Paper pilotage: nifty tools that save time and money

Mark Shiner explains how to use a pilot's slide rule to quickly calculate course to steer, while Andrew Morton uses the QuickTide for kayaking from his boat

Microlighter Mark Shiner explains the pilot's slide rule

There are many transferable skills between sailing and flying and I have always wondered why sailing folk have never cottoned on to a marvellous little gadget used by pilots for generations: the 'whizz wheel', more correctly known as the Pooley's Flight Computer.

No batteries required, it's an inexpensive plastic slide rule consisting of a double-sided, circular rule with a straight slide that runs through the middle of it. If you know your desired course and the rate and set of tide you can calculate your course to steer in about 10 seconds without making a mark on a chart. Actually, without a chart at all, although you ought to have one as the whizz wheel won't warn you about rocks or reefs!

The whizz wheel is quick and easy to use but, like most things, practice makes perfect. If you're used to drafting a course to steer on a chart and you want to try using a whizz wheel, I recommend you do both, sense-checking one against the other until you're familiar with the process.

Moving in air and water

When we sail, we know that our passage over the ground is purely incidental and that we are actually moving in a body of water. Our onward motion is utterly subject to the movement of that body of water – tide or current – whatever direction it happens to be moving in. So, if we sail at 5 knots straight into a 4 knot tide, we are really only moving over the face of the Earth at 1 knot. If we turn around and sail away from it, we are delighted to see 9 knots on the GPS and, oddly, we tend to claim the credit for all 9!

Once that tide is to one side of the boat, however, it's not just speed that is affected but also direction and that's where we need to steer a course that compensates for the drift which the tide will induce. Say I'm sailing north at 5 knots, but there is a 2-knot tide flowing south-east, it will both slow me down and send me east. I need a way to calculate, reasonably accurately, what the compensating course should be.

'You can calculate your course to steer in about 10 seconds without a chart'

As well as sailing, Mark Shiner enjoys microlight flying

Us yachting folk are taught a graphical method where we draw vector lines on our charts. Vectors express direction and magnitude so this tide can be represented on a chart by, in this case, a line pointing 135° (SE) and 2 miles in length. Well, 2 nautical miles scaled from the side of the chart that is.

Those of us who have taken an RYA Shorebased navigation course will know how this ends. You have a triangle drawn on your chart and can glean from it the compensating direction you should sail to maintain your desired course. Nothing wrong with that method but the whizz wheel does it in under half the time.

