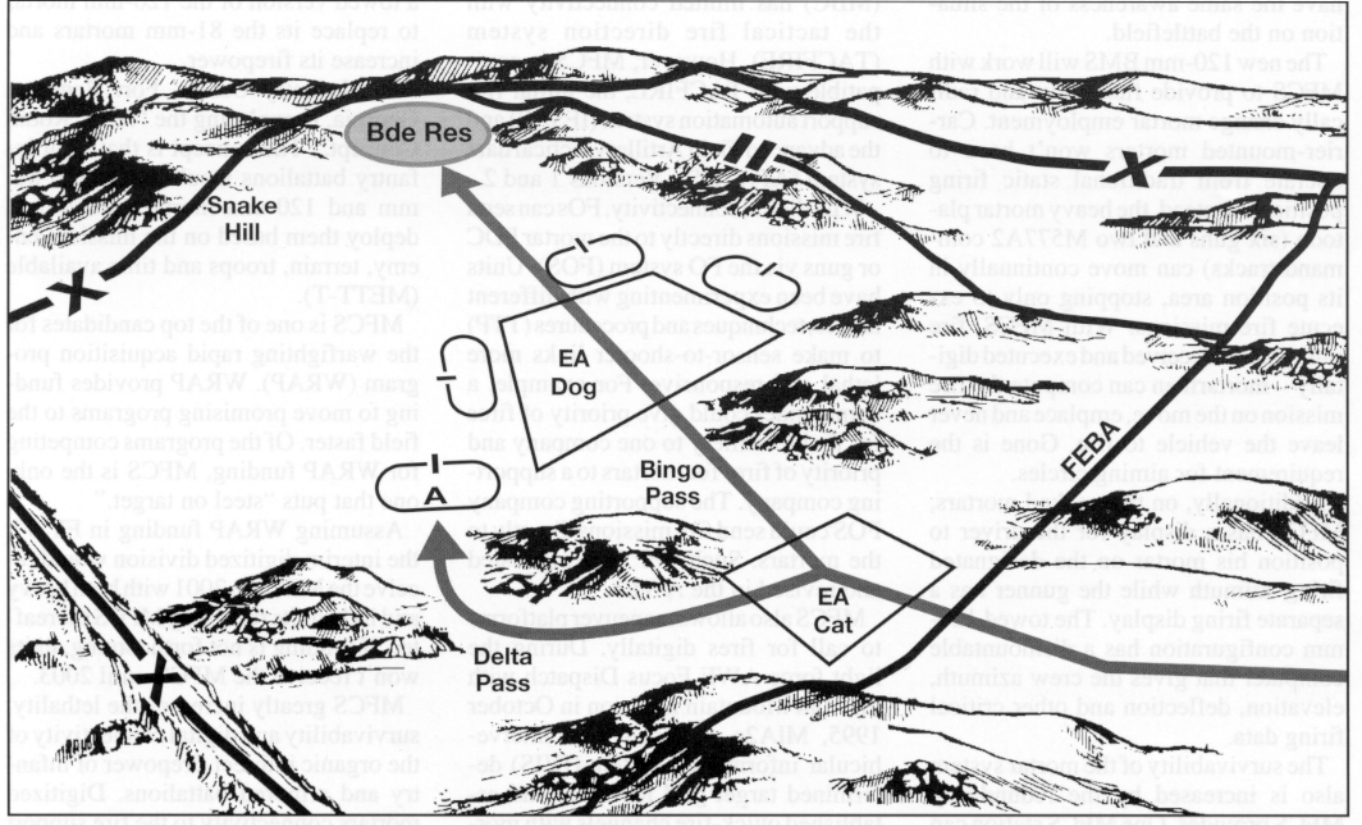

Battle Calculus and Fire Support Planning

by Major Thomas L. Kelly

You are the new fire support officer (FSO) for Task Force 1-89 Armor and are part of a 3x6 155-mm Paladin direct support battalion. It's your first opportunity to plan combat operations as part of the task force battle staff. The mission is to defend the Bingo-Delta pass complex against a motorized rifle regiment (MRR) at 70 percent strength to prevent the MRR's penetration of the task force's defense. The regiment is leading the attack with a Forward Detachment, a motorized rifle battalion-plus-sized formation. The Detachment's mission is to control one of the two passes so the remainder of the regiment can follow on its way to seize the defensible high terrain just east of Snake Hill.

