



Photos courtesy of
United Defense

Armored Cavalry Mortars: Operations and Myths

by First Lieutenant John M. Ives

The average mortar section in an armored cavalry troop is misunderstood and under-utilized. Myths and untold secrets surround the cavalry's only organic infantrymen and their elusive skills. Several Mortar Section Live Fire Exercises and a Cavalry Troop Mortar Section ARTEP put the myths to rest and revealed many secrets to this mortarman.

The basic workings of the 120mm mortar system and the M1064A3 Mortar Carrier lay directly in the hands of the mortarman themselves. However, the cavalry troop's leadership must understand what those systems can and cannot do to properly train their mortarman and succeed on the battlefield.

First, the basics. One must know round and fuze types, how the mortar section conducts troop operations, and training for the mortar section. Begin with: *FMs 23-90, 23-91, 7-90; ARTEP 7-90 MTP; and STP 7-11c14-SM-TG*. These texts should answer your questions and provide technical details. My article is a simplified list for use as a guideline and should in no way circumvent the manuals.

THE EQUIPMENT

The three basic rounds in the 120mm mortar family — high explosive, illumination, and white phosphorus — can produce several effects with the proper fuzes. Typically, each round weighs 33 pounds and is shorter than a tank's sabot round.

The High Explosive (HE), M933 or M934, is a four-charge mortar round with a kill radius of 60 to 75 meters, dependent on the terrain. The round can be stored vertically or horizontally in the mortar carrier.

The M930 Illumination (ILLUM) round can illuminate a 1,500m-diameter area for 60 seconds. When the timing is set for ground burst, ILLUM can mark a lane for close air support (CAS) missions and target reference points (TRP), given the heat of the round. In addition, the ILLUM round can counter enemy image intensification devices, thanks to its 1,000,000-candlepower brightness. (As of February 2001, the M930 is listed as XM930, still in developmental stages.)

The M929 White Phosphorus (WP) round remains the most misunderstood

mortar round. The WP round must be stored vertically or the liquid WP will coagulate on one side, thus making it fly like a wounded duck. WP liquefies at 100 degrees F. Even in cooler temperatures, the viscosity of the WP is such that it will ooze to one area if stored horizontally. Although the burst radius is much smaller than that of an HE round, WP can also cause external damage to enemy tanks and BMPs.

All rounds come with the M745 point detonation (PD) fuze already attached (except the M934 HE, which comes with the M734 multi-option fuze).

The M734 multi-option fuze has settings for PRX, NSB, DLY, and IMP. The PRX setting will burst three to thirteen feet from an object, and the NSB lowers the burst height to closer than three feet. PRX and NSB settings work well against foxholes, trench positions, and enemy dismounts in the prone position. Snow, water, ice and tree canopies affect the burst height of a PRX and NSB fuze. Delay setting bursts 0.05 seconds after impact, allowing the round to travel into the ground, bunker, or through a tree canopy before it bursts. Delay fuze settings work well

in dense vegetation, and are useful in creating casualties among dismounts, as the below-ground blast disperses shrapnel, rocks, and debris more effectively than the impact setting. All settings are changed by hand.

The M766 multi-time super quick fuze can be timed to burst 6 to 52 seconds into time of flight. This allows an air burst or an impact burst. With this fuze, a good crew, or an extremely lucky one, could take down a formation of enemy choppers. Finally, the M935 point detonation fuze can be set for impact or a 0.05-second delay.

The most important thing to remember about the fuze types and capabilities is that the special fuzes arrive separately from the rounds (except for the before-mentioned M934 HE). The unit must order them long before a deployment.

The M1064A3 120mm Mortar Carrier has a five-man crew consisting of a squad leader, gunner, assistant gunner, driver, and ammunition bearer. This vehicle, with a cruising speed of 40 mph and a 95-gallon fuel tank, has a range of 300 miles and can operate for more than three days in static positions without fuel resupply. You should know that the M1064A3's engine automatically shuts off (as if empty) if fuel readings fall below a quarter-tank; crews and mechanics usually know this information. The mortar carrier holds up to 69 of the 120mm mortar rounds; however, only 24 can be stored verti-

cally, so only 24 WP rounds can be stored on each track. In case of a war-time mission, according to veterans of Desert Storm, the HE and ILLUM rounds can be strapped, with their cases, to the sides and top of the vehicle. This increases the round count by at least twenty. Small arms fire should not detonate the rounds.

