David Dellenbaugh's
SPEED&Smarts™
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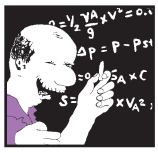
JH Peterson photos

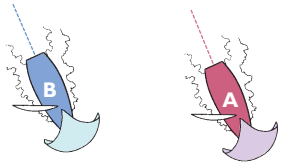
STEERING



BRAIN TEASER

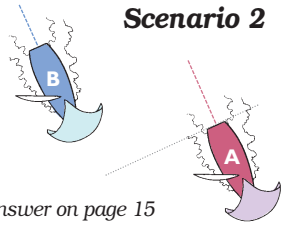
Proper course question

Two boats on port tack are on a broad reach and roughly 1.5 boatlengths apart. In Scenario 1, the boats are overlapped as shown below. In Scenario 2, the boats are not overlapped with B steering the course shown. In each case, is Boat A allowed to sail below her proper course?



Scenario 1

Scenario 2



Answer on page 15

Steer your boat fast!

Steering is the technique of guiding a boat from one point to another through windshifts and waves. It's a subtle art that requires concentration, practice and a delicate sense of feel. Whether you are sailing upwind or downwind, good steering ability may be the most critical factor in sailing your boat fast around the course.

Steering a sailboat involves a series of continual turns. Even though most of these turns are relatively small, almost all of them require moving the rudder to one side or the other. And, as most sailors know, any time you angle the rudder off centerline you create additional drag.

So the first rule of thumb for steering fast is simply to minimize steering. Reduce rudder movement and rudder angle by aiming the boat straight as much as possible, especially in flat water and steady wind. Many helmspeople have a nervous habit of oversteering, which is slow. Instead, try to hold your wheel or tiller very still.

Of course, you can't avoid turning the rudder altogether. There are many, many times in each race when the benefit of turning the rudder far outweighs the extra drag you create. For example, the rudder is essential for steering through waves, rounding marks and maneuvering near other boats.

But when you do 'steer' the boat, try to accomplish this with as little rudder movement as possible. The trim of your sails and the placement of crew weight are two ways to have a huge effect on where the boat goes without using the rudder at all. The entire crew must use these techniques aggressively to help the helmsperson steer the boat.

The rest of this issue is full of tips for how you can steer any boat faster around the course in a variety of conditions.

TECHNIQUE

Find a comfortable 'driving stance'

In many sports, athletes have a particular position they assume while playing the game. In baseball, football, golf, tennis, cricket, rugby and many others, the players use a 'stance' that helps them get comfortable and ready for action. The same is true in sailboat racing.

In order to steer a boat fast, the person holding the tiller or wheel must have a good "driving stance." This includes where and how they sit or stand, and it varies according to the boat, the person and the sailing conditions. Here are some factors to consider.

A good view

While a helmsperson must have a good sense of feel, he or she also relies heavily on many visual clues such as telltales, wind and waves on the water, instruments and so on. For this reason, it's important for the driver to be in a position where they have a clear view. The helmsperson should usually be:

• *To windward* – You will almost always will have a much better view from the windward side (*see 'Should you ever sit to leeward?' on page 3*).

• *Forward* – By moving forward you will get a better view of certain key variables such as the telltales on the jib and waves on the bow.

• *Higher up* – You will also be able to see more (e.g. waves and wind on the water) by elevating. If you have a wheel, it's often better to stand than sit. Downwind, you might stand even if you have a tiller (*see photo below right*).

Comfort

Besides a good view, the other most important factor for a helmsperson is being comfortable. Many races are very long and require an intense amount of concentration and, often, physical exertion. If you are not driving in a comfortable position, it will be very difficult to stay focused 100% on steering. That means your speed will suffer.

• *Leverage* – Make sure that you are in charge of the helm and not vice versa. For example, when it's windy, wear non-skid shoes and sit so the hiking stick makes a 90° angle with the tiller.

• *Be ergonomic* – Try to absorb the pull of the helm and mainsheet with your legs rather than your back. Don't stay in one position for too long. If you're steering with a wheel, sit for a while instead of standing. Change your grip on the mainsheet. Consider tacking!

• *Clothing* – Wear gloves so you can hold the mainsheet longer. Be sure you are warm enough, and drink water during the race.

Other factors

Being comfortable and having an

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When you are the helmsperson, it's very important that you can see all your steering guides clearly. Almost nothing makes it harder to steer than having a large crewmember with a big hat sitting right in front of you. So once you settle into a comfortable steering position (as far forward, to windward and as high as possible), make sure other members of your team do their jobs without blocking your view of the waves in front of the boat, the instruments, telltales, spinnaker luff and so on. This is relatively easy upwind (above left) because in heavy air the crew can hike outside your line of sight, and in light air they sit inside and below where you are looking. When you're going downwind, however, the crew must often sit in the middle of the boat. If the driver has a hard time seeing, he or she may have to move or even stand up (above right) to get a good view of the waves.

unobstructed view are by far the two most important things when choosing your "driving stance." Here are two other considerations.

• *Windage* – In the ideal world, the helmsperson should stay low when sailing upwind so he or she creates the least amount of windage possible. In practice, however, this reduction in drag does not nearly offset the critical steering input that you lose by compromising your position. So I wouldn't worry about windage.

• *Communication* – You must steer from a place where you can have easy, clear communication with the rest of your team. •

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Get a grip on your hiking stick

When you're steering a boat with a tiller, the way you hold the hiking stick can make a big difference. As far as I'm concerned, there are two grips to consider – the 'microphone' grip and the 'frying pan' grip.

'Microphone' grip

I use this grip 100% of the time because I like having the end of the hiking stick in front of my body. My personal preference is to hold the hiking stick right at the end (as shown), with my thumb able to go under the hiking stick or across the end of it. I feel this gives me better control of the helm and makes it much easier to trim the mainsheet with two hands (see *page 8*). Plus I hate having a hiking stick that extends beyond my grip and sometimes pokes me in my stomach. For this reason, I adjust the length of the stick so I can hold it comfortably in my lap when I'm in my normal driving position for the existing conditions. I also like to have a small knob at the end of the hiking stick to keep my hand from slipping off.

'Frying pan' grip

This grip is good for steering the boat when you want to minimize rudder movement. Consider this when you have flat water, steady wind, a relatively large rudder or a helmsperson who tends to oversteer. Once you get the boat in the groove, you can actually rest the tiller on the deck to keep the rudder perfectly steady. This grip does not work when you need two hands for trimming the main.

Should you ever sit to leeward?

When I was 13 years old and racing a Blue Jay one-design, I often used to steer from the leeward side. That perspective made it seem like the boat was pointing higher (because the forestay looked farther to windward), and sitting so close to the water made it feel like we were going faster.