Proper preparation with a chart is the

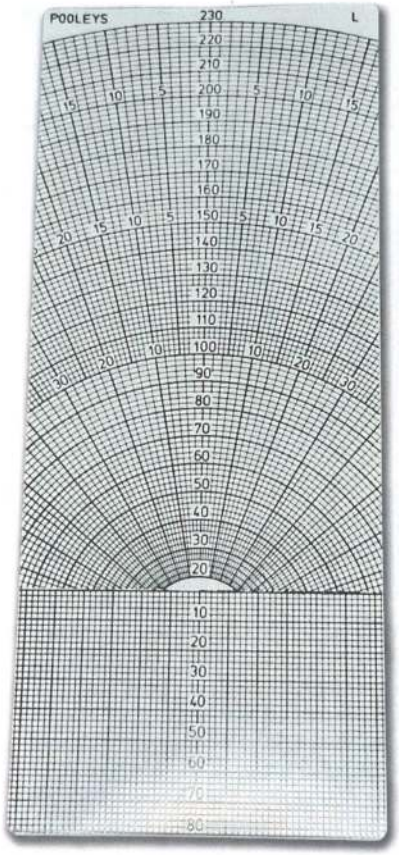


Figure 1: low speed slide

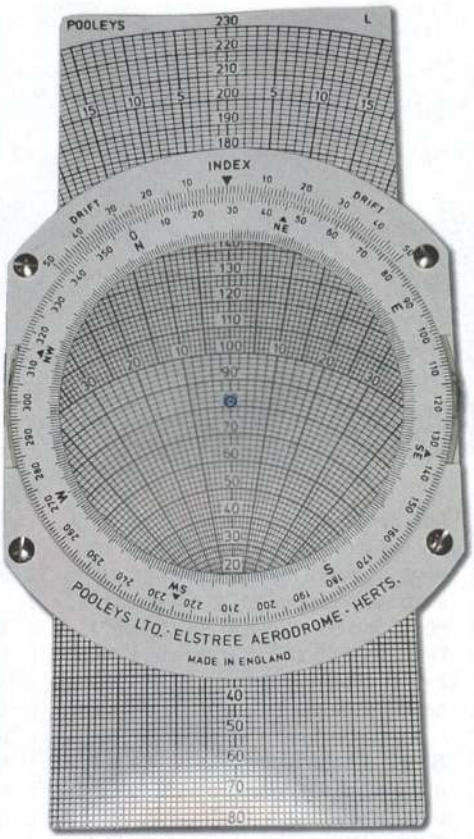


Figure 2: front window with slide inserted

Figure 3: rear view of the calculator

best way to go but a quick method to double-check could save your bacon. It's also a great open boat method.

Aircraft have the same issues. They fly in a body of air which affects them in the same way.

Before a flight, pilots can access information from the Met Office with wind information at different altitudes. This gives direction and wind speed, just like the tide. Pilots use this to draw a triangle on their air-chart to ascertain their predicted drift and so calculate their course to steer to compensate.

You may have seen aircraft flying overhead in one direction but pointing to one side of their track – a perfect illustration of the difference between 'course' and 'heading'.

However, many pilots use a whizz wheel once they have learned the principals on paper. They are even used by commercial pilots, which is some testament to their accuracy.

At this point I must mention my friend James Budge. He's an Orcadian retired seafarer who has many tales for tourists visiting Stromness and once regaled me with the following local saying: 'The wind is named from where it blows, the tide is named for where it goes'.

This is an important thing to remember as we adapt an instrument used for aviation to a marine environment. A south-easterly wind and a north-westerly tide are both flowing the same way; they are just named differently. More on that later. It's also a great saying I use when teaching my school classes at the nav school where I work. Says it all!

Let's look at the parts of the whizz wheel. Sliding through the middle is the appropriately named 'slide' – no esoteric nautical jargon here! It has two sides, one for high-speed aircraft labelled 'H' and the other for low speed aircraft labelled 'L'. You can also get a really slow additional slide for Microlights labelled 'Microlight', why not 'M'? Who knows. The low speed slide shows speeds, of both aircraft and wind, of between 20 and 230 knots, the Microlight one goes from 10 to 120.

For boats I knock off the zero and we will be using the 'L' slide in this article. That way you can use it for sailing yachts or powerboats cruising at between 2 and 23 knots.

The slide

Figure 1 shows the L (low speed) slide with arcs that represent speed.

For our scaled-down purposes the thicker arcs are 1 knot apart once you knock the zeros off.

There are also straight-line rays which show angles either side of the middle, vertical line. You can see that these angles are labelled periodically at the 100, 150 and 200 arcs.

Below the 100 knot arc the rays are in 2° increments, above that they are whole degrees. It's not hard to read once you get into it.

Circular slide rule (front)

Figure 2 shows the front (window side) with the 'L' slide inserted

The slide moves through a double-sided circular body. On one side is a clear plastic window which is textured to take pencil. You can see the slide markings behind it. Around the edge is a movable compass bezel.

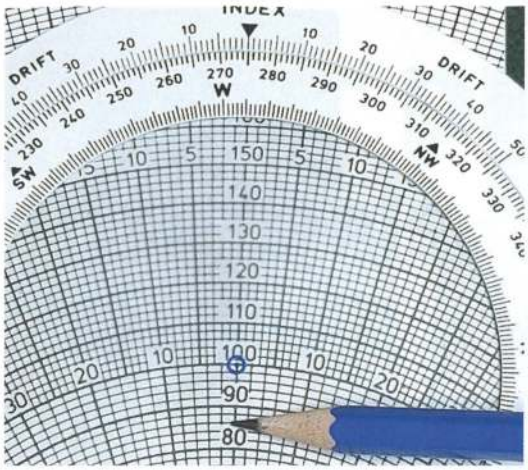
Circular slide rule (back)

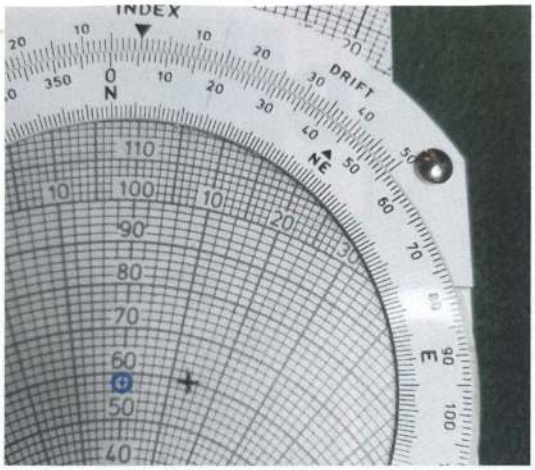
Figure 3 shows the reverse of the circular slide rule. The circular slide rule here plays no part in our course to steer calculations but is great for speed/time/distance calculations and converts nautical to statute miles.

