PROFESSIONAL FORUM

Zeroing Techniques
With Night Vision Devices

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Aiming points clearly improve a soldier's ability to engage targets at night by providing a point-and-shoot capability. Used with night vision goggles, aiming lights—the AN/PAQ-4A and AN/PAQ-4B—help soldiers see and hit targets at long ranges. A major problem with aiming lights, however, is zeroing them to the rifle. As part of the Army Research Institute's Nightfighter Program conducted by the Fort Benning Infantry Forces Research Unit, procedures have been identified that will reduce zeroing problems with the M16A2 rifle.

Why are definitive center-of-mass aim points hard to achieve during live-fire zeroing? Basically, the firer cannot see the 25-meter target clearly at night when using goggles and an aiming light. To most firers, the bloom of the aiming light through the goggles masks all of the silhouette in the target's center and much of the horizontal and vertical zero lines. In addition, parts of the target that can be seen are not clear.

Why is the target so hard to see from the firing point? A point of light blooms when viewed through an image intensification device such as night vision goggles. This blooming effect is particularly large when the light source is close or very bright, or both. The aiming light is zeroed at close range, against a 25-meter target. When the aiming light strikes this target, light is reflected in the firer's goggles and blooms, making it difficult to aim consistently at the desired point. Consequently, zero adjustments are crude at best. Finally, the firer's visual acuity with night vision goggles is not 20/20. The best visual acuity that can be obtained with third-generation AN/PVS-7 goggles is 20/40; under many night conditions, it is worse.

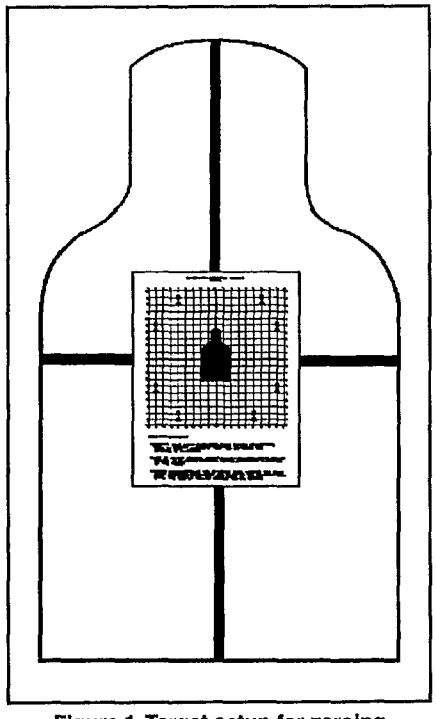

Figure 1. Target setup for zeroing AN/PAQ-4s at 25 meters.

The zeroing procedures recommended here have helped firers overcome the limitations and problems just cited. They include additional steps in preparing to fire and slight variations in the firing procedures.

The steps in preparing for zeroing are the following, in sequence:

Modify the 25-meter zero target to help the firer determine center mass of the target and maintain a consistent aim point when zeroing. Use the tan side of a cardboard E-silhouette and stripe the full length and width of the cardboard with 3/4-inch black electrical tape. These stripes should divide the E-silhouette in half, vertically and horizontally. Center and staple the 25-meter zero target at the intersection of these black stripes (Figure 1).

Mark the correct bullet impact point on the 25-meter zero target. When zeroing an aiming light, the firer points the aiming light at the center mass of the 25-meter zero target silhouette. Bullets must then hit the target at a pre-determined point. Aiming light adjustments are made until the shot group is centered over this point. The point differs for the AN/PAQ-4A and the AN/PAQ-4B, as they have different offsets from the rifle boreline and

