



LEE-BOWING: DEBUNKING THE MYTHS

CLIVE LOUGHLIN TAKES A CLOSE LOOK AT LEE-BOWING TO SHOW WHEN IT IS USEFUL, WHEN IT MAKES NO DIFFERENCE, AND WHEN IT DOESN'T WORK AT ALL

If you Google 'Lee-bow effect' you will find hundreds of articles and contradictory statements and anecdotal stories that will leave you more confused than when you started. Some are helpful but many are just plain wrong.

The confusion is partly caused by the term being applied to a number of very different situations, as this article will show.

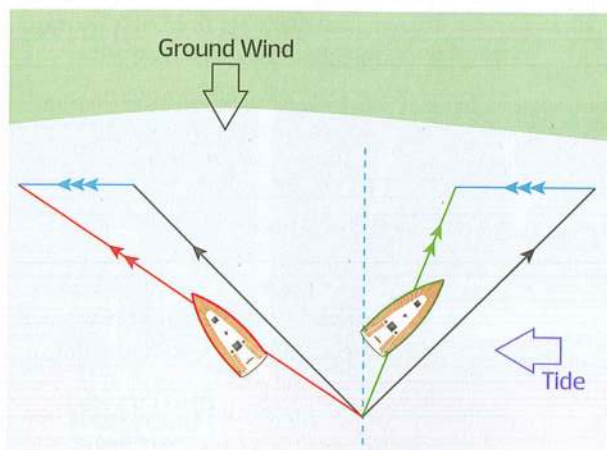
BEATING TO WINDWARD WITH A CROSS-TIDE

Lee-bowing has the greatest impact when the target destination is dead upwind and the tide is at right angles to the wind and pushing the boat sideways.

In the illustration, the green and red boats are both heading at 45° to the ground wind and are making 6 knots through the water, however the green boat has two

knots of tide pushing against the leeward side of the boat and is therefore 'lee-bowing'. The green boat is using the tide to effectively sail closer to the wind while the red boat is being swept downtide of the destination and will have a real struggle to get home at all.

BELOW
Green lee-bows the tide to stay closer to the rhumb line



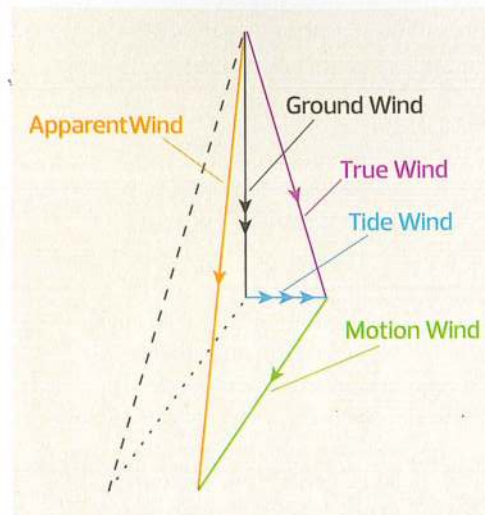
Green would work out the Course-Over-Ground for the opposite tack and plan the moment to tack for Home accordingly.

If Red recognizes the mistake early enough and works out the COG for the opposite tack, then both boats will arrive at the same time.

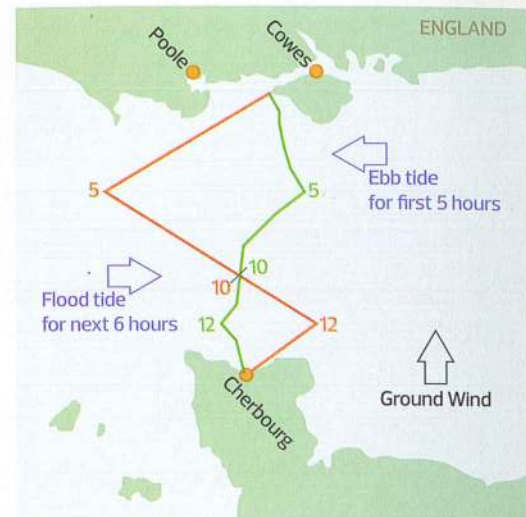
TIDE WIND

The wind that a boat experiences is the apparent wind, and this is the combination of the ground wind (the wind blowing over the surface of the earth), the tide wind caused by the boat being moved over the ground by the tide, and the motion wind caused by the boat moving forward through the water.