It will also calculate fuel consumption and, if you're really bored, you can calculate your boat speed as a Mach number for the bragging rights!

ABOUT THE AUTHOR

Mark Shiner is head of Maritime Studies at Orkney College, University of the Highlands and Islands, and occasionally lectures in psychology. He is a Yachtmaster Shorebased instructor as well as instructing Advanced Powerboat and Radio. He unwinds by teaching Scotland's only sailmaking course.





FAR LEFT Figure 4: marking the tide direction and rate

LEFT Figure 5: bezel moved to the desired course

Calculating course to steer

Calculating a course to steer will take less time than you'll spend reading about it now but here goes. Imagine you are wishing to sail a course of 005°T at 6 knots, nearly due north, and there is a tide running to 275°T at 1.4 knots.

STEP 1 Mark on the tide

We start by programming in the tide – direction and rate. So, first set the compass bezel on the body to 275°for the tide direction (Figure 4). Move the slide so that you have any convenient thick arc sitting under the small index ring-dot in the centre of the window. Put a pencil mark 1.4 knots BELOW the dot using the arcs as you scale.

(The instructions that come with the Pooley's Flight Computer tell you to mark ABOVE the index circle, but that is for WIND which, as James Budge will tell you, 'is named from where it blows!' This is the only step which differs from the instructions so do look at them, there are lots of tricks this device can do!)

STEP 2 Move the bezel to your desired course

Now, to see instantly how to compensate for this tide, move the bezel to your desired course; in this case 005°, and move the slide to put the pencil mark over the 6 (60!) knot arc (Figure 5). Notice that now we have moved the bezel around to our desired course, the pencil mark is hovering over a ray that represents 14° to starboard. Add that 14° to our course of 005°T and our course to steer is 019°T. Done, finished! If the pencil mark was to the left – port – we subtract it from the heading. Simple.

STEP 3 Look at the drift

At the top of the bezel is a handy 'drift' scale which you also find on Portland Plotters. With the bezel set to 005° find 014° to starboard on the outer scale and look at the figure on the inner scale. I've drawn a pencil line to show that (Figure 6).

What does it do for an encore? Well, finally, the index ring-dot will now be showing your speed over the ground (SOG), in this case 5.8 knots (see Figure 5).

Oh, and if you mark the tide rate ABOVE the centre ring-dot it will give you an EP track to mark on your chart to check for rocks in your future. This is because marking in the tide above the ring-dot causes the computer to indicate how much the tide will send you off course, rather than indicating the recommended course correction. In this case you can draw the track, indicated by the ray on which the pencil line sits, which will show you where the boat would sail, diverted by the tide with no corrections. This is essentially what an EP – Estimated Position – is. The RYA call this a 'predicted EP' and you might use it to show you any hazards you'd encounter if you don't correct for tide. Wowzer!

STEP 4 Compare with your chartwork

Figure 7 shows the usual, drawn triangle method for reference – to check the example calculated with the slide rule above. A reminder: for this exercise I used the following scenario: tide 275° at 1.4 knots, course 005°T at 6 knots, Difference 014° to starboard, course to steer 019°T.

