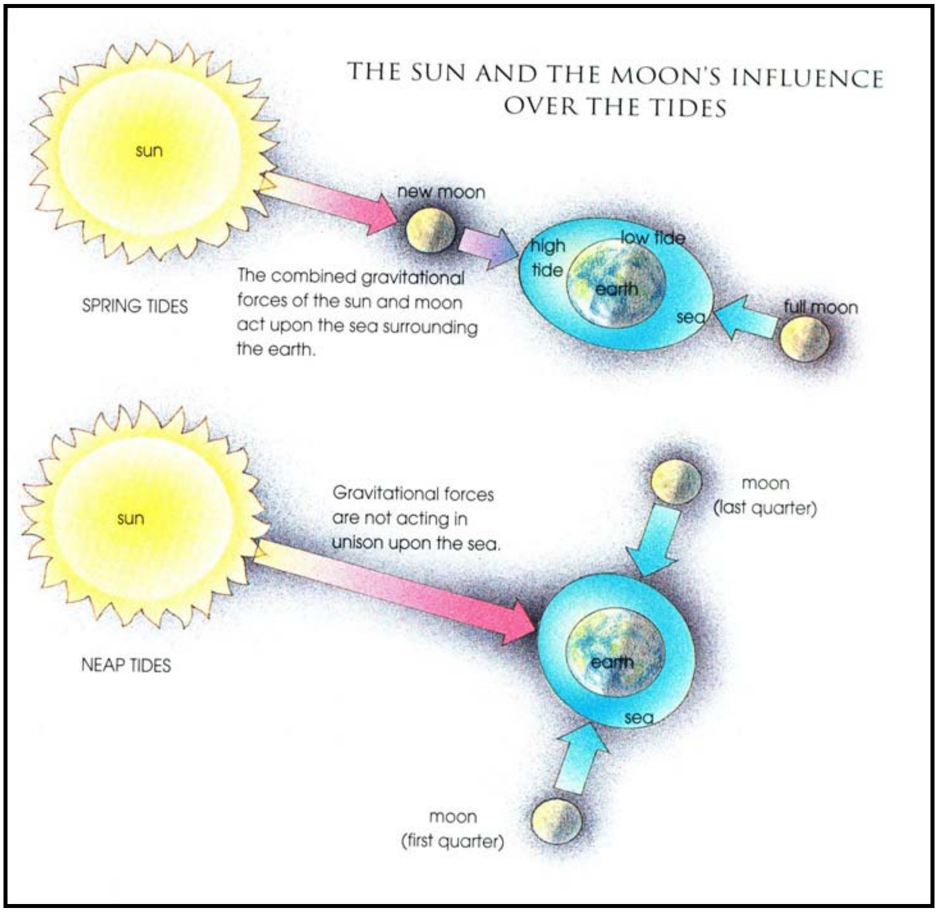
Also if there is an area where no other boats are left I would suggest you don't leave yours there, there usually is a reason!

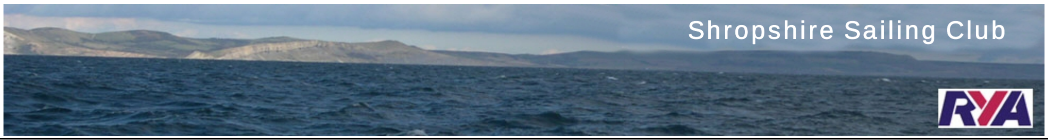
In the same way the tides need to be taken into account when anchoring. Imagine you come in and anchor near high tide, row ashore & come back several hours later to find the boat aground or bumping on the bottom. The other situation can also happen. You come in near low tide and anchor your boat which draws 2 meters with 1 meter of water under the keel then let out 4 X the depth of water 12 Meters of Chain, pull up on the anchor in & check it's holding, retire to the sailing club for a shower and then a drink in the bar. Three hours later the water has risen by 2.5 meters. The boat is now in 5.5 meters of water, you do not have enough chain / rope out and the boat is slowly heading out to sea. So when anchoring consider the depth of water and look ahead to what it will be, ensure you have enough anchor rope / chain out to accommodate the variation in depth and that you should not run aground.

