

David Dellenbaugh's SPEED & Smarts™

The newsletter of how-to tips for racing sailors

No. 97

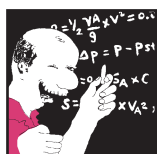
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JH Peterson photo

BRAIN TEASER

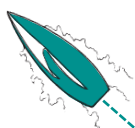
Put 'money in the bank'?



On the first windward leg of a big-fleet race, you got to the starboard-tack layline much earlier than you wanted. After sailing for a minute with your bow pointing at the windward mark, you started to get lifted, and now you are pointing about 10° above the mark. Should you keep sailing high of the mark, or bear off slightly to aim at the mark?

See page 11
for the answer.

Layline



Upwind Strategy

Theme Go the right way.....	1
Brain Teaser Above the layline.....	1
Focus Make a gameplan.....	2
Wind Shifts	4
Wind Velocity	6
Course Geometry	8
Current	10
Brain Teaser Answer	11
In Theory Play the odds.....	12
Waves	14
Boatspeed Faster or slower?.....	15
Crew Work Help with strategy.....	16

Go the 'right' way!

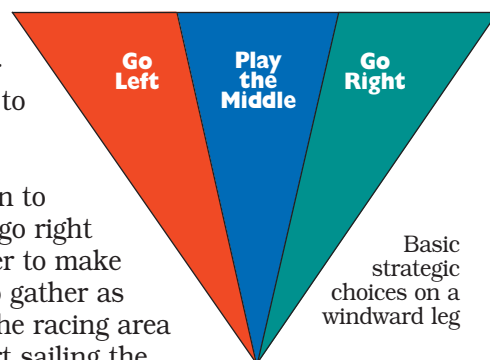
Tactics, as we discussed in the last issue, are boat-on-boat moves you make as you sail around the race course. These maneuvers are designed to help you keep control of, or avoid being controlled by, your competitors.

Strategy, on the other hand, is your plan for how you would get to the windward mark as quickly as possible if there weren't any other boats in the race. To make a strategic gameplan, you must consider factors such as wind direction, wind velocity, course geometry, current and waves. What's critical to know is whether these factors are uniform across the windward leg, and how (or whether) you expect them to change during the beat.

In simple terms, your upwind strategy boils down to three possibilities: go left, go right or play the middle. In order to make a good choice, you need to gather as much information about the racing area as you can before you start sailing the windward leg. Then keep your head out of the boat while you are racing up the beat – this way you can update your gameplan as conditions inevitably change.

Strategy is the foundation upon which tactics are based, so plan your upwind strategy first. Tactical moves are usually immediate and spontaneous, while strategy is more long term and planned. Once you have a plan, use tactics to follow your strategy as closely as possible amidst a fleet of boats that are all trying to beat you to the windward mark.

The rest of this issue is all about the big picture of upwind strategy and how you can make a gameplan for getting to the windward mark as quickly as possible. •



Basic strategic choices on a windward leg

Make a 'game plan' for the windward leg

It's critical to have a good strategic plan for the windward leg because that is usually where the fleet gets farthest apart. When boats are on opposite sides of the beat, their separation can be huge, and even a small change in wind direction, pressure or current can have a huge impact on the fleet standings.

Of course, if the conditions never change you don't have to worry about strategy. In that case, the race will be decided entirely on speed and tactics. But in reality the wind is always changing in both velocity and direction. In fact, the wind is a lot like a snowflake – it never follows exactly the same pattern in any two races.

Every race has a unique set of strategic conditions, and that's why you need to develop a new strategy for each race. This gameplan must be customized to the particular conditions that you experience in that place at that particular time.

Strategic ingredients

There are many strategic variables that affect how quickly you get to the finish. The five factors that we will cover in this issue are wind direction, wind velocity, course geometry, current and waves.

For each variable, there are two important considerations. First, is that element uniform across your windward leg, or does it vary from side to side? For example, if the wind strength is exactly equal all

It's important to think about strategy before you start sailing up the windward leg. For the first beat, develop a game plan before you get into the starting sequence. This is critical because your position on the starting line will determine where you end up on the course.

For the second or third beat, make a new plan (or revise your old one) before you round the leeward mark. This is important so you won't get stuck going the wrong way at the beginning of the windward leg.

across your cross, that variable will not influence your strategy. But if there's a lot more wind on one side, that might be the determining factor in your gameplan.

The second consideration is how you expect each variable to change as you sail up the beat. For example, will the wind shift direction? If the wind direction remains steady, this will not affect your strategic planning. But unfortunately this is hardly ever the case. Almost all five strategic variables change continuously, and this is something that the top sailors are always expecting.

Gather information

In order to make a strategic plan for the beat, you need to gather as much information as possible about the five strategic areas. This data should come from knowledge of the past, observation of the present and forecasts of the future.

- *Knowledge of the past* – Before the regatta even starts, try to find out what the wind normally does in the area where you are sailing. Identifying common trends can be

very helpful in planning a strategy. If you have raced in that venue many times before, hopefully you have a notebook filled with strategic notes. If you haven't sailed there, talk to people who are "regulars" and see what kind of 'local knowledge' you can uncover.

Other good sources of past wind trends are historical data from local airports and online data from meteorological buoys.

- *Observation of the present* – This will give you the most valid and valuable information, so it should be your primary source for strategic planning. Historical data and future forecasts are helpful, but there is no substitute for what you can see and feel in the course area just before and during your race.

So get out to the race area as early as possible and observe the wind, current and waves. Keep track of wind direction and velocity and look for trends. Don't stop doing this when your warning signal is made – the wind never stops changing so you have to keep watching it throughout the race.



JH Peterson photo

• *Forecasts of the future* – In the old days you had to get weather forecasts from the newspaper, radio or television, and these were so general (and ‘old!’) that they were almost completely worthless. Now we have two much better options: 1) web-based forecasts, some of which are fairly good; and 2) private weather and wind forecast services, available to purchase for your particular regatta.

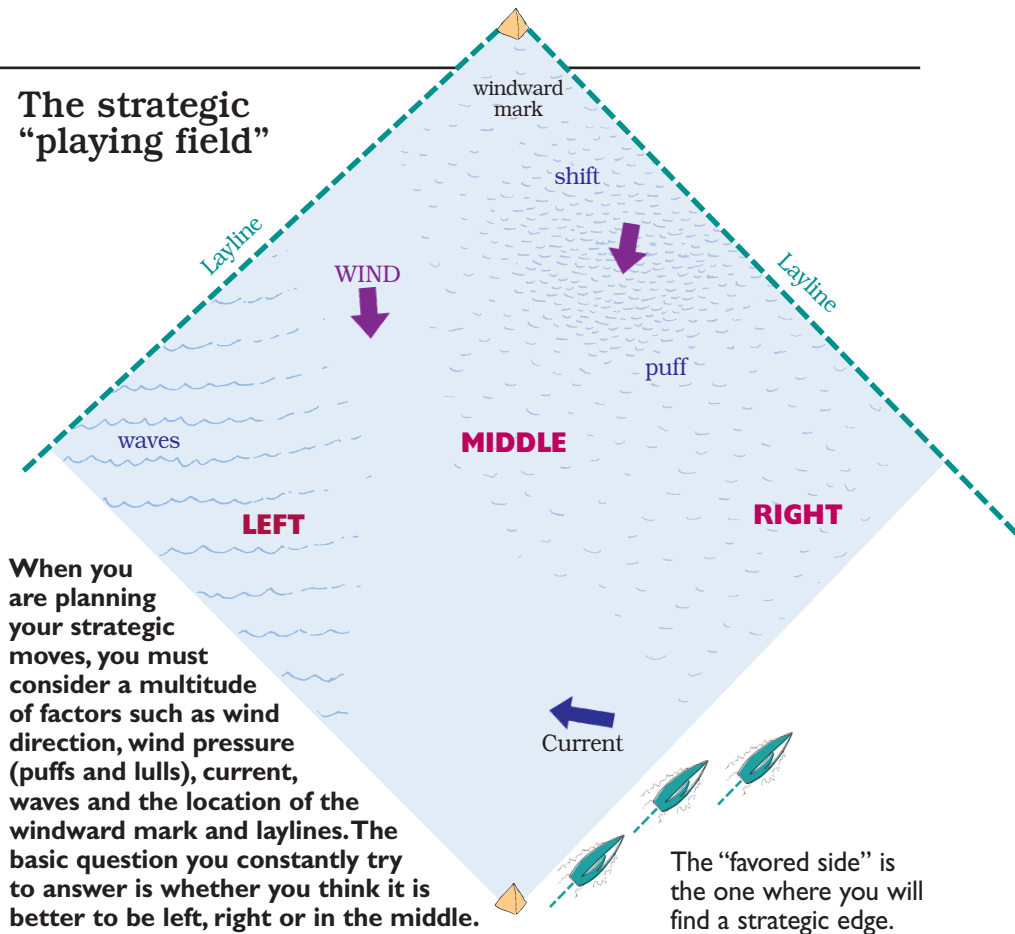
These private weather forecasts are by far the best you can get; they usually give you the predicted wind direction and velocity for each hour of the day, and in many conditions they are quite accurate. However, I recommend using these only as a general guide for strategic planning because your own observations of the race course will definitely give you the best and most up-to-date information available.