The task force commander outlines his concept of the operation: "I want Team A to limit the Forward Detachment's ability to control Delta Pass, forcing the remainder of the regiment to go through Bingo Pass. This will allow me to mass the effects of the other three company teams' direct and indirect fires into EA [Engagement Area] Dog on the reverse slope of Bingo Pass to destroy the rest of the MRR.

"Fires must disrupt the Detachment's ability to seize Delta Pass from Team A, allowing me to focus the other three teams into EA Dog. I believe Team A can retain Delta Pass if fires can destroy at least one of the Forward Detachment's MRCs [motorized rifle companies] in EA Cat."

The commander looks up at you from his notes and says, "Can you do it?"

How can you possibly answer the commander's question? One tool to help you is battle calculus. While the term "battle calculus" may not be familiar, the idea of applying planning factors, combat power values and other numeric and scientific parameters to military planning is not new.

The brigade trainers at the National Training Center (NTC), Fort Irwin, California, have defined battle calculus as "the process of using doctrinal rates, factors, speeds and other data to conduct detailed analyses that support military decision making. Through this process, commanders and staffs are able to analyze relative combat power, estimate and verify capabilities, translate [those capabilities] into missions, conduct predictive analyses and allocate resources to defeat the enemy."

For fire support planning, battle calculus can help answer questions such as "How long will it take?" "How much ammunition is required?" and "When do I need to trigger fires?" While battle calculus does *not* provide certainty, it does improve the likelihood of success. There is a danger in "over quantifying" your planning: the more you must assume as you calculate, the less realistic and accurate your work may become.

The real benefits of battle calculus occur with practice. As the task force battle staff consistently employs battle calculations, the process becomes routine and results in better developed and detailed plans and orders.

The fire support element (FSE) and the maneuver battle staff begin to "calculate" as a natural part of course of action (COA) development. The "science

of war" is reflected in realistic plans that can achieve the commander's intent. The detailed, step-by-step logical process used in battle calculus (such as the example in this article) becomes second nature and quickly gives way to "rules of thumb." When the FSO can build feasible plans rapidly and train his commander to have realistic expectations of fire support, the fire support planning process is streamlined and more effective.

Can You Do It?

Using basic battle calculus, you can determine the feasibility of your fires achieving the commander's guidance. Note that this example is based on the assumptions outlined in the scenario and is not "the formula" for answering all commanders' Can-you-do-it questions. Rather, this example shows the process of trying to best-guess the integration of time, space and asset variables to achieve a specific goal.

Step 1: Translate the commander's guidance into a quantifiable effect. Once you've defined the task and purpose for fires (critical fire support task), you quantify that task to measure success or failure.

In this case the commander's guidance was..."destroy at least one MRC in EA Cat," and his purpose was to "disrupt the Detachment's ability to seize Delta Pass from Team A, allowing me to focus the other three teams [against the MRR's main body funnelled] into EA Dog."

You must at least destroy one MRC. You consult with the S2 to confirm how many combat vehicles are in an MRC: 3 T-80 tanks and 8 BMP infantry combat vehicles.

Step 2: Equate the required effects to the required ammunition. This calculation normally is based on the graphical munitions effects tables (GMETs) as captured manually or using an automated device. For this example, I use the NTC "GMET": to kill one tank, it takes 54 155-mm dual-purpose improved conventional munitions (DPICM) and to kill one BMP, it takes 18 155-mm DPICM.

Therefore, you can calculate how many rounds it takes to achieve the effects:

3 Tanks x 54 RDs = 162 DPICM
8 BMPs x 18 RDs = 144 DPICM
Total RDs Required = 306 DPICM

You've already checked to see how many rounds of DPICM your battalion has on hand: enough for 54 battalion-three volleys of DPICM—more than enough to achieve the effects.

Step 3: Determine the minutes available for the attack. For this step, you need some additional facts and must make some assumptions. You must attack the Forward Detachment with fires in EA Cat. Because time is a function of distance, rate of movement and formation size, you gather the information you need. From the S3 and operations overlays, you determine that EA Cat is nine kilometers long. In consultation with the S2, you assume that a Forward Detachment in march formation in EA Cat is about one kilometer long by 250 meters wide. Also in conjunction with the S2, you assume the enemy rate of march in EA Cat is 30 kilometers per hour (KPH). From your FSO's "Smart Book," you determine that 30 kilometers per hour is one kilometer (KM) every two minutes.