11.4 Tidal Flow / Currents

Further points for consideration are tidal flows and currents this can be huge subject in general the current leads the tidal level. So when the tide comes up that water must come from somewhere. This is called the Flood current when it goes down it must go away somewhere this is called the ebb current. Information on this is often available on local charts or from local people. On a calm still days you can watch the current on moored boats as the current turns you can see the boats turn around pointing into the tide, it can be fascinating to watch. It is also visible when sailing past moorings and moored boats.

Very much in general the current usually turns about an hour to an hour & half before the tide. The current usually turns by the shore first. The current in the middle of a bay is less than at headlands.





12 TIDAL CALCULATION

When you need to enter or leave a harbour or estuary it is often necessary to cross a very shallow area this may be a sand bar, rocky shelf or a Sill or ledge. To do this safely the tide needs to be taken into account.

For all the ports in the UK there is tidal information available these are tide tables & tidal curves a good source of these are the nautical Almanacs, other information that you need is a current up to date chart and a pilot book for that area of coast is very handy.

12.1.1 The chart:

Gives you the position information for the channel and the predicted depth of water at the bottom of the lowest tide (Chart Datum).

12.1.2 The tide tables:

Tell you the time of High & low Water and the amount of water you could expect above that shown on the chart at High and low water.

12.1.3 The tidal curves:

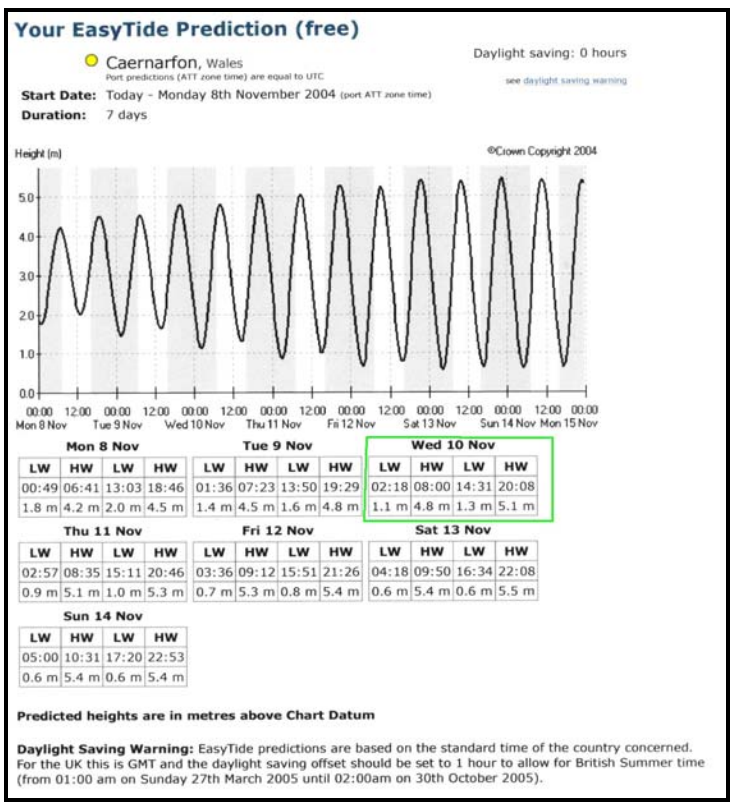
These show the profile of the rising and falling tide. Please see the diag.

12.1.4 The pilot book:

Can advise you on any local anomalies like unexpected currents good anchoring areas etc. From these you can calculate safe times to cross an obstruction.

12.2 As an example:

I am sailing to Caernarfon and would like to get in on the morning of Wednesday the 10th November 2004. To cross Caernarfon Bar I need 2.5 meters over chart Datum.



