

# TACTICS AND PREPAREDNESS



SKILLS AND SURVIVAL FOR ALL SITUATIONS

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## ZERO YOUR M-4 BEST AND WORST PRACTICES

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### Zeroing the M4. What a boring topic.

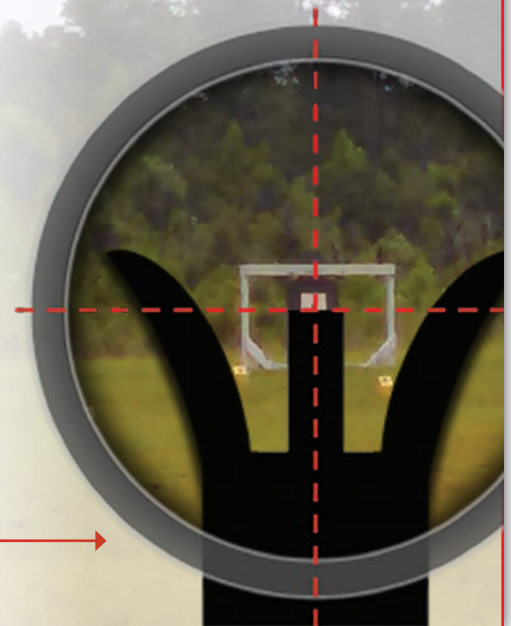
Hopefully though, if you made it past the title of this article and didn't skip forward to the high-speed-hand-to-hand-ninja-combat-techniques deeper in the magazine, you will gain a better understanding of the process. With the myriad of tactical situations any one of us may be presented with, choosing the appropriate zeroing distance for the anticipated scenario and ensuring the sights are properly aligned with the strike of the round (not the other way around) can become a complicated subject. My goal is to shed some light on the correct process, review some of the more common zeroing distances and dispel some myths about the BZO that I have encountered on my journey through the shooting world. Let's start with

some definitions to ensure we are all speaking the same language:

#### **Battle Sight Zero (BZO):**

Per MCRP 3-01A (I consider it a suitable reference) the Battle Sight Zero is defined as: *"the elevation and windage settings required to place a single shot, or the center of a shot group, in a pre-designated location on a target at 300 yards/meters, under ideal weather conditions (i.e., no wind). A BZO is the sight settings placed on* *continued on next page*

**YOUR RIFLE'S BZO SETTING WILL ENABLE ENGAGEMENT OF POINT TARGETS FROM 0-300 YARDS/METERS IN A NO-WIND CONDITION.**



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## SELECT THE MOST APPROPRIATE ZERO DISTANCE FOR THE MAJORITY OF THE ENGAGEMENT DISTANCES YOU ANTICIPATE ENCOUNTERING.

*your rifle for combat. In combat, your rifle's BZO setting will enable engagement of point targets from 0-300 yards/meters in a no-wind condition." The 300 yards/meters distance can vary based on your tactical needs, but we will cover that later.*

### Zero:

Per MCRP 3-01A "A zero is the elevation and windage settings required to place a single shot, or the center of a shot group, in a pre-designated location on a target at a specific range, from a specific firing position, under specific weather conditions". Note the difference in the two definitions and the mention of a specific firing position, which I will shoot down (pun intended) in a bit.

### Sight Alignment:

This is the relationship between the front sight post, rear sight aperture (for iron sights) or the optic's reticle and the aiming eye. This relationship is critical to aiming and must remain consistent from shot to shot. Improper sight alignment when using an optic is commonly referred to as "scope shadow" and

occurs when the shooting eye is looking through the tube at an angle. For dot optics, the dot must be in the center of the tube or window. Even those red dot sights that advertise being parallax-free will exhibit a point of impact (POI) shift when the dot is run to the edges of the field of view. If you read the fine print you will notice that most manufacturers will give a parallax-free range (e.g. under 50 yards) which just means that given the size (MOA) of the dot, size of the tube and inherent accuracy of most rifle/shooter combinations the POI shift due to parallax will be lost in the other factors.

### Sight Picture:

The placement of the tip of the front sight post (or reticle) in relation to the target while maintaining sight alignment.

