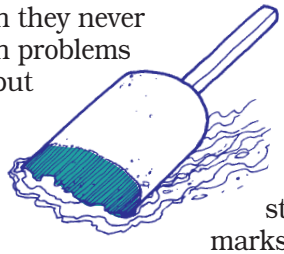
David Dellenbaugh's
SPEED&Smarts™
The newsletter of how-to tips for racing sailors Sept/October 2009

Don't be fooled by moving water!



Many sailors wish they never had to deal with problems created by current, but others view current as a great chance to be strategically smart and gain an upper hand on their competition. Since almost every racing sailor must 'come to grips' with current sooner or later, I decided to write this entire issue about what happens when the water is moving.

Most of the articles inside focus on strategies you can use to be more successful in current. Since there still seem to be quite a few misconceptions about current out there, we will also try to separate fact from fiction.

We will look at a number of different questions such as:

What is the difference between racing when the current is steady versus variable? How does current affect your sailing wind and your strategy as you approach marks? How will your race be affected by the relative angle of the current to the sailing wind?

The next fifteen pages will include a theoretical discussion about current, some rules of thumb for sailing smart when you have current, and a bunch of strategic moves at marks.

We will examine four common myths about current, and then end up with an interesting and challenging case study that incorporates (and will make you apply) many ideas described in the rest of this issue. •

JH Peterson photo

When you're racing in current, it's easy to gain or lose lots of distance. Moving water usually provides plenty of opportunities to sail smarter than your competition. But it also means you must be constantly alert, or you'll end up losing like these boats going wide at a leeward mark.

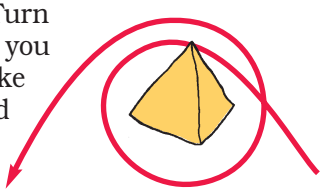
ISSUE #108

Current Affairs

BRAIN TEASER

Can you 're-round' a mark?

It used to be that when you hit a mark your penalty was to make a circle around that mark. This requirement was dropped in 1989, and now you just have to make a One-Turn Penalty. But are you permitted to make that turn around the mark? (*See answer page 11*)



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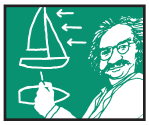


IN THEORY

Key ideas for understanding current

It's not always easy to understand how current works, especially for sailors who normally sail on lakes. The sailing environment is fairly complex because it has two fluids, air and water, that interact with each other and with a third fixed variable, land. Both of the fluids change frequently in speed and the direction they flow, which keeps things interesting for sailors!

By current, we mean the flow of water relative to land. There are three basic types of current that we will discuss in this issue:

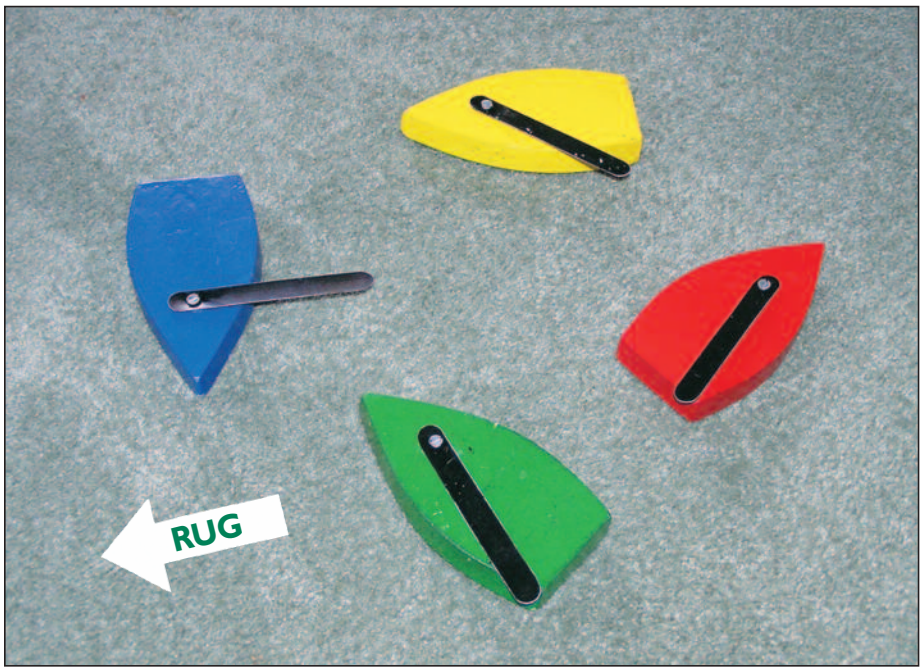
'Fair' current – The water is moving in opposition to the wind. We call it 'fair' because it helps the boats sail upwind.

'Foul' current – The water is moving in the same direction as the wind. We call it 'foul' because it works against the boats that are sailing upwind.

'Cross' current – The water is moving at an angle to the wind. It often goes across the race course from right to left or left to right.

Each of these types of current has its own characteristics and corresponding set of strategic moves. In addition to these variations in the direction of flow of the current, there are, of course, variations in the strength of the current. Strong currents have all the same qualities as weak ones, but their effects are exaggerated and therefore much more threatening to racing success.

Finally, there is a third quality of current that may be even more significant – how variable it is!



The "Moving Rug" Analogy – What happens to sailboats sailing in current is a lot like what happens to objects that are placed on top of a moving rug. When you pull the rug, all the objects move in the same direction. It doesn't matter where they are aiming or how fast they are going or where their booms are located – they will all move equally in the direction that the rug is being pulled.

This is very similar to boats sailing on the surface of a body of water that moves because of current. No matter which way the boats are pointing, the current will push them all in the same direction. That's why, for example, there is no such thing as the "lee-bow" effect (see *page 14*). You can't pinch up to make the current hit your lee bow because the current is not hitting your boat at all – instead you are floating along with the body of water just like an object on a moving rug.

Steady current

A steady current is one where its strength and direction are basically the same in all parts of the course. In addition, it does not change very much during a race. Strategically, this is the easiest type of current to play because it is the same for all boats and does not cause a change in your sailing wind. A steady current is accurately described by the 'moving rug' analogy (*see photo*).

When you are racing in steady current, it doesn't matter which way you go current-wise – it just matters how you handle your boat relative to things that are fixed on the bottom, like marks! This includes starts, finishes, laylines, rhumblines and everything involved with mark roundings.

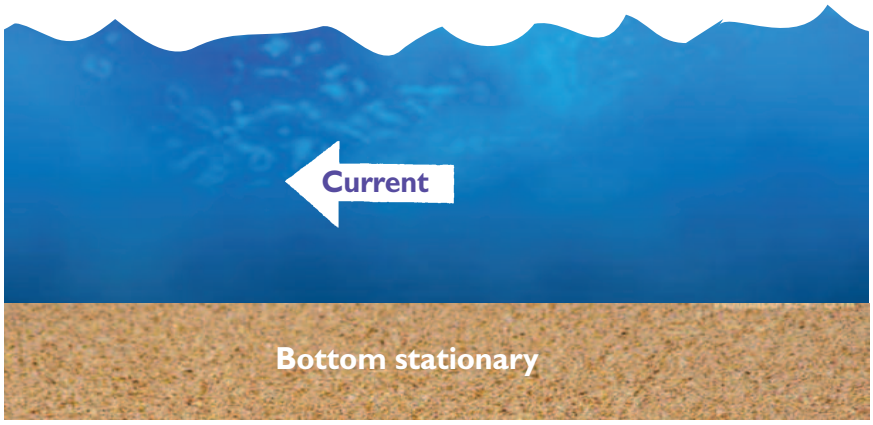
Variable current

A variable current will be different in strength and/or direction, either across the course and/or as the race goes on. Imagine boats on a "moving rug,' but different sections of the rug move in unrelated directions and at varying speeds. In addition, those rates of movement change over time.

Obviously this type of current will have an effect on the way you approach marks. But it also makes your strategic planning quite a bit more complicated.

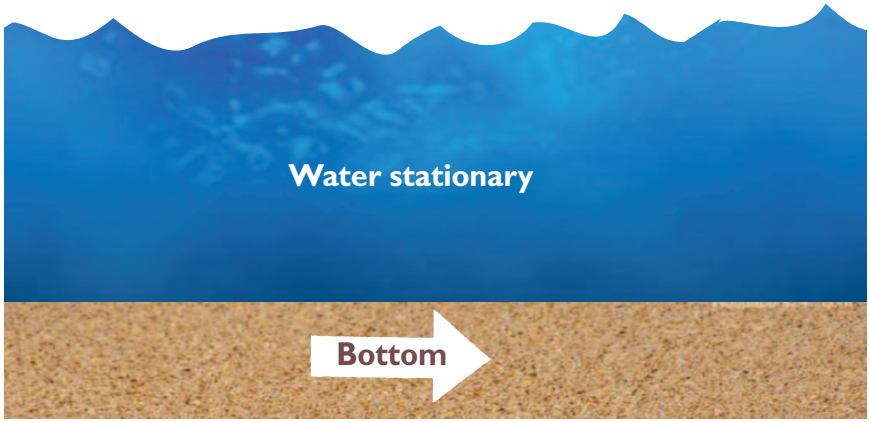
Whenever the current changes in either strength or direction, it affects not only your course and speed over the bottom (e.g. your VMG to the next mark), but also the sailing wind in which you race. Therefore, it's critical to have a good idea of how the current varies in different parts of the course.

The direction, variability and speed of the water flow are three key variables for understanding and playing current. As you will see from the rest of this issue, they will make a big difference in how you plan your strategy in current. •



The "Moving Bottom" Perspective – When thinking about current, it can be confusing to use the bottom (i.e. the land under the water) as your reference plane for boats sailing on top of the water. The problem is that most key variables for sailing are expressed in relation to the water surface, not to the bottom. Boatspeed, for example, is a boat's velocity through the water, not over the bottom. And a boat's sailing wind (see *page 5*) is the breeze felt by a boat floating on the water surface, not by an anchored race committee boat.

Here's another way to look at current that might be helpful. Instead of thinking about water moving over a stationary bottom (above), imagine that the body of water is stationary and the bottom is moving underneath it (below). This won't explain everything, but it may help clarify that in many ways boats really are on a moving rug. And, at least when the current is steady, this point of view may help in understanding how current affects wind and speed.