The M1064A3's M121 gun system can be dismounted from the vehicle if necessary, but the weight of the gun tube, 110 pounds, and the base plate, 136 pounds, are deterrents for dismounted operations. Still, crews must train for this possibility. The fast-paced tempo of cavalry missions does not lend itself to dismounted mortar operations. With a range of 200 to 7200 meters, the M121 has a rate of fire of 16 rounds for the first minute and a sustained rate of four rounds per minute. A safety lever is located at the base of the tube and the firing pin can be changed out and cleaned. Both devices are worth checking. When the gun is layed in (oriented along an azimuth with the use of an aiming circle), it has a max field of fire of 1,666 mils (approximately 90 degrees).

Do not neglect the aiming circle, mortar ballistic computer (MBC), and the M16 plotting board. The aiming circle will aid in properly and accurately laying in the guns. It is important to declinate the aiming circle often, depending on time, weather conditions, and distance moved. Often, leaders errone-

ously skip this tedious procedure during training.

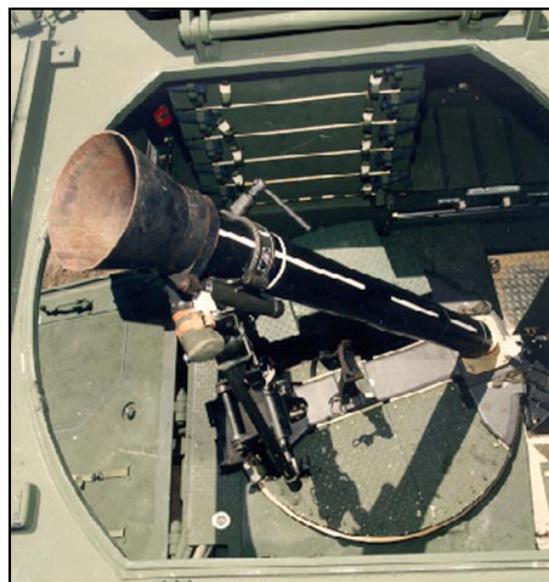
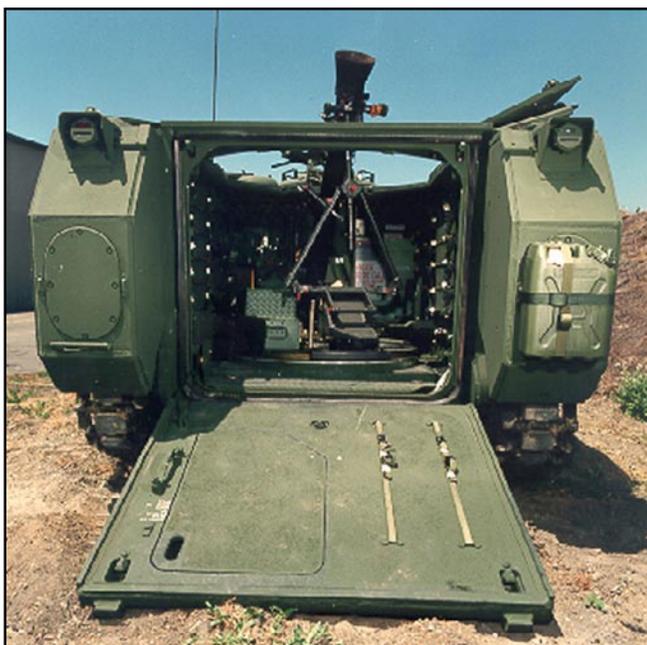
The M16 plotting board is the manual method of acquiring firing data. Although it has been replaced by the MBC, the plotting board should be used to verify the computer's data during live-fire exercises, and should be practiced during simulations.

The MBC is powered by lithium or mercury batteries, or can be attached to the vehicle batteries or the back of radio mounts in an emergency. The squad leader can either manually input the data into the MBC or the forward observer (FO) can send the information digitally with the digital messaging device (DMD).

The DMD transmits a digital call for fire directly to the MBC in either frequency hop or single channel mode. Using the digital option limits the mistakes sent during voice calls for fire and, after thorough training, can be completed twice as fast. The MBC and DMD communicate so long as the FO turns off the crypto-key on the DMD. The operation is simple and effective; however, it is a perishable skill. The FO's and the mortar men must practice this operation together to ensure both teams understand the equipment.

