Techniques for

Mortar Ammunition Planning

By MAJ Andrew Patterson

Battalion (BN) mortar platoons and company mortar sections provide the most responsive fires for maneuver formations at the BN level and below. Army Structure designs 2025–2029 and 2027–2031 assign direct support Field Artillery BNs to divisions under division artillery (DIVARTY). This allows division commanders to weigh their main efforts and shape their deep areas, potentially leaving brigades without responsive fire support if they are a low supporting effort. The governing document for Field Artillery officers, Department of the Army Pamphlet 600-3, argues that the most senior and qualified officers should serve as fire support officers (FSOs).[1] Arguably, FSOs—and FA officers writ large—are poised to understand the complicated logistics chains required to plan fires down to the company level. Professional military education (PME), FA doctrine and FA courses (such as weaponeering) provide the foundation for artillery officers and non-commissioned officers to help maneuver formations solve mortar logistic woes. Large-Scale Combat Operations (LSCO) require adequate fire support for the forces committed as well as immediately available fires for maneuver commanders to influence operations.[2] Cannons may not always be available to support maneuver forces on the contemporary battlefield. This creates scenarios where companies, battalions and brigades may solely rely on mortars to achieve combined arms. This article recommends that company, battalion and brigade FSOs understand mortar ammunition planning to rectify three shortfalls within mortar sections and platoons in order to enable timely and effective fire support to maneuver formations.

First, however, haul capacities must be understood at each echelon for dismounted, motorized or mechanized operations. Understanding how many rounds a unit can carry will facilitate the prioritization of what rounds to carry. Secondly, mortar doctrine precludes a detailed discussion of ammunition effects to derive appropriate unit basic loads (UBLs) to support the ground scheme of maneuver. Lastly, recommendations to build cohesion within maneuver battalions regarding mortar ammunition planning begins with creating a shared understanding of logistical capabilities and adequate doctrinal comprehension for the tactical employment of mortars. Integrating mortars into the fight, regardless of the echelon or unit type, starts with logistics.

Haul Capacity

Haul capacity can be defined as the weight or bulk of the cargo that a vehicle, aircraft or transporter can safely carry. In this article, haul capacity refers to the number of mortar rounds a soldier, vehicle or formation can carry. Depending on the formation type, it varies by the mode of transport. This section focuses on three aspects of haul capacity: the method of transport and haul capacity for battalion mortars, the method of transport and haul capacity for company mortars and the involvement of the forward support company (FSC) with mortar ammunition planning. Understanding the haul capacity for mortars will shape the development of what specific rounds should be brought into combat.

Mortar platoons are organic to Infantry and combined arms battalions (CABs). Mortar platoons within CABs employ four mortar vehicles within their headquarters and headquarters companies (HHC). The haul capacity for each vehicle is 69, so the total haul capacity for the entire platoon is then 276 mortar rounds.[3] Stryker brigade combat team (SBCT) mortar platoons use four vehicles per HHC. Each vehicle hauls 60 rounds, and the platoon can move 240 in total.[4] The Infantry brigade combat team (IBCT) HHCs use a HMMWV with a corresponding trailer that can hold three ammunition racks with the associated mortar stowage kit. Each ammunition rack holds eight rounds, each vehicle can haul 24 rounds and the entire platoon can move 96 rounds.[5] Each vehicle has a slightly different limitation when it comes to hauling ammunition. Additionally, depending on terrain restrictions, SBCTs and IBCTs can move their mortars dismounted. SBCTs can move medium mortars dismounted, and IBCTs can

1 *Field Artillery Branch*, DA PAM 600-3, 03 April 2024, 15.
2 *Fire Support and Field Artillery Operations*, FM 3-09, 30 April 2020, 3-38.
3 *Mortars*, TC 3-22.90, 17 March 2017, 5-41.
4 *Mortars*, TC 3-22.90, 17 March 2017, 5-53.
5 *Mortars*, TC 3-22.90, 17 March 2017, 5-15.

