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HOLDS

THE BULLET DOESN'T LIE.

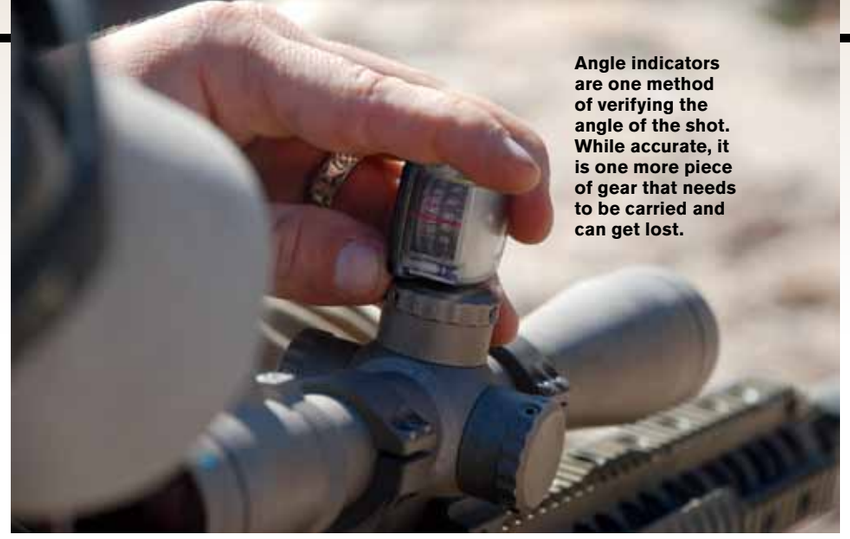
BY TODD HODNETT

It is amazing the misconceptions shooters have about shooting angle fire. I think this is due to the fact that most have never shot high angles because true high-angle fire is extremely hard to find in the U.S. Don't misunderstand me: I am talking about high-angle fire, not angle fire. Most of the misconceptions out there are based on things heard or read by the shooter, because he has never had the opportunity to engage targets where the inclination represents high-angle fire. I am going to show you a couple of high-angle formulas I have developed that make this type of shooting simple.

One should understand that a lot of the formulas out there are not correct. My formulas are built around where the bullet hits. The bullet can't talk, so it cannot tell a lie. What I do is build formulas that replicate the actual performance of the flight path of the bullet.

The key to this is that you have to shoot it. This is where I'm lucky; I have a high-angle facility near Monument Valley where I live. I can get true high-angle fire, not just slight angles.

One of the first misconceptions a shooter will have to address is the perception of angle. Most people will think the angle is much greater than it is. Several people have told me that they have shot at 45 degrees or greater, but when they actually measure the angle, they find it is not even 30 degrees. It really did look steep. I have been at ranges where the steepest target was only 30 degrees at 300 meters. This shot would only require an adjusted hold of 3½ inches. Not much of a needed adjustment. So the perception of angle must be dealt with first, and there are several devices that work great. Here are a few.



Angle indicators are one method of verifying the angle of the shot. While accurate, it is one more piece of gear that needs to be carried and can get lost.

I will show you a solution that is free and works pretty well. The men I train at Accuracy 1st are going through doors and/or jumping out of helicopters, so life can be pretty rough on their weapon systems. I came up with a tool that can't be broken or lost. You will need a tool that will measure angles, like a protractor, iPhone or something similar. Place that on your gun and tilt the gun until the device indicates 30 degrees. At this time you will need to place a mark on your stock with the use of a "plumb bob" (a weight with a string). Then repeat this procedure at 45 degrees and 60 degrees, with both up angles and down angles placed on the stock. I am having a sticker made that has the angles marked on it so guys can just make sure the top line is level with the barrel and peel off the back and stick it on the stock. Simple, yet effective.

When you shoot angle-fire shots, all you need to do is look at the target in your scope and then look at what line is pointing straight to the ground, thus giving you the angle for the shot. You can place as many marks as you desire, but I have found that these three angles are enough for me. The reason is that 60 degrees at any distance—and distance is the key—is extremely hard to find, and angle fire of 15 degrees, which can be found anywhere, doesn't really matter. You are looking at only around .22 mils difference in impact, or 5.2 inches at 600 meters. Plus, it is easy to do the math at 15 degrees, but I don't have to have it marked, I can see if it is halfway between zero and 30 degrees.

I am not going into what I think of the Pythagorean theorem. What I can say is that it takes too long even if it gives correct holds at distance. The reality is that we need a quick firing solution that we can do in our head—one that gives us the results we want. So let's get into the formulas.

THREE EASY RULES:

- 30 degrees = subtract half-MOA or .15 mil every 100m from your normal hold
- 45 degrees = subtract 1 MOA or .3 mil every 100m from your normal hold
- 60 degrees = subtract 2 MOA or .6 mil every 100m from your normal hold and then add 1 MOA or .3 mil back to the hold

(This formula works really well for .308 rifles.)

So let's work through some examples. Take a distance of 500 meters and apply all three angles, showing the math.

The gun we will be showing in the examples is a .308 with a muzzle velocity of 2,600 fps and BC of .475. The atmospherics will be 27.0 and 70 degrees.

The 500 meters distance has a dope of 3.6 mils, or 12.4 MOA.

So for 30 degrees I would take 3.6 mils and subtract 2.5 MOA (half MOA x 5) or .75 mil for an answer of 2.85 mils; the real answer is 2.9 mils.

