WINDSURFING 101: PLANING MADE SIMPLE

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A REMARKABLE ARRAY OF CHANGES OCCURS WHEN A WINDSURFER MAKES THE TRANSITION FROM NON-PLANING TO PLANING. WHEN THE BOARD DRAMATICALLY SLIPS INTO HYPER-DRIVE FOR THE VERY FIRST TIME THE FEELING FOR THE RIDER CAN BE BOTH EXHILARATING AND TERRIFYING IN EQUAL MEASURE. FOR ME THIS HAPPENED ON A SMALL GREEK ISLAND IN A HARBOUR RIDDLED WITH YACHTS LASHED TO MOORINGS. With no idea of how to handle the kit at such speed I simultaneously whooped/feared for my life as I blasted a sketchy line across the water whilst the menacing hulls flashed by. After slowing down again and dropping the rig I collapsed onto my board in a kind of trance having finally realised what windsurfing was all about.

So, in simple terms, what's happening when planing occurs and how on earth can a windsurf board travel at greater speeds than the wind? To get things started we need to go back a few years to understand what stops a board sinking in the first place.

The original 'Eureka' moment

Archimedes of Syracuse, whilst famously stepping into his bath over 2200 years ago, discovered that an object, wholly or partially immersed in a fluid, is buoyed-up (supported) by a force equal to the weight of the fluid displaced by the object. This principle explains how a buoyant force is exerted by a fluid on any object that is placed on or in it. Basically this is the only reason why a stationary board, rig and rider float either on the surface or slightly below it according to volume of board vs weight of rig and rider.

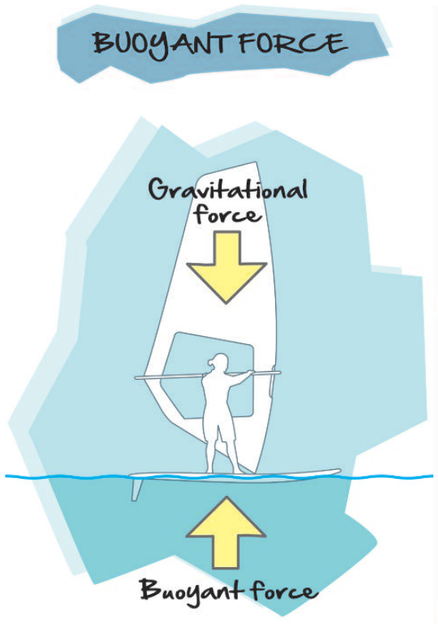
GETTING UP TO SPEED

As a windsurf board moves forwards more elements come into play. At low speed a board displaces water, pushing it out of the way and creating plenty of drag at the same time.

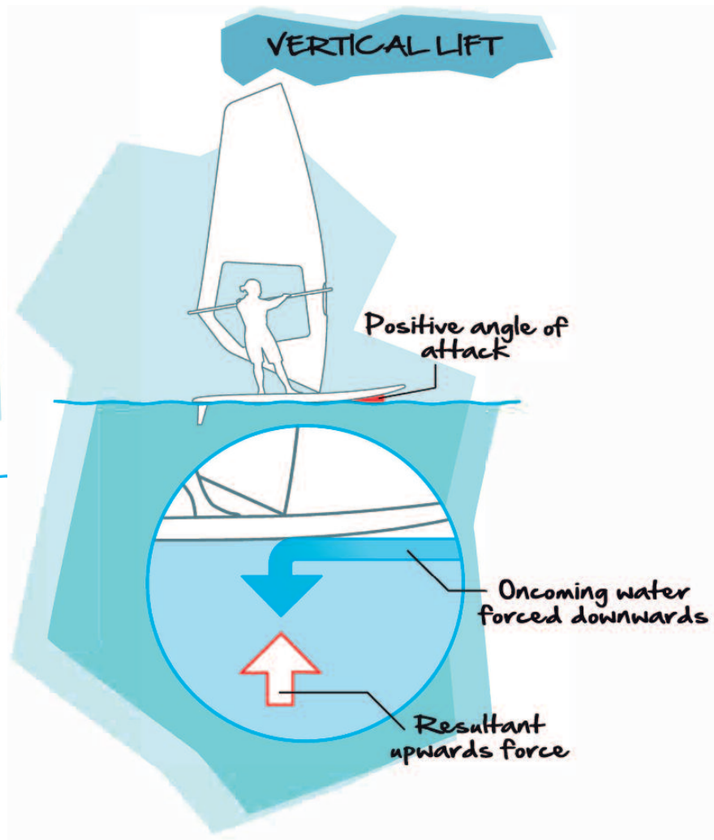
A factor that is significant in reducing drag is the forcing downwards of the oncoming water as it meets the underside of the board. The way the board presents itself to the oncoming water is described as its positive angle of attack. Too steep an angle means that the oncoming water will hit the underside of the board more head-on and prevent it reaching (or maintaining) greater speeds.