Figure 1 – Haul Capacity

Formation	Mortar Round	Haul Capacity Per Vehicle	Number of Vehicles Assigned	Number of Soldiers Assigned	Number of Rounds per Soldier	Number of Soldiers Carrying Rounds	Haul Capacity
ABCT Mortar PLT	Heavy Mortar	69	4	24			276
SBCT Mortar PLT	Heavy or Medium Mortar	60	4	27			240
IBCT Mortar PLT	Heavy or Medium Mortar	24	4	24			96
IBCT Dismounted Mortar PLT	Medium Mortar			24	3*	14*	52*
IBCT CO Mortar Section	Light Mortar			6	5**	4**	20**
IBCT CO Mortar Section w/Dismounts	Light Mortar			133	5 and 1***	65***	80**

REMARKS:

*From personal experience and unit SOP
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***The company's TLs, grenadiers, and riflemen carrying one round each to mortar firing position

use medium or heavy mortars. This ability to shift to different mortar types is known as the arms room technique. SBCT and IBCT mortar platoons possess four medium and four heavy mortars but only have the requisite manpower to use four mortars at a time. Moving dismounted potentially lessens the haul capacity since individual mortarmen or riflemen are hauling the ammunition.

Moving dismounted is exactly how company mortarmen haul light mortar ammunition. The six mortarmen within the section usually divide the ammunition amongst themselves. Each light mortar round weighs approximately 3.75 pounds, but it takes up 15x13x20 inches.[6] In my personal experience, I have found that roughly 20 rounds can be shared amongst the section. However, the companies have the ability to utilize some of the riflemen within the Infantry company to haul mortar rounds. In some cases, this increases the lethality of their mortar section four-fold. **Figure 1** illustrates the haul capacity by formation type.

"The planning factor for unit basic loads for a BN is one with the CO, one with the FSC, and one stored at the BDE's ammunition transfer and holding point. The [BN] S-4 will account for the basic loads and the FSC and BN should be able to transport all combat configured loads with organic assets."[7] Simply put, mortar haul capacity does not stop at the maneuver unit. FSCs and brigade support battalions (BSB) are responsible for holding two-thirds of the mortar ammunition during operations. Battalion and company FSOs, S-4s, the distribution platoon leader and platoon sergeant, HHC command team and mortar platoon leadership must come together to plan this breakdown. FSOs work in concert with the staff and commander to determine the desired effects that will help drive the apportionment of different mortar rounds. Again, FSOs and FSNCOs inherently have the knowledge and expertise to help their maneuver formations with mortar ammunition planning from PME, doctrine and FA specific schools.

Mortar Effects, Ammunition Types and Apportionment

Army Techniques Publication (ATP) 3-21.90 states that "combat experiences in World War II and Korea have shown that an onboard mix of 70-percent HE [high explosive], 20-percent white phosphorus and 10-percent illumination ammunition is the most flexible."[8] These numbers provide commanders with options but are not mission-tailored. FSOs, at echelon, help develop fire support tasks (FSTs) to support the ground scheme of maneuver. The task portion of the FST is broken down into three separate parts: objective, formation and function. The objective describes the targeting effect. The formation is a specified element of the enemy. The

6 *Tactical Employment of Mortars*, ATP 3-21.90, 09 October, 6-7.
7 *The Infantry Battalion*, ATP 3-21.20, 28 December 2017, H-13.
8 *Tactical Employment of Mortars*, ATP 3-21.90, 09 October, 6-6.

