



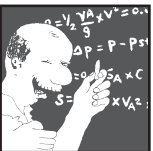
**ISSUE #106**

**Upwind Speed 3**

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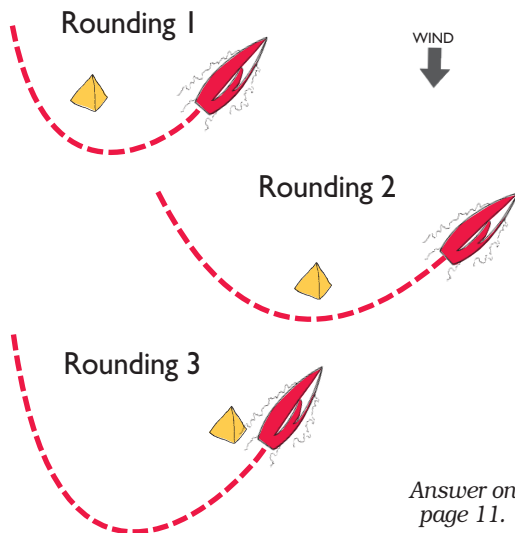
**BRAIN TEASER**

**Rounding a leeward mark**



In a big race, you approach the leeward mark without any other boats close ahead of or behind you. While you are thinking about where to

make your final jibe to the mark, you have a brief debate with your tactician about how to make the fastest 'strategic' rounding. The moderate wind is very steady and there's no current. Which of the following three options is the fastest way to go around the mark (and why)?



**Work on finding a little extra speed**

Would you spend tens of millions of dollars for one extra tenth of a knot of boatspeed upwind? This idea may seem crazy, but that's exactly what happens in the America's Cup. The sailors and designers realize that getting even a tiny bit of extra speed will give them a huge advantage over their competition, and they are willing to pay a premium for that final tenth or two.

Of course, most sailors don't have millions of dollars to spend on speed, but that's not a big problem. In fact, most of the things you can (and should) do to increase your speed are absolutely free. These include strategies like 'shifting gears' whenever conditions change, playing velocity shifts correctly, using your crew weight to best advantage, and constantly evaluating your performance based on the boats around you.

None of these techniques cost any money – they just require a concerted effort on the part of all your team members. And if you do them well (and often), they may increase your upwind performance by much more than one tenth of a knot.

That's what this issue is all about – doing the little things that can help you gain a speed edge on the rest of the fleet. This is the third part in our series on upwind speed. If you haven't seen the first two parts, you can find them in Issue 99 (*Speed Principles*) and Issue 101 (*Main and Jib Sail Trim*). Good luck! •



JH Peterson photo



# Take advantage of your crew weight

When you're picking a crew for your next regatta, it's not easy to find someone who is the perfect weight for your boat. It's difficult enough to find teammates who are skillful, eager and available. So how much they weigh is often a secondary consideration. As a result, many sailors end up racing with a total crew weight that's higher or lower than what is considered ideal.

Even if you're lucky enough to find a "perfect" size crew, however, your weight will be optimal only in a certain wind range. In light air

you will always be too heavy, and in heavy air you will usually be too light. Because of this, every racing sailor needs to know how to use their crew weight most efficiently. By understanding the advantages and disadvantages of your particular weight, you will be better able to get around the race course quickly.

On the next three pages is a list of strengths and weaknesses for lightweights and heavyweights, plus some tips on how to take advantage of your weight (or lack of it) while you are racing.



## LIGHTWEIGHTS

There are two times when your team can be considered a 'lightweight.' The first is when your crew weight is lower than the average in your fleet. The second is any time you are overpowered (since then you will have to use 'lightweight techniques' to keep your boat on its feet). Here are some of your strengths and weaknesses, plus some suggestions about sailing set-up and techniques when you don't have too much beef on the rail.

### The advantages of sailing light

There are many benefits you will get by sailing with a crew that's lighter than your competition:

- *Underpowered conditions* (i.e. light to medium air). Unless you are fully hiked out and starting to depower, it is always faster to be lighter.
- *Pointing*. A lighter boat doesn't need as much power to move it forward, so you can use flatter sails and point closer to the wind than heavier crews.
- *Waves*. In light to medium conditions, you'll be faster in chop than heavy crews since you don't have as much weight to push through the waves.
- *Accelerating*. When you're trying to build speed (e.g. after starting, hitting waves, tacking), a light boat will accelerate to full speed more quickly.
- *Reaching*. A boat with a lighter crew will have less wetted surface, which seems to help more on reaches than runs (unless you're overpowered).
- *Planing and surfing*. In waves, lighter crews will be able to surf sooner and stay on each wave longer. In breeze, you will be able to get up on a plane sooner (i.e. in less wind) and stay on it longer.
- *Boathandling*. In light air you may have an advantage because lighter people can often move around the boat more gently and efficiently.

## HEAVYWEIGHTS

You don't need to be a Finn sailor or a Star crew to be considered a 'heavyweight.' Any time you have a greater-than-average crew weight you will realize certain advantages and disadvantages while sailing around the race course. In addition, in light air all sailors are heavyweights and need to find good techniques for keeping their boats moving. Here are a bunch of ideas on how to do this.

### The advantages of sailing heavy

There are also many benefits you'll get by sailing with a crew that's heavier than your competition:

- *Overpowered conditions* (i.e. heavy air). When you are fully hiked and still need to depower, extra weight will definitely be faster because you can keep the boat flatter without flattening or dumping your sails so much.
- *Footing*. When sailing upwind, a heavy crew will be relatively better at sailing lower and faster, especially when it's windy.
- *Wind and waves*. When you have lots of breeze and bad chop, you must sail low to keep the boat powering through the waves. This is difficult for light crews who usually need to pinch to keep the boat flat in heavy air, but heavyweights will be very fast in these conditions.
- *Roll tacking and jibing*. When you need to turn the boat in light air, your extra weight will help you roll the boat hard, which is fast.
- *Power reaching*. This is where you may have the biggest advantage of all because you can keep the chute and main full and sail high if necessary.
- *Boathandling*. Big people are often stronger, and this will help your heavy-air maneuvers.



## LIGHTWEIGHTS

### The disadvantages of sailing light

I like the idea of sailing light, but lightweights do sacrifice a bit of performance at certain times:

- *Heavy winds.* With less weight on the rail, you'll have to start depowering earlier, and you'll have to do this more extensively.
- *Wind with waves.* Light crews often have to feather the boat upwind in a breeze, but this is not very fast when you have big waves and you need power to punch through them.
- *Heavy-air reaching.* This is the curse of a light crew's race because you can't depower the boat by pinching.
- *Endurance.* When you're light you have to hike harder to keep your boat flat, and this is hard to do all the way around the course.



### Tips for racing with a light crew

When you are lighter than the boats around you, or light for the existing wind strength, you should “play to your strengths” and figure out how to compensate for your weaknesses. Here are some ideas on how to do that:

A. In one-designs, a light crew needs to hike hard so make sure you are in good shape. Wear hiking pants and adjust your hiking straps so they're perfect. If you can hike harder and longer than your competitors, you will realize the benefits of being light and minimize the disadvantages.

B. To improve your endurance, use two hiking styles. The first is “flat-out,” where all crewmembers are straight-leg hiking (or leaning through the lifelines) as far out as possible. Use this at critical times like after the start or when you're right next to another boat. The second mode is a less-rigorous hiking style that should be used at non-critical times to conserve energy and strength for when you really need it.