### Max Point Blank Range:

This is the distance at which the rise or drop of the bullet will not fall outside of the vital area of the target if the shooter holds on the center of the target. For human targets this would be approximately a 6" diameter area or 3" above or below the point of aim.

### HOW TO ZERO

#### Step 1: Set the Mechanical Zero on Your Rifle.

Unless your rifle has been zeroed previously and you are fairly confident that your shots will impact the target paper at your desired zero distance you will want to center your sight's windage and elevation settings. A rough process is rotating the adjustment in one direction until it hits a mechanical stop (starting point), then rotating in the opposite direction while counting the number of clicks until it hits the opposite stop. Divide the number in half and rotate in the original

~~THE INCHES ABOVE THE POINT OF AIM IS THE MAXIMUM POINT BLANK RANGE ON A HUMAN TARGET.~~



direction by the calculated number. This will vary based on the type and manufacturer of the sight/optic and I recommend referencing the owner's manual, FM or TM for the exact procedure. Some alternatives to the mechanical zero to speed the zeroing process along include:

Using a collimator or laser bore sight to get a rough sight alignment.

Moving the target closer to ensure shots impact the paper, then adjusting the group to the center of the target before placing it at the desired range.

### Step 2: Select the Desired Zero Distance.

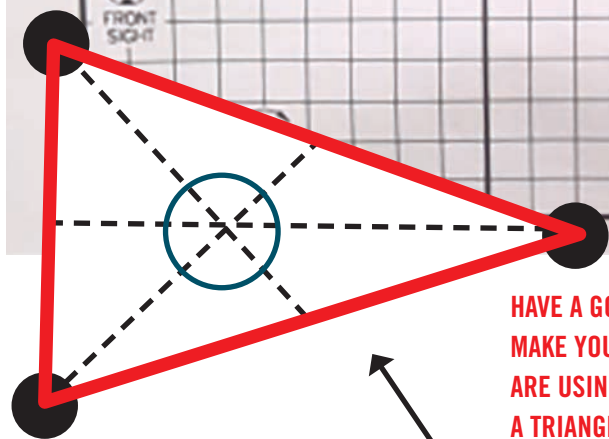
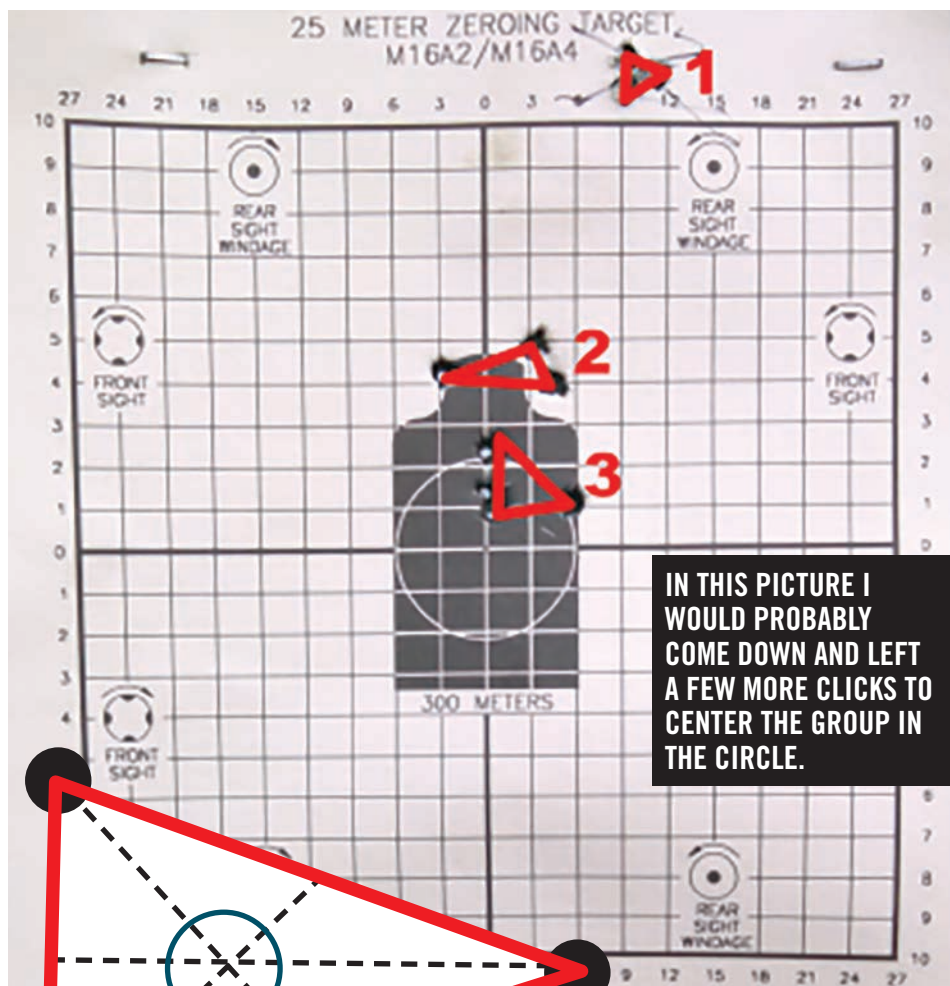
Choose the most appropriate zero distance for the majority of the engagement distances you anticipate encountering. Selecting the wrong zero distance can result in unintended consequences such as exaggerated holds over or under the target at various distances.

