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How to Win Outnumbered

In 1967 the Israelis, using in part upgunned US World War II tanks, whipped technically advanced and numerically superior formations of Arab-manned T-54 and T-55 Soviet tanks. In 1973, outnumbered overall in tanks by 8:1, Israeli armor wrought another victory. Israeli tankers emerged from the Yom Kippur War more confident than ever that their tanks can dominate a modern "mid-intensity" battlefield, and that they can fight and win tank-versus-tank battles at long odds. That confidence springs from conviction that their tank crew training, especially in gunnery, makes their machines significantly more effective than machines manned by Arabs. In other words, the Israelis made certain investments in training and personnel management for tank crews that improved the effectiveness of the tank as a weapon system, and they are convinced such investments offset Arab advantages in both quantity and quality of Soviet materiel.

This paper argues that the Israelis are quite right, and that the US Army ought to take heed. The M-60 series tank, which will be the back-bone of our tank fleet for the decade to come, will proffer no clear technical advantage over Soviet tanks, and are bound to be outnumbered on any likely battlefield. The US cannot buy, via any foreseeable materiel development, an upgrading of weapon system effectiveness comparable to that which would flow from improved training and personnel management of tank commanders. Such measures are to only means to victory in tank-to-tank battle tat the US can afford, and the Army cannot afford to defer them.

Gunnery Training: Some Historic Parables

Guns and gunnery have been central to the military art for many centuries, but that very antiquity has often obstructed progress, in that professionals too often take gunnery techniques for granted. For example, up until 1898, all gunnery at sea was dependent upon firing with the uproll of the ship. A range was estimated, and an elevation was applied to the gun, which, additive to the elevation of the ship's maximum roll, would loft the projectile to the target. The gunner then watched over open sights until the roll of the vessel brought the target into train, and fired. In 1892 telescopic sights had

been introduced, but until 1898 they were fixed to the gun barrel, and amounted to little more than an uncomfortable version of the open sights. In that year, a British officer by the name of Scott, watching his gunners at service practice, hit upon the notion of up-gearing the screw elevating mechanism to the point that the gunner could elevate and depress the gun with the motion of the ship, keeping continuous aim on his target. He re-rigged the telescope so that the sight apparatus was independent of gun recoil. And he hung a panel target off the mouth of the gun, which, moved up and down by a crank, simulated the sighting problem the gunner had to solve and provided training without expenditure of ammunition. No expensive Product Improvement Program this; Scott never consulted the Admiralty, and did all the work with his own gunsmith. With his training aids, Scott's gunners improved in effectiveness by an amazing margin. Whereas before gunnery was a slowly acquired, arcane and gymnastic art, it became with Scott's technique a skill any attentive sailor could master in a short time.

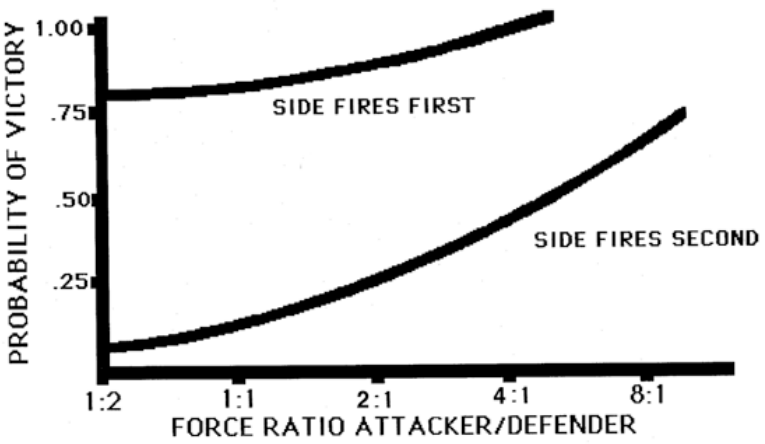
Sims of the American Navy soon learned of Scott's innovation, and although both encountered staunch opposition from traditionalists, their ships soon shot their respective fleets into imitation: in a period of just six years, the fire-effectiveness of the British and American fleets increased by some 3000 percent. As a documented measure, in 1899, before using the Scott technique, five ships of the North Atlantic Squadron fired for five minutes each at a lightship hulk at 1600 yards, scoring just two hits. Six years later, using Scott's continuous aim, one naval gunner, firing at tile same range of 1600 yards, scored 15 hits in one minute on a target 25 feet by 75 feet--and half of these struck a 50-inch by 50-inch bull's eye.

