

Using TargetBoatspeed

(more than you ever need to know about Target Boat Speed)

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General

On Target Boat Speed:

In a nutshell a "target" speed is the goal or target speed you try to achieve sailing upwind or downwind for a given wind speed.

Thus if you are sailing up wind on a Soverel 33 in 10 kts of *true* wind your optimum upwind boatspeed would be 5.9 kts with an apparent wind angle of 25° (using [Soverel 33 Targets - v.3](#) for comparison). The concept being if you are going "too slow" you foot off until you Boat Speed reaches 5.9 kts, and likewise if you are going "too fast" you pinch up.

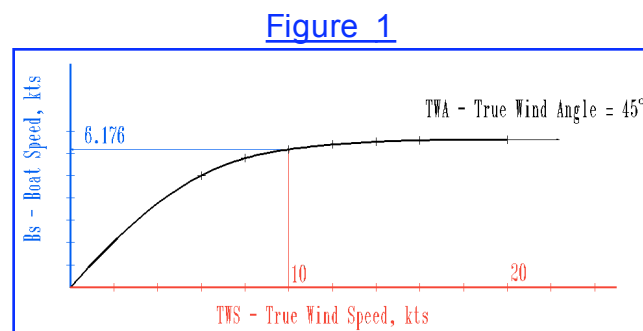
Note, these targets speeds are generated from VPP's (velocity prediction programs) and do not take into account unexpected sea states (waves from powerboats, current chop, etc.) the weight of your crew, the condition of the sails, the talent of your crew, the condition of the bottom, etc.

[you can stop reading if you have satisfied your question, the following is just more boring details of where Target Boat Speed comes from and how to use them.]

Details

The Polar Plot:

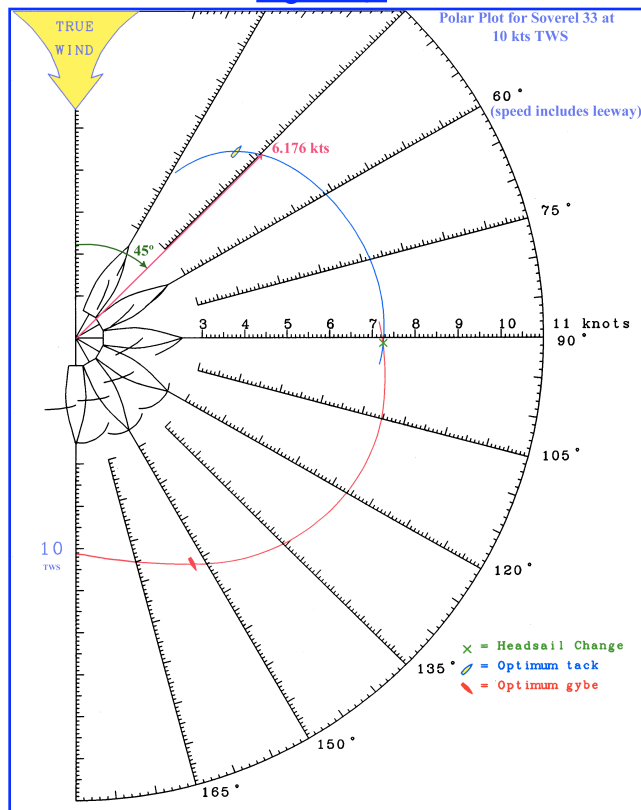
To fully understand "Targets" and where they come from, you need to understand "Polars." A polar plot presents a visual representation of boat speed in relation to True Wind Speed and True Wind Angle, and at times to a apparent wind angle. Consider the plot in Figure 1, where **Boat Speed, Bs**, is graphed in relationship to **True Wind Speed, TWS**, for a specific **True Wind Angle, TWA**.



Bs versus TWS for TWA 45°

For the full range of True Wind Angles, a polar plot can be developed, where boat speed is measured on concentric circles, True Wind Angles are measured clockwise from the wind direction, and the plot of boat speed for specific True Wind Speeds. (Fig. 2).