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Measuring Current

Most sailors estimate the current strength and direction by sailing to an anchored buoy (like the pin end of the starting line) and watching how the water flows past the buoy.

If you want a more accurate idea of current set and drift, get an object that will float very low in the water (so it's not affected much by wind). Common items that work well are a sponge or a water bottle that is mostly filled.

Place this object in the water next to an anchored buoy and start your watch. After one minute (or longer), estimate how far your floating object has traveled, and use math (see below) to calculate the current speed. You can also take a bearing from your object back to the buoy to get the direction from which the current is flowing.

Doing the math

In one minute, a one-knot current will move your floating object about 100 feet (30 meters). If your item moves only 50 feet (15 meters), the current is about half a knot. If your object moves 200 feet (60 meters) in one minute, the current is roughly two knots.

Note you can also use boatlengths to calculate current speed (many sailors find this much easier for estimating distance). For example, if you are sailing a 20-foot boat (6 meters), a one-knot current will move your floating item five boatlengths in one minute. If the object moves only two lengths in a minute, then the current is slightly less than half a knot.

Distance traveled in one minute	Speed of current
50 feet (15 meters)	0.5 knot
100 feet (30 meters)	1.0 knot
200 feet (60 meters)	2.0 knots

How current affects your sailing wind

When you're racing in water that's moving, the current affects not only your course over the bottom, but the wind you sail in too. One easy way to imagine this is to think about a boat on a river (*see below*). Pretend the current is flowing southwest at three knots. The true wind velocity, which is the wind felt by a person standing on shore, is zero.

The boat that's floating down the river has not yet hoisted her sails. Do the sailors on the boat feel any wind? Yes. They feel a breeze of three knots coming from the southwest. This is called their "sailing wind." If the river current suddenly changes direction and starts flowing northeast at two knots, they will feel a sailing wind of two knots from the northeast.

In both situations above, the sailing wind was generated entirely by movement of the water. Since there was no true wind, the sailing wind was simply opposite in direction and equal in magnitude to the current.

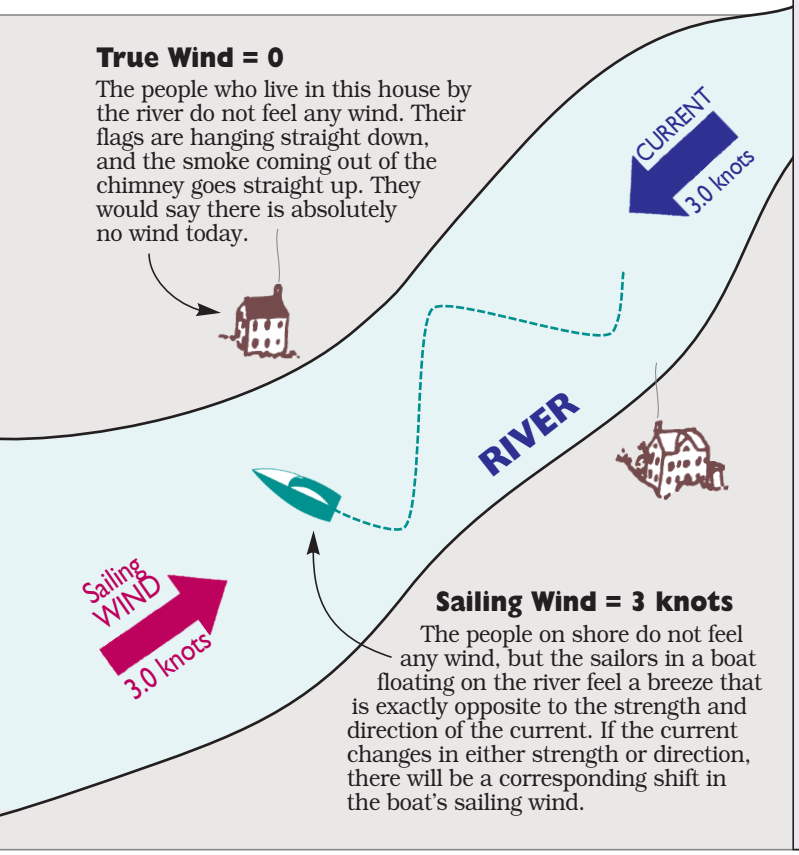
But when you have both true wind and current, the result is a little different. Suppose the person standing on the shore of the river starts to feel a light breeze from the northwest. The sailors in the boat will also feel this, but it will be combined with the wind they felt while floating down the river.

The same effect happens every time you're racing in current. The actual wind you sail in is a vector combination of the true wind (felt by an observer on land or on the anchored committee boat) and the wind caused by the current. This means your sailing wind will change (in strength and/or direction) if there is a change in any of the following four variables:

- Velocity of the true wind
- Direction of the true wind
- Velocity of the current
- Direction of the current

These four variables might be different in different parts of the course, or they could easily change over time. For example, in the situation shown at the top of the next page, the true wind velocity and direction are steady all over the course, but the current strength and direction vary greatly. As you can see, this has a large impact on the sailing wind for boats that are racing up the first beat.

As long as current strength and direction remain constant across the course, every boat will have the same sailing wind so the current won't affect your strategy. However, if the strength or direction of the current varies in different areas of the course, or if these change over time, then you will experience changes in your sailing wind direction and velocity. So before you start a race or a regatta, it's a good ☛

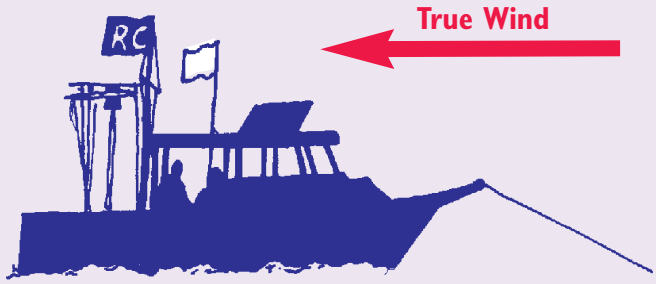


'TRUE' WIND

The true wind is the breeze that people feel when they are standing on shore or on an anchored race committee boat (since this boat is 'fixed' to the bottom). The strength and direction of the true wind are always measured and expressed relative to land.

In theory, knowing the speed and bearing of the true wind is not useful for sailors, or even for race committees. That's because sailboats float on a body of water that is almost always moving relative to land. In other words, the wind that sailors feel is usually different from the wind felt by race committee members on an anchored boat. This "sailing wind" (*see the description on the next page*) is a combination of the true wind and the wind created by movement of the water.

The only time when the true wind and the sailing wind are the same is when there is absolutely no current (i.e. the water is not moving relative to the bottom).

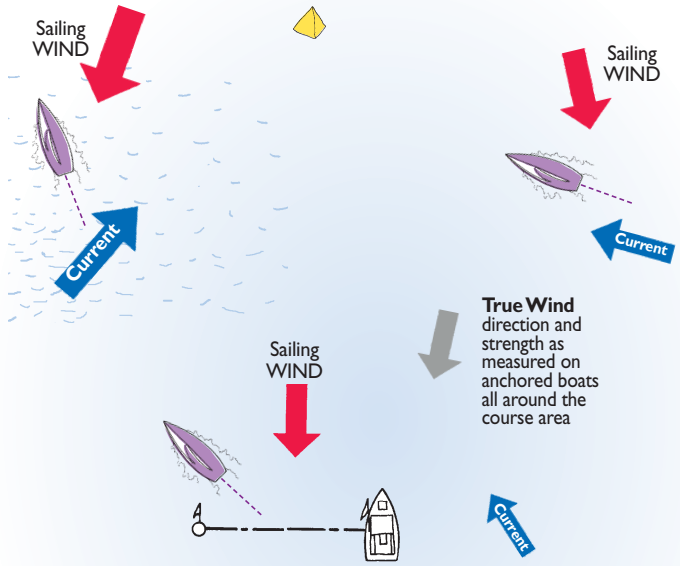


idea to 1) check out a chart of the racing area to see how geography will influence water movement; and 2) sail around the course area and look at current on different sides of the first beat.

A lot of times you can actually see areas of stronger current by looking at the ripples on the water surface. You will see more ripples (or rougher water) in places where the current is running stronger against the wind (or weaker with the wind). For example, in the diagram shown here, you would expect to see more ripples on the left side of the course where the current is running more strongly in opposition to the wind.

Sometimes it's hard to tell whether the ripples are caused by current or by a puff of wind. When you're sailing upwind, this doesn't matter so much because it is always good to sail into more wind or into current that's flowing more upwind. On the run, however, it's a little tricky. It's always smart to sail for better pressure downwind, but if the ripples are due mainly to current that might not be a great place to go.

The bottom line is that changes in current can have a profound effect on your sailing wind. This is not a factor when the current direction and strength are steady, but if the current is variable or starts changing it will impact your strategic plan. Variable current is significant not only because it affects your course over the bottom, but because it may bring a windshift or better (or worse) wind pressure. •



When the current is different across the course, your sailing wind will also vary accordingly. As you can see in this diagram, a change in either the speed or direction of the current will usually affect both the speed and direction of the sailing wind.

The influence of current on wind is especially significant in lighter air when current speed is a much larger percentage of wind speed. If the true wind in this diagram increases, there would not be as much variation between the strength and direction of the sailing wind in various parts of the course. The opposite would be true if the true wind decreases.