C. Set up some training sessions in heavy air and test different tuning and sail trim set-ups to see what is fastest. If you want to beat (or at least

(Continued on page 4)

## HEAVYWEIGHTS

### The disadvantages of sailing heavy

There is a certain security in sailing with a heavy crew, but more weight can also be costly:

- *Light to medium air.* Let's face it – in most conditions, lighter is faster. That's why sailors try so hard to remove extra weight from their boats.
- *Chop.* Heavyweights will be especially slow in chop (unless there's a lot of wind) because the boat is constantly accelerating, which is harder when you're heavy.
- *Pointing.* The higher you point, the less power you have, which is not good when you're trying to push a heavier boat through the water.
- *Underpowered reaching.* More weight = more wetted surface = more slow.
- *Surfing and planing.* The heavier you are, the harder it will be to surf on waves and get up on a plane. If other boats start surfing at 10 knots of wind, you might not surf until 12 knots.
- *Acceleration.* It will be hard to get going again after you go slow. A light-air tacking duel, for example, might not be a great idea.



J.H. Peterson photo

### Tips for racing with a heavy crew

When your crew weight is on the heavy side, how can you minimize your disadvantages and take advantage of your strengths? Here are a bunch of ideas for competing with the lightweights:

A. Before leaving the dock, get rid of all extra, non-essential weight. This applies to all crews, but it's especially important for heavyweights. Also, make sure you keep your bilge as dry as possible since a little water can weigh a lot!

B. Position your heaviest crew at “max beam” (usually in the middle of the boat fore and aft), and center the rest of your crew weight around this spot. In light air and chop, keep your crew weight as low in the boat as you can (sit on the cockpit floor if possible or, on bigger boats, go with “dogs in the house”).

C. When a crewmember has to balance the

(Continued on page 4)

## LIGHTWEIGHTS (Continued from page 3)

keep up with) other boats, you must work harder on speed than they do.

D. Practice your boathandling skills in heavy air. The ability to maneuver your boat efficiently is very important and will help make up for the speed you lose (upwind) due to being lighter.

E. In heavy air, focus on strategy and tactics because this is where you can have an advantage. Don't take tactical or strategic chances, because you won't have the speed to make up for mistakes. Wind shadows don't hurt so much in breeze, so sail in bad air if necessary to go the right way.

F. It will be easier for you to point than foot, so put yourself in situations that favor pointing. For example, when you're fighting for a lane of clear air, it's better to have another boat to leeward and ahead than to windward and rolling over you.

G. Sail with less powerful sail shapes. Use your sail controls to make the sails flatter overall and more draft-forward. If you have a centerboard, consider moving it aft in breeze to reduce helm.

H. On heavy-air reaches, delay your spinnaker set until you're sure that you can fly it under control and that it will make you faster. On some boats the jib is a good option. Sail high with the jib first so you are in the passing lane before hoisting.

I. On reaches, especially in light or medium air, look ahead so you will avoid getting stuck behind heavier crews. If you see a problem coming, head up into the passing lane early.

J. You'll be able to surf and plane sooner than heavier boats, which means the rules allow you to pump your sails sooner (i.e. in less wind pressure than heavier crews) to promote surfing and planing. It also means you need to find passing lanes in these conditions.

## HEAVYWEIGHTS (Continued from page 3)

boat or perform a task, make it your lightest crew.

D. Try to minimize maneuvers that slow you down and then require acceleration. For example, you probably don't want to make a lot of tacks unless it's really windy or really light (when your extra weight is good for rolling).

E. Don't put yourself in tactical positions where you have to point with the lightweights. Try to find lanes where you can sail fast toward the next shift, and avoid having light crews on your lee bow.

F. Power up your sail plan. You want your sails to be relatively deep and twisted, so keep everything pretty loose, at least until you start to get over-powered. Ask your sailmaker for tuning and trimming tips on how to go fast with a heavy crew.

G. On reaches, it's often good to go high early. In lots of breeze, this will allow you to roll over the slower boats ahead. In light air, it will keep the slower boats from rolling you (at least for a while).

H. On runs and reaches, use all the legal kinetic techniques available (like pumping) because your boat will need all the help it can get to start surfing and planing.

I. Work out to get in better shape and lose weight. Go on a diet. Sail regattas in windy places. Get faster by speed-testing in light air.

Even if you have a choice of several crews with various weights, don't over-think this decision. In my opinion, it's usually better to pick the more skillful or experienced crew, even if he or she is the "wrong" weight. That's because you never know what the wind will be at your next regatta, few of your competitors will be at the 'perfect' weight, and you will actually have certain advantages by being light or heavy. Plus, as we've seen here, a good crew can use technique to compensate when you have too much or too little weight. •

## SPEED & Smarts™

# #106

Speed & Smarts (ISSN 1075-5772) is published by  
**Four Winds Inc.** PO Box 435, Easton, CT 06612-0435 USA  
Customer service: 1-800-356-2200 or 203-445-0734 Fax: 203-445-0735  
E-mail: [SpeedandSmarts@optonline.net](mailto:SpeedandSmarts@optonline.net)  
Web site: [www.SpeedandSmarts.com](http://www.SpeedandSmarts.com)  
FB: [www.Facebook.com/SpeedandSmarts](http://www.Facebook.com/SpeedandSmarts)

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The **Paper version** is available only in the U.S. (\$48/86) and Canada (\$53/95).

*Speed & Smarts* is published every other month. Issues are numbered sequentially, and issue dates are approximate.

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## NEW RULES

# 2013-2016 IQ TEST

## TRUE or FALSE?

### Changes in the Definitions

**1. False.** Mark-room includes room to tack only when a boat is overlapped inside and to windward of the boat required to give mark-room and would be fetching the mark after her tack.

**2. False.** An object is an obstruction if, hypothetically, a boat would have to make a substantial course change when steering directly at it and one length away. An object that qualifies as an obstruction is always one even if no boats are aiming at it.

**3. False.** A vessel 'under way' is never a continuing obstruction. This part of the definition was written primarily to cover other boats racing, but it also applies to tugboats, cruising boats, coach boats and any other water craft that's moving.

**4. True.** While a boat is rounding a mark she is entitled only to enough room to 'round the mark as necessary to sail the course.'

**5. True.** While a boat entitled to mark-room is sailing toward the mark, she can take only enough room for a seamanlike rounding.

**6. True.** An object is an obstruction if it's big enough to require a boat to make a substantial course change when she is one length away from it. But an object that is big enough to be an obstruction for a small boat may not be large enough to be an obstruction for a bigger boat.

**7. False.** A boat is not limited to sailing only a closehauled course in order to fetch a mark. As long as she

# The Answers!

In the last issue (#105), we published an all-new Racing Rules IQ Test with 100 questions about the 2013 - 2016 Racing Rules of Sailing. Since we didn't have room to provide more than the basic answers, here are expanded explanations. To understand these answers, you need two things: 1) a copy of the new rulebook; and 2) the Rules IQ Test from Issue 105. If you don't have the last issue, simply e-mail a note to us at [SpeedandSmarts@optonline.net](mailto:SpeedandSmarts@optonline.net), and we will e-mail you a copy of the test for free.

can sail to windward of the mark and pass the mark on its required side without passing head to wind, she is considered to be fetching.

**8. True.** According to the definition Obstruction, a vessel under way (usually a boat racing) is never a continuing obstruction. However, in very rare situations, the answer could be False. If the racing boat is anchored or aground (and therefore not considered to be "under way"), it might possibly be a continuing obstruction.

**9. True.** According to the definition Zone, a boat is not considered to be in the zone unless part of her hull is in the zone.

**10. False.** This was true in the 2005-2008 rulebook, but the definition Clear Astern and Clear Ahead; Overlap says boats on opposite tacks can be overlapped if they are subject to rule 18 or if they are both sailing more than 90° from the true wind.

**11. True.** The definition Clear Astern and Clear Ahead; Overlap says specifically that these terms always apply to boats on the same tack.

**12. False.** The zone is circular only when the mark itself is circular. When the mark is oddly shaped, such as the finish-line committee boat, the zone is also irregular.

**13. False.** The definition Zone applies only at marks. However, if a mark is also an obstruction, there is a zone around that obstruction.

