The Rimfire X Count

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Buffalo Creek Gun Club, Inc.

Owen Maddox President

Match Director's Message

Practicing shooting in the wind gives a better understanding what to expect during a match.

In This Issue

SHOOTING IN THE WIND - SOME BASIC INFORMATION

By Bert de Vink

MY EXPERIENCE

This article began when I started shooting long range and I had very little experience to rely on to make adequate windage corrections. It has been about 3 years since that time and I have learned a lot through my own trial and error, talking with fellow shooters, and from my reading. There is some good stuff written about wind correction but nothing that pulls it all together in a basic and practical manner. I began as a benchrest (for score) shooter and so my wind reading and correcting skills have this as a basis. Some of this may be helpful to others starting on the same path. I don't claim that this is all there is to learn about shooting in the wind - I still have much to learn - and I welcome the comments and suggestions from those of you who will be reading this. I tried to stay away from a too technical treatment of this subject as I anticipate that most who read this will have practical applications in mind.

NO WIND AND "NO-WIND-ZERO"

If you live on planet earth, certainly in New Brunswick, Canada, you will be shooting in the wind. Oh sure, there are times when there is "no wind". You do get a few days here and there when it is quiet and the wind is hardly noticeable.

You will find relatively little wind when you get up before the sun does and get to the range in the early dawn minutes before the sun comes up over the horizon. This is a fairly predictable time for no winds and this is the time to get a "no-wind" zero for your rifle. Likewise, just before nightfall - when the sun is over the horizon and is no longer

having a heating effect on air masses in your area, you will experience a short “no wind” period.

By the way, all the information about “reading” or “doping” the wind is really hard to use if you don’t have a “no-wind” zero. Without it you can be quickly lost. So that’s the first thing to do - go to the range before the winds start blowing and sight in your rifle. Then lock the scope or sights to “zero” to that no wind condition.

Another time when there is little or no wind (or very benign winds) is when there is an even, not too light or too heavy cloud cover. This is most often associated with light drizzle and in the winter a light snow - actual or yet to come - and this relative quiet can last for most of the day to days on end. It will give you little air movement and quite predictable wind conditions to the point where shot to shot variability is not very large.

Thirdly, it is also possible to be shooting “in a tunnel”. This is where local vegetation, topography and the prevailing wind condition cooperate to give you little or no wind effect. Many of our ranges are cut out of the woods with the range 100 meters (or less) wide and with a thick line of woods on either side. It can produce a very windy wind tunnel to shoot in but it can also produce an effect where prevailing wind conditions skip

over the trees and leave the shooters in a dead valley in the lee of the wind - usually along one side of the range. Better not count on this - it doesn't happen often. When it does you'll enjoy some wonderful shooting.

Let's face it, 95% of the time that you go to the range to shoot targets, you will have to do something with the wind conditions. What this article is about is developing a partnership with the wind so that you can develop the skills to more or less accurately determine the wind's direction, velocity and effect on the path of the bullet. Your job is to shoot and learn while the wind's job is to be there. Errors in adjusting for wind effects are not so much failures but indications that you "still have more to learn". Once you understand how the wind can affect the bullet on your home range you will begin to learn the same thing on other ranges - they are all different and will present their own challenges.

SIMPLE WINDS

So, what is wind? Stupid question what? Well, let's see. In its simplest, wind is the movement of air across a terrain. We, as relatively fixed points on that terrain, feel it on our cheeks if it's light and run after our hats if it's strong. We "see" the wind in the movement of grass, leaves, dust, trees, clouds and wind flags or daisy-wheels.

We also see it in the movement of mirage which is a useful way to read light winds - but that is another topic.

When we talk about the wind, we simplify it, thinking that air moves in a straight line and at fairly constant speeds and in a consistent direction. Nothing is further from the truth. You have watched fine snow or dust blown across a wide road or parking lot. It

moves up and down and from side to side. Moving air is a turbulent mass that rolls this way and that around obstacles creating spinning, roiling effects. Don't think of clouds high up in the jet-stream - they appear to move in nice straight lines. Think of a quick stir in a bucket of water with mud in the bottom - a very active dynamic scene.

In order to talk about how the wind affects our shooting we also simplify it. We will first talk about wind direction as if it does move gently, constantly and consistently across or up and down the range. This I'll call a "simple wind". It only sometimes happens but never when you really want it to. Later we'll add the effects of air moving to different directions and at different velocities.

Air moves from a high pressure area to a low pressure area. This can happen on a large scale and we are all familiar with weather maps on the TV - a low pressure area off the coast of Cape Cod and a high pressure area in the middle of Quebec - and voila! You have masses of air moving from Northwest to Southeast across New Brunswick. These large effects are useful to shooters as these prevailing conditions give reasonably predictable wind direction and velocity as well as probability of precipitation, barometric pressure etc. So you know it's going to be cool with a 40% POP and winds of about 20 kph for example.

Air also moves on a much smaller scale. We are not really concerned about what happens between Montreal and Boston. We are, however, interested in what happens between firing point and target face. On the ground the prevailing winds are much more complicated. The moving air dips up and down over obstacles, hills and valleys, buildings and berms, back-stops, trees and bushes. Even a relatively flat surface will show turbulence and complicated wind travel with directional variations - eddies, twists, snaking, gusts and also calm spots.

Here is an interesting illustration of what I mean The Windwall

Most often when you go to the range you pick days that have relatively nice weather - not too cold or hot and not too windy. We enjoy shooting in these nice conditions. Besides, we are often testing new equipment, new .22 ammo, new bullets, powders etc and this requires manageable conditions. Going to a range can be costly in components expended or even travel costs so we tend to go when we can maximize our fun.