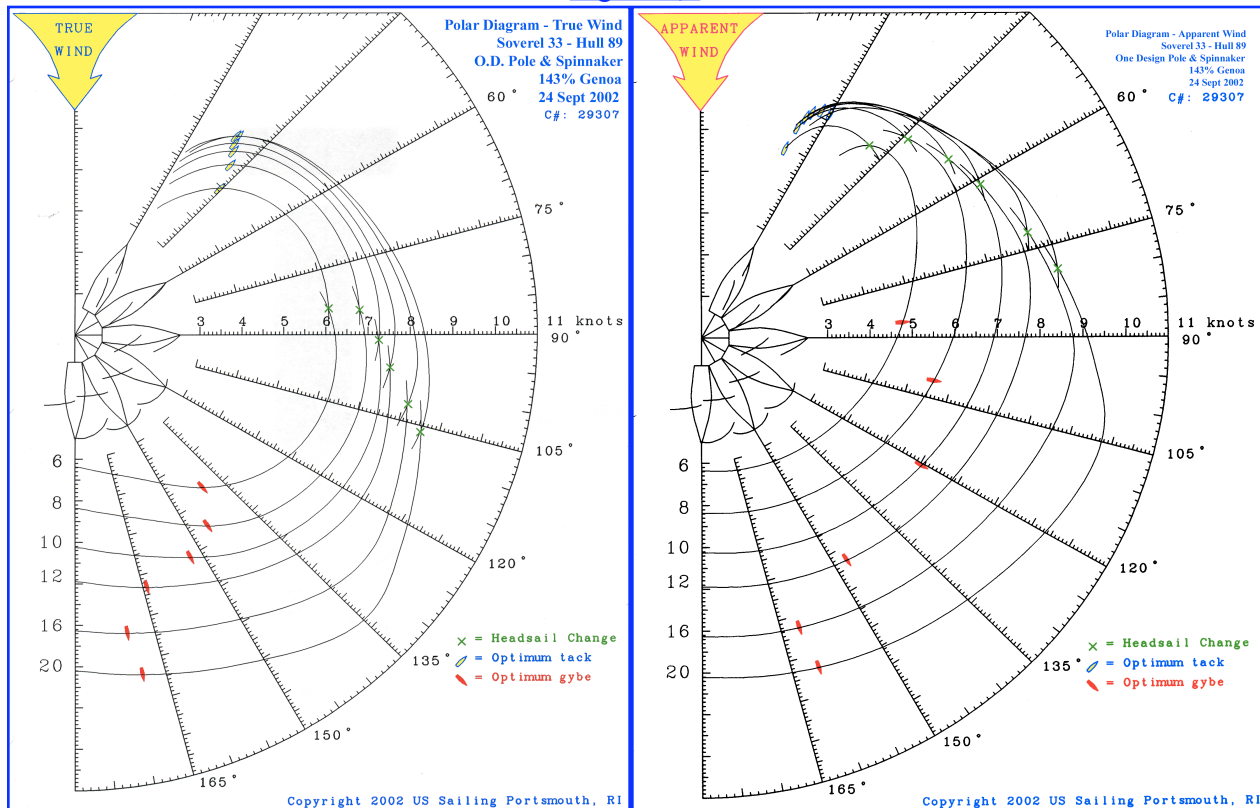
Figure 2



Polar Plot for Sovrel 33 at 10 kts TWS

Combining the range of True Wind Speeds, a complete polar plot is developed. In these examples, boat speed is graphed for True and Apparent Wind Speeds of 6, 8, 10, 12, 16, and 20 knots.

Figure 3



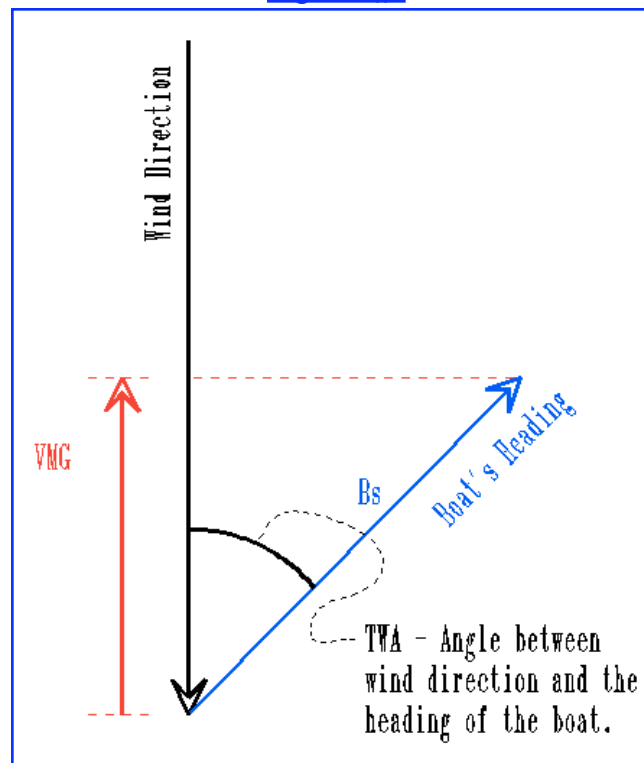
Polar Plot for Sovrel 33 Deviation [#89 TAR]

