

Shooting Clinic, Alaska Biathlon – Anchorage

11 April 2009

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Session 4: Zeroing, Factors to Consider, Windage

A. Zeroing (also see notes for session 5)

1. No-wind zero

- The experienced shooter has zeroed and marked the rifle sight under no-wind conditions so when he/she gets to the range (with the sight at the no-wind setting) and there is a wind, if the shooter is able to estimate its direction and velocity it should be possible to make the approximate sight adjustment for the rifle zero without firing a shot,

- This could save considerable time for a coach during the zeroing period of a competition where there is only a 45 minute period for a team to zero their rifles (i.e., usually about 10 min or less per competitor),

- The sight should be marked so you can return to the no-wind setting reliably (that is, you have a known place to start each shooting bout); this can be accomplished by placing marks on the sight housing and each adjusting knob (windage and elevation knobs) so when the knob marks are lined up with the mark on the housing you have a no-wind setting; before you do this, check for tightness of the sight housing on the rifle (you should check this each time before you shoot),

- It's best not to make the marks on the knobs too permanent in case something changes and you have to re-establish your no-wind setting at a later date with the marks in different positions,

- Being able to return the sight to a no-wind setting can be useful, especially if you are not working with a coach during rifle zero or a race; you should reset the sight to the no-wind position after each shooting bout so when you return for your next shooting bout you don't have to remember how many clicks of windage and elevation were applied (you will have to determine wind velocity and direction again and apply that correction to the sight),

- Obviously, the no-wind zero should be determined on a day when there is essentially no wind,

- In a perfect world, if the 6 fundamental steps for a well-aimed shot are accomplished precisely for each shot during the zeroing procedure, any deflection of a shot off center primarily will be due to the effects of wind, and it should be possible to zero the rifle one shot at a time; like the fundamental steps, you will need to practice estimating wind velocity until it is second nature -- you should accomplish this as you proceed to your shooting point,

- In our imperfect world, many slight changes other than wind can change the zero, such as variation in your position, which may cause changes in sling tension and pressure of your cheek

on the rifle, for example; so it is important to practice the fundamental steps of shooting to eliminate such variations as much as possible,

- If you have help for zeroing, or the option of viewing your shooting results through a scope, it is not so essential to return to the no-wind setting since you or the coach will determine the number of clicks of adjustment required to center your shot grouping, and confirm it,

- During a race, you are responsible for determining necessary sight changes unless your coach has a way to communicate needed sight changes to someone on the course who can then tell you what they are (especially during a 4 shooting stage race),

2. Variables and Effects

- Shooters should record in their shooting diary the sight settings, wind velocity and direction (and sun location/brightness, cloud cover, etc.) and, to the extent possible, the effects that wind has on bullet strike (and possible effects of other variables on e.g. clarity of the target, sight picture) during that shooting bout to provide data for comparison with information from previous bouts (include somewhere a general description of sling tension, and butt hook position in case you change them; mark with a sharpie where your carrying harness is attached); this will allow you to make reasonable estimates of how you and your rifle will perform under given conditions so when you come into the range and conditions have changed from that day's zero (or are different from previous shooting sessions), you will know what sight or other changes you should make to compensate,

- Many aspects of your daily activities potentially could affect your shooting so also should be recorded in your shooting diary to allow a later analysis that may suggest which activities are positive or neutral and which should be avoided or modified prior to shooting because they affected you negatively in the past; these might include eating habits, sleep patterns, interactions with other people, recent workouts for skiing or other sports, how you 'felt' on training days, sickness, and various distracting factors; all top shooters keep a shooting diary and before shooting routinely compare current shooting conditions and status of other factors to effects that they have recorded these as having at previous shooting sessions,

B. Windage

- Biathlon rifle sights generally have an accuracy of about $\frac{1}{4}$ min of angle (= one click of adjustment) equal to moving the bullet strike $\frac{1}{4}$ " at 100 yd or $\frac{1}{8}$ " at 50 yd (approximately 50 m); thus if your shots are hitting $\frac{1}{2}$ " left or right of the target center, or the current estimated wind velocity and angle is expected to move the strike this far (determined previously and recorded in your shooting diary) from your no-wind zero where your sight currently is set, you would need to apply a correction of 4 clicks,

- It is useful to have in mind this estimate for your rifle (i.e., how far a particular wind velocity is likely to move the bullet strike from your no-wind zero, and what correction is required),

- Velocity determination (see handout): the angle in degrees a flag makes with its vertical flagpole (check range flag as you come to the range, and then wind flags) divided by 4 (e.g., $40 \text{ deg}/4 = 10$) gives approximate velocity (mph) of a full-value wind directly from the side (3:00 or

9:00 o'clock on a horizontal clock system where you are considered to be at the center and the target is at 12:00),

- The effect of wind will vary depending upon the direction it comes from: full-value from 3:00 or 9:00 o'clock; ½-value from somewhere between 12:00 and 3:00 or 9:00 and 6:00 and 3:00 or 9:00 (ideally midway); ¼-value, closer to 12:00 or 6:00,

- Wind directly at or behind you (12:00 or 6:00) probably is not significant (perhaps could cause a 1/16" drop or rise, respectively, which these sights can't correct for) at 50 m unless quite strong,

- It's important to remember that the wind varies at different places on the range due to wind speed and direction, density and proximity of trees near the range, and where the point is in relation to side and backstop berms; also, that the range flag (that you notice when entering the range) is located much higher than the wind flags and represents the velocity and direction at only one point,

- Also remember that the wind indication of the wind flag closer to the target is more important than that indicated by the flag near the firing line because the wind has had a greater distance to affect the bullet trajectory,

- When the flag maintains a constant angle, the velocity is remaining constant and you can keep the zeroing sight setting; if the wind has changed significantly or gusting ('noticeable' change in angle between flag and pole) you will gain by taking the time to change the sight setting (you will need to have determined how many clicks compensates for a given wind velocity during practice sessions, or be made aware of the needed change by a coach),

- Also consider that if the wind is gusting strongly and/or blowing from a different direction than when you zeroed, as an alternative to changing the sight setting it is worthwhile to wait 5-10 seconds to see if it will calm somewhat or return to the zeroing direction – you will gain the time back if it results in fewer penalty laps (about 30 sec each),

- In his USBA camp manual (pp. 19-21 in 2008), Bill Meyer suggests going directly from appearance of the wind flag to estimated clicks of sight adjustment needed (e.g., flag straight out from a 3:00 or 9:00 o'clock wind = 3-5 clicks); it's worthwhile reviewing this discussion as well as others on various topics in the manual,

C. Exercises

1. During some of your dry firing sessions work up to holding your position for 3-5 minutes,

- This will help create a 'body memory' in skeletal and muscular elements used in each position so you won't have to think about or strain getting into and adjusting your position (straining can divert your attention from the fundamental shooting process),

- Dry firing is essential for you to progress to higher levels in this sport; no one has accomplished this without devoting considerable time to dry firing,

2. Zeroing practice: scope-check each shot; after zeroed, starting from off the mat, think through the entire shooting procedure for each shot on metal for both prone and standing positions,

3. After you have settled into your natural point of aim position at the target, close your eyes and exhale to your normal pause point, then squeeze the shot,

- Do this several times dry before firing a live shot.