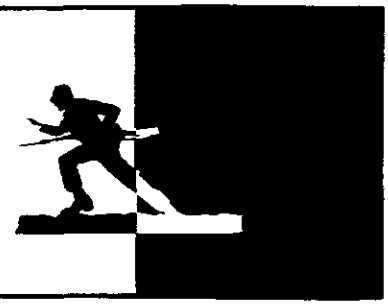
TRAINING NOTES



Bradley MILES Training
What I Didn't Know as a Company Commander

CAPTAIN GREGORY A. WATT

In today's training environment, maintaining tactical readiness is a big challenge, given current fiscal constraints and reduced operating tempo. As a result, much of our training is now conducted with simulators and simulations—such as the multiple-integrated laser engagement system (MILES). For infantry units equipped with Bradley fighting vehicles (BFVs), BFV MILES is becoming one of the primary gunnery training devices.

Having served at the National Training Center (NTC) for more than two years, I would like to share some observations and advice concerning BFV MILES training.

First, many leaders have only a general familiarity with BFV MILES, which leads them to believe it performs the same way our BFV weapon systems perform. They do not understand, for example, that a crew may do everything right with the TOW—install the MILES correctly; set, check, and align the device; employ the BFV properly; use correct gunnery techniques; track the missile for the required time—and kill a T-72 tank at 3,000 meters only 50 percent of the time; or that the crew may do everything correctly with the Bradley's 25mm cannon and kill a BMP at 2,400 meters only 23 percent of the time. These are the NTC vehicle probabilities of kill (PKs) that are duplicated at most installations—not the PKs outlined in Training Circular (TC) 25-6-7, Table 6-1, Weapons Effects Simulation Characteristics. And many of our BFV crews cannot achieve anywhere near the NTC kill probabilities.

To counter these problems, leaders at all levels must be trained on the simulation system itself—its installation, capabilities, characteristics, checks, alignment procedures, and troubleshooting. Unfortunately, the Master Gunner Course does not offer any formal training on MILES; consequently, the unit master gunners, who are the Bradley commanders' primary training managers and systems advisors, do not always have the MILES skills they need.

Local training support centers should be able to provide subject matter experts and the proper equipment: the Multiple Range Alignment Device, the MILES System Test Set, and the Electronic Systems Test Set. Other good sources of information are TC 23-5, *Bradley Fighting Vehicle Training Devices*; TC 25-6-7, *Tactical Engagement Simulation Instructors' Training Guide for Exercise Observer-Controllers*; TC 25-6-9, *Tactical Engagement Simulation Instructors Training Guide for Armored/Mechanized MILES Systems*; and Field Manual 23-1, *Bradley Fighting Vehicle Gunnery*.

If we are to get the maximum benefit from training with MILES, all leaders of Bradley units must know about the problems with before-operations checks and with the boresight and alignment of BFV MILES.

After the BFV MILES components are installed, troubleshooting often includes checking them with a controller gun, swapping out batteries, and swing testing components. But the additional checks shown in the accompanying box must also be performed.

After BFV MILES is installed and tested to ensure that all the components are operational, the BFV integrated sight unit (ISU) must be boresighted to the 25mm main gun and the TOW, using the vehicle boresight kit in accordance with TM 9-2350-284-10-2, *BFV Operators Manual for the Turret*. This boresighting must be completed before the MILES transmitters are aligned to the ISU. Then just as boresight and zero are reconfirmed with service ammunition after a major move or roadmarch—or a major temperature or weather change—BFV MILES must also be realigned at these times. Unit leaders must see that the

MILES transmitters are cleaned daily with alcohol pads or lens tissues. This cleaning should be completed before MILES is aligned and should become part of the alignment procedures.

Before performing these alignment procedures, however, the leader should consider the techniques available for this task. As with all missions, the alignment procedures he chooses will depend upon an analysis of METT-T (mission, enemy, terrain, troops, and time). Whatever the technique, constant supervision is required. Issuing a location and a not-later-than time of completion for MILES boresight and alignment, or even placing the company master gunner in charge, does not necessarily ensure an accurate MILES alignment. Individual vehicle crews must not be allowed to do the alignment on their own. The most efficient techniques that will allow a unit to maintain a common standard are either setting up a company or team consoli-

BFV MILES BEFORE-OPERATIONS CHECKS

• Use fresh batteries. Check to make sure the 6-volt batteries have between 4.5 and 6.5 volts and the 9-volt batteries have between 7.5 and 9.5 volts. (Relatively inexpensive voltmeters can be procured through local purchase in sufficient quantities to have one per vehicle. This enables a Bradley commander or gunner to check the batteries before swapping them out for new ones. Furthermore, a vehicle may continue emitting a laser beam that will "kill" a BMP without risking destruction itself, and this is not training to standard.

