Wind Calling - RAGS/10A

"But I have a Kestrel"
A Kestrel is a very accurate spot wind speed measuring device; you open the impeller housing and point in the direction of the wind and you get a value (13.4mph say). However, it requires time, effort, and training to efficiently scroll through the options, input the correct values, and eventually spit out a wind solution. Sometimes the wind will have changed in this amount of time, sometimes your RO will inform you "you've run out of time, maggot!" - but it does work and when used correctly can be a useful tool.

What if you don't have a Kestrel though? What if it ran out of battery? What if you were just using it to nail in that last step of your sweet new treehouse? Well then you need another method.

You can guesstimate what the actual wind speed is based on what you see around you. Some PRS shooters tie a piece of ribbon to their tripod and use that as an indicator. Some venues have a wind flag onsite that everyone can see. Mirage is another way of guessing (or confirming) a wind speed. There are charts out in the ether that tell you what to look for in your surroundings and then gives a corresponding wind speed based on those observations (for instance - if a nearby house was just lifted off the foundation and it was all pixelated and in black and white, you may be on the set of *'The Wizard of Oz'*). There are a plethora of tools one can use to determine wind speed, but they all fall into one of two baskets; either you use your eyes/experience and guesstimate, or you use a purpose built instrument.

First I'll start by saying that wind calling is an art not a science. There is no magic tool that will eliminate the usefulness of a well-trained, seasoned wind caller. That aside, we can use tools like Kestrels and wind roses to hone our own skills and get acceptable approximations of how the wind will move your bullet on a given shot. The following is a breakdown of how I was taught to interpret wind; after that I'll describe what I believe to be a simpler and more accurate method - maybe old dogs don't like new tricks, but I encourage all of you to give it a *shot*!

Determining a Wind Solution:

1). Distance to Target

Using a 'schmedium'-sized caliber (.24-.31 caliber), under 1000 yards, wind is rather linear in its deflection of a bullets path (past 1000yards wind becomes more exponential in nature due mainly to slower bullet speeds, so more care is necessary). Regardless of that, it is obvious that range to target plays a large role in what your total wind call ends up being. Because there are much fewer potential 'answers' than there are combinations of range/wind speed/etc., it's normally only necessary to know distance to target to the nearest 100yd interval. In some circumstances 50yard intervals become necessary. When that is the case (inside 1000 yards) you can essentially just estimate half of the 100 yard step value because of the linear nature at those ranges. Since you need distance to target in order to determine your vertical solution (DOPE) you almost always will already know your range before even contemplating the corresponding wind solution.