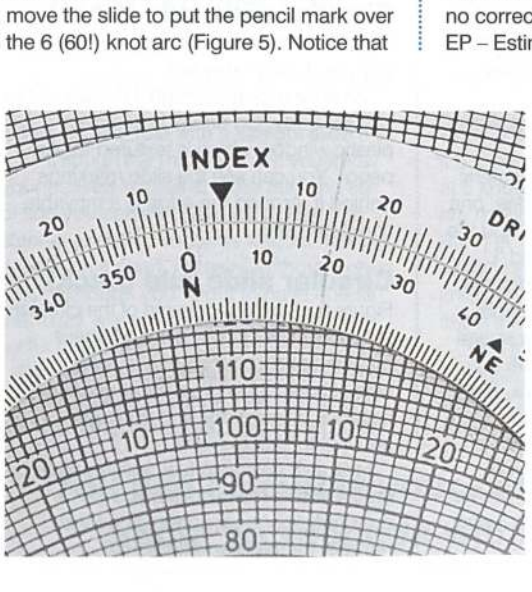
In summary

Let's look at that again in point form just to demonstrate how simple it is:

- Set bezel to tide direction.
- Pencil mark tide speed BELOW index dot – any arc on the slide will do.
- Reset bezel to desired course and place pencil mark over your boat speed.
- Pencil mark indicates the difference to your course on a ray. Add or subtract that to your course. Use the drift scale if you like. Starboard = add. Port = subtract
- Read off SOG at the circle-dot

And that really is about it for calculating a course to steer in seconds. As I said, the instructions supplied are a wealth of information if you can get past the flying acronyms, and the slide rule on the back, once mastered, is a great little calculator.

And the best bit? It's wireless!



LEFT Figure 6: using the drift function to work out speed over the ground

RIGHT Figure 7: checking the calculations against a chart

Andrew Morton is a world champion kayaker who explores Scotland with his Finnmaster 76CA motorboat – here he is racing on the River Dee

Kayaker Andrew Morton explains the QuickTide

When you are on the sea, in any kind of boat, it's worth knowing a little about the tides for two reasons:

- If you choose the tide correctly it'll help you on your way in a totally green way – free energy
- If you choose your tide incorrectly, and the wind is blowing against the tide, you could find yourself in very unpleasant and dangerous conditions, no matter which direction you are going.

ABOUT THE AUTHOR

Andrew Morton owns a Finnmaster 76CA motorboat, on which he has travelled to Shetland and back, the north coast of Ireland, the Isle of Man and much of the west coast of Scotland. He carries a kayak on board, which he uses to explore the islands and lochs he visits. He has kayaked on loch and sea for almost 60 years.

I've got a lovely motorboat, *Tiptoe*, with Garmin kit for navigation. I can travel at up to 28 knots if I wish, but I'm happier at 6 knots, and I carry a kayak with me, which I can paddle at 5 knots for an hour or two without a problem. Travelling at those slower speeds makes consideration of the tide important.

I have all the gizmos to help me calculate the tides, on my boat and on my phone, but I have to be honest, there's a lovely paper-based method I use because I find it's by far the easiest and most simple method. It can cost as little as £5 per annum, and does not rely on you needing a signal from anything.

If you are sailing at 3 knots against a 1 knot tide, then your speed over the ground (SOG) will be 2 knots. If the tide is with you, it will be 4 knots.

It's not hard to see that using the tide correctly will double your speed, or half your time, whatever way you look at it. If you're travelling more quickly, the impact of the tide is less. So, if I'm flying along in *Tiptoe* at 20 knots, the impact of a tidal flow of 1 knot will be just 5%, which I can live with.

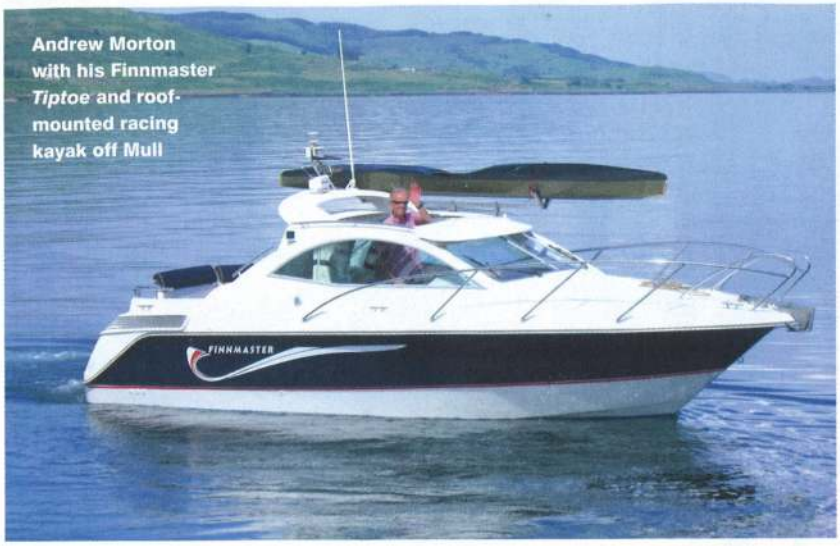
The rule is very simple then: the slower you are travelling, the more important it is to take note of the tidal flow. And I know that many *PBO* readers are often travelling very slowly under sail!