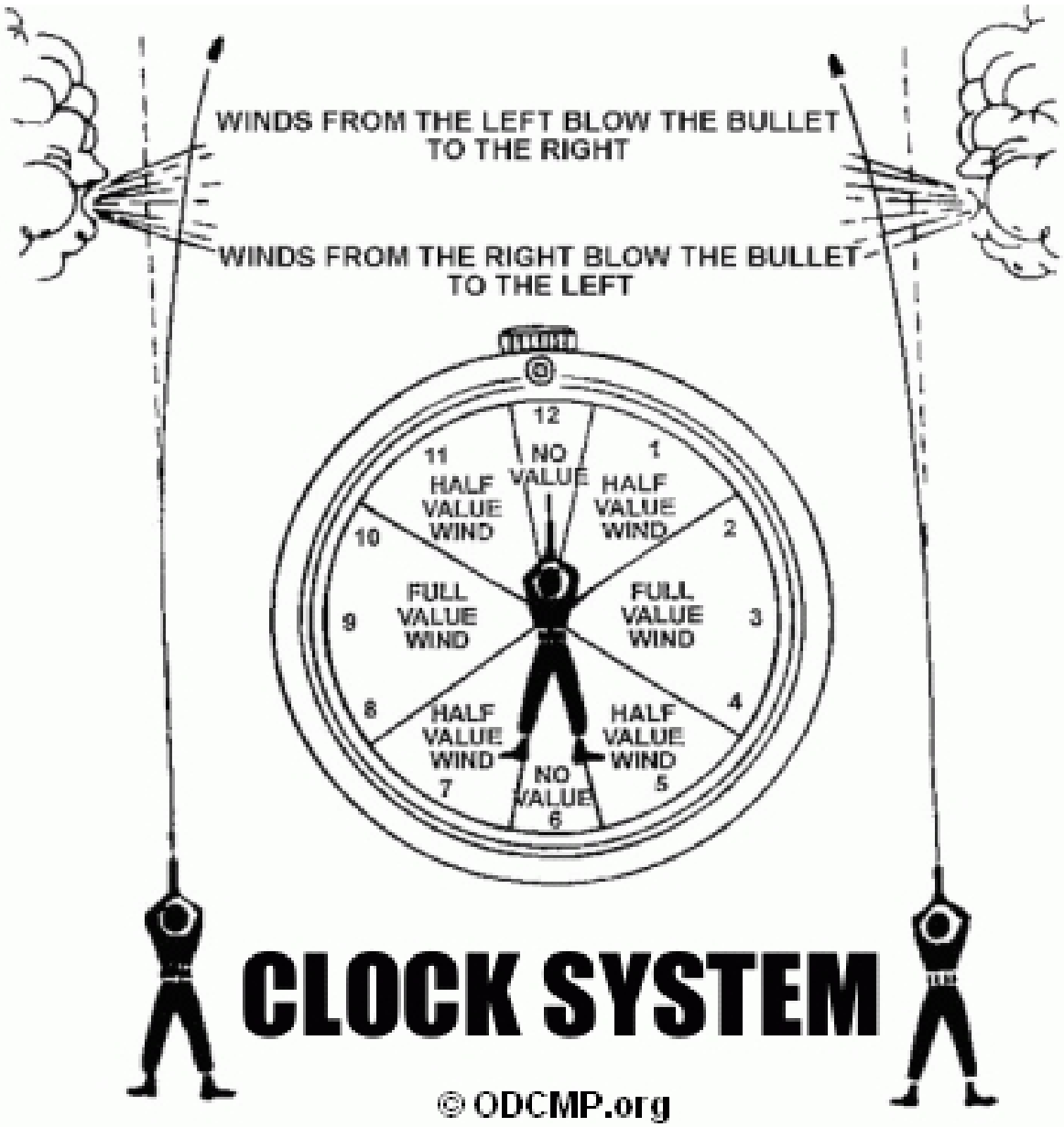
Nothing wrong with that! But, if you want to learn about wind you have to shoot in the wind. Here's a little secret, you have to take whatever wind you get at a shoot or match and if you haven't practiced in the wind you might be a bit lost at a match.

So back to our "simple winds" - that blow so predictably. The easiest to figure out are those that blow directly across the line of fire from right to left or from left to right. Also easy are winds that blow straight up and down the range. The flags and the daisy-wheels and all the natural indicators are pointing or moving in the same direction. OK, so you've studied this a bit and have decided to "dial-in" a certain windage value on your sights (or have decided to hold off a certain amount) and you start to shoot with

some good success. When the wind picks up in velocity or when it wanes noticeably yo u wait a bit and only touch the trigger when the same apparent wind conditions present themselves. You shoot your box of ammo, and go and have a beer - you've had a good day at range!

WIND CLOCK - DIRECTION OF THE WIND

Winds don't just blow from right to left or left to right and up or down range - they come from all directions. A wind clock is a useful way of picturing the direction of the wind:


WINDS FROM THE LEFT BLOW THE BULLET TO THE RIGHT
WINDS FROM THE RIGHT BLOW THE BULLET TO THE LEFT
12
NO VALUE
1
HALF VALUE WIND
2
FULL VALUE WIND
3
HALF VALUE WIND
4
NO VALUE
5
6
HALF VALUE WIND
7
FULL VALUE WIND
8
9
HALF VALUE WIND
10
11
CLOCK SYSTEM
© ODCMP.org

Imagine yourself in the center of the clock. Winds that come from the target to you are 12 o'clock winds while those that come from behind you are 6 o'clock winds. Three o'clock winds are those that blow directly across the range from the right while 9 o'clock winds are those that come from the left. Of course the wind will come from any point on the clock and usually from several adjacent points. So a 3 o'clock wind will move to a 1 o'clock or 5 o'clock wind (sometimes the movement is much more dramatic than that!) while you're waiting to shoot. Remember, we want to know the direction of the wind in the path of the bullet so we look at indicators all the way down the range to the target. If you are shooting long-range this will involve the information from several wind flags as well as natural indicators such as the trees and bushes. If you are shooting 100 yard benchrest you would probably set out 2 or 3 or more flags or daisy-wheels. In the best of circumstances, for example the "simple wind" scenario above, these indicators will all agree.