Figure 2 – Effects

Desired Effects (Table C-1, ATP 3-60)	
Task	**Effect/Outcome**
Attrit	To wear down or weaken (an opponent or enemy).
Compel	1) To force, drive or constrain. 2) To make necessary.
Convince	1) To overcome by argument. 2) To bring to belief, consent, or a course of action (COA).
Damage	To reduce the soundness, effectiveness, or perfection of.
Deceive	To cause to believe what is not true.
Defeat	To render a force incapable of achieving its objectives.
Degrade	1) Damage done to the function is permanent, but only portions of the function were affected; that is, the function still operates, but not fully. 2) A function's operation is permanently impaired, but the damage does not extend to all facets of the function's operation.
Deny	1) To hinder the enemy the use of space, personnel, or facilities. It may include destruction, removal, contamination, or erection of obstructions. 2) Damage done to the function is only temporary, but all aspects of the function were affected. 3) A function's operation is impaired over the short term, but the damage extends to all facets of the function's operation.
Delay	1) To slow down the arrival of a unit on the "battlefield." 2) An operation in which a force under pressure trades space for time by slowing down the enemy's momentum and inflicting maximum damage on the enemy without, in principle, becoming decisively engaged.
Destroy	1) To damage the condition of the target so that it cannot function as intended nor be restored to a usable condition. 2) Damage done to the function is permanent, and all aspects of the function have been affected. 3) A function's operation is permanently impaired, and the damage extends to all facets of the function's operation.
Diminish	1) To make less or cause to appear less. 2) To reduce the effectiveness of an activity. This is similar to degrade without the kinetic overtones.
Disrupt	1) To break apart, disturb, or interrupt a function. 2) Damage done to the function is temporary, and only portions of the function were affected. 3) A function's operation is impaired over the short term and the damage does not extend to all facets of the function's operation.
Divert	To restrict the enemy's capabilities to pursue a particular COA.
Enhance	To increase or make greater the capabilities of a force or a people.
Exploit	To gather information that will enable opposition ability to conduct operations to induce other effects.
Expose	1) To make known or cause to be visible to public view. 2) To make visible, to reveal something undesirable or injurious.
Harass	To disturb the rest of enemy troops, curtail their movement and lower morale by threat of loss.
Influence	1) To affect or change how someone or something develops. 2) To cause a change in the character, thought, or action of a particular entity.
Inform	To impart information or knowledge.
Manipulate	1) To influence or control someone to your advantage, often without that person knowing it. 2) Control or change information, information systems, and/or networks in gray or red cyberspace to create physical denial effects, using deception, decoying, conditioning, spoofing, falsification, and other similar techniques.
Neutralize	1) To render an enemy weapon system and maneuver units ineffective or unusable for a specific period of time. 2) To render ineffective, invalid or unable to perform a particular task or function. 3) To counteract the activity or effect of.
Prevent	1) To deprive of hope or power of acting or succeeding. 2) To keep from happening, to avert.
Protect	1) To cover or shield from exposure, damage, or destruction. 2) To keep from harm, attack, injury or exploitation. 3) To maintain the status or integrity of.
Suppress	1) Involves temporary or transient degradation of an actual or suspected enemy weapons system for the purpose of degrading its performance below the level needed to fulfill its mission objectives at a specific time for a specified duration. 2) Temporary or transient degradation by an opposing force of the performance of a weapons system below the level needed to fulfill its mission objectives.

function is the enemy formation's capability that should be stopped or allowed to happen.[9] An example would be: FST1 neutralization of the enemy support by fire position to prohibit their ability to place direct fire on the breaching operation.

Many different effects can be achieved through mortars; however, the definitions of these effects mean different things to different organizations. **Figure 2 (previous page)** provides a detailed list of effects and their corresponding definitions from ATP 3-60, Targeting. Neutralization in the fire support community is defined as "in the context of the computed effects of field artillery fires renders a target ineffective for a short period of time, producing 10-percent casualties or material damage."[10] The tactical mission task of neutralizing means "rendering enemy personnel or material incapable of interfering with a particular operation."[11] The similarity between the two definitions exists in the temporal cessation of hostile actions. However, for indirect fires, a certain number of men or materials must be damaged; ten percent assists in tying the neutralization effect to a weaponeering solution. Computer programs, such as the Joint Munitions Effectiveness Manuals (JMEMs) or Joint Weaponeering Software (JWS), simulate the required number of rounds to deliver a neutralization effect. This software considers the shell/fuze combination, range, terrain, weather considerations and enemy formation type. Fire support elements (FSEs) can develop a detailed attack guidance matrix and measures of performance. This is to ensure their mortar rounds achieve desired effects against the enemy starting in "course of action development" in the military decision-making process (MDMP) or "making a tentative plan" in the troop-leading procedures (TLPs).

Additionally, ATP 3-21.90 provides a general guide on page A-2 **(Figure 3)** that outlines how mortar ammunition can neutralize platoon-sized targets.

9 *Fire Support and Field Artillery Operations*, FM 3-09, April 2020, A-3.
10 *Operational Terms*, FM 1-02.1, 09MAR21, 1-70.
11 *Operational Terms*, FM 1-02.1, 09MAR21, 1-70.