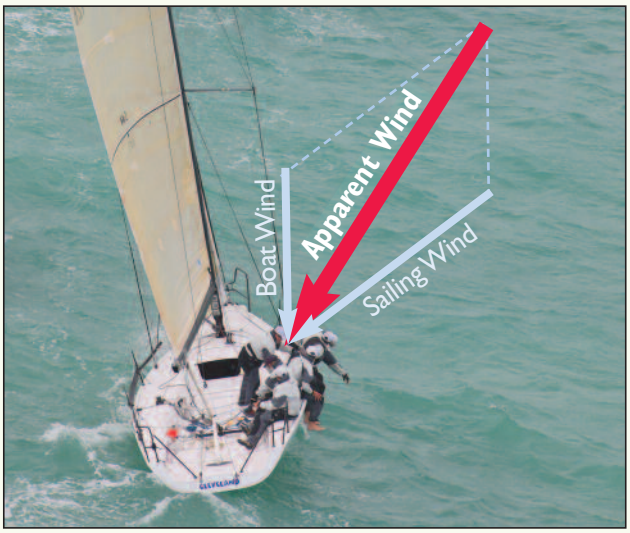
'SAILING' WIND

Your sailing wind is, simply, the wind in which you sail. It's the breeze you feel when you are sitting in your boat with your sails down, floating in the racing area. The sailing wind is a combination of the true wind and the wind created by movement of the water (current). If the true wind or the current change in either strength or direction, this will affect the strength and direction of your sailing wind. When there is no current, the boat's sailing wind will be the same as the true wind (measured from an anchored committee boat). For sailors (and race committees), the sailing wind is much more important than true wind.

JH Peterson photos

'APPARENT' WIND

Your apparent wind is the wind that you feel while you are sailing. It's a combination of the sailing wind and the wind that is generated by the movement of your boat through the water. The apparent wind changes every time your boat changes its speed or its angle to the wind, and therefore the apparent wind felt on different boats is almost never the same. Your apparent wind does include the effects of current, but it is not a useful guide for current because the effects of current on wind are very small relative to changes in boat speed and heading.



CURRENT

Figure out what's happening

Current is the horizontal flow of water relative to land and can be caused by several things including gravitational effects, weather systems and wind. Current is often a result of tide, which is the rise and fall of ocean waters due to the attraction of the sun and moon.

Since water and air are fluids, water currents are a lot like wind. They flow strongly where they are uninterrupted, and they're weaker and swirly on the downcurrent side of obstructions. Unlike the wind, however, water currents have more momentum (because water is a lot heavier than air), so they cannot change speed or direction nearly as quickly. And moving water is generally easier to see than moving air.

How to identify current

There are several ways to tell the direction and strength of the current. Tide tables and current charts are helpful for the big picture, but they are no substitute for observations you must make in the racing area.

• ***Anchored objects*** – Because current is defined as water moving relative to land, you can see it most easily in reference to objects fixed on the bottom such as rocks, points of land, lobster or crab pots, navigational aids, anchored boats (like the race committee boat), marks of the course and mooring buoys.

When you are sailing in the race area, look at every anchored object you pass to gauge the direction and strength of the current. Be careful not to confuse current with the wake left by waves breaking around the anchored object. If it's difficult to distinguish between them, drop an object in the water and watch how far it travels (*see page 3*).

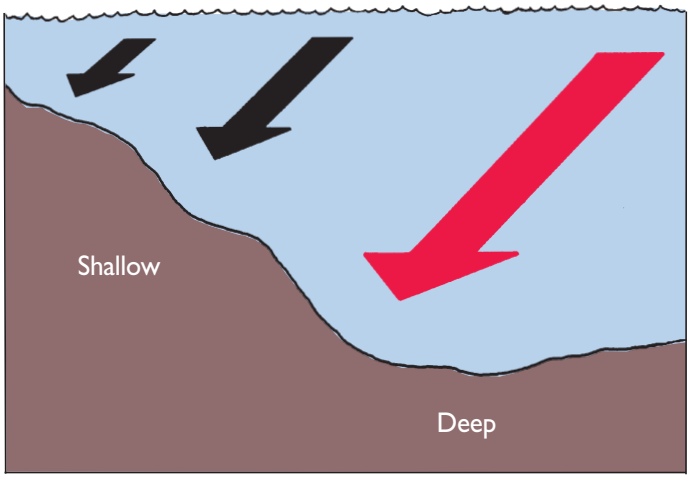
Anchored boats can also show current direction and strength if they are swinging in a direction different than where the wind would normally push them. For example, if the race committee boat is not pointing into the wind, it's probably being set by current.

Some venues have their own telltale signs about current. When racing in Annapolis, for example, you can tell when the current has changed in the middle of the Bay by watching the angles of the anchored freighters out there.

Like the wind, current is expressed as a vector that has both direction (or 'set') and velocity (or 'drift'). Unlike the wind, however, current is often described in terms of where it's going, rather than where it's coming from.

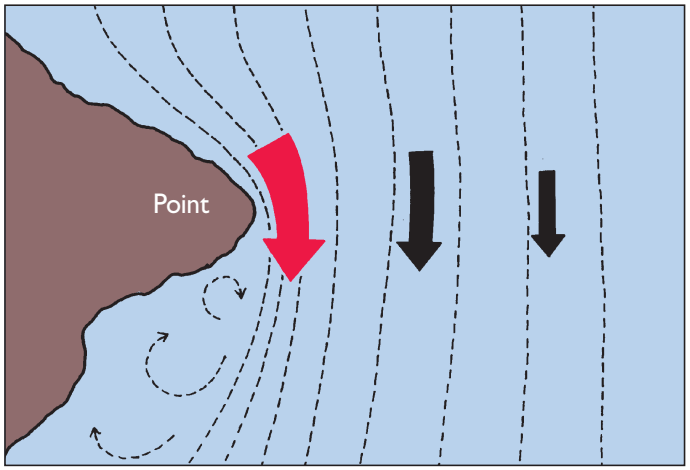
• ***Water surface*** – Whenever the surface of the water does not look like what you would expect for the given wind conditions, there is a good chance that you are seeing the effects of current. For example, when current is flowing toward the wind, the water surface is choppier than usual; when current is flowing away from the wind, the water is smoother than you'd expect. The steep waves created by the strong ebb current (which flows against the prevailing sea breeze) in San Francisco Bay are a great example.

Sometimes you will also see a bunch of weeds that collect along the boundary between two areas of current which may be running in opposite directions. ☛



More water, more current.

The current is generally stronger where the water is deeper, such as in channels or farther away from the shore. This is because when water moves across the bottom it creates friction and slows down. In deeper water, the current flow at the surface (a sailor's main concern) is greater because it is less affected by frictional effects at the bottom.



Stronger current around points.

The current is usually stronger where the flow of water is constricted, such as points of land and openings to bays or harbors. Even though the water may not be so deep here, the current will be strong if the water has to flow back and forth through a narrow area. Watch for back eddies on the downcurrent side of points and obstructions.

• *Relative motion of boats* – A third way to "see" current is by using the performance of your boat compared to fixed objects or other boats. Though this doesn't give an actual visual on moving water, you can learn a lot by watching how current affects floating objects.

The key to this technique is finding things that cannot be explained by the wind or the normal performance of boats. For example, let's say you are sailing on a reach, headed for the jibe mark. You don't notice any change in the wind, but you find that you keep having to head up a little to aim at the mark. There's a good chance the current is pushing you to leeward.

Or imagine that you are sailing up the left side of the first beat. You see boats on the other side of the course that are "making trees" on you. They don't seem to have any more wind than you, and it's a one-design fleet, so they should be going the same speed. Odds are they have different (better) current than you.

By tuning into all these signs, you should be able to get a pretty good understanding of the current characteristics in your racing area.

JH Peterson photo

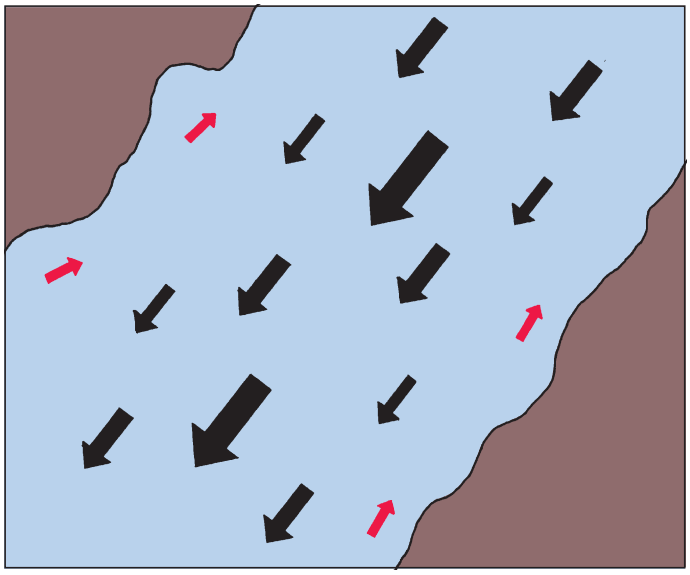
Use waves to help gauge current.

When you're looking for changes or differences in current across the course, the appearance of the water surface is often very helpful. In general, there are bigger waves (or more of a disturbance on the surface) in areas where the current and wind are flowing more strongly in opposition (or less strongly in alignment).

For example, let's say the wind is blowing from the north and the current is flowing from the south (toward the north). Because the current is flowing upwind, you will see more chop overall than if there was no current (or if the current was flowing with the wind). If you see bigger waves on either side of the course, this could be an indication of stronger current there.

When you're racing upwind in current, a good strategic rule of thumb is to stay in the roughest water. This may seem counter-intuitive because pounding into waves is usually slow when beating. But if the bigger waves are a result of more favorable current (and the resulting increase in sailing wind), then the advantages of being there probably outweigh the disadvantages.

Downwind the opposite is true. Even though bigger waves are better for surfing, the current may be better where the water is flatter. Just make sure the difference in sea state is not caused by lighter wind velocity in that area.

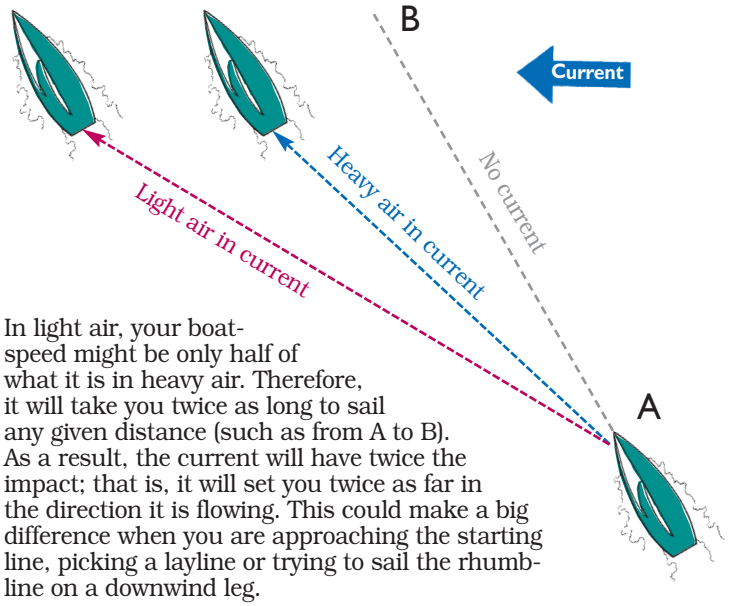


Current changes at edges first.