But a long time ago I changed that opinion. Now when I am steering I sit (or stand) on the windward side of the boat 99% of the time. For all the reasons stated on the previous page, being on the windward side makes it so much easier to gather all the information needed to do a good job of steering. I steer from the leeward side only when I am in one of the following situations:

• **Very light wind** – Sometimes the wind is so light that you need all crew weight (including the helmsperson) on the leeward side in order to heel the boat enough to keep the sails full. (*This applies upwind or downwind when steering with a wheel or tiller.*)

• **Doublehanded dinghy** – When you are sailing downwind on certain boats (e.g. 420 or 470), the crew must sit on the windward side to see/play the spinnaker, so the helmsperson must sit to leeward to balance the boat. (*This applies to doublehanded dinghies downwind.)*

• **Grooving in light air** – When the wind is light and shifty and it's hard to find a groove, it often helps to steer from the leeward side where you can see all the telltales along the luff and anything else that's happening with the headsail. (*This applies upwind or downwind, primarily when steering with a wheel.)*

• **Tactical reasons** – When you are racing upwind and you converge with a boat (or a mark) on your leeward side, it often helps to steer from that side. (*This applies primarily upwind when you are steering with a wheel.)*

IN THEORY

Use these upwind steering guides

When you are driving a boat upwind, there are many visual guides you can use to help you get and keep your boat in the groove. I typically use three primary sources of information to help me steer the boat (*unless I have instruments – see pages 12-13*). These are the jib telltales, the boat's angle of heel and nearby racing boats.

It is very possible to steer the boat fast using any one of these guides. For example, you could spend 100% of your time looking at just the telltales or at the angle of heel. Or you could watch only the boats around you and adjust your course entirely according to them.

But the idea is to use all these sources at the same time. There are two reasons for this. First, each guide will likely give you at least a little information that is different than the others. And second, you can use each guide as a check on the others. There is probably a direct correlation between how well you steer the boat and the number of different steering guides that you use while driving.

Jib telltales

One of the best visual clues for steering upwind are the telltales along the luff of your jib or genoa. This is where I look most often when I'm driving. Like a lot of helmsmen, I depend too much on this single source of information. But telltales probably give you the most accurate indication of exactly how close you are sailing to the wind and what 'gear' you are in.

Angle of heel

Many top sailors, including gold medalist Buddy Melges, use the boat's angle of heel as a primary guide for sailing upwind. One way to keep track of heel is by watching the angle between your headstay and the horizon. The goal is to keep this angle steady while you are steering upwind.

Even when you're not looking at the headstay, it's fairly easy to gauge changes in heel by using your sense of feel and balance. When you feel the boat heel over or straighten up, you know that you must make a steering change to keep a steady angle of heel.

Other boats

How you perform relative to your competitors is key in evaluating the job you are doing as a driver (*see photo and caption below*). But those other boats can also give you valuable information to help you steer your boat faster. When I'm driving, I like to have one person give me continuous feedback about our speed and height compared to nearby boats. This information is very helpful in deciding whether I should steer higher or lower, for example. It is also invaluable in identifying and fixing any speed problem we may have.

Sensory clues

While there are many great visual clues for steering a sailboat, don't forget the guides you can feel with your senses. These include the sensation of speed through the water and pressure on the helm.

By tuning into these variables and remaining sensitive to how they change from moment to moment, you can learn a lot about what your boat needs in order to steer it fast. If you feel the boat slow down, for example, you may need to bear off a little to build speed. If you suddenly feel more windward helm, maybe you should head up slightly to flatten the boat and ease the helm.

Some of these guides work for sailing downwind too. Since the 'groove' on runs is more elusive, it's good to find as many clues as possible when steering on runs. •

JH Peterson photos

Whenever you are racing and you want to judge how fast you are going or how well you are steering, there is only one way to measure this – you have to compare your performance to that of another nearby boat. Differences in speed and technique among sailboats are so subtle that you can never measure them accurately with instruments or your sense of feel.

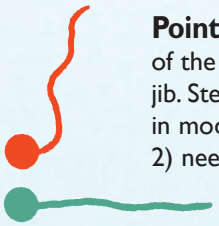
What are the implications of this for steering? First of all, you cannot evaluate how good a job you are doing by watching your knotmeter or judging how the boat 'feels.' Second, the best way to improve your steering ability is by participating in a lot of two-boat testing because this gives you instant feedback. And third, the job of steering is intimately connected with everything else (e.g. sail trim, tuning) that affects the relative performance of two boats.

TELLTALE GEARS

The action of your jib telltales is a good guide for steering fast upwind. You want the leeward telltales streaming straight back almost all the time. On the windward side, the optimal telltale action depends on a number of factors like your boatspeed, wind speed, waves and tactical considerations.

Normal mode Windward telltales lift at nearly a 45° angle much of the time, and you seldom see a 'luff' in the front of the jib. Steer in this mode when you want an optimal combination of speed and pointing to maximize VMG upwind.

Speed mode Both windward and leeward telltales stream aft and you never see the front of the jib 'luff.' Steer in this "footing" mode when you 1) are racing in light air, especially if you have waves; 2) need to accelerate; or 3) need to go fast for tactical or strategic reasons.



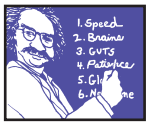
Point mode The windward telltales fly nearly straight up most of the time, and you often (or always) see a 'luff' in the front of the jib. Steer in this mode when you 1) are trying to maximize pointing in moderate wind and smooth water or for a short period; or 2) need to 'feather' or 'pinch' to depower when it's quite windy.

TELLTALE LOCATIONS

Jibs and genoas typically have three sets of telltales near the bottom, middle and top of the sail. These help the trimmers a lot, but the helmsperson can never see the top telltales and often has trouble seeing the middle telltales. As a result many drivers end up sailing by the bottom telltales. This would be OK if those telltales behaved the same as the ones at the top of the sail, but they seldom do. The solution is to steer by the telltales that are half way up the luff; these will give you the best average reading for the sail. In order to do that you may have to position yourself farther to windward, farther forward or higher up. If that doesn't work, put new telltales as high up as you can see. This small change could help you steer faster right away.

Once you get your boat tuned up and in the groove, it's possible to steer very fast by looking at nothing except the boat's angle of heel. The easiest way to judge this is by watching the angle between your headstay and the horizon. If you keep this angle constant, you will consistently sail a course that gives you the best VMG upwind. If you look at any boat that is well-sailed, you will notice that they maintain a very steady angle of heel, even when the wind velocity is up and down. This works for any kind of boat.

Put telltales here – half way up the luff.



BRAINSTORM

Try these tips for steering fast on runs

Steering downwind seems easy. After all, you just head for the next mark and let your sails out all the way. But it's not that simple.

On a run, it's usually more difficult to find the "groove" than when you are beating. That's because the downwind groove is usually much wider, and you have fewer guides to help you find the right angle and speed. Here is a brainstorm of ideas on how to steer fast in different running conditions.

When the wind is light

Perhaps the best advice for running in light wind is to err on the side of being too fast rather than too slow. It's usually better to sail on the high side of your groove rather than risk getting too low.

☛ The helmsperson should sit where he or she has a good view of the spinnaker luff (and, if possible, the entire spinnaker). This is key for knowing how much pressure is in the sail (and whether you need to sail higher or lower). In very light air when the tack of the spinnaker is on centerline, you may have to sit to leeward to get a good view.

☛ In small boats, hold the mainsheet straight from the boom, so the purchase is one to one. This makes it easier to feel the pressure in the sail and to trim or ease it.

☛ Minimize rudder movement and helm. On a run you don't need helm to generate lift, so try to keep the rudder perfectly straight to reduce drag.

☛ Use your weight to steer. In light air, don't turn your rudder any more than is absolutely necessary. Since sail trim won't help much with steering in this condition, you have to move your bodies from side to side to help turn the boat.