In 1940, the British Army, striving to recover from losses of artillery materiel in France, issued from depot stock a venerable light field piece of Boer War vintage which could still shoot dependably, and which, towed by trucks, was sufficiently mobile to add flexibility to England's coastal defenses. But in service practice, the gun crews seemed unable to sustain a reasonable rate of fire. Accordingly, a civilian training expert was called in to study slow-motion movies of a five-man crew servicing the piece precisely as called for in the field manual. The expert questioned why it was that, just before firing, two men from the crew ran smartly ten yards or so to the rear of the piece, stood at rigid attention while the gun discharged and recoiled, and then ran back to rejoin the crew. He received no reasonable answer until one old colonel, upon watching the movie, announced that it was perfectly clear what

the men were doing: they were holding the horses. That fatiguing excursion eliminated, the gun crews upped their effectiveness by one-third.

These anecdotes are included not to suggest that the Israelis are onto some Scott-like innovation in tank-shooting, or that US tankers teach horse-holding, but to stress that training technique is a central factor in weaponry effectiveness, and that its centrality has often been overlooked, even by so highly professional services as the British Navy and the Royal Artillery. The Israelis took great pains with training in gunnery, especially for tank commanders, and therein lays the explanation of their tactical dominance in the Yom Kippur War.

The effectiveness of the tank in battle, as a weapon system is bound to be highly sensitive to the state of training of the tank commander. It is he who coordinates his vehicle's action with that of other tanks, anti-tank weapons, and artillery; he who positions the tank for engagement, who designates the target, who determines range, who selects the ammunition, and who chooses the moment to fire. If he makes sound choices, he improves his chances of firing at this target before it can fire at him, and of hitting with his first shot. The importance of firing first in multi-tank engagements has long been understood, and has been central to US Army materiel developments and doctrine for years: we want our tanks to operate on the upper curve below, which shows that a capable commander with a well-trained crew, shooting first and hitting, enjoys marked advantages even when badly outnumbered.



*Elting E. Morison, Men, Machines and Modern Times, The MIT Press, Cambridge, 1966, pp. 17-24.

The graph above,* based on analysis of approximately 300 company-level armor engagements in France during World War II, quantifies the advantage which then accrued to the tank unit which got off first rounds. That advantage was so dominant that a side outnumbered 2:1, but shooting first, had a much better chance of winning than one enjoying 8:1 superiority, but firing second.

This sort of analysis has since underwritten many a materiel-oriented US combat development —range-finders, shoot-on-the-move stabilizers, etc. For years US statements of requirements for new tank guns have included such stipulations as "must have 90 percent probability of first round hit at 2000 yards." A recent USAIS staff study of opening ranges in tank battles, from World War II through 1967, showed differences in materiel and terrain, but portrayed a technology stretching toward longer and longer first shot ranges. That technology, during the Six Day War of 1967, permitted the Israelis, on the average, to start shooting at better than 1000 meters. During World War II, in North Africa, comparable figures are about 80 percent of that range. Preliminary reports from the 1973 Yom Kippur War indicate that average opening-range for day-time tank fights may be as much as 150 percent to 200 percent higher than in 1967. These figures point to the presence on the 1973 battlefields of technically advanced materiel that was no doubt used advantageously by the Israeli tank commander. But the evidence is strong —and supported by Israeli contentions— that superior crew training, not that materiel, determined combat outcome.

The Israelis, in discussing tank tactics, explicitly compare tank commanders to fighter pilots. Just as they train their fighter pilots first and foremost for air-to-air combat, so too they train their tank commanders primarily to destroy other tanks in combat. We do not have much data on the tank side of this analogy, but assuming, on the strength of the Israeli victory, parallelism, it is instructive to examine what we know of air-to-air combat.