With this info, you calculate the time available to attack the enemy in EA Cat:

1-KM Det Pass Time = 2 MIN
Travel 9 KM in EA x 2 MIN per KM = 18 MIN
Total Time Available = 20 MIN

Step 4: Determine if the required ammunition can be delivered in the time available. Now you determine if we can deliver 306 DPICM (Step 2) in 20 minutes (Step 3). You look in your Smart Book to verify that your battalion's 18 155-mm tubes' rate-of-fire is one minute per round, based on the battalion's most recent Army training and evaluation program (ARTEP) times. Therefore:

20 MIN x 18 Tubes per RD per MIN =
360 RDs in Time Available

In this step, you've learned that the battalion can deliver 360 rounds in the time available—more than the 306 rounds required to achieve the desired effects. It would appear your mission is do-able.

Unfortunately, the enemy formation you must engage is moving, so you also must calculate how many volleys your battalion can fire on the Forward Detachment at a single target location.

Step 5: Determine maximum volleys that can be fired on the moving formation at one target location. With your assumptions that the Detachment is 1,000 meters long by 250 meters wide while in march formation in EA Cat and that it will move at 30 kilometers per hour, you can calculate a pass time of two minutes—the time from the lead vehicle to the trail vehicle's crossing the same point on the ground.

Figure 1 shows how you calculate that your FA battalion can fire three volleys on the moving formation before the enemy can pass completely through the target location.

Step 6: Determine the number of attacks (battalion-three volleys) needed to deliver the required ammunition. You know that the battalion's 18 tubes firing a three-round volley is 54 rounds per attack. Therefore:

306 Required RDs ÷ 54 RDs =
6 Attacks on Distinct Targets

Because the battalion must fire at a target and then shift six times, you now must determine if the enemy will be in EA Cat long enough—if EA Cat has enough space—to achieve the desired effects.

Step 7: Determine if time and space are available to execute the required attacks. From your Smart Book ARTEP data, you know it takes your battalion two minutes to deliver a battalion-three

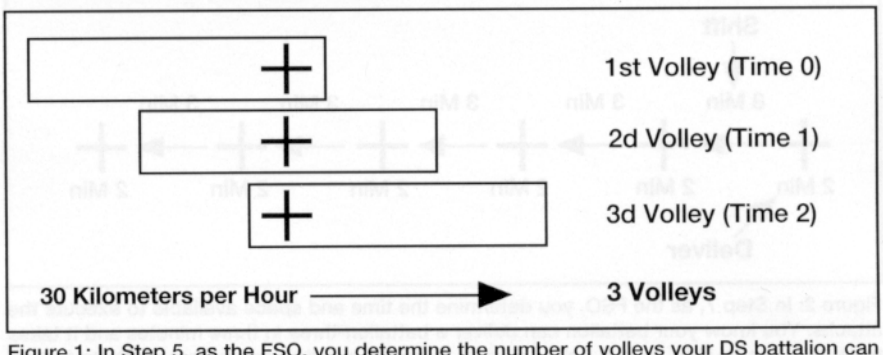

Figure 1: In Step 5, as the FSO, you determine the number of volleys your DS battalion can fire at one target location in EA Cat before the 1,000-by-250 meter enemy detachment moving 30 kilometers per hour can pass through that location.

and three minutes to shift a volley from one target to another. Figure 2 shows how you add up the shift and fire times to determine how long it will take the battalion to achieve the required effects—in this case, it's 27 minutes.

You already know the moving enemy formation will have passed through EA Cat in 20 minutes. Therefore, the answer to the question, "Can you do it?" is "No, Sir" ....That is, unless you can increase—

• The space available. Can you put an observer in position to acquire the enemy farther out? Can the battalion range the enemy farther out?

• The time available. Can you slow the enemy down in the EA with family of scatterable mines (FASCAM), other obstacles, jamming, mechanical smoke, etc.?

• The volume or lethality of fire. Can you get reinforcing artillery, close air support (CAS) or attack aviation? Can you fire Copperhead rounds?