Develop your gameplan

A few minutes before the start, or before you round the leeward mark, review your historical notes, your current observations and any forecasts you may have. Then make a strategic plan for the next windward leg. The basic goal of this



The strategic “playing field”



process should be to identify the ‘favored’ side of the beat so you can choose a route that will get you to the windward mark fastest.

A sample strategy might sound something like this: “The breeze is oscillating, but also shifting slowly to the right, and velocity looks steady across the course. The waves are uniform across the course and there is no significant current. Therefore we’ll favor the right side, playing the shifts and being careful not to overstand.”

Sometimes the wind conditions are very predictable and it’s easy to come up with a clear strategy; other times the conditions are extremely unpredictable and it seems impossible to figure out what will happen. That’s OK – sometimes the wind is really a bit random.

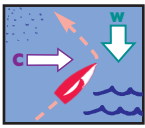
Even the top competitors begin sailing many beats not knowing which side of the course is favored. When this happens, you simply have to keep strategizing (i.e. collecting information) as you sail up the beat. The good thing about

doing this while racing is that you have all the other boats to help you see the wind patterns.

Sooner or later, you will figure out which side of the course is better and you can head there. The key, however, is what you do before you figure this out. When you’re not sure which side of the beat is favored, it’s probably best to stay somewhere near the middle of the course until things develop.

When I’m hanging out in the middle waiting for a favored side to appear, I watch my competitors to see which of them are most threatening. If the boats on the right seem to be gaining on me, that side is probably better (and vice versa), so I head that way.

The key thing about strategizing is that it’s a fluid, ongoing process. Since the wind and other variables are always changing, you can’t stop thinking about them until after you finish. And when you make a plan for the beat, you must always be willing to revise it (or throw it away) if (when) the conditions change. •



WIND SHIFTS

Look for changes in wind direction

One thing you can say for sure about the wind direction is that it's always changing. Even when it seems like a nice steady day, the wind is constantly wriggling back and forth at least a little bit. And whenever the wind shifts, it creates a large opportunity to gain distance on the other boats in your fleet.

Wind shifts are generally the most significant strategic factor of all. Each time the wind changes direction it re-shuffles the fleet standings, and in almost every race the potential gains and losses due to wind shifts are greater than any other factor, including boatspeed!

For all these reasons, it's very important to understand what the wind is doing – both before and during your race – and how best to use the wind to your advantage.

- Many windward legs are only 10 or 20 minutes long so general, large-scale forecasts (like the ones you get on the web, radio or TV) are not very helpful. It is much, much more important to rely on:

- *Local knowledge:* In the specific venue where you are racing, what does the wind usually do when it blows from each direction? Use your own experience from past regattas and ask local sailors to tell you what happens.

BASIC PRINCIPLE

Sail toward the next shift.

When the wind direction is changing, your basic strategic move upwind is to sail in the direction where you expect the wind to shift next. For example, if you think the wind will veer (shift clockwise), sail on port tack toward that shift (and vice versa).

By doing this you will end up on a higher “ladder rung” when the wind shifts, and therefore you will be more advanced in the race. Of course, there could always be reasons (e.g. current, wind pressure) when it might pay to sail away from the next shift.

- *Your own observations:* These are even more important than ‘local knowledge’ because they apply to your race area on the specific day when you are racing. Be sure to collect these before the start, and *keep observing during the race.*

- There are many reasons why the wind changes direction. These include the movement of weather systems, thermal heating, changing current, clouds and geographic effects. Keep your head out of the boat and try to understand which of these apply to your particular situation – this will help you know which way the wind will shift next.

- *Sail toward the next shift!* When you expect that the wind will change direction (it happens every beat!), the key idea in your strategic gameplan should be to sail in the direction of the next windshift.

- When making a strategic plan for your windward leg, the

Why shifts are critical



Size of wind shift	Distance (approx.) gained or lost
2°	5% of x
5°	12% of x
10°	25% of x
15°	37% of x

Changes in wind direction can have a profound impact on the relative positions of boats that are racing upwind. The bigger the shift and the farther apart the boats, the greater the gain and loss that occurs. For example, if two boats are a mile apart in opposite corners of the beat and the wind shifts just one little degree, each boat will gain or lose approximately 150 feet!



One common cause of changes in the wind direction is the presence of land near the race course. The wind encounters more friction when it flows over the bumpy contours of land, and this often affects its direction. The degree of change is influenced by your proximity to shore (the closer you are, the bigger the shift) and by the angle of the wind to the shoreline.

JH Peterson photo

relative importance of windshifts will depend on several factors:

- In light air, windshifts are less critical; wind pressure and current are more important.
- The importance of windshifts is proportional to their size.
- Shifts are more critical on longer beats where the boats get more separation (farther apart).

• Windshifts almost always fall into one of two categories – they are either oscillating (shifting back and forth around a median direction) or persistent (changing steadily in one direction). If you want strategic success, you must constantly ask yourself one simple question during each windward leg: Is the wind direction oscillating or persistent?

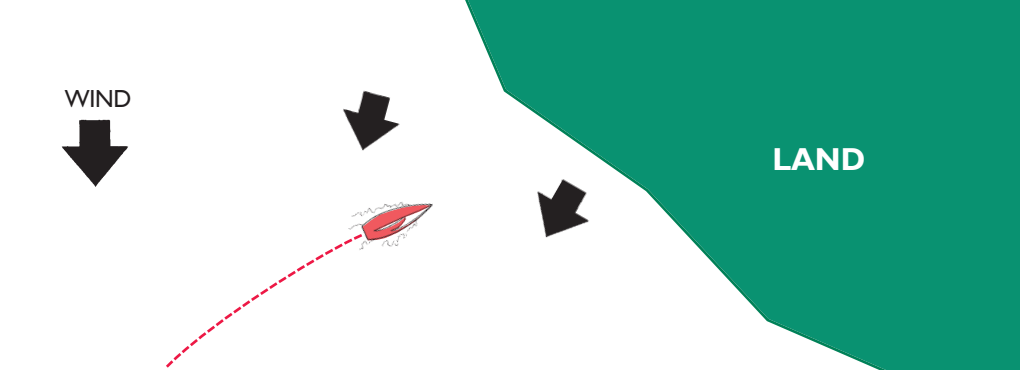
The way you answer this question will make a huge difference in how you play the shifts. For example, if you think the wind is oscillating and you get headed you should tack. But if you think the wind is shifting persistently, you should keep sailing into the shift.

