When sailing across the wind - leaning the rig forwards and towards the wind will turn the board downwind

WINDSURFING 101: NON-PLANING STEERING

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GETTING TO GRIPS WITH EFFECTIVE STEERING IS IMPORTANT AND IT IS LEARNED FROM THE EARLIEST STAGES. FROM BEGINNERS LEARNING TO AVOID AN OBSTRUCTION IN THE WATER TO THE MORE ADVANCED TECHNIQUE OF CARVING THE BOARD BY FOOT-STEERING IT'S AN INTEGRAL PART OF ANY SESSION AFLOAT. There are far too many variations of non-planing steering for the basic information here to apply perfectly to all situations. The aim then is to set the scene for steering by simply looking at what's going on when we are sailing slowly across the wind (on a beam reach) to make a board change direction.

Understanding this elementary level of board and rig control on a beam reach should form a framework of understanding to help with progression towards other more specific forms of steering including tacking and gybing. Throughout, whilst transitions will not be referred to, remember that steering is indeed an integral part of turning the board all the way around. Whilst this is done frequently at the end of short reaches I was once lucky enough to experience blasting for over 30 minutes on one tack from the Sinai deep into the Gulf of Suez. Yet even with that much water to spare I had to use steering eventually to turn around and head back before I ultimately became stranded on the remote shores of continental Africa.

A windsurfing rudder?

Let's start by 'putting the rudder on'. Imagine – if you will – an alternative world where windsurfing has developed along traditional sailing lines since the origin of the sport. Here windsurfers control power with their front hand holding the boom of a rotating sail whilst their back hand steers by gripping a long rod linked to a rudder bolted onto the tail. It's hard to imagine achieving very much on such a stand-up-sailing contraption! One of the main challenges with dinghy sailing is avoiding over-steering the rudder which makes the water flowing over it turbulent, causing it to act like a brake. Luckily, in the real world, we can steer a windsurfer without relying on a swinging chunk of wood/fibreglass/carbon at the back and this is what can make our sport so smooth at the lower end of the wind/skills spectrum and so radical at the top end.

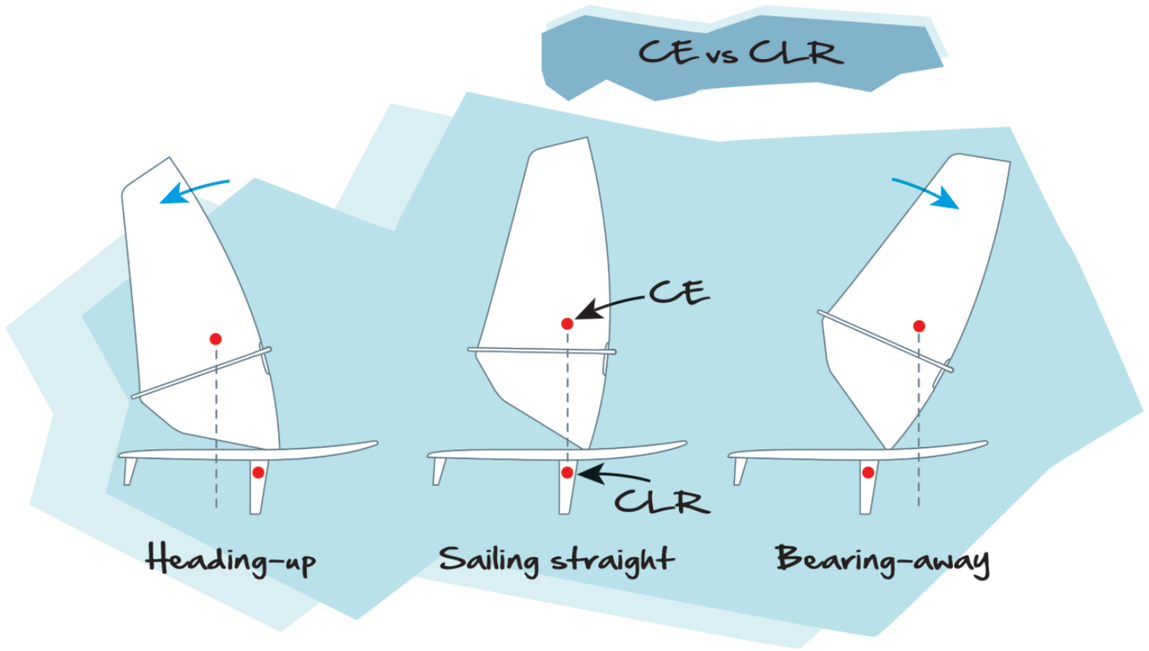
CE AND CLR

In order to change direction we lean the rig back to steer upwind and forwards to steer downwind. The lift created by the flow of air over the sail is best represented by a point in the middle of the sail above the boom and is called the centre of effort (CE).

With some of the lift from the sail pushing the board sideways the board opposes this sideways force along its length. This unwillingness of the board to slide laterally is known as its lateral resistance and the mid point of this is essentially in the middle of the board or on the daggerboard and is known as the centre of lateral resistance (CLR).

- When the CE is directly above the CLR then the board will travel forwards in a straight line as the equipment is in balance
- Leaning the rig backwards puts the CE behind the CLR and the board will turn upwind (heading up). The back of the board is pushed downwind as the board pivots in the middle
- Leaning the rig forwards puts the CE forwards of the CLR and the board turns downwind (bearing away). The front of the board is pushed downwind as the board pivots in the middle.