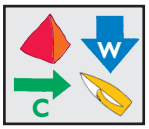
When a tidal current begins to change direction in a bay, sound or river, it will often change first along the shore and later in deeper water near the middle. That's because when the tide turns, the old current is still running strongest in the deeper water and will take longer to slow down and change there. The easiest place for the new water flow to begin is at the edges where the old current was weakest.

Respect current in light air.

The current has a much greater impact on racing in light air than it does in heavy air. That's because when there's not a lot of wind, the speed of the current is a much greater percentage of the wind speed and of your boat speed. Therefore, don't underestimate the impact of current when the wind is light, and treat it as a critical part of your strategic plan.



In light air, your boat-speed might be only half of what it is in heavy air. Therefore, it will take you twice as long to sail any given distance (such as from A to B). As a result, the current will have twice the impact; that is, it will set you twice as far in the direction it is flowing. This could make a big difference when you are approaching the starting line, picking a layline or trying to sail the rhumb-line on a downwind leg.



STRATEGY

Tips for sailing the course in current

When you are racing in current, it's important to assess how big a factor you think the current will be. For example, if you have 20 knots of wind and a quarter knot of current, you can essentially ignore the current. But when you have five knots of wind and one knot of current, the current may be everything. Here are some factors that could swing the balance either way:

• **Wind velocity** – Current is usually a bigger factor in light air because it is a greater percentage of the wind speed and your boatspeed. In light air, it will take you longer to sail a given distance, so the current will affect you more. Also, changes in current speed or direction will have a greater impact on your sailing wind in lighter breeze.

• **Variable or steady?** – When the current is steady all across the race course, it will be less of a factor because it affects all boats equally. But the more variation you have in speed or direction of the current at different points on the course, the more important it will become as a strategic factor.

• **Wind vs. current** – Should you sail for windshifts and puffs, or head for areas of better current? My rule of thumb is that favorable wind (especially more pressure) is usually more helpful than favorable current. Especially in light air, the VMG gain from sailing in a puff or a lift often seems to outweigh the VMG gains from current.

Between the wind and current, I usually focus on the one that is more variable. In other words, if the current is steady and the wind is shifty, I will play the wind. Or if the wind is steady and the current is variable, I look for better current.

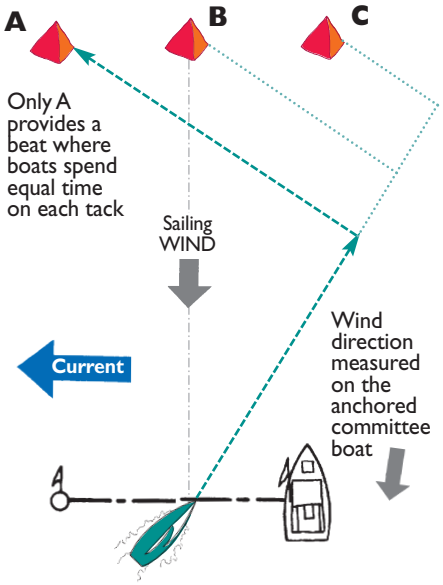
• **Point of sail** – Sometimes the relative importance of current depends on whether you are sailing upwind or downwind. When sailing to windward, better current creates more sailing wind because it pushes you more quickly toward the wind (or less quickly away from the wind). In this case, finding better current can be quite important.

On a run, however, sailing in better current means you have less wind. It still may be a good idea to play the current, but the relative advantage won't be so great.

• **At marks** – When the water is moving, this is almost always a factor while approaching and rounding marks. It doesn't matter whether the current is steady or variable across the course – once you get to an object that is fixed on the bottom the current will affect your strategy. Even though current is equal for all boats at marks, the way you handle it can mean big gains or losses.

The important thing about any variable like current is giving it the proper emphasis in your strategic plan. If you underestimate its effect, you are bound to get in trouble, especially at marks. But if you overestimate current, you can also lose a lot of distance that may be costly. •

Sail the longer tack first

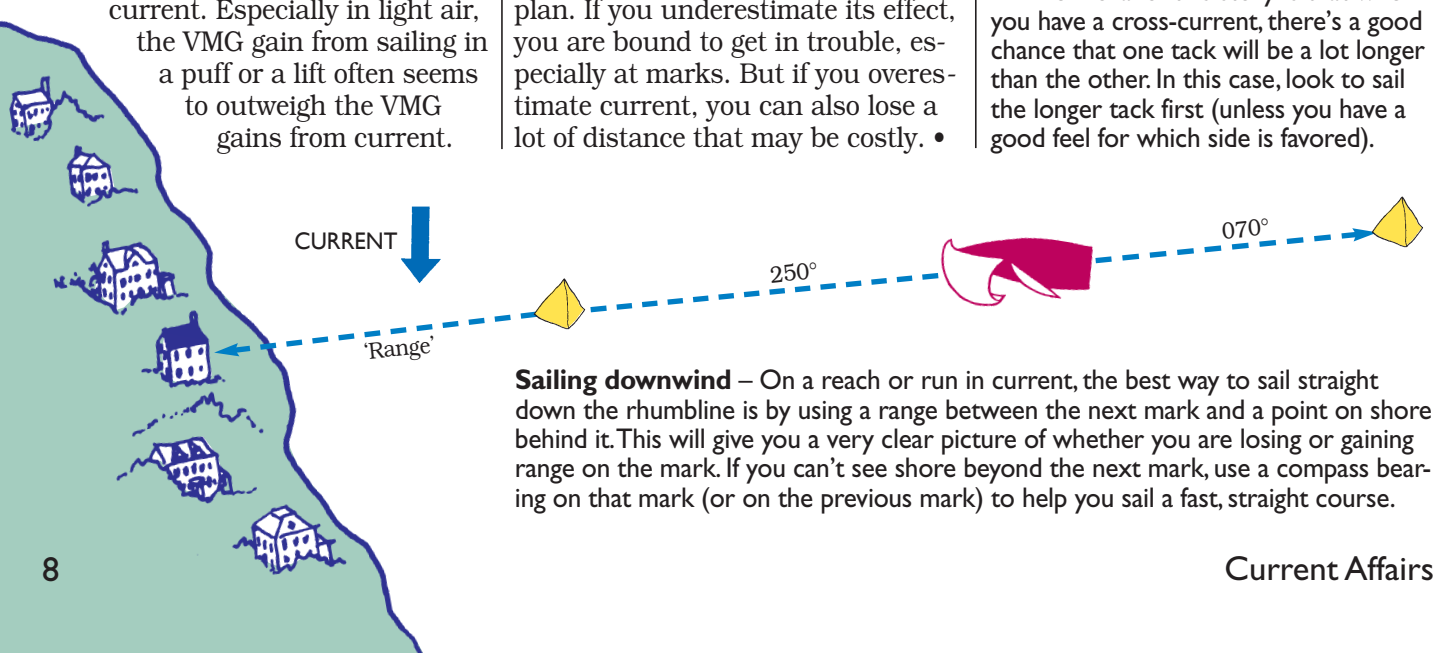


When you're racing in a cross-current, there's a strong possibility that your first beat will be skewed for two reasons:

1) If the race committee uses the (true) wind direction measured from an anchored committee boat, they will set the windward mark at C, which is way too far upcurrent; and

2) Even if the committee uses the direction of the sailing wind (the wind felt by floating boats), there is still a good chance they will set the mark too far upcurrent. For example, if they put the windward mark at B, the mark will be exactly to windward of the starting line, but boats will not spend equal time on each tack because they are pushed downcurrent during the beat.

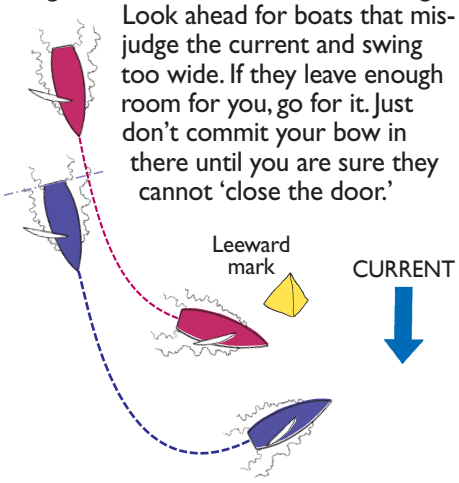
The moral of this story is that when you have a cross-current, there's a good chance that one tack will be a lot longer than the other. In this case, look to sail the longer tack first (unless you have a good feel for which side is favored).



Sailing downwind – On a reach or run in current, the best way to sail straight down the rhumbline is by using a range between the next mark and a point on shore behind it. This will give you a very clear picture of whether you are losing or gaining range on the mark. If you can't see shore beyond the next mark, use a compass bearing on that mark (or on the previous mark) to help you sail a fast, straight course.

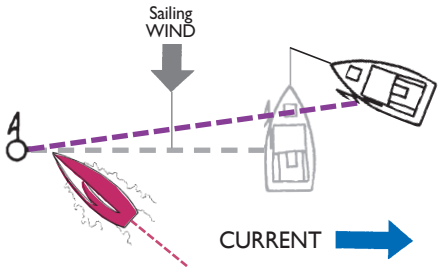
Take advantage of "room given"

When the current is running with the wind, there will often be opportunities to gain a lot at leeward mark roundings. Look ahead for boats that misjudge the current and swing too wide. If they leave enough room for you, go for it. Just don't commit your bow in there until you are sure they cannot 'close the door.'