• Sometimes what appears to be a wind shift is really a change in wind velocity, not in its direction. If you are sailing along and the wind velocity suddenly drops (without changing direction), your apparent wind will shift forward temporarily and it will seem like you're headed.

Be careful not to treat this "velocity shift" like a real change in direction. If you suspect a change in velocity, wait 30 seconds or so and see if the 'velocity shift' disappears once your boatspeed adjusts to the new wind velocity.

• Windshifts are different every day. Sometimes it's very easy to see them on the water; other times it's impossible. Sometimes when a shift hits your boat it is solid right away; other times you have to sail farther into the shift to make sure it's real.

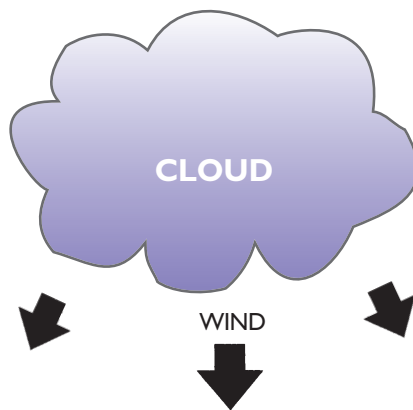
When you are trying to make a gameplan to take advantage of the shifts, there is nothing as valuable as sailing around in your race area before the start, just watching (and recording) what the wind is doing.



Geographic effects

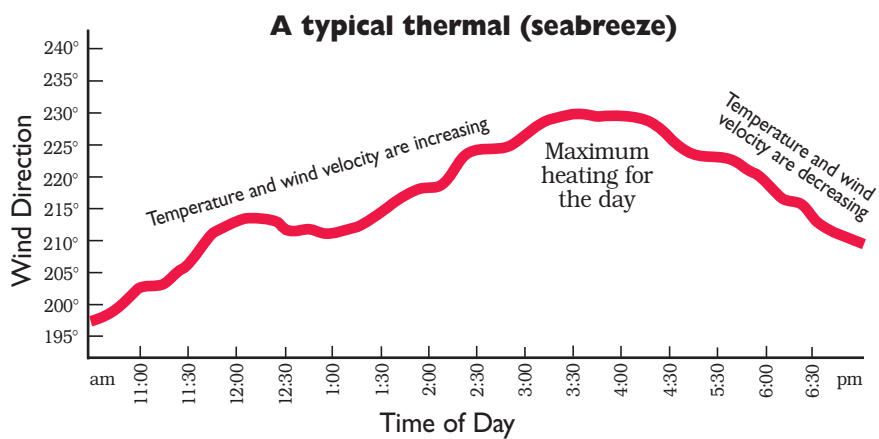
When the wind is blowing from the land at an angle to the shoreline, it tends to shift in direction so it flows more perpendicularly off the land. This effect is more pronounced as you get closer to shore. Usually, if you sail the tack that takes you more directly toward land, you will get progressively headed as you approach the shore. This "geographic shift" is like a basic persistent windshift, but it is easier to predict because it usually happens in the same place and to the same degree (so be sure to check this out before your race).

If the wind is blowing straight off the shore, it will act like an oscillating breeze, so look for more frequent and substantial back-and-forth shifts closer to land.



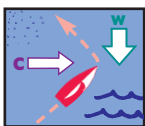
The influence of clouds

Another reason why the wind changes direction is the presence and movement of clouds. The bigger the cloud, the more potential there is for associated windshifts. Usually, the wind on the downwind side of a cloud 'fans out' in front of the cloud (and it's stronger too). Therefore, it's usually good to sail toward clouds. For example, if there is a big dark cloud coming down the left side of the beat, sail that way because the cloud will probably shift the wind direction left until it passes.



When you are sailing in a thermal "sea breeze", the wind direction usually changes slowly as the temperature of the land increases or decreases during the day. While the land heats up in late morning and early afternoon, the breeze builds in strength and gradually shifts (often to the right) toward the standard 'seabreeze direction' for that venue. Then in the late afternoon, after the warmest part of the day, the land starts cooling and the wind shifts back the other way (decreasing in strength).

Thermal breezes are great examples of persistent shifts. However, as the seabreeze develops it doesn't always shift constantly in the expected direction. As the graph above shows, there are often some small oscillations as the wind settles in. While these shifts may not be significant on a long beat, they can make a big difference strategically to boats that usually sail short windward legs.



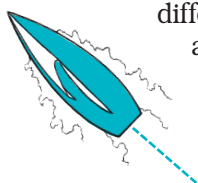
WIND VELOCITY

Try to find the best pressure

The wind is what makes every sailboat go and, almost always, more is better. Increased velocity makes you move faster through the water and also allows you to point higher. Therefore, when it comes to wind velocity the perfect strategy is easy: just find the area of your course with better pressure and head that way!

Like wind direction, the velocity of the breeze is always changing. Even on a day when it looks like the wind is steady and equal all over your racing area, there will almost always be slight differences in pressure across the course.

The key is to find these and take advantage of them.



How to find the puffs

There are a number of ways to identify better pressure on the beat. The most widely used, and usually most reliable, method is simply looking at the pattern and color of the water surface to windward.

There is usually more wind velocity where you can see:

- Bigger ripples or waves
- More tightly packed ripples/waves
- More or bigger whitecaps
- Darker colors (because of the way more ripples reflect the sky color).

You can also use other visual indicators to gauge wind pressure:

- Heel angle of other sailboats
- Pointing angle of other boats
- Action of flags or smoke
- Position and shape of clouds

Many times the differences in

pressure across the course are very subtle – they’re big enough to make a significant difference in your performance, but small enough so they are barely perceptible. To find them you must look very closely, use all the indicators available, and train your eye to see very subtle distinctions (*see below*).

Wind pressure strategies

When you are developing a strategy for the next windward leg, don’t underestimate the value of finding better pressure. Most sailors focus primarily on windshifts, but sailing in more wind is definitely fast.

There are two important goals when you are strategizing: 1) Figure out where the best wind pressure is on the windward leg; and 2) Make sure that your strategy fits with the wind velocity that you have. Here are some ideas on how to do this:

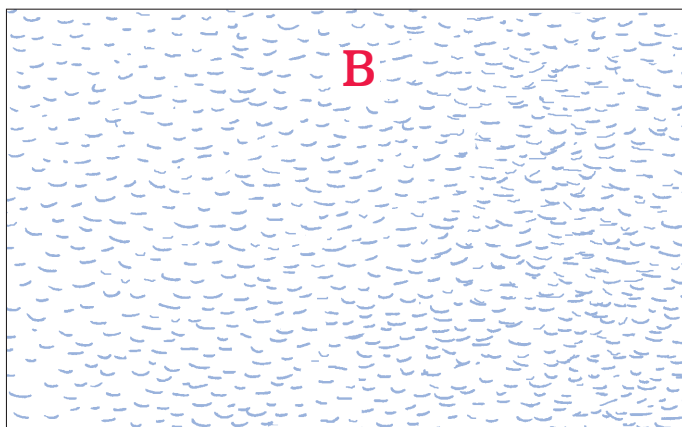
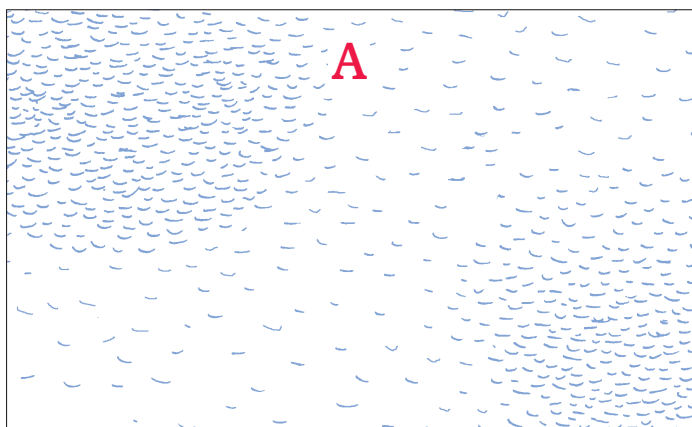
✓ Remember that the wind you will get is coming toward you from the direction of your *apparent wind*. Therefore, line yourself up so your masthead fly is pointing toward the puffs you want to get.



