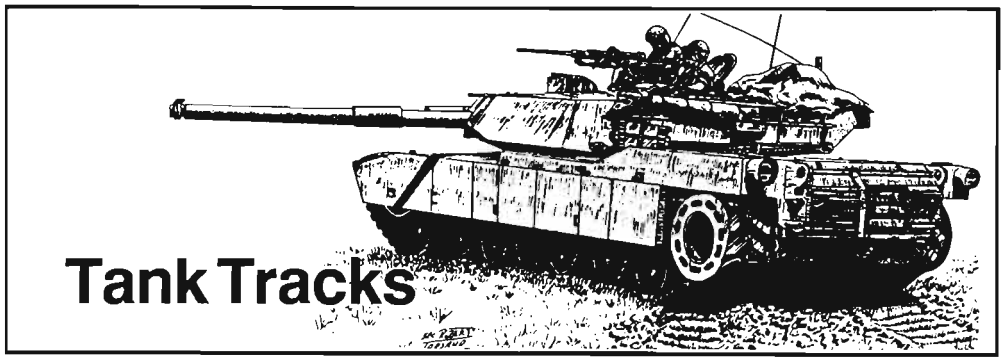
ARMOR

Reactive Armor: New Life for Soviet Tanks

See Page 6

PB-17-88-1

January-February 1988



Tank Tracks

The new year is upon us once again, and with its promise of more limited resources, it brings an increased challenge to do more with less. That challenge should not be new to many. But it does make our job at ARMOR, to pass on thoughts and ideas, that much more important. We count on you to help us with our job through your contributions, and, in turn, we might be able to help someone else with his job.

Most of you have probably seen some of the numerous articles on Soviet reactive armor in the media over the last six months. While not a new idea, the subject has caused quite a stir and subsequent debate about how to defeat it. Captain James M. Warford brings us up to speed in "Reactive Armor: New Life for Soviet Tanks." To understand what it is and how it works is the first step in defeating it. Is reactive armor really the ultimate Soviet solution that renders our primary antitank weapons obsolete that some in the media would have us believe?

The axiom, "Train as you will fight," has been with us for years. LTC Robert G. Bernier put the axiom to work daily when he commanded the 1-8 Cavalry, a combined arms maneuver battalion, at Fort Hood. During his command, the battalion took three forms: balanced, pure, and combined arms. He discusses in detail the benefits and drawbacks of this organization in "The Combined Arms Maneuver Battalion."

Too often during a training cycle, units put all their eggs in either the tactics basket or the gunnery basket at the expense of the other. LTC Lon Maggart explains in "Tactical Tank Gunnery" that this does not have to be the case. Here is an example of how to get the most for your training dollar.

In "An Electric Transmission for Armored Vehicles: A Designer's Dream Realized at Last," Raymond Surlèmont tells us that today's technology makes possible an electric transmission that is smaller and lighter than its mechanical brother. Previous experiments resulted in 70-ton monsters, but the French Cobra-41 MICV weighs in at only 8.5 tons, and the Cobra-90 AFV tilts the scales at 9.5 tons; both have electric transmissions.

Captain B. H. Friesen shines the light on an interesting moment in armored warfare in "Breakout from the Veszprem Railhead." During a desperate fight on the Eastern Front in WWII, Russian armor was so close that escaping Panther tanks fired from flatbed rail cars as the train pulled out of the station.

In another historical connection, Captain Hilario H. Ochoa follows the thread of history from the Hutier Tactics of World War I through Blitzkrieg to our modern AirLand Battle concept in "Operation Michael: The Seeds of AirLand Battle."

No one knows how long the argument has been raging. There are three jobs, but only one battalion XO. Where does he go before the battle? Where should he be during the battle? Or should he just run around like that famous headless chicken? To find out, read Captain Ronald M. Bonesteel's "The Battalion XO in Combat: Where Will He Be Most Effective," then decide for yourself.

We at ARMOR wish all of you out there good luck and good shooting in 1988.

– PJC

MARK YOUR CALENDARS!

- Light Cavalry Warfighting Symposium, at Fort Knox, 24-25 February. (See Commander's Hatch, p.4).
- Annual Armor Conference, at Fort Knox, 10-12 May. (More details coming in March-April ARMOR).

By Order of the Secretary of the Army:

Official:

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

CARL E. VUONO
General, United States Army
Chief of Staff

ARMOR

The Professional Development Bulletin of the Armor Branch PB 17-88-1

ARMOR (ISSN 0004-2420) is published bimonthly by the U.S. Army Armor Center, 4401 Vine Grove Road, Fort Knox, KY 40121.

Official distribution is limited to one copy for each heavy brigade headquarters, armored cavalry regiment headquarters, armor battalion headquarters, armored cavalry squadron headquarters, reconnaissance squadron headquarters, armored cavalry troop, armor company, and motorized brigade headquarters of the United States Army. In addition, Army libraries, Army and DOD schools, HQ DA and MACOM staff agencies with responsibility for armored, direct fire, ground combat systems, organizations, and the training of personnel for such organizations may request two copies by sending a military letter to the editor-in-chief.

Authorized Content: ARMOR will print only those materials for which the U.S. Army Armor Center has proponency. That proponency includes: all armored, direct-fire ground combat systems that do not serve primarily as infantry carriers; all weapons used exclusively in these systems or by CMF 19-series enlisted soldiers; any miscellaneous items of equipment which armor and armored cavalry organizations use exclusively; training for all SC 12A, 12B, and 12C officers and for all CMF-19-series enlisted soldiers; and information concerning the training, logistics, history, and leadership of armor and armored cavalry units at the brigade/regiment level and below, to include Threat units at those levels.

January-February 1988 Vol XCVII No. 1

FEATURES

DEPARTMENTS

LETTERS

Mission Orders Work — If

Dear Sir:

In his article, "Mission Tactics," Capt. John F. Antal says: "The aim of mission orders is to 'leave the greatest possible operational and tactical freedom to subordinate leaders,'" quoting at the end the latest edition of FM 100-5. Capt. Antal correctly notes the German origins of "Mission Orders" (Auftragstaktik). The German Army developed Auftragstaktik for use in the operational sphere first (from the 1870s onward), and only later extended its use to the tactical sphere, (mostly during WWI).

To make mission orders work in the operational sphere, you need a sophisticated sense of what operational art is. The German Army had this; our own military has only recently regained a sense of the operational level of war.

If both the commander and the subordinate share a developed sense of operational art, the commander can use mission orders to specify an operational intention. The subordinate then has freedom to use all available tactical and material means to carry out that operational intention, adapting it to changing battlefield circumstances as required. Thus, in a sense, the proper use of mission orders reduces a subordinate's "operational freedom," at least in the sense of freedom to make his own operational "policy. " The higher commander has already set operational policy, although the higher commander-may change that policy in light of new information of operational significance.

Mission orders are, above all, a command and control technique. The alternative- — trying to control operational events through detailed control at the tactical level — is usually foredoomed to failure. It certainly offers very little scope for adapting operational execution to changing circumstances, or exploiting operational opportunities. "Keep the enemy from working around our left flank in major force," is a more effective way to communicate an operational intention than specifying the location of every foxhole.

The use of mission orders allows subordinates to be flexible and to bring more resources to bear to fulfill the higher com-

DIRECTORY — Points of Contact

(Note: Fort Knox AUTOVON prefix is 464. Commercial prefix is Area Code 502-624-XXXX).

ARMOR Editorial Offices

Editor-in-Chief	
Major Patrick J. Cooney	2249
Managing Editor	
Jon T. Clemens	2249
Assistant Editor	
Robert E. Rogge	2610
Production Assistant	
Vivian Thompson	2610
Contributing Artist	
SFC Robert Torsrud	2610

MAILING ADDRESS: ARMOR, ATTN: ATSB-MAG, Fort Knox, KY 40121-5210

ARTICLE SUBMISSIONS: To improve speed and accuracy in editing, manuscripts should be originals or clear copies, either typed or printed out in near-letter-quality printer mode. Stories can also be accepted on 5-1/4" floppy disks in Microsoft WORD, MultiMate, Wordperfect, Wordstar, or Xerox Writer (please include a printout). Please tape captions to any illustrations submitted.

PAID SUBSCRIPTIONS: Report delivery problems or changes of address to Ms. Connie Bright, circulation manager, (502)942-8624.

MILITARY DISTRIBUTION: Report delivery problems or changes of address to Ms. Vivian Thompson, AV 464-2610; commercial: (502)624-2610. Requests to be added to the free subscription list should be in the form of a letter to the Editor-in-Chief.

U.S. Army Armor Center

Commandant	(ATZK-CG)
MG Thomas H. Tait	2121
Assistant Commandant	(ATSB-AC)
COL (P) Dennis V. Crumley	7555
Deputy Assistant Commandant	(ATSB-DAC)
COL Claude L. Clark	1050
Command Sergeant Major	
CSM John M. Stephens	4952
Maintenance Dept.	(ATSB-MA)
COL Garry P. Hixson	8346
Command and Staff Dept.	(ATSB-CS)
COL A.W. Kremer	5855
Weapons Dept.	(ATSB-WP)
LTC (P) George R. Wallace III	1055
Dir. of Training & Doctrine	(ATSB-DOTD)
COL Claude W. Abate	7250
Dir. of Combat Developments	(ATSB-CD)
COL Donald L. Smart	5050
Dir. of Eval. & Standardization	(ATSB-DOES)
COL Robert A. Korkin	3446
Training Group	(ATZK-TC-TBF)
LTC Clarence Belinge	3955
NCO Academy/Drill Sergeant School	(ATNCG)
CSM Johnny M. Langford	5150
Director, Reserve Component Spt	(ATZK-DRC)
COL James E. Dierickx	1351
Office of the Chief of Armor	(ATZK-AR)
LTC Albert F. Celani	7809
Army Armor & Engineer Board	(ATZK-AE)
COL Garrett E. Duncan	7850
TRADOC System Manager for Tank Systems	(ATSB-TSMT)
COL Douglas R. Burgess	7955

mander's operational intention: those resources whose use the higher commander could not sensibly specify without knowing the details of local circumstances (not to mention the labor involved in trying to micro-manage subordinate units, time and energy better spent in trying to get a handle on the operational situation).

Armies which attempt to control subordinate units by use of detailed orders do not have a clear conception of the operational sphere of war, and forego any advantages to be gained by operating in that sphere. They are also very vulnerable to opponents who can act effectively in the operational sphere.

Bradley J. Meyer,
Doctoral Candidate in Military History
Cambridge, MA

About Those "Killer Tanks"...

Dear Sir:

That's it! I can't take it anymore! We have UCOFT exercises coming out for killer tanks. We have gunnery exercises for FM 17-12, and commanders speak about making it doctrine.

Let me tell you about the killer tank. He is the unacquired target that has the good sense to use this moment wisely. I have gone over the "500 armor battles" mark in my five years of NTC experience, and I've seen it happen over and over again.

The killer tank falls into two categories:

1. He has an excellent window shot on a moving element's flank, and he engages and kills before the passing vehicles can detect him. Under these conditions, he can remain in the hull-down position and spit lead until he eventually fingers his position. About this time, the moving unit thinks it better to bypass. Now the real killer displaces and nibbles more off the tail.

2. He is firing MILES without gunfire signature from a well-camouflaged position. The big danger here is to make it doctrine to pull up and attempt to slug it out toe-to-toe with a mass of vehicles as they close on your position. That's the enemy's dream!

At the last Armor Conference, the master gunners tried to address this, and someone proposed that the M1 and M1A1 could weather the storm because the initial volley fire would be HE. Well, first of all, if you're willing to let a Soviet platoon fire a volley on your position with HE as you return fire, taking the chance that you or your vehicle's fire control will survive the blast, and you stay there while they reload for 125-mm SABOT rounds and try to ride that out — take ten dollars and go to Las Vegas; you have as much chance of becoming a millionaire.

The point here is that we need to train leaders to use good combat sense and exploit the situations they find themselves in to the best survivable advantage. The last thing we need to do is expend their lives trying to stick to a foolish doctrine.

I have a great respect for this Army's ability to fight when it is unleashed. If it is well trained, it will do the right thing when the time comes.

SFC John Bittay,
Bn Master Gunner, 1-73 Armor
Ft. Irwin, CA

Tank Gunnery Comments

Dear Sir:

I applaud your recent article dealing with tank gunnery. ("The Guts of Tank Gunnery," by CPT Kris P. Thompson, ARMOR, Jul-Aug 87) As the chief of M1 gunnery at the M1 New Equipment Training Team at Vilseck, chief of the Grafenwoehr Tank Gunnery Evaluation Team, and, finally, the commander of C Company, 2-64 Armor, in Schweinfurt, I had the unique experience of seeing both sides of the evaluation issue. I offer a few additional comments based upon that experience.

The first deals with the timeless issue of technical competence. Capt. Thompson very clearly spelled out the requirements for the lieutenants. This tenet, however, must hold equally for the noncommissioned officers. My experience as a commander leads me to believe that this is not the case. The proverbial, "Leave me alone, lieutenant. I knew this before you were out of diapers," generally is a blanket statement of a lack of knowledge. We must share the knowledge gleaned from the study of tank gunnery with our Noncommissioned Officer Corps. It must also be taught to our gunners as well.

During its last gunnery at Graf, my company finished high in the 3d ID, largely because of the word "DUMP". I taught all of the gunners the gun/sight relationships of the M1 tank, and that knowledge made the difference for many of the crews. They are out there today as living proof of that statement.

The UCOFT...ahhh...what a trainer! Who really knows how to train on it? I received the first M1 UCOFT in Europe while at Vilseck, certified in the matrix five times with a variety of gunners, and still ponder over that question.

I found that the matrix progression, although a good technique, trained far too much on degraded-mode gunnery and not nearly enough on the full-up engagements. In a unit, time is very valuable. I concentrated on TT VIII tasks, finding a variety of replications within the matrix, and trained them over, and over, and over again. I submit to anyone who challenges that approach that the tank tables were developed by Fort Knox to replicate the tasks a crew can expect to encounter in combat. It is clearly logical to conclude that training to standard on those tasks is the best road to TT VIII.

A current issue that is very controversial is the use of MILES interface devices. Until the eye-safe laser can be produced and distributed to company level, the MILES interface system is virtually useless for training on a full-up system. The range button has to be zeroed out on the CCP, and the battlesight button cannot be used to induce lead for a crew on full-up engagements on a local gunnery training facility when MILES interface is used in its current form. I tried the MILES interface device at Schweinfurt, and the crews, including my master gunner, almost always shut the system off in order to induce lead during an engagement. This concept of lead-dumping is of critical importance to a gunnery program and must be used on a tank, as well as in the UCOFT during home station gunnery.

I found the virtual key to success is to have a trained NCO corps within the company, develop a gunnery plan, and let them execute it. The people we have today are the very best and can lead a company to sure-fire success on any gunnery range if properly trained.

Mark T. Littel
Captain, Armor
Ft. Leavenworth, KS

CAT/Boeselager Kudos

Dear Sir:

I, too, would like to join the countless others who congratulated 1-11 ACR for taking home the Boeselager Cup, and the 1st Platoon, D Company, 4-8 Cavalry, 3d AD, for its magnificant performance in the Canadian Army Trophy '87 (CAT '87) However, I would be remiss if I did not point out that the 1987 Canadian Army Trophy was won by NATO's Central Army Group (CENTAG). The CENTAG team was composed of some of the finest tankers in Europe and consisted of platoons from the United States, Canada, and Germany.

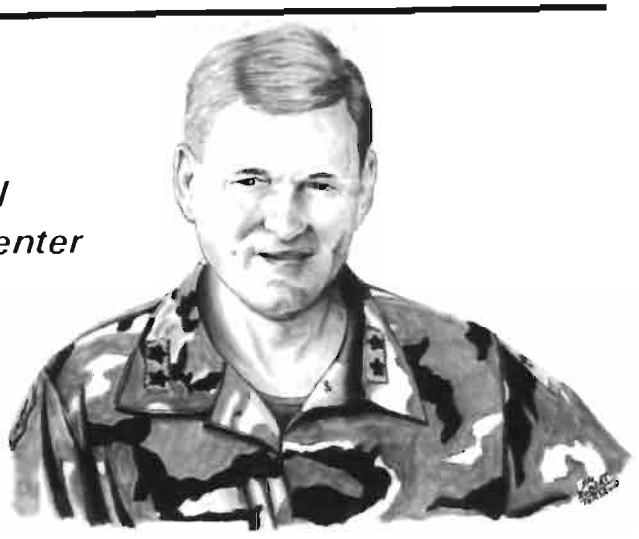
The 1st Platoon, D Company, 4th Bn, 8th Cav, with a score of 20,490, was not only the highest scoring platoon in the competition, but it also had the distinction of being the first U.S. team to attain this honor in the 24-year history of the biannual event.

The superior results attained by our tankers at CAT '87 certainly validate our training procedures as well as again proving the excellence of the M1 Abrams....

George A. Iler
LTC, Armor,
HQ CENTAG
APO NY 09099

COMMANDER'S NOTEBOOK

MG Thomas H. Tait
Commanding General
U.S. Army Armor Center



Cavalry Initiatives

Recently, in this column (March-April 1987), I argued the value of reconnaissance as a combat multiplier, and that our current cavalry and scout organizations lack adequate reconnaissance capability. Our divisional cavalry squadrons are ill-equipped, for example, to accomplish the broad range of reconnaissance missions. The air component is weather/light dependent, while the ground element lacks sufficient depth and firepower capability. Training at the National Training Center and European exercises support this contention. Our battalion scout platoons need to be reorganized; six scout vehicles are not enough. Our light cavalry squadrons have no robustness and must be reexamined. In short, we have a lot to do.

We in the Armor School remain committed to correct these deficiencies. Tanks belong in the division cavalry as does a third ground troop. We also need simple RPVs that allow commanders to look over the next hill.

While we continue our efforts to realign our scout organizations, let me update you on what we are doing to challenge scouts in the field. Two programs come to mind; one deals with the M3 Bradley, while the other focuses on training our young cavalry officers.

The Bradley Scout Section Qualification Program evaluates the scout section's tactical and gunnery abilities. Jointly developed by the Weapons Department and Command and Staff Department, the program stipulates that the scout sections must pass both Tables IX and X in order to be qualified. Table IX is designed to be conducted in the Local Training Area (LTA) in an area no smaller than 1x2 kms. Scouts are evaluated on their ability to accomplish combat critical tasks (figure 1).

Commanders select additional individual scout tasks for evaluation from a supplemental list (figure 2). The unit evaluates these tasks in a tactical scenario for both the day and night phases of Table IX.

Table X, like Table IX, will have a mix of 60 percent tactics and 40-

Continued on Page 51

Critical Task Group

The following are combat critical tasks that must be included in Tables IX and X:

- **Action on contact**
- **Send a spot report**
- **Call for and adjust indirect fire**
- **Control techniques of movement**
- **Control scout section fires**
- **Conduct a screen**
- **Conduct a passage of lines with vehicles**
- **Select firing positions**
- **Conduct a zone recon**

Figure 1

COMMAND SERGEANT MAJOR'S SEAT

CSM John M. Stephens
Command Sergeant Major
U.S. Army Armor Center

EIA Retention and NCO Reinforced Training

I hope everyone had a joyous and safe holiday. With the New Year come many "ifs." The budget reduction has everyone looking for new ideas and cheaper ways to do business and maintain a high state of readiness.

I would like to highlight retention of our excellent soldiers and reinforced training of our BNCOC graduates.

The three-year commitment for the first soldiers selected to participate in the Excellence in Armor Program (EIA) is over. They now have another choice to make, whether or not to reenlist. Retention of EIA soldiers is important to the NCO leadership of our Army for the future. Without a viable retention program, the EIA Program is useless because we will not enjoy the long-range goals of the program.

I recommend we start the new year by doing an assessment of the program in each battalion/squadron. Find out who was or is eligible and how involved the chain of command and the NCO support channel are in retaining those soldiers. Evaluate the organization's retention program and establish some long-range guidelines and objectives. If we have keyed on EIA soldiers as they progress, then little should be required when they near ETS except good leadership and counseling. If they have received promotions, recognition, schooling, and certification, then it is a matter of whether they want to stay or not. Maybe some want to return to college. That's fine also; encourage them to join the ROTC program and return to active duty as officers.

However, if there is no specific unit policy and guidelines covering EIA, then you probably have a problem and need to fix it. Retention and EIA are commander programs. He, and only he, can make both programs work or fail.

I have one more recommendation before I switch subjects. Look at all the soldiers in the organization. Select those who would qualify for the Excellence Program, regardless of MOS, and develop a program for them also. They could not meet Certification Test II promotion point qualification, but they could have the opportunity for promotion to sergeant in the same time.

The quality of retention today affects the leadership of our Army for the next 20 years.

The second subject I want to address is the reinforcement training of the soldiers we retain, specifically, tank commander and scout squad leaders, especially after BNCOC. I addressed this point some time ago, however, I still find organizations that have absolutely no knowledge of what training NCOs receive in NCOES. In order to reinforce schoolhouse training, you must know what is taught at each level and to what degree of proficiency!

I will tell anyone that the best training I ever received was not 7th Army NCO Academy, 7th Army Tank Commanders Course, or any other school I attended. The best training was the requirement I received from my commander, officers, and senior noncommissioned officers to teach classes or perform as an instructor after I graduated from 7th Army NCO Academy. I taught general subjects, leadership, marching the platoon to the motor pool, platoon physical training, etc. After I graduated from the Tank Commander Course, I was responsible for teaching boresight, M73 7.62-mm, HB M2 .50 cal, and other classes as I progressed. That training not only reinforced the training I

Continued on Page 52

Reactive Armor: New Life for Soviet Tanks

by Captain James M. Warford

At left, a T-80 with reactive armor.

Captain Mansfield was pleased with the success achieved by his team during the last couple of days. The "Assassins" had been deployed since the very beginning; and had been in combat since the day after Christmas. The burned-out enemy tanks scattered to the east of BP Tiger were proof that his tankers and Bradley crews had done a good 48-hours work. He was just returning to his own M1 when he started to wonder why the enemy tanks had not been as hard to kill as the S2 had briefed. The briefing included a description of a number of enemy tanks fitted with a new type of armor that could pose a threat to the task force's firepower.

It seemed pretty clear to Captain Mansfield, as he examined the slowly dissipating columns of smoke coming out of EA Tiger-Trap, that those enemy tanks were not fitted with the new type of armor. He was just about to put these thoughts out of his mind in favor of that night's operations order when he received a call on the task force command net. The call included a report from an infantry team that had been attacked by an enemy company while it was set up in and around a town to the northeast of BP Tiger. Although the enemy attack occurred at night, the infantry was able to report that the enemy tanks were fitted with a new type of armor that was apparently able to take a lot of punishment. The report ended with unconfirmed stories of enemy tanks exploding after being hit, and then continuing to fire into friendly positions.

The images of the battle that had taken place in that town in the dark were cut short by a spot report called in from his Bradley platoon leader. Several enemy tanks were approaching BP Tiger from the northeast; enemy tanks that he could not specifically identify. As the strange-looking tanks came into view, Captain Mansfield was able to confirm that they were enemy, but he could not be sure what model they were. It looked like each enemy tank was covered with a layer of blocks or bricks. Seconds later, his Bradleys opened fire, followed immediately by the tank platoons.

Just as Captain Mansfield was starting his own fire command he saw something that he had never seen before. At that moment he couldn't be sure, but it looked like these modified enemy tanks were being hit and exploding, and then returning fire...

Origins in Israel

In August 1982, advertisements for the Israeli Military Industries (IMI) two-tank ferry raft were in various defense-related magazines. The photograph that accompanied the ad was significant more for the cargo than for the raft itself. That cargo consisted of two Israeli main battle tanks; a modified *Centurion*, followed by a modified *M60*. Each of the tanks had a series of what appeared to be mounting points or studs for some unseen equipment or gear belonging to the crews.

These mounting points were in various patterns and were welded on to the front slope, hull deck, turret front, turret side, and turret roof of each of the sand-colored tanks. The important role played by these mounting points to both Israeli tanks and tank crewmen was dramatically demonstrated two months earlier during Operation "Peace for Galilee."

On June 4, 1982, the Israeli armed forces launched an offensive into

southern Lebanon. The three-pronged advance included large numbers of heavily-modified armored vehicles. During the first few days of the operation, news magazines printed photographs showing Israeli tanks with a previously-unseen type of applique armor that consisted of a series of blocks or bricks. The application of these bricks was so extensive that even a trained observer would be slow to properly identify each tank model. As more photographs became available, it was possible to examine this new armor more closely, and to finally determine its purpose. The armor was a reactive type that the Israelis have since named "Blazer."

Israeli Blazer armor array on M60, as first used in the invasion of Lebanon in 1982. Note different shapes of the armor blocks in different locations.

Development History

Rafael, an Israeli company, developed Blazer specifically to defeat modern antitank weapons that rely on high explosive (HEAT). This massive category of tank-killing weapons includes both antitank guided missiles (ATGMs) and the less sophisticated rocket-propelled weapons (RPG-7/RPG-16) and light antitank weapons (LAWs). This HEAT-defeating capability has attracted the interest of many countries, especially the Soviet Union.