Let's try 45 degrees. Take the 3.6 and subtract 5 MOA (1 MOA x 5) or 1.5 mils for an answer of 2.1 mils; the actual answer is 2.07 mils.

Now 60 degrees. We take 3.6 and subtract 9 MOA (2 MOA x 5, then add 1 back) or 2.7 mils, and you get an answer of .9 mil, and the real answer is .99 mil.

So as you can see, this is a very simple formula that anyone can do in his head.

The extreme angle shown in the photo to the left will need to be taken into account for an effective shot. The soldier shooting above will require much less correction.

You may find yourself with MOA scope adjustments with BDC calibrated marks on the turret. Those scopes are still out there, but I hope we are moving out of the era of MOA turrets with BDCs and mil reticles combined. This makes no sense, and as people gain knowledge, they are moving to a mil/mil system. I am not against having a BDC along with the mils, but it has to be done right, and most scopes are wrong for the "600 meters and beyond" BDC marks with corrected DA. It wasn't Leupold's fault that the military asked for these types of turrets. This was the requirement at the time.

If you find yourself with this type of scope, with half-MOA adjustments on the turret, this is how I would use it.

Shooting at a target at 500 meters, dial 5 on the BDC, then take off 5 clicks of elevation for a 30-degree angle shot.

Example math: For a target with 45 degrees at the same range you would take off 10 clicks (half-MOA x 10 = 5 MOA).

For a target off 60 degrees, you would take off 12 MOA and then add one back, meaning you would dial to the 6 on the BDC and then take off 11 MOA, or 22 clicks on a half-MOA turret.

So simple and without having to think about math, these results show close corrected elevation holds to what the ballistic solver shows. These results are also proven time and again in training.

When I begin a high-angle class, I have the student shoot his normal dope for the range of the target without inclination plugged in. This will allow the student to gain knowledge of how much deviation he can expect for the effects of an angle shot. Then we move into using the ballistic solver to give us a corrected hold for inclination in which the student can see how accurate the ballistic solver truly is. After that we move into the speed formulas, allowing the student to use my formulas to get fast, accurate holds that he can do in his head. Whether you are a hunter, military or LE shooter, a fast, accurate hold can be very important. I always tell my students that if they have time, the ballistic solver is very accurate and the choice to use. Nevertheless, my formulas allow the shooter to get a correct hold that is very close to the mathematical corrected holds the ballistic solver uses.

If you are not shooting a .308, here is another formula that I came up with several years ago. This formula is made for mil turret/mil reticle scopes.

To make the math simple, this formula uses the sine instead of the cosine for the angle. In the result, you will see that from the sine, we are able to obtain the cosine through simple third-grade math.

RULES

- 30 degrees = subtract 10 percent of the hold, then subtract .15 mil from the total
- 45 degrees = subtract 30 percent of the hold, then subtract .5 mil from the total
- 60 degrees = subtract 50 percent of the hold, then subtract .75 mil from the total

EXAMPLES

- 600m hold of 4.97 mils
- 30 degree = 5 mils – .5 (10 percent) = 4.5, then subtract .15 mil for a total of 4.35 mils
- Ballistic solver answer is 4.1 mils
- 45 degree = 5 mils – 1.5 mils (30 percent) = 3.5 mils – .5 mil = 3 mils
- Ballistic solver answer is 3.04 mils.
- 60 degree = 5 mils – 2.5 mils = 2.5 mils – .75 mil = 1.75 mils
- Ballistic solver answer is 1.67 mils.

Now you're probably wondering where the .15, .5, .75 mil come from. We are subtracting the sine of the constant, which is 1.5 mils.

Angle shooting, by nature, usually implies shooting from unconventional and precarious positions. The less complicated we can make our lives in moments like these, the easier it will be to make our shots.

The reason this is so simple is that we are taking a number that you know as your dope if you memorized your range card, or if you haven't memorized it, you have attached it to your gun somewhere. Then we just work off the cosine or sine of the angle, depending on how you want to look at it·

The ballistic solver is an awesome tool for this, and that is why we put the high-angle chart on the back of the Accuracy 1st Whiz Wheel. Just line up the flat distance dope with the angle—no math needed.

Remember that high-angle shooting is very rarely done in the prone, so real-angle fire is a class in unconventional positional shooting.

And remember that not all angle fire formulas will work at true angle fire where the range is far enough and the angle steep enough. So the best way to know for sure is to get out and shoot it. But don't be intimidated. Angle fire is easy—so easy that I try to get my students back to Texas to train in the high winds with terrain features that we get around the caprocks. You will always need more time learning winds, as this is where 90 percent of all misses originate. Wind is the No. 1 reason we miss shots in long-range shooting, and this includes high-angle fire. Even though you may be taking a shot at 600 meters with a 60-degree down angle, you may be using a rangefinder that corrects for angle distance. If it shows 300 meters, you are still doing a wind formula for the full 600 meters.

In conclusion, angle fire makes a difference if you shoot at a target with real angles and enough distance. Most places won't give you both. They may have something that looks steep, but it is not high angle and may not be enough of an angle to make you miss your target with your normal dope.

We shoot high angle in Utah, but I also go to the Palo Duro canyon in Texas, which is the second largest canyon in the U.S. Here we have only angle fire and show that it doesn't matter. There is not enough angle and distance combined to give us a real need to adjust our hold. The purpose of this is to show when angle fire matters and when it doesn't. Be smart and make the most of your training time. High angle is fun, not hard. SNIPER