☛ Try not to wear too much clothing, especially around your face and neck. When you are steering, it's good to be able to feel changes in the wind on your body.

On the edge of control

Sometimes it's very fast to be on the edge of control, but not if you capsize or broach. Therefore, when you are steering in these conditions you must find a happy compromise between going all out for speed and finding a safe course that will avoid major speed-killing problems.

☛ Overtrim your mainsheet a little. This will reduce your exposed sail area since the wind will hit the sail at more of an angle rather than perpendicularly.

☛ Sail a slightly higher angle than normal. It is much easier to steer when you remove the possibility that you will capsize or broach to windward. Sailing slightly higher may actually improve your VMG.

☛ Use lots of vang to keep the mainsail leech straight. If you allow the main to twist too much, the upper part of the sail will push sideways on the top of the mast. This side force causes the boat to roll and makes it hard to steer (of course, you must be sure someone can release the vang quickly).

☛ Put your centerboard down a little farther than usual (but not all the way down).

☛ Move your weight aft. It will be much easier to steer and control the boat if you have more of the flat stern sections in the water and less of the narrow, curved bow.

☛ Keep the backstay tighter than you normally do on a run.

☛ Steer so you keep the hull directly under the mast as much as possible. If the mast rolls to windward, turn the boat to windward and vice versa.

☛ On a boat with a symmetrical spinnaker, a good way to keep the hull under the mast is to steer the bow toward the vertical center seam of the spinnaker.

☛ Improved stability makes for easier steering because whenever

Listen to your spinnaker trimmer

The spinnaker provides your main driving force downwind, so the driver must optimize the performance of this sail. This requires extensive communication with the person who is trimming your chute. The trimmer can see and feel the wind in the spinnaker and therefore knows the answers to key questions such as: Is the sail nicely powered up or is it barely holding its shape? Was there a recent change in pressure? Are you headed or lifted? Would the spinnaker be happier if the helmsperson steered higher or lower?

The spinnaker trimmer should frequently describe what is happening. For example, he or she might say: "I'm seeing a header in the spinnaker," or "The chute is losing pressure." The helmsperson must listen carefully for these clues (*see sample dialogue on next page*) and then use this information to keep steering the boat fast.

JH Peterson photo

the boat rolls it makes the hull want to turn. One way to improve stability is to spread out your crew weight from side to side. In a two-person dinghy, for example, it's better to have one crew on each rail than both in the middle.

Running in waves

Turning your rudder is usually bad on a run, but when you're sailing in waves you often have to steer the boat aggressively. Try to turn the boat as much as possible by moving your weight, both side to side and fore-and-aft.

☛ Steer your boat toward low spots in the water ahead. Think of it as skiing through a mogul field.

☛ Don't be afraid to change your course aggressively. In certain boats and conditions you may need to head as high as a beam reach to catch a wave and then go by the lee to stay on it.

☛ Are you going faster or slower than the waves? If you're faster, look for flat spots where you can steer over the wave that's in front of your bow. If you're slower, stay with each wave as long as possible.

☛ Think of the course you steer as a series of arcs. When the boat starts to decelerate, begin arcing to windward; when you accelerate, steer an arc to leeward.

☛ It's easy to go fast when you are surfing on a wave. The key is to maximize the time you spend surfing and minimize the time spent going slow between waves.

☛ You can't catch a wave if you're going too slow. So when you are not surfing on a wave, make sure you get going fast enough to catch the next one that comes.

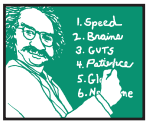
☛ Don't be greedy and try to surf each wave to the bitter end. Bail out a little early so you will be able to build enough speed to catch the next wave.

☛ Avoid waves that are created by other boats because it is difficult to sail through them. One exception is when the boat making the waves is faster than you are. Then it may be good to get stuck in their wake. •

Use your ears to steer!

Imagine closing your eyes downwind and steering only by the comments you hear from other people on your boat. Could it work? (If not, maybe the people on your boat should talk more!) There are certainly many steering clues that are hidden (or sometimes obvious) in the conversations that happen while racing. Here is one sample of a running downwind dialogue along with implications of certain comments for steering.

Downwind dialogue	Steering implications
Crew 1 – Looks like more wind coming in 30 seconds.	
Crew 2 – I'm losing a little pressure in the spinnaker.	
Helmsperson – OK, coming up about 5 degrees.	Head up a bit to get the new velocity sooner (and keep the spinnaker flying).
Crew 2 – That's good, hold there.	
Crew 1 – Puff coming in 3 . . . 2 . . . 1 . . .	Be ready to bear off with the puff.
Crew 2 – I'm easing the sheet.	
Helmsperson – I'm going to build speed for a length and then bear off. Can we move some weight to windward?	
Crew 1 – I got it (*moving to windward side*).	
Crew 2 – Our speed is four tenths above target.	Bear off to slow the boat down so you are sailing closer to target speed.
Helmsperson – OK, coming down a few degrees.	
Crew 2 – (*Speed drops.*) That's better.	
Crew 1 – Do you see those motorboat waves coming at us?	Head up to build speed before hitting the waves.
Helmsperson – Yea, thanks. Coming up a little.	
Crew 2 – I feel a lift in the chute and I'm easing the sheet a little.	
Helmsperson – I don't want to jibe here, so I'm heading up. The boat feels pretty good. How are we doing with everyone?	Head up slightly to maintain your optimum true wind angle.
Crew 1 – In general we've been sailing a little higher and a little faster than the boats around us.	
Helmsperson – Has that been good or bad?	
Crew 1 – I think we have lost a little bit to them.	If you are losing to the other boats by sailing higher and faster, try bearing off a little.
Helmsperson – Let's try sailing slightly lower and see how that works.	
Crew 2 – Do you see the boat on our windward hip?	
Helmsperson – Now I do, thanks.	
Crew 2 – We're just in front of their wind shadow.	Don't bear off too far or you will fall into their wind shadow.
Helmsperson – OK, I won't bear off any more for a while . . .	



BRAINSTORM

Tips for steering your boat fast upwind

Sailing a boat upwind is one of my favorite things in life. There is nothing quite like steering a boat that is 'in the groove' and making great VMG to windward. Here are some thoughts about techniques, goals and priorities when you are driving a boat upwind.

General rules of thumb

To steer a boat fast upwind, you must be able to guide that boat efficiently through a series of changes in the wind and water. Therefore, it's key to anticipate changes that are coming. If you don't know about a puff until it hits your sails, you will be constantly in reaction mode. Keep your head out of the boat so you can make proactive adjustments before or as the puff hits.

☛ To improve your ability to anticipate changes in conditions, assign one of your crewmembers to watch out for puffs, lulls, waves and flat spots. On small boats, this lookout often must be the skipper because the crew may not have a very good view of the race course. On larger boats, it's usually a crewmember sitting on the rail.

☛ If your boat is big enough to have a tactician, find a good one you trust so you can focus entirely on steering without having to look around very much. If your boat is small enough that you must steer and do tactics at the same time, practice steering by feel (*see page 16*) so you can look around a lot and still keep going fast.

☛ It's very important to keep talking with your mainsail trimmer for two reasons: 1) only you can feel what the boat needs through the rudder; and 2) he or she controls the sail that has the biggest impact on the balance and speed of your boat, which is critical for steering.