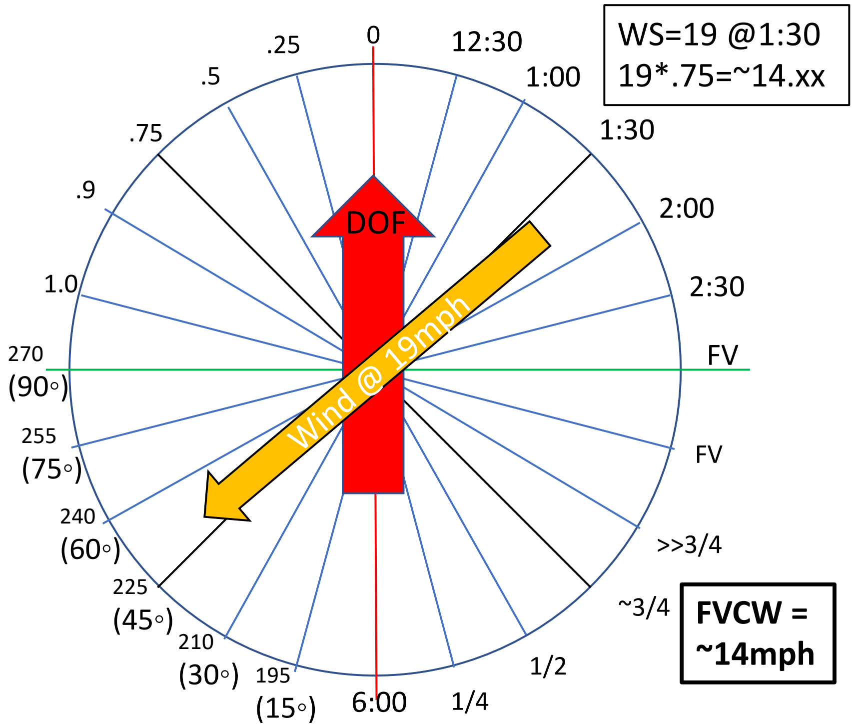
2). Wind Speed

The next thing most people want to know before making a wind call is what the current wind speed is. Some manicured ranges have optimal configurations with a plethora of wind meters, but in most cases you will only be able to accurately measure the wind's speed at your location. Wind is rarely a static beast - not only can it be gusting at your face while simultaneously being completely still 200yds downrange, it can also have vertical variations. Wind at the ground will almost always be slower than wind 30ft high, and that trend extends the higher off the ground you get - this can be especially confusing when you have a lot of trees around you and/or a valley between you and the target (shooting mountain top to mountain top). So in most cases <1000 yards your best bet is to get the best idea of the wind at your position. Additionally, the further out you go the lower your probability of a first-round, successful wind call becomes because of the inherently dynamic nature of wind (or pressure differentials). With training (and/or faster, higher BC bullets) you can stretch your abilities, but as a baseline I strive for >50% first round wind calls in winds up to 25mph and that puts my [acceptable range] inside 1000 yards.

3). Wind Angle (relative to DOF)

The most common system I know of for determining wind angle and its corresponding value (%) needed to accurately describe that wind as a standardized full value crosswind (FVCW) is currently done using a clock system for direction, and a quartering (X/4) system for calculating the corresponding FVCW values of a wind relative to your DOF. The direction of a given wind is hard to describe with less than 10 degrees of resolution - again relating back to wind being inherently dynamic in nature. Because the corresponding angular value (%) is based on a cosine function (not linear), accurately describing the angle of a wind is less important for winds coming from 2:00-4:00 or 8:00-10:00 (closer to green line below) than it is for 10:30-1:30 or 4:30-7:30 (closer to red line below). Fun fact a wind from 8 degrees (~10%) to 22 degrees (~40%) has an angular value range of ~30% and as wind speed rises and distance to target increases this discrepancy magnifies and (assuming everything else is perfect) can itself cause a complete miss, from a <15 degree shift in the angle of the wind and/or direction of fire (for a reference 30min on a clock = 15 degrees). This becomes more applicable with 2+ targets but still illustrates how easy it is to make an incorrect wind call from a minor error in the wrong place.

[Wind Speed][Wind Angle] = FVCW*



4). Gun Number

The gun-MPH (G#) system is gaining popularity for converting that FVCW value into an actual angular value that you can measure and account for using your scope (wind call). The G# system helps the mental-flow between determining a crosswind speed and turning it into an actual wind call. A G# is specific to each [gun system] - it incorporates bullet weight, barrel length (MV), and BC. To find your G# you can get close by simply taking the first number of your G1 BC (.523 ~ 5mph gun, .697 is likely a 7mph gun but may act like a 8mph gun at higher DA or a 6mph gun if you have a short barrel at low DA). To get a more accurate G# you can take your favorite ballistic solver, enter in your [gun system] details, true the MV and BC to accurately reflect your bullets vertical path. Once trued simply enter a 90 degree wind at say 600yd and tune the wind speed until the windage output by your solver = 1/1000th the range entered (i.e. for 600yd 0.6mil, 400yd 0.4mil, etc.). The wind speed that gives you that relationship is your G# (note this is a fairly constant value and only extreme DA changes will alter that [gun system's] G#). If you adjust the DA to the extremes you are likely to encounter you can calculate and make note of exactly when to expect a change in your G#. *****Another way to eliminate all deviations is to normalize your DA and use that DA value to determine G#; that way it's never that far off, conversely it will rarely be exactly correct. But because wind calling is an art I've found that eliminating possible changes is more advantageous than increasing mathematical accuracy to that degree (a 0.6mil wind call instead of a 0.5 is well within my margin of error at least); if you want ultimate mathematical accuracy you will need to manage more moving parts, and once you go past 1000 yards it may be more advantageous to do things that way. For me, inside 1000 yards, I normalize my DA and stick with a single G#.