### New Section C Rules

**14. True.** This question repeats rule 19.2(a) verbatim.

**15. False.** Rule 18.2(c) describes two times when a boat's obligation to give mark-room turns off before the other boat sails past the mark. This happens if: 1) the other boat passes head to wind; or 2) the boat entitled to mark-room leaves the zone.

**16. False.** When a leeward boat is closehauled and has to make a substantial change of course to avoid an obstruction, she can hail for room

to tack under rule 20.1 even if the boat to windward is fetching it. The only time when the answer to this question would be True is if the obstruction is also a mark and a boat that is fetching the mark would have to respond and change course.

**17. False.** Rule 19 does not apply at the RC boat when boats approach the start. But if boats are sailing by the committee boat well before or after their start, rule 19 may apply.

**18. True.** If boats are overlapped when they enter the zone, rule 18.2(b) says the outside boat must "thereafter" give mark-room to the inside boat. However, if the inside boat passes head to wind or goes outside the zone, the answer would be False.

**19. False.** Rule 18.1 says that rule 18 applies between boats when "at least one of them is in the zone." Both do not have to be in the zone.

**20. True.** If a boat is closehauled and would have to make a substantial course change to avoid an obstruction, she can hail for room to tack. This applies even if the obstruction is a mark, unless the hailed boat is fetching the mark. In that case, the answer would be False.

**21. False.** When a boat passes head to wind inside the zone, rule 18.3 says she shall not cause another boat to sail above closehauled to avoid her. If the other boat was overstanding the mark and has to head up only to a closehauled course, the tacking boat did not break rule 18.3.

**22. True.** Rule 21 says that when a boat is sailing within the mark-room to which she is entitled, she will be exonerated if she breaks rule 16 (or rule 15 or a right-of-way rule in Section A).

**23. True.** When a mark is also a continuing obstruction, rule 19.1 says that "rule 19 always applies and rule 18 does not."

**24. True.** When a boat is hailed for room to tack, rule 20.2b requires

*Continued on page 6* ➤

her to respond (by either tacking as soon as possible or immediately replying "You tack"). If she thinks the hail broke rule 20.1 (e.g. it was too early), her only option is to respond and then protest if she wants.

**25. False.** Under the old rules, a boat entering the zone clear ahead (at a leeward mark) had the right of way for the entire rounding, even if she was on port tack and the other boat was on starboard. The current rules don't change the right of way when rule 18 applies; they just say which boat gets mark-room whether or not she has the right of way.

**26. False.** When an outside boat (O) tacked inside the zone, a boat that obtains an inside overlap from clear astern gets mark-room, even if O is unable to give it. Rule 18.3b says O "shall give mark-room if the other boat becomes overlapped inside her."

### The new ISAF Casebook

**27. False.** ISAF Case 4 says, "Rule 50.3(a) prohibits the use of an outrigger and defines it to be a fitting or other device. A competitor is neither a fitting nor a device. It is therefore permissible . . . to hold a sheet outboard . . ." as long as he or she complies with rule 49 (Crew Position).

**28.** The answer for this one is debatable. ISAF Case 83 implies the answer is more likely to be true, while US Appeal 72 leans the other direction. The key is deciding whether "trimming the sail" is a "necessary task" under rule 49.2. If it is, a sailor can go outside the lifelines "briefly" to perform that task.

**29. False.** The abstract for ISAF Case 9 says, "There is no rule that requires a boat to sail a proper course." Two rules (17, 18.4) prohibit a boat from sailing above a proper course, but she can always sail below it.

**30. True.** The answer in ISAF Case 1 says, "When a boat continues to race after an alleged breach of a rule, her rights and obligations under the rules do not change." Therefore, she can protest later in the race even if she is eventually disqualified for the earlier incident.

**31. False.** According to rule 62.1, A can get redress only if B breaks a rule of Part 2 and, in the process,

causes injury or physical damage that makes A's score significantly worse. Since A was not injured or damaged here she won't get redress.

**32. False.** Fundamental Rule 1 says a boat is required to give help to any vessel or person in danger. The abstract for ISAF Case 20 explains, "When it is possible that a boat is in danger, another boat that gives help is entitled to redress, *even if her help was not asked for* or if it is later found that there was no danger."

**33. True.** In ISAF Case 71, Answer 2 says ". . . if it were determined in a hearing that a boat knew that she had been over the line, she would have been obliged to comply with rule 28.1 . . . and she would not be entitled to redress." A boat can get redress only when her score is made worse "through no fault of her own," but this is not the case if she knows she was over the line early.

**34. False.** Rule 90.2c says that oral changes to the sailing instructions can be made "only on the water, and only if the procedure is stated in the sailing instructions"; otherwise all changes to the SIs must be made in writing and posted on the official notice board before the time stated in the SIs. See ISAF Case 32.

**35. True.** The penalty for hitting a mark is a One-Turn Penalty (rule 44.2). No rule that says you can't make this turn around a mark. ISAF Case 108 says, "Her turn to round the mark will serve as her penalty if it includes a tack and a gybe, if it is carried out promptly after she is no longer touching the mark and is well clear of other boats, and when no question of advantage arises."

**36. True.** ISAF Case 44 clearly says, "A boat may not protest a race committee for breaking a rule." However, when she thinks the race committee has made an error that affects her score, she may request redress.

**37. False.** ISAF Case 39 says a race committee is not required to protest a boat "except when it receives a report of a breach of a class rule or

#### Where are the questions?

Our Racing Rules IQ Test appeared in Issue #105. If you want the questions that match these answers, you can get that issue here:

[SpeedandSmarts.com/Order/BackIssues](http://SpeedandSmarts.com/Order/BackIssues)



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of rule 43 from an equipment inspector or a measurer for an event."

**38. True.** This is explained in ISAF Case 17: "A boat is no longer subject to rule 13 when she is on a close-hauled course, regardless of her movement through the water or the sheeting of her sails."

**39. True.** This is explained in ISAF Case 52, which says, "The essential point is that rule 16.1 applies only to a right-of-way boat . . ."

**40. False.** A boat is never exonerated for breaking rule 16 unless she is taking mark-room while rounding a mark. As ISAF Case 76 explains, "When a right-of-way boat changes course she may break rule 16, even if she is sailing her proper course."

**41. False.** The rules do not require boats to anticipate what other boats may or may not do. ISAF Case 92 says, "When a right-of-way boat changes course, the keep-clear boat is required to act only in response to what the right-of-way boat is doing at the time, not what the right-of-way boat might do subsequently."

**42. False.** Simply avoiding contact does not mean that a boat keeps clear. As ISAF Case 88 says, "A boat may avoid contact and yet fail to keep clear." The key is whether the right-of-way boat had "a need to take avoiding action" (see *Definition Keep Clear*).

**43. False.** ISAF Case 103 explains: "The phrase 'seamanlike way' in the definition Room refers to boat-handling that can reasonably be





expected from a competent, but not expert, crew of the appropriate number for the boat.”

**44. True.** According to ISAF Case 85, “If a racing rule is not one of the rules listed in rule 86.1(c), class rules are not permitted to change it. If a class rule attempts to change such a rule, that class rule is not valid . . .”

**45. True.** When a boat on the same tack is clear ahead, she has right of way and does not have to keep clear until the right of way changes hands. ISAF Case 53 says, “A boat clear ahead need not take any action to keep clear before being overlapped to leeward from clear astern.”

**46. True.** Rule 14 requires a boat to avoid contact “if reasonably possible.” According to ISAF Case 107, “This requirement means a boat must do everything that can reasonably be expected of her in the prevailing conditions to avoid contact,” including keeping a good lookout and hailing.

**47. False.** In ISAF Case 112, Boat A missed a mark and later crossed the finish line. The appeal says, “A finishes provided that she crosses the finishing line in accordance with the definition Finish, whether or not a string representing her track complies with rule 28.1.”