☛ If you (the helmsperson) are also trimming the mainsail, never cleat the mainsheet unless you must. Holding the mainsheet helps you take the pulse of the boat and allows you to make quick adjustments needed for steering fast.

☛ If you are steering a bigger boat, don't get mesmerized by the instruments. They can be helpful for keeping the boat sailing near its potential, but there is no substitute for good feel and judgment.

☛ Most helmspeople like to point high when they are steering. There is nothing so reassuring as the knowledge that you are sailing higher than the boats around you. But remember this critical rule about steering upwind: "Go fast first and worry about pointing later." If you try to aim your bow too high before your foils are working efficiently, you'll be slow.

☛ Once the boat is going well, keep trying to trim the sails (especially the main) harder and point higher. As soon as you feel the boat start to slow, ease the sheet a little and bear off slightly to build speed. Then start the cycle again. When the boat feels fast, trim harder and point higher. If it feels like you are slowing down, ease and get going.

☛ Practice steering upwind. The best way to learn is speed-testing with one other boat. This gives you a great chance to try different steering techniques and get immediate feedback by watching how you do relative to the other boat.

Don't eat your sheet!

If you want to be a good smallboat helmsperson, you must know how to hold the tiller, steer and play your mainsheet – all at the same time! Sometimes I see sailors using their teeth to help trim the mainsheet. This is very slow and inefficient (and it's bad for your dental health!). So if you are a 'sheet-eater,' you need to learn a more effective technique.

I always hold the hiking stick using a 'microphone' grip (*see page 3*) with my hand on the end of the stick. When I need to trim the sheet, I grasp the hiking stick tightly between my palm and my last three fingers. This leaves my thumb and forefinger free beyond the end of the hiking stick (*Photo 1*).

Then I grab the sheet with these two fingers (*Photo 2*), and it becomes almost like trimming with two hands. With a little practice, you can trim the sheet quickly with both hands, moving the end of the hiking stick back and forth aggressively while still maintaining a smooth motion in your tiller. •


1


2

Tune in to the feel of your helm

When you are driving upwind, you can learn a lot about your boat from the feel of your rudder. One of the key variables in steering fast is the amount of windward (or leeward) "helm" that you have. This helm is a function of how far you must turn the rudder in order to keep the boat going straight. If you have to turn the rudder 2° off centerline, then you have 2° of windward helm.

Most boats will go best upwind with about 3 to 6 degrees of windward helm. Even though turning the rudder creates drag, this much helm is good for several reasons: First, it means the rudder is contributing a certain amount of "lift," which helps the boat sail to windward. Second, it gives the wheel or tiller a livelier feel and makes it easier to keep the boat in the groove. And third, windward helm makes the boat tend to point higher naturally.

However, when it's windy you don't want to get too much of a good thing. If you have more than about 6° of helm (which is very possible on a breezy day), the boat will tend to round up quickly and you'll have to pull hard on the rudder to keep it going straight. At a certain point, the increased drag outweighs the benefits of a moderate helm, and you will start going slower.

When the wind is light, your problem is that you won't be able to get enough helm. If you have less than 2 or 3 degrees, the rudder won't contribute much lift. More importantly, you will lose that gentle tug on the helm that helps you keep the boat right on the wind.

Getting the optimal amount of helm on any boat is a feel thing. As you get more steering experience, you will learn how much pull is fastest in different conditions. You'll know that in light air you need to generate as much helm as possible, and in breeze you are almost always trying to reduce helm.

JH Peterson photo

Beating in light air

When you are sailing upwind in light breeze, err on the side of sailing a little too low and fast rather than too high and slow. If you try to point and sail on the high side of the groove, all it takes is a lull or a wave or a header to kill your speed and force you to accelerate all over.

☛ Try to manufacture at least a little bit of windward helm so you will have some "feel" to help you steer. Adjustments to increase helm include adding more rake, heeling the boat more, moving crew weight forward, pulling the traveler farther to windward, and so on.

☛ It's important to stay focused on steering the boat fast. This is not easy since most light-air races are long and frustrating. As a famous Olympic and America's Cup sailor once said, "If you don't finish the race with a splitting headache, you probably didn't concentrate hard enough on steering."

☛ Move the rudder as little as possible. On a tiller boat, consider using a 'frying pan' grip on the hiking stick to keep the rudder straight and quiet (*see page 3*).

☛ Set up your sails and rig so they are more forgiving. You want full, powerful, draft-forward sails with twist that are good for footing rather than pointing. This makes your sailplan less critical and helps you steer the boat in the groove much more easily.

Heavy air and waves

When it's windy, one of the biggest problems for the helmsperson is having too much windward helm. This can be a steering nightmare because it is physically demanding and hurts your boatspeed. So work on reducing helm by using less mast rake, keeping the boat flatter, moving crew weight farther aft, dropping the traveler to leeward, flattening the sails and so on.

☛ You should usually bear off and power through chop, but as the waves get bigger you need to start steering around each one. In general, head up on the face of each wave and bear off down the back side. In dinghies, move your weight in sync with this – out and forward as you bear off over the wave and then in and aft when you hit the trough and head up again.

☛ Waves (and flat spots) seem to come in sets, so make sure that someone on your boat watches for these and gives you a warning. Point higher in the flat spots and then bear off to power through the unavoidable waves.

☛ When you're overpowered is a good time to steer by heel angle. Point the bow high enough to keep the boat on its feet. And when you want to turn the boat, you must absolutely help a lot with sail trim since weight placement and even the rudder often have little effect. •

TECHNIQUE

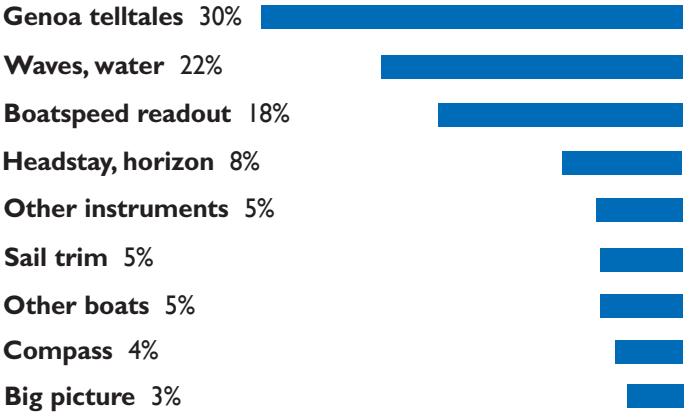
Where do you look when you're steering?

When you are steering a boat during a race, you have a lot of choices. You can look at the water or the sky, the jib or your instruments, the boat nearby or the faces of your own crew. Where should you be looking in order to steer the boat as fast as possible?

In an effort to find out how the experts do it, we asked 15 world-class helmspeople to tell us where they look when they are sailing upwind or downwind, in big boats and one-designs. We then averaged all their responses and compiled the results in four graphs below.

Each graph shows the average percentage of time that the experts spent looking at various sources of information that could be helpful for steering. If you add up the percentages in each graph they total 100%, which represents the time spent racing upwind or downwind.

