

The Artillery S2 and Interpretive Counterfire BDA

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F333 FA's Firefinder, Operation Desert Storm



Battle damage assessment (BDA) has become one of the Army's most important doctrinal issues of this decade. In February 1991 during the Gulf War, the estimated amount of battle damage to the Iraqi army triggered the start of the Allied Coalition's ground campaign. Since then, the US military has been developing better procedures to evaluate the results of all fires on the enemy's military. However, specific doctrine on how to analyze and calculate BDA and combine BDA reports from multiple sources is still evolving.

This article describes how the direct support (DS) artillery battalion or division artillery (Div Arty) S2 determines BDA from reactive counterfire using Firefinder radar acquisitions and fire mission logs—BDA interpreted from data, not from observed damage. The article also explains how the artillery S2 fuses the information to report enemy artillery concentrations on the battlefield.

Counterfire BDA Assumptions. Where direct, observed BDA cannot be conducted on enemy artillery units, the artillery S2's mission is to estimate BDA based on interpreting the physical damage caused by counterfire missions. He uses this and other intelligence infor-



mation to determine the enemy artillery's organization, location, strength and status and predict the enemy artillery's successive operational phases of fire. By continually conducting BDA, the S2 integrates himself into the counterfire mission cycle and is better able to recommend the most effective way to neutralize or destroy the enemy artillery.

Because this assessment is based on interpreted damage, not observed damage, the accuracy of the BDA estimate is contingent upon certain assumptions.

- *The BDA attrition tables are accurate.* These tables are based on the Joint Munitions Effectiveness Manuals (JMEMS). This includes the assumption that the artillery rounds fired at the

target impacted at the desired aim point in the manner in which the rounds were designed.

- *When the counterfire rounds were fired, the enemy artillery target was still located where the intelligence asset reported it.* Firefinder radars provide timely responses for reactive counterfire targets. But when using other intelligence sources for proactive counterfire missions, the FA intelligence officer at the division analysis and control element (ACE) or the maneuver brigade S2 must use target selection standards (TSS) to determine if the information can be passed to fire support channels for targeting. The average time it takes to get the information from the intelligence sensor to the shooter in conjunction with enemy artillery windows of vulnerability must be analyzed to determine if each intelligence asset is going to be responsive enough to influence enemy artillery targeting.

- *The artillery S2's original information about the size, strength, location and status of enemy artillery systems on the battlefield is accurate and, therefore, a valid basis from which to attrit enemy systems.* ("Status" refers to what operations the enemy artillery is conducting and what its defensive posture

is.) The S2 combines his knowledge of enemy artillery doctrine and tactics with a detailed intelligence preparation of the battlefield (IPB) and continuously tracks the enemy situation while simultaneously developing targets.

• *The S2's information about the radar acquisitions and friendly missions fired and munitions employed are accurate and timely.* This means he must receive complete and timely fire control log information from the fire direction center (FDC) or fire control element (FCE) and radar acquisition data from the radar target processing section.

Unobserved Counterfire BDA Analysis. BDA analysis for reactive counterfire based on an interpretation of data has two major steps. The first step is based on intelligence analysis and determines the correct enemy artillery units to attrit for specific counterfire missions. It answers the question, "What unit did we damage?"

The second step is based on the application of BDA physical damage assessment tables to determine how many artillery systems to attrit for each mission. It answers the question, "How many artillery pieces did we destroy?"

Step 1—Determining What Unit was Damaged. Identifying which enemy artillery unit to assess counterfire losses against is the more difficult of the two main analysis steps. The S2 first determines if intelligence reports on the enemy situation map have specific artillery units in the vicinity of the targeted location. If only one unit is in the area, the S2 assesses that the artillery acquisitions were from that unit and that reactive counterfire missions attrited the unit's systems.

