

A PHYSICS PROFESSOR'S VIEW OF BALLISTICS

PART VI (MORE ON WIND)

By Bert Blanton

Previously we talked about the first requirement for hunters to bring down an animal was to hit their target. We said that gravity caused the bullet to fall and how much it fell was directly (and ONLY) a factor of how long it was in flight. We can calculate that fall or drop fairly accurately and have talked about it previously. The other thing that affects our bullet's ability to hit where we are aiming is the **wind**.

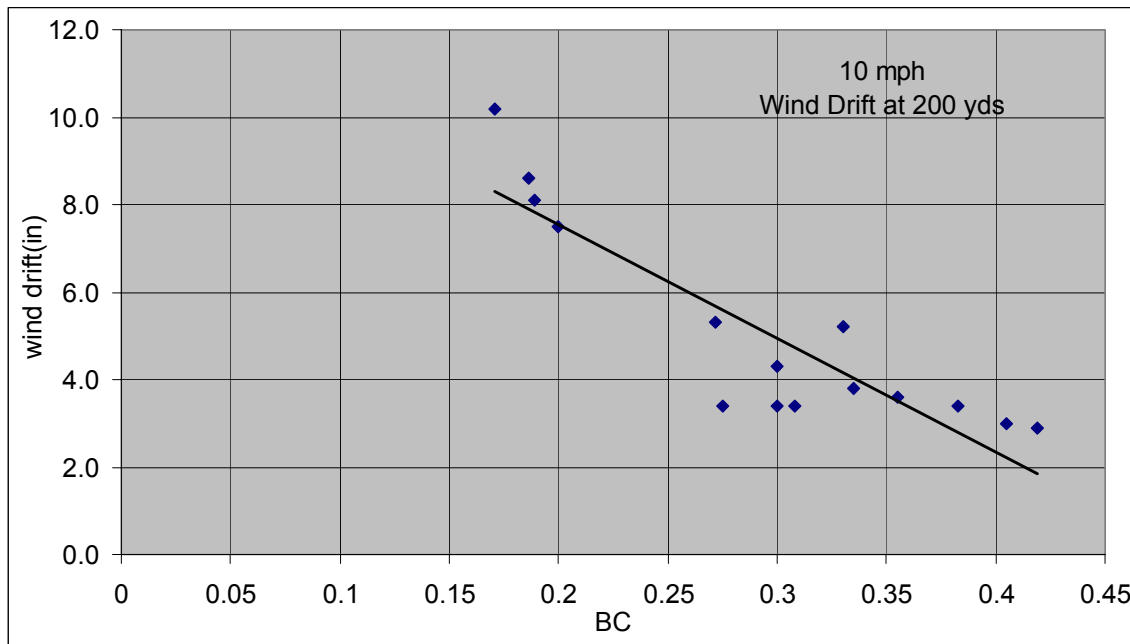
Wind data for various rounds is available from the ammunition manufacturers but it is NOT very good. How do you get wind drift data for a bullet at 200 yds? In the big outside, the wind varies in direction and intensity by the second and again as we progress along the 200 yards to the target. It may turn around and be blowing the opposite direction or at drastically different velocities as it approaches and then hits the berm just behind the target or trees in the woods. It is rare for manufacturers to have 200 yard indoor ranges and even if they did, how would they get the air to move across the bullet's path at exactly 10 mph all the way to the target?

So we are pretty much on our own. Let's consider some wind drift numbers that are floating around. Hornady says that one of my favorite rounds which is the 100g .243 Gameking has a 200 yard 10 mph wind drift of 2.9 inches. That is quite a bit but I will probably still bring my game down. Federal says that another of my favorite rounds which is the 125g 30-30 has a wind drift under the same conditions of 10.2 inches. That is gross!!!! That round has enough HITS energy to kill my deer/antelope at 200 yards but if the wind is a slight breeze at 10 mph I will MISS by over 10 inches left or right. Ladies and gentlemen, I need to know that.