OPERATIONS

Mortar men speak their own language. "Direction of fire" for the mortars is the same as setting target reference points.



The M1064A3 120mm Mortar Carrier

Appendix A:

ROUNDS		
ITEM	DODIC	NSN
M933 HE	C623	1315-01-343-1941
M934 HE w/ M734 Fuze	C379	1315-01-335-5016
XM930 Illum	C625	Not Released
M929 WP	C624	1315-01-343-1940
FUZES		
ITEM	DODIC	NSN
M734 Multi-option	N288	1390-01-268-7283
M776 MTSQ	Not Released	0000-00-900-8079
M935 PD	N342	1390-01-268-9155
M935 PD	N342	1390-01-245-8954
TRAINING DEVICES		
ITEM	DODIC	NSN
M880 Training Round	C876	1315-01-216-7070
M80 Refurbishment Kit	C045	1315-01-219-3936

Direction of fire can be relayed to the mortar section in degrees, mils or through graphics. The mortars will translate the direction of fire into deflection. Deflection refers to the gun tube orientation with respect to the direction of fire. Deflection is set as 2800 or 3200 regardless of direction of fire. For example, the troop commander calls for the mortars to set with gun tube orientation northeast. The mortars will refer to the direction of fire as 0800 mils. When they reach the given mortar firing point (MFP), the tracks will face about, and set their guns to the direction of 0800. Internally, they will set this direction of fire as the center deflection of 2800. Again, this is only in relation to the gun tube orientation. All calls for fire will be translated into deflection by the mortar section.

For planning purposes, the deflection range fan is common and quite helpful. Simply use an overlay sheet; draw a range fan with a centerline, and left and right limits. The left and right limits should be 45 degrees from the centerline, and the max distance should be 7,200 meters. Keep the range fan handy during the missions as the commander determines the indirect fire coverage from each mortar firing position.

Mortar sections set in a position and prepare to fire through three techniques: hipshoot, deliberate, and hasty occupation. A hipshoot mission is used for immediate suppression calls for fire. When the mortar section is moving and receives a call for fire, they must stop, put the guns into action, and fire the first round in less than four minutes with a 20 mil accuracy (according to the ARTEP standard). This is the most utilized and abused mission during cavalry operations. Troops should not be satisfied with 20 mil accuracy when given the opportunity to set the mortars in a MFP — consider that 20 mils at 1000 meters is approximately 200 meters off a determined target. Once the immediate suppression mission is complete, the mortars will improve their position and accuracy with the aiming circle.

A HE and WP mixture for immediate suppression will break the enemy's spirit and provide excellent suppression. This mixture provides 90 percent suppression for up to a 65m diameter, 50 percent suppression up to a 125m

diameter and only 10 percent up to 200 meters.

Deliberate occupations are time-consuming and tedious. With the recon of the MFP, setting the aiming circle, and occupying the position, the section could spend over 45 minutes before set. A hasty occupation, on the other hand, does not perform a dismounted recon, but takes the position by force.

With the aiming circle, a hasty occupation of a mortar firing point gives the unit a 2 mil accuracy of fires and the mortar section is prepared to fire in less than eight minutes (according to the ARTEP). The troop commander must plan and place MFPs throughout the sector to ensure the hasty occupations can occur.

Mortar firing points are determined and cleared using eight steps. When the scouts and the mortars work together, this process can be completed during a zone reconnaissance or a movement to contact. The eight steps are:

1. Does the tactical situation call for a MFP in that area?
2. Can the mortars range the designated targets with the $\frac{1}{3}$ - $\frac{2}{3}$ Rule? One third of the mortars' range should extend beyond the designated target area.
3. Can the mortars cover the target area from that position?
4. Does the MFP offer cover and concealed routes in and out of the position?

5. Do any existing structures (natural or man-made) mask fires and is there overhead clearance? A hilltop could mask fires and tree limbs block overhead clearance. In training, have the scouts elevate their gun tubes to the mortar's minimum elevation and mark that position. When clearing a MFP, the scouts can elevate their guns to that marked position to ensure the mortar fires are not masked. A protractor is also useful.

6. Is the position's surface condition conducive to track vehicles?

7. From that position, can the mortars maintain radio contact with the TOC, FIST-V, and commander?

8. Are there multiple covered and concealed routes to and from the positions?

It is clear the scouts can clear all mortar firing points before the mortars begin to occupy, and aid in maintaining the optempo for the troop.