### Step 3: Assume the Position.

Assume the most stable firing position under the most ideal environmental conditions possible. Referencing the definition of the battle sight zero above, you will want to select the best conditions possible to reduce the number of factors influencing the flight of the bullet to the target.

### Step 4: Fire.

Once in a stable and solid firing position and after checking your natural point of aim, fire a 3-5 shot group at your selected BZO target. The BZO target selected doesn't really matter as long as it provides good contrast with your sighting system and a refined aiming point. If using the standard military zero target for 25m or 36 yards I will generally use a 6 o'clock hold on the black as it gives me more contrast and there is less tendency for my front sight to "float" in the black on the target. When using this hold you will adjust your sights to group at the base of the target instead of in the center. Whichever hold you use, it is critically important to use the same hold for each group fired. There are also some advantages and disadvantages to using either a three or five shot group. A five shot group can give you a more accurate representation of the cone of fire for your rifle, however, the chance of flyers due to shooter fatigue can increase. Typically a three shot group is tighter and gives you a pretty good representation of where your rounds will fall.



### Step 5: Adjust Your Sights.

Once you have a good, tight shot group (sloppy groups aren't useful) you can make your sight adjustments. If you are using a three-shot group, form a triangle with the shot-holes at the corners then adjust off of the center of the triangle. Adjusting off of a single shot is not recommended as you do not know where within the cone of fire that particular shot lays, it could be far right, far left, high or low and an adjustment off of it is unpredictable. That said, I have made gross adjustments off of a single shot if I felt it was good in order to save time and/or ammo (particularly the pricey stuff). Making fine adjustments off of single shots is definitely not recommended though. Knowing your sights/optics is also important. You must be familiar with how far one click (typically measured in minute of

**HAVE A GOOD, TIGHT SHOT GROUP AND MAKE YOUR SIGHT ADJUSTMENTS. IF YOU ARE USING A THREE-SHOT GROUP, FORM A TRIANGLE WITH THE SHOT-HOLES AT THE CORNERS THEN ADJUST OFF OF THE CENTER OF THE TRIANGLE.**

angle [MOA]) will move your impacts at the distance you are performing your zero. Most close quarters optics employed on M4 style rifles will have adjustments in  $\frac{1}{2}$  MOA clicks. A minute of angle represents approximately an inch at 100 yards, so a half-minute adjustment would move the impact a half-inch at that distance. As the target gets closer the number of clicks for the same angular adjustment increases. So at 50 yards it would take four clicks to move an inch and eight clicks if the target is at 25 yards.

### Step 6: Re-Shoot and Re-Adjust.

After your sight correction, fire another group to see the effects of your adjustment. If using optics with mechanical vice elec-

tronic adjusters ensure you lightly tap on the optic to ensure the gears in the mechanism seat properly before firing your first shot. Some shooters like to adjust a couple of clicks past the setting they want and return to it to help mitigate the same problem. If you don't, your first impact may be off from your second and third due to the mechanism shifting during recoil. Continue this process until the center of the shot-group corresponds with the desired point of impact.