One good way to evaluate wind strength on the beat is by watching the angle of other boats. We usually use another boat’s heading to estimate the wind *direction* that she has. For example, if a boat on your windward hip is sailing higher than you, she probably has a lift.

However, her angle of sail can also tell us a lot about wind pressure, especially in light to moderate breeze. It could be that the boat on your hip is pointing higher simply because she has more breeze than you. Even one or two knots more breeze may let her sail significantly closer to the wind than you can, so consider this when you are looking for pressure.

Sometimes the ‘puffs’ are not so obvious



When sailors think about finding puffs, they often imagine a shifty wind blowing off the land (A). In this situation there is usually a large difference in wind velocity between puffs and lulls, so it’s easy to spot areas where there is more or less wind pressure. However, most windward legs do not look like this. Usually the differences in wind pressure on a beat are much more subtle, and a “puff” may bring only one extra knot of wind velocity (B). This is often hard to see, but it could make a huge difference in your boatspeed. Therefore, you must train your eyes to pick up the subtle signs of more wind, especially on those days when it looks like the wind is the same everywhere. (In B there appears to be better wind pressure on the lower right side of the course.)



Finding the best wind pressure is critical in light air or when there are differences in wind velocity across the windward leg. These conditions often exist on small lakes and other bodies of water where the sailing area is quite close to shore. JH Peterson photo

your apparent wind direction caused by changes in pressure. When you sail into a lull it looks like you are getting a header; a puff appears like a lift. Be sure to change gears when this happens and don't be fooled into thinking these are real shifts in direction.

✓ It's very important to keep a *good lookout* for wind pressure around the course while you are racing. Assign at least one person to watch what's happening to windward on both sides of the course.

✓ Keep in mind that **current** can have a great impact on wind pressure. The great thing about sailing upwind is that when you find better current you will also have better wind pressure, so head directly for these areas. •

✓ If there are big clouds on your course, there is usually more wind pressure fanning out on their downwind (front) side. This means it's a good idea to sail toward clouds that are moving down your beat.

✓ In a **large fleet and light air**, there is often more pressure on the sides of the course since the wind tends to lift up over the mass of boats in the middle. It's not unusual for boats on both sides to come out ahead of boats in the middle.

✓ In light air it's especially important to look for areas of better pressure because they have a relatively huge impact on your speed and pointing. In these conditions,

BASIC PRINCIPLE

Sail toward more wind.

OK, this may seem so obvious it doesn't need to be stated, but it's amazing how often boats fail to sail toward better pressure on the beat. Of course, wind pressure is just one of many strategic considerations; however, wind is the force that powers a boat, and more wind almost always makes a boat go faster.

So put a high priority on staying in areas of better wind – this is a sure-fire strategy, especially when the breeze is light to medium, or when there's a big difference in velocity between the puffs and lulls.

pressure is king! So be willing to sail extra distance or take more risk to stay in areas of better wind.

✓ In heavy air, pay particular attention to *course geometry* (i.e. your position relative to the windward mark) because your tacking angle is narrower and it's easy to reach the laylines.

✓ When you want to tack, try to do this in a puff rather than a lull. You will lose a lot less in maneuvers if you perform them when you have good pressure.

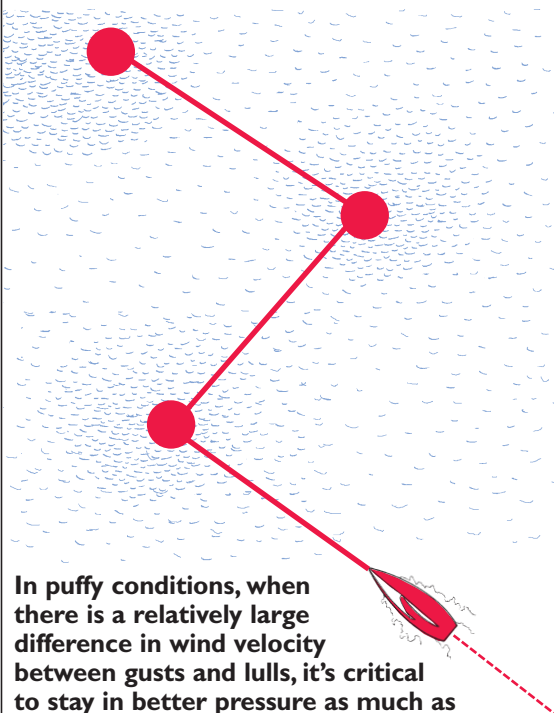
✓ When you are racing upwind, you will get puffs (and shifts) more quickly than when you are sailing around in the starting area (because you are sailing toward the shifts at a speed equal to your VMG, rather than waiting for them to come).

✓ Sometimes you must be proactive in getting to a puff sooner. It often pays to pinch toward a puff on your windward side or foot to a puff ahead of you (*see page 15*).

✓ Once you're in a puff, try to *maximize the advantage* you get from it. For example, be willing to sail a little high or low to stay in it longer. If possible, sail to the far side of the puff and then tack – this way you can sail back through the puff again if it lasts long enough.

✓ Beware of 'velocity shifts.' These are temporary changes in

"Connect the dots"



In puffy conditions, when there is a relatively large difference in wind velocity between gusts and lulls, it's critical to stay in better pressure as much as possible. The best strategy is often a "connect-the-dots" approach where you sail a course that takes you from puff to puff. Though it's not usually a great idea to chase after wind shifts, going for puffs works well.

the windward mark

inversely proportional to your confidence about what the wind will do next. If you are very sure about the next windshift, don't worry about which tack is longer. But if you have no idea what will happen next, point your bow as close to the top mark as possible.

• **Disparity.** The benefits of sailing the longer tack are also related to the disparity in lengths of the two tacks. When both tacks are almost identical in length there won't be much advantage in sailing the longer one first. However, as one tack becomes a lot longer than the other, the odds are much better if you sail that tack first.

• **Laylines.** One advantage of sailing the longer tack first is that this keeps you away from the laylines as long as possible. The laylines are usually a strategic dead-end because you no longer have the ability to play windshifts.

For all these reasons, keep tabs on your position relative to the top mark and use this in your strategy.

BASIC PRINCIPLES

Sail the longer tack first.

When you are positioning yourself on the windward leg, there is one simple and very important principle: sail first on the tack where your bow is pointing closer to the windward mark. Occasionally there are times when it's better to sail the shorter tack first, but if you have any doubt about what the wind will do next, you almost always have a better chance of success if you take the longer tack first.