Figure 3 – Mortar ATP N. Effects

Table A-1. Ammunition expenditure guide to neutralize platoon-sized targets

Target	*Terrain*	*Target Posture*	*Rounds of High Explosive*		
			60-mm	*81-mm*	*120-mm*
Trucks*	N/A	N/A	28	10	6
Armored**	N/A	N/A	Suppress	45	35
Personnel	Open	Attacking	14	8	4
Personnel	Open	Defending w/o fighting positions	40	10	6
Personnel	Open	Defending w/ fighting positions	60	20	12
Personnel	Forest/Jungle	Attacking	18	25	10
Personnel	Forest/Jungle	Defending w/o fighting positions	60	27	15
Personnel	Forest/Jungle	Defending w/ fighting positions	40	50	25
* Neutralization fire may not totally defeat; be prepared to repeat the fire mission.					
**Mortar fire cannot destroy armored vehicles, however it forces crews to close hatches and damages the exterior.					
Legend: HE – high explosive, mm – millimeter, N/A – not applicable, w – with, w/o – without					

However, this is not all-inclusive. Fire supporters possess the ability to calculate the number of rounds—and with what fuze combinations—required to destroy, neutralize or suppress. This information can be calculated on software within the battalion FSE's Advanced Field Artillery Tactical Database System (AFATDS). A radio call during step three of the TLPs or the creation of FSTs during step 3 of MDMP helps determine the amount of HE required to destroy, neutralize or suppress certain types of enemy formations.

Importantly, not all mortar HE rounds are fuzed the same way, provide the same effects or range as far. ATP 3-21.90 highlights that leaders must be aware of the combinations of fuzes and ammunition that will have the greatest effect on targets. Proximity, delay and point-detonating fuzes all provide different effects in different types of terrain, weather conditions and against different enemy types. For example, a M934 heavy mortar HE round comes with a M734 multi-option fuze that can provide proximity, delay or point-detonating functions. If an M57 heavy mortar HE round with an M935 point detonating fuze is on hand, it can be employed with that fuze setting. Appendix A of Training Circular 3-22.90 covers in detail the different types of mortar rounds and their paired fuzes. FSEs must understand that not all HE rounds provide the same effect. Specific Department of Defense Identification Codes (DODICs) and nomenclatures must be built into standard operating procedures, requests and UBLs.

ATP 3-09.30, Observed Fires, provides a brief synopsis of mortar smoke planning data in Chapter 6 **(Figure 4)**. When planning smoke missions for mortars, it is important to remember that all are white or red phosphorous, as opposed to some artillery that can deliver hexachloroethane smoke and white phosphorous (WP) rounds. From the data provided, in ideal weather conditions, one heavy mortar platoon can provide a 400-meter, 10-minute smoke screen with just 20 rounds. However, the weather is not always ideal. Several weather-specific factors contribute to planning quick smoke missions: temperature, wind speed, wind direction, humidity, cloud cover, time of day and precipitation. Additionally, factors like terrain, threat disposition and maneuver-target line need to be taken into consideration. All these considerations are calculated with the data from Figure 4 and can be computed digitally in a mortar fire control system (MFCS), lightweight handheld mortar ballistic computer (LHMBC) or manually. Providing current meteorological data from an FA BN's Profiler computer to mortar digital systems (MFCS or LHMBC) will ensure that the appropriate amount of WP rounds are used to achieve the desired effects. Conducting ammunition forecasting for quick smoke missions with MDMP and TLPs will ensure mortar formations provide the desired effects. This can help augment cannon smoke missions or mitigate their absence on the battlefield.

The type of operation a unit is conducting will determine the apportionment of mortar ammunition.

Figure 4 – Smoke Planning Data

Table 6-14. Smoke planning data (ATP 3-09.42)

Delivery System	*Type Round*	*Time to Build Effective Smoke (minutes)*	*Average Burning Time (minutes)*	*Average Obscuration Length (meters) Per Round*	
				Wind Direction	
				Cross	*Head or Tail*
155-mm	WP	1/2	1 to 1 1/2	150	50
	HC	1 to 1 1/2	4	350	75
	M825	1/2	5 to 10	350	100 to 200
105-mm	WP	1/2	1 to 1 1/2	75	50
	HC	1 to 1 1/2	3	250	50
120-mm	WP	1/2	2 1/2	100	60
81-mm	WP	1/2	1	100	40
	RP	1/2	2 1/2	100	40
60-mm	WP	1/2	1	75	40

Note. All rounds are fired as standard missions with parallel sheafs under favorable conditions.