However, the enemy can have multiple battalions and separate batteries in the same general area. Then, as time permits, the S2 must analyze Firefinder and intelligence data and other factors to try to determine which unit to attrit. The additional factors analyzed include the terrain, the enemy's doctrine and tactics and equipment capabilities. For example, an analysis of the terrain around the targeted area can reveal possible artillery position areas and help determine what type and size of enemy artillery units can fire from that location. The terrain analysis is compared with the artillery order of battle and situation templates developed during the planning process to identify the enemy unit.

The bottom line is the artillery S2 must do a thorough IPB during planning and then track enemy units throughout

the battle to accurately attrit the right units in BDA analysis.

Firefinder radar acquisition reports provide valuable information that can help determine what type of enemy unit is conducting artillery operations from a given location. Radar data used in BDA include the time of acquisition, point-of-origin (target location), point-of-impact and type of round, such as mortar, artillery or rocket. (If the radar's impact predict function is disabled or the acquisition violates a call-for-fire or critical friendly zone, the impact predict grid coordinates will not appear on the radar's digital format; the radar section must report the coordinates by other means, such as over the FM net.)

For BDA purposes, the most important data the radar provides is the point-of-origin—the location from which the enemy fire originated. The point-of-impact of the enemy round tells us what the enemy artillery was targeting and can help us determine the type of enemy artillery system that fired. This information is fused with the enemy artillery IPB on the situation template. The analysis can confirm, deny or adjust the maneuver element's situation and event templates. The DS artillery battalion S2 gives the information to his commander and maneuver brigade S2. Figure 1 shows two examples of how to use Firefinder radar data to determine which enemy artillery unit fired.

In a high-intensity battle with hundreds of radar acquisitions in a short time, the S2 may not have time to conduct this type of analysis. But he must do the analysis initially and periodically thereafter to understand how the enemy artillery is arrayed on the battlefield and what type of artillery tubes should be attrited in counterfire missions.

Step 2: Determining How Many Artillery Pieces were Destroyed. This second step of BDA analysis depends on several variables. Much of the data comes from the fire mission control logs and radar acquisition reports.

The key data the S2 uses from the fire mission control logs includes the time of the counterfire mission, targeted location, number and type of round or rocket fired and target number. The S2 uses this information in combination with the radar data to calculate three pieces of information required to assess enemy artillery losses.

• The S2 calculates the time between the intelligence report or radar acquisition and the fire mission. He does this to verify the likelihood of the target's still being in the location the acquisition or report said it was. When a firing unit and the radar are in the sensor-to-shooter mode, the counterfire mission will be timely enough to assess battle damage. However, that will not be the case for all missions. Most fire missions against enemy artillery will be based on intelligence reports or radar acquisitions. Except for preparation and preplanned fires, few missions will be shot against templated enemy artillery positions.

• The S2 calculates the range to the target from the shooter.

• He also determines what the enemy artillery system is and whether or not it's dug in or exposed.

Given these calculations, the S2 uses the JMEMs or a BDA formula modified to replicate as closely as possible the algorithm used by simulation computers to account for the damage incurred from US artillery missions. (The simulation BDA formulas developed by various units also are built loosely on JMEMs data; JMEMs data is classi-

(1) Distance Between Point-of-Origin/Point-of-Impact

- Round originated from templated motorized rifle (MR) regimental artillery group (RAG).
- Distance between the point-of-origin and point-of-impact is 16.5 kilometers.
- RAG's organic 2S1 battalion only has a range of 15.3 kilometers.
- *Therefore:* A 2S3 battalion or battery was pushed down from the divisional artillery group (DAG).

(2) Comparison with Type of Artillery Round

- Round originated from templated MR DAG.
- Distance between point-of-origin and point-of-impact is 18 kilometers.
- Type of artillery is rocket.
- *Therefore:* a BM-21 battalion or battery fired.

Figure 1: Deducting the Type of Enemy Artillery. Using Firefinder data, this figure shows two ways to deduce what enemy artillery is firing. The examples are based on "Krasnovian" threat artillery at the National Training Center, Fort Irwin, California.