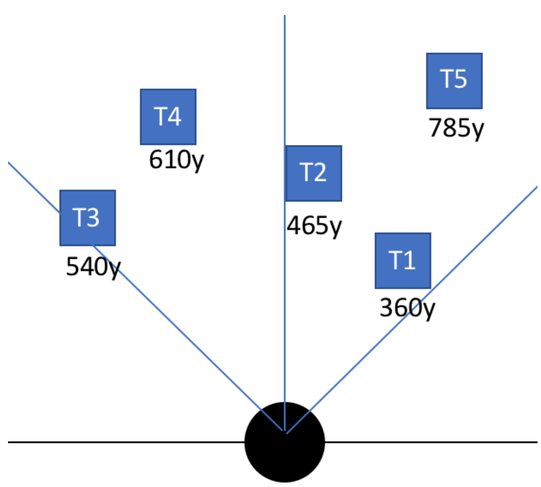
6mph gun	Bracket 1	Bracket 2	Bracket 3	Bracket 4	Bracket 5	
Yardage	**FVCW = 6**	**12mph**	**18mph**	**24mph**	**30mph**	**Delta**
100	0.1	0.2	0.3	0.4	0.5	***0.1***
200	0.2	0.4	0.6	0.8	1	***0.2***
300	0.3	0.6	0.9	1.2	1.5	***0.3***
400	0.4	0.8	1.2	1.6	2	***0.4***
500	0.5	1	1.5	2	2.5	***0.5***
600	0.6	1.2	1.8	2.4	3	***0.6***
700	0.7	1.4	2.1	2.8	3.5	***0.7***
800	0.8	1.6	2.4	3.2	4	***0.8***

[FVCW] @ [given range] = [Wind Solution] according to the above table

Issues
However there is still some areas where the G# system could be improved upon for 'on the firing line, under stress' situations where you have several things to consider simultaneously -

For instance, if I have the wind described in 3). above (WS=19mph, @ 1:30) - what is the wind solution for a target 765 yards away? It requires a bit of mental math and guessing because of cosine angle, the fact that 14mph FVCW is not specifically enumerated in G# table, and the 0.7-0.8mil spread between brackets.

In your head this can make you second guess yourself, have to double check your math. If you write it down on a piece of paper in front of you that's time elapsed which can lead to a rushed shot or a change in the wind perhaps. Now do that for multiple targets on a stage for instance (shown below).



***Don't get me wrong it is a useful system; however it could be better….**

RAGS/10A:

