TIME-COMPRESSED TANK GUNNERY TRAINING IN THE ARMY NATIONAL GUARD

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ABSTRACT

A device-based strategy is proposed for reducing or compressing the training time required to prepare Army National Guard armor tank crews for intermediate-level gunnery qualification on Table VIII. Using two computer-based devices, that is, the Conduct-of-Fire Trainer (COFT) and Guard Unit Armory Device Full-Crew Interactive Simulation Trainer - Armor (GUARDFIST I), time compression is accomplished in three ways. First, only Table VIII-related skills are trained on the devices. Second, emphasis is placed on training those Table VIII engagements typically not performed to standard. And third, training time is allocated primarily to crews that need it most, as determined through device-based competency pretesting. The strategy is designed for company-level implementation over three consecutive inactive duty training weekends.

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INTRODUCTION

In attempting to attain and maintain readiness standards comparable to their Active Component (AC) counterparts, U.S. Army National Guard (ARNG) combat arms units face significant training challenges stemming from imposed limitations on training time, that is, 12 Inactive Duty Training (IDT) weekends and a 2-week Annual Training (AT) period per year (U.S. Army Training Board, 1987). To make more efficient use of available tank gunnery training time, for example, ARNG armor units are seeking to shift from tank-based to device-based training. To maximize the payoff from such an approach, an effective and efficient strategy is needed to provide guidance on the design and execution of device-based gunnery training at the company level.

Previous tank gunnery training strategies designed for this purpose have either not provided enough specific "how to" guidance to support unit-level implementation (Headquarters, U.S. Army Training and Doctrine Command, 1992), failed to promote efficiency by requiring a full training calendar year to implement (Morrison, Campshure, & Doyle, 1991), or not emphasized device usage (U.S. Army Armor School, 1993). In contrast, the strategy proposed herein promotes efficiency through the maximal use of time-compression techniques and computer-based training devices. Its specific purpose is to prepare tank crews for successful first-run, live-fire gunnery qualification on Tank Table VIII (Department of the Army, 1993).

Two devices are used in the strategy: The Conduct-of-Fire Trainer (COFT) and the Guard Unit Armory Device Full-Crew Interactive Simulation trainer - Armor (GUARDFIST I). Time is compressed by (a) training only those skills and knowledges needed for successful Table VIII performance, (b) placing the focus of training on the most difficult Table VIII engagements, and (c) allocating training time primarily to crews that need it most.

APPROACH

The process of strategy development required (a) identifying the performance requirements of Table VIII, (b) determining the capabilities of the COFT and GUARDFIST I to support these training requirements, and (c) selecting the most efficient training approach for promoting the acquisition of gunnery skills on the devices as well as the transfer of these skills to performance on the tank.

Table VIII Performance Requirements

Table VIII consists of 12 tank gunnery engagements (see Table 1) divided equally into two groups of six engagements each: Table VIIIA is fired during the day; Table VIIIB is fired at night. Of these 12 engagements, two (A5S and B1S) are "swing" engagements that may be fired day or night, and two (A5A and B5A) are alternate engagements that may be fired in place of A5S and B5. Thus, each crew fires only 10 of the 12 engagements.

To promote transfer to live fire, device-based training should cover the actual engagements fired on Table VIII. For the sake of efficiency, however, training on all 12 Table VIII engagements may not be necessary if a subset of unique engagements can be identified that adequately covers the entire array of Table VIII tasks and conditions. To this end, two methods were used to reduce the number of engagements for training purposes. First, Table VIII engagement requirements were examined to identify duplication and to combine engagements accordingly. Second, engagements were ranked on difficulty of performance using data provided by Hagman (in press). As a result, eight unique engagements were identified and placed into three difficulty categories, as shown in Column 1 of Table 2. Shown in Column 2 are the specific Table VIII engagements covered by each unique engagement associated with the three difficulty categories.

Table 1
Table VIII Engagements

Table VIII (Day)

Engagement	Description
A1	On defense, engage a moving and a stationary tank with the main gun using the gunner's auxiliary sight (GAS) and battlesight gunnery.
A2	On defense, simultaneously engage a stationary BMP (tracked armored personnel carrier [APC]) with the main gun and a stationary BTR (wheeled APC) with the tank commander's (TC's) Caliber .50 machine gun.
A3	On offense, engage two sets of troops with the coaxial machine gun using precision gunnery.
A4	On offense and under nuclear, biological, and chemical (NBC) protection status, engage two stationary tanks with the main gun using precision gunnery.
A5A	On offense, engage a stationary and a moving tank with the main gun using precision gunnery.
A5S	On offense, engage two moving tanks with the main gun using precision gunnery.