In this scenario, you estimate the amount of movement of the bullet across the target face and you adjust your sights for that amount or hold over and fire with a reasonable expectation that the point of impact will be the point of aim. You wait for the same conditions to present themselves and the adjustment you made for the former shot should work for the present one. This assumes that you have enough time to wait and that you have picked a condition that repeats itself frequently enough to complete the string.

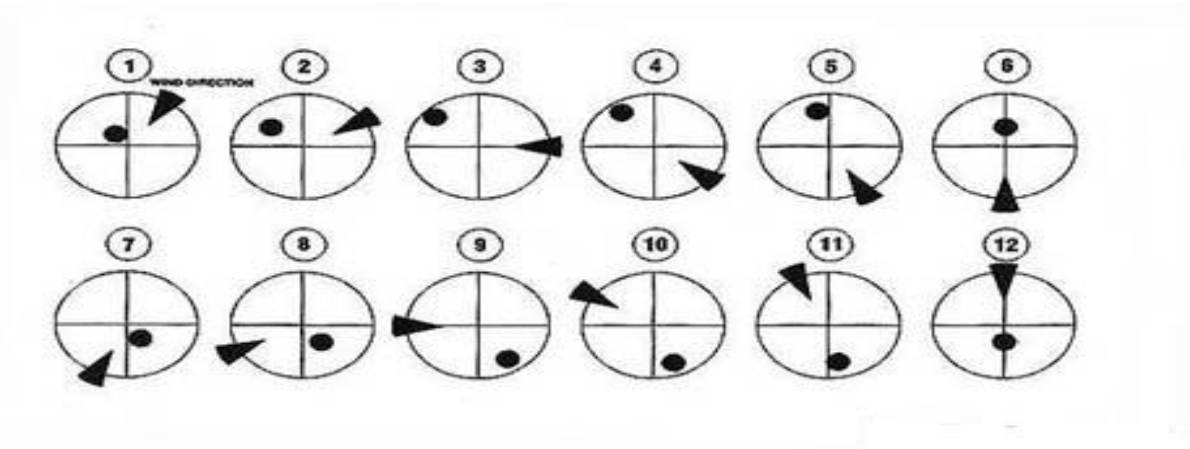
Benchrest shooters, who shoot a string of 5 rounds in 7-10 minutes (or 10 shots on record in 12-15 minutes for score shooting) often will shoot several sighters in 2 or 3 different wind conditions in order to learn the effects of the wind during that string. They

often return to the sighter target to verify the effects of a certain wind condition or to estimate a new condition. They will generally shoot their shots on record very quickly in order to capitalize on a wind condition for which they already have information from sighter shots. They also typically shoot in a rising wind rather than a waning wind or no wind. A rising wind is more even and predictable and will last longer. Sometimes they run out of time and then have to finish their string in wind conditions for which they have not shot sighters - discomforting but still manageable based on their experience.

As an aside, it is better to learn to adjust your sights than to holdover because this gives you an objective count of “clicks” and MOA. This is essential for repeatability. Holding over (Kentucky Windage) is less objective - more of an “art” that has more subjective error and is more difficult to reliably repeat - especially for a new shooter. At the same time, it must be said that many shooters hold over very successfully from time to time. F-class shooters and benchrest shooters will often hold over when adjustments are not very large - do it enough and you’ll eventually get good at what you’re doing. Keep in mind, though, the larger the hold-over, the larger the chance of error.

WIND-VECTOR EFFECT

Below are some diagrams that show where a bullet (black circle) will cut the target given certain wind directions (black triangles). Numbers refer to wind-clock directions.



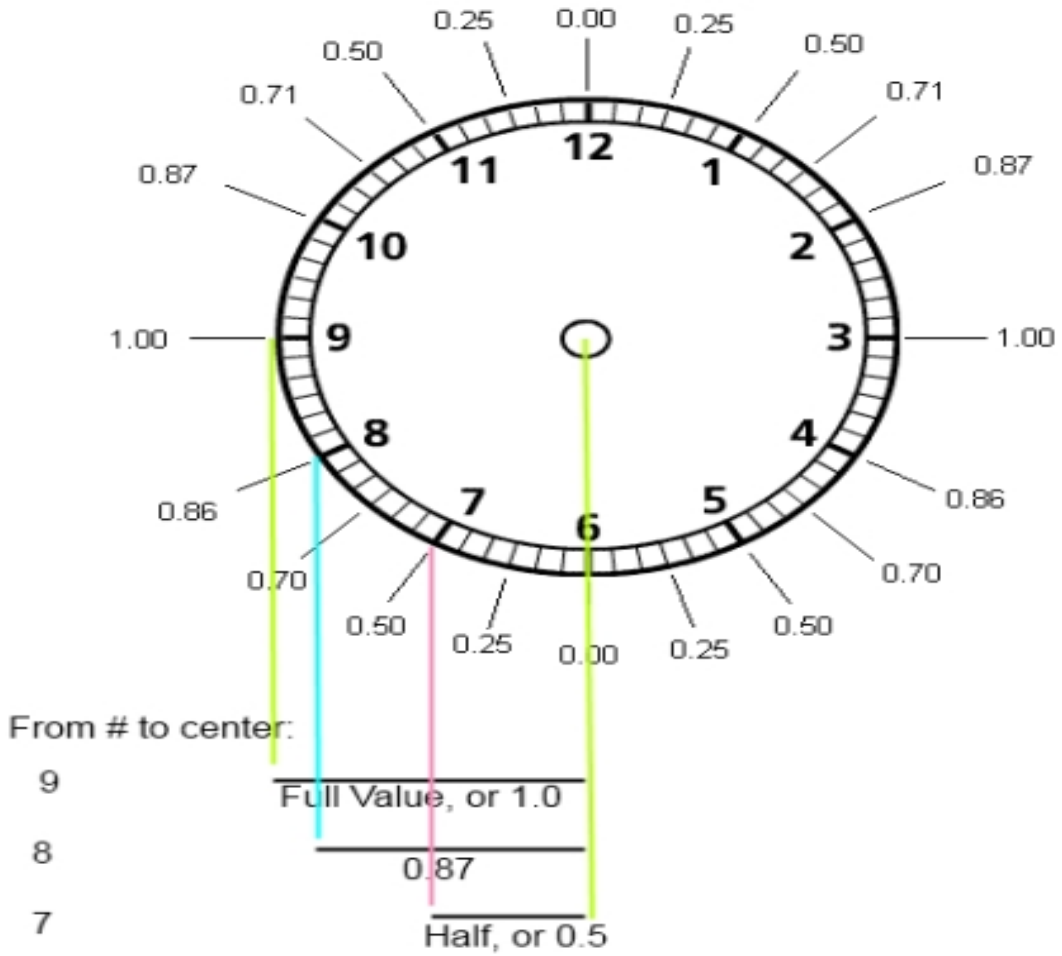
So air that blows from 12 or 6 o'clock will not move the bullet laterally. Because of