**Step 7: Verify.**

After the final adjustment, fire a four or five round group to verify that actual point of impact matches the desired point of impact. If you are using one of the near zero distances to get a zero for a longer range (e.g. 50 yards for 200m or 36 yard for 300m) it is imperative that the zero is verified at the far zero distance to ensure the desired effects. Usually minor adjustments are necessary.

**COMMON ZERO DISTANCES**

There are a number of near zero/far zero combinations used based on the desired flight of the round and the anticipated engagement distances. Due to the numerous variables that can affect both internal and external ballistics (barrel length, gas system length, temperature, barometric pressure, bullet weight, powder type, ballistic coefficient, etc.) the near/far zero combinations are only approximations and, as I stated above, should be verified at the far zero distance before using the rifle operationally. For the purposes of this article and the combinations below we will assume an M4 rifle with 1:7 twist 14.5" barrel firing 62gr M855 projectiles (Ballistic Coefficient of .301) at a velocity of 2900fps. There are many arguments for and against each BZO and I have come across many people who will fight to the death in defense of their chosen zero distance. I don't recommend focusing on just one and trying to make it work in every situation, instead I advocate knowing the different combinations, how your rifle performs using each, weighing the advantages and disadvantages, then selecting the zero based on your situation and anticipated engagement distances. For each zero, no matter which one you choose, you must know the trajectory of the round and the amount to hold under or over a target at a given range in order for it to be effective.

**36/300 yard BZO –**

This is the classic military near/far zero combination for the M4 and gives a decent working range from 25 yards out to approximately 350 without having to hold over or under the target significantly. At 25 yards, since the bullet is still on its upward trajectory to 36 yards, a hold under of 1" is required to place the round at the desired point of impact, a 2.5" hold under for 75 yards, 4" for 100 yards, 5" for 200 yards, and back to point-of-aim / point-of-impact at 300 yards. For everything from 25 yards to 300 yards it is simple enough to hold under the desired POI by the appropriate amount. However, in my opinion, it is not the best BZO distance for close quarters or past 300 yards since inside of 25 it is a hold-over, transitions to a hold-under out to 300, then back to a hold-over with a 13.5" hold for center-mass hits at 400 yards.

**25 yard BZO –**

Typically used when access to a longer range is problematic and if you are familiar with the holds can be used effectively at short range out to 400 yards. Where this technique has its shortfalls however, is the amount of hold-under required for shots between 75 yards and 300 yards. A target at 50 yards requires 2.5" under, 4.5" at 75 yards, 6" at both 100 yards and 300 yards. Past 300 yards transition back to a hold-over of 5" at 400 yards. The same complexity of hold-over/under transitions exists for this BZO as well as the 36/300 yard combination.

**50 yard/200m BZO –**

This is a good general purpose zero which limits hold-over and hold-under to less than 3" out to approximately 250 yards. There is still a hold-under / hold-over switch, but it is minimal, resulting in a 1.25" hold-over at 25 yards, point of aim at 50 yards and a 1" hold-under at 75-100 yards. This zero really only falls apart past 250 where a 7.5" (throat) hold-over is required at 300 yards, 23.5" (over the top of the head) at 400, and a whopping 50" hold-over for center mass hits at 500 yards.

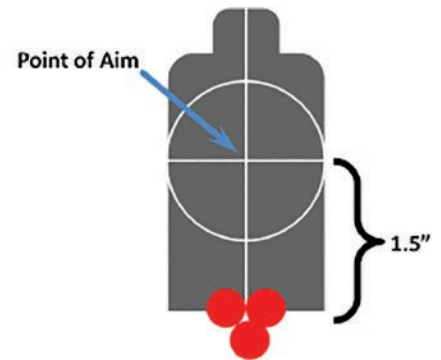
**100 yard or 100m BZO –**

This is a great, simple, zero distance if you plan to engage targets out to about 200 yards. Since the bullet only meets the line of sight once (at 100 yards or 100m, depending on if you zeroed in yards or meters) there is no transition between hold-over and hold-

under thus eliminating a potential point of confusion. 25 yards requires a 1.5" hold-over, .25" at 75 yards, point of aim at 100, .5" at 150, 2.75" at 200 yards, 12" at 300 yards, 30" (way over the top of the head) at 400 yards, and almost 60" for a hit at 500 yards. So comparing the 50/200 and the 100 BZOs you can see that the 50/200 adds a little complexity to the holds, but extends the useful range while the 100 BZO simplifies the holds with a limited range as the trade-off. Again, you have to evaluate the situation you plan to employ your rifle in, weigh the pros and cons of the different zero distances and choose the one that best fits your capabilities and situation. Write it down, along with any other relevant zeroing information, and be certain that your rifle is zeroed as you remember it was.