No weapon system has been so extensively and expensively engineered to diminish human influence on battle outcome as the modern fighter aircraft. In World War II a tank and a fighter cost about the same, but while the tank's cost has since increased by a factor of 10, the fighter's cost has gone up by 100. Yet USAF experience over North Vietnam was comparable to

* Col. J. N. Merritt and P.M. Sprey, "Money for Men or Materiel," unpublished.

that in Korea and World War II: crew skill remained a primary factor in combat results. In every war since World War I, about four percent of pilots have accounted for 40 percent of air-to-air kills; and if there has been a premium on excellence, the price of mediocrity has been so high that less than one in five pilots has better than a 50-50 chance of surviving his first decisive combat. One analyst, upon examining these data, concluded that:

> ...Any realistic assessment of the capabilities of projected equipment must properly account for the variability of individual performance, and allow the selection and maximum exploitation of the rare capabilities of the best operators, while raising to a maximum the performance of the less skilled.*

Another analysis of these figures held that:

> ... With intensive pilot training and selection, an air force could develop a pilot group capable of sustained 5:1 to lO:l exchange ratios against any air force that simply produces pilots on a standardized production line curriculum.**

The Arab:Israeli fighter ratio was 2.5:1 at the outset of the Yom Kippur war; the air-to-air loss ratio was 56:1.

If the fighter-pilot/tank commander analogy is valid, then the Israelis can look with satisfaction on their policies for the selection, training and management of tank crews. Each trainee learned to be e loader first, and then progressed through the more skilled positions in the crew via a combination of separate school courses followed by experience in a unit. Crews were kept together, and commanders pegged to a specific tank. The Israelis preferred to commission tank officers from the ranks of proven tank commanders. Dry firing, dry runs, and simulation were extensively used in tank gunnery training, and each active Army crew underwent qualification firing twice annually (reservists fired over a two-year span). The Israelis have discovered no training magic; American observers report that their tank ranges are not unlike ours, except that Israeli gunnery training is more intensive, more precise, and more specifically related to combat readiness for specific crews. When they had the ammunition, they fired significantly more

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* Herbert K. Weiss, "Systems Analysis Problems and Limited War," Conference, 18-20 Jul 66, Annals of Reliability and Maintainability, New York, NY, 1966, V5, p. 308.

** Merritt and Sprey, op. cit.

ammunition to train gunners and tank commanders than do US Army units each year. They put greater stress upon accuracy and they used surprise targets and multiple targets in their version of the Tank Crew Qualification Course. And since they kept tank commanders and gunners assigned to the same tank, year in and year out, the training was cumulative. The battle was the pay-off: in the Yom Kippur War Israeli tank commanders hit, at ranges up to 3000 meters, Arab antagonists apparently trained to fire only after closing to 800-1000 meters, and incapable of burst-on-target adjustment or any other accommodation to first round miss.

The following table summarizes four battles of the Yom Kippur War drawn from post-action American reports:

Israeli Posture	Total No. Tanks, I+A	Tank Odds I:A	Tank Exchange Ratio:I:A
Night Attack	870	1:2	1:6
Defense	180	1:1	Arabs wiped out
Defense	700	1:6	1:6
Defense	110+	1:2+	1:50+

Altogether, half the participating tanks were casualties; the Arabs lost more than 800, the Israelis less than 100. These statistics provide three points of interest: (1) Materiel was not determinant; in fact, in the last cited combat the Israelis were manning captured Soviet tanks, so that materiel on both sides was identical. (2) These battles surpass, in numbers of tanks engaged, any (recent?) experience of American armor. (3) The outcomes confound US Army doctrine and training techniques, in that were we to stage a war game or maneuver to try to learn how to fight such battles, the side playing the Israelis would have lost each, and the exchange ratios would have been exactly reversed.