Further, in order to steer downwind effectively, we must lean the rig towards the wind as well as forwards. When I am running the early phases of instructor training I always ask the candidates why they think the rig needs to be leaned towards the wind as well as forwards yet I seldom procure the correct answer. So lets look more closely at this.

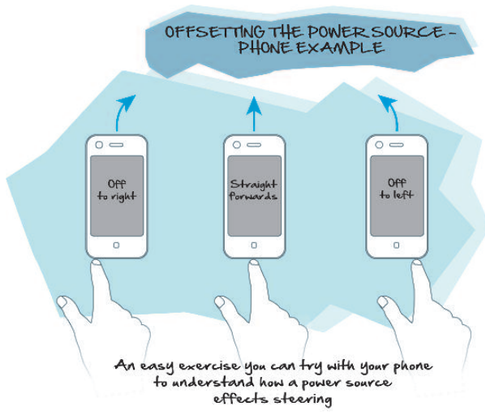


Positioning the Centre of Effort in front or behind the Centre of Lateral Resistance is the key to steering

OFFSETTING THE POWER SOURCE

Imagine owning a small powerboat and storing the outboard engine off the boat when not in use. Imagine attaching the engine to the middle of the back of the boat and centralising the steering. When the boat is put in forward gear which way will it go? The answer, of course is forwards, in a straight line.

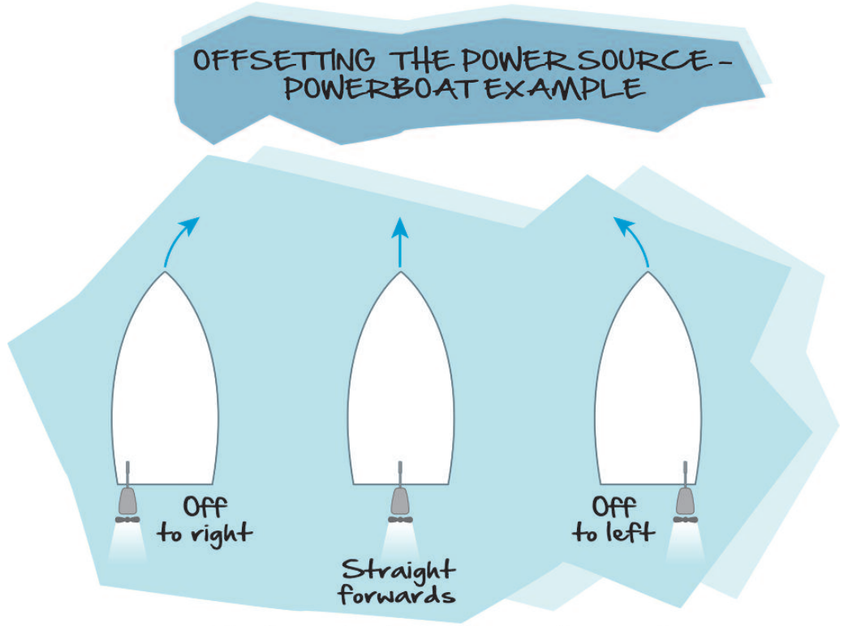
Now imagine that one day you ask a friend to attach the engine for you – a friend who does not quite know what to do – and let's say that they attach it securely to the back of the boat but, instead of putting it in the middle, they erroneously position it far over to the left hand side. Now which way will the boat go in forward gear? Even with the steering centralized the boat will turn right and we need to appreciate why. The force pushing the boat forwards is no longer acting on it centrally. With one side being pushed effectively and the other side experiencing drag then the boat will turn as it pivots around the side that is feeling neglected.



An easy exercise you can try with your phone to understand how a power source effects steering

Try it. Take your phone and place it on a table directly in front of you with a short edge facing you. Place your index finger in the middle of the short edge and push the phone forwards. It should travel in a straight line away from you. This represents a balanced power source. Now try it again but this time place your finger on one end of the short side and push it forwards. The phone should turn smoothly to the opposite side as it moves forwards. This represents an offset power source.

So when we lean the rig forwards and towards the wind we throw the CE not only in front of the CLR but, crucially, over the windward side of the board. This provides more power to the windward side than the leeward side so the windward side is propelled forwards more effectively than the leeward side – and it is this that turns the board downwind.



Thinking about how the positioning of a powerboat engine could effect it's control helps to understand how a windsurfer steers

When we steer upwind the rig needs to be leaned back and away from the wind. As the sail is already positioned away from the wind however (over the downwind side in its natural sailing position) we only need to focus on leaning it back.

THE STEERING PLANE

So with steering in non-planing conditions across the wind there is a diagonal plane in which the rig moves as can be seen in the annotated photo.

Understanding this will help to steer smoothly and proficiently, especially when counterbalancing the pull of the sail with the body. Another critical reason that non-planing steering must be performed along the diagonal plane is that airflow over the sail is kept smooth (laminar) which transfers power into the turn. Over-sheeting the sail in order to lean the rig directly towards the nose or tail would mean trying to steer using turbulent airflow which would fail to turn the board effectively. So to get your beam reach non-planing steering just right, remember to only position the rig forwards and backwards along the diagonal plane and from here other more specific steering techniques will follow.

Changing direction at planing speed – the more dynamic version of steering – will be covered in the next article.

The diagonal plane for non-planing steering when sailing across the wind

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