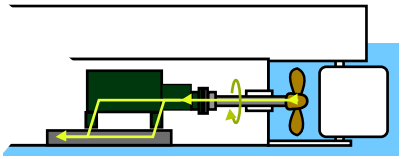
BOATS BEHAVING BADLY

This is not intended as guide to boat handling, more as food for thought about what is going on in and round your boat as you cruise. You can't really learn to manoeuvre a boat from anything on paper, if you are starting from scratch or want a qualification then you really need to learn at the tiller or wheel. The Royal Yachting Association runs day courses on inland boat handling.

This takes the form of some Not-So-Frequently-Asked-Questions from someone with a single-screw inboard-engined displacement vessel such as a narrowboat. The answers may apply to a greater or lesser degree to any sort of powered vessel.

Q. What drives a boat?

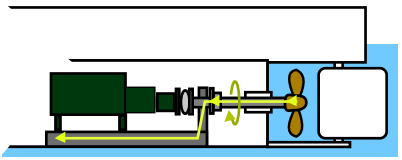


A. The engine - in a lot of boats anyway

Q. Why not the propeller?

A. Well, it does and it doesn't. Technically - the engine turns the propeller which converts rotary motion into a forward or backward force (*Axial Thrust*, if you want words to show off with!), This is transmitted back to the engine by the prop shaft and through to the boat, so you could say the boat itself is being pushed along by the engine mounts.

Q A sobering thought, but are all boats pushed along by their engine mounts?



A No, in better set-ups the prop shaft is supported by a special bearing, called a thrust bearing, which takes the driving forces directly through to the hull of the boat. The engine can then be mounted on softer mounts and some sort of flexible coupling put in to absorb vibration.

Q. Can the propeller screw itself off the boat when you put the engine hard astern?

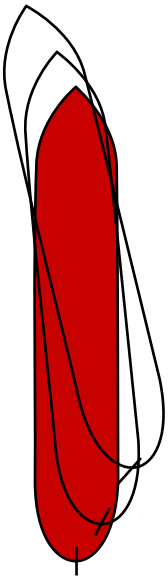
A. If it got loose, I suppose, yes, but it is held on with a big nut, and that is stopped from spinning off by a split pin, or should be. What might happen is that the shaft comes out of its coupling to the engine. You could have nightmares about this if you imagine it sliding right out of the boat and you having to find a large cork - fast. In fact that is unlikely as, as soon as it came free, it would stop turning, and in any case the rudder is in the way. Worth checking all the shaft clamps are tight though.

Q. What makes a boat go round a bend?

A. Not the rudder. The rudder actually applies a sideways force to the boat in the **opposite** direction to the way you want to go. However, because this force is applied at the stern, the boat's bows swing into the turn, and the hull is no longer pointing the way it is going. It is water pressure against the side of the boat that forces it to go the way you want.

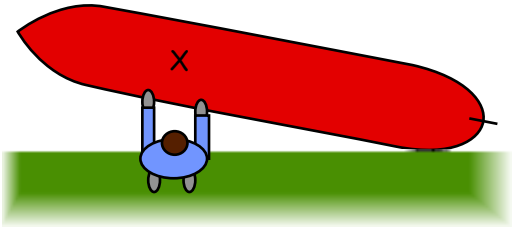
Q So you are saying that when you put the rudder over the boat starts by going the wrong way?

A. Very briefly, yes. most of it does. When you start the turn, about two thirds of the boat wants to go the wrong way, only the front third starts off the right way. That is why it is very difficult to steer away from a bank using rudder alone.

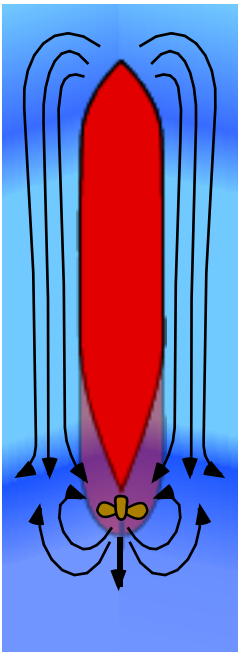


Q. So the boat swings about a point about a third of its length from the front?

A. Yes, It is quite important to good boat handling to know where this 'pivot' point is. If the boat was on open water and you push sideways at the stern, this is the point where the boat doesn't move. Conversely if you push sideways at this point, the stern stays where it is. In a way it is like the "sweet spot" on a cricket bat, where the impact of a ball gives the least jarring at the handle. A good crew will push here rather than right forward and so get the bows of the boat out further without driving the stern into the bank. It is also the best point to attach a towline and leave the steerer in full control.