other factors there will be a movement up or down. Typically a 12 o’clock wind will move the bullet down a bit while a 6 o’clock wind will move the bullet up a bit. A shooter might make some adjustment in longer ranges but adjustments for 50 meter rimfire would be quite small and corrections are not generally necessary for 100 meter centrefire.

Obviously, air that is moving from 3 o’clock will push the bullet towards the left while a 9 o’clock wind would do the opposite. Again other factors are involved so a 3 o’clock wind actually moves the point of impact left and a bit up from the point of aim - to the 10 o’clock position. A 9 o’clock airflow will do the opposite - it will cause the bullet to move right and down from the point of aim - to the 4 o’clock position.

THE AMOUNT OF A CORRECTION

When the wind comes from different points around the clock, it has a greater or lesser effect on where the bullet finally strikes the target. Below is a diagram of the wind clock - we have added the value of the correction that corresponds to direction of the wind.



Three and 9 o’clock winds need a full windage correction expressed as a “times 1.00” or “Full Value” or 100% correction. Six and 12 o’clock winds have no lateral drift effect and so do not require a windage correction - hence 0.00 or “No Value” or 0% correction.

Winds out of 2, 4, 8 and 10 o'clock are fairly close to the 3 to 9 o'clock axis and require a correction from "times 0.70 to 0.86". This may be rounded off from "times 0.70" to "times 0.85" or anywhere in between. I usually apply "times 0.75" or "3/4 Value" or 75% correction.

Finally, winds that arise out of 1, 5, 7, and 11 o'clock are closer to the 6 to 12 o'clock axis and need "times 0.25" to "times 0.50" correction or anywhere in between - again I usually round out to the higher value - "times 0.50" - that is "Half Value" or 50% correction.

Here's a thought. You may round out these numbers in a way that works best for you - perhaps you tend to over-correct so you may wish to round to a lower value. I tend to under correct so I use a larger value. In shooting, as in so many other things in life, do what works best for you. What I say here or what others suggest may be worth a fair try but it must work for you or you will abandon it. Give these numbers a try - they will put you close to the centre of the target. Then use your sighter shots to refine the correction.

The amount of windage correction that is needed is expressed in Minutes of Angle (MOA). One MOA at 100 yards is about 1 inch, at 200 yards one MOA is about 2 inches, at 300 yards one MOA is about 3 inches and so on. These numbers are really close to actual values which are very slightly larger but most shooters are happy to use them rounded off to whole inches. Talking in terms of MOA is most useful if you shoot ranges of different lengths - especially the longer ranges - after all one MOA at 300 meters subtends the same angle as one MOA at 900 meters. If you only shoot fixed distances - eg., rimfire benchrest at 50 meters or benchrest at 100 meters - it is just as useful to talk in terms of inches.

VELOCITY OF THE WIND

So we have seen that the Direction of the wind determines some of our corrections. Now it's time to consider the Velocity or wind speed. We have seen how wind can push a bullet along - left or right - away from the aiming point and now we need to know how much in inches or in MOA the bullet will be pushed across the target face. How much the bullet is pushed by the wind, or "wind-drift" is the distance between where we expect the bullet to hit (usually the aiming point) and where it actually hits (the point of impact). This assumes that we have done everything else right and the drift is only due to the wind.

Obviously, the faster the wind speed the more the air mass will move laterally and the more a bullet will be pushed to hit the target left or right of where we aimed. We assume again a "simple wind" - constant and consistent air flow across the range. We all realise that the effect of the wind speed is going to show up most with air that moves along the 3 to 9 o'clock axis. So a 3 or 9 o'clock wind is going to move the bullet the most - requiring a "Full Value Correction".

By the way, bullets don't actually get pushed over by the force of the wind on their sides the way a leaf might be moved across a puddle by the wind. When a bullet leaves the muzzle, it quickly points slightly into the wind and the different effects of air on the nose and the base cause it to move in the direction of the base. A good reference for this is found at this address http://www.gsgroup.co.za/winddrift.html

NATURAL INDICATORS OF WIND SPEED

If you dislike carrying or using wind flags and prefer to use natural effects as evidence of wind direction and speed, the following indicators may be of some help to you.

TABLE 1: Natural Indicators of Wind Speed

1-3 mph: Barely felt on face/slight cooling. May see drifting smoke rise straight up to slight drift, light grass movement or only a few leaves in motion

1-5kph

3-5 mph: Wind pressure felt lightly on arms and face. Grass obviously in motion. Leaves rustle. All leaves on a given tree moving, twig and branch tips beginning to move

5-10kph

5-8 mph: Wind pressure clearly felt on face. Twigs and branch tips move. Whole branches start to move. Leaves flip over on windward side of tree.