In our Field Manual 105-5, Maneuver Control, we teach that when unit's casualties approach 40 percent, probability of its performing mission approaches O percent (p. 177). Yet Israeli tank battalions are known to have slugged on to sweep the field despite losses of 50 percent or more. We also teach that:

> "For friendly forces advancing with a combat power superiority of 5 to 1, losses to friendly forces will be about one-fifth of those suffered by the opposing force...

when tanks maneuver against tanks, the losses are computed in the inverse ratio of participating tanks of the opposing forces. . . ." (pp. 114, 123, 173).

This sort of linear relationship has been suspect among theorists. In 1967 an analyst* presented a paper at a NATO conference which aggregated the results of some 92 battles in which one side was outnumbered: some between armor forces, some infantry and some air. He reduced opposing forces to numerical values using conventional firepower scores derived from weapon systems data, as in FM 105-5. He then examined the marginal effectiveness (kills) of each force unit of score. FM 105-5, and orthodox game theory, would predict that as one side added units of force, its effectiveness (kills) would increase proportionately (linearly). But the data from the 92 battles showed a strong advantage for the outnumbered side: doubling the larger force improved the smaller's exchange ratio by a factor of four.

Whether this analysis is accurate or not, the Yom Kippur War provides ample evidence that fighting masses of tanks is different from engagements involving relatively small packets. A sort of "mathematics of melee" becomes operative: individual tank-versus-tank superiority is multiplied many times. Probably panic plays a prominent role. Probably too, the outnumbered force enjoys relative ease in targeting, tank for tank, while the more numerous force, because of mass, has difficulty in finding cover. But whatever the explanation, the implications are plain that modern combat requires forces ready to fight outnumbered in mass-tank battles, trained to exploit fully the phenomena cited above. Assuredly, the high confidence the Israelis trained into their tank commanders played a major role in their dramatic tactical victories.

The American Tank Commander

Any American would hope that the US Army, like the Israelis, had a well-founded system for attracting, selecting and training competent noncoms to command its tanks. Of all US soldiers, tank commanders ought to be supported in a special way by the TRADOC school system. Such Department of the Army incentives as proficiency pay ought to reward the topflight tank commander, both in recognition of his worth, and as an

* Robert L. Helmbold, "Some Observations on Validating Combat Models," unpublished.

inducement for other noncoms to compete for his position. And American field training should prepare him for fighting massed armor battles. The fact is that a dismal opposite obtains.

-Worldwide, the US Army is short tank commanders. One CONUS mechanized division, in July 1973, had 47% of authorized MOS 11E40 NCOs qualified to command tanks. The division commander thereupon reclassified involuntarily 48 E6 from other MOS in order to improve his "readiness" posture, and as of January, 1974, had 54 percent of authorized MOS 11E40. In the reclassification proceedings, each candidate, allowed to state his preferences concerning the action, expressed in one way or another disinterest in commanding a tank, and disdain for the long hours, intensive command pressure on maintenance, and hard field work involved in the MOS. Whether that group reflected Army-wide attitudes or not, NCOs Army-wide are not beating down their commander's door to become tank commanders, although the opportunities are plentiful. The US Army has not been able to attract enough sergeants of appropriate rank and skill to man the tanks in units of the Active Army.

—The majority of US Army tanks commanded by sergeants are in the hands of men rated in the lower half of the NCO Corps, sergeants whose only formal CONARC-TRADOC training was received during AIT five years or more ago. Moreover, TRADOC school prerequisites are such that these men are ineligible for either NCOES at Fort Knox, or the NCO Academy in their division. In November 1973, MILPERCEN sampled, using ADP, TO&E units worldwide to analyze soldiers in the grade of E6 holding MOS 11E40 who were scheduled for reassignment. Of a total of 828* identified for the sample, 435 or 52.5 percent were ineligible for a TRADOC school because their Primary Military Occupational Specialty Score was below 100 (the median. score) —in brief, the majority were in the lower half of their MOS-grade group.

--Most of the brighter, more capable noncommissioned officers of Armor Branch in MOS 11E40 are not in command of a tank but in jobs outside TO&E units. The MILPERCEN survey quoted above found that while DA awards proficiency pay to 20% of all E6 in MOS 11E40, its sample of 828 in

*A significant sample. Army is authorized 2,238 E6, MOS 11E40, but had 1,547 in November 1973, to man the 2000 odd tanks in TO&E units of the Active Army.

tactical units contained only 130 pro-pay recipients, less than 16% of the total.

