Iraqi 122–mm SP Howitzer in 1991; Photo by CWO4 Kenneth Brooks, USMC

Removing the Unknown from Counterfire BDA—A 90 Percent Solution

by Major Raymond C. Hodgkins

The development and validation of a battle damage assessment (BDA) model was one of the results of the 10th Mountain Division (Light Infantry) Battle Command Training Program (BCTP) Warfighter exercise last October at Fort Drum, New York. The BDA model provided the 10th Division Artillery Commander a fairly accurate estimate of the disposition of the enemy's indirect fire systems—accurate enough to help in counterfire decision making.

The model combines both the art and science of BDA to produce a "Murder Board"—a snapshot of the enemy's indirect fire strengths at a given period in the battle. The scientific portion of the model is the estimation of the effects of specified volleys of shell/fuze combinations as listed in the Joint Munitions Effectiveness Manuals (JMEMs). The model also takes into account what we know about the doctrine and tactics of the enemy.

The artistic portion of the model relies on the division artillery S2's templating skills and two "rules of thumb" for the minimum time required to execute general support (GS) fire missions from acquisition to steel on target. The end state is an approximately 90-percent solution that helps the division artillery commander in the critical counterfire fight.

The Model. The model, in principle, is simple. In conjunction with the Field Artillery intelligence officer (FAIO) and the division G2, the division artillery S2 determines the initial enemy order of battle, including the number and types of his fire support systems. This estimate comprises the listing on the artillery Murder Board. (See the sample page of a Murder Board in Figure 1.) Once the shooting starts, the S2 crosses the enemy systems off the Murder Board (blackens in the holes on the matrix in Figure 1) when damage is observed or unobserved fires comply with the rules of thumb. The model accounts for the many sources in the division that can capture BDA.

Type	Unit	MM	# of Tubes
2S5	1/101 National Artillery	152	000000000000000000
2S5	2/101 National Artillery	152	000000000000000000
D-20	3/101 National Artillery	122	000000000000000000
D-20	4/101 National Artillery	122	000000000000000000
D-20	5/101 National Artillery	122	000000000000000000
BM-22	1/101 National Rocket	220	000000000000000000
BM-22	2/101 National Rocket	220	000000000000000000
BM-22	3/101 National Rocket	220	000000000000000000
2S5	1/601 National Artillery	152	000000000000000000
2S5	2/601 National Artillery	152	000000000000000000
2S5	3/601 National Artillery	152	000000000000000000
2S5	4/601 National Artillery	152	000000000000000000
2S5	5/601 National Artillery	152	000000000000000000
S23	601 National Artillery	180	000000000000000000

Figure 1: Murder Board. This is one page of a chart that tracks battle damage to enemy artillery systems. The initial listing is based on military intelligence and knowledge of the enemy's doctrine and tactics. When the battle begins, the division artillery S2 blackens in a circle for every system neutralized or destroyed.

For battle damage caused in observed fires, the fire direction officer (FDO) in the direct support (DS) battalion tactical operations center (TOC), the FAIO at the division main command post (DMAIN) and the fire support officer (FSO) at the maneuver brigade fire support element (FSE) collect the artillery BDA for consolidation by the counterfire officer at the FA brigade TOC. These reports capture what the forward observers (FOs) saw on the battlefield.

For unobserved GS fires, the BDA is collected and consolidated by the counterfire headquarters—the FA brigade. Because there are no observers to count the damaged tubes or launchers, the model relies on mission-fired reports (MFRs) for missions executed within a certain time.

During Dragon Summit, the 10th Division Artillery applied two time rules before assessing battle damage on unobserved targets. The first was for fires delivered by the counterfire headquarters. In this case if rounds were sent down range within five minutes of the moment the target was acquired by the Q-37 Firefinder radar, then the counterfire officer in the FA brigade TOC assessed the damage according to the JMEM.

The FAIO in the DMAIN applied the second rule. In this case if a division-level delivery system—fixed-wing air, attack helicopter, Army tactical missile system (ATACMS), etc.—attacked a stationary target within 30 minutes, then the FAIO determined the damage by the JMEM. For BDA to be posted on the Murder Board, the unobserved mission fired had to be executed within the time specified by the rules. This time constraint ensured the targeting data was still valid when the mission was fired.

The FAIO in the DMAIN plays an important role in artillery BDA collection. (See the "FAIO's Steps in Killing a Target" on this page.) He accounts for not only the unobserved fires executed within 30 minutes, but also observed fires from assets available at the division-level—for example, special operations forces (SOF) or unmanned aerial vehicles (UAVs).