• Turn on vehicle master power, and push the PRESS TO READ button on the control console. The display should read 00.

• Set the system by inserting the green key in the key receptacle on the control console and turning the key counterclockwise to CONTROLLER; then turn it back and remove it. Turn the console switch to HIT/KILL, then to SELF TEST. Press the PRESS TO READ button. The display should read 88. Turn the console switch to MISSILE, then press the PRESS TO READ button. The display should read 12. Turn the console switch to MAIN GUN, then push the PRESS TO READ button. The display should read 15. Then turn the console switch to COAX, and push the PRESS TO READ button. The display should read 45.

• Insert the orange key in the control console receptacle at the 9 o'clock position; turn the key clockwise to the WEAPON position; then turn it back and take it out. There should be a tone in the intercom, and the combat vehicle kill indicator (CVKI) light should be flashing. Turn the control console switch to HIT/KILL, and press the PRESS TO READ button. The display should read 99.

• Reset the control console with the green key, and confirm that you still get the display readings: 12, 15, 45, and 88.

• Next, conduct the trigger interface test by turning the turret power ON and setting the manual/power operation levers to MANUAL. Punch up either AP HIGH or HE HIGH on the weapon control box, and move the ARM-SAFE-RESET switch to ARM; ensure that the indicator light comes on. Push the LO AMMO OVERRIDE switch, and fire 100 rounds using HIGH RATE with the trigger on the traverse hand wheel for at least 30 seconds. Check the control console by moving the switch to MAIN GUN; the display should read 14. If it does not, fire the MAIN GUN for an additional 10 seconds and recheck. Then move the ARM-SAFE-RESET switch to SAFE. Raise the TOW launcher and make sure it is locked in the FIRING position. Set the MILES TOW simulator system to DRY FIRE. Press the TOW system button on the TOW control box. The TOW test light should come on for 12 seconds. Move the ARM-SAFE-RESET switch to the ARM position and push the MISSILE TUBE 1 button on the TOW control box. Ensure that the indicator light comes on. Fire a missile, and make sure the NOT READY light comes on and stays on for 11 seconds. Move the ARM-SAFE-RESET switch to SAFE. Check the control console by switching to MISSILE. Press the PRESS TO READ button, and the display should read 11. This completes testing the control console and the trigger interface.

• Now conduct the main gun transmitter test by selecting DRY FIRE on the 25mm laser transmitter; turn the turret power ON and the turret drive OFF. Punch up either AP SS or HE SS on the weapon control box. Move the ARM-SAFE-RESET switch to ARM, and ensure that the indicator light comes on; then push the LO AMMO OVERRIDE switch. Next, either use an operational man-worn laser detector (MWLD) or the detector belt from the left side of the turret. Place either device in front of the main gun transmitter, and fire the main gun transmitter using the trigger on the traverse hand wheel. Either listen for a KILL indication from the MWLD alarm or, while firing make sure the FLASHWESS light is flashing. When the FLASHWESS ceases to flash, ensure that the CVKI is flashing continuously. Then turn the control console switch to HIT/KILL and press the PRESS TO READ button. The kill code should read 22. Reset the control console.

• Now move to the COAX machinegun transmitter test by making sure the COAX is loaded with blank ammunition or that the dry fire plug is installed. Select 7.62 on the weapon control box and press the LO AMMO OVERRIDE button. Turn the ARM-SAFE-RESET switch to ARM, and make sure all indicator lights are on. Use an operational MWLD, and hold it directly in front of the main gun transmitter, ensuring that the soldier wearing it does stand in front of the coaxial machinegun barrel. Fire the COAX using the trigger on the manual traverse hand wheel; if blank ammunition is not used, tap the COAX microphone on any metal surface concurrently. Listen for a KILL or a NEAR MISS indication from the MWLD alarm; if the alarm is not activated, continue firing and tapping the microphone. Then reset the MWLD.