--Our doctrine does not relate proficiency in tank gunnery directly to tactics, ATT/ORTT, or even Readiness Reports. Proficiency as a tank commander or a tank gunner is also unrelated to the Enlisted Evaluation System, and does not figure, except indirectly, in promotion, qualitative management actions, or school selection.*

Of course, one might draw comfort from asserting that the methods the US Army uses to assess NOS proficiency, to award a PMOS score, and to confer pro-pay, do not reflect the actual high combat prowess of its tank commanders. (After all, facility with the annual 125 question, multiple-choice quiz probably has little to do with battle skills.) But the conclusion seems inescapable: those methods shunt the rewards of incentives of pay, professional schooling (and hence promotion), away from most of our tank commanders. Hence, whatever their other benefits, their contribution to the weapon system effectiveness of the US tank is questionable.

Since the US Army, in denying 50 percent of tank commanders formal schools, depends exclusively on unit commanders to develop their proficiency, it should be noted here that its support for that training has been confined to modest expenditures for practice ammunition and ranges to support one gunnery "season" per tank per annum. A large part of our total annual expenditure of tank ammunitions supports training of entry-level soldiers in AIT. The US Army, other than in USAREUR, puts little emphasis on tank commander proficiency. USAREUR stresses TCQC competition, but allows rigged crews for high scores on a thoroughly rehearsed, no surprises, course. Despite ballyhoo over readiness, the fact is that Army Regulation 220-1, on readiness reporting, sets no standard to be achieved in tank gunnery, nor does the Army Training Test for the tank battalion do so: in brief, a US tank battalion commander could conscientiously rate his unit at REDCON l even though a large percentage of his tank commanders and gunners had never fired their main guns. Despite every indication that battlefield effectiveness involves an intimate relationship between gunnery and tactics, the US Army seldom, if ever, practices the two together. Our formal tank gunnery ranges are solo tank performances, and, severely constrained by safety,

*A survey of CONUS tank units in November 1973 showed that less than half of assigned tank commanders or gunners had fired for qualification in the previous year.

cannot train or test the full range of tank commander skills which govern the tanks' tactical effectiveness, such as multiple, surprise targets. The tank battalion ATT focuses on moving and communicating, and includes scored live firing only as an option which stipulates no standard for tank gunnery; indeed, main armament hits are aggregated with those of machine guns in the scoring. Maneuvers or field exercises are even less apt to teach realistic tank tactics which link gunnery and maneuver. Tank recognition training, particularly under field conditions, is rare. In fact, our present ATT/FTX technique leads to potentially murderous emphasis on maneuver in neat formation, and on "engagement" at short ranges where leaders can get "credit," and umpires can decide on a victor. FM 105-5 virtually abrogates controlling tank battles:

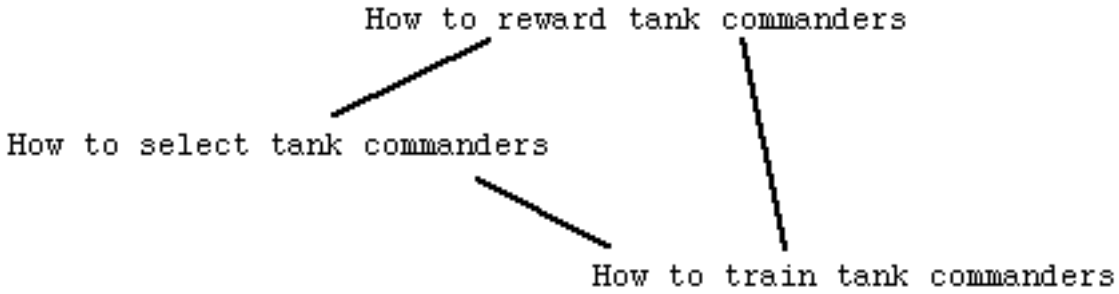
> "Fire duels among tanks, self-propelled guns, and antitank guns are judged on the basis of cover, concealment, position, fields of fire, first aimed shot, caliber of weapons, and whether the tanks are stationary or moving. There is no fixed method of determining the victor. ..Fire duels at great range are difficult to umpire. Losses are assessed only when, in the opinion of the umpire, a fair decision can be made..." (pp. 99, 100, 123).