The addition of tide wind causes the apparent wind to back in the above example and this will allow Green to point higher or sail faster.



ABOVE LEFT
The Apparent Wind is the sum of the Ground Wind, Tide Wind and Motion Wind. The dashed line shows the Apparent Wind if tide is not taken into account



Definitions

Different sources define different winds in different ways. What follows are the definitions used for this article.

Ground Wind – the wind experienced by a boat at anchor.

Tide Wind – the wind created by the boat being carried on the tide. This has the same speed but opposite direction to the tidal stream.

Motion Wind – the wind created by the boat's forward motion through the water. This has the same speed and opposite direction to the boat's movement through the water.

True Wind – is the sum of Ground Wind and Tide Wind.

Apparent Wind – is the sum of True Wind and Motion Wind.

Both boats are making six knots through the water but Green is disappointed to see from the GPS that her speed over ground (SOG) is always less than six knots and sometimes drops to four knots.

Red, on the other hand, is cracking along with an SOG always above six knots and sometimes almost 10 knots.

After five hours the tide turns and both boats put in a tack to maintain their strategy of lee-bowing or not.

After 10 hours of sailing, Red and Green are surprised to cross tracks with each other, and each continues for a further two hours before realising that they need to tack in order to make it to Cherbourg, where they should both arrive after a 14-hour crossing.

With Red and Green both arriving at the same time, it could be argued that lee-bowing makes no difference as the passage times are the same.

WHY LEE-BOW?

The real advantage of being on the tack that heads into the tide (lee-bowing), is to potentially be in a better position to reach the destination if the wind changes direction.

Red's ground track has taken her well away from the straight-line course and after five hours she is only about 8nm closer to Cherbourg. Red would be in big trouble if the wind backed while she was so far west and might struggle to make it to Cherbourg at all; while Green may be able to take advantage of the wind shift to bear away a bit and arrive sooner.

TACKING IN A TIDAL STREAM

One myth often associated with lee-bowing is that a boat in a tidal stream will experience different wind strength and direction on either tack.

The true wind is a combination of the ground wind and the tide wind and this will be the same for everyone on the water regardless of the direction they are sailing in.

So a boat close-hauled on port tack will be in the same wind as the boat close-hauled on starboard, and both boats will make the same speed through the water.

The boats will have no way of knowing if the true wind they are sailing in is just ground wind or a combination of ground wind and tide wind – to them it will just be 'the wind' – and that is all there is to it.

However, the tide wind can have a very significant effect on the strength and direction of the true wind and this will change the direction the boats can sail in and their course over the ground.

WORTH A PINCH?

Another popular myth associated with lee-bowing is that a boat that is sailing close-hauled directly into a tidal stream will gain great benefit by heading up a bit further so that the tidal stream is at an angle to the lee-bow.

The idea is that the tidal stream will somehow magically push the boat to windward.

If a boat sails closer to the true wind than close-hauled its speed will drop and this will reduce the

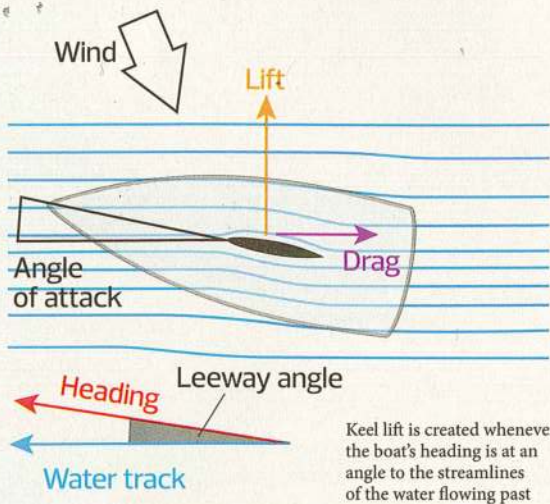
CROSS CHANNEL TACTICS

For this example (above right) the ground wind is from due south and the boats are close-hauled at 45° to the ground wind on either 135° T or 225° T.

