

How the Guard Could Cut Costs on Table VIII Without Really Trying

by Dr. Joseph D. Hagman and Dr. Monte D. Smith

In today's environment of ever diminishing resources, do you as an Army National Guard (ARNG) armor unit commander find yourself under pressure to do more with less, especially when it comes to your tank gunnery program? Back in 1996,¹ we developed a timesaving, device-based gunnery training strategy to provide you with some relief. Nonetheless, you say the prospect of more resource cuts looming on the horizon is still making you nervous. So, where else can you turn to cut costs without sacrificing the gunnery proficiency of your tank crews?

While training devices may once again provide an answer, we've been looking instead for a way to cut the cost of live-fire gunnery evaluation. After analyzing the 1993-1997, first-run, Tank Table VIII (TTVIII) scores of 716 ARNG crews in Project SIMITAR's (Simulations in Training for Advanced Readiness) gunnery database,² we've come up with what we think is an easy-to-implement strategy for cutting the range time, ammunition, and OPTEMPO costs of TTVIII.

Although it may sound like heresy to suggest a change in how TTVIII is evaluated, the threat of future resource cuts has given us little choice but to at least consider the notion. In reading on, you'll find out exactly how the strategy works and the kind of resources it would save.

How the Strategy Works

The strategy uses cutoff scores to predict, as early into TTVIII as possible, which crews will, and which crews

won't, first-run qualify (Q1). These predictions are then used to qualify some crews and to send others back for remedial training — two actions that to date have had to await the firing of all 10 engagements.

Table 1 shows what the cutoff scores would be, based on the performance analysis of our tank crew sample. For example, crews scoring 109 or lower after two engagements would be predicted to achieve Q1 no more than 5% of the time, whereas those scoring 176 or higher would be predicted to achieve Q1 at least 95% of the time. Crews scoring 164 or lower after three engagements would be predicted to achieve Q1 no more than 5% of the time, whereas those scoring 256 or higher would be predicted to achieve Q1 at least 95% of the time, and so on. Crews firing between the cutoff scores would continue firing. Those scoring between 109 and 176 after two engagements, for example, would continue on to the third engagement. They would then be reevaluated on the basis of how they scored in relation to the cutoff scores provided in Table 1.

These predictions will apply to whatever set of 10 TTVIII engagements you plan to fire. Thus, you don't have to modify your training program or your TTVIII engagement scenario for the predictions to hold up. You just have to be willing to use them in making early qualification and remedial training decisions based on the cutoff scores provided. It's that easy, and your decisions will be correct at least 95% of the time.

TTVIII by firing the first two of the 10 scheduled engagements. Those scoring 109 or lower would be pulled from the range and given remedial training, perhaps on the Conduct-of-Fire Trainer (COFT) or Abrams Full-Crew Interactive Simulation Trainer (AFIST). Following remediation, they would be given one rerun attempt, starting at the top with the first two engagements.

First-run crews scoring 176 or higher after the first two engagements would be awarded early qualification (Q1e); those scoring from 110 to 175 would go on to the third engagement. Crews scoring 164 or lower after three engagements would undergo remediation before beginning their rerun from the top. Rerun crews would be evaluated as if they were firing their first run, except that predictions would now apply to Q2 rather than Q1. Those predicted to need remediation as a result of poor performance on their rerun would receive an unqualified rating. First-run crews scoring 256 or higher after three engagements would be awarded early qualification; those scoring from 165 and 255 would go on to the fourth engagement, and so on.

What's The Payoff?

Generally speaking, the earlier in the TTVIII engagement firing sequence that predictions can be made, the greater the resource savings will be. Assuming that each engagement accounts for roughly 10% of the total resources spent on TTVIII, crews predicted to Q1 after only two engagements would save about 80% of the resources needed to fire all 10. Those predicted to Q1 after three engagements would save about 70%, and so on.

We believe that resources can be saved by predicted Q1 crews as well as by those predicted to need remediation. Using our tank crew sample, we calculated (a) the number of crews in a typical 58-crew battalion that would be predicted to Q1 after each engagement, and (b) the predicted number of engagements they would save. As shown in Table 2, the seven crews predicted to Q1 after two engagements would save a total of 56 engagements (7 crews x 8 engagements =

# of Engagements Fired	Remediation Cutoff Scores (≤)	Q1 Cutoff Scores (≥)
2	109	176
3	164	256
4	215	317
5	304	390
6	357	458
7	439	524
8	500*	592
9	600*	643

*Mathematically eliminated

Implementing the Strategy

Figure 1 shows, in part, how the proposed evaluation strategy would be implemented using the cutoff scores in Table 1. In general, crew gunnery proficiency would be evaluated after the firing of each TTVIII engagement, rather than after the firing of all 10. All crews, for example, would begin

Table 1. Cutoff Scores for Remediation and Q1 Predictions

56), the one crew predicted to Q1 after three engagements would save seven engagements, and so on, with 121 engagements saved in all by the entire battalion. Thus, on predicted Q1 crews alone, 21% (121/580) of an armor battalion's first-run engagements could be saved merely by applying the proposed evaluation strategy.