Okay so let's look at some calculations. See table and graph below. I calculated the time in flight of several of my favorite rounds and plotted that against the wind drift for a 10 mph crosswind. Not a very good correlation. I then looked at Ballistic Coefficients (BC). A pretty good correlation here. The entries in the table are sorted by the wind drift at 200 yds from least to most. As you can see, the better the BC the less the wind drift with a few exceptions.

Effect of Ballistic Coefficient (BC) on Wind Drift (WD)

bullet	Cal	Muz Vel(fps)	100yds		200 yds			BC
			Vel(fps)	WD(in)	Vel(fps)	WD(in)	TIF(secs)	
100g gameking	0.243	2960	2741	0.7	2533	2.9	0.22	0.419
100g Hor ILBTSP	0.243	2960	2730	0.9	2508	3.0	0.22	0.405
100g Nos Part	0.243	2850	2612	0.9	2386	3.4	0.23	0.383
70g	0.243	3450	3113	0.8	2802	3.4	0.19	0.308
80g	0.243	3425	3080	0.8	2764	3.4	0.19	0.300
55g	0.243	3850	3438	0.8	3064	3.4	0.17	0.275
100g Fed SP	0.243	2960	2697	0.9	2448	3.6	0.22	0.355
95g Hor SST SF	0.243	2908	2648	0.9	2402	3.8	0.23	0.335
69g	0.223	2950	2642	1.0	2353	4.3	0.23	0.300
160g LeverRev 30-30	0.308	2400	2150	1.2	1917	5.2	0.28	0.330
55g	0.223	3240	2800	1.2	2400	5.3	0.21	0.272
40g Vmax	0.223	3800	2762	1.1	2762	7.5	0.18	0.200
170g RN 30-30	0.308	2200	1894	1.8	1619	8.1	0.31	0.189
150g RN 30-30	0.308	2390	2019	2.0	1686	8.6	0.29	0.186
125g RN 30-30	0.308	2570	2083	2.3	1656	10.2	0.28	0.171

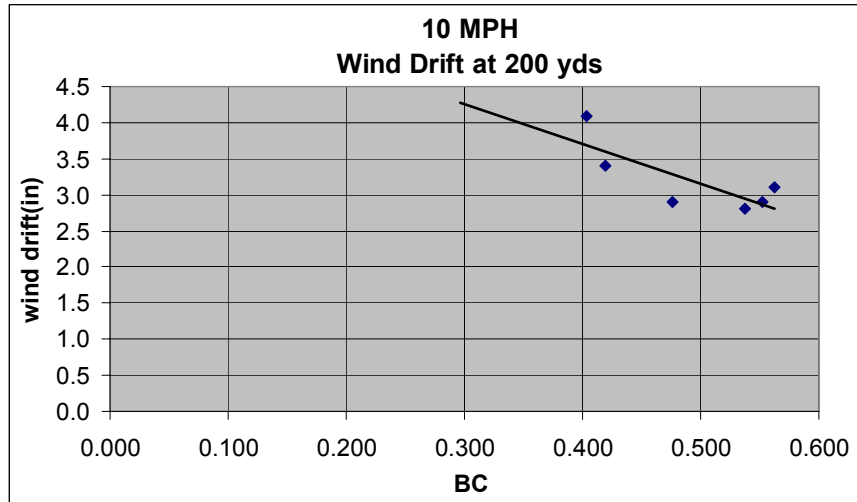


Some interesting observations:

1. The least wind drift (best BC) of the ones I looked at is the .243, next is the .223, and last is the 30-30 round nosed.
2. I expected the .223 rounds to do best but their BCs are worse than the .243s. The 40g .223 Vmax has a BC of only .200. A larger caliber such as .270 or 30-06 with good BCs should be as good as the .243 or maybe better. (The BCs get better at larger calibers). Check the Sierra bullet table and graph below.
3. Check your favorite round. Here's how:
 - a. Look up muzzle velocity and BC. (Choose Hornady or Sierra-they list BCs for every bullet.)
 - b. Put bullet weight, BC, and MV into Hornady ballistics calculator with wind=10 mph. This will give you 10 mph crosswind wind drift at various distances.
 - c. Make a table of wind drift hold offs for 100 yds, 200 yds and etc. **FYI A 20 mph wind has twice the drift of a 10 mph wind.**
4. **To decrease your wind drift use a bullet with the best BC you can find!**

Just for grins and giggles, I looked at Sierra's best. I picked the best BC for a series of calibers (which also happened to be their heaviest bullet almost every time) and put them into Hornady's calculator. Below is a table of what I got. All calibers had similar wind drift. Of course all calibers had pretty good BCs also. Again the wind drift generally decreased with better BCs. The BCs generally improved with larger calibers and/or heavier bullets?!?