VMG:

VMG is defined as velocity made good against the direction of the wind. **VMG** is that portion of the boat's velocity vector which represents the progress of the boat against the wind and is quantified by the expression $VMG = Bs \times \cos(TWA)$, where **TWA** is the angle between the direction of the wind and the direction of the boat (Fig. 4). Thus:

True Wind Angle, TWS	Boat Speed, Bs	VMG	
0°	6.0 kts	Bs x 1.000	6.0 kts
45°	6.0 kts	Bs x 0.707	4.2 kts
90°	6.0 kts	Bs x 0.000	0.0 kts
135°	6.0 kts	Bs x -0.707	-4.2 kts
180°	6.0 kts	Bs x -1.000	-6.0 kts

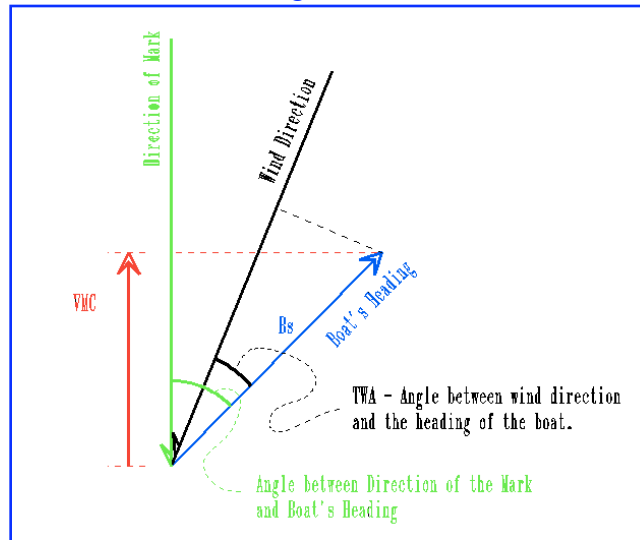
Figure 4



VMC:

VMC is defined as velocity made good against the course to the mark, not the direction of the wind. **VMC** is commonly confused with **VMG**. Generally, a GPS or LORAN will give **VMC** as the speed made good towards a mark or waypoint, over the bottom, not through the water (this is sometimes labeled as **VMG** by the GPs or LORAN.) Only when the bearing to the mark and the bearing of the True Wind are the same will **VMC** be equal to **VMG**. $VMC = Bs \times \cos(Am)$, where **Am** is the angle between the direction of the mark or waypoint and the direction of the boat. (Fig. 5)

Figure 5

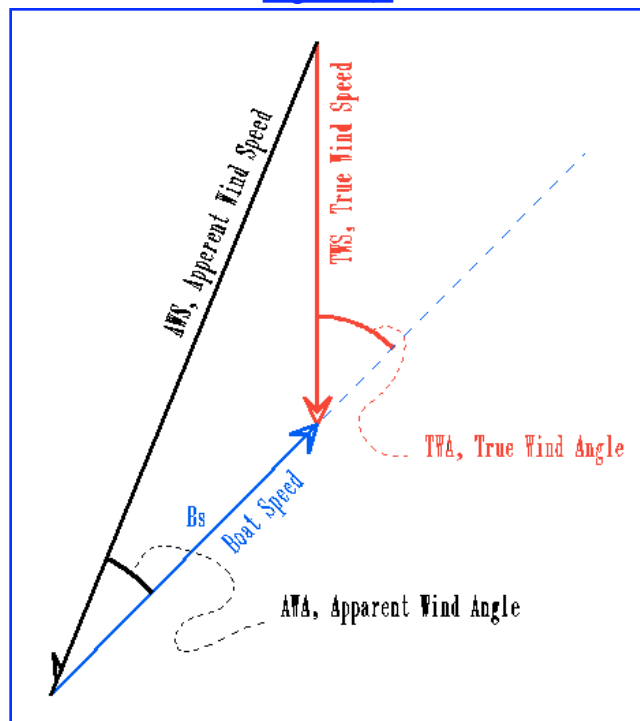


VMC

True Wind Speed & True Wind Angle:

True Wind Speed, **TWS**, and True Wind Angle, **TWA**, are the speed of the wind relative to the water and the angle of the wind relative to the bow of the boat, respectively. Apparent Wind Speed, **AWS**, and Apparent Wind Angle, **AWA**, are the vector sums of the True Wind Speed and angle and boat speed. This is the wind you feel as the boat moves through the water and the wind the sails see. (Fig. 6)

Figure 6



TWS, TWA, AWS, & AWA

Target Speed:

Definition:

The "Target" speed is the optimum upwind or downwind point on the polar diagram, that will get you upwind or downwind the fastest. The Polars show that Target Boat Speed, when sustained over a long period, will produce the best **VMG**, velocity made good, for upwind and downwind sailing, where tacking and jybing are a necessity.

How do you utilize Targets:

To some Target Boat Speed, is the "single most important value" to use for beating upwind and tacking downwind for maximum performance. The crew utilizes target speed as the primary indicator for maintaining the highest potential of the boat upwind and downwind, with constant interaction between helmsman, tactician, and sail trimmers.

Target Speed [theoretical goals]:

1. develop the best speed for maximization of performance.
2. compensates for sailing too high (pinching) and too low (footing).
3. compensates for changes in sea conditions: smooth water to rough water.
4. allows you to trim sails to optimum angle [in theory, the jib Telltales are for trimmers only, and the helmsman watches the Boat Speed]
5. promote good team work: sail trimmer, helmsman and tactician coordination
6. compensates for different wind velocities
7. promotes proper response to velocity shifts as a result of changes in wind velocity.

Other thoughts on Targets:

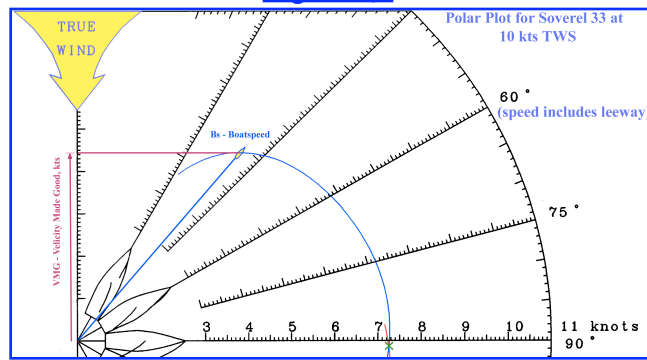
The best "targets" you can get are developed thought experience. In other words, how does your speed and point compare with other boats.

Your own testing and data recording before and during races is extremely valuable data. You can construct your own set of Polars, or update existing Polars with footnotes of sail selection, lead position, halyard tension, and sea conditions.

Details:

Consider both **VMG** and the Polar Chart together. From the Polars ([Fig. 3](#)) you know that the Target Speed point is the boat speed that maximizes VMG for a particular True Wind Speed. (Figure 7)

Figure 7



You know that if you sail too high for too long a time period, performance will decrease, and if you sail too low, performance will decrease. Target Speed, therefore, is the value which you should always try to maintain to stay at maximum performance. The important concept is to identify the target speed for a True Wind Speed, and then use the target speed to monitor the performance of the boat and sailing techniques of the crew. Apparent Wind Angle or True Wind Angle, and VMG functions do not have the inherent stability to verify your performance upwind or downwind, especially over the entire period of the leg of the course.

Target Speed is the upper and lower limit of speeds for sailing upwind and downwind to maximize performance. The telltales will not tell you the whole story over these speed changes. If you are **"too fast," head up**. When you are too fast, you should head up, but the telltales will indicate that you are too high. In these instances, disregard the telltales, until boat speed approaches target, then bear off to hit target at the proper wind angle, with the telltales flying. Likewise, if you are **"too slow," bear off** to accelerate to Target Boat Speed. The telltales will tell you that you are sailing too low, again the helmsman should disregard the telltales and the trimmer should adjust the sails until boat Speed approaches target speed and then head up so that you hit target speed at the proper wind angle and adjust the sails accordingly.

Using the apparent wind angle function or Windex to steer by, especially at night, is slow.

The technique emphasizes the coordination required between the trimmer and helmsman. Both the jobs of the helmsman and trimmer should be regulated by the Target Speed - Boat Speed relationship.