From some positions, mortar sections can perform their own calls for fire and conduct their missions through direct lay. In this situation, the mortars range their targets and set their directions of fire. This method is quite useful in defensive operations and in flat land areas.

After setting a desired MFP, the mortar section calls for a ballistic meteorological message (MET message). The MET message enables the mortar sec-

tion to compensate for all nonstandard conditions. It contains data on air temperature, air density, wind speed, and weight of propellant and rounds. The message is initiated by the Field Artillery Target Acquisition Battalion and is sent to the squadron/battalion fire support officer (FSO). Once received, the FSO disseminates the MET via FM communication to the mortar section sergeant, who, in turn, compiles the data on a Ballistic MET Message form (DA Form 3675). The mortar squad leader then inputs the data into the MBC or manually completes the data on a MET Data Correction Sheet for Mortars (DA Form 2601-1). With either the form or the MBC, the squad leader can update the firing equipment to meet the necessary changes and conditions that affect the mortar round's flight. The MET message is received with the initial registration of rounds, and a second message should be sent four hours later to compute differences and update the equipment. The messages can be sent for each position, but a standard area message sent daily by the FSO will suffice for cavalry operations.

During zone reconnaissance, MFP locations and displacement criteria are dependent on tempo. Naturally, tempo is dependent on terrain-oriented or enemy-oriented zone recons. A terrain-oriented zone recon allows several MFPs to be set throughout the sector and gives the mortars time to displace to the next position. This ensures planned coverage of danger areas.

Enemy-oriented zone recons move faster than terrain-oriented, and change the displacement criteria of the mortar sections. Mortar firing points should be placed to cover danger areas and dis-



Art by SFC Michael Munoz

“Should the troop choose the indoor option, the mortar section can continue to train on the mortar ballistic computer, the plotting board, basic map reading, .50 caliber PMI, and conduct of the Fire Direction Center (FDC) exam....”

placement criteria should be understood by the mortar section before missions begin. This is an excellent opportunity for the scouts to clear the MFPs through sector.

Movements to contact call for hip-shoots more readily, but hasty occupations are preferred. The troop commander must plan carefully when placing and displacing mortars. Moving the mortars, for example, as the lead scout section reaches the line of contact is not wise.

For defensive operations, the commander must ensure routes in and out of MFPs are readily available and several are identified. The movements can be rehearsed and timed by the mortar section prior to contact, and rounds can be cached at each point. For example, cache illumination rounds for TRPs and CAS lanes in the initial position, and WP and HE mix in the last position for the final protective fire

(FPF). Screen lines are performed in the same manner.

Cache points are simple and often overlooked. The unit can emplace any number of rounds at any number of points. Ensure the cache points are not obvious and camouflage is utilized. The mortar section prepares the rounds as soon as the cache point is verified and rounds are dropped. This will save time during the battle. Also, the mortars should prepare the points to be blown in place in case of emergency. This implies that C-4 and accompanying equipment must be supplied, and the mortar men must be trained in demolition.

Obstacles are often a source of contention, and breaching operations must be rehearsed. One step often considered late into the process is the “R” (reduce) in SOSR (suppress, obscure, secure, and reduce). Delay or impact fuze settings on HE rounds fragment concer-

tina wire, while a proximity fuze setting detonates mines with overpressurization. This reduction of the obstacle will aid in the breach before the breach force enters the enemy's kill sack. Naturally, mortar fire can also be used against possible enemy overwatch positions or as immediate and limited smoke on or around the obstacle.

The mortar smoke mission is by far the most misunderstood operation. From the scouts to the troop commander, a virtual hand wave is given in dealing with obscurity. The unit plans for 15 minutes of smoke, yet does not provide for it. Under the most favorable conditions (70 degrees F with a slight breeze), two WP rounds will cover a 100m by 40m area for 60 seconds.

Keep in mind, however, that WP rounds take 30 seconds to produce smoke after impact. Adding even a 10-mph breeze will double or triple the number of rounds for the same time and area. For example, 15 minutes of smoke in 50-degree temperature with a crosswind of 20 mph would require over 80 rounds. Given the space for WP rounds on a mortar carrier (24 vertically), this mission would be impossible to accomplish without a cache or immediate resupply.