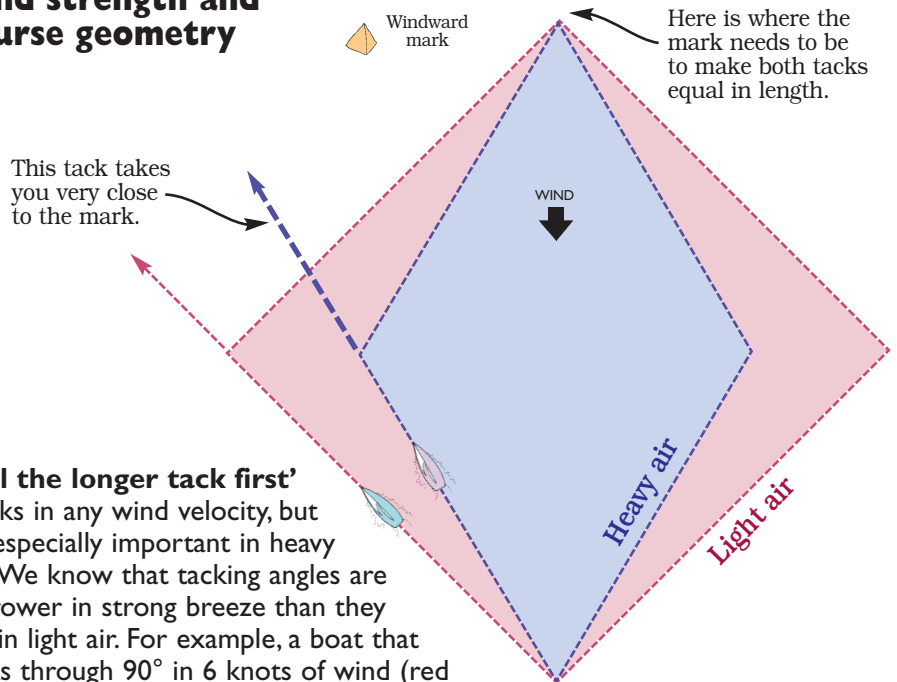
Avoid laylines and corners.

Once you reach the layline you've come to a strategic dead-end since you can no longer take advantage of windshifts. So try to stay away from the edges of the course as long as you can. This is almost the same as the principle above because if you sail the longer tack first you will be heading for the middle of the course.



Boats with wide tacking angles, like these Optimists, have an easier time avoiding laylines than closer-winded designs. For boats with narrow tacking angles, like an Etchells, even a small windshift means that one tack will become a lot longer than the other. Therefore, when you're sailing a boat that points quite high, be careful about going too far on the shorter tack.

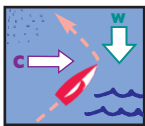
Wind strength and course geometry



'Sail the longer tack first'

works in any wind velocity, but it's especially important in heavy air. We know that tacking angles are narrower in strong breeze than they are in light air. For example, a boat that tacks through 90° in 6 knots of wind (red diamond) might tack through only 70° in 18 knots of wind (blue diamond).

We also know that marks are seldom set directly to windward. More often than not, one tack is longer due to a windshift or misplaced mark. The narrower your tacking angle, the greater the odds that you will be very close to fetching the windward mark on one tack. So when it's windy and your tacking angles are their narrowest, watch out for windward marks that are not exactly to windward!



CURRENT

Strategic impact of moving water

In most races, the strategic factors that have the biggest impact are changes in wind direction and velocity across the course. But sometimes the presence of current can affect the boats just as much (or even more!).

The subject of current is fairly complex and seems to bring with it many misconceptions. Since we have only two pages here, I will try to keep the subject simple and cover the main things you should consider about current when you are planning your upwind strategy.

When the current is uniform

The first and most basic thing to understand about current is that if its speed and direction are uniform across your race course it will have no impact on the favored side of your windward leg. It doesn't matter whether the current is running from left to right or from right to left, or whether its strength is one knot or five knots – if it is equal on

both sides of the course it won't make either side better than the other. This continues to be true even if the wind shifts in strength and/or direction.

So when you find current that is uniform across the course and you don't expect it to change during the beat, you can forget about it when making your strategic plan.

Current and course geometry

Of course, even if current does not affect the favored side, its presence will always influence your laylines to the windward mark (*see below*). When you are racing in current, you will reach the laylines sooner or later than you think, and it's likely that one tack will be longer than the other. All of this could influence how you sail the beat.

When current is not uniform

Strategically, current is especially important when its direction or strength (or both!) are different in various parts of the windward leg.

This often happens when you are racing in a venue where there is strong current and land near the race course. In San Francisco

Bay, for example, you will often find four knots of flood current in the middle of the Bay and one knot along the city front. This means if you play the right side of the beat (in the middle of the Bay) you will have three more knots of current pushing you to leeward than a boat hugging the shore on the left side. Strategically, that is a huge factor!

So whenever you suspect there is current in your racing area, take enough time before the race to sail around the course and look for differences in strength or direction. Then factor this into your strategic gameplan for the windward leg. Obviously, you'd like to sail to the side where you have more favorable current or less adverse current.

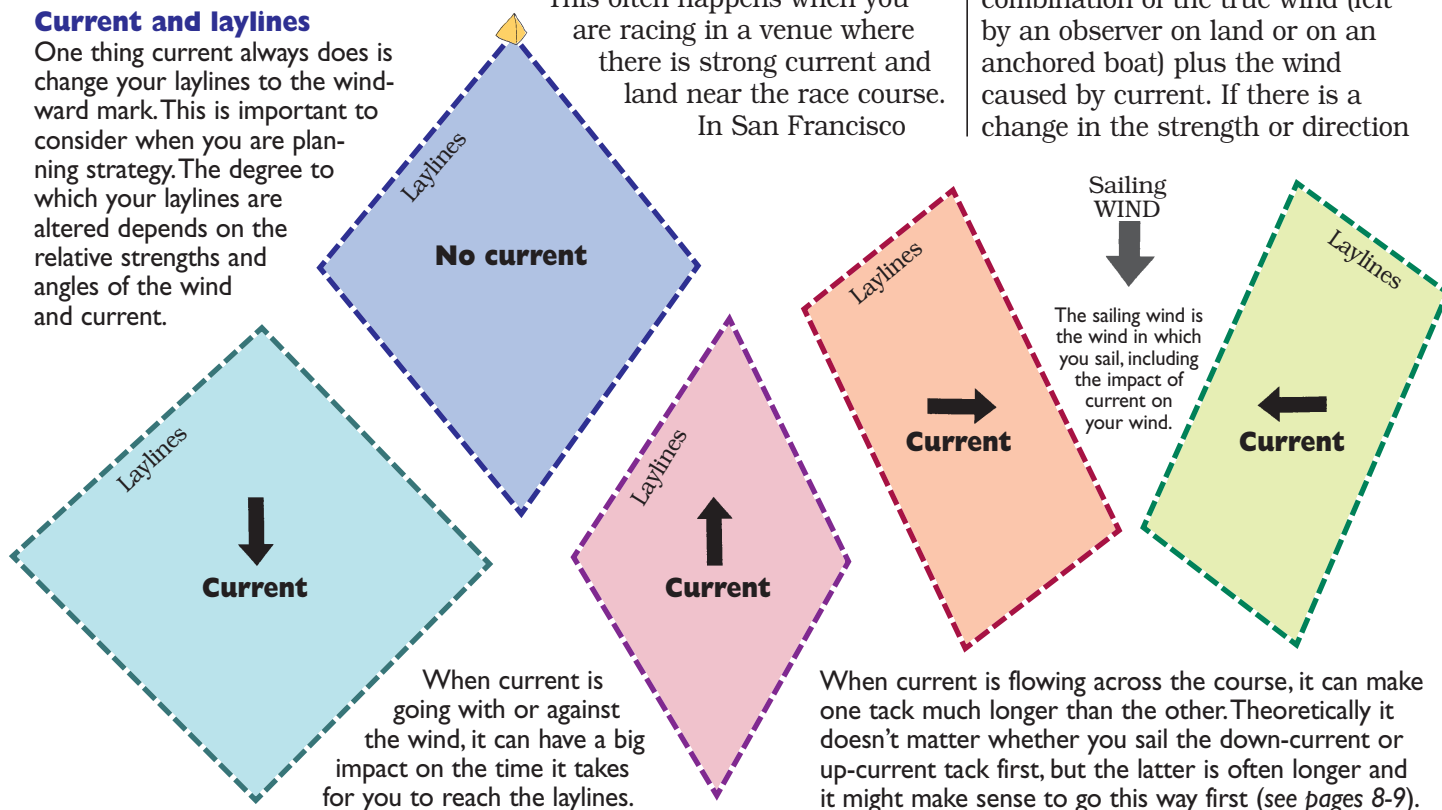
Current and your sailing wind

In addition to the huge impact that current can have on your course and speed over the bottom, it also affects your strategy because it changes the wind in which you sail.