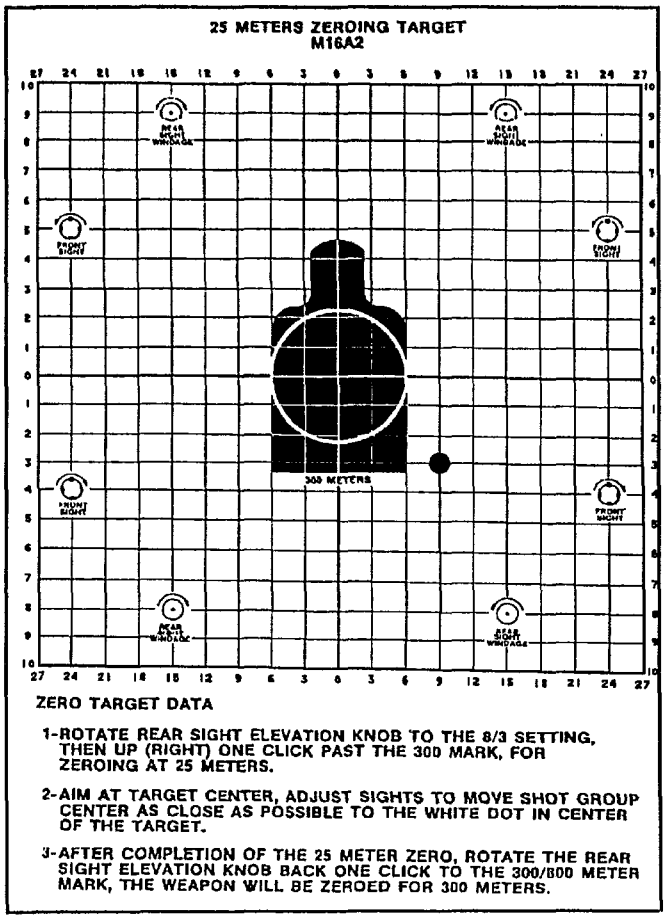

Figure 2. Live-fire zero target for the AN/PAQ-4A. (Bullet impact point is at the intersection of line 9 right and line 3 down; 3.1 centimeters right of target center and 2.8 centimeters below target center.)

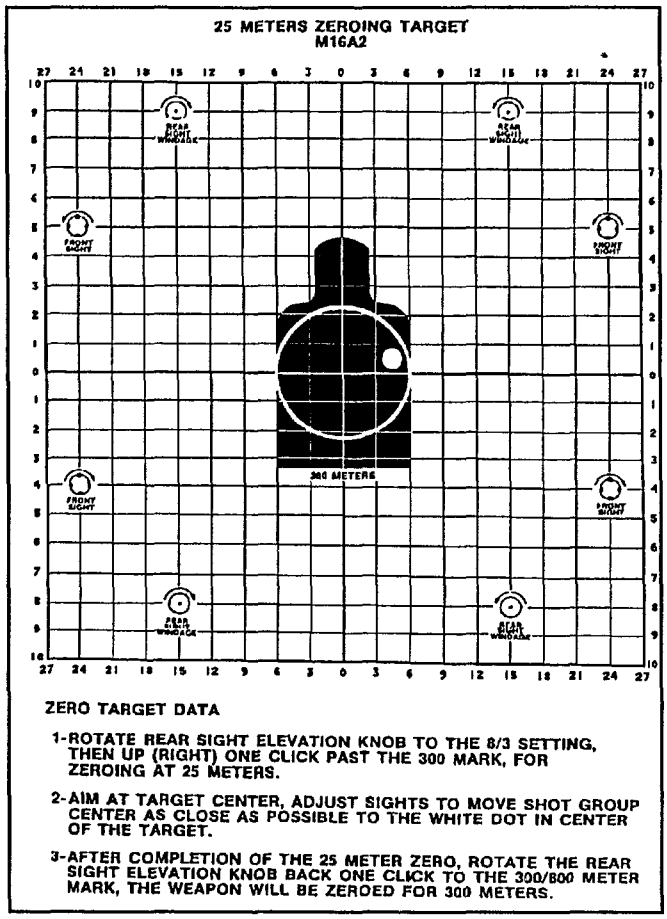

Figure 3. Live-fire zero target for the AN/PAQ-4B. (Bullet impact point is the "box" bracketed by lines 3 and 6 right and lines 0 and 1 up; 1.55 centimeters right of center and 0.45 centimeters above target center.)

are zeroed for different distances. (The AN/PAQ-4A is zeroed for 100 meters, and the AN/PAQ-4B is zeroed for 250 meters.) Mark the bullet impact point on the zero target as indicated in Figures 2 and 3 to ensure that bullets are adjusted to the right location for each aiming light.

Construct a ruler for determining the number of aiming light click adjustments for windage and elevation. The vertical and horizontal lines on the M16A2 zero target should not be used. They do not correspond exactly to the click size for either aiming light, and they do not form squares on the target. Therefore, these lines cannot be used to determine the number of clicks to adjust the aiming light up or down, right or left. Laminated rulers that withstand the damp night air should be constructed to reduce errors in the windage and elevation adjustments and to expedite the zeroing process. The rulers for each aiming light are illustrated in Figure 4, but are not to scale. A 12-inch ruler works well for determining the distance between the correct bullet impact point and center mass of the shot groups. Label the rulers as shown to make sure they are used appropriately. During zeroing, place a ruler at each 25-meter zero target location.

Make a training aid showing which direction to turn the aiming light knobs to adjust bullets on the bullet impact point. Experience has shown that the markings on the aiming light knobs can be misinterpreted. Bullets can suddenly go off the zero target, off the E-silhouette, or in the wrong direction because the aiming light was not adjusted correctly. A training aid such as that shown in Figure 5 corrects this problem.

For the AN/PAQ-4B, it is important to stress that this aid, as illustrated, is appropriate only when used with the M16A2 rifle. It does not apply to weapon systems on which this aiming light is mounted in a different position relative to the bore of the weapon.