Legend: HC—hexachloroethane mm—millimeter RP—red phosphorous WP—white phosphorous

Units that are conducting breaches, wet gap crossings or any other operation that requires a significant amount of WP should consider carrying a larger amount of WP ammunition within their UBL than the previously mentioned doctrinal guideline of 20-percent. Holistically, mortar operations should be planned in conjunction with MDMP and TLPs to determine how many rounds are required to achieve the desired effects. UBLs should be built in conjunction with FSOs to ensure the appropriate rounds are present on the mortar line, FSC and BSB. To fully understand the proper apportionment of HE, illumination and WP rounds a mortar section or platoon should haul, an analysis must occur first. What effect is to be achieved, against what enemy formation and in what operating environment?

A Way Forward

This article recommends two ways to improve mortar ammunition planning. First, logistical planning for mortar employment must be a team effort. This team should consist of FSOs, mortar leaders, HHC command teams, maneuver BN S-4s and elements from the maneuver battalion FSC. All three portions of mortar haul capacities must be understood at the battalion and brigade levels to ensure that the FSC and BSB maintain the secondary and tertiary mortar ammunition required to sustain the fight. Continued dialogue must occur between FSEs, HHCs and maneuver battalion FSCs during operations to ensure the correct ammunition be brought forward from logistical nodes. Secondly, we must understand each other's doctrine. Training Circulars 3-20.33, 3-22.90 and 3-22.91; Mortar Tabular Firing Tables; and Army Techniques Publications 3-21.20 and 3-21.90 all provide imperative information for the employment of mortars at any echelon. ATPs 3-09.30 and 3-09.42 provide the knowledge of integrating fire supporters to the brigade and below. More emphasis needs to be placed in FA Basic Officer Leadership Course (BOLC) and Captains' Career Course (CCC) on mortars and their ammunition requirements. For example, the fire control program of instruction at FACCC includes a class on ammunition management. The practical exercise within that class can include a mortar ammunition planning application to further the development of leaders. This list is not exhaustive, but it provides a baseline for anyone who wants to incorporate mortars into the fight.

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Background photo by Edward Muñiz, Fort Sill Public Affairs Office.

Figure 5 – Example

Examples of Heavy and Light Mortar Ammunition Configuration Examples

System	Mode	Haul Capacity	HE	WP/ RP	Illum	Effects	Remarks
Heavy Mortar (IBCT IN BN)	Towed	96	46	48	2	Neutralization of x3 ENY PLT dug in; Neutralization of x1 ENY INF PLT i/o; x1 Immediate Suppression Mission; x3 300m 10min SMK screen; x1 Lateral or Range Spread Illumination Mission	Heavy smoke consideration in open terrain.
Heavy Mortar (IBCT IN BN)	Towed	96	68	22	4	Neutralization of x2 ENY PLT dug in; Neutralization of 1 ENY INF PLT i/o; x2 Immediate Suppression Mission; x1 300m 10min SMK screen; x2 Lateral or Range Spread Illumination Missions	Doctrinally recommended 70% HE, 20% WP, and 10% Illum breakdown in forest/ jungle terrain.
Light Mortar (IBCT CO)	Sectio n	20	14	6	0	x1 100m 3min SMK screen; 6 min of HE Suppression or x3 Immediate Suppression TGTs	Mortar SEC carrying ammunition only in open terrain.
Light Mortar (IBCT CO)	Sectio n+CO	80	70	6	4	x1 100m 3min SMK screen; Neutralization of x1 ENY PLT dug in; 5 min of HE Suppression; x2 Lateral or Range Spread Illumination Missions	Mortar Section w/Infantry Company carrying ammunition in open terrain.

REMARKS: Ammunition considerations here are given with standard MET conditions and from doctrinal adjudication templates. It is highly recommended to use MFCS, LHMBCs, AFATDS, and JWS to forecast the necessary ammunition allocation to achieve desired effects.