Your "sailing wind" is a vector combination of the true wind (felt by an observer on land or on an anchored boat) plus the wind caused by current. If there is a change in the strength or direction

Current and laylines

One thing current always does is change your laylines to the windward mark. This is important to consider when you are planning strategy. The degree to which your laylines are altered depends on the relative strengths and angles of the wind and current.



of either the current or the true wind, you'll see a change in both the direction and magnitude of your sailing wind (*see right*).

If the current is uniform on your windward leg and remains that way until after you round the windward mark, don't worry about how the current affects wind. But if the current varies across the course or changes during the beat, then it will change the direction or strength of your sailing wind – and that could be significant strategically.

Light versus heavy air

In all wind conditions, the presence of current will affect your sailing wind and your course relative to the windward mark. So you should always keep current in mind. But this is especially true in light air because the speed of the current is much more significant relative to your (slow) boatspeed and to the (low) true wind velocity.

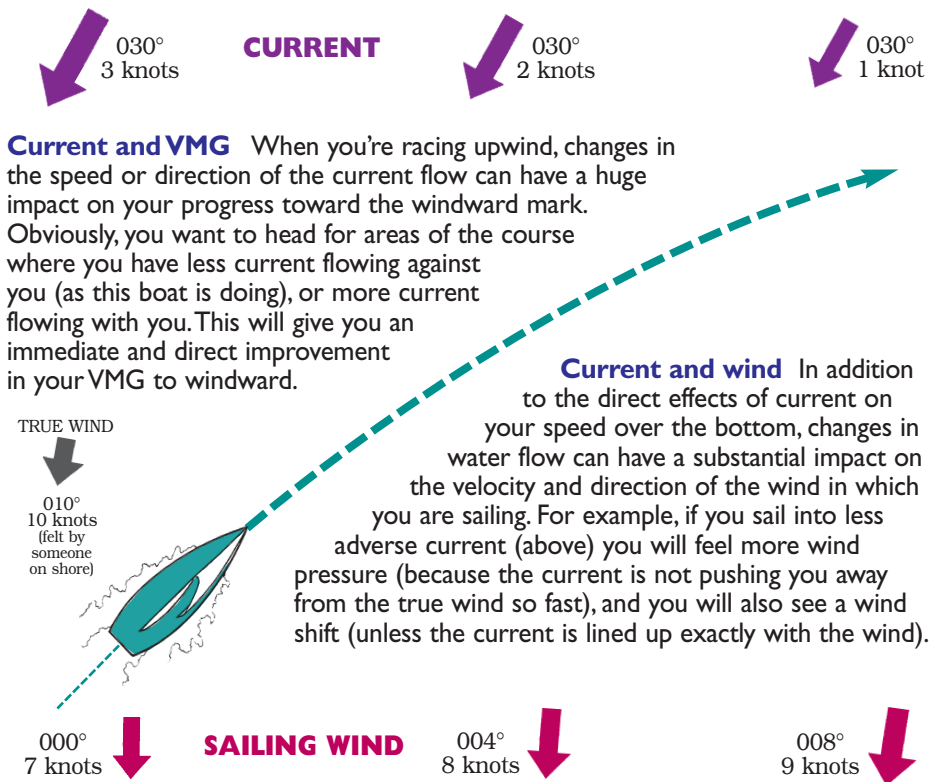
Let's say you are racing in 6 knots of true wind. If the current is flowing in the same direction at one knot, your sailing wind is only 5 knots – this drop from 6 to 5 knots will greatly affect your speed and pointing. However, if the true wind is 15 knots the current will reduce your sailing wind to 14 knots; this is barely noticeable.

The current has a similar effect on your speed over the bottom. In light air, the current may be a huge percentage of your boat speed so it will affect your performance (including laylines) much more than when you are sailing faster in breeze.

What's the moral? The lighter the wind, the more of a priority you should make current when you do your strategic planning.

Don't fall for current myths

There are a lot of misconceptions about the effects of current, and these can lead to some pretty crazy strategies. For example, there is no truth to the "leebow effect", so it won't help to pinch and aim your bow to windward of the current. Unless you are sure about a current strategy, stick to the basics and don't go on wild goose chases. •



Current and VMG When you're racing upwind, changes in the speed or direction of the current flow can have a huge impact on your progress toward the windward mark. Obviously, you want to head for areas of the course where you have less current flowing against you (as this boat is doing), or more current flowing with you. This will give you an immediate and direct improvement in your VMG to windward.

Current and wind In addition to the direct effects of current on your speed over the bottom, changes in water flow can have a substantial impact on the velocity and direction of the wind in which you are sailing. For example, if you sail into less adverse current (above) you will feel more wind pressure (because the current is not pushing you away from the true wind so fast), and you will also see a wind shift (unless the current is lined up exactly with the wind).

TEASER ANSWER

When you're on the layline and you get lifted above the mark, it's not always easy figuring out what to do. There may be tactical reasons (i.e. the presence of other boats) to sail high or low, but let's assume you are sailing by yourself and you just want to follow the best strategy for getting to the mark as quickly as possible.

I think the key factor is your distance from the windward mark. If you are fairly close, it's probably better to sail a little high and put some "money in the bank". This way you will avoid having to make two costly tacks if you get headed just before the mark.

If you are far from the mark, however, you should aim your bow right at it. If the wind stays the same or lifts you, this will be your fastest course. If you get headed you will have to do two tacks, but you will probably come out ahead of a boat that sailed high and is now farther from the new windshift.



JH Peterson photo



When strategizing, play the odds

Good strategists need to have many special qualities. They must be fortune tellers to predict upcoming windshifts. They need nerves of steel for making critical strategic decisions. And, perhaps most importantly, they must have the judgment of a shrewd blackjack player to assess the odds of various strategic moves.

Sailboat racing is really a game of probability. Since you are never 100% certain what the wind will do, you have to play the strategic odds. That's what the best sailors do. They think about the probabilities of every move and try to sail all the way around the course using only strategies that have a high chance of success. If a strategy is not likely to succeed, they won't consider it unless they're desperate.

In sailboat racing, as in most areas of life, every potential course of action brings with it a certain risk and also provides a certain reward. To be successful, you must assess the possible risk or reward in any particular action, and then choose actions that fit into your strategy for the race or series. Your ideal scenario is to maximize the possibility of gain while at the same time minimizing potential loss.

One of the exciting things about our sport is that there are so many variables, and you never know exactly what's going to happen. That makes every move at least a little bit chancy, so you can't get rid

In sailboat racing there is no one who can predict future weather conditions with absolute certainty; therefore, no strategy is a sure bet. However, certain strategic moves have a higher chance of success (or failure) than others. As a strategist, your challenge is to consider the possible strategies you might pursue, and figure out how good the odds are that each one will succeed. Then it should be fairly easy to make up a strategic gameplan that has the best chance of working.

of risk entirely. In fact, there are many times when you must be willing to take calculated risks. But you should avoid unnecessary, unwise or un-chosen risks. These come from strategic moves with a chance of failure that far outweighs their potential rewards.

A real-life situation

Consider this common scenario on the first windward leg: In a fairly large one-design fleet, your pre-start strategic plan was to hit the left side hard for more pressure. However, you got a bad start and were forced to tack to clear your air. Now you are on port tack, crossing behind all the other boats and heading toward the right side of the beat. What should you do?