How It Works

Blazer armor consists of a series of bricks, each attached to the tank by a bolt and nut, and containing a special plastic explosive sandwiched between two steel plates. In theory, this reactive armor "simply involves the use of chemically-stored energy to extend the range of the variables of hardness, density, spacing, and differential obliquity."[1] When a HEAT warhead hits one of these bricks, the plastic explosive inside the brick detonates. The explosive force of this detonation is directed away from the brick's inner steel plate, and concentrates in the opposite direction of the attacking warhead. This explosion forces the HEAT-formed "jet" to malform and lose its energy so that the heavily-weakened jet is not capable of penetrating the tank's main armor. It is easy to see that a tank equipped with this type of armor, under attack by HEAT weapons, could give the impression that it had received a crippling blow, while actually it only sustained the loss of one or more of it's reactive armor bricks. According to the manufacturer, Blazer bricks "are not activated by small arms ammunition fire, or artillery shell fragments."[2] One source stated that detonation of the bricks would only occur if hit by 23-mm rounds or larger. In spite of the capabilities that this new armor has to offer, it does have some limitations. The first of these deals with attack discrimination. The armor must have the capability to distinguish between artillery airbursts, heavy machinegun fire, and attack by an antitank weapon. If artillery shell fragments could cause the reactive armor to detonate, the effectiveness of this armor could be negated by the preparatory fire delivered prior to an attack. This would also have the additional drawback to an enemy of displaying a vehicle signature (from the detonating bricks) where a conventionally-armored tank would remain hidden.

In spite of Israeli claims to the contrary, this aspect of reactive armor probably remains to be proved. During operation "Peace for Galilee," "the artillery threat was at best modest."[3]

The second limitation concerns the problem of detonation chain reaction. The hit on a single brick mounted at 10 o'clock on the turret front, for example, should not cause a series of detonations that would leave the entire left side of the turret exposed.

A third limitation deals with the safety of friendly forces supporting tanks fitted with reactive armor. A reactive armor brick detonated by an RPG-16 could cause a serious problem for the tank's supporting infantry teams. This danger would not be limited to dismounted infantry, but could include the unbuttoned crew of the tank that was hit as well. While the employment of body armor would lesson the danger to some degree, this is an inherent problem that may be impossible to solve.

A fourth limitation concerns the lack of effectiveness of reactive armor (as it is currently designed) against tank main gun-fired kinetic energy projectiles. These armor-piercing rounds, such as APDS-T and APFSDS-T, are apparently only marginally affected by reactive armor bricks.

The final point for discussion here is more of a challenge than a limita-

tion, how to replace damaged or detonated reactive armor bricks while in the field.

It will be obvious that a crew will have to replace battle-damaged bricks as soon as possible. The brick design must allow for easy crew replacement. Once this has been achieved, the logistics problem must be solved. Will newly delivered bricks be considered and handled as explosive ammunition, or as replacement parts? The design of Blazer armor allows the tank to go for an unlimited time without the bricks, and then to add them during increased tension. This capability allows the reactive armor to be secured in a safe place while the tanks in training, as well as providing the additional benefit of keeping the design and any "up-armoring" a secret from a potential enemy. The capability of carrying out a rapid up-armoring program under a veil of at least some degree of secrecy is another characteristic that has attracted the Soviets to adopt reactive armor. The Soviets could have applied the same level of secrecy to their initial deployment of reactive armor that they historically have used to hide the existence of their most capable antitank weapons. According to Soviet author Viktor Suvorov, these weapons are only employed "at times of acute tension."[4]

The amount of information concerning the effectiveness of Israeli Blazer armor during Operation "Peace for Galilee" is very limited. We know that the Israeli Army fitted the armor to a variety of its tanks, including *M60A1s, Centurions,* and *M60A3s*. One of the characteristics of this armor is that the size and shape of each brick is not uniform, and can be tailor-made to protect specific weaknesses of specific vehicles. The Israelis built the bricks in the shapes of squares, rectangles, and triangles, and included many variations of each shape. They mounted the bricks close together and covered most of the front and side surface of each tank. It is interesting to note here that an angled series of bricks mounted on to the hull deck to each side of the driver's position protected the turret ring area. The amount of increased protection on these tanks was obviously substantial; and, according to several unclassified sources, constituted a very successful baptism of fire for reactive armor.

The Israelis, who have offered their Blazer reactive armor on the export market since at least 1983, decided that its tactical advantages outweighed the limitations and possible risks characteristic of this type of armor. This decision, which enabled the Israelis to field an improved armor system when it was needed, "could sound the deathknell of existing antitank rockets and missiles."

The Soviets Seek Solutions

The Soviet Army's concern over the massive deployment by NATO of modern ATGMs is well-documented and has already been discussed in the pages of *ARMOR*. This long-standing concern has forced the Soviets to seek solutions to counter this NATO capability. Western defense sources have apparently agreed that the best way to negate the effects of the HEAT warhead carried by an ATGM is to make use of Chobham-type armor. These advanced "brews" of armor, however, have the critical drawbacks of extreme cost and complexity. To date, these drawbacks have been important enough to keep the number of tanks fitted with advanced armor relatively small. The Soviets, long aware of these problems associated with Chobham-type armors, were forced to develop and field other solutions to the ATGM problem. Several intelligence sources have confirmed that the latest fielded Soviet main battle tanks are fitted with some form of advanced armor. This armor, while much less sophisticated than the Chobham-types in the West, is still a vast improvement over conventional tank armor. According to *Soviet Military Power 1986*, these modern Soviet tanks are fitted with "improved armor incorporating laminates and composites."[6] *International Defense Review* published a copyrighted drawing in February 1987 of a section view of the Soviet *T-80* and *T-64B* front slope armor. This drawing clearly showed the armor to have an actual thickness of 200 mm, consisting of steel and glass-fiber composite design.

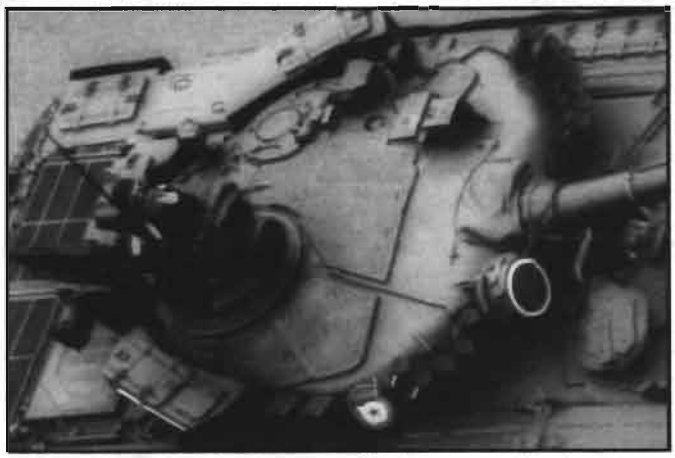
Other unclasssified sources have stated that this composite armor is not limited to the front slopes of these tanks. As already discussed in the pages of *ARMOR*, the use of a cast turret design does not in any way rule out the use of composite armors.

In 1985, the Japanese magazine, *TANK*, published a drawing of a section view of a modern Soviet tank turret that showed large squares or boxes within the turret frontal armor on each side of the main gun. These squares or boxes are most probably some type of composite material. The shape of the turret fronts of modern Soviet tanks has undergone a sometimes unnoticed redesign over the years. One of the most dramatic changes was on the most recently-identified new version of the *T-72* main battle tank, which I have labeled the *T-72M1* (1986). This tank, which paraded in Red Square in November 1986, carries a heavily-modified turret that has a new, pronounced turret frontal overhang and a large compartment on both sides of the main gun. One can see that the Soviets, using the armor

technology and resources available at the time, fielded very capable main battle tanks with very capable armor.

Phase One: "Blanket Armor"

The first phase of the armor upgrade program began some time prior to 1984, and was first seen fitted to a *T-72M1* in November of that year. This modification, which consisted of "blanket" of non-metallic applique armor bolted to the turret roof, like the third "reactive armor phase," relates directly to the armor protection starting point (composite armor) described above. The non-metallic blanket fitted to the *T-72M1* was approximately 35-50-mm thick and appeared to be very similar to Kevlar© fiber panels produced in the West. Some sources claim that the additional armor was to counter the effects of enhanced-radiation weapons in Western Europe. While this theory is possible, it is clearly not the main Soviet motive for such a modification. A more likely reason for adding the soft armor to the turret roof is the increasing threat posed by NATO top-attack weapons. These weapons, ranging from 30-mm depleted uranium armor-piercing rounds to "smart" submunitions delivered by a variety of sources, are becoming more and more important to NATO's antitank doctrine. The Soviet applique covers most of the turret roof area, to include the tank commander's (TC) and gunner's hatches, the gunner's GPS "doghouse," and the mounting frames for the TC's vision blocks. It does not, however, cover the area directly above the turret frontal armor. The Soviets apparently felt that this area of the turret was capable enough not to require the additional protection of the armor blanket. In May 1985, the Soviets paraded the *T-64* main battle tank for the first time through Red Square, giving Western analysts their first opportunity to examine it. Unclassified sources have identified this tank as a version of the *T-64B* that is "not fitted with the guidance equipment for the *Kobra* guided missile system."[7] Those *T-64s* were also fitted with a non-metallic armor blanket. In this case, however, the applique armor was of a different design than that on the *T-72M1*. On the *T-64*, the blanket appeared to be made up of several small sections or panels bolted to the turret very closely together; while on the *T-72M1*, the blanket was apparently a large one-piece covering. The area of the turret covered on the *T-64* also appeared to be smaller than that covered on the *T-72M1*. Finally, unclassified photographs that have appeared in defense-related magazines like *Soldat und Technik* and *Military Technology*, have confirmed that the non-metallic armor blanket has also been fitted to the hull deck above the driver's position on both tanks.



Top view clearly shows added armor "blankets" on turret of this T-72. Experts disagree on its purpose.

Phase Two: "Horseshoe" Armor on Older Tanks

The second phase of the armor upgrade program appeared on Soviet tanks deployed in Afghanistan in 1986. The armor modification, first seen on a knocked-out Soviet *T-55*, consists of simple cast steel plates added to the turret front (one curved plate on each side of the main gun) and on the front slope. This "horseshoe" armor is about 100-150-mm thick and is intended to defeat infantry antitank weapons.[8] Since its first sighting, this additional armor has appeared on *T-54, T-55*, and *T-62* main battle tanks.

Most of the information concerning this armor modification has become available since the well-known withdrawal of some Soviet forces from Afghanistan. Photographs of these forces taken prior to their return to the Soviet Union have appeared in news and defense-related magazines. The tanks featured in these photos are heavily-modified *T-62s* (labeled the *T-62E* by one source for easy identification until the correct Soviet designation is known) that have been fitted with a variety of improvements. The most important is the added armor plates. Two cover the turret from the main gun around the turret front to about the 3 o'clock and 9 o'clock positions. The tanks also had hull-length, non-metallic side plates mounted on each side of the hull. These plates, resembling Kevlar© fiber panels, are angled slightly outward away from the tank and are most likely intended to protect the fender fuel cells from heavy machine-gun/automatic cannon fire. The armor plate added to the front slopes appears to be identical to the turret plates, and covers the entire area of the front slope.

Finally, these tanks also had fabric or rubberized hull skirting, three

large smoke grenade launchers, and what appears to be a small, boxed laser rangefinder mounted above the main gun. While these modified *T-54, T-55,* and *T-62s do not pose the same threat as the more modern T-72, T-64,* and *T-80s,* this phase of the armor upgrade program has achieved it's goal. The older tanks that are still in service with the Soviet army have received new life; and, in their updated forms, will continue to be used for training and combat into the future.

T-62 modified with applique armor on turret front and sides, non-metallic armor on fuel cells, and rubber side skirts to predetonate HEAT rounds.

Phase Three: Reactive Armor Is Adopted

The final phase of this armor upgrade program is the massive effort the Soviets are undertaking to fit their most modern main battle tanks with reactive armor. This effort, first identified in 1984,[9] is certainly the most significant armor improvement plan so far identified in the Soviet army. Exactly when this Soviet interest in reactive armor first came into being is not clear. At the unclassified level, however, all of the available information points to the successful use of Blazer reactive armor by the Israelis in 1982.

Several open sources have confirmed that the Syrian army captured a number of Israeli tanks fitted with Blazer reactive armor. Exactly how many they captured is unknown, as is the types. The most probable and widely-accepted information confirms that the tanks were *M60A1s* and that the number the Syrians captured was small. Blazer reactive armor was subsequently made available to the Soviets. This acquired Israeli technology was apparently something that the Soviets were waiting for. As a result, they were able to rapidly field a reactive armor system on their most modern tanks. These tanks, described by *ARMOR* author Steven Zaloga as premium tank types, were suddenly appearing fitted with Soviet reactive armor in East Germany.

To date, the only Soviet tanks that have been identified carrying reactive armor bricks are the *T-64B* and the *T-80.* Unclassified drawings (in the case of the *T-64B*) and photographs (in the case of the *T-80*) have recently appeared in defense-related magazines. This recently released information has made it possible to assess this new Soviet capability.

Unlike Blazer reactive armor, the Soviet bricks appear to consist of one uniform design; although their fitting to the two premium tanks mentioned above is not the same. "The explosive brick measures about 250 x 150 x 70mm. It has four bolt holes, one on each corner, to attach one brick to another."[10] Each of these bricks attaches to the tank's main armor with two mounting points that hold them at specific angles. Just how the bricks are arrayed on each tank type, however, is a different story. The reactive armor bricks fitted to the front slope of both the *T-64B* and *T-80* are set up in the same manner. It is not until we examine the turret and hull-skirting arrays that the difference becomes apparent. "In the case of the *T-80,* no panels (bricks) are fitted to the side skirts, while the *T-64B* has up to four layers of reactive armor panels."[11] As far as the turret arrays are concerned, the bricks are in two parallel layers on the turret front of the *T-64B;* while on the *T-80,* the bricks are fitted to the turret in the shape of a "V". This "V" is attached to the turret main armor at it's widest point, with the narrowest part pointing away from the turret. The result is that each array resembles the tip or head of an arrow. The reason for these differences is not currently known. One theory is that the main armor of each tank requires a different configuration of reactive armor bricks to achieve a certain level of overall protection. The number of bricks fitted to each of these tanks is also different. "The *T-80* pattern appears to be the more economical of the two configurations, averaging 111 bricks, compared to 185-211 brick panels on the *T-64B.*"[12] This total number of bricks includes what appears to be a single layer of reactive armor fitted to the turret roof of each tank.

Finally, the *T-64B* and *T-80* are the only Soviet tanks that have been seen carrying reactive armor. This does not, however, rule out the application of reactive armor bricks to another tank type in a time of crisis. Based upon the modifications applied to the latest identified version of the *T-72,* the groundwork has already been laid.

That tank is known as the *T-72M1* (1986), first seen in November of that year. The smoke grenade launcher array that has been a standard feature of late model *T-72s* had been changed with all launchers now mounted on the left side of the turret in a single group. This change not only brought the *T-72* series on line with the latest models of the *T-64,* it also cleared

the turret frontal armor of any obstruction that would interfere with the future mounting of reactive armor.

Conclusion

The Soviets realized many years ago that the promising armor technologies NATO was developing would reach the battlefield before they could produce their own. Cost and complexity of the new armor would be big enough stumbling blocks to keep Soviet tanks with their equivalent of Chobham-type armor on the drawing boards for quite some time. The Soviet army would continue to rely on the "older" designs that made such a huge impact on the armies of the West since as long ago as 1965.

One of the primary reasons that tanks like the *T-64* and *T-80* have made such an impact was that they were protected by some form of advanced armor. The armor of these tanks still poses a serious threat to NATO forces. The problem the Soviets faced was how to update their fielded tanks to allow them to hold their own against the much newer NATO main battle tanks. They found the solution with reactive armor.

Some sources have incorrectly stated that reactive armor is the ultimate protection a tank will probably ever need. This is far from the truth, I have stated the various reasons for this. Soviet reactive armor should not be considered as a single entity. It is part of an observed three-phase plan to fill the gap between currently-fielded tanks and the next Soviet tank. When we correctly assess that the reactive armor on the *T-64B* and *T-80* supplements composite armor, we can finally understand this significant new threat to NATO.

The significance of this new threat is apparent in the concentrated effort that the armies in the West have initiated to counter it. New ATGMs like the German TRIGAT (two tandem HEAT warheads), the French HOT 3 (two tandem HEAT warheads, and the American TOW 2A (two tandem HEAT warheads), are all examples of this NATO effort. According to *Jane's Defence Weekly*, "If the Soviets are fitting reactive armor to tanks already fitted with laminate (composite) armor, then they could well have complete protection against ATGMs on which NATO relies for much of its antitank defensive capability."[13] The Soviets have succeeded in rapidly fielding a stopgap improved armor system that will allow them the time they need to develop and field their own version of Chobham-type armor. We must fully understand this success and counter it before NATO tank commanders start their fire commands. Reactive armor is indeed new life for Soviet tanks.

Captain James M. Warford was commissioned in Armor in 1979 as a distinguished military graduate from the University of Santa Clara, California. He has served as a tank platoon leader, support platoon leader, and has commanded A/2-66th Armor Regiment (COHORT). He is currently the commander of HHC/2-66th Armor Regiment, 2d Armored Division (FORWARD).

Notes

[1]Simpkin, Richard, "From Array to Disarray? Tactical Aspects of Active and Reactive Armors," Military Technology, April 1986, p. 20.

[2]"Blazer Add-on Reactive Armour," International Defense Review , vol. 16, no. 11, 1983, p. 1534.

[3]Simpkin, Richard, "From Array to Disarray? Tactical Aspects of Active and Reactive Armors," Military Technology, April 1986, p. 20.

[4]Warford, Captain James M. , "T-64, IT-122, and IT-130: The Soviet Advantage," ARMOR, September-October, 1985, p. 41.

[5]Zaloga, Steven J., "Soviet Reactive Tank Armour Update," Jane's Defence Weekly, May 23, 1987, p. 1011.

[6]Secretary of Defense, Soviet Military Power, U.S. Department of Defense, April 1986, p. 67.

[8]"Horseshoe Armour Fitted to Soviet Tanks," Jane's Defence Weekly, January 10, 1987, p. 18.

[7]"The T-80 Tank Unveiled," Jane's Defence Weekly, May 3, 1986, p. 804.

[9]Zaloga, Steven J. , "Soviet Reactive Tank Armor Update," Jane's Defence Weekly, May 23, 1987, p. 1011.

[10]Ibid., 1014.

[11]Ibid.

[12]Ibid.

[13]Russell, Simon 0., "Soviets to Deploy T-64 Reactive Armour," Jane's Defence Weekly, May 17, 1986, p. 863.

A Scaled Target Engagement Range

New England Reservists Defeat the Range Space Problem With Ingenuity on a Large Scale

by John Rasmuson

A happier marriage of high-tech and salvage there never was: lasers, garage-door openers, car parts, and store-bought gadgetry, all fitted ingeniously into a World War II-era movie theater at Fort Devens, Massachusetts.

Called the Scaled Targets Engagement Range (STER), it is nearly a perfect synergism — the whole exceeding the sum of its Rube Goldberg parts — that offers New England-based Reserve Component and Guard units incomparable antitank training.

The STER was born of need. Training space for tanks in the northeast is as scarce as winters are long and punishing. Thus, the relatively modest $200,000 investment in the STER has returned immediate dividends in unit readiness, not to mention obvious savings in ammunition costs.

The STER has three indoor firing lanes; each is complete with 1/60-scaled landscapes that come to life in a gunner's sight and each is equipped with a mix of pop-up and moving targets. A sound system adds the din of battle at the flick of a switch, and the lights can replicate the shadowy illumination cast by overhead flares.

With an M-55 laser mounted to the tank's main gun with a Brewster Device, gunners engage targets with laser pulses at simulated distances up to 1,800 meters. A flash of light from an automobile dome light wired into the base of the miniature target signals a hit.

"For Tank Tables I and II, it's the most outstanding indoor facility I've ever seen," says SFC Shaun Grimley, master gunner with D Troop, 5th Cavalry, 187th Infantry Brigade (USAR).

The overriding value of the STER, Grimley points out, is the amount of

uninterrupted training time it affords, a boon to those who soldier only on the weekend. "There's no set-up time, no weather interference, just pure, unadulterated, training," he said

A training room, outfitted with audio-visual learning projectors, is available to those not on the firing line, which enhances cross-training for crew members.

To build the simulation facility was an evolutionary process, says Roland Roy, simulations branch manager of Fort Devens' training support division. "It was a process that began with jackhammers and has been sustained with experimentation and innovation," he says.

To power the tank turret was one such innovation. By joining 500-amp rectifiers to the tank's jumper-cable receptacle, the building remains free of diesel exhaust, and by day's end the tank's batteries are fully charged, not drained. Tank crews are not the only beneficiaries of the combat-simulation facility, however, for it is easily adapted and frequently used for TOW gunnery.

A laser and television camera are attached to the missile launcher. The camera serves as a "critiquing tool" which provides an instant replay for the TOW gunner.

When fired, a pneumatic device on the TOW launcher provides a realistic backblast, and a ten-second delay in the laser circuitry accurately simulates the missile's flight time to target.

The STER gets high marks from TOW gunners. "It's as close as you can get to the real thing," says Richard Billing, an antiarmor platoon sergeant with the Connecticut Army National Guard's 102d Infantry.

Billing rates the STER in superlatives -- "The best training for TOW gunnery because it allows the gunner not only to track the target, but to see where he's hitting.

"Gunners who excel in simulation are candidates to fire the one service missile the battalion fires each year," Billing added.

The ingenuity that has transformed an aging movie theater into a state-of-the-art training facility continues to be an important part of the STER's development. According to Roy, a laser device has been successfully adapted for the 90-mm recoilless rifle, and plans include modifications for the 1/60-scale to simulate target distances from 250 to 3,000 meters.

Says Roy: "We'll continue our efforts to incorporate current technology in the STER. You can't build something like this and expect it to be good for a lifetime."

The prospects are bright, then, for the unlikely pairing of high tech and the salvage yard, and New England Guardsmen and Reservists will continue to hone their tank-killing skills without firing a live round.

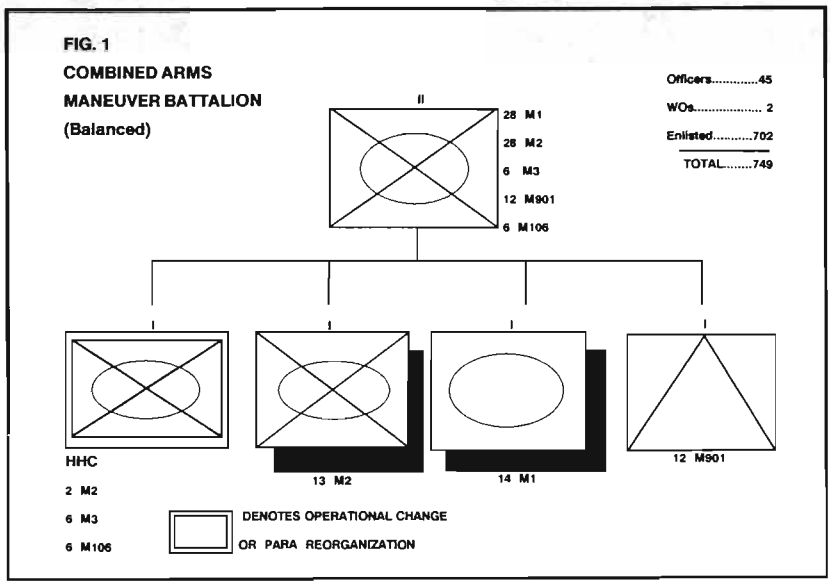
SFC Grimley, master gunner, at the Ft. Devens scaled range.

John R. Rasmuson has been the Media Relations Officer in the Public Affairs Office at Fort Devens, Massachusetts, since 1977. He is a graduate of the Army Advanced Public Affairs Course, (Univeristy of Wisconsin), the Command and General Staff College, and holds a master's degree in English. He is a major in the Army Reserve and is currently serving as an intelligence officer with Army Forces, Iceland. While on active duty, he was assigned to the Army Security Agency Field Station in Asmara, Ethiopia. He is a member of the Association of the U.S. Army's Advisory Board of Directors.

The Combined Arms Maneuver Battalion

Armor and Infantry Build a New Relationship In Ft. Hood Experiment

by LTC Robert G. Bernier



"The organization which assures unity of combatants should be better throughout and more rational...soldiers, no matter how well drilled, who are assembled haphazardly into companies and battalions will never have, never have had, that entire unity which is born of mutual acquaintanceship."

— Colonel Ardant du Picq.

In early 1986, the commander of III Corps obtained approval to organize three combined arms maneuver battalions. Two of the battalions would be armor heavy; the third would be balanced, with an infantry base and its organic antitank company. On 3 September 1986, the 2d Brigade, 1st Cavalry Division, reorganized in accordance with the DA-approved Combined Arms Maneuver Battalion (CAMB) MTOE. The brigade will remain organized under the CAMB MTOE for at least two years for evaluation.

Simply stated, a combined arms maneuver battalion is a battalion of mechanized infantry, armor, and antitank companies, with a headquarters company composed of support elements which are in proportion to the number and types of line companies.

Why CAMB?