### Other Rule Changes

**48. False.** Rule 32.2 says specifically that a shortened course must be signalled before the first boat crosses the new finishing line.

**49. True.** After the starting signal, the RC may abandon a race for any reason listed in rule 32.1. If one boat has already sailed the course and finished within the time limit, the RC can still abandon the race but must first consider ‘the consequences for all boats in the race or series.’

**50. False.** According to rule 41a, you can receive ‘help for a crew member who is ill, injured or in danger’ and continue racing. But if you receive any other kind of help under Fundamental Rule 1 you must retire.

**51. False.** This was a grey area under the old rules but is now clearly spelled out in rule 51 (Movable Ballast), which says, “All movable ballast, including sails that are not set, shall be properly stowed . . .”

**52. False.** The old rule 17.2 prohibited sailing below your proper course in certain situations, but that part of the rule was deleted in 2009, so now there is never any prohibition on sailing below a proper course.

**53. False.** The answer used to be True, but not now. Rule 62.1(a) still allows a boat to get redress from an improper action of the protest committee, but not when that boat was a ‘party’ to the hearing.

**54. False.** Rule 87 (Changes to Class Rules) says the SIs may change a class rule “ . . . only when the class rules permit the change or when written permission of the class association for the change is displayed on the official notice board.”

**55. True.** When a boat is sailing her proper course, she is permitted to interfere with a boat on another leg of the course (see rule 24.2).

**56. True.** When a boat gets a leeward overlap from clear astern, rule 17 limits her course only as long as she remains on the same tack. If she jibes twice, she can then sail above her proper course.

**57. A.** According to the Section C preamble, Rule 20 (Room to Tack at an Obstruction) does not apply when boats are approaching a starting mark to start, so W does not have to respond to a hail there. If L hails in the situations described in answers B and C, W still has to respond but L will be penalized.

**58. D.** The answer is found right in the definition Zone. It says the zone is the “area around a mark within a

distance of three hull lengths of the boat nearer to it.”

**59. C.** Rule 17 gives the answer in its first sentence: “If a boat clear astern becomes overlapped within two of her hull lengths to leeward of a boat on the same tack . . .”

**60. D.** The old rule 17.2 (Limitation on sailing below a proper course) was deleted, so there is no longer any time when a boat cannot sail below her proper course.

## SITUATIONS

**61. M.** Boat X does not have the right of way, so she is entitled to take only space permitted by mark-room.

**62. P.** X has the right of way on starboard tack so she is not limited to taking only mark-room and Y must keep clear of her. However, X cannot sail wider than her proper course because of rule 18.4 (Gybing).

**63. W.** This situation is the same as #62, except it’s at a gate mark, so rule 18.4 does not apply. As long as W has the right of way she can sail as wide of the mark as she wants.

**64. P.** X has the right of way so she is not limited to taking only mark-room. However, rule 18.4 applies here so X cannot sail wider than her proper course.

**65. W.** X is an inside boat with the right of way and “luffing rights.” Since rule 18.4 does not apply in team racing, X can sail as wide around the mark as she wants.

**66. P.** At a regular leeward mark in a fleet race, it doesn’t matter if X got her overlap from astern or not because rule 18.4 says that in either case she must jibe to sail her proper course around the mark.

**67. W.** X has the right of way so she is not limited to mark-room. Also, X is not overlapped inside of Z, so rule 18.4 does not require X to jibe to sail her proper course. Therefore, X can sail wider than her PC.

**68. W.** Very similar to #67. X has the right of way and no rule limits the course she can sail, so she can go wider than her PC.

**69. M (possibly W).** X does not have the right of way so she is limited to taking only mark-room (if Z has to change course while X is doing this, X will be exonerated for breaking rule

*Continued on page 12* 🐼



## BOATSPEED

# How's your upwind speed?

When you are trying to improve your boat's upwind performance, it is essential to compare your boatspeed and height (pointing) to other boats. It's almost impossible to gauge subtle differences in performance by using just feel or instruments, so keep a close eye on nearby boats while you are racing or training.

There are two dimensions of performance that you should monitor. The first is boatspeed, which is simply how fast you are going through the water. The second is your height, or how well you are pointing. Whenever you talk about your performance in relation to another boat, you should mention both speed and pointing.

When you talk about speed, there are only three possibilities: you are either faster than the other boat, slower than they are, or both boats are going the same speed. The same is true with height: at any point in time you must be pointing higher, lower or the same as the other boat.

When you combine three speed variables with three pointing variables, you get a matrix of nine possible ways to compare your boat's performance to that of a nearby boat (see chart). For example, you might be sailing faster than the other boat but lower. Or you could be going higher and the same speed.

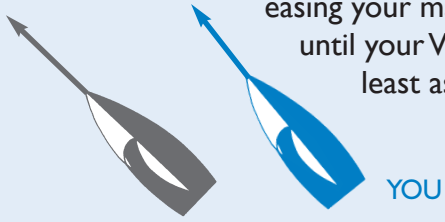
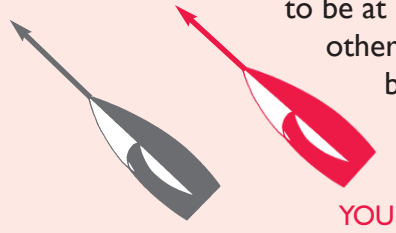
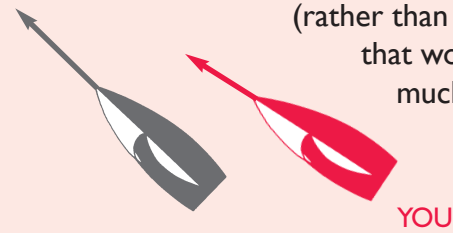
The first step in improving your performance is knowing where you fit into this matrix. For example, if you are higher and faster you may not want to make any changes, but if you are lower and slower you will probably need substantial adjustments in tuning and/or trim. In between those two extremes are seven more common relationships, each of which requires a unique response in order to maximize performance.

The purpose of this chart is to represent the nine-part matrix visually (so it will be easier to think in these terms) and to begin the process of thinking about the actions that are necessary when you find yourself in each situation. •

### Color Key for Chart

- Your performance is **better** than the other boat.
- Your performance is **worse** than the other boat.
- Your performance is **the same** as the other boat.
- Your performance may be **better, worse or the same**.

## HEIGHT

	<h1>Slower</h1>
<h1>Higher</h1>	<p><b>“Higher and slower”</b></p> <p>This could be good or bad, depending on your VMG. You must ask yourself: At this rate would you get to the windward mark before the other boat(s)? If not, try changing something (e.g. bearing off slightly or easing your mainsheet) until your VMG is at least as good.</p> 
<h1>Same</h1>	<p><b>“Same height and slower”</b></p> <p>Work on speed. Going faster will help almost any speed or pointing problem. You may have to give up some height at first to do this, but the added speed will then help you point higher. If you can't get your VMG to be at least equal with other boats, make bigger changes in your trim.</p> 
<h1>Lower</h1>	<p><b>“Lower and slower”</b></p> <p>Check the major things first, like is there a plastic bag caught on your rudder? If not, start making changes. Focus on adjustments (e.g. sheet tension, backstay, heading, weight) that could have a major impact on speed (rather than little things that won't have much effect).</p> 



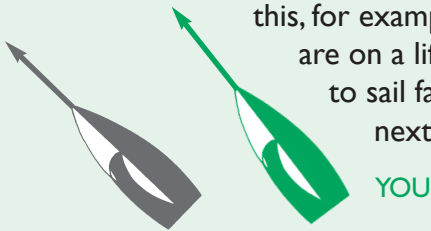
# BOATSPEED

## Same

## Faster

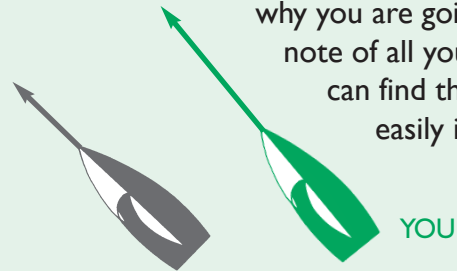
### “Higher and same speed”

Good! Tactically and strategically, you might occasionally want to trade some height for speed. That is, you could probably ease your mainsheet a little and end up going the same height and faster. You might do this, for example, when you are on a lift and you want to sail fast toward the next shift (a header).