10-15kph

8-12 mph: Raises dust and loose paper. Smaller branches clearly in movement. Tree tops begin to move at 8 and move clearly at 12.

15-20kph

12-15 mph: Wind pressure is felt against body. Larger branches move.

Bushes sway. Lighter debris moves on the ground

20-27kph

15-20 mph: Small trees trunks sway. Larger debris moves on the ground

Dust clouds form.

27-36kph

20-25 mph: Large tree trunks sway. Difficulty walking. Wind whistles.

Spray blown up on water.

36-45kph

25-28 mph

This article may interest you - it is oriented to wind doping in hunting situations using the natural indicators above http://artoftherifle.blogspot.ca/2012/01/shooting-in-wind.html

The author also uses some “high-tech” stuff to help him. Here’s another author who uses natural indicators of wind speed but comes from a sniper’s background http://www.snipersparadise.com/bits-o-wisdom/basics/71-reading-wind-there-are-no-flags-on-the-battlefield

100 METER CENTREFIRE CORRECTIONS

Let's consider shooting in air that moves along the 3-9 o’clock axis and that we are using wind indicators made out of surveyor’s tape - you know the orange ribbon that is fairly thick and not very sensitive to light winds and too sensitive for strong winds but is not too bad for medium winds and is found on every range.

Let’s talk about 100 meter centerfire shooting first. At about 4 mph the tape will be about ⅓ of the way up from vertical or about ⅔ of the distance from horizontal. This has little effect (about ⅛ of an inch of drift) on a centerfire bullet at 100 meters. Double that to about 8 mph and the tape will be about ½ of the way up or a little more, from vertical and will wave slightly. At 8 mph the bullet will be moved about ¼ to ⅓ of an inch at 100 meters. At 12 mph, the flag will be mostly horizontal and will wave briskly and steadily and move the bullet at least ½ inch (1/2 MOA) at 100 meters. The flag is much less sensitive at 16 mph but will be horizontal and snap strongly and the bullet will be moved about ¾ inch. At 20 mph it will be moved 1 inch off the point of aim but the tape is not very useful as an indicator now.

This is a bit of an aside. If you want to learn to shoot accurately in the wind, you have to have reliable wind indicators - ones you have gotten used to and have come to use successfully. Make yourself some flags or buy some. Each time you practice, shoot over your flags and get accustomed to what they tell you. Start with one or two spaced equally down the range and make sure you can see them with your non-dominant eye. Yes, shoot with both your eyes open so you can see any changes in conditions before the trigger breaks. This is much more comfortable and has saved many shooters from serious point loss. The flags are a tool and are only as good as the skill with which you can use them. Without indicators (flags, daisy wheels or natural) you are quickly lost.

Another aside. Most people have a very difficult time judging the velocity of the wind with flags or natural indicators. There are reasonably priced wind speed indicators (the Kestrel line is well rated) that are available from most shooting supply places. These devices will give you accurate readings of wind velocity when you can use them. Most shooting rules prohibit their use at the firing point while you are shooting but OK their use before or after you shoot. They are reliable indicators with which you can develop your skill in calling wind speed - you can learn to compare wind speed on the indicator with natural indicators.

FULL BORE/ LONG-RANGE CORRECTIONS

In Full-bore and High-power shooting, ranges include 300 to 900 meters.

The same winds will obviously have a much greater absolute effect on a bullet at 900 meters than on one at 300 meters. A number of factors are at play here - the length of time a bullet is in the air, the velocity of the wind and the “slippery-ness” of the bullet expressed in BC (Ballistic Coefficient). The longer a bullet is in the air, the longer the wind drift forces can act on the bullet. Secondly, the velocity of the wind has a direct multiplying effect on the bullet. A wind at 10 mph will need about 10 times the correction

of a 1 mph wind, and a 6 mph wind will need about ½ the correction of a 12 mph wind. Finally, the ballistic coefficient is the most important single factor in long range bullet flight in the wind. Assuming the same muzzle velocity, a bullet with a higher BC will be able to fly with less vulnerability to wind effects and will arrive at the target hitting closer to the point of aim with less correction.

This is another topic, but it is also important that a bullet's velocity remains above the sound barrier for its entire flight to the target face (speed of sound is Mach 1 and is dependent on elevation and atmospheric conditions). Some writers recommend that for long range shooting you would develop loads that are at Mach 1.2 or greater when the bullet cuts the target and then you won't have stability problems. Important for stability is that the bullet retains its super-sonic flight all the way to the target. This is where ballistics charts and calculations come in handy**. (Note 2)**

Let's take a look at the correction value for bullets that are not very "slippery" - that have a bit lower BC. An example would be the .308 caliber Sierra 155 grain HPBT bullet that is so often shot and works well enough in fullbore shooting. It has a BC(G1) of .450 and if it is loaded to leave the muzzle at 2800 fps, its velocity will be about Mach 1.2 at 700 meters and it will still be supersonic (about 1180 fps) at 900 meters. If you increased the velocity to 2900 fps (be careful and watch for pressure signs), it will reach Mach 1.2 at about 800 meters and will also be supersonic (about 1230 fps) at 900 meters.

Another example of a bullet that is not very "slippery" is the .224 caliber 80 grain Sierra HPBT. It has a BC (G1) of .420 and can be loaded to 2950 fps (again watch for pressure signs). At 750 meters it will reach Mach 1.2 and will still be supersonic (about 1185 fps) at 900 meters. The following chart shows the corrections required at

distances from 300 to 900 meters and for winds that range from 1 mph to 20 mph. Thes e numbers are averages for several bullets with a BC in the .400 to .450 range - ie. the not-so-slippery-ones.