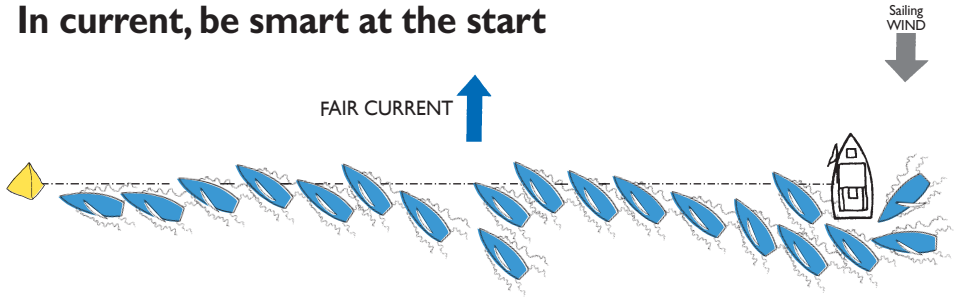


Watch for swinging RC boats

At the start and finish lines, watch how the committee boat swings on its anchorline. This is usually a good indicator of current, but it may also be an important strategic factor. Often the current pushes the boat away from the position that would make the line square, and this could have a significant impact on where you start or finish the race.

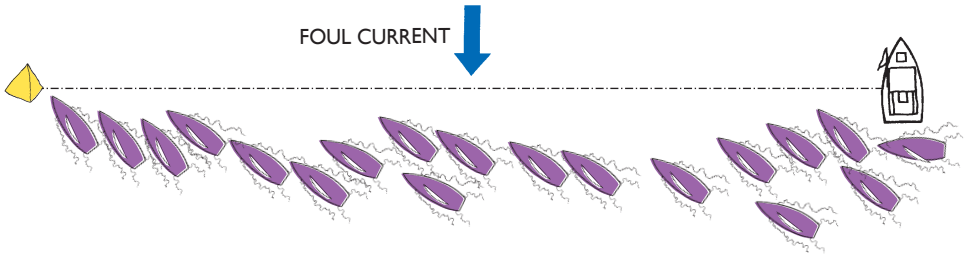


In current, be smart at the start



▲ When the current and wind are going in opposite directions, watch out for a bulge in the middle of the line and the possibility of general recalls. Make sure you get a line sight if possible. If you like the left side of the course, this is a great time to go for the pin end of the line because it will be easy to fetch the buoy. But you never want to start at the committee boat in these conditions because it's too easy to get caught barging.

When you're practicing before the race, don't sail too far to windward of the line since it may take you a long time to get back for the start.

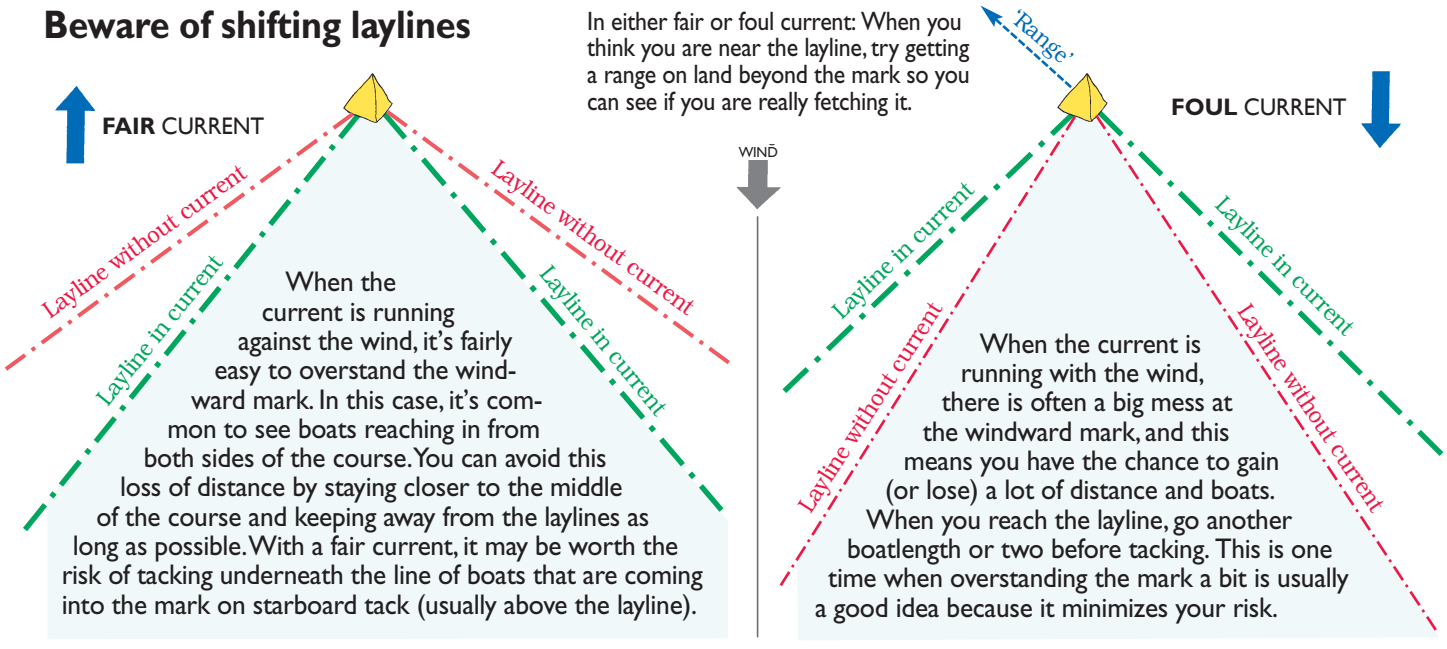


▲ When the current and wind are going in the same direction, many boats will be late for the start. There will often be a sag in the line, so the middle is a great place to be. If you have a confident line sight you may be able to start several lengths to windward of the other boats. Just remember: 1) In light air the current will affect you much more as you approach the line; and 2) When the pin end of the line is favored it will take you longer to get to the line (because of your oblique angle to the line). Therefore, in both cases you must stay a little closer to the line than you think.

In foul current, the committee boat end is fairly safe. You might even be able to make a barging approach if you really like the right side of the course. But stay well away from the pin and the typical mess there.

Beware of shifting laylines

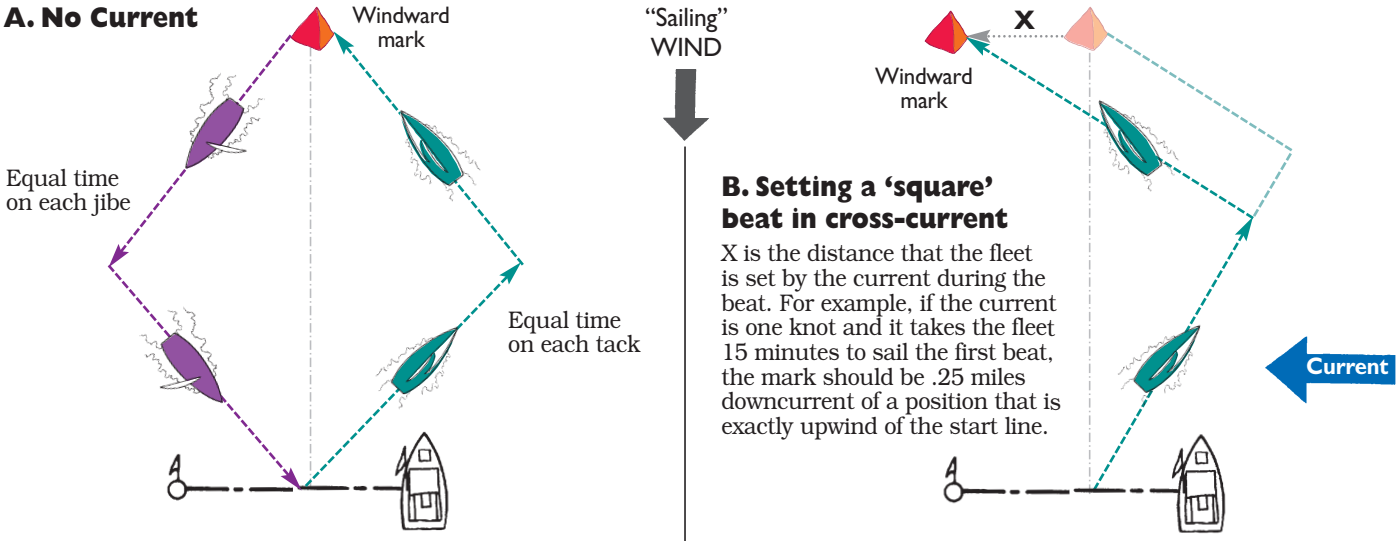
In either fair or foul current: When you think you are near the layline, try getting a range on land beyond the mark so you can see if you are really fetching it.



Handling W-L courses in cross-current

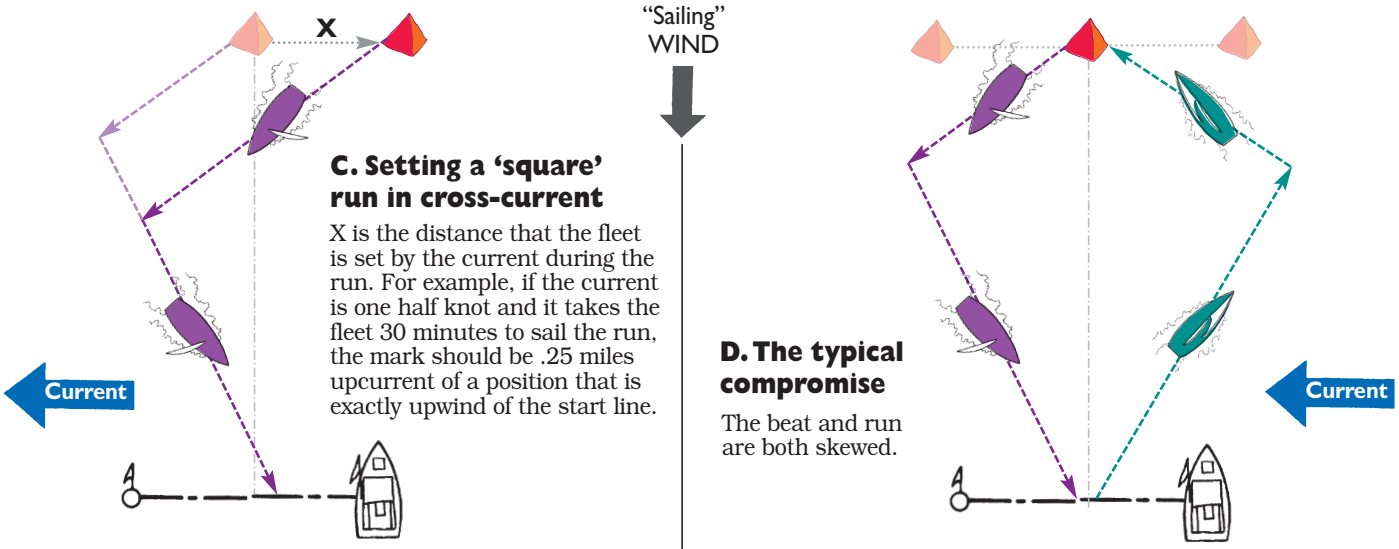
On a windward-leeward course, the windward mark should be positioned so boats have to spend the same amount of time on each tack during the beat and run. This is relatively easy to do when there is no current (and the wind is not too shifty!). But if the current is flowing across the wind, it can be quite a challenge.