A board with a perfect shallow angle, however, will deflect the oncoming water downwards effectively, resulting in a (reactionary) vertical force upwards on the board.

As it moves along, a board sits in a wave of its own creation with a crest near the front and a crest just behind it. With too much weight on the back the board has a mountain to climb and will have low forward speed and high drag. A perfectly trimmed board, however, with plenty of power from the sail will allow the board to move forwards effectively and – as the speed increases and the drag decreases – the board will lift upwards out of the water enabling it to sit in front of its forward crest – often referred to as having 'overtaken its own bow wave'. Now the board is planing, literally skimming across the water unfettered by the drag it previously experienced when in displacement mode



Buoyant force acting on a windsurfer allowing it to float

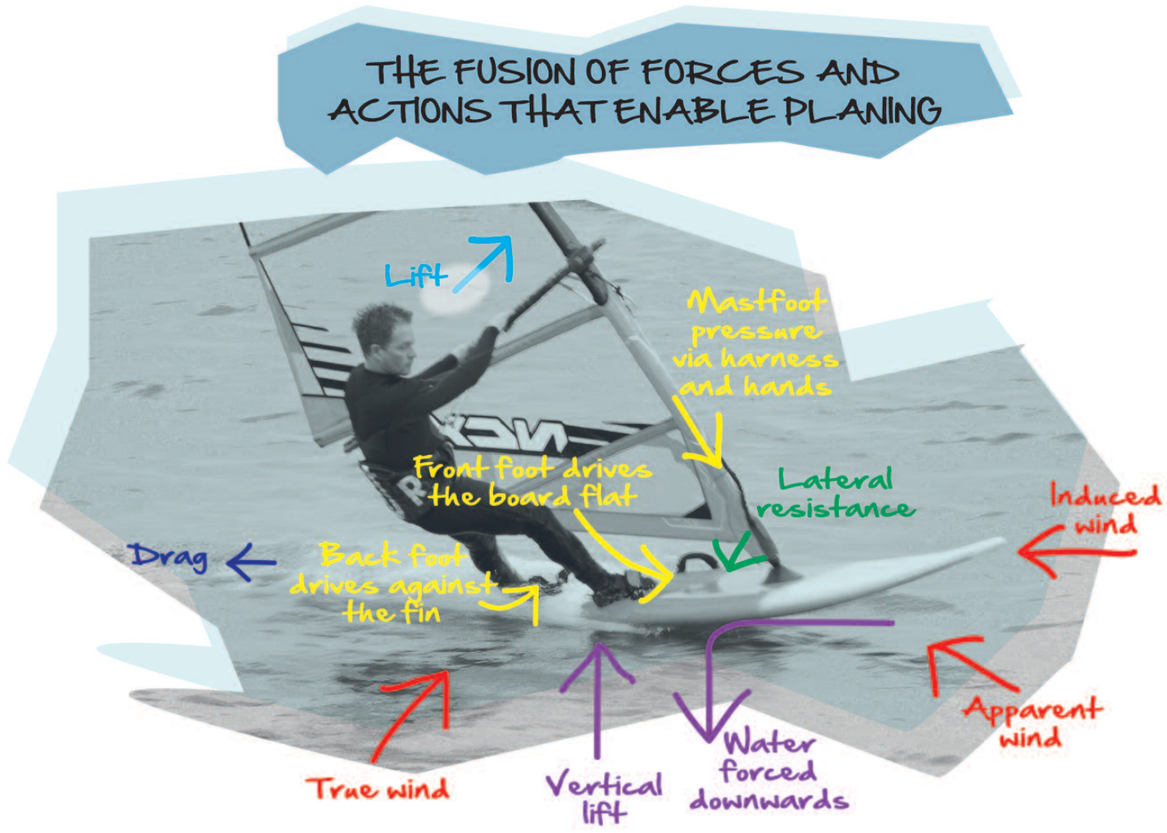


Vertical lift is created as more power is transferred through the board

CAN A BOARD SAIL FASTER THAN THE WIND? APPARENTLY!

The forward speed that we create as we windsurf is called the induced wind (like the wind a cyclist feels in their face as they ride along on a windless day) and it hits the rig at exactly the same speed that the board is travelling in. This headwind (negligible at low speed yet of paramount importance at high speed) is added to the true wind with vector addition.