CAMB's objective is to optimize the warfighting capability of our heavy forces by organizing battalions to train as they will fight. Its basis is in the Army's training philosophy: "Successful armies train as they intend to fight, and fight as they are trained."[2] More to the point: "Units and headquarters that will fight together in teams, task forces, or larger units, should train together routinely."[3]

CAMB improves the fighting capability of heavy forces by improving leaders' proficiency at integrating tanks and mechanized infantry; facilitates task organization and its sustainment; and capitalizes on the effects of constant association. CAMB units are also expected to reap long-term professional development benefits in the exposure they provide leaders of combined arms operations.

There is probably little argument with the doctrinal necessity to train routinely in a cross-attached mode. However, with the fielding of new, more capable and more complex systems, the need to train that way has become increasingly urgent. For the first time, we have an infantry fighting vehicle intentionally designed for its employment in combination with the new main battle tank. We expect the effect of the Bradley IFV and the Abrams tank, when properly employed together, to be greater than that of either system employed separately.

This effect, however, is not automatic. Events at the National Training Center have shown that units find it difficult to obtain their full potential. The speed of the M1 and M2 makes their employment harder to control. A friendly platoon covers the distance to a position before the artillery can process and fire its request for fire on that position. The demands to get infantrymen forward to breach and clear obstacles compete with the pressing need to keep Bradley TOW launchers firing from long stand-off ranges. One quickly learns that, indeed, "The Bradley is not a tank," as the enemy precipitously destroys them in a matter of seconds. The command and control arrangements for dismounting infantrymen, unique to the Bradley force and necessarily effected hasti-

On the Employment of Combined Arms in World War II: "Whenever possible, it was best to join the same tank and infantry units together in training and combat. Not only did the staff function better, but the lower unit commanders and individual tank crews and infantry squads became acquainted and gained confidence in each other. Units gained objectives as a team and not as individual arms."

— The Armor School, 1947

ly in this fast-paced context, are an entirely new dimension in the employment of infantry.

Under the most stressful conditions, short of actual combat, commanders must draw heavily from their previous experience in the employment of combined arms. Too often that experience has proved inadequate. There is just too much to know about the relative capabilities of the Bradley and Abrams systems alone, far more than a few short training experiences with cross-attachments can provide.

The CAMB argument is that it has become largely pointless for battalions to continue to live as pure units and to only cross-attach occasionally, as has been the tradition. We can gain more by organizing as combined arms, with pure tank or mechanized infantry units as the exception.

One of the goals of CAMB is to strengthen armor-infantry teamwork by living and working together. In view of such programs as COHORT and the Regimental System, this goal should not require much discussion. Beyond the obvious benefits of tankers and infantrymen marching under the same battalion colors, there are other advantages that specifically apply to warfighting.

One of the four basic tenets of AirLand Battle doctrine is "Initiative." "If subordinates are to exercise initiative without endangering the overall success of the force, they must thoroughly understand the commander's intent."[4]

Any properly experienced armor captain, for example, can understand his infantry task force commander's concepts of operation. But to "thoroughly understand his intent" requires that he personally know the commander. He should also have an appreciation of his own commander's frame of reference. Under CAMB, the armor captain gets to know his infantry commander, and, over the long term, develops a general appreciation of infantry. And, for his part, the task force commander can better entrust his tank company commander's initiative, because he knows him and his capability.

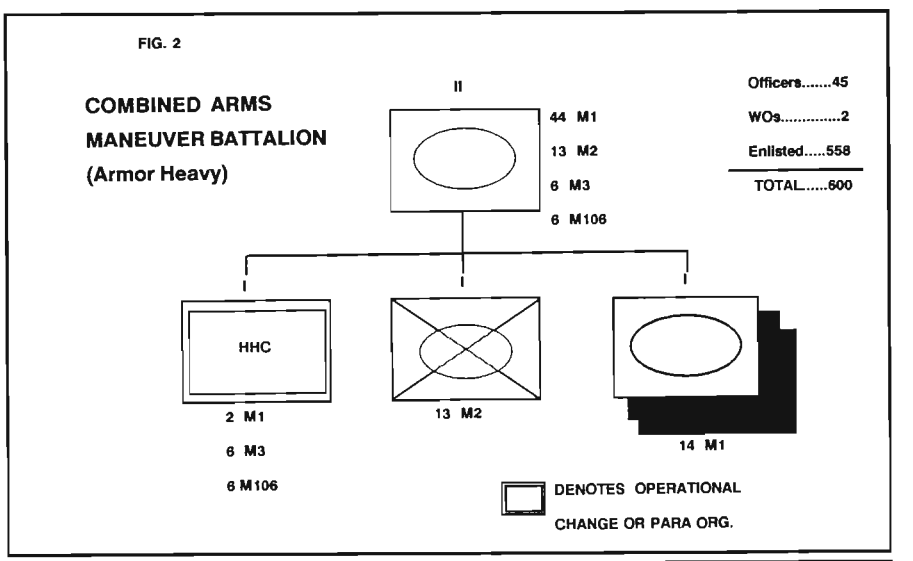
If experiences to date are any indication, CAMB will have a positive catalytic effect on the close combat heavy force as a whole, as well. The CAMB inherently provides a common focus to the Armor and Infantry communities.

Task Organization

Many fear that CAMB will create fixed organizations, preempt task organizing on the basis of METT-T, and reduce higher commanders' flexibility to tailor battalions according to the situation. Ironically, the proponents of CAMB share these understandable concerns. Their intent is to create no such constraints, but quite the opposite. By developing a common battalion base (HHC) to command, control, and support up to five maneuver companies in any combination; by routine staff and service support experience in sustaining a cross-attached organization; and, by continuing to practice cross-attaching companies from one CAMB to another; CAMB intends to, and does, facilitate task organization. The result clearly increases commanders' flexibility.

In terms of its organizational design, CAMB is certainly not the final solution. It is more probably a 60-80-percent solution to any combat task organization. As one commander put it: "What are we really talking about anyway! There are only so many ways to split a

FIG. 2



brigade." Beyond that, it follows that it is much easier to go from some mix to any other mix, than to start from a pure tank or mechanized infantry organization. For the CAMB headquarters and its support structure, there is essentially no change in leadership when making further cross-attachment.

At this point, one might ask: Why make CAMB a documented organization? Could we not accomplish the same goals through "semi-permanent" cross attachments of a few months duration? In fact, many FORSCOM brigades do just that for their train-ups before NTC rotations. In reality, however, if such provisional cross-attachments last longer than a months, they become inefficient to the point of being counter-productive. From their previous experience at being cross-attached for six months without MTOE documentation, two of the current CAMBs found there to be some 73 administrative functions that required special or off-line management. Actions normally handled in stride, ranging from simple personnel actions to submission of USRs, ran counter to the "system" at every level and consumed inordinate amounts of valuable time. MTOE documentation for CAMB "legalizes" the unit in the system, resulting in the disappearance of problems associated with provisional organization.

CAMB In the 1st Cav Division

The combined arms maneuver battalion organization is shown in figures 1 and 2. Task force 1-5 Cavalry, balanced, is at figure 1. Task forces 1-8 Cavalry, and 1-32 Armor, both armor heavy, are at figure 2.

It is important to understand that the CAMBs are composed of existing personnel and equipment authorizations — a zero-sum exchange among the three battalions. In addition to the line company cross-attachments, which include each company's maintenance team, some adjustments in personnel and equipment were made to align the HHCs.

The most immediate lesson of CAMB organization is the need to align the HHCs of the tank and mechanized infantry battalions. Under their J-series MTOEs, the HHCs of the two type battalions are not suited to rapid cross-attachment, nor for the sustainment of task forces. The biggest difference is in the support platoons. The infantry battalion's support platoon has 5-ton cargo and tank and pump unit (TPU) trucks; while the tank battalion has the 10-ton cargo and 2,500-gallon fuel HEMMTs. The two types of trucks have considerable differences in cross-country mobility and load capacity.

Under normal circumstances of task organization, infantry task forces find it hard to meet the additional fuel and ammunition needed by their attached tank companies. To compensate for this, tank battalions normally send two cargo HEMMTs and two fuel HEMMTs with their detached tank companies. Infantry battalions respond in kind with 5-ton cargo trucks and TPUs. This exchange solves the transportation problem but creates a problem in maintenance. The tank battalion's maintenance section has the tools, mechanics, and repair parts to support 5-ton trucks; but the infantry battalion has no mechanics (MOS63S), special tools, or parts to support the HEMMT.

There are further problems. The infantry and armor battalions both have some M2/M3-qualified mechanics, and M2/M3 PLL, because their scout platoons (M3-equipped) are the same. But the tank battalion's assets are insufficient to sustain even one attached Bradley company; and the infantry battalion has no tank maintenance capability at all. The traditional solution to these maintenance support problems is to break out of each battalion's maintenance section a "special maintenance package" to sustain cross-attachments. This is time-consuming and is not a complete solution, because the leaders of each type battalion are not normally familiar with the other's vehicles and equipment. The CAMB solution was to cross-level trucks and HEMMTs, drivers, fuel handlers, and mechanics, and to adjust the battalions' PLLs. The result is that each CAMB has most of the required assets in place to sustain a task organization. And, by working with the different vehicles on a daily basis, maintenance leaders become increasingly more qualified to perform their service support functions.

Because the CAMB exchanges were made from within existing assets, there remain some shortfalls in TMDE and STE. The infantry-based CAMB, for example, is left critically short one set of M1 adapter hardware for STE-M1/FVS and M1 break-out boxes.

There was one other significant change under the CAMB MTOE. The battalion executive officer and S3 Air slots of the tank and balanced CAMBs were changed to reflect Infantry and Armor primary specialties, respectively.

Bottom line, the reorganization to CAMB requires no additional people. If CAMB were to be formed permanently, we would have to address equipment requirements such as additional STE-M1 hardware for the infantry-based CAMB. The HHCs would probably be better suited for the sustainment of cross-attachments if all had the HEMMT, but that is really an issue separate from CAMB. The 5-ton

cargo truck has some good features - the troop hauling capability, for example, and the 5-ton/HEMMT combination worked-out under the current CAMBs might prove to be a feasible alternative. As a side note, the reorganization to CAMB surfaced some other significant differences in the 3-series MTOEs of the tank and infantry battalions. For example: although the infantry company XO is a second-in-command fighter, like any other line company XO, he rides in an M113, which cannot keep up with the rest of his company. A tank company XO commands a tank, which keeps him up and enables him to take command more rapidly.

What Has Not Changed

Under CAMB, many things do not change and are not intended to change. The line company organizations do not change at all. They train as they always have, and their platoons are occasionally cross-attached to form company teams. At every opportunity, the CAMBs take on their normal combat support and service support "slice" to train as full-up task forces. Organizational relationships with fire support teams (FIST), engineers, and so on, remain unchanged.

Views of the CAMB Experience

In FY 1988, authorities will make formal assessments to determine whether the CAMB concept should be pursued further. To be sure, the answers to many questions will be elusive. Evaluation will be largely subjective, relying heavily on the sensings of CAMB leaders and subject matter experts. Those measurements that are quantifiable will be influenced by numerous variables and will, in many cases, lack appropriate baselines or precedents for comparison. Meanwhile, it may be of interest to consider some of the issues and observations already surfacing.

To say that CAMB is an emotional issue in relation to branch affiliations is a gross understatement. One of the first issues inevitably raised is the suspected degradation of individual training that may result from branch biases of the various CAMB leaders.

A case in point is the concern over training and use of the Bradley-mounted infantryman, (MOS11M). To be candid, the feeling is that, particularly under an armor-based CAMB, the 11M soldier will not receive adequate training in basic infantry fighting skills. The implication is that the quality and content of individual training stem directly from the battalion commander and his infantry-or-armor-flavored staff. But, in reality, individual training takes place almost entirely within the purview of company command. Under CAMB, recall, nothing changes at line company level. BTMS and its bottom-up approach to planning remain in effect, and the leadership positions in CAMB companies remain occupied by branch-qualified individuals.

Of equal significance is the veiled suspicion that armor and infantry CAMB commanders will respectively pay less attention to the infantry or armor-specific training needs of their soldiers. Even if one were to assume this concern to be a reality, as a natural function of battalion commanders' backgrounds, then one might just as well assume that a commander who came up through a CAMB or similar experience would be more inclined to pay due attention to both tankers and infantrymen.

Finally, we should remind ourselves that CAMB is an organizational issue — how best to train an organization to fight other organizations. Individual training is certainly one consideration; but, it is shortsighted to weigh the relative merits of this concept on the basis of individual performance.

One CAMB commander raised two interesting points. The first involves ownership. Normally, when an infantry battalion commander, for example, gets an attached tank company, he does not overly concern himself with its state of training. The company's shortcomings succumb to the temporary nature of its attachment. But, under CAMB, the battalion commander "owns" that tank company and, therefore, has a vested interest in its performance. For that reason alone, the battalion commander sets higher standards for the company. Indeed, he is able to set higher standards, because he has learned more about what to look for — has become more technically proficient — with respect to the tank company. Finally, his ownership of the company enables the CAMB commander to enforce the standards he sets for it.

The second point is about training focus. Because it is more closely organized for warfighting, CAMB tends to focus its commander's training efforts more sharply on mission. Again, using the 11M infantryman as an example, the CAMB commander finds himself more inclined to train his infantrymen in the tasks associated with their specialty; e.g., breaching and securing major tank obstacles. There is little perceived need, and precious less time, to be training the 11M soldier as a man for all seasons — doing such things as rapelling and airmobile assaults.

Generally, CAMB infantrymen have found that they have not lost their dismounted skills but have refined them in coordination with tanks.

In terms of preparation for combined arms operations, CAMB has

The CAMB Experience

Problems and Solutions:

LOGISTICS	
• Armor and Infantry support platoons use two kinds of trucks — the 5-ton and the 10-ton HEMTT — with different mobility and load-carrying characteristics.	SOLUTION: Units exchange trucks.
MAINTENANCE	
• Infantry units can't support HEMTTs or maintain tanks.	SOLUTION: Cross-level trucks, HEMTTs, drivers, fuel handlers, mechanics.
• Armor unit's assets insufficient to maintain Bradleys.	
• Infantry-based CAMB is short M1 adapter hardware for STE-M1/FVS test equipment.	SOLUTION: None found.
COMMAND & CONTROL	
• Infantry XO rides in an M113 that has difficulty keeping up.	SOLUTION: None found.

so many built-in training efficiencies that it may well be the best bargain in town. Resourcing, cross-training, and professional development are a few areas in which CAMB offers extra returns on investment.

When it comes to resourcing, CAMB is an especially good deal. When a CAMB wants to go to the field as a task force, or wants to send out a company team of tanks and infantry, the resources to do so are readily at hand. However, a pure battalion must coordinate with another battalion to get its desired tank or infantry element. This is not only time-consuming, but, often one finds the other battalion in a different training cycle, or following its own (conflicting) schedule, which prevents the opportunity entirely. The problem of having to break a company out of its parent battalion's schedule is nonexistent when the companies required for combined arms training are already within one's battalion.

Commanders have traditionally tried with varying and usually slight degrees of success to get their units to cross-train their soldiers. CAMBs still make these concerted, formalized efforts. But, to a very large degree, cross-training in a CAMB occurs naturally and affects everyone from the battalion commander to the private soldier. Through this mode, officers and men of CAMBs learn routinely — in the normal course of daily operations — what other battalions will only experience in task-organized field operations.

Consider for a moment the case of the battalion motor officer (BMO). Every day, the CAMB's BMO deals on a large scale with the fault diagnosis, repair, services, parts identities, and so on, of both tank and infantry systems. Compare that with the case of his pure battalion counterpart, who must deal with the two systems for the first time, and then only temporarily, when his battalion is task organized in the field. The three existing CAMBs have already produced BMOs, technicians, and NCO supervisors who "know" the Bradley as well as they already knew the tank. In response to questions on what he had learned about the vehicle, one BMO, an armor officer, went beyond that aspect. He said, "I have not only learned the Bradley, I have learned the people who maintain it. When a new Bradley mechanic is assigned to my infantry company's maintenance team, I know from experience his capabilities. I know what the schoolhouse taught him, and what we must teach him here. Before, I only knew such things of tank mechanics."

At the mechanics' level, the cross-training that naturally permeates garrison maintenance and services pays huge dividends in the work-sharing that necessarily occurs in the 24-hour-a-day efforts of unit maintenance collection point (UMCP) operations. On the job, CAMBs produce bona fide "new systems mechanics." The high operational rates that the CAMBs have sustained throughout extensive field exercises are likely a manifestation of what their mechanics and maintenance supervisors learned through cross-fertilization.

One of the clearest examples of the cross-training opportunity offered by CAMB is in the support platoon. Except in the event of war, a standard battalion's support platoon will almost certainly never experience the handling and transport of both tank and Bradley munitions. But CAMB support platoons get that experience all year long — every time their units go to any live-fire range.

Professional Development

CAMB provides a singular opportunity to "train the trainers" of

tank/infantry task forces and heavy brigades. The only other place such an opportunity exists is in regimental cavalry, where commanders learn multiple systems throughout their career progression. Compare that with the situation of a typical brigade commander. If he did not command a CAMB, then he may have worked with both tanks and infantry in only a few ARTEPs and maybe in at least one NTC rotation. CAMB commanders and staffs do almost nothing, day-to-day, that does not involve both armor and infantry considerations. In time, they become increasingly proficient and confident in their ability to train subordinates on the multiple systems of teams and task forces. In field operations, their estimates and decisions become based more on personal experience and less on supposition. And it should not overly tax one's imagination to foresee the well-rounded S3 or commander that such an individual as the BMO just described might one day become.

Implicit in most of what I have said is a professional blending that is occurring in the CAMB. Except for the adherence to branch qualification for company commanders, CAMBs make easy the normal intra-battalion assignment changes that promotions and vacancies require. As a result, infantry officers have become support platoon leaders for tank task forces, armor officers have become motor officers for the infantry-based task force, and so on. As these officers (and some senior NCOs) move on to other assignments, they will take with them valuable experience.

Normally, armor and infantry battalions go about their business with little need to talk with one another. But CAMB commanders, staffs, master gunners, and so on, are in frequent communication on topics from gunnery and maintenance to tactics, SOP, and career counseling. The swapping of ideas and assets fosters teamwork in the brigade and would seem beneficial to the force as a whole.

Task Organization and Sustainment

As a result of the HHC realignment, CAMBs have become more adept at supporting further cross-attachments. Changes in task organization, which usually involved the addition of a fourth or fifth company, have been executed in stride. The only real adjustments were adaptations to new personalities.

The anticipated improvements in maintenance support and support platoon operations were realized in ARTEPs and NTC rotation. In one NTC battle, the armor CAMB's infantry company suffered 70 percent casualties. The battalion was able to evacuate all casualties in one hour. The battalion XO attributed the success of this feat to the staff's and infantry company's familiarity with one another and to their common knowledge of the battalion's combat service support SOP. The XO expressed fear at what might have happened had the infantry company been unfamiliar, or had the staff not had routine experience in supporting an infantry company.

Conclusion

Whether the Army will build on the strengths of CAMB remains to be seen. Creation of the existing CAMBs has at least caused some healthy and timely introspection about our approach to training heavy forces for employment in combat. In the process, some irrefutable organizational design changes have surfaced; some of the branch stovepiping has been removed; and many leaders' perspectives on the employment of combined arms have broadened.

The relative merits of CAMB may be extremely difficult to quantify. Because of the realities and effects of variables such as personnel turbulence, for example, expected improvements in commanders' ability to integrate tanks and infantry may not be immediately apparent. If the decision-makers at least accept CAMB as a promising idea, then in deciding to pursue it further, they will need to rely largely on subjective assessments and their own intuitions. We have seen that FORSCOM brigades recognize the need to form their battalions into task forces for NTC train-ups, often for up to six months. So a good question to ask is this: Why do they go back to pure battalions for the remainder of the training year?

Notes

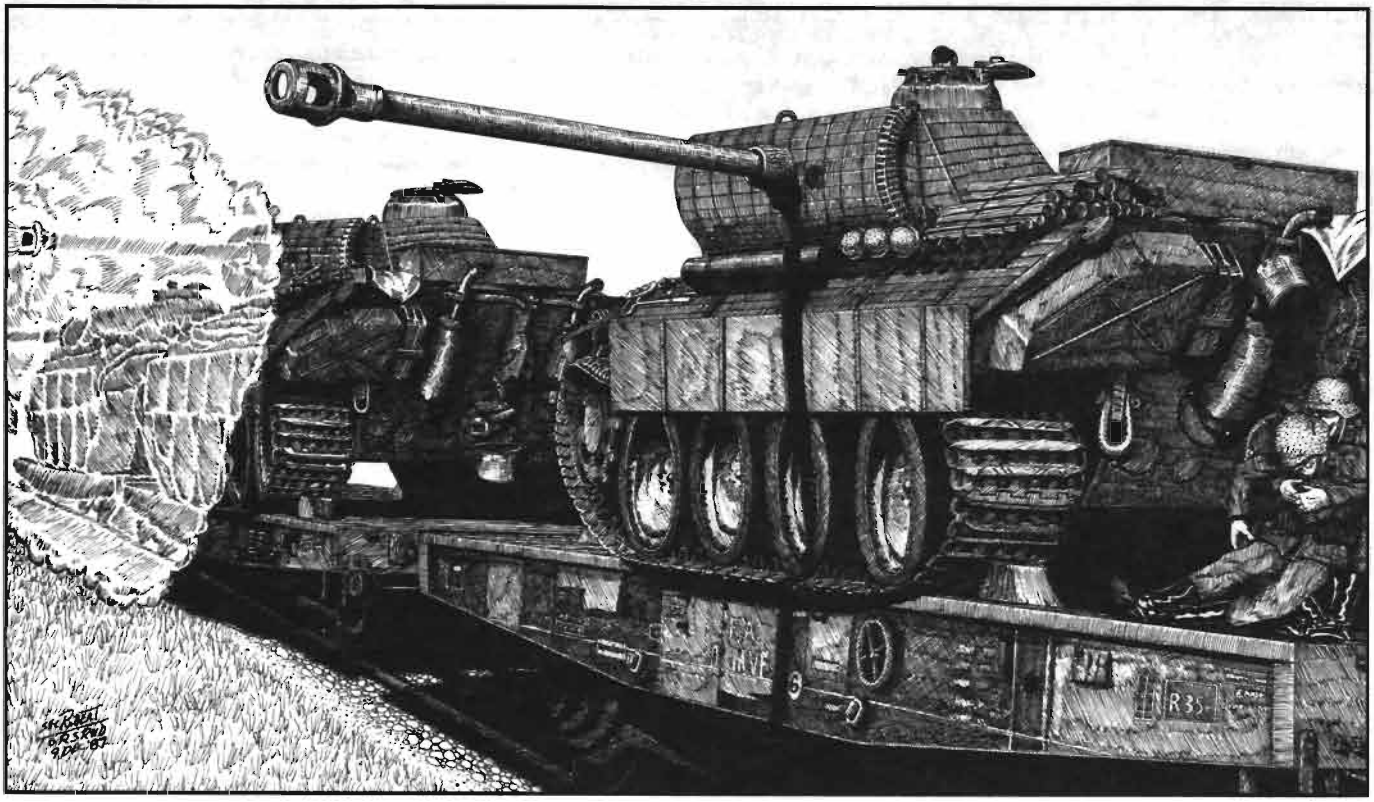
[1]In his two-year command, the author's battalion actually assumed three different configurations: first, as a balanced, M1/M2-equipped task force extended in cross-attachment for six months; then, as a pure M1 tank battalion for a year; and, for the last six months, as a CAMB of three Abrams tank companies and one Bradley infantry company.

[2]FM 25-1 (Training).

[3]FM 100-5 (Operations).

[4]FM 100-5 (Operations).

LTC Robert G. Bernier was commissioned in Armor from the University of Maine in 1967 and holds a Master of Arts degree in Management from Webster University. With service in five different cavalry squadrons, in CONUS and overseas, he has served multiple tours as platoon leader and troop commander. He has also been a squadron S3, squadron XO, brigade S1 and brigade S3. Most recently, he commanded the 1st Battalion, 8th Cavalry (CAMB), 1st Cavalry Division. He is currently attending the Naval War College at Newport, Rhode Island.



Breakout from the Veszprem Railhead

by Captain B.H. Friesen

Maneuver is one of the most important principles of war influencing a mechanized army. Without maneuverability, both decisive attacks and strong defensive actions are not possible. Not all maneuver however, is dependent on combat vehicles moving under their own power from one point to another. When movement is not possible due to mechanical limitations or fuel shortages, units can use other means, such as rail, to gain the initiative.

The German Army made excellent use of railroads to transport troops during both World Wars, thereby gaining strategic advantages. Very few historical works, on the other hand, cover rail movement in the tactical realm. During WWII, the German Army made good use of railroads to move armored vehicles short distances, minimizing fuel consumption and wear on those vehicles. But there is not always a railhead located well within friendly lines. The 2nd SS Panzer Division's (*"Das Reich"*) tank regiment faced this problem in March 1945. The breakout from Veszprem depicts exactly how close to the forward line of troops an armored unit can successfully execute a rail-loading operation.