In this condition, even the best race committee has a hard time setting a square beat. And it's impossible to set both a square beat and a square run (unless the committee moves marks or uses long offset legs). As a result, sailors will often find one tack longer than the other when racing in a cross-current.



On a perfect windward-leeward course, the boats should spend equal time on port and starboard tacks during both the beat and the run. Unless there is a cross-current, this is easy to do because the race committee can position the first mark exactly to windward of the starting line.

When the current is flowing across the wind, setting a good windward-leeward course is more difficult. To get a beat where boats spend equal time on each tack, the mark must be moved downcurrent of a position directly upwind of the start line (by the distance the boats are set by the current during the beat).



If the windward mark is set directly upwind of the starting line, then on the run the upcurrent (port) jibe will be longer than the downcurrent jibe. Therefore, to get a square run (where boats spend equal time on each jibe) the committee must move the windward mark upcurrent (by the distance the boats are set by the current during the run).

The windward mark must be moved downcurrent to get a square beat, but upcurrent to get a square run. Unless the committee is willing to set a long (upcurrent) offset leg or move the marks for each leg, this means the beats and runs will be skewed. Knowing this can be very helpful for your strategy since it often pays to sail the longer tack or jibe first.

Current: *Risky business!*

It's impossible to write about the subject of current without also discussing risk, which is defined in the dictionary as "exposure to the chance of loss."

In sailboat racing, if you do something that increases the likelihood that you will lose positions or distance in the race, you have taken a risk. Though you must sometimes accept a bit of risk to achieve your goals, this shouldn't be a regular part of your strategy (since risk, by definition involves a greater chance of loss than gain).

However, the simple presence of current usually increases the risk level. If the current is strong or variable across the course, the risk goes up even more.

When racing in current, you normally have an increased risk of these undesirable outcomes:

- Being OCS at the start
- Getting caught in the line sag and ending up late for the start
- Touching marks
- Sailing extra distance (e.g. overstanding the mark or being swept off the rhumbline downwind)
- Going to the unfavored side of the course (due to current)
- Allowing other boats to round inside you at marks

All of these outcomes are normally avoided with a bit of caution and good sense. But when you are racing in current you need to have an additional dose of each. Here are some ideas to help you be a bit more conservative in current:

- Before the start of a race, make sure you're aware of the strength and direction of the current in the racing area;
- Use ranges on land behind the starting pin as well as behind the reaching and leeward marks;
- Give the marks a little wider berth than normal;
- In a foul current, go one or two boatlengths past the point where you think you're on the layline to the windward mark;
- Watch out for asymmetries on a windward-leeward course;
- Sail the longer tack or jibe first!
- Stick to moves that are sure bets.

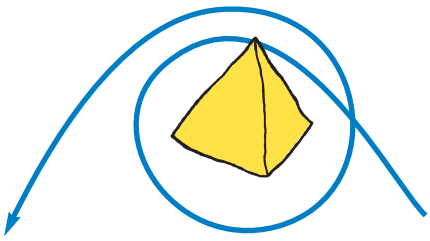
In sailboat racing, your goal is almost always to minimize the amount of risk that you are taking. By pursuing high-probability options, you maximize your chances of success and reduce the likelihood of major disasters. The last thing you want to do, unless you are desperate, is to allow a roll of the dice to determine your racing fate.

JH Peterson photo

Here's a risk that didn't work out. When you're racing in adverse current and approaching a windward mark on the layline, a good rule of thumb is "better safe than sorry." Consider overstanding at least slightly or bailing out before boats on your windward hip prevent you from tacking. If you ever start to think you may need to pinch around the mark, that's usually a good sign that it's time to tack.

TEASER ANSWER

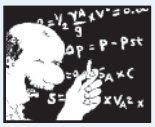
(From Brain Teaser on page 1)



Yes, if you hit a mark, you can take your One-Turn Penalty around the mark. There is nothing in rule 44.2 (One-Turn . . . Penalties) that prohibits you from re-rounding the mark. It just says you have to make one turn that includes one tack and one jibe.

However, the rule does say that you must get "well clear of other boats as soon after the incident as possible." If you keep clear of other boats and you happen to sail around the mark while taking your penalty, that's fine.

Of course, you must comply with the "string" provision of rule 28.2. There is no restriction about looping around a mark or about having your string touch it twice, as long as your course meets the other requirements of that rule. •



MYTHBUSTERS!

Separating current fact from fiction

No discussion of current would be complete without considering a few misconceptions that pop up whenever sailors talk about this subject. While most sailors seem to understand current fairly well, it's amazing to hear some assumptions that are used for planning strategy, even by top racers.

With a mythbuster mentality, I chose four misunderstandings that are fairly common and can make a significant difference on the race course. These range from the idea that apparent wind will be different on opposite tacks in current to my old favorite 'lee-bow effect,' which never seems to go away.

Hopefully, a discussion of these myths will provide a new, more accurate way to plan strategy when sailing in current. I encourage you to consider the next three pages with an open mind. If you still have questions about any of the 'myths,' feel free to send an email and I will try to respond individually, on the website or in a future issue. Thanks.

David@SpeedandSmarts.com
www.SpeedandSmarts.com

JH Peterson photo

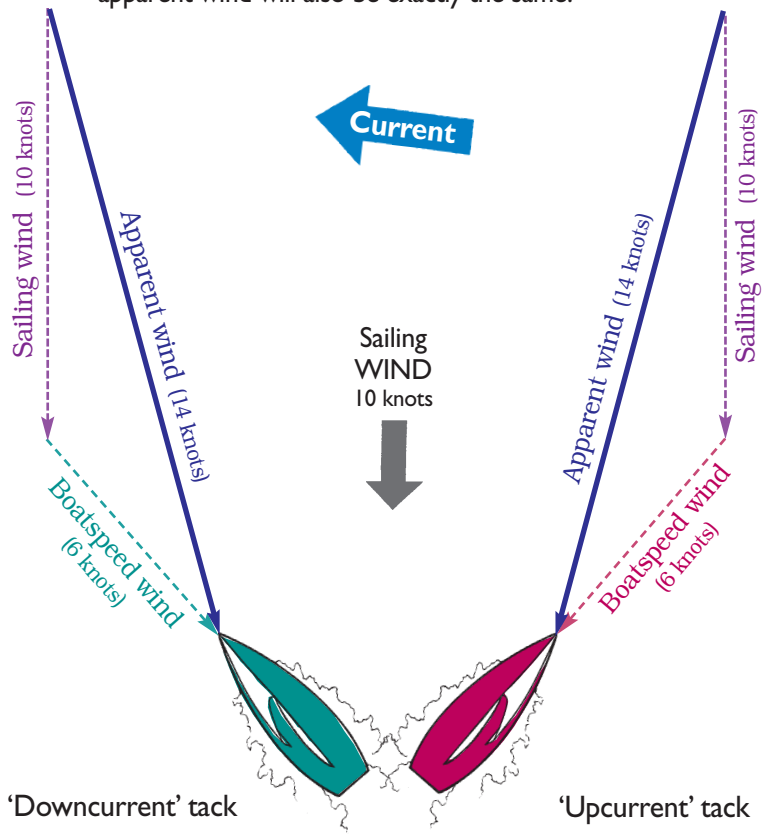
MYTH #1

"You will feel more wind on the 'downcurrent' tack."

Not True. When the current is not aligned with the wind, one tack will always be headed more with the current (the downcurrent tack) while the other will be headed more into the current (the upcurrent tack). With a bit of geometry, we agree that a boat's speed over the bottom will be greater on the downcurrent tack than on the upcurrent tack, and this leads some sailors to question whether boats on opposite tacks feel different wind.

The answer is definitely no (assuming equal performance and no asymmetries other than current). Here are several ways to explain this:

- The wind you feel while sailing is your apparent wind, which is a combination of the sailing wind and the wind created by the movement of your boat through the water (*see page 5*). Since the boats have the same sailing wind and perform identically, they will have exactly the same apparent wind.
- The boats' sailing wind already includes the effects of current (because it's a combination of the true wind and the wind caused by current). If you also factor in their differing speeds over the bottom, you will be counting current twice, which will not give a correct result.
- The boats are floating on a body of water and they don't know anything about the bottom. If they were suddenly sailing on a bottomless sea, this would not affect the wind they feel on each tack.
- Even though boats on opposite tacks are moving at different speeds over the bottom, the component of their speed in the direction of the sailing wind (VMG) is exactly the same for both (because the current pushes them at exactly the same speed and direction over the bottom). Therefore, their apparent wind will also be exactly the same.