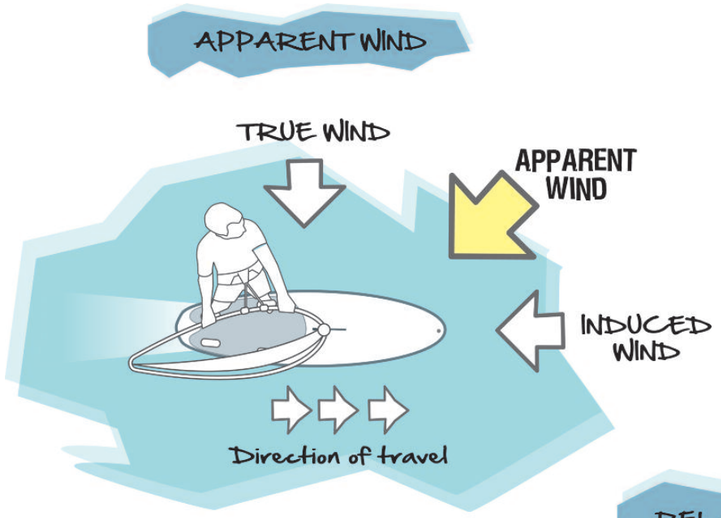
This increases the strength of the wind, as felt by the rig, which increases the power output of the sail, as well as changing the direction of the wind hitting the sail. This resulting apparent wind comes from further ahead than the true wind.



A planing board skims over the surface of the water, having reached a critical speed whereby vertical lift becomes the predominant upwards force

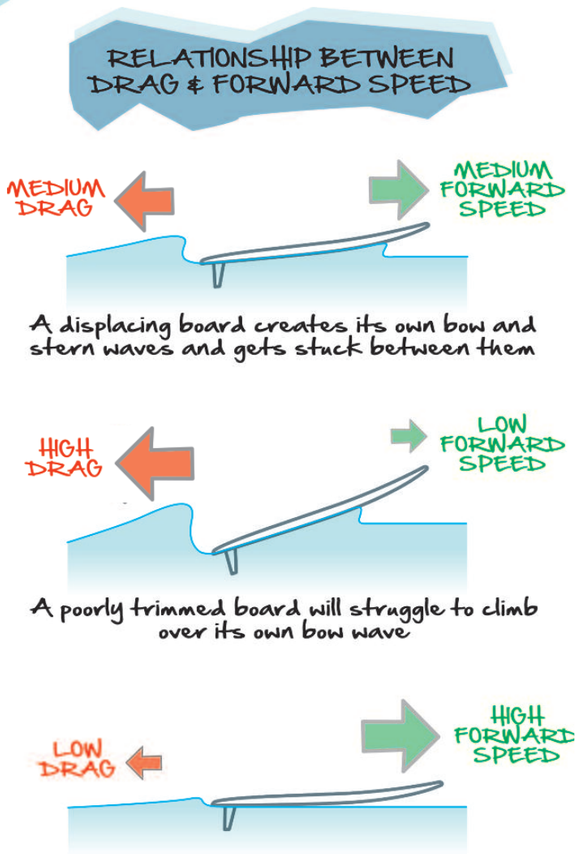
Things are being kept super-basic here. If you're not careful, a number of rather more academic factors can creep in such as wind shear, inverse cosines and quadrant ambiguity which are not generally at the forefront of people's minds when the sun is out and the wind is blowing!

What is important, however, is that the rider in the real world needs to pull the sail in closer to the centre line of the board as the speed increases and the wind is felt from further ahead. Sailing on the apparent wind maintains the smooth flow of air over the sail, allows the board to be sailed faster than the wind and the world is a happy place.



The sail is pulled in closer to the centreline as the speed increases and the apparent wind is felt from further ahead

The challenges come when we are windsurfing through the buffer zone between non-planing and planing as our equipment is fought over by the rival forces attempting to dominate it. What we do with our rig and with our weight on the board needs to change fluidly to meet the needs of these rules of physics at this time.



A displacing board creates its own bow and stern waves and gets stuck between them

A poorly trimmed board will struggle to climb over its own bow wave

A perfectly trimmed, well-powered board is able to sit in front of its own bow wave and planing occurs

So there it is – a simplistic version of how a rider, successfully harnessing stronger winds, can enable planing by transferring the rig's energy through their body and board to reduce the board's drag in favour of vertical lift and, hence, greater forward speed. Once planing occurs and the fun intensifies, the only thing left to worry about is dodging those moored yachts - so join us next time for a 101 article on steering…

Simon Winkley is a RYA Advanced Windsurfing Instructor and a RYA Windsurfing Trainer running instructor courses across the UK and overseas. He is supported by Starboard, Severne and Bray Lake Watersports and provides windsurfing coaching holidays through Ocean Elements in Vassiliki