UPWIND – Big Boats



Notes on steering upwind in big boats

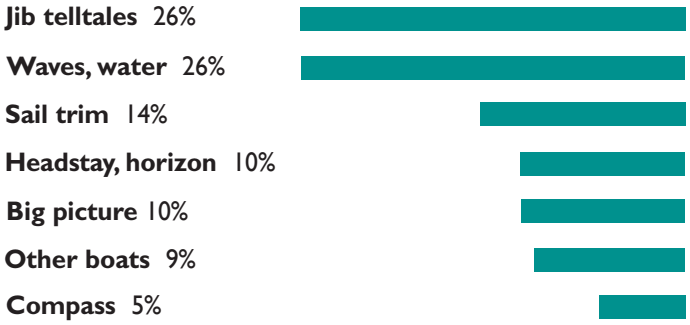
• On bigger boats, the helmsperson usually has more help from other people than on one-designs, and this affects where he or she looks in two ways:

1) The helmsperson can focus on the most important things (telltales, instruments, waves) and assign other crew to cover the rest (other boats, sails, big picture); and

2) The amount of time the helmsperson spends looking at different things may depend on the experience of other crew. For example, if the sail trimmers are very inexperienced, the percentage of time spent looking at sails would be greater.

• Wind speed will affect these numbers. For example, when the boat is overpowered in a breeze, helmspeople are likely to spend more time watching the headstay angle and less time worried about the telltales. In very light and shifty air, the telltale percentage might be as high as 50%.

UPWIND – One-Designs



Notes on steering upwind in one-designs

• These helmspeople spent much more time looking at sail trim than their big boat counterparts (14% to 5%). That's because big boats have separate trimmers for each sail while on one-designs the helmsperson is usually the mainsail trimmer. Since the main has a huge effect on speed and steering, the helmsperson must give it a lot of attention.

• They also spent much more time looking at the big picture (10% to 3%) because the helmsperson must function as the tactician. And they spent almost twice as much time (9% to 5%) looking at other boats. Since one-designs don't have instruments, other boats are key for gauging performance.

• One-design helmspeople said they looked at waves and water in front of the boat just over one quarter of the time. This percentage would probably go down in flat water and up when there are big waves.

• The wind conditions will also affect these percentages. When sailing on a shifty inland lake, for example, the amount of time spent looking at the compass might increase a lot.

When sailors are racing a one-design downwind (*see below*), for example, they spend 33% of their time looking at waves around the boat. That means for every minute of driving downwind, the helmsperson watches the waves and water for about 20 seconds. Note that these percentages are only averages and will vary according to boat type and conditions. In light air with totally flat water, for example, most drivers will not spend a third of their time looking at waves!

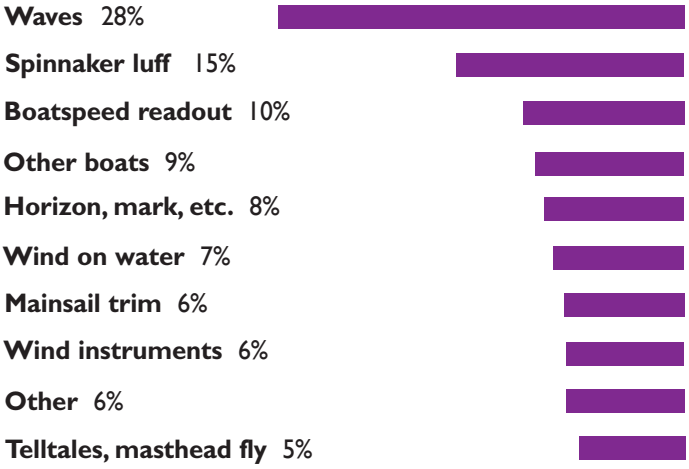
One thing that becomes clear when looking at the graphs is that the helmsperson must absorb a lot of information while making decisions about how to steer the boat. And the graphs list only the visual clues you should consider. There is still a lot more information that you must collect with other senses, especially your sense of feel.

The trick as a helmsman, then, is setting priorities. You can't evaluate all the incoming data completely, so you need to figure out which is most important. This way you won't get so lost or overwhelmed.

The purpose of these graphs is to offer some priorities about which clues are most important at different times. They offer a broad guide about where you should spend your time, at least visually, while driving.

JH Peterson photos

DOWNWIND – Big Boats



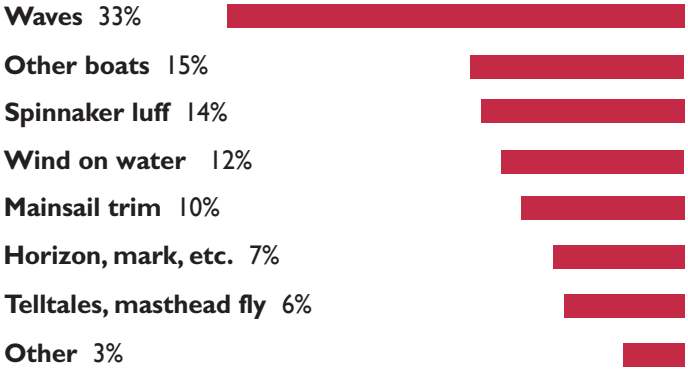
Notes on steering downwind in big boats

• When the water is very flat, obviously the amount of time spent looking at waves will go down. If the wind is light and puffy, more time will be spent watching the wind on the water since steering requires anticipating changes.

• On average, helmspeople spent almost twice as much time (10% to 6%) looking at their boatspeed compared to their true wind angle (Wind instruments). This shows some preference for using speed rather than wind angle as the target that helmspeople are aiming for.

• This graph has the most categories, which means that helmspeople steering downwind on big boats look around at more sources of information. This could be a reflection of how hard it is to keep a big boat in the 'groove' downwind.

DOWNWIND – One-Designs



Notes on steering downwind in one-designs

• Waves have a much larger effect on smaller boats and that's why helmspeople spend, on average, a third of their time looking at the waves. In flat water, this percentage could go way down, but in surfing conditions it might be over 50%!

• This graph has by far the highest percentage of time (15%) spent looking at other boats. This search for a measure of relative performance reflects two things: 1) the difficulty of finding the groove downwind; and 2) the lack of instruments.

• Drivers spend little or no time looking at the compass. This could be because many smaller one-designs don't have compasses. But even on boats that do, the wide range of angles that small, light boats sail downwind make compass information less valuable for steering.

• One surprise is that drivers spend only 14% of their time looking at the spinnaker. In my experience, this information source is almost as important as the jib telltales upwind.

Use your instruments for steering

When you are steering a boat upwind or downwind, you should use any source of information that might help you sail the boat faster. This certainly includes the data that comes from your instruments, whether you have a simple compass or a top-of-the-line instrumentation package.

However, if you are going to be using instruments, there are a few general guidelines that you should keep in mind:

1) You must take the time to calibrate your instruments before using them in a race. I'm not saying the instruments need to be perfect, but they should be fairly accurate. If you don't have the time or energy to do this, the information you get may be nearly useless.

2) Do not over-rely on your instruments. Some sailors view the numbers on the screen as fact or truth, but sometimes instruments give you information that is clearly wrong or misleading. Make sure you always double-check the numbers with your own judgment.

3) Realize the limitations of your instruments. One big problem is that the numbers shown on your displays describe the past. There is always a delay in displaying data about wind and speed, so don't treat these as if they are in real time. If you steer entirely by the instruments, therefore, you will be constantly reacting to what has already happened. So keep your head out of the boat.