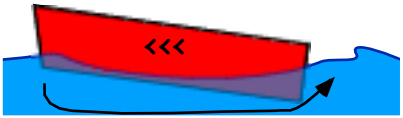
Q. Why do you get breaking wash?



A. There are several ways of looking at this, perhaps the easiest is to think of what happens when you move something through water like your hand. You immediately see that the water from in front flows round the side of your hand to fill in the space behind. The same thing happens with the hull of a boat. Then take the propeller which is forcing water back, some of which would like to go round and fill in the 'vacuum' in front of it. Put the boat and the propeller together and the water coming forward beside the propeller collides with the water flowing back beside the hull and forms the wave. Like a wave on a beach rolling into shallower water, near the bank its base is slowed down and the top breaks over forward.

Q. You say there are other ways of looking at it?

A. Yes, the true physics is very complex to compute, but it is down to wave motion. The first thing is to imagine yourself as some water as the boat passes. To start you moving there must be a gradient in the water so the pressure of water behind you is more than in front. To keep you moving no gradient is needed, but to stop you the water in front of you needs to be higher than behind. These gradients cause water to flow back alongside your boat and are the reason why the water level seems to drop as your boat passes and recover behind it. In fact, at normal speeds energy is given to the water to make it move by the bows of the boat and returned to the boat at the stern.



However the depression in the water level beside a moving boat is a form of long wave, and waves can only travel at a certain speed, ones with longer distances between crests go faster. If your boat tries to overtake its wave then it starts to climb ‘uphill’ and no longer benefits from the energy in the crest behind it, which is then dissipated as turbulence against the bank. In narrow channels the restriction means water has to flow faster beside your boat and the wave is more intense, and also cannot travel as fast.

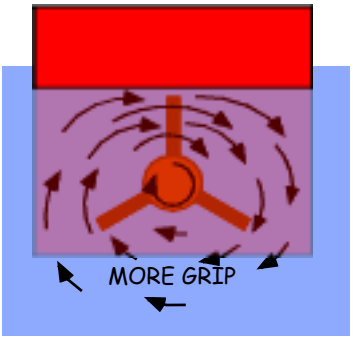
The fact that longer waves go faster explains why longer displacement hulls can go quicker in open water. Unfortunately in canals and with parallel sided boats the effective wave length of the boat is not its true length but more like the the combined length of its fore and aft swims plus a bit in between, as the wave caused is not a smooth curve but has a flat bottomed trough. This means that narrow boats can’t go as fast as their waterline length should dictate.

Q. Does this energy business make any difference to stopping?

A. Yes, you may have noticed that when you thought you had stopped your boat it starts creeping forward again. Water is still in motion round the boat and builds up behind, or, if you like, your wave trough goes on ahead and your boat tries to drop into it. This is further complicated if you are trying to stop alongside the bank. The flow left after your motion gets all mixed up with the currents caused by reversing the prop and applying rudder and can push you all over the shop. The best plan is not to rush things.

Q. Isn’t slewing when stopping due to the paddle-wheel effect?

A. Yes that does come into it, depending on the depth of water. Some folks say it doesn’t effect their boat. or, more likely, it never comes to their aid when the most want it, and that is often because the water is shallow.



The effect has nothing to do with the density of water being greater at depth: that is true but negligible at the depths of a boat prop. However it is still best explained by imagining the prop as a paddlewheel. Ignore the movement of water axially (There’s that word again - meaning fore and aft) and imagine the blades flattened to be at right angles to the plane of the prop like a true paddlewheel. Now, when it is turned, the water flows round and round. However remember that if we get the water rushing round at so many cubic whatsits per second, if it has to pass through a restricted passage it has to go faster.

This happens under the counter of the boat, and because the water is flowing faster in the same direction as the blades, the blades have less ‘bite’ on it. Under the boat there is more room so the water flows slower and the blades are able to push against it and drive the stern sideways. If the bottom of the canal is close the flow is again confined, speeding up and balancing the effect under the counter.

Q. Why does it only seem to happen when in reverse?

A. In reverse the blade curvature is not ideal and more paddle like, and the rudder is no longer able to correct for it. When stopping there is more time for the effect to take hold.

Q. What can you do about it?

A. Not a lot, understand it, study when it happens. Smaller props with more tip clearance are less prone, but not if they are too coarse pitched. You could try oars or get a boat with twin props rotating in opposite directions. Till then, again anticipate hazards and don’t try to do things in a rush.