Table VIIIB (Night)

B1S	On defense, engage a stationary tank with the main gun from a three-man crew configuration using precision gunnery.
B2	On defense, engage two stationary BMPs with the main gun using precision gunnery.
B3	On offense and under NBC protection status, engage a stationary BMP with the main gun and a stationary RPG team with the coaxial machine gun using precision gunnery.
B4	On offense, engage a stationary and moving tank with the main gun using precision gunnery.
B5	On defense, engage a stationary tank with the main gun using GAS battlesight gunnery under external illumination.
B5A	On defense, engage a moving tank with the main gun using precision gunnery.

Difficult Engagements. Three of the four "difficult" engagements require employment of either the coaxial or Caliber .50 machine gun, either alone or in combination with the main gun. The fourth engagement of this category requires engagement of a moving target using the GAS. Besides being difficult to perform, these four engagements encompass most of the tasks and conditions encountered in Table VIII. Because these engagements are both difficult and comprehensive, they are the primary training objectives of the proposed strategy.

Fundamental Engagements. The next two engagements are called "fundamental" because they require crews to engage tank targets on either the offense or the defense without significant complicating conditions. Typically, these engagements are performed relatively well (Hagman, in press), presumably because they are not complicated by "additional" requirements such as using multiple weapon systems or engaging non-tank targets. Although the tasks and conditions of these fundamental engagements are encountered while practicing the difficult engagements, it is assumed that less proficient crews will learn these skills more efficiently under the simpler conditions of the fundamental engagements.

Special Engagements. The two engagements in this category are called "special" because they should be trained

Table 2
Difficulty Categories of the eight Unique Table VIII Gunnery Engagements and Associated Device-Based Training Exercises

Engagement Category		Device Training Exercises	
Description	Table VIII Engagements	COFT	GUARD-FIST I
Difficult Engagements			
On defense, engage simultaneous targets with the main gun and the TC's Caliber .50 machine gun.	A2	101 111[b]	---[a]
On offense, engage two sets of troops with the coaxial machine gun using precision gunnery.	A3	102 106	6A2
On offense, under NBC conditions, engage a stationary BMP with the main gun and an RPG team with the coaxial machine gun.	B3	101	6B3
On defense, engage a stationary and a moving tank target with the main gun using battlesight gunnery and the GAS.	A1, B5	113 117	6A1
Fundamental Engagements			
On offense, engage stationary or moving tank targets with the main gun using precision gunnery.	A4, A5S, A5A, B4	102 106 110	6A3 6A3 6A5 6B4
On defense, engage a moving tank with the main gun using precision gunnery.	B5A	105	6B5
Special Engagements			
On defense, engage two stationary BMPs with the main gun using precision gunnery.	B2	105	6B2
On defense, engage a stationary tank target with a three-man crew using precision gunnery.	B1S	103 107 119	6B1

[a]GUARDFIST I does not simulate the Caliber .50 machine gun and therefore is unable to support training on this engagement.
[b]COFT provides only part-task training for the TC on the Caliber .50 machine gun.

only under special circumstances, e.g., if the loader is inexperienced in changing from battlecarry SABOT ammunition to the HEAT rounds used for engaging lightly-armored vehicles, or if the TC is relatively inexperienced as a gunner under a three-man crew configuration. Typically, these special engagements are performed very well (Hagman, in press) and should not require training unless the above circumstances exist.

Device Capabilities

Regarding fidelity of simulation, COFT and GUARDFIST I are roughly comparable in that they both allow crews to use realistic tank controls in response to computer-generated images displayed through tank optics. They do differ, however, in certain respects. COFT, for example, is a stand-alone device that supports the training of only the gunner and TC, with inputs from the loader and driver simulated by an instructor/operator (I/O). In contrast, GUARDFIST I is a tank-appended device that supports the training of all four crew members, although the loader and driver simulation is at a lower level of fidelity than the TC and gunner simulation. In addition, COFT simulates all three M1 tank weapon systems (main gun, coaxial machine gun, and Caliber .50 machine gun), whereas GUARDFIST I simulates all but the TC's Caliber .50 machine gun, and therefore cannot support *simultaneous engagement training.*

Regarding training software, both devices offer evaluation exercises that present a heterogeneous set of engagements intended to simulate the array of Table VIII tasks and conditions, and training exercises that contain a more homogeneous set of engagements that focus on specific gunnery skills.