FM 105-5 is mute On how the umpire would control a night action at any range. And, as we have seen above, that FM prescribes that even when the umpire chooses to adjudicate a fire duel, he must apply a naive linear ratio derived from numbers of tanks on each side. This doctrine is the product of Our World War II experience, when we prevailed because we overwhelmed the Germans with tanks. Our doctrine presumes friendly superiority of numbers; we train accordingly in the field.

The status of gunnery training within US Army tank units can be summarized as mediocre. Commonly, one finds ill-trained sergeants trying to train crews using rote methods. The company officers supervising the sergeants normally have had the benefit only of Knox's basic course. The field grade officers above usually have had little recent experience with gunnery or tank tactics, and often delve into technique only superficially. This system is clumsy at best in adapting to changes in materiel or doctrine —e.g., in ammunition, in adjustment technique, or in tactics: Fort Knox's mechanisms for passing-the-word are haphazard. Moreover, every indication points to the situation's worsening as changes multiply (the Yom Kippur War will fuel many such), and the US Army's Armor materiel diversifies.

We are already in difficulty over the complexities of our tank fleet. As the types in service proliferated, we have tried to keep pace by adding special courses in our training base, affixing an Army Skill Indicator to the successful trainee, and then relying on our personnel management system to match the entry-level soldier with the equipment on which he was trained. That system's signal lack of success thus far inspires little confidence that we will be able to cope with a larger family of tanks, including three versions of the M60, the XMI and the M551. Some of the more poignant frustrations of being a tank commander these days, receiving mistrained crewmen, is likely to remain routine: e.g., for crew duty on an M551 (ASI R8), he might get replacements from AIT on the M60A2 (ASI Wl); or in knowing that only two out of every five turret mechanics in the unit are school trained for the M551 turret, and that the TO&E provides no school trained supervisor for even those few mechanics —with evident impact on the operability of his tank.

Here is a web of problems:



If we are to improve ourselves with respect to one part of this nexus, we shall have to operate on all. Answers to these questions must be interdependent.

How to Train Tank Commanders

The place for TRADOC to begin improving tank combat effectiveness via upgrading tank commanders is with training and doctrine: what is to be taught, and how it shall be taught.

First, we should enjoin the Armor School to develop training tech-niques which marry gunnery with tactics, and permit realistic field training exercises of both. What Knox should look for is a way to pit tank commanders against other tanks, at actual combat ranges. We want to train tank commanders as they would fight, engaging elusive tanks at combat ranges, not sitting-duck cloth rectangles. We want them to confront squarely the first-shot, first-hit payoff/penalty, as opposed to some abstract firepower score computation. And we

want them to learn to shoot and move amid a massed foe, by day and by night.

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There is a technology at hand which permits just that: it is possible to use a burst of eye-safe laser energy to simulate a tank round, and to rig all participating vehicles with a laser-detector which, upon being activated, emits a visible signal of hit —in one version, commercially available, the hit cuts the ignition of the target tank and looses a smoke grenade. While such hit-kill devices have to date been of foreign manufacture, the management consultant firm of Arthur D. Little, under contract with CATB, has established that American industry can build a safe, reliable, cheap laser engagement simulation system for training applications.