The mast is a great place to mount your boatspeed readout (and other important instruments) because it's easy to see the numbers while looking forward. That way you can simultaneously watch the instruments, telltales, waves and angle of heel. You wouldn't want to use instruments that are mounted in the cockpit because you'd have to look down to see them and that would interrupt your view of everything else.

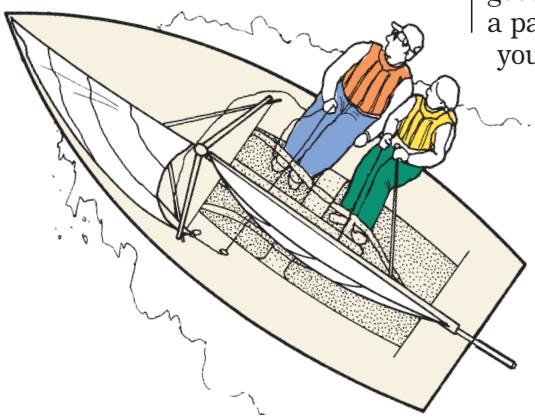
Develop targets

One of the best things about having instruments (assuming you have a boatspeed readout) is that you can use target speeds to guide your steering. 'Targets' are performance goals that tell you how fast you should sail your boat. Basically, a target is that speed at which you will maximize your velocity-made-good (VMG) for a particular boat in a particular wind velocity. When you are sailing upwind, your target is the speed that will maximize your VMG to windward. (*See page 13 for a lot more about using target speeds.*)

Other steering guides

One instrument I never use for steering is the compass. This is a great tool for playing windshifts, but it won't help you much with guiding your boat through the ever-changing wind and waves.

Some of your wind instruments can be very valuable. Downwind, the true wind angle is a great guide for finding the best course to sail (*see next page*). Upwind many drivers prefer to use the apparent wind angle (AWA). I wouldn't steer only by this readout, but it can help you make sure that you are steering in the ballpark on each tack. •



No instruments? No problem! Your brain and eyes are the best instruments you can get. Besides, most racing boats have no more than a compass and many don't even have that. When you don't have a boatspeed readout, you just have to steer the boat mainly by feel and rely more on other sources of information such as your performance relative to other boats.

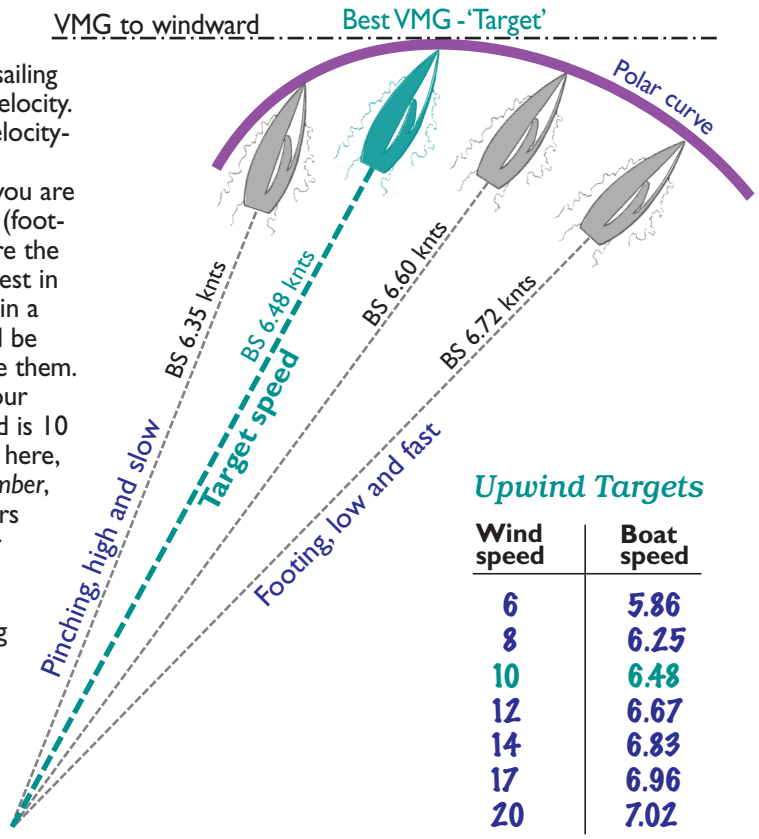
Aiming for targets upwind

One of the most helpful steering guides you can have when sailing upwind is a target speed for your boat in the existing wind velocity. This 'target' is the speed you should sail to maximize your velocity-made-good to windward.

As a helmsperson, you must constantly choose whether you are going to sail your boat high and slow (pinching), low and fast (footing), or somewhere in between (*see diagram*). Your 'targets' are the boatspeeds and wind angles that will get you upwind the fastest in various wind velocities. These can be calculated theoretically in a computer or empirically while racing other boats, and should be displayed in chart form where the helmsperson can easily see them.

When you sail upwind before a race, start by choosing your boat's target speed for the wind velocity you have. If the wind is 10 knots and your upwind targets are those shown in the chart here, then you should aim for 6.48 knots. *But this is just a rough number*, for several reasons: First, your chart of upwind target numbers is never exactly right. Second, your boat's knotmeter is never exactly right. And third, any asymmetries in waves or wind (e.g. sheer, gradient) will affect the speed you are able to sail.

What this means is that you should start sailing around 6.48 knots and see how this works. At that speed, how is your performance relative to other boats? Adjust your speed until you find the best upwind VMG. Then use this info to modify your upwind target (and change it during the race if necessary).