In almost every circumstance, you should tack toward the left side as soon as you get clear air. This was your plan before the start and you should stick to it unless you see a change in the wind. If you don't tack, you will be taking a big chance by splitting from the fleet in the unfavored direction. Sure, there is a small chance this will work, but there's a better chance it won't and you'll end up farther behind.

Stack the odds in your favor

Here are a bunch of things you can do to give yourself a better chance of success on the windward leg:

- When you are doing well, be conservative strategically so you minimize the chances for other boats to pass you. When you aren't doing well, try to catch up in small steps. If you go for the whole enchilada all at once, you will have to take too much risk.

In general, strategic moves that come with large possible rewards also have a low chance of working. You should not normally try these unless it's late in the race or series and you are desperate.

- There's a lot of evidence that says the sailor who wins the most races is usually the one who makes the fewest mistakes. This is a great way to approach every aspect of sailboat racing, especially strategic planning. If you stick with high-probability moves, you will tend to make fewer errors.

- How do you improve your chances of making successful strategic choices? Go for the moves that have proven to work over and over again in the past (*see box*). Avoid going out on a limb or doing



JH Peterson photo

something that works only once in a while. One thing that good sailors do especially well is avoid getting into positions where they need big rewards. This is how they minimize their need to take big risks.

- Develop a strategic gameplan before you begin the windward leg, and stick to this until you have a definite reason to change it. You almost always have a higher chance of success if you base your decisions on a well-thought-out plan rather than a spur-of-the-moment feeling. Most last-minute decisions have a lower probability of success because they don't consider the full range of strategic variables.

- It doesn't usually work when you make a strategic move just to be different from other boats in your fleet. Often it's tempting to sail to the opposite side of the beat than the boats in front of you. But if you have a strong feeling that they are going the right way, follow them! They are ahead of you because they are fast or smart (or both!), so odds are they're going the right way.

- View each windward leg as a new strategic challenge with a unique set of weather conditions. Don't go to the right on the second beat just because that side paid off on the first beat. However, if conditions appear similar the second time around, the fact that the right side worked before may increase the odds that it will work again. •

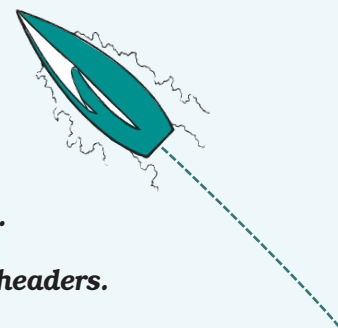
Follow basic strategic principles.

A strategic principle is an axiom or rule of thumb that is accepted as a general racing guideline because it has worked so many times in the past. For example, a classic principle of upwind strategy is to sail the tack that takes you toward the next wind shift. This almost always puts you farther ahead of where you'd be if you sailed away from that shift. Therefore, it's a widely accepted principle.

When you are making a gameplan for the upwind leg, try to select strategies that are relatively low-risk with a higher probability of success. The best place to start is by sticking with the basic strategic principles whenever possible. These rules of thumb are proven to have a relatively high chance of success in a wide range of conditions. They're especially useful when you are not sure what the wind will do next.

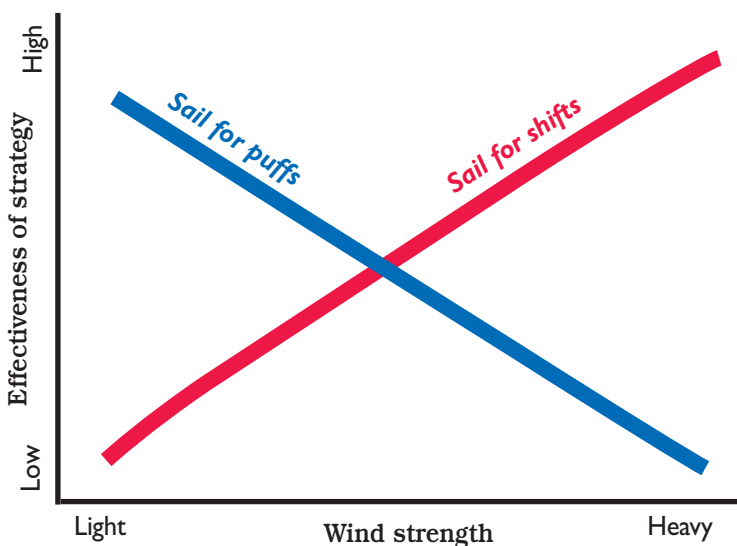
Here are several key strategic principles that you can use in your next race: many of these are covered in other parts of this issue.

- **Sail toward the next shift.**
- **Sail for better wind pressure.**
- **Sail the longer tack first.**
- **Stay away from corners and laylines.**
- **In an oscillating breeze, tack on the headers.**
- **In a persistent shift, sail the heading tack first.**
- **Sail for puffs in light air and shifts in breeze.**



Of course, every rule has its exceptions, and there are certainly times when these rules of thumb will not get you to the windward mark faster. But if you are playing the odds, the principles above are a good bet most of the time. So stick with these unless you have a good reason to do something different.

Should you sail for puffs or shifts?

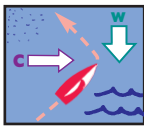


When you're racing upwind, sometimes you have a choice of sailing toward the next wind shift or heading for a puff with more wind pressure. The better choice often depends on how much breeze you have.

In heavy air, sailing into a puff will increase your speed only marginally, if at all, because you are probably overpowered already. Therefore, when you are racing in higher winds, you should place more of a priority on playing the shifts in wind direction.

In light air, however, you are always underpowered. A puff might almost double the strength of your sailing wind, and this would make a large difference in your speed through the water. In addition, the extra wind velocity allows you to point closer to the wind (because your tacking angle in strong wind is narrower than in light wind). This "lift" is often as big as the lift you would get from a windshift.

That's why, in light air, you should usually search for better pressure first and worry about windshifts second. Conversely, as the wind gets stronger, your priority should change to looking for the shifts.



WAVES

Sail for smoother water unless . . .

When you're racing downwind, the waves are your friends because they help you surf faster. On most offwind legs, the bigger the waves the faster you'll go.

When you're trying to sail fast upwind, however, waves are detrimental to your health. They smack into your bow, cause your boat to hobby-horse and generally slow you down. Therefore, it's good to avoid waves as much as possible.

In light winds or when the wind is blowing offshore, the water surface is quite flat and waves are not an issue. But as the wind starts to pick up and the waves build, you should begin looking for smoother water on your windward leg.

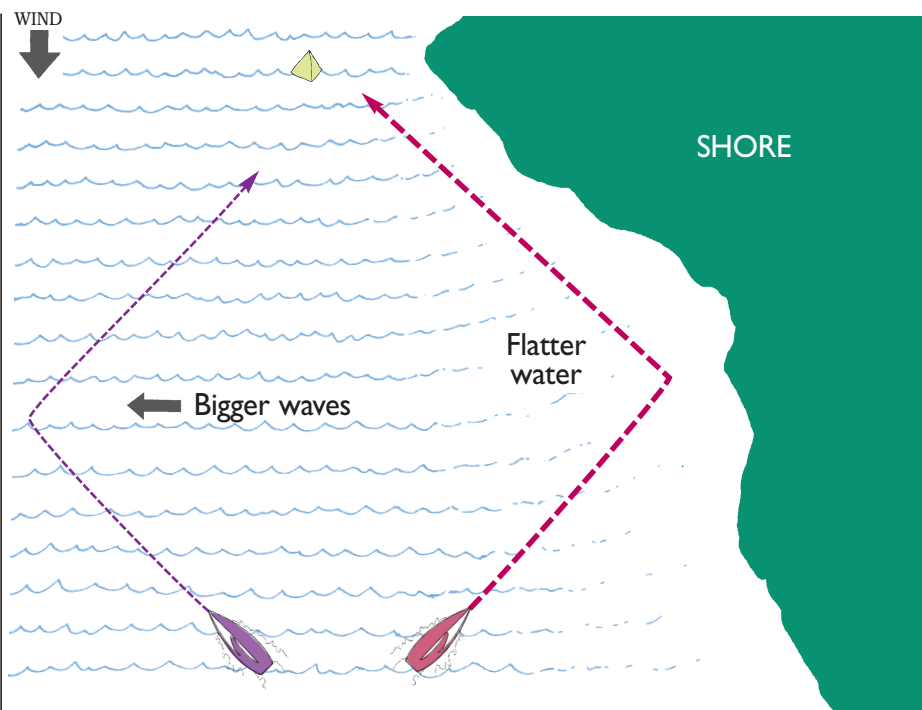
If the waves are equally bad all across your course (this is usually the case), they won't be a factor in your strategic gameplan. But sometimes you find areas of the course where the water surface is relatively smooth. This happens occasionally when the water on one side of the beat is protected by shore.