### “Higher and faster!”

This is the dream of any boat racing upwind! When you're in the 'groove,' don't touch anything (unless conditions change, of course!). But make sure you look around to understand why you are going so well. Take note of all your settings so you can find this groove more easily in the future.



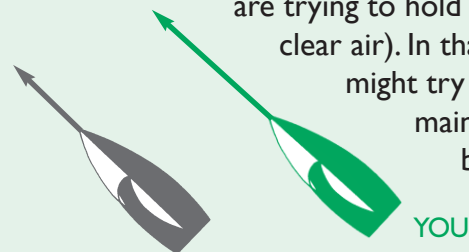
### “Same height, same speed”

In this case you know you are going upwind exactly as well as the other boat. That's a good thing if the other boat is usually fast relative to the fleet, or a bad thing if you know they're slow. When your performance is even, this is a great time to try changing a speed variable and see how it affects your VMG.



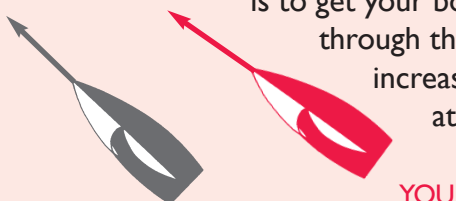
### “Same height and faster”

Good! Going fast always makes it easier to stay in the groove and to perform maneuvers. But sometimes you may want to convert some of your speed into better height (for example, if you are trying to hold a thin lane of clear air). In that case, you might try trimming your mainsheet a little bit harder.



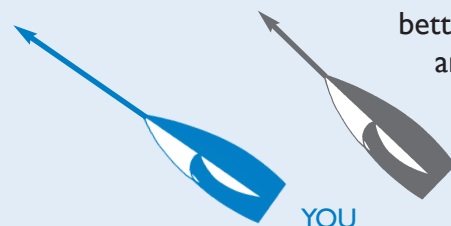
### “Lower and same speed”

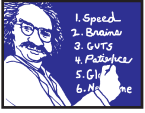
Work on pointing. The temptation when you don't have great height is simply to turn the boat toward the wind. That may work for a short time, but you will end up being lower and slower. The long-term key for better pointing is to get your boat going faster through the water and increase the lift generated by your foils.



### “Lower and faster”

This is a lot like “Higher and slower” – whether it is good or bad depends on how well you are making ground to windward. So when you say “We're lower and faster,” also say “... and our VMG is \_\_\_\_\_ (e.g. better).” Going lower and faster may also be a good move for tactical or strategic reasons.





# How to sail fast in ‘velocity shifts’

The easiest way to explain the concept of velocity shifts is to start with an example. Imagine you are sailing upwind, closehauled on starboard tack. It’s a very puffy day, with lots of increases and decreases in wind velocity. However, the wind direction remains exactly the same during all the puffs and lulls.

As you sail along, the wind you feel on your face is called your apparent wind (Figure 1). It’s a vector sum of the ‘sailing wind’ (the wind you would feel if you were sitting on a floating log) plus the ‘boat wind’ (caused by the movement of your boat through the water). As long as the sailing wind and your speed remain constant, the velocity and direction of your apparent wind will also remain exactly the same.

Now, all of a sudden, the front of your jib luffs, and you wonder



**A “velocity shift” is a temporary change in the direction of the apparent wind you feel, caused by an increase or decrease in wind velocity without any change in the direction of your actual sailing wind.**

how it’s possible to get a header when the wind direction is perfectly steady. But this wasn’t really a change in wind direction – what happened was that you sailed into a lull and got a “velocity shift” that looked a lot like a header.

When you first hit the lull (see Figure 3), the true wind drops but your speed is still relatively high, and this makes your apparent wind move forward. This ‘velocity header’ will last only until your speed drops to match the new wind strength.

A similar effect happens when you sail into a puff (Figure 2). Your boatspeed doesn’t increase right away, so initially the puff moves your apparent wind aft. This is called a ‘velocity lift.’ As your boatspeed increases to match the new wind strength, however, your apparent wind will return roughly to its original direction.

Since velocity shifts are caused by the time lag between changes in wind velocity and corresponding changes in boatspeed, they will be more significant on boats that take longer to accelerate or decelerate. In other words, the heavier your boat, the more pronounced your velocity shifts will be. A light boat like a Laser adjusts quickly to new wind speeds, so velocity shifts are small.

## Recognizing velocity shifts

It is sometimes difficult to recognize whether a change in your apparent wind is due to a velocity shift or to a real change in the direction of your sailing wind. It’s important to know this, because you must often respond differently in each situation. Here are several ways to figure out which kind of shift you have:

1. **Look ahead.** You get a velocity shift only when the wind speed changes, and this is something you can often see on the water to windward. This is probably the most valuable method of gauging velocity shifts because it allows you to anticipate what’s coming and to be proactive about changing gears.

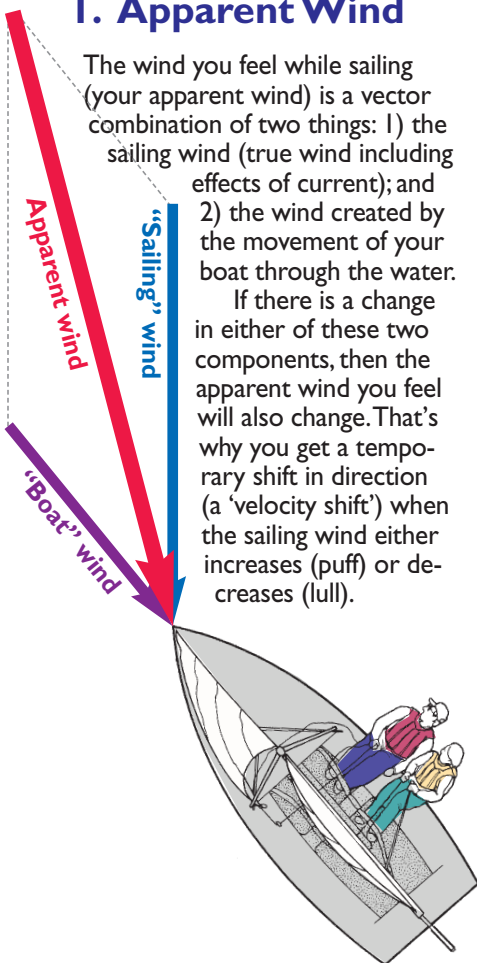
2. **Feel the pressure.** If the shift you get is due to a change in wind velocity, you should be able to feel this. For example, a velocity lift should come with more wind on your face and more heeling.

3. **See how long it lasts.** One big difference between a velocity shift and a ‘real’ shift is that the former is temporary and lasts only until your boatspeed adjusts to the new wind speed. So if you can’t see or feel different wind pressure, wait a few seconds to see if the shift disappears. If it does, it was probably due to a change in velocity.