Upwind Targets

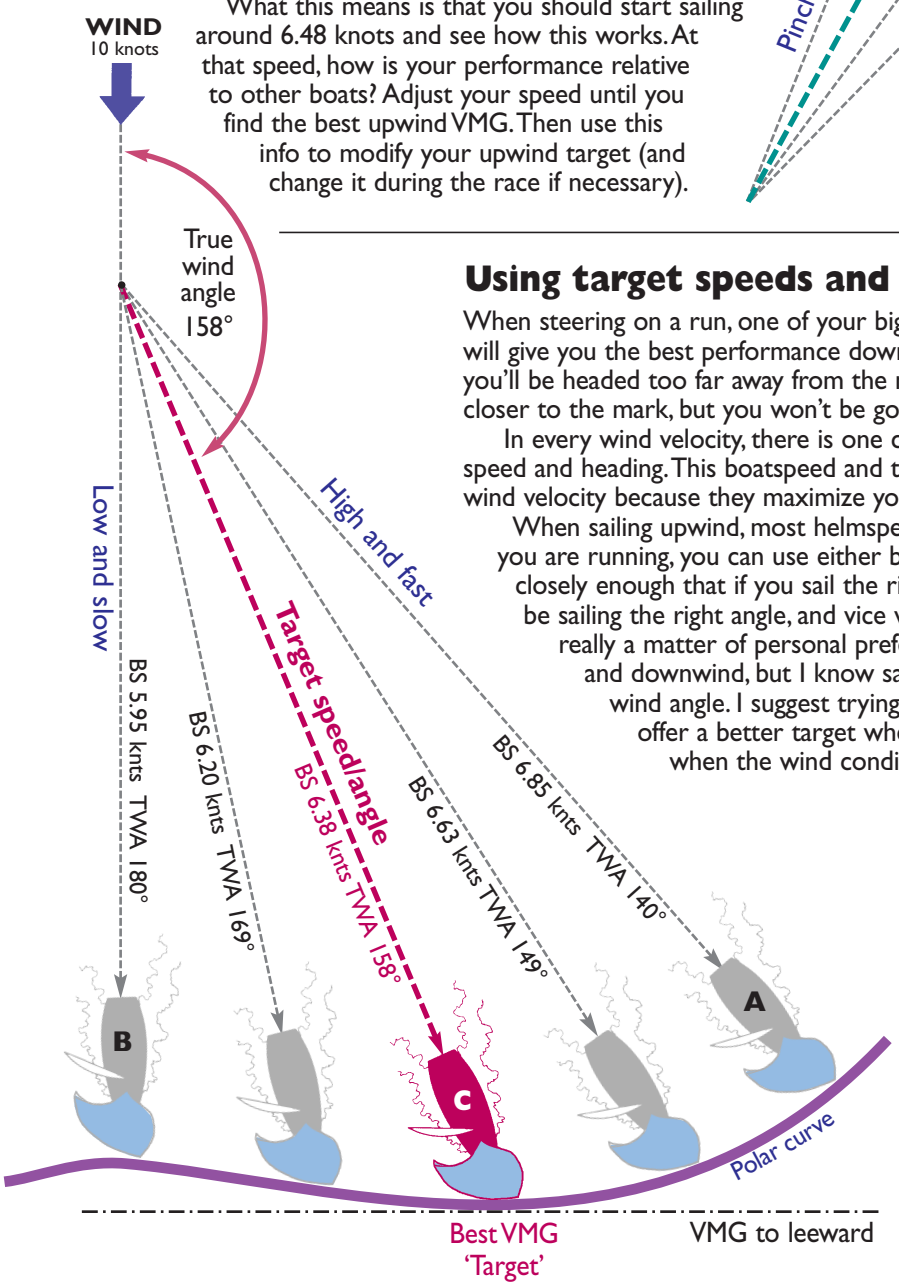
Wind speed	Boat speed
6	5.86
8	6.25
10	6.48
12	6.67
14	6.83
17	6.96
20	7.02

Using target speeds and wind angles downwind

When steering on a run, one of your biggest challenges is picking the speed and angle that will give you the best performance downwind. If you sail too high (A), you will go fast but you'll be headed too far away from the next mark. If you sail too low (B), you'll be aiming closer to the mark, but you won't be going very fast.

In every wind velocity, there is one course (C) that gives you the best combination of speed and heading. This boatspeed and true wind angle (TWA) are your "targets" for that wind velocity because they maximize your velocity-made-good to leeward.

When sailing upwind, most helmspeople use only boatspeed as their target. But when you are running, you can use either boatspeed or TWA. In theory, these are related closely enough that if you sail the right speed for a given wind velocity you will also be sailing the right angle, and vice versa. Therefore, the decision of which to use is really a matter of personal preference. I like steering by target speed both upwind and downwind, but I know sailors who steer downwind using only the true wind angle. I suggest trying both and seeing which you prefer. Boatspeed may offer a better target when your instruments are not well-calibrated or when the wind conditions are screwy.



Downwind Targets

Wind speed	Boat speed	True Wind Angle
6	5.75	125
8	6.12	145
10	6.38	158
12	6.65	163
14	6.93	165
17	7.45	162
20	8.32	154

A chart of the downwind targets for a particular boat, showing her optimal speed and TWA for each wind velocity.

CREW WORK

Help make your driver's job easier

I know most skippers have a pretty cushy job. They don't have to grind, hoist or hike too hard, and they miss most of the big waves that soak everyone else. But when it comes to steering, they still need lots of help from the entire team.

In many situations, the crew has almost as much control over the boat as the skipper. Have you ever seen what happens on a windy day when the driver tries to bear off and the mainsail trimmer doesn't ease the sheet? Sometimes this is pretty ugly!

The concept of steering involves a lot more than just turning the rudder from side to side. It has a lot to do with weight placement and sail trim, both of which are controlled primarily by someone other than the skipper. So, if you want to go fast and win more races, every crewmember must help the helmsperson steer around the course.

Here are some things you can do to make your driver's life easier:

✔ **Use your weight to help steer the boat.** A racing boat is always responding to changes in the wind, water and other boats, so it almost never goes in a straight line. Every time you need to turn, no matter how slightly, help the driver by heeling the boat to the appropriate side – to leeward if you want to head up or to windward if you want to bear off (*see below*).

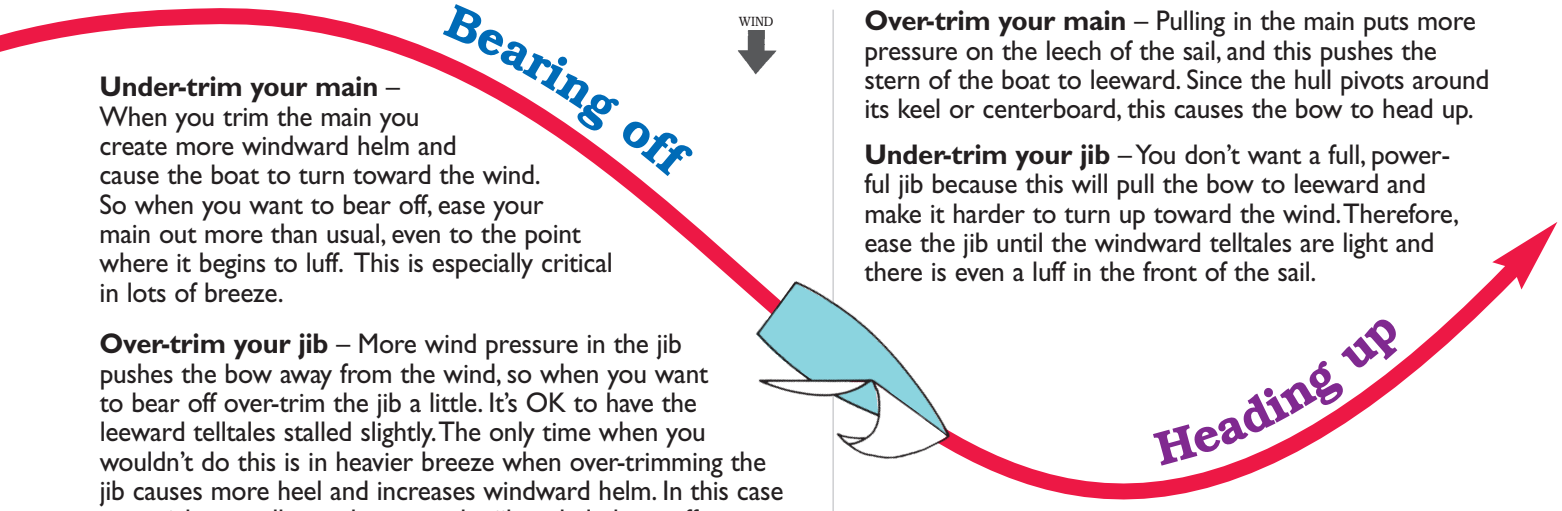
✔ **Trim your sails to help steer the boat.** Besides using your weight, you can help steer the boat around the course with sail trim. If you get lifted, for example, and the jib telltales stall, ease the jib sheet to reattach flow and make it easier for the driver to head up with the lift. Whenever you need to bear off, ease the mainsheet a bit; when you want to head up, overtrim the main a bit and ease the jib (*see below*).