Evaluation Exercises. On COFT, the evaluation exercises (termed "gate" exercises) make up the last set of exercises in Group I of the recently fielded Advanced Matrix (U.S. Army Armor School, 1991). Each of the 16 gate exercises presents a different selection and ordering of 10 Table VIII engagements. On GUARDFIST I, a single Table VIII evaluation exercise, covering 10 of 12 Table VIII engagements, is provided as part of the final group of exercises (Group 6) in the GUARDFIST I training matrix (Industrial Data Link and Computer Sciences Corporation, 1994, February). Excluded from this exercise are the Simultaneous Engagement A2 (i.e., GUARDFIST I does not simulate the TC's Caliber .50 machine gun) and Engagement B5 (i.e., GUARDFIST I does not simulate external illumination for nighttime engagements).

Training Exercises. To support training, specific exercises were selected from Group 1 of the COFT advanced training matrix and Group 6 of the GUARDFIST I training matrix. To promote transfer to live fire, these exercises were selected to correspond closely to the eight unique Table VIII engagements. The two right-hand columns of Table 2 show the specific exercises selected for training purposes.

TRAINING APPROACH

The final step taken to support strategy development was to specify how training should be conducted in order to ensure maximum efficiency and effectiveness. The traditional bottom-up approach, where each crew begins training on easy engagements and proceeds to more difficult ones as proficiency increases, was judged to be inappropriate because of the limited amount of device-based training time available to ARNG tank crews. Thus, an alternative top-down approach was adopted where proficiency is first assessed and then followed by training at the highest engagement difficulty level indicated.

THE STRATEGY

Based on this top-down approach, the training strategy depicted in Figure 1 was developed. The strategy begins with a device-based pretest using GUARDFIST I or COFT to assess the need for device-based training. On GUARDFIST I, the pretest consists of Evaluation Exercises 6E1 and 6E2 which correspond to Parts A and B of Table VIII. These two exercises are to be administered four times, without feedback, so as to provide an adequate performance sample from which to make a valid assessment of crew proficiency (Smith & Hagman, 1992). On COFT, two exercises are to be selected from advanced matrix Gate Exercises 130-135 and two from Gate Exercises 136-139. Crews scoring 2800 points (i.e., 700 points per administration) or more are deemed "qualified" and not in need of device-based training. Crews scoring between 2800 and 1400 points on the pretest are deemed "partially trained" and would begin device-based training on the difficult engagements shown in Table 2. Crews scoring below 1400 points are deemed "untrained" and would begin training on the fundamental engagements (see Table 2) and then would proceed to the difficult engagements as proficiency dictates. For training purposes, proficiency is defined as destroying the targets on two consecutive attempts without committing a procedural error. Crews considered partially trained or untrained on the basis of their pretest performance may also receive training on the special engagements (see Table 2) if crew membership includes a new TC or loader. As a final step, all crews, including those considered to be qualified, would undergo a posttest, identical to the pretest, for the purposes of assessing their terminal device-based proficiency and of ensuring reliability of measurement. Under this strategy, it is anticipated that most crews will require less than 8 hrs of device-based training and testing, provided no special