**25/100m BZO –**

There is an expedient method for obtaining a rough 100m BZO if you only have access to a 25 yard range. If you adjust your elevation settings to print shot groups 1.5" below your point of aim it will result in an approximate zero at 100m.



**BZO MYTHS AND MISCONCEPTIONS**

After working for various groups and organizations, and from hanging out in numerous gun stores I have heard many inaccurate, and some patently absurd recommendations for how to zero a rifle. Below you will find some of the most common misconceptions:

**Your Zero is Only Good for the Position You Used to Initially Zero.**

This theory is actually supported by the USMC's definition of a zero that I cited in the introduction to this article (and is false). The mechanical relationship between the line of sight and the path of the bullet is not changed by firing position, with the exception of cant angles which change the angular relationship between the sights and the



## FORCE RECON MARINE TRADES SOME STABILITY FOR COVER AND SPEED FOR A FAST SHORT RANGE SHOT.

### WHY DO THIS?



### WHEN YOU CAN DO THIS...



bore. Therefore, as long as the head is in the proper position to align the shooting eye with the center of the sights or optic (and that relationship is maintained) and the rifle is not canted to one side or the other, the round will impact at the same point on the target regardless of shooting position.

### You Have to Train Like You Fight.

I don't know how many times I have heard this from inexperienced "instructors" who insist that a BZO must be performed while wearing all combat equipment, to include a helmet. Requiring this almost always results in poor shot groups due to shooter discomfort and incompatibility of certain equipment in certain shooting positions (helmets in the prone for example). A poor

shot group makes it difficult to properly gauge the adjustments and an unstable firing position causes groups to be inconsistent. I can guarantee that as long as the shooting fundamentals are followed a zero shot without equipment will be the same as when the shooter dons his kit in the future. The other piece to "training like you fight" is the prohibition on using any form of artificial support (e.g. sandbags). In this case the instructor insists that the shooter must use an unsupported prone position and cannot rest the handguards or magazine on additional support or the ground with the mindset that it will affect the zero or these items won't be available in combat. As long as the barrel itself is prevented from contacting the support (which can disturb the natural whip of the barrel and change the point of impact) any support that can be utilized should be utilized to get the tightest shot groups pos-

sible. The more stable and comfortable the shooter is, the more accurate and effective the zero will be. I recently proved this to members of my unit during a training exercise where we shot the Army's rifle qualification course. I zeroed at 25 yards (adjusted to give me a 50 yard/200m BZO) without any kit, in the prone, using sandbags and my magazine for support. I then shot the qualification course in full combat equipment, including helmet, from a standing position and cleaned it with a score of 40/40.

### The Zero is Only Good for the Individual that Zeroed the Gun –

This only holds true for inexperienced shooters who cannot properly apply the fundamentals of marksmanship or who have some weird eye disorder. For shooters who have a solid understanding of, and can properly apply, sight alignment and sight picture rifles can be exchanged with an imperceptible amount of zero shift. As long as the shooter zeroing the rifle has the eye centered behind the sights and shoots a proper zero, anyone who can properly align his/her eye can shoot the same point of impact. I have routinely demonstrated this by grabbing a student's rifle off the line and shooting the same zero.

In conclusion, there are a lot of factors that affect the zero process and choosing the proper zero for your application can be confusing. The best way to determine what works for your particular rifle and ammunition combination that is still applicable given the tactical situation is extensive testing at various ranges and data collection. Hopefully you found this article informative and I now release you to peruse Andy Curtiss' high-speed-hand-to-hand-ninja-combat-techniques found elsewhere in this magazine. ✓

*\* Hold over and under amounts generated using JBM Ballistics Calculator ([www.jbmballistics.com](http://www.jbmballistics.com)).*

### BIO

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