## 1. Apparent Wind

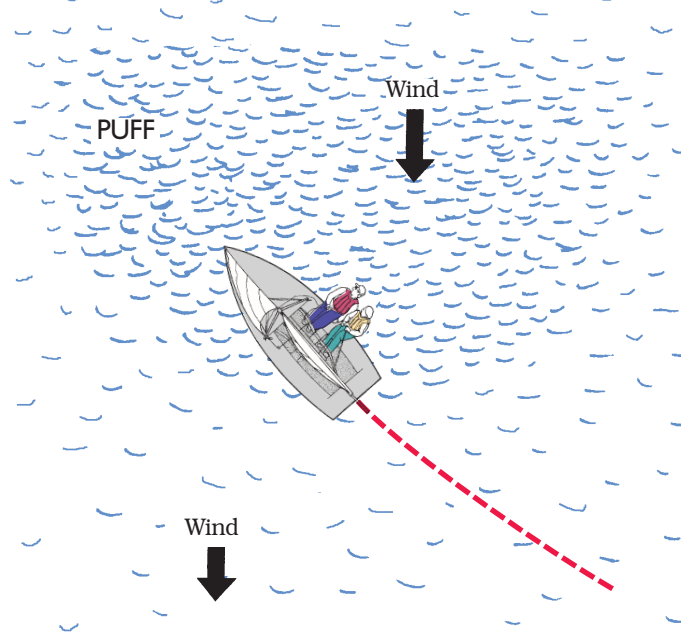
The wind you feel while sailing (your apparent wind) is a vector combination of two things: 1) the sailing wind (true wind including effects of current); and 2) the wind created by the movement of your boat through the water.

If there is a change in either of these two components, then the apparent wind you feel will also change. That’s why you get a temporary shift in direction (a ‘velocity shift’) when the sailing wind either increases (puff) or decreases (lull).



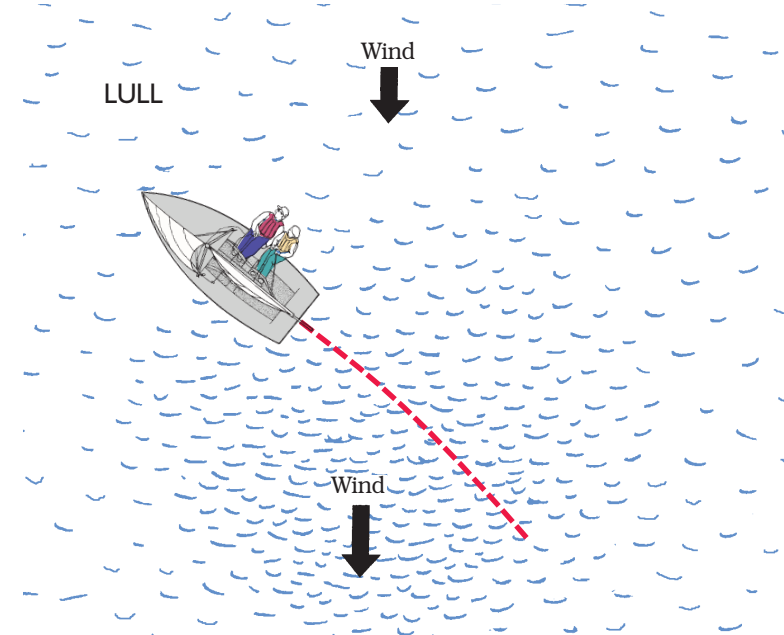


## 2. Handling a 'Velocity Lift'



- It's critical to anticipate the puffs that are coming before they reach you. Otherwise you'll be operating in reaction mode – the boat will heel over, lose power and you'll be fighting weather helm. Instead, be proactive by hiking out and making other 'gear changes' (see pages 13-15) before or as the puff hits.
- When a puff first hits, it's like getting a lift. You have to ease your sails out a little because your apparent wind has gone aft. This is especially important for the jib or genoa because this allows the bow to turn up into the shift more easily.
- Keep your sails eased slightly until you have steered up into the puff and accelerated to the new wind velocity. Then trim them back in – they will probably be a little tighter than before the puff because now you have more wind.
- When a puff hits, should you take all the lift immediately or head up more slowly? I recommend taking all the lift you can while you have it – this will get you farther to windward and won't really hurt your acceleration in the puff.
- When you sail into a puff you should get a lift because of the increased velocity. If you don't get lifted temporarily, it's a good clue that you may have gotten an actual header due to a change in the wind direction.

## 3. Handling a 'Velocity Header'



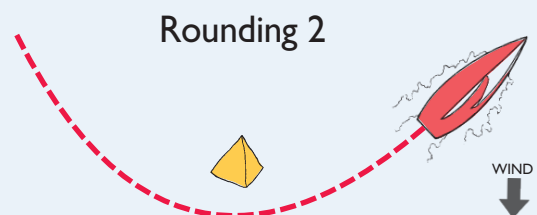
- It's even more crucial to anticipate velocity headers because when you sail into a lull you have less margin for error. Be proactive by leaning in, bearing off and easing sheets.
- When you sail into a lull and get a velocity header, you may actually have to trim your sails (especially the jib) a little tighter momentarily. This will keep flow attached to the sails (and will minimize luffing), and will help turn the bow down to the new course you want to sail.
- When you get a velocity header, I think it's better not to bear off too far to try and fill your sails. Turn down slowly and see if your sails fill again. This will give you better VMG while your speed drops to match the new wind velocity.
- As soon as you have turned to your new course for the lighter air, be sure to ease your sails out – a little more than before the lull because now you have less wind.
- When you get a lull you also expect to get headed because there is less wind. If you don't get headed, there's a good chance that the actual wind direction may be a lift.
- A velocity header is not a good time to tack because you aren't really headed and you don't want to maneuver in lulls. Instead, wait at least a short time and see what happens.

### TEASER ANSWER (from Brain Teaser on page 1)

And the answer is . . . Rounding 2!

- Rounding 1 is not a good look because the boat's approach is too close to the mark. This means she has to make a sharp turn, which is slow, and she ends up going too far to leeward.
- Rounding 3 is a good approach when there are boats close ahead or behind and you need a tactical rounding so you end up to windward of them after the mark. But don't follow this path on your own because it takes you far to leeward of the mark (and therefore costs you twice that distance). •

Look for more on this and other mark roundings in Issue #107!



*Rounding 2 is the best option (without other boats around) because the gradual, steady-radius turn allows you to keep max speed, and it doesn't take you any farther to leeward than is absolutely necessary.*

10). As long as X keeps clear of Z, X can sail wider around the mark. But if Z has to change her course to avoid X while X is taking more space than permitted by mark-room, X breaks rule 10 and won't be exonerated.

**70. M.** X is entitled to mark-room but she also has to keep clear of Y (rule 11 Windward-Leeward). Therefore, X may only sail within the mark-room to which she is entitled.

**71. M.** Since X does not have the right of way, she can take only mark-room while rounding this mark.

**72. M.** Since X does not have the right of way, she can take only mark-room while rounding this leeward mark. Because this is a gate mark, rule 18.4 does not apply here, but that doesn't matter because 18.4 applies only when the inside boat has the right of way (not the case here).

**73. W.** X has the right of way and 'luffing rights', so she is not limited to taking only mark-room. Since rule 18.4 does not apply at a gate mark, X can sail as wide as she wants.

**74. P.** As in #73, X has the right of way and rule 18.4 does not apply at this gate mark. However, X got her leeward overlap from astern, so she can't sail above her proper course during this overlap (rule 17). Therefore, X must jibe to sail her proper course around the mark (unless her proper course is to the other gate).

**75. True.** Unless L is taking a penalty, she is a leeward boat with the right of way and therefore W must keep clear of her. This applies even if W is entitled to mark-room.

**76. More info.** If the boats were overlapped like this when the first one entered the zone, then the answer would be True because P has an inside overlap. However, in this case we are not sure how they entered the zone. If S was clear ahead when she got to the zone, she does not have to give P mark-room.

**77. True.** There is no rule that prohibits a boat from sailing below her proper course, so Z can sail below her PC here if she wants; of course, she must comply with other rules such as rule 11 (Windward-Leeward).