Make a transparency showing the appropriate shot-group size. This step is needed for two reasons. First, the four-centimeter circle marked on the 25-meter target is not centered over the bullet impact point for either aiming light. Second, firers cannot be as precise at night as during the day. Our research showed that the four-centimeter shot group is an unrealistic standard for night firing, given the reduced visual acuity at night through goggles and the difficulties in aiming consistently. A 5.5-centimeter criterion is better. To help trainers and firers apply this criterion, a laminated see-through or transparent training aid marked with a black 5.5-centimeter circle should be used.

The actual zeroing procedures are as follows:

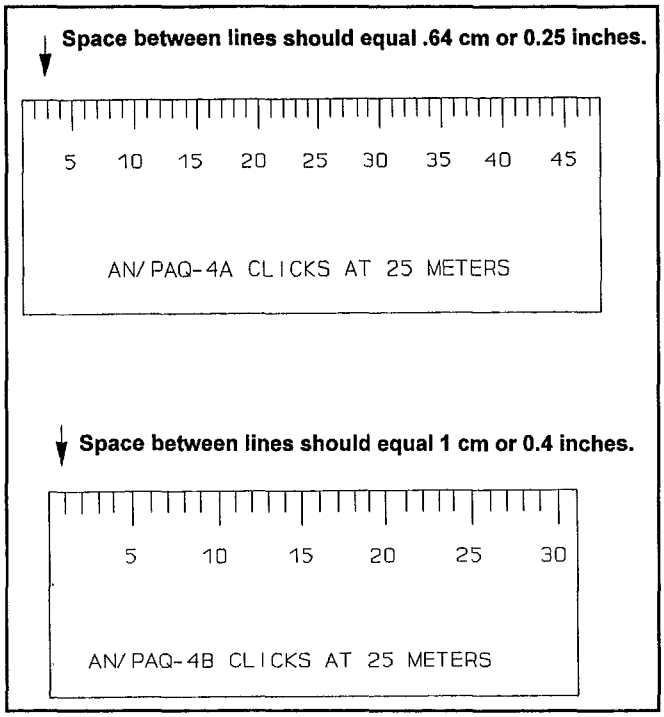

Figure 4. AN/PAQ-4A and AN/PAQ-4B aiming light rulers for the 25-meter zero target. (The rulers are not to scale.)

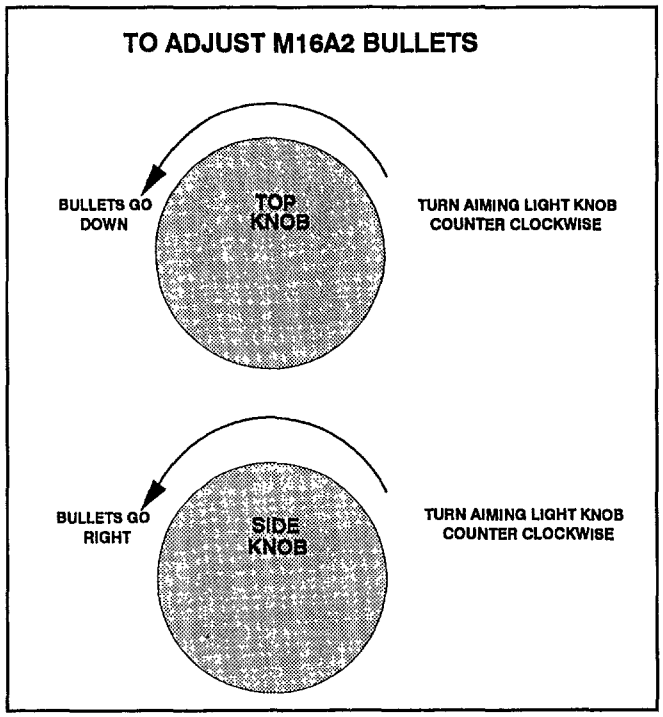

Figure 5. Aiming light knob adjustment guide shows movement of bullets with the M16A2 rifle when aiming light knobs are turned counterclockwise. (Bullets go in the opposite direction when the knobs are turned clockwise.)

Use the standard Army flashlight to light the target. The flashlight helps diffuse the bloom of the aiming light in the goggles and provides a more definitive aim point. Place the flashlight at the firer's position in a supported position such as a V-notched stake. The flashlight can be pointed directly at center mass of the target or slightly below the target, according to the firer's preference. If there is enough ambient light in the night sky, a flashlight may not be needed.

Fire two, three-round shot groups before making any aiming light adjustments. This will give a much better indication of the firer's aim point than a single three-round shot group. This procedure will avoid premature adjustments and "chasing bullets" in the dark. Triangulate and number each shot group. Do not adjust the aiming light unless the firer is shooting consistently and the aim point can be determined.