Your EasyTide Prediction (free)

Caernarfon, Wales
Port predictions (ATT zone time) are equal to UTC

Daylight saving: 0 hours
see daylight saving warning

Start Date: Today - Monday 8th November 2004 (port ATT zone time)
Duration: 7 days

Mon 8 Nov

LW	HW	LW	HW
00:49	06:41	13:03	18:46
1.8 m	4.2 m	2.0 m	4.5 m

Tue 9 Nov

LW	HW	LW	HW
01:36	07:23	13:50	19:29
1.4 m	4.5 m	1.6 m	4.8 m

Wed 10 Nov

LW	HW	LW	HW
02:18	08:00	14:31	20:08
1.1 m	4.8 m	1.3 m	5.1 m

Thu 11 Nov

LW	HW	LW	HW
02:57	08:35	15:11	20:46
0.9 m	5.1 m	1.0 m	5.3 m

Fri 12 Nov

LW	HW	LW	HW
03:36	09:12	15:51	21:26
0.7 m	5.3 m	0.8 m	5.4 m

Sat 13 Nov

LW	HW	LW	HW
04:18	09:50	16:34	22:08
0.6 m	5.4 m	0.6 m	5.5 m

Sun 14 Nov

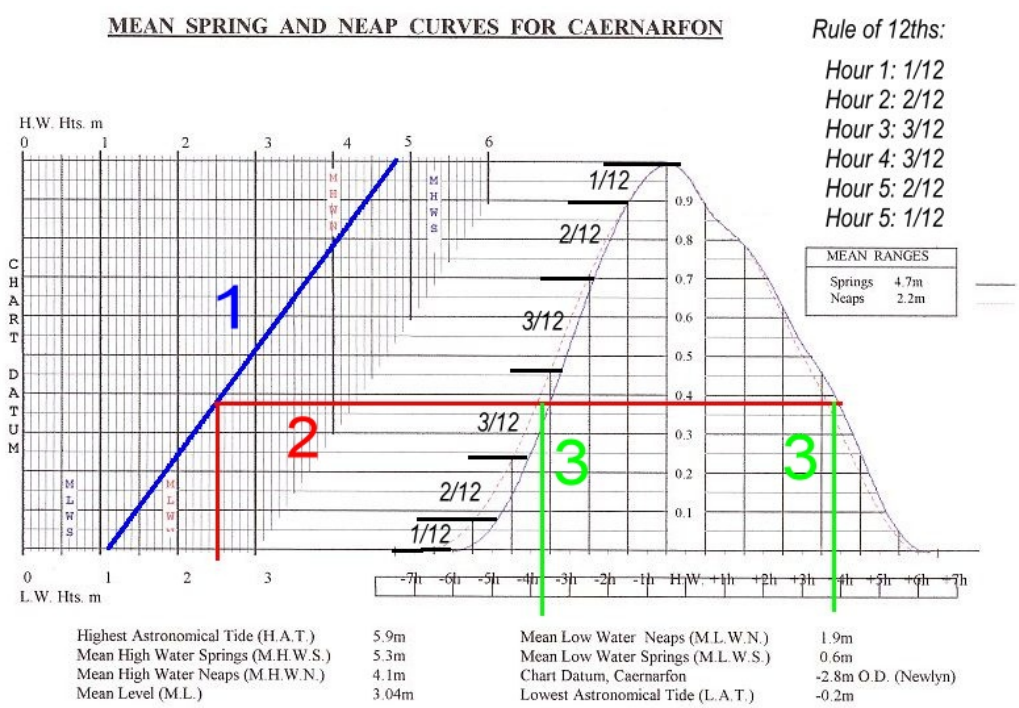
LW	HW	LW	HW
05:00	10:31	17:20	22:53
0.6 m	5.4 m	0.6 m	5.4 m

Predicted heights are in metres above Chart Datum

Daylight Saving Warning: EasyTide predictions are based on the standard time of the country concerned. For the UK this is GMT and the daylight saving offset should be set to 1 hour to allow for British Summer time (from 01:00 am on Sunday 27th March 2005 until 02:00am on 30th October 2005).

To calculate a safe time to cross

1. From the tide table note the time of High Water for that day.
   High water - 08:00
2. From the tide table note the heights at High & Low water:
   Low water – 1.1 Meters and
   High water - 4.8 Meters
3. With a pencil (you may have to do it again) draw a line from the Height at Low water to the height at high water on the graph at the left side of the page. This is shown in Blue.
4. Draw a vertical line up or down from the depth you need (2.5) until it crosses the line you first drew, this line can then be extended across to the tidal curve on the right side of the page. This is shown in red.
5. By dropping lines down from this you can read off the times before and after high water when it should be possible to enter. Shown in Green.