Firing Unit	# Rds/Rkts Fired	Target	Range to Tgt	% BDA	# Attrited	Strength
(1) US 155mmHow Bn	Bn 6 (144 Rds)	2S3 Bn 152mmHow	12 kms	.33	6 Tubes	12/18 66%
(2) US MLRS Plt	Plt Volley (36 Rkts)	BM-21 Btry 122mmMRL	30 kms	.17	1 System	5/6 83%

Legend:
Bn = Battalion **How** = Howitzer **MLRS** = Multiple-Launch Rocket System **Plt** = Platoon **Rkts** = Rockets
Btry = Battery **kms** = Kilometers **MRL** = Multiple Rocket Launcher **Rds** = Rounds **Tgt** = Target

Figure 2: Calculating Battle Damage Assessment (BDA). These two examples of BDA calculations are loosely built on JMEMs data (actual data classified as "Confidential").

Unit	Type Arty	Grid	Strength	Status	Est Damage
64 MR DAG	152mmHow Bn 2S3	WJ364721	18/14	Firing in Open	IIIIII (6)

Figure 3: Artillery Order of Battle/BDA Tracking Chart. This example is of a motorized rifle (MR) divisional artillery group (DAG).

Arty Group	# Bns	# Systems	# Est Destroyed	# Remain	% Strength
1 RAG	2	36	12	24	66
2&3 RAG	5	90	36	54	60
55 MR DAG	4	72	26	46	64

Figure 4: Counterfire BDA Report

fied.) Figure 2 uses fictitious JMEMs data to calculate BDA in two examples.

Counterfire BDA Tracking and Reporting. The artillery S2 can use several techniques to track BDA. The most common format is an Excel spreadsheet or a similar table.

Figure 3 shows the technique of combining enemy artillery order of battle information with BDA attrition on a work sheet. The key part of any BDA work sheet is the column that allows the S2 to subtract artillery tubes as he analyzes counterfire missions. As the battle continues, he tracks the number of artillery systems destroyed in each enemy artillery unit and, periodically, issues a counterfire BDA report.

Counterfire BDA reports from the DS FA battalion S2 are sent to the Div Arty S2 and brigade S2. The brigade S2 consolidates BDA from all units in the brigade combat team (BCT) and forwards it to the division G2. (To prevent redundant reporting, the Div Arty S2 uses the DS battalion S2's report for informational purposes and does not report it to G2.) If the Div Arty is the force FA headquarters, the subordinate FA unit S2s calculate and collect BDA from their units' counterfire missions and report the information to the Div Arty S2 for analysis.

All general support (GS) or general support reinforcing (GSR) units report BDA to the Div Arty S2, who consoli-

dates the BDA and sends it to the division G2. Units reinforcing (R) a DS FA battalion report counterfire BDA to the maneuver brigade S2, either directly or through the DS FA battalion S2, depending on standing operating procedures (SOP).

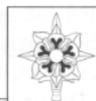
The BDA report format, like the format for tracking counterfire BDA, must be kept simple. Both contain similar information. The BDA report conveys the current estimated strength of the artillery concentrations or units directly opposing the supported maneuver force. For the DS FA battalion S2, this could be several regimental artillery groups (RAGs) and a division artillery group (DAG). For the Div Arty S2, this might be several DAGs and reinforcing corps or army artillery. Figure 4 shows a sample BDA report.

The 2d Infantry Division Artillery in Korea has had success using this counterfire BDA process in several exercises, including Ulchi Focus Lens, a Battle Command Training Program Warfighter and the Joint Precision Strike Demonstration. Overall, the aggregate numbers for estimated counterfire BDA were close to the actual amount of enemy artillery destroyed.

However, in comparing the estimated and actual numbers destroyed from each specific unit, there were some discrepancies. The estimates were too high for some units and too low for others. This

confirms that the more difficult analysis step is determining which enemy unit had its artillery destroyed rather than how many systems were destroyed.

Although counterfire BDA is primarily an estimate, S2s and commanders can use it effectively. It not only helps them understand artillery effects on the enemy, but also aids in tactical intelligence analysis to provide a common understanding of the battlefield and help predict enemy actions.



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