Use the aiming light ruler to determine the number of clicks in windage and elevation required to move the strike of the bullet to the desired impact point. Use center mass of the shot group for these measurements. Check the knob adjustment guide to ensure that adjustments are made in the correct direction.

Center the shot-group size transparency (the 5.5-centimeter circle) over the bullet impact point to evaluate each shot group. All bullets should be within the circle and as close to the impact point as possible.

Fire no more than four shot groups for each 25-meter zero target to accurately assess shot groups. The wide dispersion of bullets frequently makes it difficult to mark shot groups distinctly and can result in an incorrect adjustment. Put up a new 25-meter target after this point.

Checklist

The following checklist summarizes the steps that should be taken when zeroing an aiming light. It assumes that all training aids and target modifications have been made.

Prepare for zeroing with aiming lights:

- Zero the M16A2 rifle for 300 meters during daylight hours.
- Use a striped E-silhouette.
- Use a 25-meter zero target marked with the correct bullet impact point.
- Center the 25-meter zero target on the stripes on the E-silhouette.
- Place the aiming light ruler and shot-group size transparency at each 25-meter zero target location.
- Place the aiming light knob adjustment guide at each firer's position.

Zeroing procedures at night with aiming lights:

- Be sure the rifle is set properly for zeroing at 25 meters, one click up from the 300-meter setting.
- Shine a flashlight on the 25-meter zero target from the firer's position, as needed.
- Fire and mark two, three-round shot groups before making the first aiming light adjustment.
- Use the aiming light ruler to determine the number of clicks for windage and elevation adjustments.
- Check the knob adjustment guide to ensure that adjustments are made in the correct direction.
- Use the shot-group size transparency

Since the live-fire procedures described in this article were developed and tested, the Dismounted Battlespace Battle Lab at Fort Benning has developed a dry-fire boresighting technique that is effective, easy to use, and inexpensive. Soldiers will benefit from knowing both live-fire and dry-fire techniques.

to evaluate size.

• Put up a new 25-meter target after firing four shot groups.

When finished with these steps, move the elevation knob on the M16A2 down one click to ensure that sights are aligned for 300 meters. At this point, the rifle sights are battlesight zeroed for 300 meters; the AN/PAQ-4A is zeroed for 100 meters; the AN/PAQ-4B is zeroed for 250 meters.

These procedures will result in better aim points, better aiming light zeros, and more target hits at range. They will also save time and ammunition during the zeroing process. Fewer errors will be made in adjusting the aiming light. Do not omit steps; each is critical.

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CASEVAC for Light Infantry Units

At a Combat Training Center

CAPTAIN JAMES SISEMORE

The evacuation and treatment of casualties on the battlefield is one of the most frustrating and difficult missions for a light infantry unit during a rotation at a combat training center (CTC). It is also one of the most important.

Each unit that prepares for a rotation understands that it will suffer casualties. Most units try to prepare for casualties by implementing training that incorporates casualty evacuation (CASEVAC) into the scenario. But these units often find during a CTC rotation that they are not prepared to handle the large number of casualties they experience. And leaders do not realize the way these casualties affect the ability to complete a mission, or even continue it.

The techniques and options I cover here will not solve all the problems you encounter, but I believe they will help you prepare for a CTC rotation, or for combat.

Integrate evacuation and available medical treatment assets into your battalion planning sequence. The battalion S-1 and medical platoon leader play an important part in wargaming and should be included in the decision making process. It is during this process that the medical platoon leader can use his ability to support the mission. By including medical support in the wargaming process and later in developing the synchronization matrix, you can tailor medical assets to support the tactical scheme of maneuver and increase the plan's effectiveness.

Using the course of action decided upon, the medical platoon leader should plan his support on the basis of the main effort. Medical support needs to focus on the point at which the commander, S-3, and S-2 plan for the main effort to encounter strong enemy resistance.

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Tailor the medical support to the mission. There are several ways to plan and conduct medical support during an operation. Depending on the assets available, a single or a dual aid station can be established to support the mission. The benefit of either type varies with the category of mission. The important thing to remember in developing a plan is to tailor medical coverage to mutually support all company teams in both offensive and defensive operations.

The use of a single aid station may be beneficial in operations where large numbers of casualties are expected in a single operational area. With a single station, the complete assets of the medical platoon are available in one location, its sustainment and resupply are easier; and, since it is often located with the combat trains, it is easier to defend. A single station may also be necessary if medical crewmen have become casualties and you cannot man more than one.

The use of dual or mobile treatment teams can be an advantage in the treatment of casualties in offensive operations. A mobile team can move quickly to the site of the battle and treat the casualties on the objective (once it is secure or the fighting has advanced beyond the initial contact site). This "follow and support" concept assists triage forward, which in turn improves the treatment of casualties at the main aid station.

Most light infantry units, depending on the table of organization and equipment, are authorized a "professional doctor" (an active Army physician dedicated to the