

# FROM THE BORESIGHT LINE

## The Z-Pattern

by 1SG Michael D. Stephens

The coaxially mounted machine gun enhances the lethality and versatility of armored vehicles, allowing crews to engage targets effectively and contribute to the success of combined arms operations. Its integration with the main gun's fire control system also ensures coordination and synchronization of firepower, maximizing the vehicle's combat effectiveness on the battlefield. Training and proficiency in gunnery techniques like the z-pattern are essential for armored vehicle crews to maximize the effectiveness of the coaxial machine gun in combat situations. Regular practice and simulation exercises help develop the skills and muscle memory needed to employ the weapon system accurately and decisively on the battlefield.

During the 2024 Sullivan Cup competition, vehicle commanders and gunners generally engaged vehicle targets with vehicle-mounted machine guns effectively. However, troop target presentations presented the crews with unique challenges. During the competition, crews did not demonstrate correct machine gun engagement techniques when firing the coaxial machine gun at a troop array, failing to hit the targets. The competition crews engaged the target correctly by firing an initial burst at one of the troop silhouettes using the coaxial machine gun (coax). However, their subsequent actions indicate a lack of proper adjustment techniques. Proper adjustments involve elevation (up and down) and azimuth (left and right). The crews only adjusted elevation, which means they failed to account for any lateral movement, z-pattern, needed to cover the width of the target array.

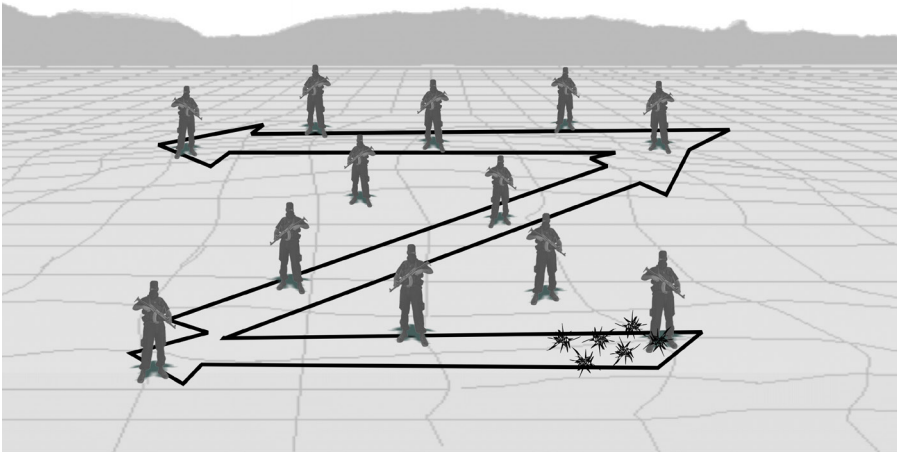


The firer must consider factors such as target acquisition, reticle lay, and correct engagement techniques to successfully engage the target. Scan and search techniques such as rapid scan, slow scan, and detailed search will aid the firer to identify the target quickly. Once the firer has identified the target, the firer must correctly place the reticle on the target or at its base, depending on the target array presented to further posture the system for effective use. To effectively use the coaxial machine gun against a troop array (targets with width and depth) the firer (often the gunner) must show an understanding of machine gun theory. The gunner's knowledge of the machine gun is not complete until they learn about the action and effect of the projectiles when fired. The following terms help the vehicle commander and gunner understand the characteristics of fire of the coaxial machine gun: line of sight, the burst of fire, trajectory, cone of fire, beaten zone, the effect of range on the beaten zone, and effect of slope on the beaten zone.

They must also demonstrate the ability to execute correct engagement techniques such as correct reticle lay, using

bursts of fire, and the "z-pattern." Once the firer has appropriately placed the reticle and determined an appropriate range for the target, the firer should begin firing a burst at the front right silhouette and deliberately move the impact of the rounds, the beaten zone, from right to left and work in a "z-pattern" back to the right. The "z-pattern" is a tactical maneuver commonly used by armored vehicle crews to engage enemy dismount teams transitioning between primary and secondary fighting positions. This maneuver involves tracing a pattern resembling the letter "Z" with the fire of the coaxial machine gun, covering the potential routes enemy dismount teams might take during their movement. By employing the Z-pattern, crews can effectively suppress and engage enemy personnel as they move, preventing them from reaching their secondary positions or conducting offensive actions. This tactic maximizes the firepower of the coaxial machine gun, utilizing its capability to lay down suppressive fire along specific routes of enemy movement.