The FAIO, the S2 at the division artillery TOC and the counterfire officer at the FA brigade TOC each independently updates his copy of the Murder Board, analyzing the raw BDA data, and then pools the information collected every four hours. The fire supporters at these organizations resolve discrepancies among the Murder Board versions before updating the division artillery commander.

Baptism Under Fire. At the beginning of the exercise, the 213 enemy systems recorded on the Murder Board (enemy strength based on knowledge of/intelligence on the enemy) as compared to the 202 actual systems were about 95 percent accurate. This initial estimate set a solid data base upon which to determine BDA when the Warfighter preparation fires began.

Figure 2 shows the actual and perceived enemy strengths recorded approximately 24 hours after the exercise started. The Murder Board statistics reflect that the 10th Division had reduced the enemy's indirect fire systems by 127 systems with a perceived total of 86 systems remaining. In reality, the enemy had lost 67 of its indirect fire systems for an actual total of 135 remaining systems—a 36 percent disparity between reality and the Murder Board. (At this point in the battle, unobserved counterfires accounted for nearly 90 percent of the BDA on the Murder Board.) Clearly, the model needed to be

Iraqi D-30 Howitzer, 1991

FAIO's Steps in Killing a Target

1. A target is acquired.

2. The Field Artillery Intelligence Officer (FAIO) at the division main command post (DMAIN) checks the time of acquisition to ensure the targeting data is still valid.

3. The FAIO evaluates the target: is the target on the high-payoff target list (HPTL), is the target location error (TLE) of the collection asset good enough and are there enough firing units and ammunition available? If the acquirer's TLE is too imprecise to fire a target on the HPTL, the FAIO can initiate collection by a more accurate acquisition asset.

4. If target data meets the requirements, the FAIO generates a fire mission; delivery assets include the Army tactical missile system (ATACMS), attack helicopters, fixed-wing aircraft, naval surface fires, etc.

5. When the time the target was fired is sent back to the FAIO, he assesses battle damage. For unobserved fires, he assesses battle damage from the Joint Munitions Effectiveness Manual (JMEM) if a target acquired by the all-source collection element (ACE) was attacked within 30 minutes or if a target acquired by a Q-37 radar was attacked within five minutes. He records the damage to enemy artillery systems on the Murder Board, a "bean-counting" document also maintained by the S2 at the division artillery tactical operations center (TOC) and the counterfire officer at the FA brigade TOC.

6. When the shot time does not get sent to the FAIO, he can use intelligence collectors, such as the unmanned aerial vehicle (UAV) or special operations forces (SOF), to assess the damage. He records the battle damage observed by the UAV or SOF on the Murder Board.

7. Every four hours, the FAIO shares his Murder Board information with the division artillery S2 and FA brigade counterfire officer.

8. A new target is acquired, and the steps repeat themselves.

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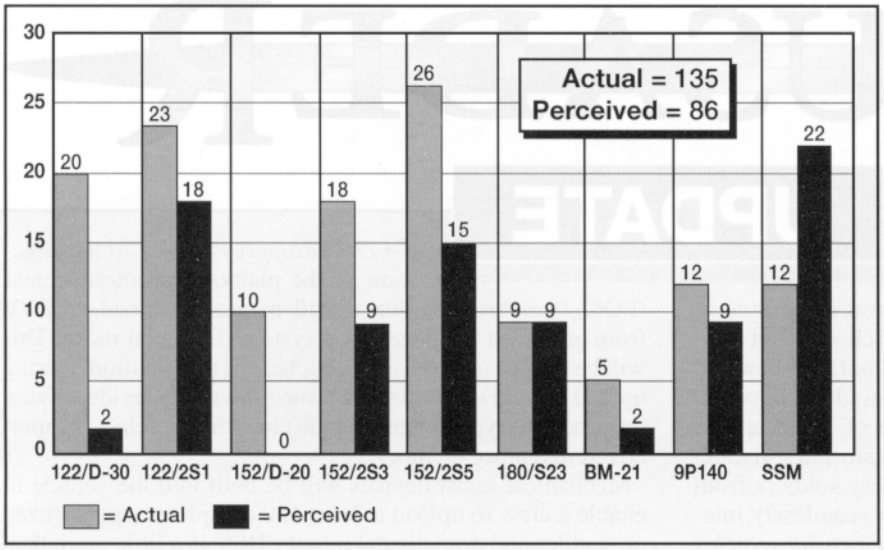

Figure 2: Initial BDA Model Statistics. This figure charts the actual and 10th Mountain Division Artillery's perceived battle damage statistics on enemy artillery strengths collected by the BCTP observer/controllers 24 hours after the Dragon Summit Warfighter exercise started. Based on the initial BDA model, this data shows a 36 percent disparity between the actual and perceived enemy artillery strengths; the model had not accounted for enemy replacement systems.