Figure 1: The QuickTide code for the day set at G0 for the worked example

Two paper tools

My method makes use of two paper tools:

- QuickTide. A single copy of this little gadget costs £10 and lasts for two years – so £5 per annum.
- Admiralty Tidal Stream Atlas. I have two, one for the west coast of Scotland where I do much of my cruising, and one for the north east, including Shetland and Orkney. They cost around £15 each, although, if you have a chart for the area you are cruising in, you'll find small, less



Andrew Morton with his Finnmaster *Tiptoe* and roof-mounted racing kayak off Mull

detailed, tidal stream pictures on the back of the chart.

Duncan Ogilvie, who invented the QuickTide system, has sold almost 50,000 of these over the past 20 years, to canoeists, yachties, swimmers, anglers, bird-watchers and many others, who want to know about the tides. That's testament to its value.

The QuickTide card enables you to find out the times of high tide and low tide at any time over two years in the area you have chosen.

Firstly, find the colour of the area you are cruising in, then note the code for the date on which you are planning to sail. Finally, align your colour of arrow with the code from the table. If the table code is in bold italics, then it's a spring tide. If the code is in a black-lined box, it's a very big spring tide.

The Admiralty Atlas

But how do I relate the QuickTide to the Admiralty Atlas? Very easy. All you need to know is the time of high tide at Dover, and on the Scottish card shown on the previous page, the colour is a strong red. So, the Isle of Man is my 'Dover' for Scotland. Align the red arrow to the code for the day, and you've got high tide at Dover. Take care, this is not quite the case for the other two cards, which cover mostly England, Wales and Ireland, with some of France and Spain. But whatever card you buy, it's easy to work out the colour code for Dover.

The Tidal Atlas has 13 pages: six hours before high tide at Dover, high tide at Dover, and six hours after high tide at Dover. So, once I know the time of high tide at Dover for the day in question, I simply go to the middle page of the Atlas (high tide at Dover) and mark the time in pencil at the top of the page (pencil is important, because I want to rub it out when I use it for another day). If high tide at Dover is at 2pm, I just pencil in the appropriate times on all the other 12 pages of the booklet as 8am, 9am, 10am, 11am, noon, 1pm, 2pm, 3pm, 4pm, 5pm, 6pm, 7pm, 8pm. I can then plan my day and, during the day, can look at the relevant page of the atlas at any time I want and get an instant summary of the tidal flow.

The speed and direction of the tide on the Atlas is given as two numbers with an arrow. The arrow varies in thickness and length according to the speed of flow of the water, and the two numbers relate to the average speed of the tide at neaps and springs in tenths of a knot. So 02,05 means that the speed of the tide at neaps is 0.2 knot, and springs, 0.5 knot. Often the speed isn't given, and you have to make your own judgement based on the thickness of the arrows.

Worked example

STEP 1 Say, you were cruising south-west between Rhum and Eigg on 25 May 2020 at 1pm. The QuickTide code for that day is ***G0*** and it's in bold italics, which means it's a spring tide (Figure 2, right). Align the red arrow (Dover) with G0 on the card (Figure 1, previous page) and that will give you high tide at Dover at around 2pm. Our 1pm time is one hour before HT at Dover.

STEP 2 Turn one page back in the Atlas and check the tidal flow between Rhum and Eigg at 1pm (Figure 3, far right). It reads 03,07 SW. So that means the tide will be helping me to the tune of 0.7 knots, which is definitely a bonus worth taking. That's close to a 20% improvement, if your speed through the water is 4 knots.

The beauty of this system is that it is quick and easy to use, once you get the hang of it, and it doesn't rely on the Internet. That's particularly handy when you are out of signal. Why not give it a go, and extend your cruising range accordingly?