• To test the TOW transmitter, set the MILES TOW missile simulation rounds (MSRs) to dry-fire and erect the TOW missile launcher. Then press the TOW system button on the TOW control box (TCB). The TOW indicator light will come on, and then the TOW test light will come on for 12 seconds. Turn the ARM-SAFE-RESET switch to ARM, and push the MISSILE TUBE button on the TCB. Make sure the indicator light comes on. Again, the MWLD may be placed directly in front of the TOW transmitter, or the detector belt from the left side of the turret may be placed in front of the TOW transmitter. Fire the TOW missile using the manual trigger on the traverse hand wheel, and watch for the NOT READY light to come on and stay on for 12 seconds. Since you are simulating the tracking time of the round, you have to keep the trigger depressed for the entire 12 seconds, regardless of the range. Either listen for a KILL from the MWLD alarm, or check the control console and ensure that it shows an 07 kill code. Then repeat these test procedures for MISSILE TUBE 2. Upon completion, rekey the MWLD and reset the TOW by moving the ARM-SAFE-RESET switch to RESET. Due to the PHPK of BFV TOW MILES on an IFV or a BMP and a T-72 tank, you will not get a kill every time you fire a TOW missile at one of these vehicles. You must continue with this test until you get a KILL.

• Finally, test your detector belts by ensuring that the turret power is ON and the turret drive is OFF. Make sure all cable connections for the detector belt sections are clean and tight. Ensure that the cable from the CVKI light to the control console is also clean and tight. Then test each belt section by using a controller gun on NEAR MISS, and fire at each detector from no more than 10 feet away. The CVKI should flash each time you fire. A detector belt is considered non-mission-capable if more than one of its detectors is bad.

dated boresight and alignment line, or boresighting and aligning one cohesive platoon at a time. The only prerequisites are that a unit's BFVs be fully mission-capable, their MILES operational, and their turret weapon systems boresighted to the BFV ISU before the unit occupies the boresight and alignment line.

The MILES alignment range must be planned in detail. The use of a global positioning system (GPS) or a long-range navigation (LORAN) system significantly increases the accuracy of MILES alignment and a unit's ability to kill at precise ranges. Both of these devices will give azimuth and distance to the target from the firing line. Either with the company or a platoon on line at one time, the chain of command should be held accountable for ensuring that the alignment of the BFV MILES is conducted to standard. This is a platoon and company mission with a task and a purpose, and it requires the same sense of urgency and intensity as conducting actions on contact. As the master gunner works with the firing vehicle, the platoon sergeant should ensure that the rest of his vehicles are lined up and prepared to conduct the MILES alignment procedures. The platoon sergeant makes sure the units go through the process in a timely manner. He stays one vehicle ahead of the master gunner so that each vehicle is ready to fire when he calls for it. The platoon sergeant aligns his own BFV MILES last.

To boresight the BFV turret weapons, a unit can make a boresight panel out of a 4x4 sheet of plywood. Black and white spray paint is readily available through self-service supply centers. To boresight the BFV turret weapons in accordance with TM 9-2350-252-10-2 or TM 9-2350-284-10-2, this panel is placed out at 1,200 meters. The panel must be staked in and the azimuth and distance from the firing line must be verified with GPS or LORAN.

Since MILES is a line-of-sight system and range has little effect on the transmission of light, the range control knob should be placed on 0 (although any range may be indexed so long as it is not changed). Taking into account that the highest probability of hit to probability of kill (PHPK) with the 25mm main gun MILES transmitter on a BFV is 17 percent or on a BMP 23 percent at 2,400 meters and that it is a line-of-sight system, it does not make any sense to align the 25mm main gun MILES transmitter at a range of less than 2,400 meters. The same thought process is applied to aligning the BFV TOW MILES. The highest PHPK for the BFV TOW MILES against either an M1 or a T72 tank is 50 percent at 3,000 meters, so the TOW MILES alignment target should be placed at 3,000 meters. (If a 25mm main gun transmitter or a BFV TOW transmitter cannot kill at these ranges, it is out of tolerance and should be exchanged or turned in for repair.) A target position is therefore staked out at 2,400 meters and another at 3,000 meters to verify the azimuth and distance to these target positions from the firing line with a GPS or LORAN. The position of the boresight panel, the 2,400-meter target and the 3,000-meter target should not exceed the field of vision on the HIGH MAG setting in the ISU, from the firing line.