Sierra Gameking bullet	Cal	Muz Vel(fps)	200 yds Vel(fps)	200 yds WD(in)	TIF(secs)	BC	ave vel	sec dens
175g	0.284	2582	2266	2.7	0.25	0.538	2424	0.310
150g	0.277	2772	2401	2.8	0.23	0.476	2587	0.279
200g	0.308	2441	2142	2.9	0.26	0.552	2292	0.301
250g	0.338	2405	2114	2.9	0.27	0.563	2260	0.313
100g	0.243	2838	2413	3.1	0.23	0.419	2626	0.242
117g	0.257	2701	2373	3.4	0.24	0.403	2537	0.253
65g	0.223	3010	2399	4.1	0.22	0.297	2705	0.185



If you haven't already done so, make a table for bullet drop compensation and wind drift for various distances for your round. If you are using a rifle/cartridge with MV faster than about 2950 fps, zero your rifle at 200 yds. Slower rounds are better zeroed at 100 yds or even 50 yds. See previous discussion on this in Part I. My .243 and .223 are zeroed at 200, my 30-30 at 100 and my 22LR at 50.

If you want to zero at 200 yards but don't have a 200 yard range, look up the 200 yard zero ballistics in the Hornady or Federal calculator for your cartridge. (Again you have to know MV and BC or Federal cartridge model number). This will tell you how high the bullet will be as it passes 100 yds on its way to the hypothetical 200 yard target. Let's say it is 2.8". Now go to the range and make a dark mark on your target at 2.8" above the center. Put the crosshairs on the center of the target and adjust your scope elevation knob such that the bullet actually passes through the paper 2.8" above the center when your crosshairs are on the center. You are now zeroed at 200 yards. Crosshairs on a target 200 yards from you will hit dead on. Crosshairs on a target 100 yards from you will hit 2.8" high.

The Hornady ballistics calculator will make the table for you if you want. Copy it and laminate it and put with your rifle. This will tell you what corrections to make at various target distances for wind AND bullet drop. While hunting, memorize the most likely ones so you don't have to look them up at an inopportune time. And practice, practice, practice.

Example: Browning BLR .243 with Fed 100g Soft Point - 200 yd zero.

Range (<i>yards</i>)	Muzzle	50	100	200	300	400	500
Velocity (<i>fps</i>)	2960	2825	2694	2442	2205	1981	1771
Trajectory (<i>200 yd. zero</i>)	-1.5	0.6	1.6	0.0	-7.5	-22.1	-45.7
Wind Drift (<i>inches</i>)	0.0	0.2	0.8	3.5	8.4	15.9	26.2
Come Up in MOA	-1.5	-1.2	-1.6	0.0	2.4	5.3	8.7
Wind Drift (<i>moa</i>)	0.00	0.37	0.79	1.69	2.68	3.78	5.01

For this cartridge I CAN put the crosshairs on the target from the muzzle out to just past 200 yds. If I do, I will be about 1.5" high at 100 yds. I will aim about an inch or so below the target at 100 yds, if I can remember. I will hold about 1 inch either side for each 10 mph of crosswind at 100 yds and about 3.5 inches at 200 yds. At 225 yds I will hold about 4-5 inches to the side for wind and aim up about 1.5 inches. Beyond 225 yds, I will not shoot because I am not prepared to do so. You can see from the table above that the bullet drop and the wind drift increase rapidly past 200 yds and beyond. In every case, I have to estimate the distance and the wind direction and velocity. More art than science. Maybe that is the fun of it.