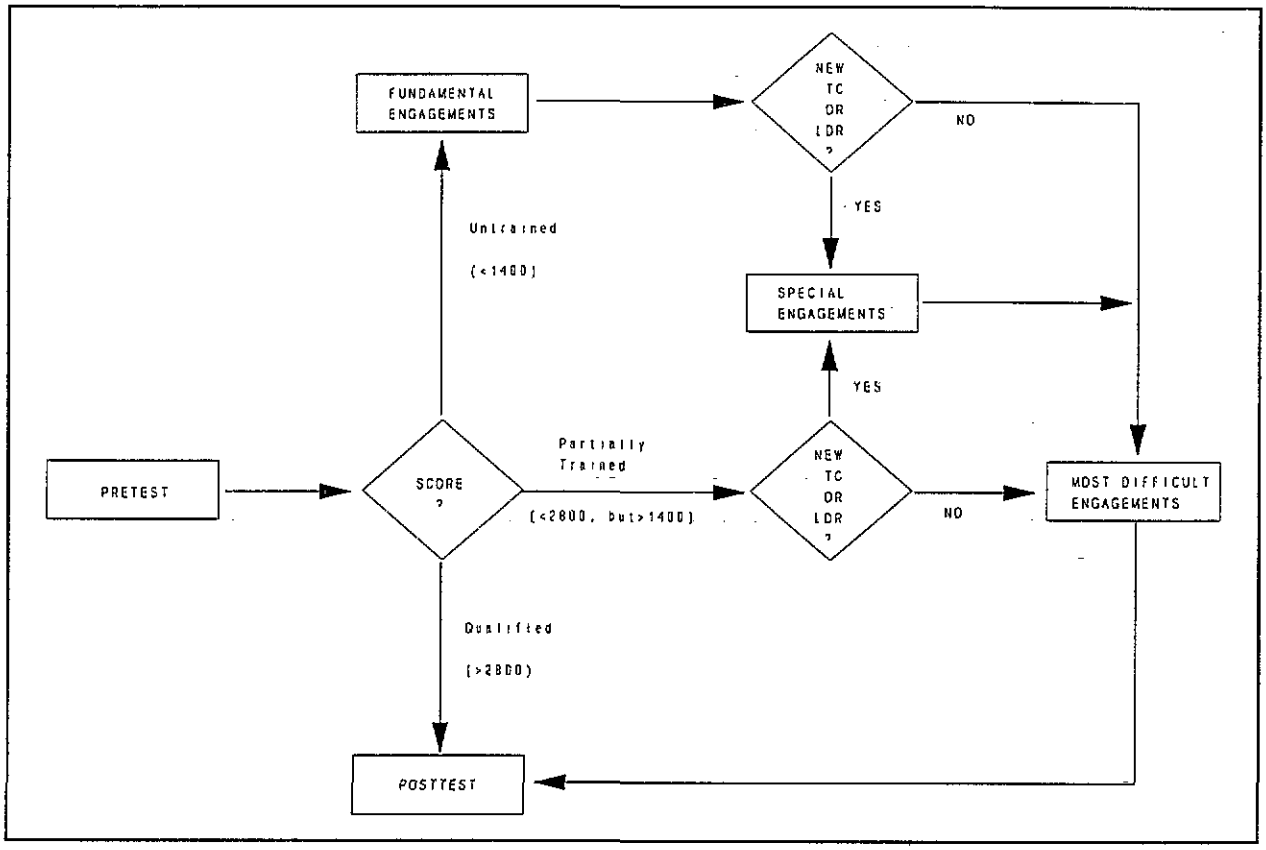

Figure 1. Flow of training and testing events in the strategy

engagement training is required (See Morrison & Hagman, inpress, for additional details.).

IMPLEMENTATION CONSIDERATIONS

The proposed strategy is designed to be implemented over three consecutive 3 IDT periods scheduled immediately prior to the AT period during which Table VIII will be fired. To maximize efficiency, device pretesting should be combined with Tank Crew Gunnery Skills Test (TCGST) administration. Pretesting should take about 60–90 min per crew.

Between the TCGST and the next IDT period, the unit commander and training noncommissioned officer (NCO) should review pretest performance to determine the appropriate training exercises for each crew. Depending on pretest performance, a crew may next undergo posttesting (i.e., qualified crews), training on the most difficult exercises (i.e., partially trained crews), or training on the fundamental exercises (i.e., untrained crews). Similarly, performance must be reviewed between the first and second and the second and third IDT periods, respectively. This review is required for selecting the appropriate training exercises and for determining which crews no longer require device-based training. The latter will ensure that limited available device time is diverted to crews that need it most.

If a unit has access to both COFT and GUARDFIST I, training should be scheduled such that crews practice the engagements on the device that provides the better simulation. The COFT, for instance, is the better device on which to train the simultaneous engagement, because only COFT provides a simulation of the TC's Caliber .50 machine gun. Once device-based training/testing is completed, tank crews should transition to the live-fire tank table exercises prescribed in FM 17-12-1-2 (Department of the Army, 1993).

In conclusion, several things should be noted regarding the proposed strategy. First, it does not provide sufficient training for loaders and drivers. Supplemental on-tank training will need to be scheduled, for instance, to give loaders practice at loading/unloading and drivers practice at starting/stopping and maintaining a steady gunnery platform.

Second, the strategy does not support the training of all aspects of tank gunnery. Skills and knowledges involving fire control system calibration, conduct-of-fire commands, and misfire procedures, for example, should be mastered either before or in conjunction with training on the devices. Development of a workbook is underway to support a concurrent approach to training these skills and knowledges (Pope, in preparation).

And lastly, in order to save time the proposed strategy recommends that COFT and GUARDFIST I be used in ways for which they were not originally intended. Thus, a formative evaluation is needed to test the validity of this approach in an actual ARNG setting. This evaluation should focus on determining whether or not (a) the devices are capable of providing efficient and effective training on the identified engagements, (b) a typical ARNG armor company can complete the recommended training in the time allotted, and (c) device-based training on the recommended engagements improves performance on Table VIII.

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