✔ **Make it easy to keep the boat going fast.** It's tough for any helmsperson to steer a boat in light or shifty conditions. On the next page is a description of how you can widen the steering 'groove' by making the front of your headsail rounder. Another easy way to help is by simply easing your sheets slightly. It is definitely easier to keep the boat going fast when the sails are undertrimmed rather than when they are overtrimmed.

✔ **Communicate with your skipper.** It's a lot easier for the helmsperson to steer when he or she knows what is coming. So look ahead at the water, and give a loud warning about puffs, lulls, waves and flat spots. This will help establish the idea of a 'steering team' rather than expecting the skipper to be 100% responsible for driving.

✔ **Be aware of the skipper's position.** Steering is a priority so the helmsperson must be free to sit or stand wherever he or she wants. This means everyone else must position themselves accordingly. If the skipper sits to windward in light air, for example, everyone else may have to be to leeward. When you are sitting to windward, make sure not to block the skipper's view forward.

✔ **Spend some time steering yourself.** If you want to support your helmsperson, get as much time on the helm as you can. This will help you better understand what it takes to steer a boat fast.



Under-trim your main – When you trim the main you create more windward helm and cause the boat to turn toward the wind. So when you want to bear off, ease your main out more than usual, even to the point where it begins to luff. This is especially critical in lots of breeze.

Over-trim your jib – More wind pressure in the jib pushes the bow away from the wind, so when you want to bear off over-trim the jib a little. It's OK to have the leeward telltales stalled slightly. The only time when you wouldn't do this is in heavier breeze when over-trimming the jib causes more heel and increases windward helm. In this case you might actually need to ease the jib to help bear off.

Heel to windward – When you heel to windward, the shape of your hull in the water makes the boat tend to bear off. It's especially important to do this in lighter air when sail trim has less of an impact on turning. Even if you can't heel the boat to windward, it helps to reduce leeward heel as much as you can.

Over-trim your main – Pulling in the main puts more pressure on the leech of the sail, and this pushes the stern of the boat to leeward. Since the hull pivots around its keel or centerboard, this causes the bow to head up.

Under-trim your jib – You don't want a full, powerful jib because this will pull the bow to leeward and make it harder to turn up toward the wind. Therefore, ease the jib until the windward telltales are light and there is even a luff in the front of the sail.

Heel to leeward – You can almost always heel the boat to leeward and this is a good idea when you want to head up, especially in light air (since there isn't enough pressure in the sails to help the boat turn much). More heel creates more windward helm and an asymmetrical underwater hull shape that both help the boat head up.

JH Peterson photo

It's important for the entire crew to steer the boat as a team. Your goal is to turn the boat using sail trim, crew weight and as little rudder as possible. When rounding a leeward mark, for example, the crew can help make a fast, smooth turn by a) heeling the boat to leeward (which makes the boat head up); b) trimming the main slightly ahead of the turn; and c) trimming the jib slightly behind the turn (which lets the bow head up more easily).

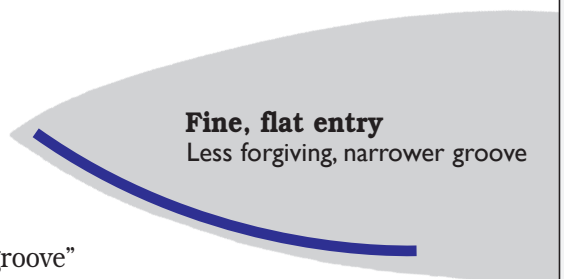
Give your helmsperson a 'wider groove'

It's not always easy to steer fast upwind. Sometimes the boat just doesn't seem to go fast through the water, or it won't point well. Occasionally it feels like you are 'hooked up', but your performance is very inconsistent. In other words, it's hard to find the "groove."

The "groove" is a sometimes-elusive state where the boat is achieving near-optimal upwind performance. When you can't find the groove, there could be several explanations. You may have an inexperienced helmsperson, a breeze that is light or shifty, tricky waves, sails that are not trimmed optimally, or some combination of the above.

No matter what the reason, a good solution is often to set up your sails so the helmsperson has a wider groove. You can do this by making the front of your jib or genoa rounder (usually by increasing the amount of headstay sag). With more curvature in the front of your jib, it will be easier for the wind to stay attached to your sail.

This makes it easier for the helmsperson to find the groove and keep the boat there. Of course, having a fuller entry means you give up some pointing ability. But this is usually better than having a jib that points high but is "in the groove" only a small percentage of the time.



TEASER ANSWER

The answer is: YES, Boat A may sail below her proper course in either case. Old rule rule 17.2 used to prohibit sailing below a proper course on a downwind leg when there was another boat on the same tack within two lengths that was either overlapped to leeward of or clear astern but steering a course to pass to leeward of her.

However, rule 17.2 was deleted from the rulebook in 2009, so there is no longer any rule that prohibits sailing below your proper course at any time. Of course, in the two situations shown Boat A must comply with all other rules. In Scenario 1, for example, A is a windward boat so she must keep clear of Boat B to leeward (rule 11). •

This answer has been updated for the 2013-2016 rulebook.

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TECHNIQUE

Practice to become a better helmsperson

If you are wondering whether it's possible to become a talented helmsperson if you didn't start sailing an Optimist at age 5, I believe the answer is yes. Steering is largely a cerebral activity, and that makes it easier to learn. You may just have to work a little harder than sailors who grew up with a tiller in their hand.

Practice Time in the boat is usually the best way to learn how to steer fast. Get as much "stick time" as you can in a variety of conditions. When you are steering, whether it's during a race or in practice, focus 100% on driving the boat fast. Try different things to see what works, and what doesn't work.

JH Peterson photo

Anna Tunnicliffe-Funk, 2008 Olympic gold medal winner in Laser Radials, steers upwind during a tuning session in the chop of Biscayne Bay.

Watch an expert Whenever you have a chance, go racing (or practicing) with another sailor who is a very good helmsperson. Watch him or her carefully: Where do they look while they're steering? How and what do they communicate with their sail trimmers? and so on. Invite him or her to come sail with you during a practice session and give you a critique on your steering.

Do two-boat testing Most people think testing with two boats is primarily a way to work on speed and sail trim. But it's also a great environment for improving your steering technique because it lets you try different things and get instant feedback! So go two-boat testing any time you possibly can.

Steer without looking Since a good helmsperson needs to be able to 'feel' the boat through the wheel or tiller, it's helpful to practice steering without looking at all the sources of information that are available. The typical way to do this is sailing with a blindfold, or with your eyes closed.

I recommend a different exercise. I think sailing with a blindfold is unrealistic and too difficult. Instead, try sailing with your eyes open but not focused on anything in particular. Just stare in the direction of your apparent wind and try to maintain an awareness (in your peripheral vision) of all the things that are important for steering. This is more realistic and will help you collect input from many sources while racing.

Steer without a rudder This is always a good steering exercise, but it's probably better for getting the crew involved in steering than for the skipper.

If you practice hard and keep an open mind to learning, you may soon develop a very quick "paw." •

SPEED&Smarts
P.O. Box 435, Easton, CT 06612
SpeedandSmarts@optonline.net

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