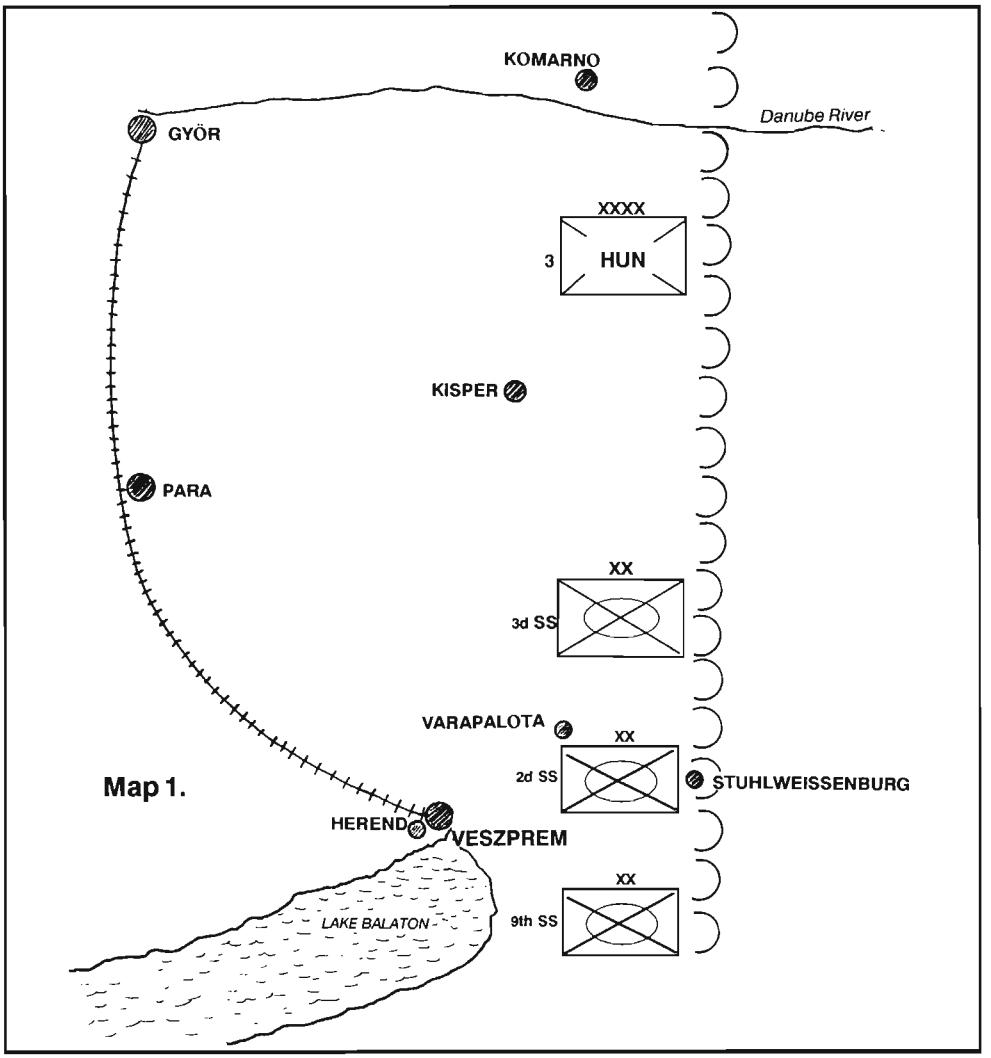
In mid-March 1945, a portion of the Eastern Front ran through western Hungary (Map 1). The Hungarian 3rd Army defended the northern sector, from Komarno to Kisper. The 6th SS Panzer Army defended from Kisper south to Lake Balaton. On the evening of 18 March, the majority of the Hungarians deserted or went over to the Russians, leaving a large gap in the front. The 2nd SS Panzer Division's two panzer grenadier regiments immediately rushed north to plug the gap, while the neighboring 3rd and 9th SS Panzer Divisions extended their fronts to absorb the withdrawal (Map 2).

The *Panther* tanks of the 2nd SS Division's tank regiment needed repairs badly. They pulled back several kilometers to a railhead near the town of Veszprem, rather than roadmarch the 60 kilometers north to the break in the front. The lead elements of the Panzer regi-

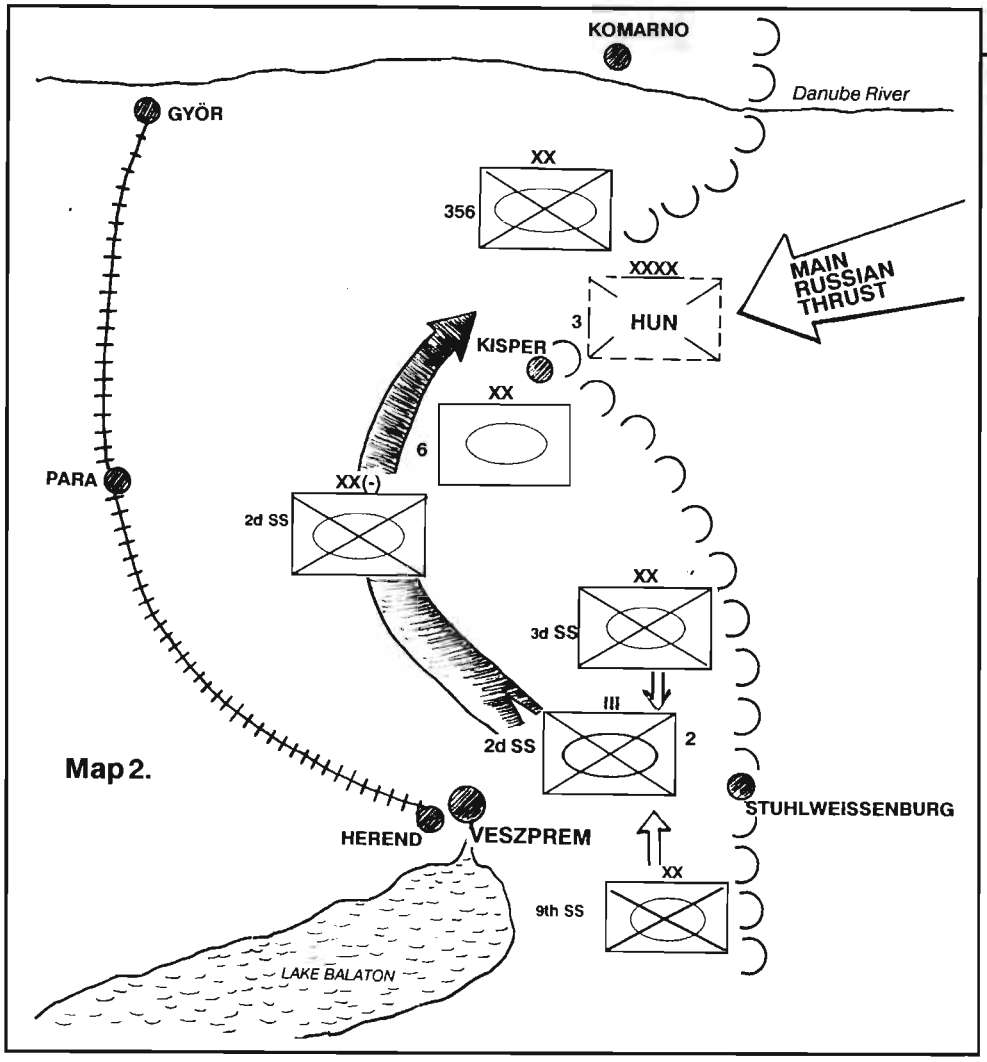
ment arrived at the railhead just before dawn on 20 March. The railhead itself was in the tiny village of Herend, just northwest of Veszprem. By mid-morning, more than forty of the regiment's tanks had arrived at Herend, and the *Panthers* began to drive onto the rail cars. *Sturmbannfuehrer* (major) Alois Ennsberger, the regimental motor officer, supervised the loading operations. Shortly after the loading began, a *Kubelwagen* (jeep) arrived with a highly agitated sergeant at the wheel. He exclaimed that Russian tanks were only two kilometers east of Herend and heading towards the railhead. Initial disbelief faded as other vehicles arrived with similar reports. A regimental staff officer quickly organized a defensive perimeter around the eastern half of the village (Map 3). The first two tanks on the ramp remained to load onto the train, while the others deployed by company on the outskirts of town.

Unterscharfuehrer (sergeant) Peter Rauch had been with the division since 1943. Originally from Moenchen-gladbach, in the Rhineland, his first position with "*Das Reich*" was as a loader on a *Tiger* tank. After several months, he became a gunner and eventually rose to command a *Panther* tank in the Battle of the Bulge. His tank was part of the regimental headquarters section, which consisted of seven *Panthers* in March 1945. Rauch positioned his tank behind a slight rise between two barns. He could see other vehicles from his section occupy positions among the buildings to his left and right. Ahead of him were about 2,000 meters of cornfields, followed by a wooded area.

Several minutes after Rauch took position, *T34s* crept from the wooded area to his direct front. Six Russian tanks probed towards the village, apparently unaware of the German presence. When they had closed to within 1,000 meters, a voice came over the radio (Rauch thought it sounded like one of the regiment's company commanders) directing the company on the right flank to engage the *T34s*. Several seconds later, the crack of 75-mm cannon erupted from the right, and all six *T34s* received hits in their flanks. Some exploded violently,



The German Army and its Hungarian allies were holding this line in western Hungary in March 1945 as the Red Army pressed westward. Panther tanks of the 2d SS Panzer Division were pulling back to the Veszprem railhead for movement toward a repair depot when the Russians broke through the northern sector. (see Map 2.)



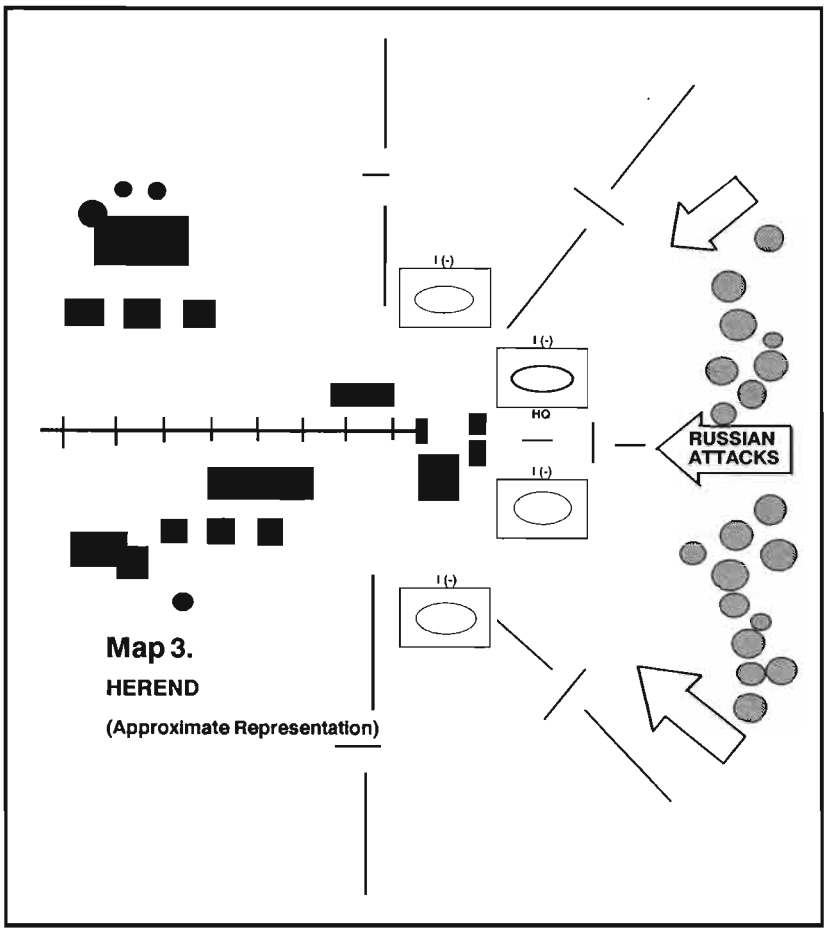
The majority of the Hungarian units in the northern sector deserted or went over to the Russians on 18 March, forcing 2d SS Panzer Division to send its two panzer grenadier regiments north to plug the gap.

while the others just burned. None of the crew members emerged.

Sporadic artillery fire began impacting within and around the village. Rauch assumed it was mortar shells and high explosive tank rounds, because the fire was too light to do much damage. This was, no doubt, a Russian spearhead. His own artillery was still too far behind to fire on the Russians. As the rounds came down around him, Rauch spotted 15-20 *T34s* charging the German left flank at full speed. Infantrymen clung to the sides of the tanks. The *T34s* were firing on the move, but were not hitting anything. He was about to report his sighting when the same voice over the radio announced, "*T34s*, two o'clock, headquarters section engage." Rauch directed his gunner to the center of the target group in accordance with his section's operating procedure. All sections, platoons, and companies in the panzer regiment had a standard procedure governing target group engagement. They used the "clock method" to identify the target group's general location, with the center of the unit's sector at 12 o'clock. The unit designated to engage the target divided the target from left to right, the left-most friendly element engaged the left-most enemy element and then worked inward. The right-most element simultaneously engaged the right-most enemy element and also worked inward. The center friendly elements engaged their center enemy counterparts and worked outward. Cease fire was automatic when they destroyed all enemy elements. This procedure was simple enough for everyone to use, and flexible enough to apply to any given formation.

Rauch's loader announced that he had loaded and primed the antitank round. Rauch spotted the antenna of a Russian company commander's tank and ordered his gunner to fire at it. Two seconds later, the antitank round slammed into the *T34's* fuel cell, causing a violent explosion. Rauch was glad they had destroyed the command tank because it was the only one in the Russian company with a radio. The other Russian tank commanders were now without direction and would blindly follow the last command given. It was common knowledge in the German Army that killing the Russian commander during an attack usually resulted in a broken or failed attack. After the first *T34* burst into flames, the Russian infantrymen leapt from the charging tanks and took positions around and behind them. Rauch directed his radio

operator to stay alert for enemy infantry and to keep the bow machine gun ready. Rauch engaged and destroyed two more tanks, hitting one just above the roadwheels and blowing the turret off the other. Less than ten minutes after the firing started, 19 *T34s* were burning on the outskirts of Herend, some within 400 meters of the German positions. The smoke was thick in the turret of the *Panther*, and Rauch felt like throwing up. He sweated profusely, his throat microphone itching on his neck. "Can we turn on the ventilators?" asked his loader. "No," said Rauch, "they'll interfere with the intercom. Go ahead and crack open the side hatches."



Panther companies as deployed on eastern edge of Herend.

At the railhead, panic ensued when the first *T34s* appeared. When the sporadic shelling began, the Hungarian train engineers attempted to flee. They were persuaded, at gunpoint, to remain at their post. Soldiers armed themselves with machine pistols and *panzerfausts*. Disregarding all safety precautions, the rail loading progressed quickly. The soldiers did not have time to tie down the *Panthers* once they were in position on the railcars. They merely locked the brakes and traversed the turrets in the direction of the battle. Turret crews remained with their vehicles in hopes of adding some fire support to the battle. This would prove a very wise precaution.

Unterscharfuehrer Rauch used the 20 minutes of calm after the attack to his advantage. He maneuvered his tank to a better covered position and redistributed the available ammunition to make it more accessible. Suddenly, his earphones erupted with, "Infantry, 12 o'clock, 1,200 meters." The hair on the back of Peter Rauch's neck stood on end as he saw the brown-clad figures creeping through the cornfields. German tankers feared dismounted Russian infantry above all else. They were determined, resourceful, and extremely hard to spot until they were on top of you. Experienced Russian infantry had absolutely no fear of tanks; they attacked them with satchel charges, mines, and even Molotov cocktails. Rauch's driver swore and started babbling, "We've got no infantry support. They'll be on us like flies. We've got to get out of here."

"Don't lose your head," said Rauch firmly. He told his radio operator," It's up to you to keep them off us with your machine gun." Machine guns were already chattering on the left and right as Rauch's radio operator fired a burst.

Rauch was thankful that he had a five-man crew. He fully agreed with the German Army that a four-man tank crew was not as effective as five. The tank commander was the "brain" of the tank, planning and directing the fire of a tank-killing system. If he operated a machine gun, it made the rest of the tank ineffective as a tank killer.

The gunner was the hand and trigger finger for the main gun. Using the gunner to aim the coaxial machine gun was wasteful because it turned the tank into an enormous, mobile machine gun emplacement.

The main gun was then useless. The gunner would aim the coax, while the loader shot it, ONLY if there were no tank targets in sight. The main machine gunner on a German tank was the radio operator/bow machine gunner. He was the only crew member who could afford to operate independently without degrading the effectiveness of the tank-killing system. His primary duty was to keep enemy infantry away from the tank. A fifth crew member also came in handy when replacing broken tracks.

The Russians made three infantry assaults within an hour. Mortar and tank rounds were still sporadically impacting in Herend. Rauch used his periscopes to maintain 360-degree visibility, ensuring that the enemy was nowhere near his vehicle. This was very important because with no infantry support, the tank commander was the only one who could ensure that enemy infantrymen did not approach his tank from behind. He also observed the tanks to his left and right to spot any infantry approaching them.

He knew that his other tanks were also watching him. In past engagements, his section's tanks had cleared each other of enemy infantry by firing on each other with machine guns.

Convinced that no Russian armored vehicles were participating in the assault, he had his gunner aim the main gun at the infantrymen while the loader fired the coaxial machine gun. The Germans halted all three assaults. Hundreds of dead Russian infantrymen littered the cornfields, some within 100 meters of the defensive positions.

The final infantry assault had not yet died down when Rauch spotted a formation of tanks moving in a wide circle long the left flank. He counted 14 *T34s* and reported this immediately over the radio. The German Army trained all personnel to take the initiative to call in spot reports. This facilitated action because it was not necessary for key leaders to keep an eye on everything in their sector of responsibility. Sixty alert, knowledgeable observers in each company were exponentially better than only two or three.

The only reply to Rauch's report was, "Headquarters section, engage." After his gunner squeezed off the first round, the radio crackled with reports of 17 *T34s* moving along the right flank. The company occupying the center-right sector received the order to engage that formation. Rauch realized that the Russians were attempting to envelope the railhead. He had not had time to engage another *T34* before the formation on the left flank pulled back, leaving four burning hulks behind. Staring in disbelief, the young tank commander saw that the same was taking place on the right flank, though no more than five *T34s* were burning. The Russian commander was not accepting any more losses.

There were now very few tanks left around the perimeter. Several teams of soldiers, armed with MG34s and *panzerfausts*, assumed positions on the edge of town to ward off attacks. A flight of *IL-2* ("Iron Gustav") ground-attack bombers appeared without warning over the railhead. The crews manning the flak cars (reinforced concrete rail cars carrying anti-aircraft guns) needed no orders to engage the aircraft. "Don't worry," shouted Ennsberger, "the safest place is at the target." This was indeed true, because the Russian aircraft attacked as they always did, perpendicular to the train rather than along the length of it. The bombs fell many meters short of and past the target, inflicting no damage on the train. As more machine guns joined in, the wall of tracers terrified the pilots, causing them to drop the rest of their bombs and fly east. The Russian Air Force was by no means as tenacious as the Red Army. A crusty old *hauptscharfuehrer* (master sergeant) remarked, "If those had been American planes, we would all be dead."

Peter Rauch's tank was the second-to-the-last tank loaded onto the rail car. Before moving to the railhead, he destroyed another *T34* that attempted to infiltrate Herend. As he approached the ramp, he saw the *Panthers* on the rail cars firing towards the Russians, each shot rocking the cars violently. Soldiers on the ground were shouting warnings, frightened that the rail cars would tip over. "Would you rather be captured?" shouted back one of the tank crew members. Rauch had his gun tube over the tank's back deck, but told his gunner not to fire until they were set on the train. He then noticed he was on the last remaining rail car. As soon as his tank stopped, the train began slowly to pull out. He stared incredulously at the tank remaining on the ramp, a lone *Panzer IV*, realizing that it had lost its spot to save an additional *Panther*. Anger flashed in Rauch's mind. Soldiers of the Waffen SS did not leave their comrades behind, even if there were not enough rail cars present. Only then did he see 10 *Panthers* approaching from the south, firing on the Russian positions. This must be the regiment's 4th Company, commanded by *Unterstumfuehrer* (second lieutenant) Knocke. The *Panzer IV* was not alone after all. Sporadic

"...The Veszprem action also illustrates the importance of teamwork and swift target identification. Units must practice standard operating procedures so that all actions are automatic. All units, down to individual tank crews, must have the discipline to hold their fire until ordered to fire...."

high explosive shells were still impacting in Herend as the train pulled clear of the village.

All of the tanks on the train escaped, reinforcing a new defensive line forming farther west. The 2nd SS Panzer Division's ability to withdraw the majority of its armored force intact prevented that portion of the Eastern Front from collapsing. Actions such as this could no longer win the war, but extended it several weeks. This enabled thousands of refugees to make their way west, escaping life behind the Iron Curtain.

Unterstumfuehrer Knocke's company joined a regular army unit and fought its way through the Russian lines. Although Knocke's company was behind enemy lines, the unit's discipline preserved its fighting spirit. The men had confidence in their commander and in themselves. All 10 *Panthers* were destroyed in numerous fire fights, but most of the crew members rejoined their regiment at Esterhazy eight days later.

This small military operation stresses that there is no such thing as a secure railhead during wartime. The forward line of troops can change quickly, with enemy armored spearheads penetrating far into the friendly rear area. Even if enemy units are far away, there is still a great possibility of enemy agents operating in the railhead area. Units should train for these possibilities so that soldiers do not panic if such situations arise. All weapons systems not directly involved in the loading operation must deploy quickly to repel the attacker. If a prolonged defense is necessary, individual vehicles must break off, one by one, to load onto the train. As the outer defensive perimeter becomes thinner, vehicles already on the train must use their firepower to supplement the defense. Makeshift antitank and machine gun crews are the final defensive measures if no infantry support is available. Such an operation is very difficult, but by no means impossible.

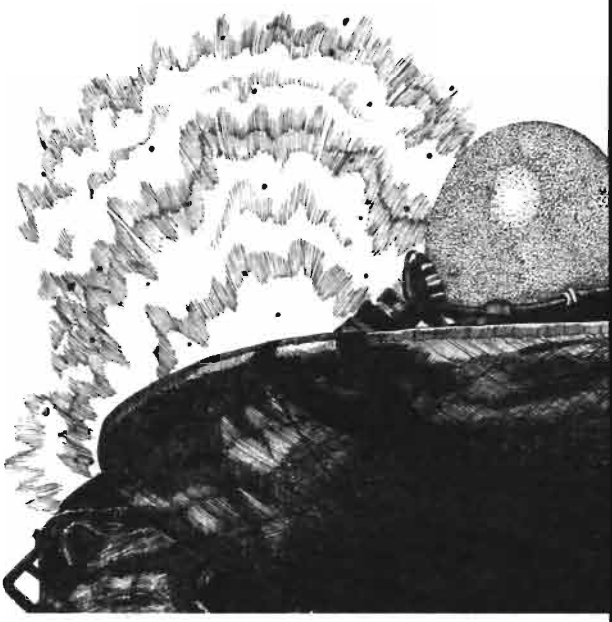
The Veszprem action also illustrates the importance of teamwork and swift target identification. Units must practice standard operating procedures so that all actions are automatic. All units, down to individual tank crews, must have the discipline to hold their fire until ordered to fire. This conserves ammunition and ensures engagements at decisive ranges, both of which are very important when fighting a numerically superior enemy. The Germans did this very well at Veszprem. Individual companies engaged the entire target group, rather than the whole regiment firing at will. They held out for six hours using this system, but used only a fraction of their ammunition. The key link in this system is one overall commander. If no organic commander is present, a senior individual must take charge, or the units will begin to fight separately.

Finally, Peter Rauch's crew portrays how vital it is that a tank's crew members work together as closely as the fingers on one hand. Each crew member must be thoroughly familiar with the others, and know how they will react in all situations. This saves valuable seconds of reaction time, and gives the crew a decisive edge over the enemy. To keep tank crews together as long as possible is the only way to develop such teamwork. The German Army stressed crew integrity. Wounded soldiers always returned to their crews after convalescence, and crews were never split up unless promotion or death made it impossible to do otherwise. The Veszprem operation typifies the results of this system. High quality crew-teams are the key to destroying enemy tanks.

Captain B.H. Friesen was commissioned in Armor from the USMA in 1983. He has served as an M1 tank platoon leader and company XO with 1st Bn., 64th Armor; and assistant S4 at 2d Bde. in the FRG. A graduate of the AOB, AOAC, Airborne School, and Cavalry Leaders Course, he is currently assigned to 3d Sqn., 3d ACR at Fort Bliss.

Tactical Tank Gunnery

by Lieutenant Colonel Lon E. Maggart



"...The evaluators are often the best teachers available to our soldiers..."

The preparation of soldiers for combat is the first and foremost mission of every maneuver commander. Armor commanders, in particular, know that both tactics and gunnery are integral to fight the tank successfully. Why, then, should soldiers train to accomplish them as separate tasks?

Lieutenant Colonel Bill Hansen made these points in a recent *Armor* article, in which he described a program to align tank gunnery training with actual battlefield requirements. (See "Integrating Tactics and Gunnery Training," March-April 1985.)