Travelling against the tide

What happens if you find yourself sailing or paddling a kayak against the tide? Simple: if you are near the coast, go as close to the land as is safe, and make best use of the eddies. Check out the exemplar page from the tidal atlas, and see how

GREEN TRAVEL

The impact of the tide can be considerable. On this occasion I was traveling south between two Orkney islands on my way back from the Shetlands, and my speed through the water was 6.7 knots (bottom right of screen) , but my SOG was 12.2 knots (top left). I know it looks as if I'm heading north, but my chartplotter is set to point upwards in the direction of travel, in this case 219° (top right). Note that the engine is barely ticking over at 1,000rpm, using only 3.5lt of fuel per hour, and I'm whizzing along at over 22 kilometres per hour. That's 'green' travel!

A QUICK REMINDER ON TIDES

At their simplest, tides come in and out twice a day, regressing about 50 minutes each day. In other words, if high tide is at noon one day, the next day it will be high tide around 1250. If you're good at maths, you'll see that in 14 days' time, you will be more or less back to where you started from. So, if it's high tide at noon on a Monday, two weeks later it will be high tide close to noon again on a Monday.

In the Mediterranean the volume of water is relatively small, so the tidal range is only a few centimetres in most parts. In the Forth estuary at Port Edgar, the range can be 5m at spring tides (ie the high tide is very high, and the low tide on the same day is very low). Neap tides are the opposite: high tide is not very high, and low tide is not very low.

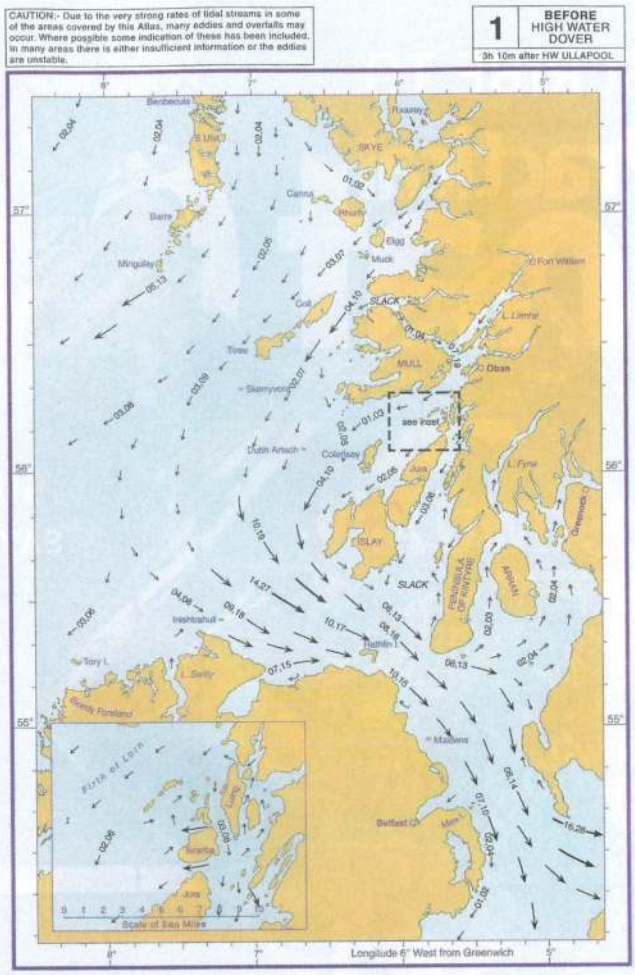
The tides are caused by the gravitational pull of the moon, with a little help from the sun. When sun and moon are in alignment, they help one another and you get big spring tides. When they are aligned at right angles to one another, the gravitational effect of the moon is reduced by the pull of the sun, and you get neap tides. The