TABLE 2: Full MOA Correction at Several Distances and Wind Speeds for "Not-so-Slippery" Bullets

	1 mph	2 mph	4 mph	6 mph	8 mph	10 mph	12 mph	15 mph	20 mph
300m	.2moa	.5moa	1.0moa	1.5moa	2.0moa	2.5moa	3.0moa	3.7moa	5.0moa
500m	.5moa	.9moa	1.8moa	2.8moa	3.7moa	4.6moa	5.5moa	6.9moa	9. 2moa
600m	.6moa	1.2moa	2.3moa	3.5moa	4.7moa	5.8moa	7.0moa	8.7moa	11.7moa
800m	.9moa	1.7moa	3.5moa	5.2moa	7.0moa	8.7moa	10.4moa	13.0moa	17.3moa
900m	1.0moa	2.0moa	4.1moa	6.2moa	8.2moa	10.3moa	12.4moa	15.5moa	20.5moa

Here are a couple of examples of how you would read this table:

1. For a lower BC bullet at 300m, a full value correction of 1.0 MOA is needed in 4 mph winds,
2. For a lower BC bullet at 800m, a full value correction of 10.4 MOA is needed in 12 mph winds.

Correction values for bullets that have a higher BC and which are therefore more "slippery" in the wind, will be smaller. At milder winds and at shorter ranges, the effects are hardly noticeable but in conditions with stronger winds the differences in performance between "slippery" and "not-slippery" bullets is quite remarkable. Our largest example of this is at 900 meters with a 20 mph wind where 6.5 MOA (that's 58 and ½ inches!) less correction is required for high BC bullets.

Examples of bullets that are more "slippery" include the .224 caliber Berger 90 grain VLD Match which has a BC(G7) of .281 and which exceeds Mach 1.2 at 900 meters if it is loaded to 2800 fps at the muzzle. Another good example is the .308 Caliber Berger 185 grain Hybrid Match bullet which has a BC(G7) of .291 and which, if loaded to 2700 fps will also exceed Mach 1.2 at 900 meters. The next table shows the same full value MOA correction for ranges from 300 to 900 meters and with wind speeds of 1 mph to 20 mph.

TABLE 3: Full MOA Correction at Several Distances and Wind Speeds for "Slippery" Bullets

	1mph	2mph	4mph	6mph	8mph	10mph	12mph	15mph	20mph

300m .2moa .4moa .7moa 1.1moa 1.5moa 1.8moa 2.2moa 2.7moa 3.7moa

500m .3moa .7moa 1.3moa 2.0moa 2.6moa 3.3moa 3.9moa 4.9moa 6.6moa

600m .4moa .8moa 1.6moa 2.4moa 3.2moa 4.0moa 4.9moa 5.1moa 8.3moa

800m .6moa 1.2moa 2.3moa 3.5moa 4.7moa 5.3moa 7.0moa 8.7moa 12.0moa

900m .7moa 1.4moa 2.7moa 4.1moa 5.5moa 6.8moa 8.2moa 10.3moa 14. 0moa

You would read this table in the same way as the one above except that it is for bullets with a higher BC.

Wind speed is estimated from the angle of the wind flags that are about mid-range. A general rule of thumb is that the angle that the bottom of the flag makes with the pole divided by 4 gives an estimate of the wind speed. So a flag that creates a 15 degree angle with the pole indicates 3-4 mph; a 30 degree angle is 7-8 mph; 45 degrees indicates 10-12 mph and 60 degrees is 15 mph. Faster winds make the flags less useful. You will often use natural indicators as well as wind flags to estimate wind speed. In Full-bore, long-range shooting you have 45 seconds to release your shot after your shooting partner's shot has been scored. This forces you to attend to the wind fairly constantly, to make frequent adjustments in your estimates of wind direction

and

speed and to make the necessary sight correction before you concentrate on releasing your shot. (**Note 1)**

In order to make a windage correction you will need a combination of wind speed and direction, as well as the Full Value correction figures from the charts above. So you are combining the values of the charts above with the correction factor in the wind clock further above - “100% - 75% - 50% - 25% or 0%” - or whatever you have decided is appropriate for you. You first need to identify your bullet type - lower or higher BC and apply the right correction value chart. It would probably help to make your own chart copied on a recipe card so that you can bring it to the range. You can round out the values to make calculations simpler. The numbers will put you close to the centre of the target and then you can use your sighter shots to refine the corrections on your sights.

Suppose, shooting at 300 meters you have a fairly light wind that is coming down range straight towards you from the targets. The wind flags are pointed about 1/2 down (at about 45 degrees) indicating about 10-12 mph. You would enter no correction because a 12 o’clock wind has 0% value. You take the shot and it falls low in the V-bull. Good shot!

At another time, shooting 185 Berger Hybrid Match 308 cal. bullets at 600 meters, you feel a fairly strong wind on your left cheek and it is rustling leaves in bushes, small twigs and branches and some tree tops. The wind flags close to you are about 2/3 down from horizontal (about 30 degrees up) and are pointing towards 4 o’clock. This approximates an 8 mph wind from 10 o’clock. Your correction value is 3.2 MOA X .75= 2.4 MOA. You enter the correction on your scope/sight and fire your shot. You have adjusted the point of impact 2.4 X 6 = 14.4 inches to the left. (At 600 meters 1 MOA = 6 inches). Your shot falls into the 5 ring about ½ inch from the V-bull at 3 o’clock and in

the middle (on the waterline). If you had scanned the entire range before taking your shot, you would have seen that 2 flags closest to the target had begun to float up a little and at the time that you broke your shot, they were indicating a 10 mph wind. A slightly larger correction would have been needed for a hit inside the V-bull.