At almost the same time that article appeared, 2-69 Armor, 197th Infantry Brigade at Fort Benning, Georgia, built a similar program tailored to a tank battalion. The battalion developed the tactical gunnery programs because units must train precisely as they expect to fight.

There are several good reasons to combine tactics and gunnery. The most important is the limited training space and time available to the Army today. By developing a program in which tactical skills are always included as a part of gunnery training and vice versa, the commander can accomplish several training tasks simultaneously and save both time and space. Secondly, by combining tactics and gunnery, the distinction between the two is soon blurred, and soldiers quickly begin to think about tank fighting as an integrated operation in which both skills are essential for success. This thought process will eliminate field training exercises and external evaluations in which gunnery skills seem to be superfluous to the training objective. Finally, such integrated training rapidly makes unit SOPs important documents, and standardization becomes rampant in the unit. Soldiers will begin to "think" that they are fighting, not just training, because the difference has been eliminated.

While any unit can develop a tactical tank gunnery plan, unless it is part of a total program in which component tasks are related to one another logically and in support of the unit's purpose, it will not necessarily be successful. A good training program of any kind must describe the commander's desired outcomes before the unit expends any resources.

Pre-training Evaluation

To that end, the leadership of 2-69 Armor developed a comprehensive program of planning, executing, evaluating, and providing feedback for specific tasks with the National Training Center (NTC) as the focus for unit training. In order to improve the tactical skills essential for success at the NTC, we evaluated unit performance on those skills to determine what needed additional emphasis. The abilities to accurately engage and destroy enemy targets, to maneuver the tank tactically, and to find and occupy positions that offer cover and concealment were high on the list. This evaluation revealed that the existing battalion gunnery program did not train tank crews to accomplish these tasks very well.

The solution to this complex problem was to build a gunnery program in which tank crews stayed in a constant tactical state throughout the training period. This and fanatical adherence to the standards set forth in FM 17-12-3 produced substantially higher kill ratios during subsequent force-on-force and live fire phases at the NTC than the unit's previous rotation.

From a training management viewpoint, the commander can tailor such a program to meet available range and ammunition constraints

"...The precombat inspection is an excellent opportunity for the company commander and his officers and NCOs to train subordinates...before training starts in earnest. It is also the first step toward the team-building process necessary for survival in combat — and at the NTC...."

and the normal training distractors that any unit experiences. Because an OPORD governs its execution, FRAGOs can make any adjustments easily and effectively,

To prepare for the gunnery period, each company commander prepares a plan that provides specific guidance to his platoons based on battalion goals and objectives. This plan must include specific company requirements and concurrent training. A typical battalion gunnery program begins with preliminary gunnery training that the company commander and his master gunner design to meet the special requirements. The company program considers past crew performance, previous training and unit commitments during the train-up period.

In addition, emphasis is on vehicle maintenance during this phase. Beginning with the last service before the gunnery period, the turret receives a thorough check, which includes borescope and pullover, sight purge, synchronization, and ballistic solution checks.

Setting Up Assistance Teams

To reach the desired high gunnery standards, we organized a battalion tank gunnery assistance team (TGAT) well before we started training. The company master gunners and the best tank commanders and gunners form the nucleus of the team. The gunnery team conducted the tank crew gunnery skills test (TCGST) and selected the tank crew evaluators (TCEs) who evaluated company and battalion training during the remainder of the gunnery period.

While many units have de-emphasized the role of the evaluators, we found them to be a significant aid in evaluating crew performance during training and qualification. More important, the evaluators are often the best teachers available to our soldiers. While it is possible to evaluate crew functions from the tower, it is unlikely that the crew can learn how to shoot more effectively without an on-board expert (coach) to provide meaningful comments at the conclusion of each run. The evaluator also kept everyone honest by ensuring that the crew followed the rules. The battalion master gunner certifies each member of the assistance team and each evaluator before training begins.

The battalion's first centralized gunnery training was the crew gunnery skills test. The master gunner and the S3 validated the test to ensure that instructions, evaluation, and goals were in accordance with battalion guidance.

The success of the gunnery program first became evident during the gunnery test as soldiers quickly learned that we would enforce high standards of gunnery performance. No one, including the battalion commander, was allowed to proceed to the next tank table until he had mastered the test. The company commander can conduct additional concurrent training if he desires. MILES gunnery techniques, terrain driving, wingman training, and platoon obstacles are examples.

Upon completion of the company gunnery skills test, the battalion commander conducted a precombat inspection of personnel and equipment.

Precombat Inspections

The precombat inspection is an excellent opportunity for the company

commander and his officers and NCOs to train subordinates and attachments on the unit SOP and the standards expected before training starts in earnest. It is also the first step toward the team-building process necessary for survival in combat — and at the NTC. The battalion commander can get a feel for NCO proficiency, leadership, and SOPs in each company. Following the inspection, each company conducted an evaluated tactical road march of at least two hours duration in accordance with a battalion march table. This road march can be especially beneficial to the company commander because it allows him to shake out the bugs in his command and control system and to train with his SOP. A quartering party preceded the main body into a tactical assembly area near the next range. The quartering party adhered to specified ARTEP standards, including NBC monitoring, security measures, selection of positions, establishment of land line communications, and road guides. As part of the company program, commanders conducted the road march under simulated NBC conditions, in MOPP status, at night, with an attack enroute, under NCO leadership, under the control of the executive officer, or in any other way that has significant training value.

Building Cohesion at the Platoon Level

The company is responsible for the initial tank tables and the tank crew proficiency course, which comprise the next phase of training. The platoon leader and platoon sergeant conduct this training to foster platoon-level cohesion. This step is essential to develop the platoon leader and those skills necessary to make the wingman concept work.

The execution of OPORDS, map reading, graphics, and reporting procedures receive emphasis in this phase of training. It will not be uncommon to note an improvement in platoon leader skills from just listening to the dramatic increase in their levels of confidence on the radio. This improvement can occur in as little as three days of intensive training and is generally accompanied by a noticeable decrease in the number and duration of radio transmissions on the platoon net.

The important point here is that all training after the gunnery skills test was linked to the unit's tactical mission. This provided a mechanism to evaluate individual and unit performance on the component tasks of the battalion's overall mission.

The company commanders included whatever tactical training events they wanted during the preliminary gunnery phase. For example, each company could have an obstacle-breaching drill that included engineers during the TCPC or by the tank platoon alone. These skills have direct application at the NTC, in both the force-on-force and live fire phases.

The battalion incorporated MILES into the TCPC. This provided a direct link between gunnery training and success against the OPFOR at the NTC. Finally, during the preliminary phase, the company commander further developed his SOP, communication between him and his platoon leaders, and continued the team-building process. The company commander is free to concentrate on tactics because the company master gunner focuses on the technical aspects of gunnery.

The battalion standard for the TCPC was that each crew must demonstrate proficiency before it could continue to TT III and IV. We programmed sufficient time for the company commander to conduct as many repetitions as necessary to ensure that the crews mastered basic skills. MILES feedback gave a real-time evaluation of crew progress and reduced the repetitions necessary before crews achieved proficiency.

Because the crews had some respite from the rigors of garrison duties, they could devote a few uninterrupted hours to honing their field maintenance skills. In our case, the long road distance from garrison required commanders to plan training in such detail that they eliminated numerous shopping trips to pick up equipment, personnel and supplies. Because detailed planning is the key to success at the NTC, commanders got in the habit of doing so early in the training period. At the conclusion of this phase, the company commanders were required to make a tactical reconnaissance of the next range.

An Unfamiliar Range Poses Added Challenges

Due to construction of a new multi-purpose range at Fort Benning, the battalion had to use a nonstandard range for tank gunnery during the development of its tactical gunnery program. This proved to be particularly advantageous because the nonstandard range was a natural area with trees, high grass, rolling terrain, and few range markers or observable target pits. To develop a qualification program on this range placed a premium on map reading skills, selection of firing positions, terrain driving, and target acquisition. We conducted the movement to and occupation of the tactical assembly area most often at night under the watchful eye of an evaluator. The company performed all normal assembly area procedures including a tactical ammunition up-load and a refueling operation, usually by platoon.

Before range firing began, the company commanders planned for a calibration exercise and TT VI as a tactical operation. Because of the nature of these two events, one platoon could fire, while the others remained concealed in the assembly area and worked on prepare-to-fire checks and concurrent training. Units should be encouraged to be imaginative during this phase because they can learn many tactical lessons with little or no expenditure of resources. To illustrate the point, one platoon firing on the calibration line can use camouflage nets, establish a hot loop, and practice reporting procedures according to the unit SOP. The platoon leader is now able to practice platoon fire commands while he runs the exercise. The company commander should use this time to check load plans and crew drills. Meanwhile, battalion sets up a sand table exercise to train leaders on the control and distribution of fires and intelligence preparation of the battlefield (IPB).

The point is that no matter what the primary training objective, units can practice many tactical skills from crew to company level in almost any environment. All that is required is attention to detail, concentrated planning, and some imagination. More important, the effort to reduce the distinction between gunnery and tactics continues in a subtle but effective manner.

Tactical Movement to the Range

Late in the day, when TT VI is to be completed, the company commander issued a warning order, followed by an OPORD and overlay to NTC standards, which set the stage for TT VIII. Using the "one-third, two-thirds" rule, the company commander prepared a company order for his platoon leaders. The intent was to practice the steps necessary to give each tank commander an order and overlay in a timely fashion. This is important because failure to receive and to understand the commander's intent at platoon and crew level has proved time and again to be the weakest link at the NTC.

"...We conducted the night phase similarly, except that we incorporated night tactical operations techniques. We used light sticks to mark routes and firing positions. Wingmen used night vision devices both for training and safety..."

The S3 controlled execution of TT VIII with assistance from the battalion master gunner and the gunnery assistance team. This group planned target location, engagements, tower and wingman scripts, and certified all evaluators working the range. The company is responsible for providing firing tanks and wingmen at the specified time and place.

In executing the OPORD, the tank crew, under the control of his wingman (who was always the company commander, platoon leader or platoon sergeant) departed the tactical assembly area at the designated time along a prescribed route to the first checkpoint on his overlay. Some company commanders used the link-up time to evaluate responsiveness to orders.

The use of on-board smoke as part of the movement criteria, and the use of some or all of the passage point procedures specified in the ARTEP are options available to the company commander as part of the training package. Some company commanders chose to use the initial checkpoint as an attack position to evaluate crew performance in accordance with his unit SOP. In any case, the crew should test-fire machine guns at the first checkpoint, then proceed down the qualification course.

The tank commander's overlay had all necessary graphics to portray correctly the tactical situation, including a series of points that roughly corresponded to the firing positions. The tank commander navigated between each checkpoint, using terrain driving. The wingman issued specific target instructions to make the exercise tactically meaningful, but conducted all engagements in strict accordance with FM 17-12-3.

At the last engagement, the tank commander received a spot report on some type of enemy activity that required him to make a call for fire. He had to execute the request correctly within thirty seconds. If he did so, the battalion heavy mortar platoon executed the call for fire. In addition to the obvious benefits for the tank crew, the mortar platoon received excellent training in integrating their fires into the tactical scheme. Because the mortar platoon historically has difficulty with tactical integration at the NTC, this element was a positive effort to solve that problem.

"...The benefits were substantial in leadership development, mastery of gunnery skills, performance at the NTC, and most importantly, the elimination of the distinction between tactics and gunnery...."

Practicing Night Operations In Conjunction with Gunnery

We conducted the night phase similarly, except that we incorporated night tactical operations techniques. We used light sticks to mark routes and firing positions. Wingmen used night vision devices both for training and safety. Wingmen called for illumination to add realism and to further train the younger leaders. We used unit recognition signals at the attack position and throughout the exercise. The outbrief included night tactical operations to assist tank crews in becoming more expert under those conditions.

Summary

The most important benefits of this gunnery program are total crew involvement in the integration of tactics and gunnery, and the tactical development of the platoon leader and sergeant in bringing effective tank fires on the enemy. We accomplished these important lessons through the tactical nature of the program and by using the chain of command as wingmen. The company commander, platoon leader, and platoon sergeant were responsible for directing the movement of their wing tanks, providing engagement instructions, and for observing fires. In the process, they gained the mental and oral communication skills necessary for survival and success on the battlefield. The interaction between tanks on the range stressed the development of a mental picture of desired battlefield outcomes in the minds of the junior leaders and exercised the communication skills necessary to convey that picture to subordinates in the wing tank, all in a short radio transmission.

At the conclusion of each run, both the tank crew evaluator and the wingman debriefed the crew using the after-action review format. Tower personnel provided input for the briefing to bring out strengths or weaknesses that they noted. The debriefing was a formal presentation of each engagement, which included crew cuts and the score. We used the debriefing as the primary teaching tool throughout the gunnery program because it represented a thorough evaluation of all tactical and gunnery skills. An important feature of the debriefing was that the crew's own platoon leader or sergeant was a participant. In addition to the team-building benefits, the crews helped their wingmen to become better leaders and communicators by pointing out deficiencies in technique or instructions during the engagements. At the conclusion of TT VIII, the company either continued on to TT IX or returned to the motor pool.

The conduct of such an extensive gunnery program required a reasonably large expenditure of manpower from the battalion. However, the benefits were substantial in leadership development, mastery of gunnery skills, performance at the NTC, and, most important, the elimination of the distinction between tactics and gunnery. Graduates of this program are tank fighters who have the skills and desire to meet the enemy and to destroy him.

Lieutenant Colonel Lon E. Maggart commanded 2-69 Armor, Fort Benning, Georgia, from April 1984 to April 1986. He is presently assigned to the Inspector General's Office, HQ, V Corps, in the FRG.

The Battalion XO in Combat: Where Will He Be Most Effective?

by Captain Ronald M. Bonesteel

Among the more significant points discussed in After-Action Reviews (AARs) at the National Training Center (NTC) is that of the physical location of the battalion executive officer (XO) prior to and during an engagement.

The XO's primary consideration is to place himself where he can best fulfill his responsibilities to the commander and to the battalion. This is such an obvious fact that it hardly seems worthy of discussion, but like too many crystal-clear factors, it is often overlooked simply because it is out in plain sight.

In order to determine the XO's best (most functional) placement in battle, we must first review his most important duties from the battalion commander's point of view--and by doctrine. Opinions vary on just where the XO should be during battle. They range from that which says the XO is primarily responsible for the Combat Service Support (CSS) function and should work from the Brigade Support Area (BSA), to that which says the XO's main function is to coordinate the entire battalion staff and to monitor the information flow between battalion and brigade. This latter premise holds that the XO should be at the Tactical Operation Center (TOC). A third theory holds that the XO should be forward in the battalion's secondary effort area where he can keep abreast of the ongoing battle. Yet another proposal would place the XO at the TOC during the actual fight and then have him free to circulate from front to rear areas, as needed, during lulls. All of these opinions take into consideration that the XO may have to assume battalion command at a moment's notice.

For the purpose of this article, I chose four criteria to evaluate the courses of action in placing the XO:

- Ability of the XO to coordinate the staff.
- Ability of the XO to assume command.
- Ability of the XO to control the CSS effort.
- Ability of the battalion to react to changing battle situations and flex missions.

The first three items specifically delineate the XO's three most important doctrinal responsibilities, and the fourth provides a cause-and-effect relationship between the XO's actions and the battalion's success. Therefore, how the XO's position affects each of these four criteria becomes the major determining factor in deciding his location.

General Information

In 1984, Major Generals Frederick J. Brown and John W. Foss, commandants of the Armor and Infantry Schools respectively, sent a message to LTG Carl E. Vuono, the TRADOC commanding general, that gave their interpretations of the duties of the XO:

Keep abreast of his own, higher, lower, and adjacent unit operations...anticipate future requirements and oversee the planning process... eavesdrop on his own and higher command nets...report to and relay orders and messages from higher headquarters...coordinate the execution and planning of the CS and CSS operations...take over a combat vehicle and become directly involved in the battle as directed by the commander, and be prepared to take command.... Additionally, FM 71-2J outlines the requirement for the XO to transmit the commander's guidance to the staff and to coordinate the staff in its efforts to fulfull that guidance.

The TOC responsibilities are many and complicated, but its primary job is to keep the commander informed on all aspects of friendly and enemy situations during battle. In addition to this all-encompassing requirement, BG Leland, a former NTC commander, says the TOC must provide the commander with all of the information in a consolidated and analyzed form; it must remain stationary at critical times and must provide reflex responses, such as dropping to internal nets of unanswering companies, relaying for distant stations, and checking compliance with the commander's instructions.

TOC manning is composed of the battalion S2 and S3 sections, and

the fire support element (FSE), for a total of 20 officers and soldiers. FM 17-17 states that if the XO does not supervise the TOC; the S3, or one of his assistants, will fulfill that role. It also states that if the XO is not forward on the secondary effort, the S3 will be there.

If, in that case, the XO is supervising the CSS effort, the S3 will be at the secondary effort, leaving the TOC under the supervision of the assistant S3. This can lead to trouble if this officer is young and inexperienced. Also, his rank may tend to cause problems when he deals with staff officers or company commanders. The young captain who can run the TOC and make decisions in the absence of the commander, as the XO or S3 would do, is a rare person, indeed. Here again, it is a lack of experience, not a lack of motivation, that hampers this young officer who has received a job far above his trained capabilities.

The negative results of situations such as these are documented in the 1981 and 1982 NTC observation reports.They indicate that this technique, which was often used at that time, often resulted in a TOC that operated ineffectively as a command and control facility during battle.

Another point to remember in placing the XO is that FMs 17-17 and 71-2J state that the locations of the TOC, combat trains, and field trains behind the forward line of own troops (FLOT) are 4-10 km, 4-10 km, and 20-25 km, respectively.

In the TOC

Those who hold that the XO should operate from the TOC present these arguments:

When stationed at the TOC, the XO is on the spot to coordinate the staff's planning efforts during battle. He has information from all levels of command at his immediate disposal. He can talk to any member of his staff through the battalion command or admin/log nets during the battle. Immediately following the battle, he has access to the commander to help develop or ascertain the commander's concept for the next operation. Once the S1, S4, and BMO have moved forward to the TOC, the XO has his entire staff on hand and can distribute the requirements for fulfilling the commander's intent. Before the new order is published, the entire staff is at the TOC, and the XO can ensure that all aspects of the operations order (OPORD) are in synch. Lastly, the XO can oversee any coordination between company commanders and staff officers that might take place at that time.

"...We gain very few advantages in placing the XO on the battalion's secondary effort...."

Although the XO's ability to assume command from the TOC is limited because of his distance from the FLOT (4-10 kms) and his lack of a personal combat vehicle at the TOC, the XO has the latest information on the battle and is, therefore, better able to assume command than if he were in the trains area or in the secondary effort area. Although the XO has only a limited capability to control the CSS effort from the TOC, he is in contact with his S1, S4 and BMO via radio and will have personal contact with them during the initial planning phase and during the OPORD sequence.

Finally, his access to large amounts of information, his staff and the commander's, as described above, combined with his experience and the force of his presence as second in command of the battalion, enables the XO to take immediate action upon receiving a flex mission from brigade, or upon noting a significant change in the overall situation. This, in turn, enables the battalion to better react to flex missions and the changing situation.

In The Secondary Effort Area

We gain very few advantages in placing the XO on the battalion's secondary effort. While there, his ability to coordinate the staff during the battle is severely limited, and if he has to assume command, his available battle information will be much less than that which he would have had at the TOC. However, there are those who feel that the XO would be in a superb position to assume command from the secondary effort because he would be physically involved in the ongoing battle. On the other hand, his view of the battle would be strictly limited to what he would see through his periscopes, and he would not have the overall view he would have had at the TOC.

Also, to place the XO at the secondary effort would restrict his ability to move freely as far back as the field trains to coordinate and supervise their efforts between battles. If the battle unexpectedly resumes, or he has to suddenly assume command, the XO will be many kilometers behind the battle line. If, on the other hand, he chooses to go

no farther back than the TOC, he will not be able to personally supervise any of the CSS effort.

Finally, with the XO in the secondary effort area, the S3 will supervise the TOC. Although the S3 will supervise the TOC better than one of his assistants, he usually does not have the experience, nor the authority that the XO has. Therefore, the diminished ability of the S3 to start the staff planning process will reduce the ability of the battalion to react to flex missions and changing situations.

The Trains/TOC Areas

Those who hold that the XO should work in the trains/TOC areas during the planning phase of the battle, and in the TOC during the battle, argue that to work between the TOC and the trains during the planning phase, the XO can supervise the planning preparation and coordination of his entire staff. He has them physically at the TOC for initial guidance, he can spot-check them in the trains area and forward, and he has them together again at the TOC for the OPORD sequence. Furthermore, he has the same capabilities during the battle as he did when he worked exclusively out of the TOC area.

In The Trains

Arguments against placing the XO in the trains area include the limitation of his ability to coordinate the efforts of the staff from there. Because the CSS effort depends upon the tactical plan, the XO must move to the TOC accompanied by at least the S4 to ensure the proper coordination of the CSS effort in support of the upcoming operation. Staff coordination during the battle is even more difficult because of the XO's separation from the tactical planning staff (S2/S3) and the reduced amount of information available there.

The XO's ability to assume command from the trains area is only fair. He is 4-25 kms behind the FLOT and without his own combat vehicle. Although the administration/logistics center (ALC) should maintain a situation board, its emphasis is in monitoring the CSS effort and it can give the XO only limited overall battle information. If he has to assume command, the XO would do so under constrained circumstances.

Although the XO would be available immediately in the trains area to resolve conflicts that might arise between the S1, S4 and BMO, this is not his primary responsibility.

Finally, with the XO in the trains area, the TOC is under the command of a junior and, very likely, an inexperienced officer. As discussed above, this usually results in a TOC that operates poorly as a command and control facility. As a result, there will be a reduction in the battalion's ability to react to flex missions and changing situations.

Conclusions

The final analysis supports the opinion that the XO should be free to move between the trains areas and the TOC during the planning stages and then remain at the TOC during the execution stage. By following this course of action, the XO will be able to best perform his staff supervision and coordination functions before and during the battle, and be on the spot with the best information to assume command during the battle if required.

The 1985 NTC Observation Notes state quite clearly that units at the NTC needed their XOs to supervise CSS efforts, primarily during the planning phase, in order to be consistently successful. They also noted that the success of the OPFOR was directly related to their XOs being at the TOC during the battle. Furthermore, a random selection of 15 battalions at the NTC showed that four of them did not use their XOs at their TOCs during the battle. Of these, three had poor TOC operations in command and control. The 11 battalions that used their XOs at the TOC all received favorable results in TOC operations.

These are suggestions--suggestions backed by NTC Observation Notes and other reliable factors, but suggestions nevertheless. They are not infallible--nothing is in battle, but they offer an excellent choice from which to start, and one that will be successful. We cannot overlook the importance of the XO in a consistently well-run operation. It will serve battalion commanders well to place him where he can do the most good for the longest period of time.

Captain Ronald M. Bonesteel was commissioned as an infantry officer from West Point in 1979. He served as a rifle platoon and weapons platoon leader in Korea and as a scout platoon leader, CS company XO, battalion S1 and S4, and company commander at Ft. Riley, KS. A graduate of the AOAC and Combined Arms and Services Staff School, he is currently attending Harvard University for graduate studies in training for his secondary as a Russian and East European foreign area officer.

An Electric Transmission for Armored Vehicles:

A Designer's Dream Realized at Last

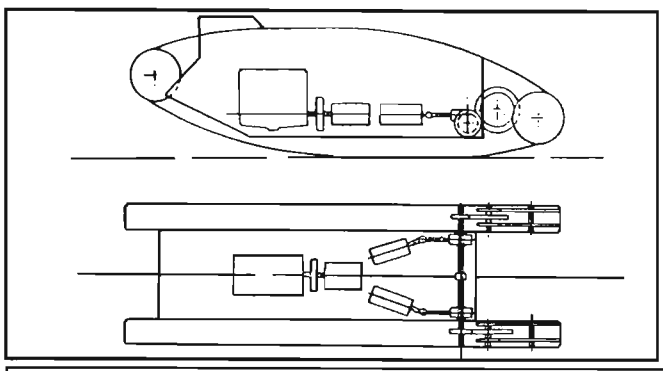
by Raymond Surlémont

The design of an armored fighting vehicle can only be a three-way trade-off between firepower, protection, and mobility. A tank that gives its crew good protection is necessarily heavily armored. This cuts down its tactical mobility, making it an easier target.

On the other hand, a heavy and powerful armament adds weight to the vehicle, trading off mobility and weight available for armor protection. This leads to a vicious circle in armor design. Heavy weights and big volumes also make transportation over long distances very difficult.

In the case of an armored personnel carrier, the problem is all the more complex because this type of vehicle needs not only space for its crew but also maximum room for a maximum number of passengers in acceptable comfort. On the other hand, to minimize its vulnerability it needs as low a silhouette as possible. These opposing requirements, compactness and usable space, present the military engineers with choices leading to a compromise.

Below, the power transmission layout of the WWI-era Daimler Petrol Electric tank drive.