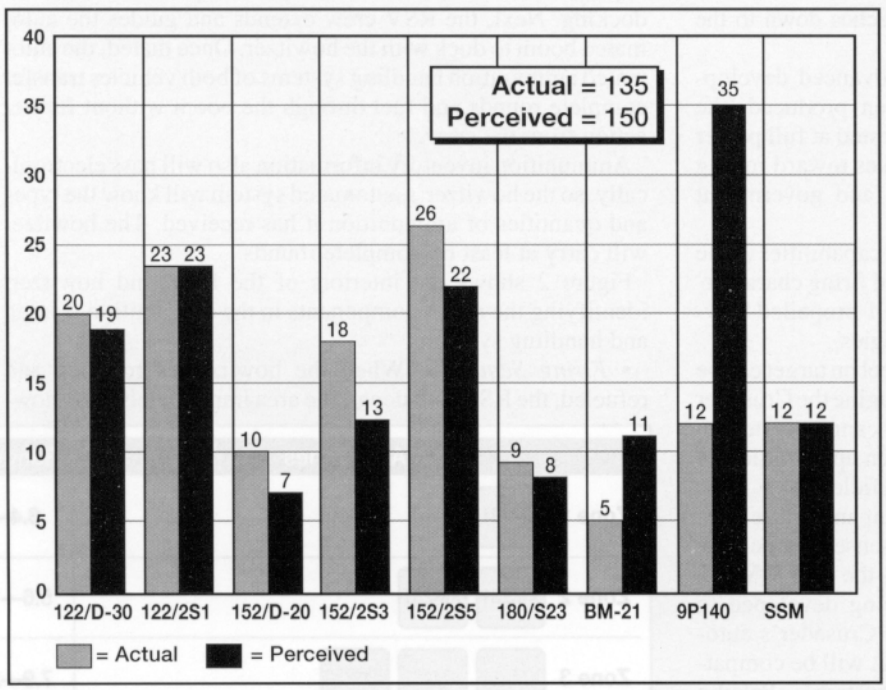

Figure 3: Modified BDA Model Statistics. Based on the revised model, this figure charts the actual and 10th Mountain Division Artillery's perceived enemy artillery strengths 24 hours after the exercise started; the data was collected by the BCTP observer/controllers. The perceived battle damage statistics were about 90 percent accurate—accurate enough to be useful for decision making.

refined to provide accurate enough information for decision making—regardless of the fact that the data was based on the less accurate unobserved fires.

Tweaking the Model. The primary difference between the original model and the tweaked model was the accountability of the enemy's resupply and repair capabilities. The original model failed to account for the enemy's replacing his destroyed or damaged enemy indirect fire systems. In the Dragon Summit Warfighter scenario, he could replace or repair approximately 50 percent of his losses within 24 hours.

In Figure 2, the enemy's actual total strength of 135 operational systems accounts for the replacement of 34 enemy systems (50 percent rate); however, the Div Arty's perceived estimate of 86 operational systems did not account for any replacement tubes; this oversight contributed to the disparity between the two totals.

Figure 3 reflects the revised BDA data from the tweaked model. As compared to Figure 2, the perceived enemy strength total went up from 86 to 150 systems by adding the estimated 50 percent replacements to the estimated total losses. Because the number of actual losses (67 systems) was unknown at that time, the 64 replacement systems added to the total was calculated using 50 percent of the perceived losses (127 systems). A comparison between the actual and perceived totals produced a respectable 10 percent disparity.

Conclusion. Knowing the actual strength of the enemy's indirect fire systems would allow the division artillery commander confidently to focus his limited friendly artillery assets on the battlefield. Unfortunately, the enemy does not volunteer this information. During Dragon Summit, the estimates from the Murder Board were, perhaps, the next best thing.

The 10th Mountain Division Artillery's model provided a fairly accurate and reliable tool that accounted for BDA from both observed and unobserved fires. The Murder Board provided the division G2, FAIO, FA brigade counterfire officer and division artillery S2 common information on the enemy's artillery order of battle for targeting.

Undeniably, the revised model aided the 10th Mountain Lightfighters to defeat the enemy during Dragon Summit.

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