Finally, suppose you are shooting at 800 meters in a prevailing 3 o'clock wind. You are using your .223 with a good load behind Sierra 80 grain HPBT bullets. It is your turn to shoot and you notice the wind has shifted to about 2 o'clock. You quickly calculate that a 2 o'clock wind with 45 degree flags (12 mph) would require a .75 X 10.4 MOA correction and so you adjust your scope 7.8 MOA to the right. You settle in to shoot and just before you are ready to fire, you notice that the wind has switched back to 3 o'clock. What's more, 5 of the flags on the range agree while those in the middle of the range are hopelessly twisted around the flagpole. You realise you will need a full correction so you quickly add another 2.5 minutes to your correction and shoot in this wind condition. You are a bit worried and wonder if you should have made the additional correction. When the target is again visible the marker is a little bit high in the 5 ring - hooray - a good call and a good shot! You forgot, though, that a 3 o'clock wind will push the bullet left and up.

50 METER RIMFIRE CORRECTIONS

So now we are ready to consider rimfire shooting in the wind. I find this most challenging - a long term learning. My hat's off to those who can shoot rimfire consistently well in the many different and difficult conditions mother nature offers us in New Brunswick - especially those who can do so on several different ranges and over 100 as well as 50 meters. Rimfire shooting is where shooting over wind flags is essential if you want consistent results and match success. Let's see what happens in rimfire shooting in the wind.

As the illustrations of the targets below show, wind drift is much more dramatic with .22 target shooting. These illustrations assume a 3 o'clock wind that is consistent over the 50 yards. At 2 mph the point of impact is moved 0.2 inches; at 4 mph this increases to 0.4 inches; at 6 mph this increases to 0.6 inches; at 8 mph this figure is 0.8 inches and at 10 mph this increases to 1 full inch. A 12 mph wind would move the bullet 1.2 inches while a 15 mph wind will push the bullet a full inch and a half. Note that the actual point of impact also rises pretty dramatically to 10 o'clock. A 9 o'clock wind would have the same values but the actual point of impact would be quite a bit lower and to the right - at 4 o'clock.

Since we generally shoot at 50 meters in New Brunswick, the actual wind drift values are going to be somewhat greater. (The difference between 50 meters and 50 yd. is 12. 5 feet - a little over 4 yards). This results in an 8% increase in wind drift for 50 meters). At 2 mph the wind drift is actually .22 inches and at 10 mph it is actually 1.1 inches.

It is clear that with such dramatic wind drift, careful attention to wind indicators and the ability to wait for the same wind condition is of great importance. I have noticed that

many rimfire shooters shoot quickly through the first half of the relay. They then slow do wn and begin to take more care but have as much as 10 minutes left when they finish. It seems to me that those that use a timer, pace themselves more evenly, will often have only a minute or two left, and more importantly, seem to shoot somewhat better scores.

You have your rifle zeroed in calm conditions.

According to the Bernoulli Effect, or some other mysterious force . . .
If the barrel has a right hand twist, and almost all have:
A wind from the right will force the bullet up to about 10 o'clock.
A wind from the left will forced the bullet down to about 4'oclock.
If you don't believe that: Just remember that bumbelbees can't fly either.

IF the wind is constant over the whole distance to a 50 yard target, you might consider the values shown here as probably being close.

A wind from 10, 1, 5 or 7 o'clock will drift the bullet half as much.

IF you can guess the average velocity of the wind, based on what you see 3, 4, or 5 wind flags doing: You are a better man than I am.

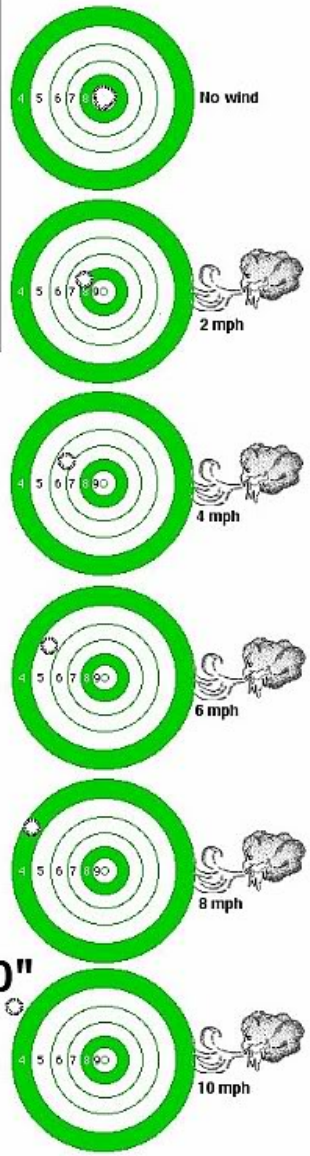
I'm a Wind Probe convert, and I use two of them.

Joe Haller (Mr. Frosty)

The USBR target at 50 yards in the wind

10 ring = .10"

2mph = .2" drift
4mph = .4" drift
6mph = .6" drift
8mph = .8" drift
10mph = 1.0" drift



COMPLICATED WIND PATTERNS

So far we have considered a “simple wind” and the effect it has on the path of the bullet to the target. We have adjusted our sights to correct for the direction and the velocity of the wind and as long as things don’t get too muddied we’ll do OK. We’re reasonably good shooters so we are consistent in our form and trigger release, we watch wind indicators and wait for the same condition to reappear before we commit ourselves to the shot. We do reasonably well most of the time except when wind conditions are more extreme or complicated.

As we have said before, winds twist and turn, eddie and snake, rise and wane and may drop off completely. The main rule of thumb for shorter ranges and benchrest shooting is to try to shoot in the same condition each time.

In order to identify the same condition you will likely have to use more than one indicator. While it is true that more indicators provide more information and that this may lead at first to information overload, it is the only way to “see” what the wind is doing down the range. It takes practice shooting in the wind and shooting over your flags to become more sure and fluid with all this. Start with one flag and put it about ⅓ of the way down the range between the muzzle of the rifle and the target where you can see it with your non-dominant eye. Don’t put it too far off to one side as the wind may be different there. You want to know what is happening with the wind in the path of your bullet.