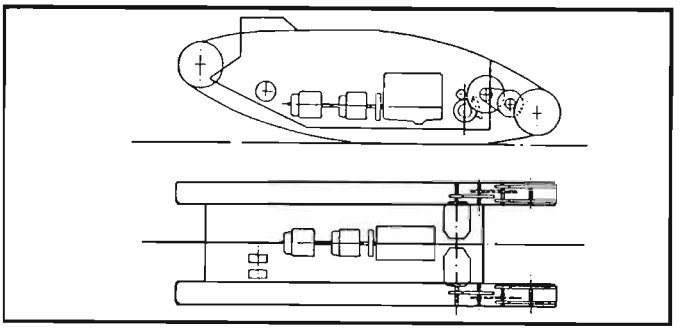


Because men are not compressable and need enough room to live and fight within the vehicle, the obvious solution is to reduce the dead weight and volume resulting from unnecessary mechanical components. Electrical transmission of power to the drive sprockets offers an interesting alternative to overcome the many design constraints that mechanical transmissions impose.

The mechanical transmission of the common tracked armored vehicle is composed of an automatic or semi-automatic gearbox, differentials or torque converters, shafts, universal joints, final drives and track drive sprockets. This setup imposes multiple design problems in weight and volume, as well as a mechanical complexity vulnerable to breakdowns.

By contrast, electrical transmissions eliminate the major part of weight and volume problems, resulting in overall design advantages.

Below, the layout of the British Westinghouse Petrol Electric tank propulsion system.



Electric current from a generator, rather than mechanical torque, moves through a cable to electric motors located at each drive sprocket, at a considerable saving in weight and volume. This permits improvements in the general appearance and compactness of the vehicle. Reversing the present circle in armor design permits the following advantages:

- Less volume to protect reduces the weight of armor necessary to achieve a given ballistic protection.
- Reduced weight results in a lower ground pressure, which improves the mobility of the vehicle on soft terrain.
- A lighter vehicle permits a suspension with external coil springs. This is lighter, cheaper, and easier to maintain than a torsion bar suspension, and it uses lighter tracks.
- These multiple reductions in weight require less automotive power, allowing the choice of a smaller, lighter, and more economical engine.

A smaller engine has a lower fuel requirement. The resulting tanks

are lighter and smaller for a given range of action.

Further advantages of an electric drive system are: high mobility, full automatic system, ease of driving, and modular conception. The latter makes it possible to place the thermal motor in front of the vehicle, and the electric motors at the rear, or vice versa, which allows not only good weight distribution, but also the use of identical drive components for different types of vehicles of the same family.

Not a New Idea

The idea of giving tanks electric transmissions is practically as old as tanks themselves. In 1917, the French company Forges et Acieries de la Marine et d'Homecourt (FAMH), built 400 *Saint Chamond* tanks (23 tons) fitted with a Crochat-Collardeau "petrolco-electrique" electric transmission. The tank's Panhard engine coupled directly to an adjacent compound dynamo. This dynamo supplied current to two electric motors, each one mounted over a drive sprocket and driving a track. A foot pedal, which operated the main rheostat for the two driving motors, controlled speed and also controlled the gasoline engine carburetor. A secondary rheostat also controlled each electric motor, thereby providing steering. A pole charger permitted reversing the current flow to reverse the driving motor.

Also in 1917, a tank went through trials in Great Britain with Daimler and British Westinghouse electric transmissions. The first one was on *"Mother,"* an early design model; the second was renamed *Daimler Petrol Electric machine* and used an upgraded (125 hp) Daimler engine with a dynamo directly coupled to it. Current went to two electric motors in series, each of which could be independently controlled by shifting the brushes. Each motor connected through a two-speed gearbox to a worm reduction gear, from which the drive passed through a further gear reduction to the sprockets driving the road chain driving wheels. By connecting the two worm-wheel shafts with a dog clutch, they obtained a differential lock.

The TOG, a WWII-era British tank design, used an electrical power transmission system, but was never produced for combat use.

At first, this transmission seemed so promising that the Tank Supply Committee ordered 600 sets. On tests, however, the tractive effort was too low and could not pull the tank out of a shell hole. After much controversy and testing, the committee dismissed the Daimler Petrol Electric transmission and cancelled all orders.

Commonly used on British trolleys, the British Westinghouse electric transmission, renamed British Westinghouse Petrol Electric machine, went into a *Mark IV* tank with a beefed-up (115 hp) Daimler engine. This engine, moved towards the rear of the tank, allowed room for two generators in tandem in front of it, with one exciter between them. There was one electric motor on each side of the tank behind the engine, each driven by one of the generators. These motors drove the track through double-reduction spur gears, chain, sprocket-pinion and sprocket wheel. Control was by a rheostat on the exciter circuit of each motor, and special reversing switches were so interlocked that they could not be operated before the current was switched off.

Considered as satisfactory in some ways, the British Westinghouse petrol-electric transmission was too heavy, noisy, and cumbersome for practical purposes.

In 1918, the United States carried out trials with the experimental *Holt Gas-Electric Tank*, built through the collaboration of the Holt Manufacturing Co. and General Electric Co. A high-speed Holt engine operated a GE generator, which provided the current to drive two electric motors, one for each track. Varying the current to the track-driving electric motors steered the tank; a brake on

each motor shaft held the track on the side toward the turn. With this transmission, the Holt tank weighed more than 20 metric tons, prohibitive for its size.

In France, Peugeot built a "petroleo-electrique" tank prototype in 1918, and, between 1919 and 1921, the Societe des Forges et Chantiers de la Mediterranee (FCM) at La Seyne, near Toulon, produced ten 70-ton tanks, type *2C*, with a more advanced system of electric transmission.

The Sautter-Harle and Alsthom electric transmission for the *2C* tank was ingenious but very heavy. It had duplicate electric generators to compensate for any possible power failure. Two six-cylinder petrol engines drove two direct current generators through an "elastique" connection. If one of the tank's engines failed, the crew could connect both tracks to the remaining working engine. Each of the electric driving motors received a 300-volt current, which enabled the tank to continue to move and mancuver in spite of the much reduced power and speed. A small auxiliary motor drove a generator that served the main generators which, in turn, acted as starters for the two petrol engines. The electric transmission for the *2C* tank weighed 16 tons, which was about 23 percent of the tank's weight.

After a 15-year eclipse, the French Societe d'Etudes et d'Applications Mecaniques (SEAM) resurrected the idea with the *Poniatowski* experimental tank constructed in 1936. In 1917, a "char de forteresse" programme – a tank capable of crossing Hindenburg Line obstacles and assaulting its blockhouses – led to the manufacture of a full size mock-up of an FCM *F1* tank, with an Alsthom electric transmission. Armed with a long 105-mm gun and 75-mm guns in two turrets, it would have weighed 145 tons. WWII brought to a halt other projects for tanks with electric transmissions, including an assault tank by ARL.

WWII Experiments

But WW II re-launched studies in this field outside of France.

In Great Britain, the British Electric Co. provided the electric transmission for the 65-ton *TOG*, built by William Foster and Co. in 1940. The diesel engine drove two main generators, coupled mechanically, which, in turn, powered an electric motor for each track. The vehicle speed was controlled by a foot accelerator pedal, which operated the diesel engine throttle, controlling the vehicle's speed. A hand lever controlling the motor and generator field strengths provided a further variation in the vehicle's speed. A steering wheel operated a potentiometer rheostat, which varied the relative field strengths of the two generators. To turn the steering wheel either way caused the opposite motor to receive increased voltage and power. The remaining motor sent power through its own generator to the outside track and assisted in the turn. It was also possible to reverse either motor independently and make a pivot turn. Air brakes could hold either track stationary for a skid turn.

In Germany, Ferdinand Porsche designed the electric-driven *VK-3001(P), VK-4501(P), VK-4502(P), and VK-4504(P)* projects. In 1943, his company built 90 *"Elefant"* (formerly *"Ferdinand"*) 65-ton tank destroyers, which had an electric transmission from Siemens-Schuckert of Berlin. Two parallel 300-hp Maybach engines drove a single generator, which supplied current to two electric motors. These were located in a separate transmission compartment and were linked to their respective rear-drive sprockets through a geared drive. Electrically operated, these gearboxes had a three-speed ratio available, forward or reverse, and a top speed rated at 20 km/h. A hydropneumatic assisted electric steering system had a final drive reduction ratio of 16.5:1.

After December 1943, the Germans tested the prototype of a 188-ton monster tank, named *"Maus"*. It was also equipped with a huge Siemens-Schuckert electric transmission, which included a tandem generator weighing 3,885 kg (8,547 lbs) and two electric motors weighing 3,770 kg (8,294 lbs), which drove simple reduction gears that could adjust to either road or cross-country operation and gave Porsche's mobile pillbox a maximum speed of 20 km/h. An airstream from the engine fan cooled generators, electric motors, reduction gears, and brakes.

Because there were few bridges capable of taking such a weight, the *"Maus"* had been designed to be submersible to an eight-meter depth. An attachable, single, big chimney served as air supply and emergency exit for the crew, as well as for cooling the electric motors. When a *"Maus"* had to cross a deep river, a cable from a second tank on the bank provided power. Once across, the first *"Maus"* would power the second one through the same cable.

The United States also had explored these ideas with a series of experimental tanks: the *T1E1* heavy and the *T23, T23E3, T25*, and *T26* mediums. They had a GE electric transmission. The 250 tanks produced never saw combat.

In 1944, the Soviet army carried out trials with a prototype (*IS-IE*) of the *Stalin* heavy tank, with an electric transmission and a modified running gear.

Up to this time, electric transmissions proved to be considerably heavier – three tons in the case of the British *TOG* – than an equivalent mechanical drive, although easier to control and readily applicable to the steering of the tracked vehicles.

In the mid-1960s, the FMC Corporation conducted experiments with a *M113* APC with both AC and DC types of electric drive.

Ten years ago, a Belgian electrical and engineering company, the Ateliers de Constructions Electriques de Charleroi (ACEC), undertook the design and development of an electric transmission system for tracked armored vehicles. The company drew on its experience in the field of electric transmissions for locomotives and tramways. Its preliminary experiences of an electric drive on an *M24 Chaffee* light tank, and then on an *AMX-10P* APC, convinced the engineers that only an entirely new design would fully realize the potential of the electric transmission.

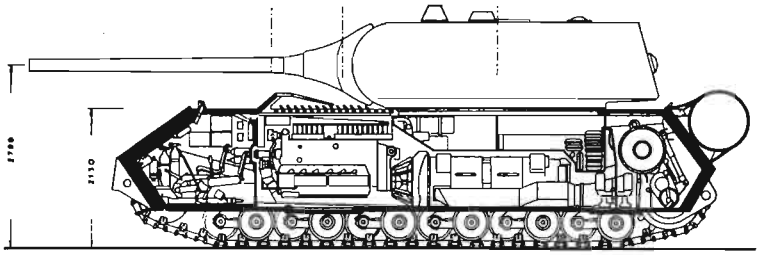
This was the starting point for the design of the *COBRA* MICV on which studies began in 1976. A first prototype (P1) in mild-steel appeared in May 1978, fifteen months after its start on the drawing board. Two other *Cobra* prototypes (P2 and P3) appeared in armor plate in 1980, with various technical improvements (tracks, air conditioning, final drive). The Belgian Army's Military Board supervised trials of the *Cobra* (P3) at the Belgian Army's Proving Ground at Brasschaat. The *Cobra* (P3) trials resulted a new prototype (P4) at the end of 1983. In September 1984, technicians from the U.S. Army's Tank and Automotive Command (TACOM), visited ACEC and examined and tested the vehicle. From mid-1984 to May 1985, the Cobra (P4) underwent official trials at Brasschaat and at the maneuver terrain at Marche-en-Famenne.

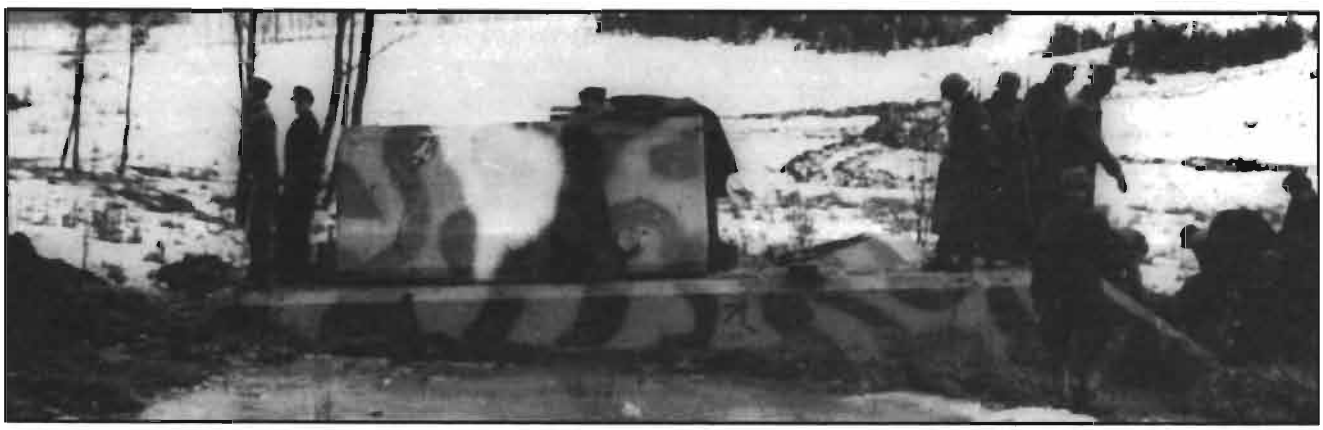
In October 1985, a pre-production vehicle, the COBRA-41 Mechanized Infantry Vehicle, left the ACEC factory in Ghent. It was followed in August 1986, by a Fire Support Vehicle, the COBRA-90 light tank, armed with a 90-mm gun.

ACEC Electrical Transmission

The ACEC electric transmission system for its Cobra vehicles is very light and efficient and consists of an

At 188 tons, the huge German Maus heavy tank used electric drive but never got beyond the testing phase. The Maus being tested in photo has a large weight in place of the turret seen in plans at right.





The Cobra 90 light tank, above, and the Cobra 41 APC, at right, are both powered by electric drives, but the powered sprockets are at the rear on the APC and at the front on the Cobra 90. The two vehicles illustrate the flexibility of layout possible with electrical drive. A diesel engine drives the electrical generators in both vehicles.

alternator, a rectifier and two electric sprocket motors.

The alternator is of the flywheel type, without endshields. The rotor is of the salient-pole type with annular field winding. It replaces the original flywheel and carries the starter ring. This construction does away with endshields and couplings. It is very simple, reliable and light. The rectifier is integrated into the alternator stator and is composed of a double silicon diode bridge (six components), and is cooled by the alternator's fan. This diesel-electric power group occupies the same space as a normal diesel engine.

The sprocket motors include a two-stage road and cross-country planetary reduction gear, which integrates a hydraulically actuated, oil-bathed, multi-disc brake. Because the wear is negligible, these brakes require no maintenance work.

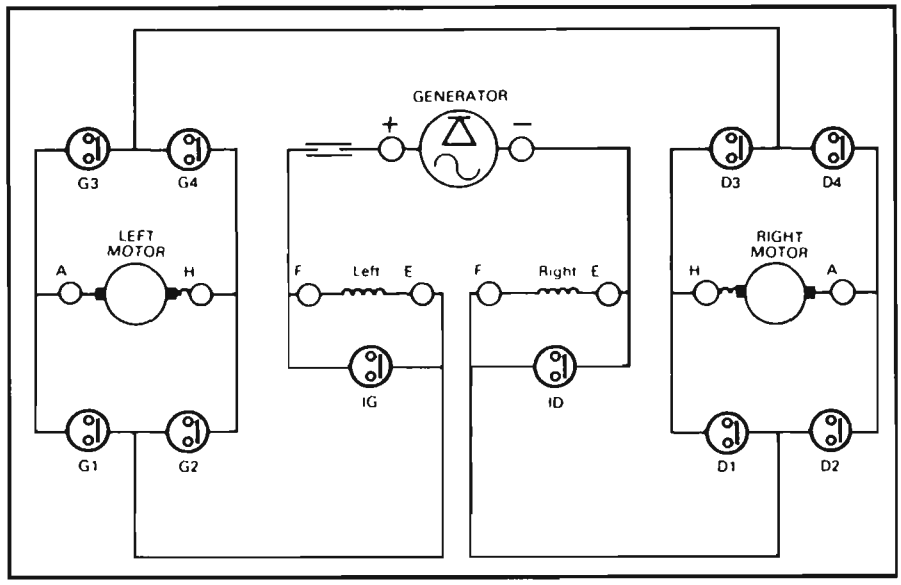
The driver has few controls: two direction levers and an accelerator. The driver has no gears to change, and he can select the automatic final reduction gear ratios while on the move. The set-up is extremely simple and the time necessary to train drivers is very much reduced. In emergencies, any of the other crewmen can take over from the driver.

Tactical and Strategic Mobility

The considerable reduction of weight and volume due to the elimination of a number of components reflects in the low battle weight of the vehicles: 8.5 tons for the *Cobra-41* MICV and 9.5 tons for the *Cobra-90* AFV. This was notably

less than the U.S. Marine Corps' *LAV* (12.3 tons) eight-wheeled armored vehicle that has an equivalent degree of protection. Both foreign vehicles have a more compact configuration than the *LAV*. Nevertheless, the *Cobra-41* can carry two crewmen and ten combat troops. It has a transportation capability of seven cubic meters in volume; i.e. a ratio of useful-to-total volume of 7.5 to 10 (compared with the 4.9 to 10 for the *M113*). On the other hand, the *Cobra-90* has a three-man crew and it carries an ACEC-designed, electrically-driven turret housing the MECAR 90-mm Kenerga gun. Both vehicles use identical automotive components. Due to this compactness, a C-5A "Galaxy" transport plane can carry a 16-APC infantry company and still have 60 tons to spare. A C141A can carry four *Cobras*, and a C-130 "Hercules" can carry two.

Powered by a 190-bhp Cummins turbo-compressor diesel engine, both the *Cobra-41* and *Cobra-90* can attain 76 km/h on a level road and have a range of 600 km. The vehicle's speed in reverse is the same as in forward gear. The *Cobra-41* is rear-driven and the *Cobra-90* is front-driven. The suspension of the latter is strengthened by hydraulic shock absorbers on front and rear wheel stations. The *Cobra* vehicles run on a reinforced rubber track of the double continuous band type. Designed by ACEC for minimal metallic friction, these tracks are 30 percent lighter than metallic tracks. This track does not suffer from the track-throwing problems that plagued the U.S. *M114* during the 1960s. They also make the vehicles less noisy and allow them the necessary discretion for reconnaissance, antitank and enemy artillery observation missions. The light weight of the machines ensures easy



Electrical schematic of the ACEC drive system for armored vehicles.

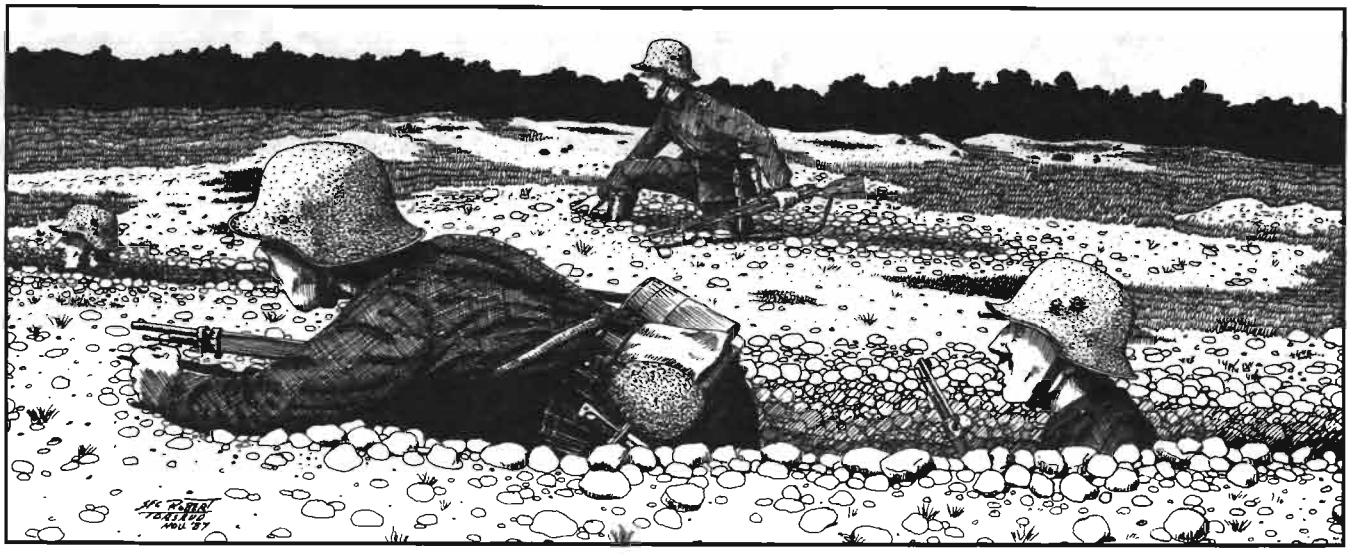
going over loose or sandy terrain, with a ground pressure as low as 0.4 kg/cm^2.

The *Cobra-41* has a good amphibious capability without any preparation, thanks to two electrically powered hydrojets and the automation of its trim vane control. On the other hand, the *Cobra-90* has amphibious capability with its flotation screen. The compact silhouette of the *Cobra* vehicles, their agility, and their capacity to instantly change into reverse give them a significant degree of additional protection. They are also easy to hide.

No Longer a Dream

Until recently, the application of an electric transmission to armored and tracked vehicles had remained an unrealized dream. Now, thanks to the possibilities opened up by recent technological advances, it is no longer a dream. The ACEC successful, reliable, and lightweight electric transmission opens up a new era in the design and development of tracked armored vehicles, making it easier to meet some of the design requirements. It will also provide a cost effective ratio superior to that of other types of transmissions. Thus, an electrically-driven combat vehicle becomes very attractive in terms of performance, reduced training time, and easier maintenance, making it a more economical and energy-saving war machine.

Raymond Surlémont is the Belgian correspondent for *Defensa*, the Spanish military review. The author of the book, *Japanese Armor*, he has also written for *Jane's Defense Weekly*, *Technologia Militar*, *Armada International*, and *Armor*. He is one of the founders of the association which supports the Belgian Tank Museum in Brussels.



Operation Michael: The Seeds of AirLand Battle

by Captain Hilario H. Ochoa

Many soldiers do not realize the historical aspects of AirLand Battle. AirLand Battle is based on proven concepts on battlefields around the world. One example occurred during WWI. It was called "Operation Michael," and it clearly shows us the basic AirLand Battle tenets of initiative, depth, agility, and synchronization.

Time was running out for the Germans in the spring of 1918. Their defeat of Russia had freed large numbers of troops for use on the Western Front, but the Germans realized that they had to force at least a stalemate in France before the Allied naval blockade and American mobilization forced them to accept a peace of exhaustion.

On March 21, the Germans launched a massive offensive against the British along the Somme River. The German attack was more successful than any since 1914. The British Fifth Army suffered heavy casualties and was pushed back 40 miles in 10 days. The Germans had found a new formula for victory, a technique known as Hutier tactics.

Like AirLand Battle doctrine, these tactics fulfilled the requirements of the time and offered a sensible, flexible, and aggressive plan to win on the battlefield. Both doctrines are similar for their aggressiveness, use of available techniques and technology, adaptability, and reliance on and confidence in the soldiers who wage them.

Genesis on the Russian Front

Hutier tactics took their name from General Oskar von Hutier, the man who first applied them on the Russian front the autumn of 1917. In operations around Riga, at Uxkull, the Germans forced the passage of the Dvina River. The heavily entrenched Russians outnumbered the German forces. So, Hutier had to try something new, and what he did went almost unnoticed at the time by other tacticians because the fight itself was so insignificant.

Hutier also applied his methods to shred the Italian Army in the battle of Caporetto. In the March 1918, offensive, Hutier was in command of the crack 18th Army.

In actual fact, General Ludendorf, Germany's first quartermaster general, was responsible for the application of the Hutier concept, in cooperation with his chief of artillery, General Bruckmuller.

German doctrine rejected the standard concept of massive artillery preparations and dense waves of assaulting infantry. Instead, a special task organization combined special tactics and training.

The Germans organized their troops into three echelons: storm troops, conventional infantry as follow-on forces, and reserves. The storm troops (or assault battalions) were made up of highly trained, specially selected men whose mission was rapid penetration and exploitation to disrupt the enemy's rear

area. The battalion had four rifle companies, one machine gun company (six to nine guns), a light mortar platoon (two trench mortars), two artillery pieces, and a flamethrower section. The special assault divisions of the 18th Army had nine assault battalions, two light artillery regiments, three combat engineer companies, and the usual service units. The conventional infantry units were also equipped with light artillery and mortars. The infantry reserves had the mission of consolidating gains, protecting the flanks of the penetration, and resupplying the assault units.

The assault units consisted of the best soldiers, all under 35 years of age. Most were from the Russian Front, where they had not become encumbered by the concepts of trench warfare. Hutier conducted six weeks of intense psychological and tactical training designed to encourage small unit leader initiative, exploitation through bypassing pockets of resistance, and the use of combined arms. They were trained to infiltrate enemy positions before and during artillery barrages, in the use of observation balloons, and pyrotechnics for adjusting fire and marking the progress of the attack, and in making tactical decisions at low levels of command to exploit weaknesses. By 8 March 1918, 70 German divisions had received this training.