R = Range to Target
A = Wind Angle
G = Gun MPH or G#
S = Wind Speed

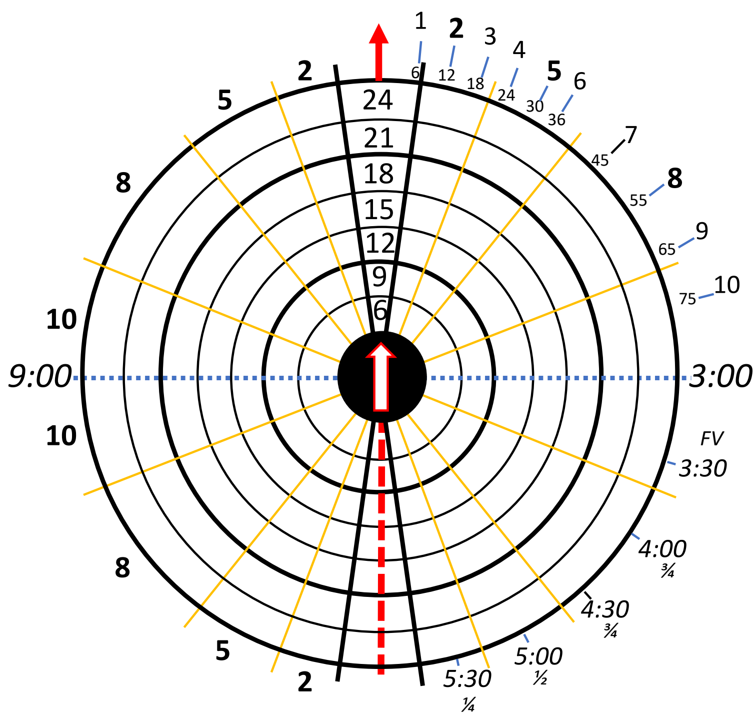
[R]*[A]*[(S/G)] = Wind Solution

Range to target of 765yd can be rounded up to 800 or "8"
Wind speed of 19mph is then [inversely-rounded] down to 18mph for ease

Ex 1).
[(8*3/4)]*[(18/6)] = 6 * 3 = 1.8+mil

(since we know the answer will not be .18 given the inputs and won't be 18 ever really).

However this method also has some drawbacks - 2-3 multiplication functions of mental math mainly. Also the angle is a fraction (3/4) which means you have an added function of dividing by 4 always, inherently. So to reduce the number of functions necessary and streamline the mental math process for more complicated situations (multiple targets/time constraints), I changed the (X/4) 'quartering' system described (see 2) Into a 'tenth' or 10 angle system (hence 10A). This allows us to forget about any divisors and have a simpler, easier multiplication function to get a wind call quicker with more ease. The drawback is you must learn where the (X/10) values are located in a circle.



The good news though is you don’t need to know all 10 to be accurate. I picked 3 values (plus no value (0) and full value (10)) which represent a similar area as in the ‘quartering’ circle - 2, 5, and 8. With this you can actually be more accurate than the quartering system because you are allowed the freedom to add or subtract a tenth when deemed necessary for say a ‘strong 2 (3)’ or a ‘weak 8 (7)’ without increasing the number of functions necessary to convert to a wind call.

That same wind (19mph @ 1:30) for a 765yd shot looks like

[(8*8)*(18/6)] = 64*3 = ~60*3 = 1.8+mil

But you may think well what if I have a 7mph gun, or a wind speed not divisible by 6?

Ex 2).
A 525yd shot from between 12:30 and 1:00 (12:45), wind speed at 16mph with a 7mph G#

5*3*16/7

With this I could use inverted rounding and round the 16mph wind down to 14 to make it easily divisible while also rounding either the 5 to 6 or the 3 to 4 (up, the inverse of the initial rounding)

6*3*14/7 = 0.4

5*4*14/7 = 0.4

Or you can guesstimate the original
5*3*16/7 = 15*~2.3 = ~0.35 or 0.4

And if it were a 6mph gun
5*3*16/6 = 15*~2.6 = 0.39 or 0.4

(indecipherable differences in answers; lets magnify the wind speed and distance though and see how big the error gets from a 6mph gun to a 7mph gun and how important the distinction is inside 1000yd).

Ex 3).
Say we have a 840yd shot with wind speed of 23mph @ 2:00

G# = 7
8*8*23/7 = 2.1 actual
(here Id want to round speed down to 21; therefore would round yardage up to 9)

9*8*21/7 = 72*3 = ~2.2

G# = 6
8*8*23/6 = 2.5 actual
(here Id want to round speed up to 24; therefore would round yardage down to 8)