"Too fast," head up

If you are "too fast:"

1. Trimmer should trim slightly as you head up.
2. As excess speed starts to bleed off, Trimmer should ease to allow you to them bear off and maintain speed again.
3. Helmsman should call out: "above target, trim slightly. Coming up, trim with me. Boat speed slowing, east to proper trim at target." Or something to that effect.
4. Helmsman starts to come down to reestablish target speed

This is a constant loop, with constant positive interaction between Helmsman and Trimmer. Tactician can then use excess speed to his advantage tactically against other boats. A good example of this use is in sailing through changing sea states. Assume that you are sailing in 2-3' chop at target speed, and the boat enters a smooth condition with 1' chop. Boat Speed starts to accelerate as the boat hits smooth water. Use this excess speed to sail higher and gain distance to weather maximizing performance.

"Too slow," bear off

If you are "too slow:"

1. Trimmer should ease sails to allow you to bear off and accelerate.
2. Helmsman should call out: "below target, ease sheets bearing off."
3. As the boat speed builds towards Target, Trimmer starts to trim. Helmsman slowly starts bringing the boat back to close hauled.
4. When Boat Speed reaches upwind target, Helmsman call out: "Boat Speed at target, full upwind trim" and Helmsman settles in at target Speed upwind.

Again, this is terrifically positive and productive interaction between the crew for maintaining maximum performance upwind. As the previous example, this coordination of Helmsman, Trimmer, and Target Boat Speed allows you to maintain maximum performance when you enter a rough patch of water - sailing through a current rip - or backwash near a shore. As the boat enters the rough water and Boat Speed slows, you reestablish target speed quickly, allowing you to preserve your maximum performance level.

Compensating for Sea Conditions.

Target speed can compensate for overall sea conditions:

1. In smooth water, the boat is able to sail to Target speed while pointing high. The average sailing angle is closer to the wind, and target speed is maintained. The same rules apply during shorter changes in sea state - too fast, head up; too slow, bear off.
2. In rough seas, the Target Speed will remain the same, but the average wind angle will be wider, and you will have to sail lower because of the sea conditions. However the theory of target speed s hold true: too fast, head up; too slow, bear off.

I'm not competitive when I sail to the Targets!

The Targets posted here on the website are for the individual boats as noted. For instance, the Targets for *Deviation* are for using a 143% headsail, with a 14' OD size girth Spinnaker. Thus if you have tried the Targets, and have failed to be satisfied, then you can establish your own, through trial and error, which is optimized for you own boat, set up, and style of sailing.

The best "targets" you can get are developed through experience. In other words, how does your speed and point compare with other boats.

Your own testing and data recording before and during races is extremely valuable data. You can construct your own set of polars, or update existing polars with footnotes of sail selection, lead position, halyard tension, and sea conditions.

<u>TWS</u>	<u>Upwind / Sail</u>	<u>Downwind</u>
3	2.4 / 143%	2.1 / 0.6 oz.
5	4.0 / 143%	3.7 / 0.6 oz.
8	5.6 / 143%	5.5 / 0.6 oz.
10	5.9 / 143%	6.0 / 0.6 oz.
12	6.0 / 143%	6.4 / 0.6 oz.
13	6.1 / 105%	6.6 / 0.6 oz.
15	6.2 / 105%	7.0 / 0.6 oz.
18	6.3 / 105%	7.8 / 0.6 oz.
20	6.3 / 105%	8.2 / 0.6 oz.
23	6.3 / 105%	8.8 / 0.6 oz.
25	6.4 / 105%	9.3 / 0.6 oz.
30	6.5 / 90%	10.7 / 0.6 oz.

Sample Duct Tape Strips (re. *Deviation* 2002)

Three pieces of duct tape in the cockpit can be the most guide on the boat. With True Wind Speed on the first piece of tape, Target Boat Speed and Headsail for upwind and Target Speed for downwind sailing. Use the true wind function to reference the target speed. Continuously checking boat speed against target speed will maximize your performance. As True wind changes, check your new target speed and respond to maintain maximum performance.

Example:

1. Helmsman checks True Wind Speed,
2. Helmsman identifies target speed for that True Wind Speed.
3. Helmsman checks boat speed in relation to target speed.
4. If boat speed is slow, Helmsman communicates with the Trimmer to ease the sails, bears off, accelerates, and re-trimms
5. Helmsman then rechecks True Wind Speed, and so on . . .