Battalion resources should also be saved on crews predicted to need remedial training simply because they can be identified before they've fired all 10 TTVIII engagements. Just exactly how much savings, however, would depend on how many rerun engagements are fired. Having crews start their reruns from the top, and then reapplying the proposed cutoff-score strategy, should help to maximize the savings on each rerun attempt. Thus, in general, reducing the number of engagements fired through early prediction of which crews will, and which won't, first-run qualify should translate into less range time, fewer rounds, and reduced OPTEMPO costs each year on TTVIII. These savings can be used to offset future resource cuts or, until then, be either pocketed or used for other purposes such as platoon-level gunnery.

What Next?

Since we started looking for a way to cut the cost of live-fire gunnery evaluation, the TTVIII engagements have been changed.³ So, we still need to test our strategy out on the new engagements once enough first-run data become available. Although the specific cutoff score values for early qualification and remediation, as well as the level of expected resource savings, may change somewhat from that reported here, the notion of using cutoff scores for prediction purposes should still work. We'll just have to wait and see how well.

# of Engagements Fired	Predicted # of Early Q1 Crews	Predicted # of Engagements Saved
2	7	56
3	1	7
4	3	18
5	4	20
6	3	12
7	2	6
8	1	2
9	0	0
Total: 21		Total: 121

Table 2. Predicted # of Engagements Saved by an Armor Battalion on the first Run of TTVIII

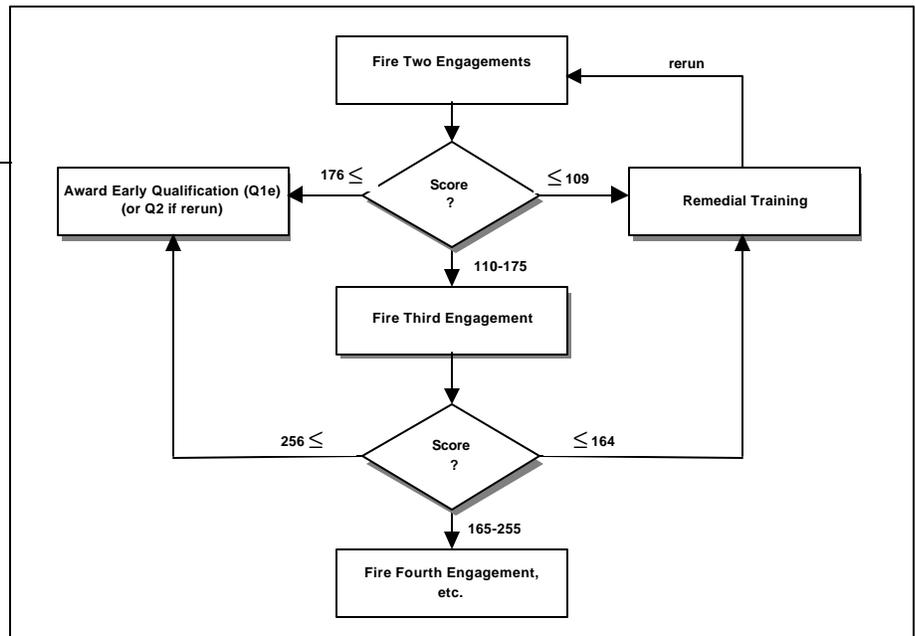


Figure 1. Flowchart of TTVIII engagement sequence

We also need to extend our investigation to the Active Component (AC). Just to see what would happen, we did analyze the 1993-1994, first-run TTVIII scores⁴ of 838 Grafenwoehr-firing crews and found no need to develop early qualification and remediation cutoff scores because the Q1 rate was so high (98%). Thus, before even a single round is fired downrange, one could predict with near certainty that any particular AC crew would Q1. Given such a high Q1 rate for "Graf-firing" crews, one has to wonder why they fire TTVIII at all in these days of tight resources. But that's another matter. An answer to the question of whether such a high Q1 rate will be fired on the new engagements by Graf-firing crews, or by AC crews stationed stateside, must await further data collection. We'll get back to you on what we find.

In the meantime, we believe that range time, ammunition, and OPTEMPO costs can indeed be cut considerably on TTVIII, without jeopardizing its purpose and intent, by simply evaluating crew performance as you go along, rather than waiting until all TTVIII engagements are fired. The strategy just described is an easy way of doing so that we think makes sense.

We'd like to hear your thoughts on this. You can reach us by regular mail at the U.S. Army Research Institute, 1910 University Drive, Boise, ID 83725; by telephone at 208-334-9390; or by e-mail at hagman@ari.army.mil.

Notes

¹Hagman, J. D. & Morrison, J. E. (1996, November-December). "Research Pays Off for the Guard: A Device-Based Strategy For Training Tank Gunnery," *ARMOR*, pp. 48-50.

²Smith, M.D. (1998). *User's Manual for an Army National Guard (ARNG) Armor and Mechanized Infantry Gunnery Training Assessment Database*. (Res. Product 98-34). Alexandria, Va.: U.S. Army Research Institute.

³Department of the Army (1998). *Tank Gunnery Training (Abrams) (FM 17-12-1-2)*. Washington, D.C.

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