It would be jejune to state that laser engagement simulation could increase the effectiveness of our tank gunnery 3000 percent, as Scott's innovation reformed naval gunnery 75 years ago. But possibilities exist for dramatic improvement. As a tactical training technique, an optical simulation of combat firing has already been proven advantageous with SCOPES, the Infantry Squad Combat Operations Practical Exercise (Simulation). Moreover, in Army Research Institute experiments in September and October 1973, at a CONUS post, optical simulation similar to SCOPES was applied to tank unit combat, and successfully so: tank commanders on a delay position were observed to dismount loaders, who with binoculars observed for targets so that the commander did not have to sit with turret exposed; attacking tank platoons demonstrated that they had learned the advantage of overwatch during movement. To promote such training, the British have adopted SIMFIRE, a laser engagement simulator, for each copy of which they are reportedly willing to pay up to 10 percent of the tank production price. The US Army has SIMFIRE in limited use at Fort Knox (for combat developments purposes, not training), and following the CATB lead, has MILES (Multiple Integrated Laser Engagement Simulator) under development. SIMFIRE is expensive, not wholly reliable, and complicated; MILES is more promising as a more recent technology, cheaper, more rugged, more general in application, but has lower fidelity as a tank gunnery trainer. MILES can and should be made compatible with SIMFIRE. Yet both enjoy very low visibility in the Armor community —witness their lack of prominence at the Armor Combat Vehicles System Review. The US Army has largely ignored the potential of these devices, and there remains a substantial body of opinion within Armor Branch that, the only satisfactory way to train in gunnery being to shoot the main armament, laser simulators should be suppressed lest DoD seize on them to axe ammunition allocations.

There are three other important reasons why CG TRADOC should lend all his weight to the rapid fielding of MILES/SIMFIRE. First, these direct fire simulators, coupled with TWAES (the USMC computer system for field exercise control, which has advantages for indirect fire simulation) could yield important dividends in doctrinal and materiel development: a unit equipped with these devices could, in its field training exercise, become an instrumented laboratory, enacting scenarios for testing US tactics or new equipment. While such exercises would lack the precision and detail of a CDEC experiment, they would provide dense data from troop usage, and could illuminate how a given tactical scenario might be influenced by different force ratios, different terrain, different weaponry, or different commanders, at a fraction of the cost of fully instrumented tests. For example, we might thus quantify tile importance of good tank commanders, perhaps obtaining data like that cited above on fighter pilots. Or we might, through trial and error, work out the best tactics for defending or attacking when outnumbered 2:1 or more, conditioning our tank commanders to cope with odds as we develop doctrine.

The second rationale is related to the first: with a full simulation capability for FTX (MILES plus SIMFIRE plus TWAES), the US Army would have a genuine performance test for maneuver battalions, around which realistic ATT or ORTT could readily be staged without elaborate control apparatus, check lists, written records, and the like. FM 105-5 is still based on the control procedures we used in the Louisiana Maneuvers before World War II: flags, horns, loud speakers, fire power scores. However useful these may have been in the era of the 37mm gun and .50 cal MG, they are inept for tank battles which open at 3000 meters, are often fought at night, and develop in a swirling rush. There is no way, using these antique methods, we can satisfactorily train in or evaluate techniques of modern mounted combat. The Armor School ought to start now preparing ATP and ATT based on engagement simulation, so that we will have the doctrine when the materiel is ready.

The third reason for laser simulation is that it offers the only prospect for a training technique which will enable American tankers to train realistically in fire and movement at night. Whatever the advantages of hitting first in the daytime, these are greater at night. But training in the dark with armor is inherently dangerous and wasteful: Maneuver control is all but impossible using current doctrine, and after-action critique futile. Laser engagement simulation could provide the key

missing ingredients: built-in control, and credible, visible payoff for proper gunnery technique.

Together with a tactical training technique based on engagement simulation, the Armor School should be also tasked to develop a full function gunnery simulator for garrison/armory crew training. The basis for this simulator could be the Moving Target Screen component of MILES, linked with a turret/hull mockup, and a pneumatic recoil generator.. (One can note that Soviet troops in Germany have been observed firing laser weapon simulators on projected targets, and using tank rocker-beds, so that they can conduct practice in "firing" from a moving tank in their motor parks.)

Without waiting for simulators, however, CC TRADOC should direct the integration of tank gunnery into ATT, which will bring it under the AR 220-1 readiness reporting system, and thus obtain for it appropriate command emphasis. He should, moreover, change ammunition allowances, and prescribe at least double the rounds fired by assigned tank commanders and gunners each year.

The Basic NCOES at Fort Knox should become the proving ground and the seminal bed for introducing, testing, and spreading word about better training techniques. That course ought to focus squarely on producing lethal tank commanders.