In this case the safe time to enter are roughly 3 & ¾ hours either side of high water i.e. between 04:15 and 11:45. These times are not exact and at the end of these notes I mention some factors, which must be taken into consideration.

If the tidal curve is not available there is an approximate method that can be used. Called "The Rule of 12'ths" This is based on the fact that most tidal curves follow the same basic shape that the flow of the tide changes its rate by a 1/12th starting slowly then faster holding the full speed for the middle two hours and the slowing over the last two.

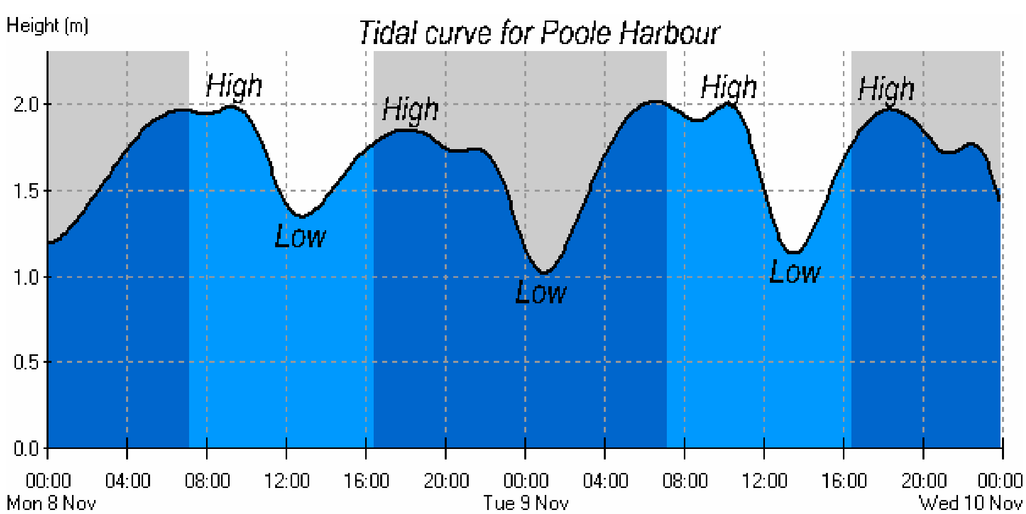
I have tabulated it below I have also sketched it onto the tidal curve.

+/- 5 Hours	Hour 1 - first Hour	1 / 12th	1/12th
+/- 4 Hours	Hour 2	2 / 12th	3/12th
+/- 3 Hours	Hour 3	3 / 12th	6/12th
+/- 2 Hours	Hour 4	3 / 12th	9/12th
+/- 1 Hour	Hour 5	2 / 12th	11/12th
High water	Hour 6 - Last Hour	1 / 12th	12/12th

So to calculate using this method:

1. From the tide table note the time of high water for that day.
   High water - 08:00
2. From the tide table note the height at High & Low water:
   Low water – 1.1 Meters and
   High water - 4.8 Meters
3. Calculate the tidal range, or the difference between High and Low heights.
   4.8 – 1.1 = 3.7 meters
4. Calculate how much over the low water needed.
   2.5 – 1.1 = 1.4 meters
5. Calculate how many 12th's this is of the range.
   (1.4 / 3.7) X 12 = 4.5 (12th's)
6. Look in the table above and this falls between Hour 2 (at 3/12th) & Hour 3 (at 6/12th), 4.5 is about halfway between these two so you could approximate the safe time as High water +/- 3 ½ Hours.

In most cases this will give a workable solution but for some areas this is defiantly not the case, Poole Harbour and Southampton are two such examples. I have included a tidal curve for Poole as an example. Note the irregular pattern.



There is a variant on the rule of 12th's called the percentage rule but I can never remember that one.

12.3 External factors that can change the tide height.

The following need to be taken into account and can make a significant difference to depth of water and must be borne in mind.