The New Tactics Are Applied

At 0500 on 21 March, General Bruckmuller's artillery barrage began. Instead of the usual barrage that lasted for days, or even weeks, this barrage consisted of 10 minutes of gas shelling, followed by five hours of mixed gas and high explosive. The fire was concentrated on known British artillery positions, command posts, road junctions, and communications installations.

At 0930, under cover of a rolling barrage, the storm troops assaulted in small, combined arms groups. They had no specific objectives as had always been the case in prior attacks, only axes of advance, with the intent to penetrate as deeply as possible.

The British made the mistake of concentrating their units in the forward trenches, where they were pounded by the artillery, overrun, and bypassed early in the attack. Late on 21 March, the commander of the British 5th Army ordered a withdrawal to the Somme, 10 miles to the rear. The Germans advanced 38 kilometers in four days, and on the 25th, renewed the attack and again pushed forward. When the British were finally able to stop the Germans in the Somme sector, the Germans launched two more attacks against the British, and then the French. All three failed for a variety of reasons; the principal one being troop exhaustion.

It is important for us to consider a key point of defensive and offensive doctrine before continuing with the similarities between Hutier tactics and AirLand Battle doctrine.

The Germans came to realize during WWI that it was more beneficial to restructure their defensive doctrine to a more flexible defense in depth. This new doctrine included such ideas as five successive defensive lines in critical sectors. The system emphasized three principles: flexibility, decentralized control, and counterattack. The combination of these principles made the German defenses seemalmost invincible to Allied assault tactics. Attrition and overwhelming Allied numerical superiority resulted in this change in German fighting doctrine. The change from the flexible defense to the successful offensive doctrine of Hutier tactics was the result.

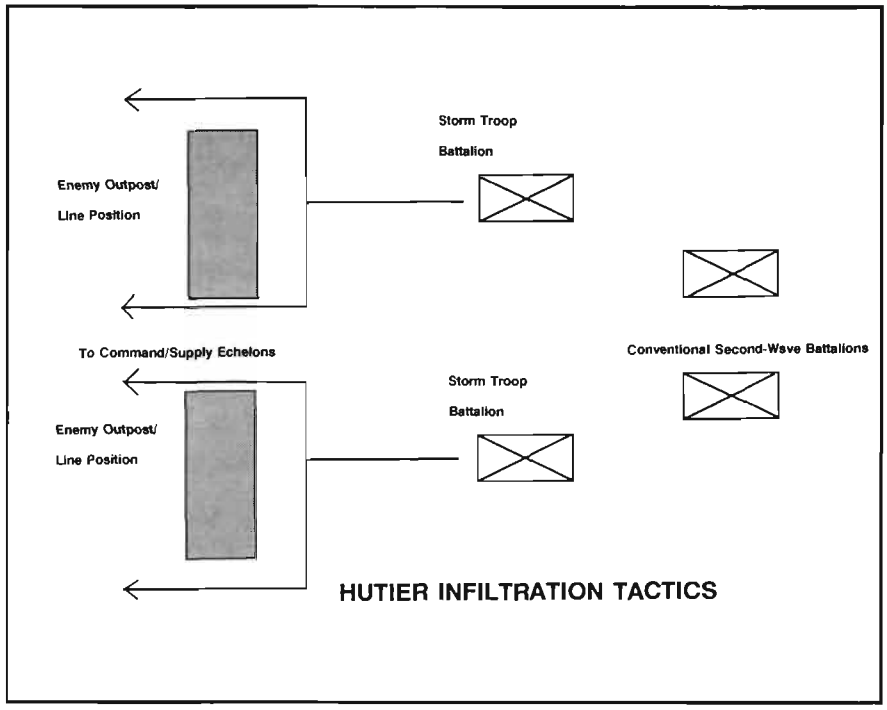
Hutier Tactics Reborn

These changes in 1918 are similar to our own recent doctrinal changes. In 1976, the Active Defense doctrine appeared in Field Manual 100-5, "Operations". Reliance then was on firepower, success in the first battle, the advantages of defense, and the use of fortifications. The doctrine dealt briefly with the offensive operation and immediately created controversy. Field commanders felt that, even though they could win against the leading enemy echelons, they would be unable to withstand the follow-on forces.

The next step was the Central Battle concept, which concentrated on operations at the FLOT (Forward Line of Own Troops), the extensive use of covering forces, and firepower. The concept of Force Generation was closely allied with this doctrine. Commanders, however, continued to question the validity of this doctrine, and a series of studies, such as Division 86 and Army 86, stimulated active debate.

AirLand Battle, our new offensive doctrine, is the result of the concepts of the Integrated Battlefield and the Extended Battlefield. Like Hutier tactics, today's AirLand Battle doctrine is more offensive- and win-oriented. Both doctrines focus on soldiers, as well as systems and tactics. They both depend on basic tenets of initiative, depth, agility, and synchronization.

FM 100-5 tells us, "At the operational level, the force will defeat the enemy by destroying critical units or facilities. At the tactical level, both attrition and massed fires, substituting for massed troops, will occasionally facilitate decisive



HUTIER INFILTRATION TACTICS

maneuver at the operational level." This concept is important in both doctrines. Historians have often related AirLand Battle concepts to blitzkrieg tactics. But the significance of the WWI Hutier tactics is that they represented a blitzkrieg without tanks.

In Hutier tactics, commanders on the spot exercised subordinate initiative. This enabled the commander to deal with rapidly changing battlefield situations. This concept evolved from an important aspect of the German flexible defense called decentralized control. Squad and platoon leaders had considerable independence and might defend or delay anywhere forward of the third, or main, defense line. The forward, or "Front Battalion Commander," frequently directed the entire defense of a regimental sector. This commander had the authority to commit the remaining two or three battalions of his regiment in a counterattack at his own discretion. This exaggerated the difference in decision cycles: while the British and French attackers had to seek orders and reinforcements from their corps or army commanders located miles to the rear, thedefending German battalion commander could direct a regimental counterattack on the spot.

Is this not the same type of initiative we want to instill in our subordinate leaders? As FM 100-5 tells us, "To preserve the initiative, subordinates must act independently of each other within the context of an overall plan. They must exploit successes boldly and take advantage of unforeseen opportunities. They must deviate from the expected course of battle without hesitation when opportunities arise to expedite the overall mission of the higher force. They will take risks, and the command must support them. Improvisation, initiative, and aggressiveness are traits that must be strong in all leaders."

Initiative implies an offensive spirit in the conduct of all operations. The officers that led the storm troop battalions were specially chosen for their staunch bravery, moral as well as physical.

"The turmoil of our feelings," one of them wrote, "was called forth by rage and the thirst for blood. As we advanced heavily but irresistibly toward the enemy lines, I was boiling over in the fury which gripped me. The overpowering desire to kill gave me wings. Rage squeezed bitter tears from my eyes. Only the spell of primeval instinct remained."

Another important aspect of Hutier tactics was the bypassing of enemy strongpoints in order to move into enemy rear areas. The artillery preparation destroyed British communications and command centers, as well as artillery positions. Such concentration on deep targets caused the British defenders to lose all organization and they collapsed from the rear forward. The British were unable to concentrate their firepower or maneuver their forces to meet the threat. As in AirLand Battle tactics, commanders then also needed to understand depth of time, space, and resources to execute appropriate countermoves, to battle the forces in contact, and to attack enemy rear forces.

The Role of Reserves

Just as reserves play a key role in achieving depth and flexibility today, so did reserves play an important role in Hutier tactics. Since the assault troops bypassed major enemy centers of resistance, the second echelon, or conventional infantry, was responsible for eliminating these positions.

Using Hutier tactics, the Germans avoided enemy strengths and attacked his vulnerable areas. Their organizations had the basic structure,

equipment, and weapons systems to complete their tasks.

While the ground troops found gaps in the enemy's lines and were pressing deep into his rear, the ground attack squadrons of the air force were bombing and machine-gunning surviving enemy points of resistance. Another key to the success of Hutier Tactics was the combined arms battle groups at company and battalion level. They had elaborate systems of communication and control which enabled them to achieve not only maximum combat power, but a coordinated action.

In these tactics, we see the importance of having a leader who can react to any situation and think on his feet.

FM 100-5 says that forceful and rapid operations achieve at least local surpise and shock effect. The following is a good example of what this means to us.

"In two days of fighting, the Germans had captured the whole of the British defended zone on either side of the Somme. By 24 March they won through and had advanced 14 miles in 4 days, the greatest gain of territory since 1914."

The Importance of Intelligence

Certainly one must ask why certain units or places are chosen to be attacked. In the case of Operation Michael, why did the Germans attack the British 5th Army and why did they attack in the area of the Somme River? There are several important reasons.

- First of all, the British were still the German's toughest, if not the most numerous enemy. Defeat of the British forces would not only be important militarily, but would also be a psychological blow to the entire Allied effort.

- Secondly, the Somme was a sector the British had recently taken over from the French. Consequently, the line was in a poor state of repair and, most important, it was a boundary seam of the Anglo-French front. A blow here would split the Allied front in two.

- A third reason was that the British 5th Army was the weakest of the four British armies in France. It had only 12 divisions stretched over a 42-mile front. When the attack came, infantry was crowded in the forward trenches in the exact zone which the artillery bombardment neutralized.

The final reason was that the army was commanded by Hubert Gough, whose tactics had been so disastrous at Ypres the previous autumn. In arriving at these reasons, the Germans depended heavily on intelligence about the enemy. The ability to be agile on the battlefield requires such good, accurate intelligence, and lots of it.

Conclusion

The employment of Hutier tactics and their success in bringing mobility back to the battlefield in the spring of 1918 clearly indicate the beginnings of AirLand Battle fundamentals. This can be more clearly understood in a paragraph from FM 100-5:

"AirLand Battle doctrine takes a nonlinear view of battle. It enlarges the battlefield area, stressing unified air and ground operations throughout the theater. It distinguishes the operational level of war — the conduct of campaigns and large-unit actions — from the tactical level. It recognizes the nonquantifiable elements of combat power, especially maneuver, which is as important as firepower. It acknowledges the importance of nuclear and chemical weapons and of electronic warfare, and it details their effects on operations. Most important, it emphasizes the human element: courageous, well-trained soldiers and skillful, effective leaders."

References

World War I. S.L.A. Marshall. American Heritage Press. New York. 1971.

"Soldiers." July 1983 article on AirLand Battle. LTC P. Cavanaugh Jr., p.6.

Towards Combined Arms Warfare. CSI. CPT Jonathan M. House. USACGSC. Fort Leavenworth, Kansas.

The Two World Wars. Susanne Everett and Brigadier Peter Young. Bison Books. 1983.

FM 100-5. Operations. August 1982.

Captain Hilario H. Ochoa was commissioned in Armor from Texas A&I University in 1975 and is a graduate of the AOBC, AOAC, and CAS^3. He has served as a tank platoon leader, CSC XO, support platoon leader of 3/67th Armor, 2d AD; and S1 and tank company commander of 2/33 Armor, 3d AD. He served as military history and leadership instructor at the C&S Dept, USAARMS, from 1983-1985, and also served at the C&S training branch.

Irrational Weapon System Acquisition

by Lieutenant Colonel Edward A. Bryla

The essence of ultimate decision remains impenetrable to the observer — often, indeed, to the decider himself...There will always be the dark and tangled stretches in the decision-making process, mysterious even to those who may be most intimately involved.

—John Fitzgerald Kennedy[1]

A guest speaker at one of the nation's senior service colleges recently criticized the U.S. Department of Defense (DOD) for having extreme difficulty in getting new technology applied in non-traditional ways or across service roles and missions. His criticism caused little excitement among the assembled students and faculty. In fact, based on the number of "knowing" glances exchanged in the audience, his indictment seemed to be accepted as dogma.

Why not!

Similar criticisms can often be found in the Congressional Record, in press descriptions of the DOD, and in discussions within the military departments and the Office of the Secretary of Defense (OSD). They are part of the rationale for President Reagan's National Security Directive 219 (NSDD 219) on Defense Management and the recent Goldwater-Nichols DOD Reorganization Act of 1986, Public Law 99-433 (PL 99-433).

But are his statements factual? Are there other "irrational" factors that limit the ability of the DOD to get "the most bang from its Research and Development (R&D) buck"? What can, and should, be done about it?

Recognizing that DOD has and will probably continue to spend millions of dollars and man-hours each year attempting to improve its weapon system acquisition process, this article attempts to answer some of the above questions and to add to what appears to be a rather limited body of work on the "irrationality" of U.S. weapon system acquisition.

Framework

What is "irrational" about U.S. weapon system acquisition?

In a strict sense, an "irrational" element of weapon system acquisition would be any factor that affects the decision-making process other than the cost, the performance, or the effectiveness of the weapon system. But, the reaction of the senior service college audience described above, reflected cost, performance, and effectiveness are not the only issues that a U.S. DOD decision maker must typically deal with.

But what is the real world of U.S. weapon system acquisition?

A good place to begin any search for understanding of the environment of weapon system acquisition is found in the work of Robert L. O'Connell. O'Connell argued that although the accepted rules of weapon advocacy appear to leave little room for the nonrational and prejudicial, it is also possible to point to a variety of instances, both recent and historical, when the values and institutions of those involved made it difficult to accept a particular weapon in spite of a clearly demonstrated combat superiority.[2] O'Connell hypothesized that there is a fundamental misunderstanding of the intimate relationship between humans and their armaments.[3]

Unfortunately, although O'Connell stated that some good work had been done, Keegan's *The Face of Battle*, Lewis' *The Social History of the Machinegun*, and Nef's *War and Human History* were cited as attacking the problem as he was advocating, O'Connell offered very little substantive evidence to support his hypothesis.[4]

Fortunately, and importantly for the purposes of a rigorous examination of the issue, O'Connell also provided a context within which one could examine weapon system acquisition decision-making. O'Connell's framework is comprised of a set of perspectives (anthropological, historical, sociological, psychological, cultural, and arms control), which would allow weapon system development decision-making to be viewed not as something alien, but rather as a tangible manifestation of some of man's most basic fantasies, myths, and institutions.[5]

A Political Perspective

To be more specific, we should add a political perspective to O'Con-

nell's list; especially with the rationalization, standardization, and interoperability (RSI) policies of the DOD during the last twenty or so years, and the more recent quantum growth, in numbers, expertise, and power of the congressional committee system. I do not mean to suggest that RSI is necessarily dysfunctional, nor that the Congress does not have a role to play, but merely to identify that there are important "irrational" aspects in weapon system acquisition attributable to these factors. Given recent U.S. experience, one might even argue that the political perspective is perhaps the most important consideration in U.S. weapon system acquisition.

Other Research

John Guilmartin and Daniel Jacobowitz offer some of the substantive data missing from O'Connell's work. The motivation for their effort was a concern that the debate over the worth and effectiveness of military technology was all too often conducted in a social and tactical vacuum by a system ill-equipped to take the human element into account. They felt that recent U.S. analyses of military technology neglected the real, but hard-to-quantify, fears, frictions, and uncertainties of combat.[6]

Guilmartin and Jacobowitz probed the critical relationship between weapons, tactics, and cohesion through a selective analysis of historical military systems. Specifically, they examined the Macedonian phalanx, the Roman legion, the Swiss pike square, the tactical system centered on the English longbow, the Spanish tercio and derivative systems of Gustavus Adolphus and Maurice of Nassau, Napoleon's and Nelson's systems, the German Stosstruppen infantry units of World War I, and the derivative German Blitzkrieg tactics of World War II.[7]

The Macedonian Phalanx

The Macedonian phalanx provides an early and particularly illustrative example of a weapon system that, if it had been viewed only from an evaluation of cost and effectiveness, would undoubtedly have met an early planning, programming, and budgeting system (PPBS) cycle "death."

Would Hannibal's elephants have survived the modern weapons acquisition cycle?

The principal weapon of the phalanx was the sarissa, a heavy, 14-foot spear, which was virtually useless in single combat. A computer-simulated duel between "the Threat," a conventionally armed hoplite with his short spear, sword, and shield; and a sarissa-armed infantryman, would undoubtedly reflect the hoplite's individual superiority. In the simulation, the hoplite, iteration after iteration, would be played easily avoiding the point of the unthrowable sarissa, brushing its shaft aside with his shield, and drawing the Macedonian onto his spearpoint or blade for the kill.[8]

Historically, against a Macedonian phalanx deployed on level ground with covered flanks, traditionally-armed hoplites had little confidence in their ability to break the juggernaut of massed and leveled sarissae and typically were slaughtered.[9]

The Roman Legion

The Roman legion, like the Macedonian phalanx, adapted a weapon of doubtful utility in single combat to effective mass use which, like the sarissa, might never have survived the modern development process. While the 14-foot sarissa was too long to be effective in single combat, the 18-inch Roman short sword was too short. Yet, the Romans consciously used training and discipline to weld the short sword, shield, and pilum to the trained, disciplined legionary to make a highly cohesive tactical system. With shields held in the left hand, the tactics of the legion depended on each man's right flank being covered by the next legionary, a cohesiveness inducing dependence made greater by the shortness of the legionary's sword.[10]

The Flower and End of Knighthood

The combination of the armored knight and a heavy warhorse, a combination made viable by the generalized adoption of iron armor, weapons, and the stirrup, was a highly successful weapon system in Western Europe from the Ninth Century. By the 14th Century, however, the knight's protective armor developed in response to advances in weaponry, notably the crossbow, and in part by the demands of jousting and dueling to

ness. The fully developed armor helm limited vision, hearing, and speech.[11]

Physically fresh knights fighting on flat terrain in a relatively uncomplicated tactical scenario could effectively exploit the advantages of almost complete armor protection, but such circumstances did not always prevail. The improbable result, in too many scenarios, was the superiority in hand-to-hand combat of thinly protected yeomen archers over armored knights.[12]

The French battlefield defeats of the Hundred Years War demonstrated the use of technology, in the form of the longbow – which must have initially seemed marginally effective to contemporary observers – made tactically decisive by mating with a social system that encouraged cohesion. Conversely, the French negated the capabilities of the armored knight by allowing discohesive elements to drive technological development in a manner that worked counter to tactical requirements.[13]

World War I

A persistent European focus on human factors, particularly by the French and British prior to World War I, resulted in an almost mystic belief that the moral shock value of infantry bayonets and cavalry lances would overwhelm the cyclic manufacture of death by quick-firing artillery, repeating rifles, and the machine gun.[14]

World War II

Whatever failed the British and French armies in the spring of 1940, it was not the technical capabilities of their tanks. An imaginary systems analyst comparing the *Matilda II*, the *Char B-2*, and the *SOMUA* tanks to the German opposition in the winter of 1939-40 would have certainly judged the Allied tanks sure winners one-on-one.[15]

U.S.-German tank development in the 1960s was an unsuccessful effort at weapons cooperation.

Yet certain features of the French tanks, in particular, suggest a continuity of engineering and tactical outlook in the socially-impelled characteristics of design going back to the knight's confining armor. The collar insignia of the French Tank Corps in WWI, for instance, consisted of a closed medieval helm superimposed on crossed cannon,[16] perhaps reflecting the failed doctrinal development of the Allies. Where German tanks almost invariably had the crew grouped together in a large and relatively spacious central compartment, French tank designers tended to isolate the individual members of a tank crew. German tanks all had three-man turrets; French tanks had one-man turrets. German tank designers favored side-by-side seating arrangements for the driver and the assistant driver; the men could see and communicate with each other. By contrast, the crew members of the French tanks tended to be in tandem, separated by machinery.[17]

Main Battle Tank Development

The U.S.-German experience during 1963-1978, in an attempt to collaboratively develop a main battle tank, provides more recent data on the impact of "irrational" factors on weapon system acquisition.

Despite the U.S. Army's desired 1965 acceptance date for a new main battle tank to replace its *M60* series tanks, the initial agreement between the two countries, signed on August 1, 1963, by U.S. Secretary of Defense (SECDEF) Robert McNamara and his German counterpart, Franz Josef Strauss, resulted in pushing the earliest possible acceptance date for a new U.S. tank to 1969. McNamara's rationale for the agreement, and implicit acceptance of the risk of a less than effective U.S. tank force during the delay, was to develop a better end product at lower cost and to simplify Allied maintenance and support problems. Others, however, noted an additional reason, and perhaps primary reason, in the need to rectify a serious U.S. balance of payments problem.[18]

The U.S. and German program managers for the joint development program realized early on that, lacking a single executive, the requirements formulation process might bog down in debates over differing national tank concepts. To prevent this, the two program managers decided to contract for an impartial parametric design and cost effectiveness study to determine the tank's requirements. Despite this analysis, the commitment of each nation's army to its preferred tank design concepts and the commitment of each nation to its own tank components made the task of generating the new tank's requirements a time-consuming negotiating process[19]. The resulting design compromise was probably more complex and

risky than either army would have pursued if left to itself.[20]

Development of some of the primary components for the tank ran into severe technical difficulties and, although the first prototypes demonstrated real promise, by the time they first appeared, the program had already begun to dissolve.[21] In January 1970 the collaborative effort was formally terminated, leaving the U.S. without the main battle tank it had wanted to field in 1965.[22]

After 1970, each nation forged ahead on national tank development programs. Although the U.S. program, the *XM1* project began as a strictly national development, by 1973, the new U.S. SECDEF and his staff had again begun to seek ways of using the program to accrue the benefits of standardization and to create a two-way development street with the Germans. Because their activities threatened the *XM1*'s cost and development schedule, the SECDEF and his staff were opposed, given that the program was already eight years late, by those in the U.S. Congress who preferred to see the *XM1* program meet its cost and schedule goals. Although much of the record of the debate between OSD and these congressmen focused on the military value of the German tank and its gun, behind this lay a more fundamental debate over the real value of cooperation within the alliance.[23]

As a result of OSD's efforts, the Americans, Germans, and the British agreed to test and evaluate each nation's proposed future tank gun system in hopes of selecting one as standard. The United States went even further and committed to mount the winner of the competition in the *XM1*. The implementing gun trials demonstrated that although the U.S. 105-mm gun and ammunition provided more than enough power to meet the existing threat, the foreign 120-mm gun systems seemed better suited for meeting the longer term threat. As a direct result, the *XM1* program was delayed an additional four months to allow for the contractors competing for the *XM1* contract to incorporate a turret capable of accepting both the U.S. 105-mm gun system and one of the foreign 120-mm gun systems into their design.[24]

Eventually the United States decided in favor of the German gun system. Although the decision maker, in this case the U.S. secretary of the Army, denied that his decision had been influenced by Germany's consideration of an AWACS buy, the symbolic significance to the Germans of the gun decision apparently played a minor role in precipitating support for the decision within OSD.[25]

Congress severely criticized the Army's gun decision for its lack of sound military rationale. In testimony before the Congress, the Army general who conducted the U.S. portion of the gun trials stated that the risk and expense of adding the 120-mm gun system to the *XM1* were too costly a hedge against the possibility that the Soviets might build a tank with armor that fell between the capabilities of a 105-mm and a 120-mm gun. The Army secretariat argued that the 120-mm offered more potential than the 105-mm and that armor remained a highly uncertain technology, one in which the possibility for radical improvements could not be easily discounted.[26]

Members of the congressional committee reviewing the decision reported that there existed no convincing evidence that the decision was based on military requirements. The congressional view was that the gun decision was a non-military choice.[27]

Conclusions

Even this relatively brief examination provides ample evidence to support Robert L. O'Connell's hypothesis that there is an "intimate relationship between humans and their armaments." Especially for the U.S., if one recognizes the open, information-driven, democratic nature of U.S. society and the unique role played by the Congress in the weapon system acquisition process. Perhaps "intimate relationship between Americans and their armaments" is a more appropriate description for O'Connell's hypothesis.

As suggested earlier, given recent U.S. experience, it seems that the political perspective is the most important consideration when dealing with U.S. weapon system acquisition. The U.S. congressional debate on accepting a 9-mm foreign pistol as the DOD's standard sidearm is probably the most publicized recent example.

The presence and impact of factors such as that of the American political system must be acknowledged, understood, and controlled. If nothing else, the historical review of Guilmartin and Jacobowitz clearly shows that these factors are a two-edge sword that, while having the potential to be extremely dysfunctional, can work to provide not only better individual weapon systems but also better tactical systems.

Finally, what can or should we do about it?

Recommendations

Guilmartin and Jacobowitz may provide the key! The U.S. defense establishment must take better ad-

vantage of, more fully accept, and more openly acknowledge the importance of the "Iron Triangle" of U.S. industry, government, and military.

First, although military strategy and tactics are the province of the military, the weapons they require must be developed within DOD and with industry in a more active and mutually participatory form.[28] The task is not an easy one! "Black" and compartmented programs, which compose an ever-growing share of the defense program and which routinely comprise most of DOD's technologically advanced programs, typically restrict access to only a subset of the already extremely small group of "players" who have a real impact in the acquisition process.

Although modern technology is mainly the province of industry, U.S. firms must also be able to more thoroughly understand the military's battlefield needs.[29] Industry's task is much more than just the execution of a set of specifications translated by a program manager from the "user's" requirements. Regardless, both industry and the military, and those who study these issues, must recognize that not only does the parent American society determine the nature and intensity of the cohesive forces that bind together the American soldiers who will use the weapons but, in addition, that the society, in the form of its elected officials, will only provide for the use of its scarce resources on weapons that it understands and supports.