If you can spend a large part of the windward leg sailing in flatter water than your competitors, there is a good chance you will beat them to the windward mark. So consider this in your strategic planning.

When you do see a difference in waves across the course, try to figure out why this is happening. Smoother water is often caused by lighter wind or more adverse current; when this happens, it's often better to sail in bigger waves!

TIP: Sometimes the waves are not aligned with the wind, so you hit them at different angles on each tack. If all other strategic factors remain the same, it won't matter if you sail the slower (into the waves) or faster tack first. But here are two things to keep in mind:

- The wave angle may give you clues about an upcoming windshift.
- If you're not sure what the wind will do, you might sail the faster tack first since that way you will get farther up the ladder to the windward mark.



Play the waves strategically

There are not many windward legs where it's possible to avoid sailing in waves. But sometimes when you are sailing near shore, the wind is lined up so the water is less bumpy as you get closer to land (above). Sailing in flatter water will definitely help you go faster upwind, so it's probably a smart strategy to head for shore in the situation above (assuming you've considered other strategic factors).

DANGER!

Be careful about sailing for smoother water upwind! It's true that you will go faster in flat water than in waves, but this assumes all other factors are equal. There are several reasons why you may find smaller waves in parts of the windward leg, and two of these are strong reasons to avoid sailing in those areas of smoother water:

1) **There is less wind.** The size of the waves is usually proportional to wind strength. Therefore, the most common reason for differences in wave action across the course is simply because there's less wind velocity in that area of the beat. In the situation above, for example, the smoother water near shore may be occurring because the land blocks some of the wind. While it's good to avoid waves, the gains you make from being in smoother water are seldom worth the losses you suffer due to sailing in lighter wind. So before you try to escape from the waves, make sure you aren't also sailing into lighter air.

2) **There is worse current.** The size of the waves is also a function of current. In general you'll find bigger waves where there is more current running against the wind, or less current going with the wind. Smoother water means you have more current going with the wind or less against it. Therefore, if the waves on your course are due in part to current, you should actually sail for rougher water, not smoother water, when going upwind. The area of bigger waves is where the current will give you the biggest push to windward (or the least push to leeward).



Use your speed strategically

When you are racing upwind, most of the time you should sail your optimal closehauled angle (i.e. the course that gives your best performance to windward, or VMG). Sometimes, however, it's better to sail a little slower (point higher) or faster (foot off lower) than normal.

In the last issue, we talked about when you would change your speed for tactical reasons. For example, you might point higher and go slower when you're trying to pinch off a boat to windward.

Temporarily sailing a little fast or slow can also be a good option strategically, even when there are no other boats around. By choosing to sail a different speed and height temporarily, you can often take advantage of changes in the wind and get to the top mark sooner.

Times to sail slow

Sailing slow, or 'pinching', is a good strategic move when you expect the next puff or shift to come from your windward side. Here are specific times to sail in this mode:

- *Sailing on a header* – You shouldn't normally sail on headers, but sometimes you get stuck in this position temporarily. When that happens, sail slow and high so you move closer to the direction where the next shift (a lift!) will come from.

- *Pinching to a puff* – If you see a puff coming from your windward side, it often pays to pinch up so you get the puff sooner. This works best when: a) the puffs are moving slowly toward you; b) the puffs bring a large increase in wind; or c) the puff might pass behind you if you keep sailing your normal speed. In these situations you will gain by going to the puff rather than waiting for it to come to you.

- *Squeezing up to the mark* – If you are close to the windward mark and not quite fetching it, your best strategic move may be to squeeze up toward the mark so you can round it without two extra tacks.

Times to sail fast

Sailing fast, or 'footing', is a good strategic move when the next puff or shift will come from straight ahead. Here are some specific times when you might go into this mode:

- *Sailing on a lift* – In a breeze that's oscillating, you should be sailing on lifts most of the time. And when you're on a lift, you want to sail slightly lower and faster than normal. This will give you the best VMG in the direction of the median

wind, and it will get you to the next shift (a header) faster.

- *Footing toward a puff* – When you see more pressure in front of you, sail fast in that direction so you get to the puff sooner. This is especially important in lighter air.

- *Overstanding the mark* – When you have overstood the windward mark from fairly far away, aim at it and sail fast to get there as quickly as possible (see *Teaser Answer on page 11*). •



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It doesn't seem like you'd ever want to go 'slow' when you're racing upwind, but there are some times when pinching (sailing a little slower than your optimal upwind speed) is a good strategy. Other times it's better to 'foot' (sail a little faster than normal). It all depends on what the wind is doing and what speed works best for your strategic plan.

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97

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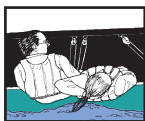
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CREW WORK

Help your skipper with strategy

Even when you're not driving the boat, there are a lot of things you can do to help your team with strategy. Unlike tactics, strategizing is usually quite deliberate – it takes place slowly and with enough lead time to incorporate comments from every crewmember.

In addition, executing a sound strategy requires a number of skills that depend on good crew work. Here are the top three ways (in my opinion) that crewmembers can be helpful in making and carrying out your team's upwind gameplan.

1. Keep a good lookout.

It's very important to watch what's happening around the race course, both before and during the race. You can never have too much information about what the wind might be doing, so try to give regular updates about the strategic "big picture" that you are seeing.

For example, you might say, "There's better pressure on the far right," or "The boats on the left look lifted on port tack." It's especially helpful to do this while you are racing upwind because then your helmsperson is focused on keeping the boat going fast and avoiding other boats.

2. Change gears efficiently.

Upwind strategy is all about taking advantage of changes in the wind and water. In order to do this, you must be good at "shifting gears." For example, it's a good strategic



JH Peterson photo

It's difficult for crewmembers to help with tactics because boat-on-boat situations are very fluid, and decisions must be made quickly by the person holding the wheel or tiller. But strategy is different. Strategic planning usually involves more gradual, big-picture stuff and requires a good view of the overall race area. For both these reasons, crewmembers are in the perfect position to help.

move to sail into a big puff, but if you let the boat heel over when the puff hits you will lose all the benefits of sailing in more wind.

3. Perfect your tacks. Good boathandling is obviously key for close tactical maneuvers, but it is also critical strategically. Imagine a boat racing upwind in a regularly oscillating breeze. If her crew is skilled enough to tack the boat with minimal loss, the helmsperson can

take advantage of even the smallest windshifts. But if the boat loses two lengths in every tack, it won't pay off to tack on the smaller shifts, and you will lose a strategic opportunity to gain on other boats. So if you want to help your team get better strategically, practice roll tacks!

It's hard to execute an effective gameplan without good crew work – that's why everyone on the boat is critical for strategy. •

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