Overall, the z-pattern is an effective strategy for armored vehicle crews to



**Figure 1. Proper z-pattern as described in FM 3-20.21, *HBCT Gunnery***

disrupt and neutralize enemy dismount teams, enhancing the vehicle’s defensive capabilities and contributing to overall mission success. Each burst of fire should be approximately 10-15 rounds, allowing the gunner to use 2-3 tracers for sensing as well as the “splash” of the rounds being fired as they impact the ground near the target. The firer will deliberately move the beaten zone across the target array by slowly and smoothly using the control handles to manipulate the reticle placement during the engagement. Abrupt movements can disrupt accuracy and make it challenging to maintain effective fire on target. Throughout the engagement, the firer should keep a clear sight picture to accurately assess the placement of the reticle and the impact of rounds. This ensures that the firer adjusts with precision and in response to real-time feedback. By systematically moving the beaten zone across the target array, the firer can effectively engage each target or cover a designated area with suppressive fire. This technique is particularly useful in defensive or area denial situations where the goal is to prevent enemy movement or limit their ability to return fire.

Crews can train coaxial machine gun engagement techniques in diverse ways. Simulations provide an opportunity to train correct engagement

techniques without the use of a live-fire range. Simulations also provide a safe and controlled environment for crews to familiarize themselves with the operation of the machine gun, practice target acquisition, and refine their aiming and firing techniques. These simulations can mimic various scenarios, including engaging troop arrays in different terrain and weather conditions. The Advanced Gunnery Training System (AGTS) provides a simulated environment replicating real-world scenarios and allows crews to hone their target acquisition, identification, engagement, and target destruction skills.

The AGTS can only be effectively used when training is conducted by certified instructor/operators (I/Os) and certified vehicle crew evaluators (VCEs) for system management and crew evaluation. Certified AGTS I/Os will provide crews with systems management and tracking crew progression through the system’s matrix. AGTS can simulate various conditions, terrain, and targets, ensuring that crews are prepared for any challenges they may face in the field. However, the system does not assess incorrect engagement techniques when using the coaxial machine gun against troop arrays.

Certified VCEs will provide crucial feedback to the crews, enabling the crews

to be better prepared for upcoming live-fire engagements. Certified VCEs will enable crews to develop correct engagement techniques and best practices following doctrine and unit standard operating procedures. This training not only improves their proficiency but also enhances their ability to react swiftly and accurately in high-pressure situations. The certified VCE needs to be familiar with machine gun theory and correct coax engagement techniques to provide the appropriate feedback to the crew. Using AGTS can significantly enhance a crew’s combat readiness and effectiveness. Progressing through simulations and live-fire gunnery tables is crucial for crews to build proficiency, especially when it comes to engaging targets such as troop arrays with the coaxial machine gun.

Following the simulation training, live-fire gunnery tables allow crews to apply what they have learned in a realistic setting. This hands-on experience is invaluable for developing muscle memory, improving accuracy, and increasing confidence in engaging targets with the coaxial machine gun under live-fire conditions. Progression through these training stages ensures that crews are thoroughly trained and proficient in using the coaxial machine gun to effectively engage troop arrays and other targets they may encounter in combat situations. It also helps instill a sense of teamwork and coordination among crew members, as they learn to communicate effectively and work together to accomplish their mission objectives.

The crew’s understanding of how to apply the coaxial machine gun properly is crucial for their ability to engage and neutralize targets on the battlefield effectively. Crew members must undergo thorough and rigorous training in the operation, handling, and firing of the coaxial machine gun. This includes familiarization with the weapon system’s controls, sighting mechanisms, and fire control systems. Crew members need to always maintain situational awareness, continuously scanning the battlefield for potential

threats and opportunities. This allows them to quickly identify and prioritize targets, adjust their firing solutions, and respond to changing tactical situations. Effective communication and coordination between crew members are essential for maximizing the coaxial machine gun's effectiveness. The gunner must effectively communicate target locations and engage commands to the rest of the crew, while other crew members provide support, assist with target acquisition, and ensure the smooth operation of the vehicle. Crews must be adaptable and able to adjust their tactics and firing techniques based on the terrain, environmental conditions, and the nature of the threat. This includes employing different firing patterns, utilizing cover and concealment, and maneuvering the vehicle to optimize firing positions. Maintaining fire discipline is critical to conserving ammunition, minimizing exposure, and maximizing the effectiveness

of suppressive fire. Crews must avoid wasteful or indiscriminate firing and focus on accurately engaging priority targets to achieve the desired effects.

By mastering the z-pattern and other principles and applying them consistently in combat situations, armored vehicle crews can leverage the full capabilities of the coaxial machine gun to engage and destroy targets effectively, contributing to the success of their mission and ensuring the safety of friendly forces.

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## Notes

<sup>1</sup>Headquarters, Department of the Army (2009, September). FM 3-20.21 Heavy Brigade Combat Team (HBCT) Gunnery.

<sup>2</sup>Headquarters, Department of the Army (2017, April). TC 3-22.240 Medium Machine Gun.

<sup>3</sup>Headquarters, Department of the Army (2005, August). FM 3-20.12 Tank Gunnery (Abrams).



From the ARMOR Art Archives:  
An M1IP Abrams In Korea