8*8*24/6 = 64*4 = 2.56 or 2.6

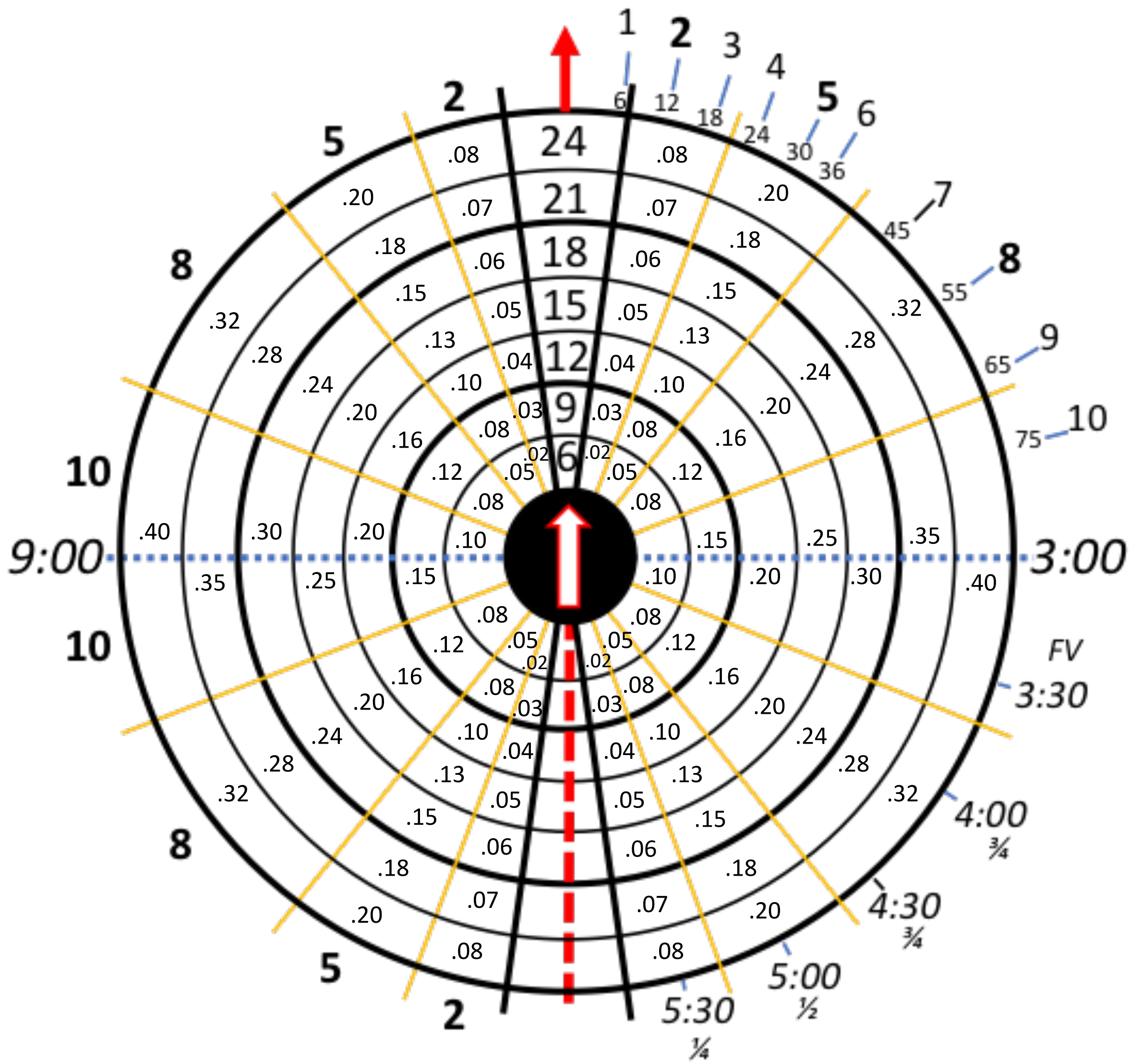
(but I may have chosen to round the angle down to 7 instead)

8*7*24/6 = 56*4 = 2.24 or 2.2

So depending on which number you decided to round you end up with a range of 0.4mRad. This shows the limits of the RAGS/10A method.

A close to FV wind above 20mph means you have much less rounding room. But honestly if I were shooting 800+yd with a 20+mph wind from any direction I wouldn’t expect to hit first round impacts because of the room for variability in actual wind felt by the bullet at that range with that magnitude.

RAGS/10A works, is more versatile and more accurate than using G# brackets and quicker than scrolling and selecting values with a Kestrel, but it can still be even easier/better.



Using the constants provided in the RAGS/10A wind rose (RAGS-Rose), you can simply glance at the wind speed and angle closest to ‘actual’ and multiply the constant by the known ‘range to target’ rounded to nearest 100yd and have a wind call instantly with 1 multiplication function. Its so quick you can easily make a wind bracket determination as well for lull and/or gust even with multiple targets.

“The way of the future!”