MYTH #2

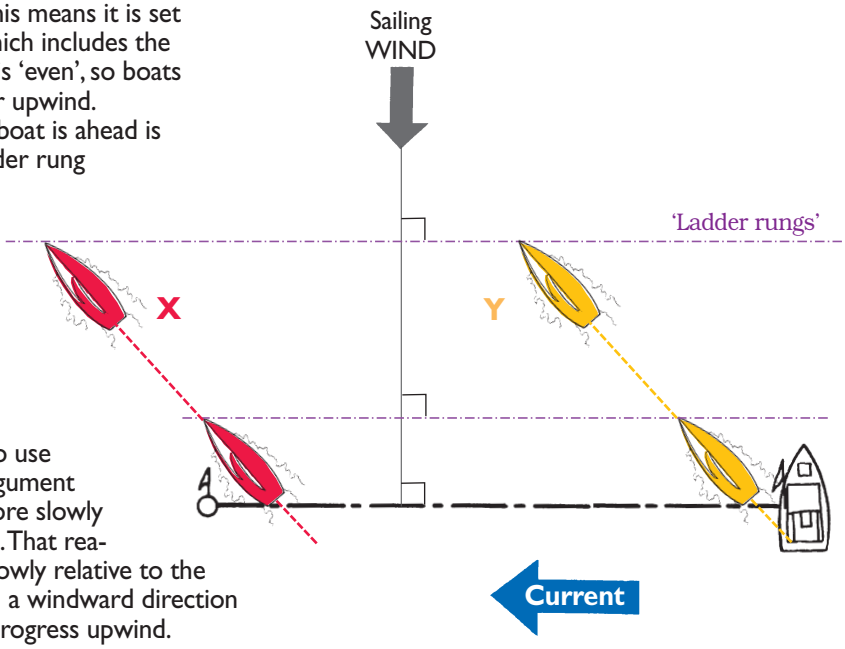
"On a 'square' starting line, boats that start at the upcurrent end will be ahead."

Not true. When a starting line is 'square,' this means it is set perpendicular to the boats' sailing wind (which includes the effects of current). In other words, the line is 'even', so boats starting anywhere on the line are equally far upwind.

On a beat, one way to figure out which boat is ahead is by thinking in terms of 'ladder rungs.' A ladder rung is an imaginary line drawn perpendicular to the boats' sailing wind. A ladder rung also represents a line of equal position in the race since all boats on the same ladder rung are equally far upwind.

Because a 'square' starting line is perpendicular to the wind, it is the same as a ladder rung. Therefore, any boats on that rung, or line, are equal in the race.

It's easy to believe this myth if you try to use the bottom as your reference plane. The argument says that when X tacks she will be going more slowly over the bottom than Y, so Y must be ahead. That reasoning is incorrect. X may be going more slowly relative to the bottom, but the component of her speed in a windward direction is exactly the same as Y, so X makes equal progress upwind.



MYTH #3

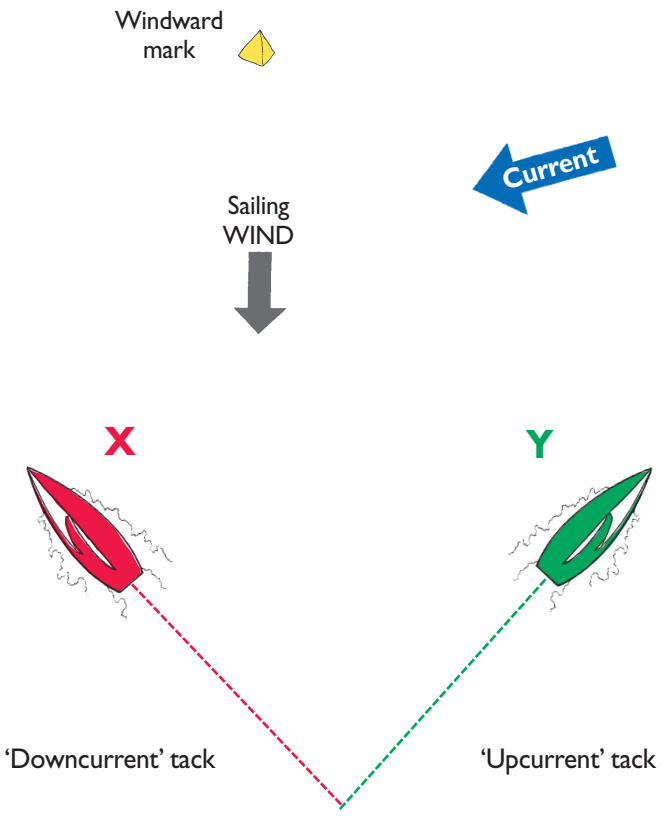
"On a windward leg, it's always better to sail the tack that takes you 'upcurrent' first."

Not true. Though sailing the upcurrent tack may be a good idea in certain situations, there is no implicit advantage in being farther upcurrent of the mark. As long as the wind and current remain constant, a boat that sails the downcurrent tack first will have exactly the same VMG as a boat that sails upcurrent first.

While X and Y have different speeds over the bottom, their speed through the water and the component of their speed to windward (through the water and over the bottom) will be exactly the same. So there is not necessarily any advantage to sailing upcurrent first.

However, there may be times when sailing the upcurrent tack first improves your chances of getting to the windward mark sooner. In many races where there is a cross-current, the race committee does not set the windward mark far enough downcurrent. As a result, the windward leg is skewed so you have to spend more time on the upcurrent tack.

One of the most foolproof rules of thumb for any windward leg is to sail the longer tack first. So when the leg is skewed because of current, it's often smart to sail the upcurrent tack first. Though this does not give any advantage by itself, it keeps you in the middle of the beat, which increases your chances of success when you're not sure which way the wind will shift next. It also minimizes the risk of getting to the layline too soon, which can be a problem with sailing the downcurrent tack.



MYTH #4:

"You can improve your upwind VMG by pinching to get the current on your lee bow."

Absolutely false. There is no such thing as the 'lee-bow effect.' To understand this, imagine that you are racing upwind in a large one-design fleet. When you sail your normal closehauled angle on port tack (*see diagram*), it happens that you are headed directly into the current, which is running quite strongly.

Would it be advantageous to pinch up slightly so the current hits your lee bow? Would this give you more of a push to windward and therefore better upwind VMG than the other boats?

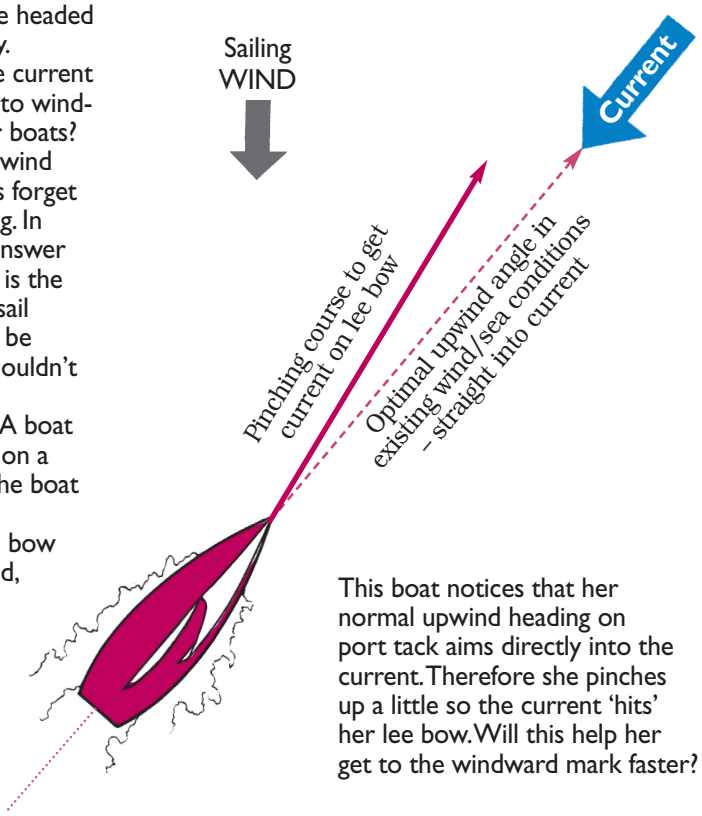
Unfortunately, this doesn't work. In fact, pinching upwind will give you a worse VMG than your competitors. Let's forget about the current for a moment and talk about pinching. In the absence of current, would you pinch upwind? The answer is no. Your "normal" closehauled heading, by definition, is the angle that gives you your best VMG. You can pinch and sail higher than your normal angle, but your boatspeed will be slower and your resulting VMG will be lower. So you shouldn't normally pinch in the absence of current.

The same reasoning applies when you have current. A boat sailing in current moves just like an object that's sitting on a moving rug. No matter which way its bow is pointing, the boat still moves in the direction that the current is going.

You cannot pinch to get the current to 'hit' your lee bow because the current doesn't 'hit' your boat at all. Instead, the boat is floating in a body of water that happens to be moving relative to the bottom. But the boat doesn't know this (and neither do the sailors unless they see current flowing past an anchored boat or buoy).

The lee bow effect is definitely a myth, and pinching is equally slow whether or not you have current. The best way to maximize your upwind VMG is by sailing your normal, optimal closehauled heading.

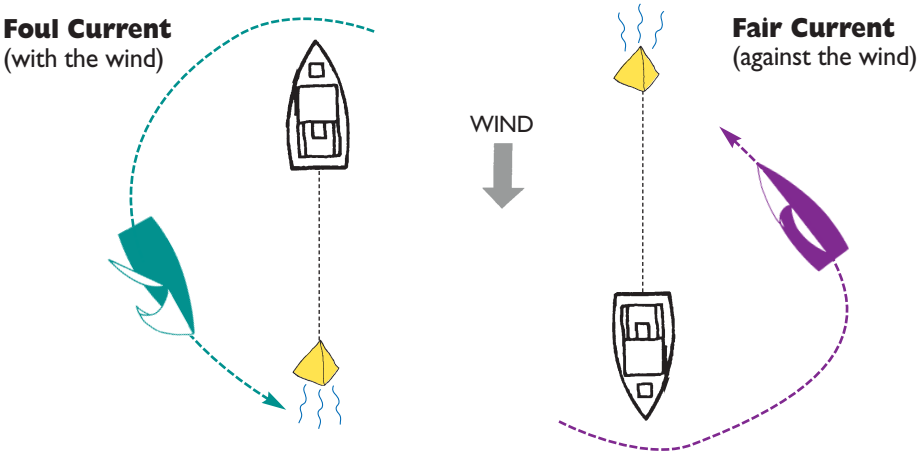
The Lee-Bow Effect?