Three options are available to use as targets at the 2,400-meter and 3,000-meter target points:

- A Multiple Range Alignment Device is the most desirable because it resets itself and does not need to be manned, unless a leader wants to know the strength of his MILES. Obviously, this alignment device must be mounted on top of something to be seen at 2,500 and 3,000 meters. The company's HMMWV (high-mobility multipurpose wheeled vehicle) or 2½-ton truck are two possi-

BFV MILES ALIGNMENT PROCEDURES

- Begin by aligning the TOW laser transmitter first. Turn the turret power switch ON and the turret drive switch ON.
- Raise the TOW launcher, and then turn the turret drive OFF.
- Select TOW on the TOW control box, either MISSILE 1 or MISSILE 2, and looking through the gunner's eyepiece acquire the target at 3,000 meters. Ensure that the gun elevation device is on POWER and the TOW elevation drive is on MANUAL. Put the turret traverse drive on MANUAL. Center the TOW reticle crosshairs on the target.
- Disconnect the TOW transmitter cable connector. Slightly loosen the ¾-inch retainer screw on top of the TOW laser transmitter so the movement of the transmitter does not put a strain on the retaining pin. Also loosen the four adjusting cap screws on the side of the TOW laser transmitter, using the adjustable wrench from the BFV basic issue items.
- Again, looking through the gunner's eyepiece on the ISU, center the launcher on the target at 3,000 meters.
- Now looking through the TOW transmitter's boresighting telescope, rotate the elevation adjustment knob to move the transmitter vertically until the crosshair is aligned vertically on the same target as the BFV's ISU.
- Next, while looking through the TOW transmitter's boresight telescope, rotate the azimuth adjustment knob to move the transmitter horizontally until the crosshair is aligned horizontally on the same target as the BFV's ISU.
- Look through the TOW transmitter boresight telescope and the ISU gunner's eyepiece to verify the alignment accuracy. Tighten the retaining screw and the four adjusting cap screws. If necessary, repeat these procedures to ensure that alignment is accurate.
- Reconnect the TOW transmitter cable connector. REMINDER: If the azimuth adjustment knob does not allow enough movement to permit alignment, loosen the transmitter mounting bolts and move the transmitter along the slot. Then tighten the mounting bolt again and make final adjustments with the azimuth adjustment knob.
- Moving on to the 25mm gun, again ensure that the turret drive switch is OFF; and acquire the target at 2,400 meters looking through the gunner's eyepiece on the ISU, and center the 25mm gun reticle crosshairs on the target.
- Slightly loosen the adjusting knob on the 25mm/coax laser transmitter and, while looking through the transmitter's boresight *telescope, adjust the elevation by turning the elevation screw.* Then adjust the azimuth by pushing the transmitter left or right as necessary. Adjust the elevation and azimuth until the crosshairs in the transmitter's boresight telescope are aligned on the same target as the crosshairs of the 25mm gun reticle in the ISU. Then tighten the adjustment knob.
- Look through the transmitter's boresight telescope and the 25mm reticle in the ISU and verify alignment. REMINDER: If it is necessary to adjust the 25mm transmitter's alignment, repeat these procedures.

bilities and target reference point burn barrels are another.

• An actual target vehicle at the designated range—a BFV at 2,400 meters and an M1A1 at 3,000 meters—can be used. The targets must be manned, and the soldier on board must have radio communication with the firing vehicle and also a *green key* to reset the system. The benefit with this option is the added confirmation that the firing vehicle's MILES will kill the target vehicle's MILES.

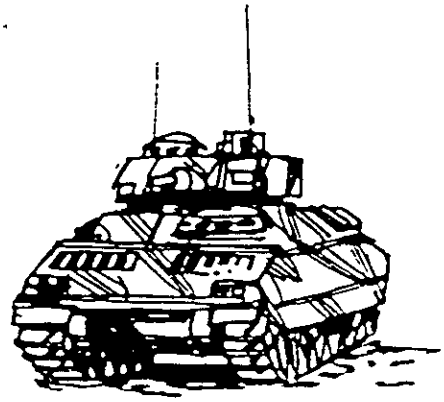
Alignment using this option requires one-sensor kills, and the additional sensors must be completely covered. Army green tape is not enough, because it is too porous and allows some light to penetrate it. A denser material such as plywood panels or duffel bags must be used.