When you are comfortable shooting with one flag, add another about ⅔ of the way to the target. Take the information from both and make a mental picture of what a thread or a string fixed at your shooting position and hovering in the wind might be doing. Try

to assign a correction value to the information from each flag and then combine/ average the result. Decide which flag, if any, is more important. You can give a bit more value to the flag you believe is more important for that wind condition. At first this may be slow and tedious but after a bit you will become more automatic in the decisions you make. Always try to shoot the same wind. In time you can add as many flags as you are comfortable with.

There is a bit of a debate about which flag is more important in developing a wind correction - those that are near the shooter, those further down the range or none. Some people argue that moving air has the same effect all the way to the target while others tend to think that wind effects closer to the muzzle have a greater down range effect. My view on this is that if I'm dealing with a fairly simple wind, each flag has about equal value. If the wind is more complicated, it is more confusing to me and I assign more importance to flags closer to me. A push on the bullet closer to the muzzle will subtend the same angle all the way to the target which to me means a little nudge at the muzzle will grow into a larger effect at the target. If there are conditions, (eg. a flag or two down range pointing in the opposite direction) that appear to cancel this effect, I will reduce the correction. Generally though, if I know what the bullet will do in a couple of wind conditions and I have sighters to rely on, I will wait for the condition to return. In

benchrest shooting I will often use the flags not so much to figure out an absolute correction but to identify the wind condition I want.

This is true of 100 meter centerfire shooting and 50 meter rimfire shooting. Long-range shooting is different in that you have less time to wait for a wind condition. Here it somet imes “works” to wait for a repeating wind condition but most of the time you will have to figure out the absolute correction for each shot. Nothing sharpens the thinking process as having to become committed to a decision about a correction in a short time and under pressure and then to shoot that correction. Feedback is almost immediate - good for learning. Needless to say, most of the time during the 12 or 17 round relay is spent in following the changes in the wind in addition to recording scores, wind calls and hits.

Something to think about. In benchrest style matches, I have noticed that many shooters use their sighters to “sight in” their rifle at the match. If you’ve had some bad luck with your equipment or have had to replace a scope you may have to do that. Generally though, you should have a “no wind” zero on your rifle before you come to the match and use the sighters to see what actually happens in a couple of repeating wind conditions. Based on this information, you decide on the amount of the correction. Before you shoot or even when you are waiting for your relay to shoot, look at the flags and determine ahead of the match what wind conditions tend to repeat - this practice may also be useful in long range matches. When you shoot your sighters, shoot 2 or 3 shots in wind conditions that you have already identified are repeating. After the match, return your sights to the “no-wind” zero because the next time you shoot it will all be different again.

RECORD KEEPING

In order to learn from your shooting in the wind it is important to keep records of all shots fired in the wind. You will want to review your shooting afterward and draw conclusions from your notes. This is easier to do during practice and only a little less easy but still very possible during match conditions. It is possible to develop a routine in which recording information is a natural part. In the real world, an average shooter may not shoot many practice shots aside from sighting in/zero-ing and the shots fired in developing a load or two. It then becomes essential to keep good records during matches - especially those matches that are less important for competitive standing.

You will have to decide what information you can comfortably collect while shooting but certainly a record of the load, chronograph readings if you took them, number of rounds, and details of the location should start the list. Also record any other equipment that you have used - front rest/bipod, rear rest, shooting bench, personal gear and padding - during the shoot. It is very different to shoot from a bench than it is to shoot prone. If the rifle is intended for prone shooting it would be best to shoot it prone and have all the records pertain to prone shooting after basic load development is done.

Record what you think you will need of date, time of day, location of the sun, prevailing wind, temperature, precipitation, humidity, elevation, barometric pressure, and mirage.

Record the settings on your sights or scope and any changes you make to the sight settings. With respect to the wind, record the direction, velocity and the correction estimation you used for each shot (the call/ point of aim) and also where the shot cut the target (actual/point of impact). If your point of aim deviates from a center hold (i.e., you held over) then record that as well. From where the shot hit, you can determine the ideal wind correction that would have put the bullet in the center of the target. Also record if the shot was released cleanly or whether you were uncomfortable, or distracted or the rifle moved during the shot or anything else that may have affected the shot. If you have confidence in the shot then the difference between the call and the actual shot can teach you much about wind correction for the next shot. Good records also will help determine where you might want to focus your learning.

REFERENCES

Here are some references for further reading if you are so inclined:

- Fundamentals of Wind Doping by Tom Guerin
- The Wind Is Not Your Friend by Doug
- Doping the Wind by Bart Bobbitt
- Reading the Wind by Emil Praslick III
- Wind Drift by Gerard Schultz
- Horizontal Wind Drift vs Distance: The rule of square
- Vector Wind Effects for Right Hand Twist Barrels by TMT Enterprises
- Art of the Rifle:Shooting in the Wind by Rifleslinger
- Reading Wind: There are no Flags on the Battlefield by Flea

Also a couple of books:

- The Wind Book for Shooters by Linda K Miller and Keith A. Cunningham
- Applied Ballistics For Long Range Shooting by Brian Litz

Note 1: If you have no flags available and if you find the natural indicators difficult to read, there is another method that will allow you to estimate wind velocity. Stand on the firing point and allow a small leaf or piece of paper to fall from shoulder height and in the direction to which the wind is blowing. Without moving your feet point at the leaf or paper you have dropped. The angle between your arm and your body is an approximation of the angle of a flag on that range and at that moment. Also, keep in mind that this estimate is not made in the bullet's path and applies only to the firing point.

Note 2: Another tried and true method for estimating the approximate required MOA windage correction has been used since the early days of target shooting with the 30-06 cartridge. It uses a formula that considers the range in yards and the speed of the wind in mph.

$$\frac{\textbf{Range in yards}}{\textbf{100}} \times \frac{\textbf{Speed in mph}}{\textbf{Constant}} = \textbf{MOA Windage}$$

The **constant** varies depending on the range: 100yd to 500yd = **15**

600yd = **14**

700yd = **13**

800yd = **13**

900yd = **12**

1000yd = **11**

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