1. Wave height. The heights calculated are from the surface of a flat sea to the seabed. If there are waves when you are in a trough there is going to be less water. To make matters worse a small wave out sea can become significantly bigger when running up into shallow water, there may also be a tide or current running this can also make the waves bigger. If you ground in a trough you can hit very hard and do some serious damage to your boat. This is how Ted Heath's yacht Morning Cloud was lost.
2. Atmospheric pressure. During a high pressure the tide is held down and this can lead to there being less height than predicted, conversely Low pressure can give more water.
3. Wind direction. When there is an offshore wind the tide can be held back giving less depth of water and conversely an on shore wind can give you more water but bigger waves.
4. Recent bad weather. If there has been a recent gale sand bars & Bouyage can shift a new wreck can arrive, so extra care should be taken, I have seen the boat alongside me hit a wreck, bad weather had moved some of the buoys and they had strayed to the very edge of the channel.

In most places it is easy to contact the local Harbour master or port authority they can usually advise you on channel buoying, clearances and any new problems. In fact they often ask for your draft and will advise on safe times. It's always a good idea to ask, they are usually very helpful advising on good anchorages, local restaurants etc!

To put this into perspective, the calculation we have just done is what I would use in a prolonged period of good weather to bring my boat over Caernarfon Bar an area I know well. I draw 1.95 Meters I need 2 Meters over chart datum, at 3 hours 45 minutes before High water I would take it very slowly and be watching the depth very closely on the other end of the tide (when it is falling) the last time I would attempt to cross is 3 Hours after High water. You do not want to run aground on a falling tide.

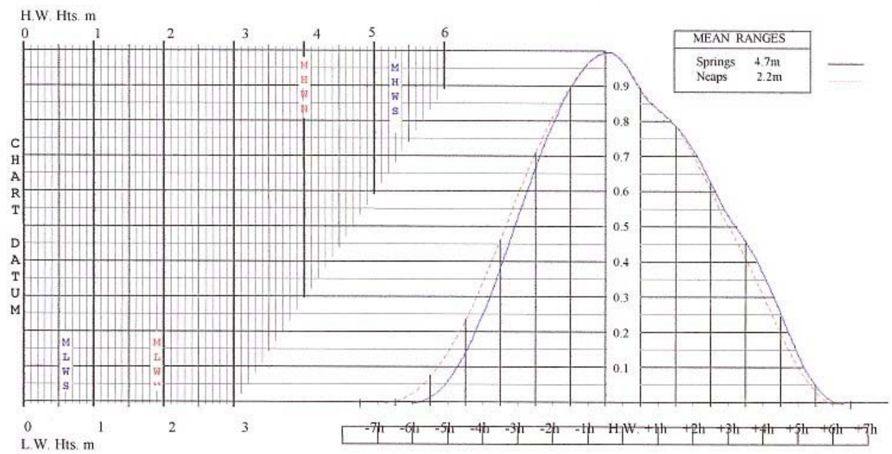
As a point of interest the pilot recommends that you should limit your crossing time to high water +/- 2.5 Hours.

Currently there have been some big southerly gales and there has been a steady swell running in from the South, I would want at least 2 meters under me on a calm day, in rough conditions I would want more and would limit my crossing to 2.5 hours before to 1 hour after High water.

Another tip for crossing bars, if there is an on-shore wind or swell try and cross about 1.5 Hours before High tide at this time the current should still be running in – with the wind/waves, this should lengthen the distance between waves and reduce their height. If you leave it until High water the current will most likely have turned and will now be running out strongly this will create a 'wind over tide' situation which will shorten the distance between waves and make them a lot bigger.

In practice it is always a good idea to cross with a rising tide as if you do stray out of the channel and run aground you have every chance of getting off.

MEAN SPRING AND NEAP CURVES FOR CAERNARFON



Highest Astronomical Tide (H.A.T.)	5.9m	Mean Low Water Neaps (M.L.W.N.)	1.9m
Mean High Water Springs (M.H.W.S.)	5.3m	Mean Low Water Springs (M.L.W.S.)	0.6m
Mean High Water Neaps (M.H.W.N.)	4.1m	Chart Datum, Caernarfon	-2.8m O.D. (Newlyn)
Mean Level (M.L.)	3.04m	Lowest Astronomical Tide (L.A.T.)	-0.2m