• The Mobile Independent Target System (MITS) is placed on a HMMWV or a 2½-ton truck, the console switch is changed to reflect an armored personnel carrier, and the vehicle is sent out to the appropriate range. This is an economical option to use at home station where other equipment may not be available and funds may be scarce. Observations of this technique have reflected mixed results, however, and it should be the last choice.

After MILES alignment has been conducted at 2,400 and 3,000 meters, the trainer might consider placing a target vehicle out at 3,750 meters and monitoring which BFVs can kill it at this extended range. This same process can be used for the M1A1 main battle tank (MBT) MILES, as frequently both the BFV and the MBT MILES can kill at distances that exceed the published ranges. Each gunner must maintain a laminated 3x5 card with the date-time group of the last time he boresighted and aligned his MILES, whether he can kill with his 25mm gun at 2,400 meters and with his *TOW* at 3,000 meters, and the maximum range at which he can kill with each of his weapon systems. Platoon leaders and company commanders need to take this information into account as they place individual vehicles in the defense.

The range setup can be incorporated into unit SOPs, and with practice this can be done while the sand table is being built and the graphics are being reproduced. The master gunner should be required to give the commander and each platoon leader sketches of the range that they can include as additional instructions when issuing their warning orders. As with all preparations, the eighth step of the troop-leading procedures must be applied, and the actual MILES alignment procedures must be supervised.

A key point must be made regarding the MILES alignment process: If a BFV's MILES transmitters for both the TOW and the 25mm/coaxial machinegun are not mounted securely, it will not matter whether these transmitters have been boresighted and aligned or not. Particular



attention must be paid to the installation of the 25mm/coaxial machinegun transmitter, and it must be "slammed" onto the gun barrel so the teeth bite when it is secured; otherwise, it will vibrate loose and throw off any alignment that may have been done.

The TOW transmitter has a history of stripped mount bolt holes, broken bolts, and the like. The proper bolts, flat washers, and lock washers must be used to secure it. Local installations frequently use heli-coils and threaded stock to make field expedient repairs for mounting the TOW MILES transmitter. The stability of this transmitter, and thereby its accuracy, can be increased if Velcro and a wood block shim are added between the transmitter and the outside of the launcher while the transmitter is mounted in the existing bolt holes, either in the normal position or slid forward.

Once the alignment has been verified by the acquisition and engagement of the targets at 2,400 meters and 3,000 meters, at a minimum, crews should again clean their transmitters and move back to their assembly areas. This completes the testing, boresighting, and aligning of their BFV MILES equipment.

Since BFV MILES is not a true representation of the capabilities and effects of the 25mm main gun and the TOW, leaders must now accept this as a training constraint. Unfortunately, this tends to force units to train for the simulation itself instead of for combat.

Specifically, in the employment of BFV MILES, the vehicles with a primary weapons ready posture of TOW must be considered. Positions that allow these BFVs to be emplaced above any potential obscuration and to be stationary increase the effectiveness of their fires. Massing fires by using the volley fire technique also increases their PHPK, given the number of code words transmitted per second. If, for example, it is determined during the commander's mission analysis that the unit faces a close-in fight in fairly restrictive terrain, one technique with the 25mm main gun is to refer the auxiliary sight at 1,200 meters when the turret weapon systems are initially boresighted. These points are further discussed in TC 23-5, *Bradley Fighting Vehicle Training Devices*.

Although some units may not have problems with massing fires or with boresighting, aligning, and employing weapons, the leaders and trainers in these units must rigidly adhere to boresighting and alignment procedures. Instead of relying solely on their master gunners, they must be intimately involved in their units' BFV MILES training.

Captain Gregory A. Watt is assigned to the Combined Arms Center at Fort Leavenworth. He previously served in platoon and company observer-controller and training assignments at the National Training Center. He is a 1983 ROTC graduate of State University of New York at Fredonia.