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1	A6	B0	A6	B6	C0	D0	D4	E4	F1	*F1*	*E9*	*E9*	1
2	B0	B4	B0	C2	C7	D6	D9	E8	*F4*	*F4*	*F1*	*F2*	2
3	B5	B9	B4	D0	D3	E0	E4	*F2*	*F6*	*F6*	*F4*	*F5*	3
4	C0	C5	C1	D6	D8	E5	*E8*	*F5*	*F9*	*F9*	F6	F8	4
5	C5	D1	C8	E1	E2	*E9*	*F2*	*F8*	*G1*	G1	F9	G1	5
6	D0	D6	D4	E5	*E6*	*F3*	*F6*	*G1*	G4	A2	G3	A5	6
7	D5	E0	D8	E8	*F0*	*F7*	*G0*	*A1*	A4	A5	A6	A9	7
8	D8	E4	E2	*F2*	*F4*	G1	*G3*	A4	A7	A8	B1	B5	8
9	E2	E7	E5	*F5*	*F8*	A2	A3	A7	B1	B2	B7	C1	9
10	E5	*F0*	*E9*	*F9*	G2	A5	A7	B0	B5	B8	C4	C7	10
11	E8	*F4*	*F2*	*G3*	A3	A9	B0	B4	C0	C5	D0	D2	11
12	*F2*	*F8*	*F6*	A5	A7	B3	B3	B9	C7	D2	D4	D6	12
13	*F5*	*G1*	*G0*	A9	B1	B8	B9	C4	D4	D8	D8	E0	13
14	*F9*	A5	G4	B4	B6	C3	C4	D1	E0	E2	E2	*E4*	14
15	*G3*	A9	A6	B9	C2	C9	C9	D7	E4	E6	*E5*	*E7*	15
16	A7	B4	B1	C6	C8	D4	D4	E2	E8	*E9*	*E9*	*F1*	16
17	B2	B9	B7	D3	D4	D8	D9	E6	F1	*F2*	*F2*	*F5*	17
18	B7	C6	C4	D8	D8	E2	E4	E9	*F4*	*F6*	F6	F9	18
19	C2	D2	D0	E2	E2	E6	E7	F3	*F8*	*F9*	G0	A2	19
20	C8	D7	D6	E5	E5	E9	F1	*F6*	*G1*	G3	A4	A7	20
21	D4	E1	E0	E8	E8	F2	F4	*G0*	*A2*	A5	A9	B1	21
22	D8	E4	E3	*F1*	F1	*F6*	*F8*	*G4*	A6	B0	B5	B6	22
23	E2	E7	E5	*F3*	*F4*	*F9*	*G2*	*A4*	B1	B5	C1	C2	23
24	E6	*F0*	*E8*	*F6*	*F7*	*G3*	*A2*	A8	B6	C2	C7	C7	24
25	*E9*	*F2*	*F0*	*F8*	*G0*	*A3*	*A6*	B2	C3	C4	D2	D2	25
26	*F2*	*F5*	*F3*	G1	G3	A7	B0	B8	D1	D1	D6	D6	26
27	*F4*	*F8*	*F5*	A3	A4	B2	B4	C4	D8	D5	D9	D9	27
28	*F7*	G0	F8	A6	A8	B7	C0	D2	E2	D9	E2	E2	28
29	G0	G3	A5	A9	B3	C2	C6	D8	E6	E1	E4	E5	29
30	G3		A8	B4	B8	C8	D2	E3	E9	E4	*E7*	*E8*	30
31	A6	na20	B1		C4		D8	E7		*E6*		*F1*	31

many eddies you can spot. There are quite a few, and many more unmarked, because they are too small and too close to the shore.

Of course, kayaks can make great use of eddies when the tide is against them, because they can get so close to the shore. You should think about getting one – they are great fun, not expensive, and they are good for your health!

■ See next month's Summer issue of PBO for Andrew Morton's guide to paddling and cycling from your boat



FAR LEFT Figure 2: QuickTide card gives codes for each day of the year so you can quickly find the time for high tide at Dover. Code for 25 May is *G0*

LEFT Figure 3: Tidal Atlas page confirms tidal flow speed between Rhum and Eigg at 1pm on the day

Contact

QuickTide is available from **quicktide.co.uk**

Do you have any cross-over gadgets, equipment and methods from other hobbies that are useful for boating? Send your ideas to **pbo@futurenet.com**

Tidal race off Rathlin island

moon and sun align at full moon and new moon, and spring tides occur a day or two after full moon and new moon. Spring tides and neap tides follow approximately a two-week cycle. So, if there are spring tides around the 10th of the month, they'll occur again around the 24th of the same month. Keep in mind that spring tides tend to be particularly strong near the equinoxes: March/April and September/October.

The tides are also affected by local topography, by air pressure and by the wind. Low air pressure on the sea allows it to rise a little. For the technically minded, you could expect 1cm of a rise in sea level for a drop in pressure of 1hPa. There are many tidal anomalies too. For example, round Islay and Rathlin Island in the North Channel, the tides are a bit variable. On the River Forth near Stirling, the tide often surges up twice in every cycle, giving a double high tide every 12+ hours. Sometimes you even get a tiny tidal bore flowing round the bends towards Stirling, which is always fun to see.