**78. More info.** We can't determine the answer because we don't know how this overlap was established. If X got this leeward overlap from astern, rule 17 says she cannot sail above her proper course as long as she remains overlapped within two lengths. But if Z came from astern, the situation is very different.

**79. False.** When a boat passes head to wind inside the zone and is subject to rule 18.3, this is the only time on the race course when a boat that gets an inside overlap from clear astern is entitled to mark-room even if the outside boat can't give it.

**80. True.** L has the right of way over W and B and is therefore an obstruction to both. According to rule

19.2b, when B gets an inside overlap on W, W must give B room to pass the obstruction (L), "unless she [W] has been unable to do so from the time the overlap began."

## FILL IN THE BLANKS

**81. 3.** The definition of Zone says that the zone is an area around a mark within a distance of three hull lengths from the mark.

**82. D.** The old rules allowed the sailing instructions to change the zone to two or four hull lengths, but that is no longer an option.

**83. 2.** Both Match Racing (Appendix C) and Team Racing (Appendix D) decided to stay with a two-length zone for 2013-2016.

**84. D.** There is never a zone around an obstruction unless that obstruction is also a mark.

**85. D.** There is no longer any rule that prohibits a windward boat (or any other boat) from sailing below her proper course.

**86. 1.** The definition Obstruction says that an object is an obstruction if it's big enough so that a boat would have to make a substantial alteration of course if she were aiming directly at it and one hull length from it.

**87. 2.** Rule 17 turns on and says a boat cannot sail above her proper course only when she gets a leeward overlap from astern within *two* of her hull lengths of a windward boat.

**88. True.** It does not matter whether the boats are on opposite tacks or whether rule 18 applies. As long as both boats are sailing more than 90 degrees from the true wind, they are overlapped when neither is clear astern of the other.

**89. False.** Rule 19.2c explains when a boat that comes from clear astern is entitled to room at a continuing obstruction. However, that rule does not apply in this case because the boat coming from astern has the right of way. Therefore, the boat ahead (A) must keep clear.

**90. More Info.** If B came from behind and got an overlap at this moment, the answer would be True because there is not enough room for B to fit between A and the shore at this moment. However, if A got this inside overlap at a time when there was room for her to pass safely



JH Peterson photo



between A and the shore, then A does have to make room for B to pass the continuing obstruction here.

**91. 19.** The committee boat is both a mark and an obstruction (see *Definitions*). However, rule 18 does not apply here because the boats are not required to leave this mark on a certain side until they approach the line to start. Therefore, rule 19 applies at this obstruction.

**92. N.** According to the preamble to Section C, neither rule 18 nor rule 19 apply “. . . at a starting mark surrounded by navigable water or at its anchor line from the time boats are approaching them to start until they have passed them.”

**93. N.** Rule 18 does not apply in this situation because the boats are not required to leave the pin-end mark on a certain side until they are approaching the line to start. Rule 19 does not usually apply here because the pin end is not normally large enough to be an obstruction.

**94. 19.** The anchored powerboat is an obstruction so rule 19 applies when the two boats are passing it.

**95. 18.** When a mark is also an obstruction, rule 18 applies and rule 19 does not (see rule 19.1).

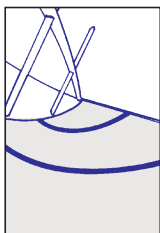
**96. 19.** The boat on starboard tack (S) has the right of way over both port tackers, so she is considered an obstruction to them. Therefore, rule 19 applies as they pass S.

**97. 19 (and 20).** The two port tackers are approaching an obstruction, so rule 19 applies. However, when the leeward boat hails for room to tack, rule 20 also applies and requires certain responses from the windward boat.

**98. 19.** While these boats are passing the shoreline, which is a continuing obstruction, rule 19.2c explains the requirements for giving and receiving room.

**99. 19.** A third boat overlapped to leeward has the right of way over both boats and is therefore an obstruction (but not a continuing obstruction) to them. So rule 19 applies while they are passing this third boat.

**100. 19.** In this case, the windward mark is also a continuing obstruction. Rule 18.1d says that rule 18 does not apply “if the mark is a continuing obstruction, in which case rule 19 applies.” •

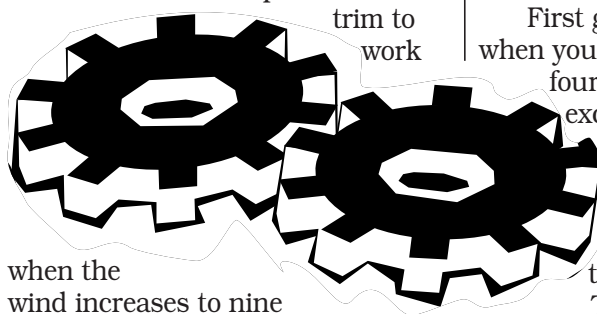


## SAIL TRIM

# The importance of changing gears

**M**y favorite sailor, Buddy Melges, is fond of describing one of the secrets to his many successes over the years. “You just have to present your boat for Mother Nature,” says Buddy. What he means is that you must change the trim of your boat and sails so you’re ready for whatever puffs, lulls or shifts Mother Nature sends your way.

Buddy grew up sailing on the small, shifty lakes around Wisconsin and he knows that ‘changing gears’ (adjusting the set-up of your boat) is absolutely critical to keep going fast. You can’t trim your sails for maximum performance in seven knots of wind and expect that same



trim to work when the wind increases to nine knots or drops to five.

I have always liked Buddy’s use of the word “present” to describe this process. In order to “present your boat for Mother Nature,” you must get it all ready before Mother Nature arrives. In other words, you have to anticipate the changes that are coming and make the necessary changes *before* they reach you.

For example, if you first become aware of a puff when you feel your boat start to heel over, it’s too late. You are already losing power, failing to accelerate quickly, and turning your rudder too far to fight excess windward helm. You didn’t present your boat for Mother Nature.

Instead, you should have seen the puff on the water before it hit you. This way you could have changed gears (by hiking harder,

dropping the traveler, getting a little extra backstay, etc.) just before and as the puff hit. The energy that was previously wasted (because it went into heeling the boat and/or spilled off the sails) is now used to move the boat forward.

### The Car Analogy

One of the best ways to improve your boatspeed is to increase the percentage of time that you spend sailing in the right “gear.” For the sake of simplicity, sailors often describe a sailboat, like a car, as having several gears. These cover the range of upwind sailing and are described in on pages 14-15.

First gear is used to accelerate when you are going slowly, while fourth gear is used to handle excess power when you are cruising at full speed.

Third is used when you have maximum pointing, and second is a transition from first to third.

These four gears are not defined in black-and-white – they are simply helpful guides. Honestly, I don’t know of any sailor who says, “Let’s shift into second gear now.” But I know many good sailors who anticipate changes in conditions and continually make all the trim adjustments on the next two pages.

Obviously, you don’t have time to make every change listed for each gear. So you have to prioritize. The key settings are the ones that will have the biggest immediate impact – like your mainsheet, jib sheet, boat heading and position of crew weight. The most important thing is to be proactive, not reactive. Be sure to present your boat for the wind and waves that are coming. •

Turn to pages 14 and 15 for much more on how to shift into the right gear. •



# 1 First

First gear is the mode to use when you are going relatively slowly and you need as much power and punch as possible for acceleration.



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# 2 Second

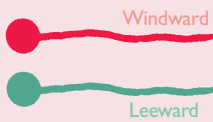
Second gear provides a transition from the power of first gear to the pointing of third gear. It is a good overall compromise in moderate conditions.