This boat notices that her normal upwind heading on port tack aims directly into the current. Therefore she pinches up a little so the current 'hits' her lee bow. Will this help her get to the windward mark faster?

Simulate current for training

Here's a way to practice in the current that you expect at a future regatta. Grab a mark, a piece of line and a friend or coach in a motorboat. The boat driver should tow the mark slowly (at a knot or so, depending on how much current you expect) at least several boatlengths behind the motorboat. To practice in a foul current, aim the motorboat upwind. To simulate a fair current, head downwind. You can try a cross-current by going 90° to the wind. The sailors should circle the motorboat and mark, practicing mark roundings, laylines and boathandling as if there is current.



CASE STUDY DISCUSSION

Which boat will get to the windward mark first?

This discussion is based on the problem that's described on page 16.

If you think Boat B will come out ahead or feel it would be a tie, you'll be surprised to learn that Boat A gets to the windward mark first. It's tempting to think that when the current gets stronger the boat that sailed upcurrent of the mark (B) will come out ahead. Let's look at why this doesn't happen.

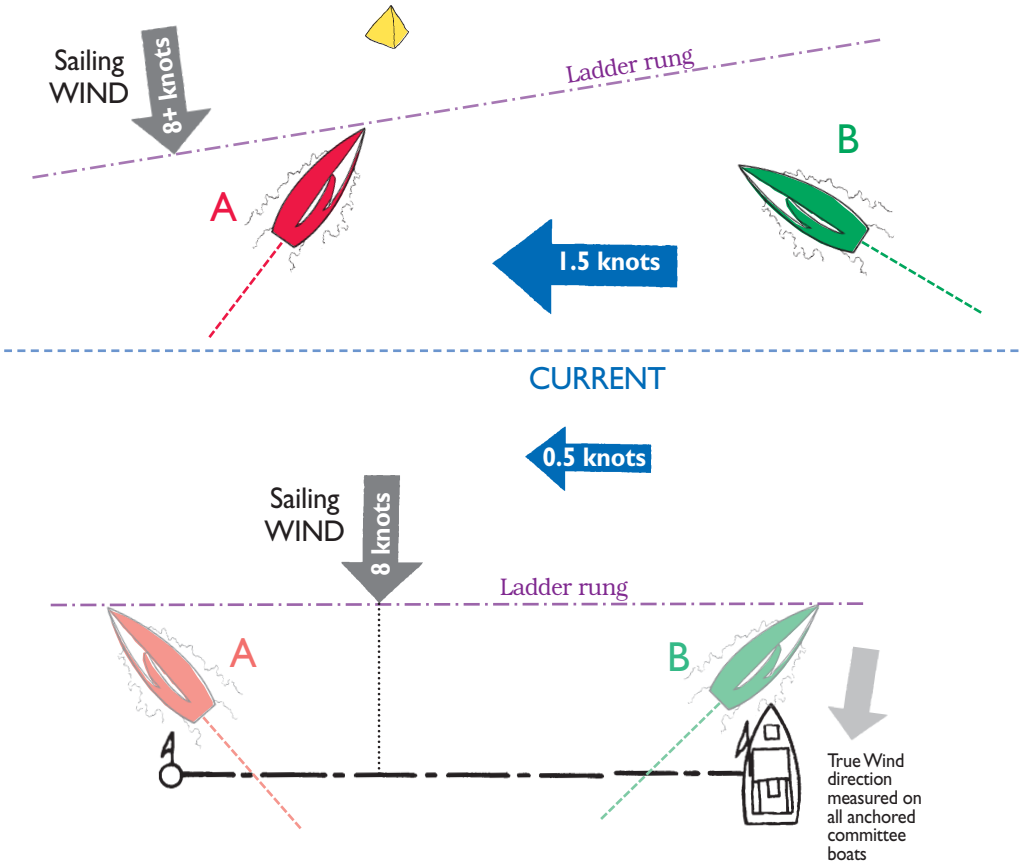
First of all, check the text under the diagram to be sure you understand all the terms and conditions that are part of this problem. For example, it's important to realize that the starting line is set square to the 'sailing wind,' which includes the effects of current.

The basic way to determine which boat is ahead is by drawing 'ladder rungs' perpendicular to the wind direction. At the start of this race, Boats A and B are even in the race because the starting line is square to the wind (which means all boats on the starting line are on the same ladder rung).

As long as the sailing wind remains the same (and the boats go the same speed), A and B will stay on the same ladder rung and even. Though B is 'upcurrent,' this does not give her any advantage because the current pushes both boats equally in the same direction.

Since the current and wind remain steady for the first half of the beat, the boats will still be even in the race when they reach the dotted line. However, at that point one thing changes – the current increases by a knot, and this affects the boats' sailing wind. Since the current is coming from the east, an increase in its strength shifts the sailing wind toward the west.

This left shift changes the ladder rungs. The boat that's closer to the new wind direction (A) moves to a higher ladder rung. As long as she doesn't overstand the windward mark, A will get there first. •



Make sure you understand all the conditions

When you're trying to figure out how current affects the leg you are sailing, don't base your decision on faulty logic or assumptions. Start by getting all the correct facts. For the situation above, here is an explanation of the conditions that were given as part of the problem:

• *The boats are identical and always sail the exact same speed.* That is, they go the same speed through the water, so their knotmeters read exactly the same.

• *The direction of the current does not change.* The current is always flowing from right to left, perpendicular to the first-leg rhumbline.

• *The starting line is square to the sailing wind.* Therefore, at the start both boats are on the same ladder rung so they are equal in the race. This is true even though B is at the 'upcurrent' end (see Myth #2 on page 13).

• *The 'true wind' stays the same all over the course during this leg.* Boats anchored around the course measure the same steady (true) wind speed and direction during this entire windward leg.

• *Both boats are always sailing in equal current and wind.* In other words, when the wind and current change in direction or strength, they change instantly all across the course so the two boats always have the same exact conditions.

• *The strength of the current instantly increases from 0.5 to 1.5 knots when both boats are half way up the beat.* When the boats reach the dotted line (which happens at the same time), the current for both suddenly increases by one knot. This also affects their sailing wind.

• *Neither boat overstands the windward mark.* Both crews are very smart and they tack early enough so that, even with a current of 1.5 knots, neither boat sails past the layline to the windward mark.

• *Neither boat loses any distance while tacking.* Since Boat A has to do one more tack than B, we assume for this problem that both can tack without losing any distance.

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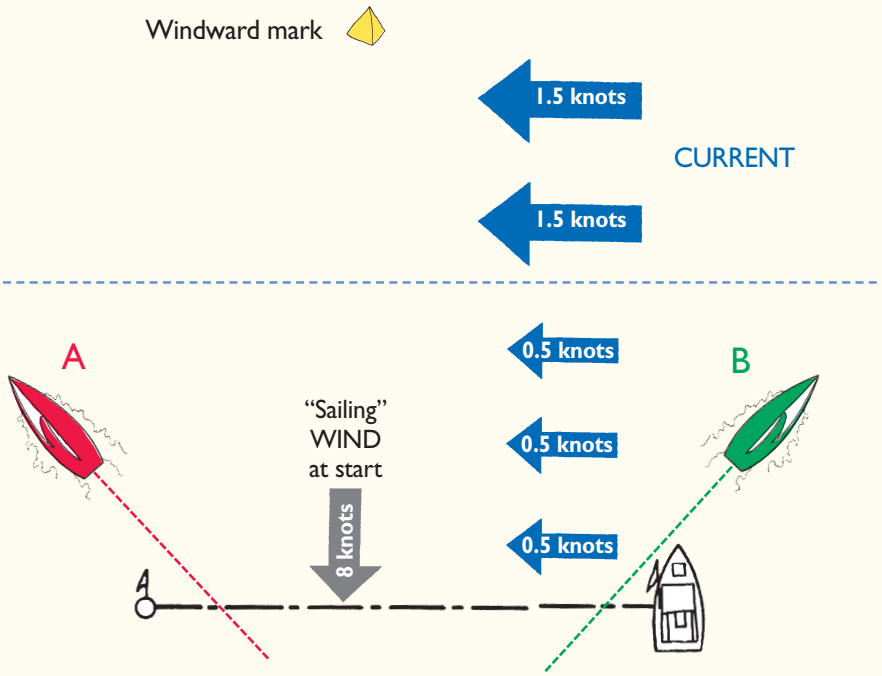
CASE STUDY

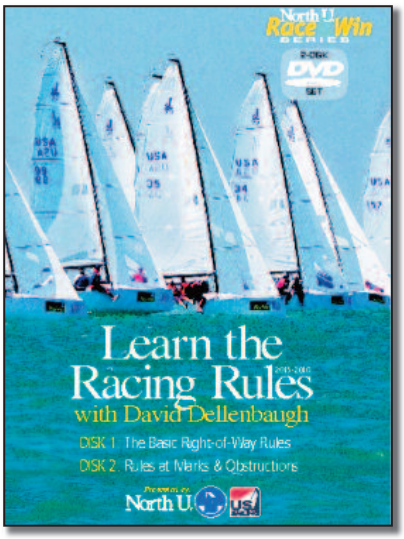
How will current affect this beat?

Two identical boats are match racing. Their starting line is square to the 'sailing wind' at the start, which is 8 knots from the north. The (true) wind direction measured by all the anchored RC boats never changes. The current flows right to left, perpendicular to the wind. It is 0.5 knots for the first half of the beat and instantly builds to 1.5 knots (from same direction) for the second half. Boat A starts on starboard tack at the pin end and sails to the left corner. Boat B starts on port tack at the boat end and goes to the right corner. Both sail the same exact speed in equal current and wind at all times. Neither overstands the windward mark nor loses any distance while tacking. Which boat gets to the mark first (or is it a tie)? (*See the discussion on page 15.*)



Gift ideas for sailors!

Are you looking for a sailing gift for a family member, friend or crew? Here are two ideas that will be useful for a long time!



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