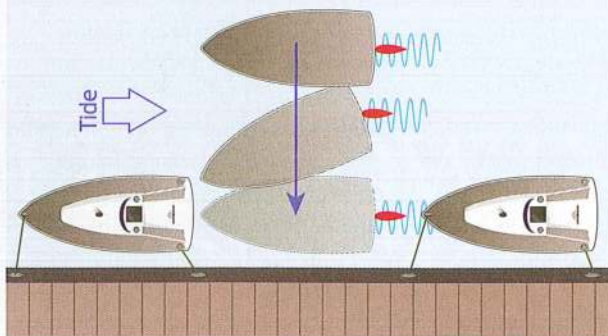
Green has read about lee-bowing and the advantages of being on the tack that heads into the tide.

Red doesn't believe in lee-bowing and decides to demonstrate this by always sailing on the opposite tack to Green.

ABOVE RIGHT
Green lee-bows the tide while Red does the opposite. Markers show where each will be after five, 10 and 12 hours



Keel lift is also used to help ferry glide sideways into a berth



lift generated by the keel and so leeway will increase. The ground track may be slightly better than it was when sailing close-hauled, but at a much reduced speed.

WHAT ABOUT KEEL LIFT?

When a boat is on a beat or a reach, the wind will be acting to blow the boat sideways (leeway). The effect of this is greatly reduced by the keel, which creates lift in much the same way as an aircraft



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wing. This lift works to oppose the sideways push caused by the wind.

KEEL LIFT IN OPEN WATER?

Keel lift is a constant benefit in reducing leeway and can be a powerful extra force to assist ferry gliding in rivers and marinas. But if we are sailing at an angle to the tidal stream will this also help us to move upwind?

Sadly the answer to this is 'No'.

This is a tricky concept, and is probably at the root of much of the controversy associated with lee-bowing.

When ferry gliding the idea is to match the forward movement of the boat through the water to counteract the tidal stream, so that the boat is stationary over the ground.

When in open water it is as if the boat is sailing in a very large tank of water that is on a conveyor belt, and where the movement of the belt represents the tidal stream. As the conveyor belt moves, then so also does the tank of water.

However, within the tank of water there is no tidal stream and so the opportunity for generating

keel lift never occurs. The keel lift that aids ferry gliding is created because the water is moving past the static boat which is held at an angle to the stream, as opposed to the tank where the boat is sailing straight through static water.

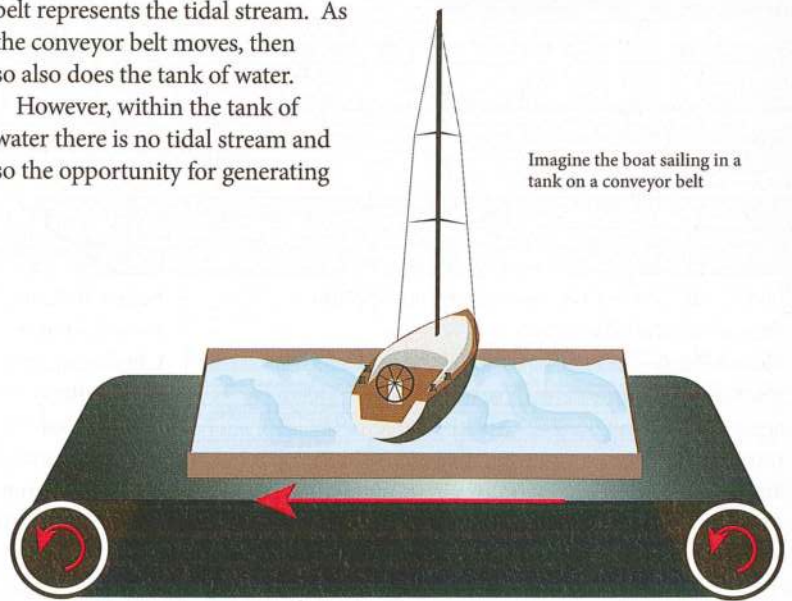
LEE-BOW ON THE RACECOURSE

Lee-bowing is a mainstay of the racing fraternity and has nothing at all to do with the lee-bow effects discussed above.

The aim is to position the boat to leeward and a bit ahead of the competition.

A sailing boat will deflect the flow of the wind for several boat lengths ahead and behind it.

This effect can be used to 'head' a nearby opponent by deflecting the wind onto the wrong side of their sails. To add insult to injury this also subjects them to the disturbed water in your wake.



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