WHEN

**Use first gear for** • Straight-line sailing in very light air • Light air when you have more waves than wind • Whenever you need to accelerate from a very slow speed and you don't have much power • After tacks • Coming off the starting line • Punching through motorboat waves • Sailing in bad air • When you want a very wide 'groove'

**Use second gear for** • Flat-water sailing in light or very light wind • Medium breeze when you have a lot of chop • Whenever you're close to full speed but still need to accelerate • When you need to be in "foot" mode • When you're in first gear and you want to shift up to point higher • When you're in third gear and you need to shift down to go faster

JIB TELLTALES



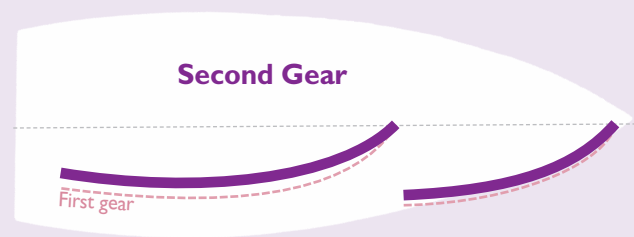
In first gear, "press" on the jib (i.e. bear off far enough) so both the windward and leeward telltales flow straight aft. If the windward telltales lift at all, you are sailing too high. If the leeward telltales stall, you are sailing too low.



In second gear, sail with the windward telltales lifting up somewhat from a straight-back position. This could be anywhere from about 10° to 40° above horizontal. You should not see any luff in the front of the jib.

SAIL TRIM/SHAPE

Mainsheet eased • Boom at or just below centerline • Mainsail twists so the top batten angles slightly to leeward • Top main telltale flying • Backstay slack • Outhaul eased • Cunningham loose enough so lower main luff has wrinkles • Jib sheet eased • Jib lead forward • Jib twists so mid-leech angles a bit to leeward • Jib luff tension loose so there are hints of horizontal wrinkles along luff • Max headstay sag



Mainsheet trimmed so top batten is parallel to boom • Telltale at end of top batten flows almost all the time • Traveler pulled to windward so boom is trimmed on centerline • Outhaul slightly eased • Cunningham slightly tensioned or slack to maintain some horizontal wrinkles • Jib lead in "normal" position • Jib sheet trimmed so mid-leech is parallel to centerline



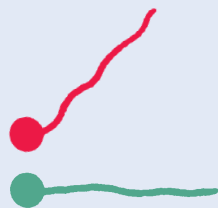
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# 3 Third

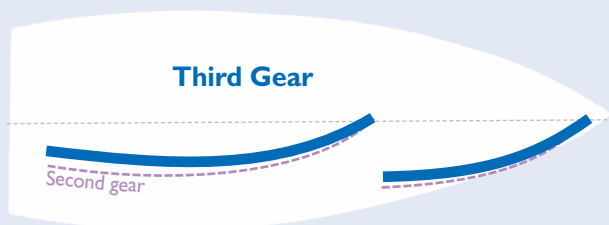
Third gear is your pointing mode when you have enough (but not too much) power and you can point very high without losing speed.

**Use third gear for** • Any conditions where you are able to point high • Moderate breeze • Lighter wind with very flat water • When you have a good bit of power but are not overpowered • When you need to be in “point” mode • Heavier air with less waves than wind • When you’re in second gear and you want to shift up into higher pointing



In third gear, on most boats, the windward telltales should be lifting up at about a 45° angle most of the time. You will sometimes be able to see a small luff along the front of the jib.

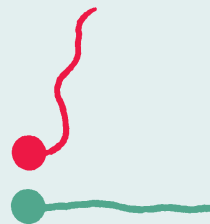
Mainsheet reaches max trim • Top batten angles a few degrees to windward • Top batten telltale stalls 50% of time • Boom trimmed slightly to windward of centerline • Outhaul tight to remove foot shelf • Cunningham tensioned slightly to leave only a hint of luff wrinkles • Some backstay tension to reduce headstay sag • Jib sheet tight so mid-leech angles slightly to windward • Jib lead is at farthest inboard setting



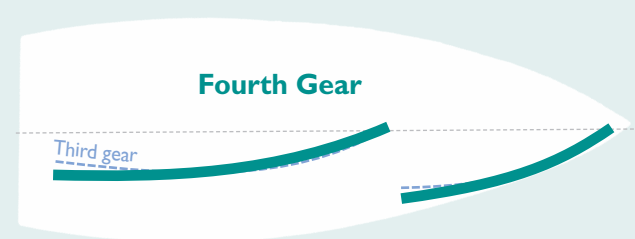
# 4 Fourth

Fourth gear is used when you are already going as fast as possible and you have to start depowering because you have too much power.

**Use fourth gear for** • Heavy air • Any time you are overpowered and cannot hike the boat flat • Moderate-heavy air with more waves than wind (when you have to put the bow down to go through the waves) • When you’re in third gear and you’re getting overpowered • Survival



When you’re in fourth gear, the windward telltales will be lifting straight up (so they are nearly vertical) almost all the time. There is usually a luff in the front part of the jib.



Mainsheet tight but eased as needed to keep boat on its feet • Top batten twisted to leeward • Backstay very tight to flatten main and jib • Maximum outhaul • Cunningham very tight to pull draft forward • Vang very tight to maintain leech tension when sheet eases • Traveler eased so boom is below centerline • Jib lead outboard slightly and aft • Jib luff tension tight

UPWIND ‘GEARS’

WHEN

JIB TELLTALES

SAIL TRIM/SHAPE

This issue was updated in February 2014.

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## BOATSPEED

# When going fast, trim harder



One thing all good sailors have in common is that they are always looking for more of an advantage when racing upwind. They are constantly making small (and large) changes to the trim of their boat and sails, trying to find better speed and height.

My favorite trim adjustment is the mainsheet. During almost every race, I constantly ease and trim the sheet in a never-ending search for improved performance (and I never cleat the sheet unless there is too much load for me to hold it).

My basic philosophy is this: If the boat feels good and our speed seems OK with the boats around us, I trim the mainsheet harder. I like trimming the sheet as hard as possible. More sheet tension means a tighter leech, straighter headstay and flatter sails – all of which help the boat point higher.

Of course, there is a limit to how hard you can trim the mainsheet, especially in lighter wind and waves. When your boat doesn't feel good and you're not going OK with the boats around you, then you

have to do the opposite – ease the sheet. This will power up your sails and get the boat going faster, which is a prerequisite for good pointing.

Once the boat gets going faster and feels better, I start trimming in again. As I sheet harder, I pay very close attention to how this makes the boat feel. If a little more trim seems to give the boat a bit more power and punch, then I keep going. But if that little bit of extra trim makes the boat feel more sluggish, then I ease back out slightly.

This should be a constant loop, always trimming harder to make sure you are on the edge of max trim and easing when you've gone a little too far. It's like trimming a spinnaker, where you continually ease the sheet until there is a curl in the luff, then trim in slightly.

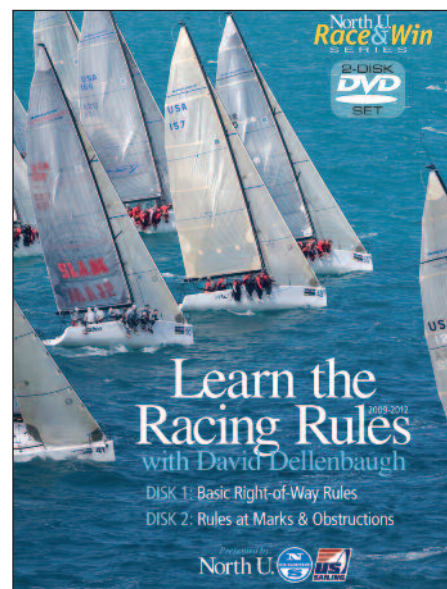
One word of caution: In certain conditions (light air, shifty wind, chop, an inexperienced skipper), it may be hard to keep the boat 'in the groove.' In these conditions, it's usually much better to have the mainsheet a little too eased rather than too tight. That is, it's safer to aim for more speed and less height.



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