TRAINING

Moving the rounds for any defensive or offensive operation is quite difficult. An LMTV holds approximately 100 rounds and a HEMTT holds approximately 300. A good technique is to provide each mortar section with a HEMTT or LMTV during training exercises. Also, practice the time it takes to upload and download rounds from a HEMTT, break down the rounds at a cache point, and move the HEMTT to and from the field trains for more rounds. This will provide realism in training and will change how the troop and the support platoon do business.

Other training techniques for the mortar section are conducted indoors, in the motor pool, or just outside the gates of the motor pool. Should the troop choose the indoor option, the mortar section can continue to train on the mortar ballistic computer, the plotting board, basic map reading, .50 caliber PMI, and conduct of the Fire Direction Center (FDC) exam. In the motor pool, the mortar sections can practice laying in the guns, placing the guns into ac-

tion, non-moving hipshoots, gunner's exams, dismounting the gun system, and aiming circle operations. Set the aiming poles in coffee cans filled with cement or sand. Sand in the coffee cans better simulates properly setting the poles, as the soldier must ensure the poles are leaning at exactly the perfect angle. Just outside the motor pool gates, the mortar section can enjoy a variety of operations, including deliberate and hasty occupations, hipshoots, all the training mentioned above, and M880 subcaliber rounds.

The M880 subcaliber training round is used in conjunction with the 81mm subcaliber insert. With ranges from 47 to 458 meters, and the fact it uses a very low powered 20 gauge shotgun shell (with no pellets), the M880 can be used almost anywhere. The round provides a flash, bang, and smoke signature on impact and is fired using the same equipment as a regular live fire. The rounds cost much less than 120mm rounds and misfires are handled easily with the use of a "boom box" and a hammer. The biggest complaint with the M880 is that the crews must refurbish their own rounds after firing. When all rounds are expended, the crews walk down range and recover the M880 body and fins. The refurbish kits contain all materials necessary to refire the M880 bodies, and if the body and fins are still serviceable, the refurb kit can be added in about 5 to 10 minutes per round. With over 100 M880 bodies and refurb kits, this could take several hours to complete. Nevertheless, after completing a few refurbis, the time will decrease as the crews develop confidence and proficiency.

For the cavalry troop leaders, it is important to become familiarized with the basics of the mortar sections. The leaders should get involved with the gunner's and FDC exams. Keep in mind that these exams are the mortar equivalent of the Tank Crew Gunnery Skills Test (TCGST). Just like the TCGST, the crews must be qualified before a live-fire exercise. Troop commanders and scouts should understand how to choose and clear mortar firing points. This helps secure the positions and the mortars will perform hasty occupations more readily. The mutual support is a simple circle; the scouts support the mortars so the mortars can support the scouts.

Supply should have the list of fuzes and rounds necessary to perform the missions. (Appendix A lists some fuzes and rounds.) The troop must remember that the "neat" things mortars can do are dependent on the fuzes available. In addition, plan in advance for smoke missions or the troopers will have a false sense of realism from the training.

For the FOs, TCs, and BCs, perform calls for fire in training while observing the mortars. This shows exactly how much goes into a mission and how long it can take. Push the training a step further and have the mortars perform a hipshoot for the leadership of the troop, as this will be an eye-opening experience.

For the mortar section, do not accept the four-minute ARTEP standard for a hip shoot. A trained section can fire an immediate suppression mission in less than two minutes. Remember that the reason behind immediate suppression is trouble that was not expected, and four minutes is ridiculously long to wait for support. Also, do not accept the eight-minute ARTEP standard for a hasty occupation. As soon as the first vehicle stops, the section should take no longer than six minutes to secure the position by force, erect the aiming circle, lay in the guns, and fire the first mission. Train religiously on these tasks.

CONCLUSION

Remember the importance of the mortars. They are the troop's only organic indirect fire element, and as an integral member, should be trained to the troop standard. Understanding the support mortars provide during all operations builds a more succinct unit. Plan for their resupply, and do not settle for the hand-wave method of smoke operations. Use mortarmen, but use them correctly. Realism in training, no matter how painful in practice, will save lives on the battlefield.

1LT John Ives was commissioned in 1997 from New Mexico State University. He served as tank and mortar platoon leader in 1-72 AR, Camp Casey, Korea, and as a tank platoon leader, scout platoon leader, and troop XO in 1/3 ACR at Ft. Carson, Colo. Currently, he attends the Captain's Career Course.