This example demonstrates that battle calculus is not a pure science and won't generate a flawless solution to every battlefield fire support problem. In fact, the battle calculus "answer" is rarely a definitive "Yes" or "No" but instead suggests how you can make success more likely by integrating obstacles, employing intelligence and electronic warfare (IEW), repositioning observers or adding killing assets and other combat multipliers. The answer should only be "It can't be done" after you've exhausted all means to meet the commander's guidance.

There are many ways to use battle calculus in fire support planning. Even the steps in the example in this article may change as mission, enemy, terrain, troops and time available (METT-T) change. To facilitate the process, the FSO should have at least the planning information listed in Figure 3 readily available in his Smart Book or through his FSE. The basic thought process of applying reasonable assumptions and tested planning factors to try to improve the feasibility of fire support plans and their synchronization with maneuver is sound.

- Number of Killer Missions by Munitions and Target Types
- Time Required to Fire Killer Mission by Munition (Ready to Rounds Complete)
- Artillery Shift Time by Weapon and Target Types (Planned or Target of Opportunity)
- Minimum and Maximum Ranges by Weapon and Munition Types and Primary Method of Delivery
- Copperhead Planning Factors (Copperhead Coverage Template)
- Observer Status (Location, Equipment, Observation Limits)
- Radar Status and Capabilities
  - Systems Available
  - Ranges
  - Cumulative Cue Time/Threat
  - Zone Planning Factors/Considerations
- Close Air Support (CAS)
  - Available Aircraft by Types and Sorties
  - Aircraft Capabilities
  - Available Munitions and Restrictions/Limits of Each
  - Response Time for Immediate CAS (Request to Command Post)
  - Station or Loiter Time (Command Post to Off-Station)
  - CAS Tactical Planning Data: Threat and Tactics, Required Airspace, Coordinating Alternative and Suppression of Enemy Air Defenses (SEAD) Timing/Separation
- Radio Ranges by Radio Type/Configuration
- Family of Scatterable Mines (FASCAM)
  - Number of 400 by 400 Medium Density Minefields
  - Time Required to Emplace by Battery/Two Batteries/Battalion for On-Order and Be-Prepared
- Number of Minutes of Illumination by Weapon Type
- Number of Modules of Smoke: 600 x 15 Minutes x Wind Direction x Conditions
- Target Spacing Minimums: Rate-of-March (Kilometers/Minutes) x [Shift Time + Deliver Time]
- Trigger Leads: Rate-of-March (Kilometers/Minutes) x [Time-on-Target Process Time + Time of Flight]
- Commander's Intent
- Commander's Planning Guidance

Figure 3: Fire Support Planning Factors for Battle Calculus. This kind of information and more should be readily available in the FSO's "Smart Book" or through his FSE.

To use battle calculus will not guarantee your fire support plans will succeed; but, when used routinely, battle calculus will result in fire support plans that *can* succeed. And that may be all an FSO can plan on.

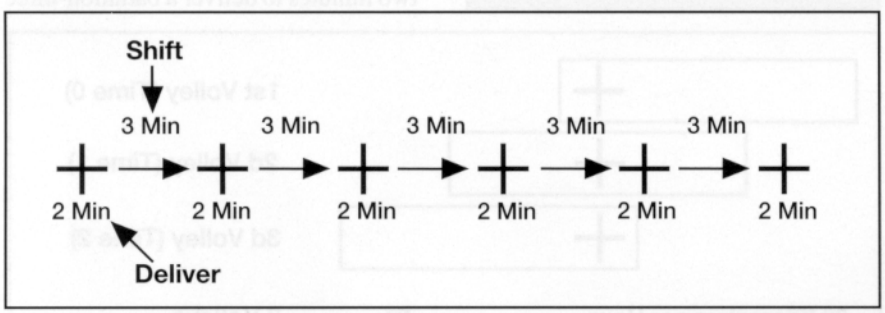

Figure 2: In Step 7, as the FSO, you determine the time and space available to execute the attacks. You know your battalion can deliver a battalion-three in three minutes and it takes three minutes to shift from a volley on one target to a volley on another. With that information, you can determine the battalion will take 27 minutes to deliver enough rounds to have the required effects.

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