We should seek DA approval for Knox to train a cadre of Master Gunners, capable of advising how to teach tank gunnery and tactics to tank commanders in units using field engagement simulation and the full-function simulator. (It is germane t.hat REDEYE has been fielded with an expensive, partial-function simulator, involving an MCA-underwritten special building and a full-time O&MA funded civilian operator. Our tankers deserve no less.) These Knox-trained gunnery instructors should be fielded, one to each tank battalion of the US Army. These men would be picked and trained with all the care we give to selecting and qualifying an instructor pilot, for their role is comparable. Each Master Gunner is to be held responsible for advising a unit commander on the proper utilization of simulation equipment, and for proper conduct of all other aspects of tank gunnery. As often as every six months, they should be brought back to Fort Knox for update and debrief, so that Knox kiss a responsive feedback on gunnery training, and a conduit through which it can pass late information on gunnery technique direct to units. Moreover, as shall be outlined below, the Master Gunners should play an important part in evaluating noncommissioned officers for proficiency pay

purposes. In effect, with its Master Gunners, the Knox would take the Armor School to each unit, where it could tailor instruction to the equipment in tile hands of the unit, its terrain, and its mission.

With the Master Gunners in place, it ought to be possible to cut back instruction at Fort Knox to the highest density tank alone, (especially in AIT, with the expectation that a Master Gunner would give "augmentation training" at the unit if the unit's equipment were different. (In Sheridan units, there is also a need for a Master Turret Mechanic, similarly trained and qualified, for the purpose of training and supervising turret mechanics.)

How to Reward Tank Commanders

Obviously the US Army should prize, and reward accordingly, the proficient tank commander. But in order to do so, we must find evaluation media which identify the man who excels in those skills which contribute directly to tank weapon effectiveness. This suggests that we should look for performance tests which can be uniformly administered throughout the Army —and that leads us to the full-function simulator as a means of providing a performance test, and the Master Gunners as the quality control mechanism.

But the US Army should not wait for a simulator, and the sketched revision of the Enlisted Evaluation System. CG TRADOC should recommend now that proficiency pay be reserved for those soldiers in MOS 11E40 who are actually serving in tactical units as tank commanders and who have qualified on the standard TCQC within the year. Pro-pay would go to the number among these which equates to 20% the total in their MOS/grade. Eligibility would otherwise be determined by the present written evaluation tests; soon as practicable, however, equipment-specific, "branched" tests should be substituted. And as soon as simulator-based testing can be undertaken, comparative evaluation of performance should supplement written tests. Conceivably, with the Master Gunners deployed, sufficient comparability can be established among unit tank gunnery shoots to employ actual range performance, so that pro-pay would hinge mainly on range scores.

Nor should CG TRADOC wait to reserve slots in Advanced NCOES for serving tank commanders; we should insure that ANCOES classes are filled from their ranks first. The ANCOES should aim at producing platoon sergeants lethal with groups of tanks, and on their way to becoming Master Gunners. Moreover, the CG should seek to have DA promotion boards be instructed to weight heavily service as a tank commander.

How to Select Tank Commanders

By the time the foregoing measures are taking effect, it ought to be possible for the US Army to approach selection of tank commanders with both more optimism and better system. We should have basis for building up the job as one of the greatest positions in soldiering, and we could be credible because of the incentives for proficiency in the job, and the measures we apply for determining same. Hence, more good soldiers would try for

it. And with better training, unit commanders ought to be able better to identify soldiers with an aptitude for the job.

The prospective tank commander ought to be able to perform any job in the tank crew, plus the crucial task of crew leading. Accordingly, before even to being considered for the job, he ought to have qualified, position by position, skill level by skill level, on performance tests in his tank. Only those tests, and his commander's certification that he is a tank-commander candidate, should be prerequisite for going to the Basic NCOES Course.

But the key step in his getting his tank ought to be a gunnery-tactics performance test score better than another potential or serving tank commander in his battalion —the would-be commander should literally have to shoot another man out of the saddle in order to get command of a tank, and a chance at pro-pay.