All three, the military, industry, and the Congress, must work to reduce the negative impact of the adversarial relationships inherent in the process by which they provide these resources.

Notes

[1]Allison, Graham T., Essence of Decision, Explaining the Cuban Missile Crisis, Boston: Little, Brown and Company.

[2]O'Connell, Robert L., "Putting Weapons in Perspective," Armed Forces and Society, Vol. 9, No. 3, Spring 1983, p. 442.

[3]Ibid, p. 441.

[4]Ibid, p. 443.

[5]Ibid, pp. 442-453.

[6]Guilmartin, John F. and Daniel W. Jacobowitz, Technology, Primary Group Cohesion, and Tactics As Determinants of Success in Weapons System Design: A Historical Analysis of an Interactive Process, USAF Air Command and Staff College, 1984, p. 2.

[7]Ibid, p. 10.

[8]Ibid, pp. 12-13.

[9]Ibid.

[10]Ibid. p. 16.

[11]Ibid, pp. 21-22.

[12]Ibid.

[13]Ibid, p. 23.

[14]Ibid, p. 28.

[15]Ibid, p. 45.

[16]Ibid, p. 45-47.

[17]Ibid.

[18]McNaugher, Thomas L., Collaborative Development of Main Battle Tanks: Lessons From the U.S. - German Experience, 1963-1978, Santa Monica: The Rand Corporation, 1981, pp 5-7.

[19]Ibid, pp. 7-11.

[20]Ibid, p. 15.

[21]Ibid, p. 18.

[22]Ibid, p. 19.

[23]Ibid, pp. 30-31.

[24]Ibid, pp. 40-46.

[25]Ibid, p. 55.

[26]Ibid, pp. 56-57.

[27]Ibid, p. 57.

[28]Guilmartin and Jacobowitz, pp. 70-71.

[29]Ibid, p. 70.

Modifying The Army's Armored Vehicles

In his book, *War As I Knew It*, General George Patton had a section titled, "Earning My Pay." I would like to present something similar on the subject of modifying some of the Army's armored vehicles. Some of these proposals may already be in development, others may have been tried, but found infeasible.

- Replace either the M240 at the loader's station or the TC's M2, with the MK-19 40-mm grenade launcher on the *M1A1* series tanks. This weapon would be effective against APCs, helicopters and soft targets. The MK-19 could also be mounted on the *M48A5, M60A3*, and the *M551* tanks.

- There are two *M48/M60*-series vehicles that need to be replaced with new vehicles based on the *M1* chassis. The first is the *M88A1*, which, with the fielding of the *M1A1*, will have it's recovery capabilities pushed to the limit. The other is the *M48/M60 AVLB*. This vehicle can't keep up with the *M1* units. If *Abrams*-series vehicles replace these two armored vehicles, tank battalions would have all their heavy, armored vehicles sharing the same chassis and engine. This would make the mechanic's and supply personnel jobs easier.

- The *M113* series has been in service since the 1960s, and three of the series should be replaced by *M2/M3* series vehicles, and a new ARV is also proposed. The *M577* is too large and is easily recogized on the battlefield. It should be replaced by an *M2* CP vehicle. This version would retain its turret with either a

dummy gun or the current 25-mm cannon with a limited amount of ammunition and dummy TOW launchers. This would help keep the CP from attracting fire. The vehicle would also be equipped with extra radios, map boards and a tent extension. The second vehicle is a medical post vehicle equipped with stretchers without its turret. The third vehicle is an *M2*-series ARV, if the *M2* chassis is suitable for the basis of an ARV.

• As the *M992 FAASV* enters service, there will be a surplus of *M548*'s. They could be useful as an engineer mine-clearing vehicle equipped with a line charge system similar to the British Giant Viper and the Soviet mine clearers based on the *BTR-50* and the *SO-122*. The *M548* could also be used as a heavy mortar platform, similar to the Isreali 160-mm mortar based on the *Sherman* chassis. Because of the rough terrain in Korea, the *M548* could be issued to the tank battalions there as tracked supply, ammunition, and fuel carriers.

• Because the National Guard and Reserves are the last to recieve new equipment (except for round-out units), I propose three modified vehicles to upgrade the combat capabilities of these units without spending millions of dollars for new vehicles. The first is a *M60A3* with a 120-mm gun. This would reduce the amount of ammunition carried, but ammunition supply would be easier. The second vehicle is an *M113* with a 25-mm turret and twin TOW lanchers, The turret would be similar to the *M2*'s, but smaller. The *M113* AIFV would be based on the *M113A3* with external fuel tanks and add-on armor and interior spall protection. The third vehicle is an *M548* MLRS with an armored cab and a more compact version of the current system, unless the current MLRS can fit on the *M548* chassis.

• A percentage of the 82nd Airborne Division's *M551A1s could be reamed with a 90-mm gun. Current technology has produced 90-mm ammunition that has the capabilities of 105-mm ammunition. For every one missile-armed Sheridan* there could be two 90-mm-armed *Sheridans.* This would give the 4/73rd both missile and main gun capibilities. The French Panhard *M-11* would be a perfect vehicle for airborne, airmobile, and light divisions. The *M-11* could be mounted with TOW or a four-tubed Stinger launcher for air defense. The *M-11* could also be used to carry the CO/BN/BDE command post radios.

I presented these ideas with the hope that if they are useful, someone can put them to good use.

SGT Russ Sundlof
Trp A, 1/26 Cav
CTARNG

A Reply from DCD's Director To Sgt. Sundlof's Proposals

The director of Combat Developments reviewed SGT Sundolf's proposals. While the ideas appear to have merit, we have considered each of them in the past and, for a variety of reasons, rejected them. Specific comments follow, but the real issue is the age-old problem of the false economy of upgrading old equipment instead of procuring new equipment, coupled with the very real fact that most older equipment simply does not make adequate marginal contributions to warfighting.

A classic historic analogy is the U.S. Army rifle after the Civil War. Breech loaders and metallic-cased cartridges reached a reasonable level of development during the war, and progress was continuing worldwide on improvements in magazine feed and breech-locking mechanisms. The massive demobilization of American forces produced a surplus of muzzle loaders which economists could not imagine being scrapped. Some use had to be found for so many weapons, and it was. Springfield rifles were modified to Allin Conversion, 1865 rifles; the "trap door" breech loaders, the predecessors of the famous 1873 trap door rifles and carbines. While this saved lots of money, it meant that Custer's 7th Cavalry, armed with single-shot rifles, faced Indians armed with repeaters. Even more critically, U.S. troops fought the battle for San Juan Hill armed with those same single-shot, black powder rifles, while the defenders were armed with bolt-action repeaters using smokeless powder.

The Army has learned the lesson and made its decision. At least until it is forced to do otherwise, the Army's modernization effort is based on developing modern equipment with further growth potential, and not to continue recycling old equipment. We do not want improved *M113s if Bradleys* are available. We do not want improved *M60*s if *M1*s are available. The same applies to helicopters, trucks, artillery, etc. Our policy is to modernize as rapidly as possible....

Specific Comments

• **MK-19 40-mm for tanks**: We have studied this idea repeatedly and it is undesirable.

The MK-19 is ineffective against helicopters and APCs due to its very low velocity and low probability of a hit against a point target. While effective against soft targets in the open, its long time of flight makes its ability to suppress questionable.

The ammunition for the MK-19 is very heavy and bulky. A standard 48-round box weighs approximately 50 pounds and is as bulky as 500 rds of .50 cal. or about 2,000 rds of 7.62-mm.

• **M1 variants for recovery vehicle and AVLB:** Already decided.

The decision on the recovery vehicle has been made, and the *M88* variant was the Army's choice because of cost and forecast performance. There may yet be an *M1*-based competitor, but we are not yet sure how that will come out two years from now.

The Engineer School is the proponent for AVLBs. It is looking at IM1 variants for AVLB and possible other engineer vehicles.

• **M2/M3 variants to replace M113 variants:** Generally unsuitable.

The *M577* needs the added head room offered by its raised roof. An *M2* variant's head room would be comparable to that of a normal *M113* APC.

The same applies even more so to the medical post vehicle. Work room is the critical need.

The current recovery vehicle of the *Bradley* battalion is the *M88*-series recovery vehicle. Although larger and heavier than the *Bradley*, it is equally suitable for recovery of tanks which might be cross-attached to the battalion. A *Bradley* ARV would be too limited in its capabilities, whereas the *M88* series is becoming a "universal" system in all "heavy" battalions (tank and mech).

• **Roles for surplus M-548s:** Generally unsuitable.

Engineers are fielding Mine Clearing Line Charge (MICLIC), a system similar to "Giant Viper". An armored vehicle (M113, M9 ACE, tank, etc.) will tow it in a trailer that can survive the hostile fires encountered at a minefield. The *M548* is unarmored and is not survivable.

The Israeli 160-mm mortar on a *Sherman* tank chassis is an ingenious use of available resources, but the U.S. Army does not use, nor require, a 160-mm mortar system. Also, the Israeli system has an opening in the tank floor through which the mortar is passed so that its recoil is absorbed by the ground, not the vehicle's suspension.

As an ammunition and fuel resupply vehicle, although the *M548* has merit, its payload is small compared to the tank battalion's *HEMTT*. The problem becomes one of manpower. We would need far more *M548* drivers to transport the same tonnage carried by *HEMTTs*.

Upgrading National Guard and Reserve equipment: The retrofit costs are much higher than most people realize. Added to the cost of continued operation of old equipment, it is more cost effective to field new equipment. Specifically:

• **We have studied the M60A3 with 120-mm gun repeatedly.** The added weight and the balance problems require major redesign of the turret. The added weight also decreases reliability of the drive train and suspension system, as well as further reducing the *M60*'s marginal performance.

• **M113 with 25-mm turret and twin TOW launchers** is not unlike the early concepts which led to the development of the Mechanized Infantry Combat Vehicle (MICV) which ultimately evolved into the Bradley Infantry Fighting Vehicle. Generally, the 25-mm turret takes

Upgunning the Sheridan has been ruled out because there are too few to justify a unique gun and ammunition system, according to DCD.

up too much room, reducing the *M113*'s primary role of transporting personnel. The added weight of the turret also degrades the drive train and suspension system. The weight problem gets still worse if armor is added to raise the *M113*'s protection level to that of the *Bradley*. It must be understood that the *Bradley* is not the oversized giant that the popular press has insinuated. Side by side, the *M113* and *Bradley* hulls are about the same height. The turret is what makes all the difference in height, and its presence forced the lengthening of the vehicle to retain personnel space.

• **M548 mini MLRS**: Same integration problems as above. Also, there is no "mini" MLRS to install. Such a suggestion requires an entirely new, incompatible, rocket system.

• **90-mm gun for M551A1s of 82d Airborne Division:** This sort of idea has been repeatedly raised and rejected. Although the replacement for the *M551A1* has not yet been selected, extensive modifications to the existing fleet will not be approved. In this specific case, a 90-mm gun would require a unique ammunition for such a small number of vehicles (2/3 of a battalion, or approximately 37) that it could never be practical.

DONALD L. SMART
Colonel, Armor
Director, DCD, Ft. Knox, KY.

 (Continued from page 4)

percent gunnery. It is designed to be a part of a scout's Level One Gunnery Program. Controlled by the platoon leader, Table X scenarios are conducted in six phases. This permits adequate evaluation of the troop-leading procedures and allows for more concentration on objective evaluation.

The advantages of this program are many:

- It integrates tactics and gunnery in a system program. Our approach answers those who feel gunnery and tactics are often downplayed in one area at the expense of the other.

- It is flexible. Commanders in Europe can conduct Table IX in their LTA and Table X during the regular gunnery cycle. Counterparts in FORSCOM, ranges permitting, can either run both tables live-fire or conduct Table IX in local training areas.

- It permits scouts to train as we expect them to fight. It reinforces smart habits, such as reporting before engaging. It integrates mortars and artillery and it stresses the scout section leader's ability to lead his element and distribute its fires.

Evaluation is based on a possible 1,000 points – 600 for tactics, 400 for gunnery. Checklist-formatted score sheets are used to critique the section's tactical proficiency. Tactical tasks receive a simple GO/NO-GO. Gunnery standards mirror the current FM 23-1, *Bradley Gunnery Standards.*

Scouts must obtain an overall score of 70 percent on each table in order to qualify as a section. Fort Knox will conduct a validation test in December 1987 and field a coordinating draft in June 1988. Eventually, the Scout Section Qualification will be an appendix to USAIS's FM 23-1.

Based on the Mission Essential Task List (METL), the commander chooses from the following tasks:

- **Coordinate with adjacent unit**
- **Conduct an area recon**
- **Conduct a route recon**
- **Reconnaissance by fire**
- **Prepare a recon overlay**
- **Install/remove a hasty protective minefield**
- **Plan a recon patrol**
- **Conduct a recon patrol**
- **Supervise the preparation of a section-size element's defensive position**
- **Consolidate and reorganize section-size element following contact (defense)**
- **Initiate unmasking procedures**
- **Direct the crossing of a contaminated area**
- **Prepare and submit NBC 4 reports**
- **Prepare and submit NBC 1 report**
- **Calculate and designate placement of timber-cutting charges**
- **Calculate and designate placement of steel-cutting charges**
- **React to indirect fire**

Figure 2

Field input and unit performance at the National Training Center have driven the requirements for specialized cavalry and reconnaissance training.

The Armor School has initiated two new resident courses of instruction: the **Cavalry Leaders Course (CLC)** and the **Scout Platoon Leaders Course (SPLC).**

The CLC program of instruction includes 15 days of training designed to prepare senior first lieutenants and captains for assignments as squadron operation officers and cavalry troop commanders. The course focuses on squadron- and troop-level tactical operations and the roles and missions of cavalry in AirLand Battle. Instruction covers regimental as well as divisional cavalry variations of reconnaissance, security, and economy of force missions. CLC uses the small-group method of instruction, and all small-group instructors are experienced cavalry troop commanders.

The SPLC consists of 15 days of training to prepare lieutenants as scout platoon leaders. The course focuses on scout platoon operations and individual scout skills. It is applicable to scout platoon leaders assigned to cavalry squadrons, separate brigades, armor and

mechanized battalions, and light cavalry troops. This course includes six days of mounted tactical training, during which students are evaluated on their ability to lead a scout platoon.

Graduates of AOAC who have assignments to cavalry units automatically attend CLC. Graduates of AOB who have assignments to cavalry units or scout platoons automatically attend SPLC. Both courses are open to the field for officers to attend on a TDY and return basis. Once you have selected officers for assignment to cavalry units or scout platoons, send them to the Armor School and we'll train them!

We request MACOMs, divisions, and regiments scheduled to gain officers attending AOAC and AOB to establish pinpoint assignments to cavalry units and notify Armor Branch as early as possible, so we can streamline the CLC/SPLC student selection process.

We teach the Cavalry Leader's Course quarterly. The Scout Platoon Leader's Course will begin 15 February 1988. We will have 8-11 classes per year. Contact the USAARMS Cavalry Branch, C&S Department, for dates.

We have also begun to train those scouts going from OSUT to light divisions on the HMMWV. It will no longer be required for their units to expend a lot of effort to train on a new piece of equipment.

We are also developing a scout's "rites of passage." **The Scout Badge** will be similar to the EIB and will concentrate on individual scout skills. Please give me your comments and ideas on the Scout Badge.

We have new Scout Platoon Doctrine on the street. FM 17-98, *The Scout Platoon*, and ARTEP 17-57-10, *The Scout Platoon MTP*, went to the field in November 1987.

A **Light Cavalry Warfighting Symposium** is tentatively scheduled for 24-25 February 1988

The purpose is to bring all of the light cavalry community, organizations and service schools together to discuss light cavalry issues. Our specific objectives are to:

- Identify deficiencies in light cavalry doctrine, organization, equipment, and training.
- Formulate short- and long-term strategy for the light cavalry force.
- Create a dialogue and establish points of contact between units and service schools.
- Identify key issues to discuss at the May 1988 Armor/Cavalry Conference.

It took us a long time to recognize the Armor Force was composed of more than Abrams-series tanks — we now have some cavalry momentum.

Scouts Out!

Treat 'em Rough!

(Majors Scott W. Rowell and Robert Wilson were the primary authors of this editorial.)

Driver's Seat

Continued from Page 5

received in school, but developed many other areas within and around me. Maybe not then, but later on, I realized the importance of that training. I also realized the importance of critiques, or after-action reviews. After each presentation, the platoon sergeants would sit down with me and review the class, highlighting the positive and negative points of the presentation.

We must do the same with our BNCOC grads. Know what subjects are taught and how. Develop your graduates by requiring them to teach certain subjects in the organization. An example would be an M240 MG or direct main gun engagement from the commander's weapon station. Both are TCCT-1 requirements tested in BNCOC to standard.

If for some reason a BNCOC graduate cannot successfully teach SL3 technical subjects, I would pay a visit or call the commandant of the academy that teaches CMF 19 BNCOC and discuss the problem. Chances are that the standards for the TCCT-1 are not being performed to standard.

Too often, we do everything ourselves or require the master gunner to teach the entire gunnery program. Commanders should use master gunners as their advisors and unit gunnery program managers. Master gunners should monitor classes and make recommendations.

Use the unit NCO structure to form your instructor cell to teach gunnery. Use your BNCOC graduates as part of the cell.

By upgrading the retention and reinforced training standard of our NCOs, we will increase our Army's readiness at a reduced cost.

BOOKS

Acts of War, The Behavior of Men in Battle, by Richard Holmes. The Free Press, New York, 436 pages. $19.95.

Acts of War is an essential addition to the contemporary soldier's library. Richard Holmes, a British military historian, focuses on the "actualities of war." His stated purpose is to address the "fundamental questions on the nature of human behavior in battle, as he focuses on the individual soldier, the "first weapon in battle." With historic examples and quotations from soldiers, Holmes describes the battlefield and the men who occupy it.

He takes the reader through all stages in the development of a warrior, from his entry into military service and thence, via "rites of passage," to his physiological and psychological response to the "effects of weapons upon the fragile and complex human body." He addresses many contemporary issues, such as the presence of women in combat and the "fragging" of superiors.

The book is a handy reference for today's soldier as he tries to answer "What is combat really like?" It provokes discussion by focusing on the man in battle, not on the tactics of maneuver units. An index is included that provides for rapid focusing on specific topics, and the prolific inclusion of quotations and specific historic examples adds credibility to the author's comments.

The U.S. Army has now reached the point of officers assuming battalion command who have never seen war. We have to rely on historians to chronicle for us what soldiers learned in the past. Understanding what happens on the battlefield and what makes soldiers tick will better prepare us for conflict. This book provides an excellent mechanism for trying to understand just that.

RICKY LYNCH
CPT, Armor
DCD, USAARMS

The American Soldier in World War II, by Lee B. Kennett. Charles Scribner's Sons, New York, 1987, 241 pages. $20.95.

G.I.: The American Soldier in World War II is an engaging book about the beliefs, behaviors, and experiences of the average American soldier throughout WW II. This compact volume is a sociological study that entertains with anecdotes and little known, but interesting, facts. And, as in his five previous books, Kennett has organized G.I. so that each clear, concise chapter flows smoothly into the following in a basically chronological order.

Kennett begins with the turbulent, somewhat unpopular adoption of the draft in 1940 and then observes the average draftee from the receipt of "Greetings" to discharge and postwar reunion. In his study, Kennett has made wide use of polls, surveys, and letters of WWII soldiers, and has created an accurate portrait of the WWII GI that is surprisingly similar to the American soldier in Vietnam. While education levels and economic expectations were much lower (average education level was fourth grade; some draftees had never worn shoes), basic attitudes toward the Army, military discipline, and life in general were about the same. They left C-ration cans everywhere (before the golden C-ration cans received a can of green paint, hostile reconnaissance planes used them to locate American routes and positions), fished with hand grenades, took shortcuts across cultivated fields, and were patriotic without feeling the need to express it.

While well researched, G.I. uses only one published source not previously well known - a "secret" War Department report on the morale and attitudes of 1941 draftees entitled "Morale in the U.S. Army." It was classified because it revealed a very low state of enlisted personnel morale and shockingly poor leadership. Kennett further describes the racial hostility that caused discrimination, conflict, and riots, and led, on one occasion, to the transfer of hundreds of Regular Army (as opposed to draftee) personnel from a camp in South Carolina because of racially-motivated problems. He tells us of the cultural shock experienced by both the draftee and his Regular Army sergeant upon the infusion of massive numbers of civilians into the ranks. Fortunately, this period of severe difficulties, with the possible exception of the racial problem, ended by 1942.

Probably the most useful parts of this book are the chapters that discuss combat and its consequences, including medical evacuation and capture, and how the American soldier coped. Kennett displays good insights, and this section of G.I. tends to complement S.L.A. Marshall's Men Against Fire. Also in this section are our WWII Allies' and enemies' views of the American soldier. All observers agreed the American soldier was "fantastically well equipped" and preferred to use stand-off firepower rather than closing with the bayonet, although the Germans found that Americans were quite willing to carry the fight when deprived of support during the Battle of the Bulge. The other combatants were also taken aback by the high pay Americans received and the importance Americans placed on comfort items; e.g., the British were "dismayed" by the amount of Coca-Cola the Americans brought with them on the invasion of North Africa.

G.I. contains a few small errors and a flawed statistical conclusion, but these do not detract from the reader's enjoyment.

This book would be beneficial for the student of WWII battles who wants a more rounded view of American participation in the conflict and its effects on the average citizen-soldier. I recommend it to the Armor reader.

JIMMIE D. STARLING
1LT, Armor
194th Armored Brigade

Armour of the Korean War 1950-1953, by Simon Dunstan. Osprey Publishing Ltd., 40 pages,

Mr. Dunstan does not detail the Korean War, but he does cover the armor units involved in that war from the time they went to Korea, their assignments, and the battles they fought.

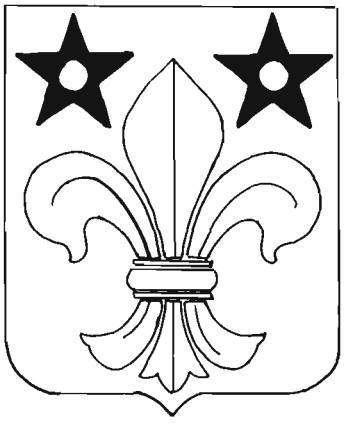
For instance, 64th Armor, an all-black unit, arrived in Korea in November 1950, and was part of the 3d Infantry Division. The British 8th King's Royal Irish Hussars arrived in Korea in November 1950 and were assigned to the 29th British Independent Brigade, 1st Commonwealth Division. These are a just a few of the 22 armor units mentioned.

Mr. Dunstan also covers the various tanks used by the U.S. and the South Korean units, as well as the North Koreans.

The book has 38 black and white photographs of armor vehicles, including some good action scenes. There are eight pages of color art work by Terry Hadler on armor vehicles and their markings.

This is a great book and I highly recommend it to people who are into military modeling and military history.

SFC ROBERT J. TORSRUD
Ft. Knox, KY



Symbolism

Yellow is the color used to denote armor. The pierced mullets simulate spur rowels and refer to service by elements in World War II; the fleur-de-lis alludes to campaigns in France and Italy earned by elements of the regiment in that war. The colors red and green symbolize the French Croix de Guerre and the Belgian Fourragere (1940) awarded to an element of the regiment.

Distinctive Insignia

The red embattled arrowhead, with charges of the coat of arms, alludes to the spirit of the unit and is symbolic of its motto and its history.

252d Armor

Ready, Poised, Decisive

Lineage and Honors

Constituted 20 March 1959 and allotted to the North Carolina Army National Guard as the 196th Armor, a parent regiment under the Combat Arms Regimental System. Organized 1 April 1959 from existing units in south central North Carolina to consist of the 1st Reconnaissance Squadron and the 2d Medium Tank Battalion, elements of the 30th Infantry Division.

196th Armor redesignated 10 March 1963 as the 252d Armor, a parent regiment under the Combat Arms Regimental System, to consist of the 1st and 2d Battalions, elements of the 30th Infantry Division.

Campaign Participation Credit

Headquarters Company, 1st Battalion (Fayetteville), and Company B, 2d Battalion (Sanford), each entitled to:

World War II-EAME

Normandy
Northern France
Rhineland
Ardennes-Alsace
Central Europe

Headquarters Company, 2d Battalion (Raeford), entitled to:

World War II-EAME

Rome-Arno
North Apennines
Central Europe
Po Valley

Decorations

Headquarters Company, 1st Battalion (Fayetteville), entitled to:

French Croix de Guerre with Palm, World War II, Streamer embroidered FRANCE (30th Infantry Division cited; DA GO 14, 1959)

French Croix de Guerre with Silver-Gilt Star, World War II, Streamer embroidered STOUMONT and HABIEMONT (119th Infantry cited; DA GO 43, 1950)

Belgian Fourragere 1940 (119th Infantry cited; DA GO 43, 1950)

Cited in the Order of the Day of the Belgian Army for action in BELGIUM (119th Infantry cited; DA GO 43, 1950)

Cited in the Order of the Day of the Belgian Army for action in the ARDENNES (119th Infantry cited; DA GO 43, 1950)

Company B, 2d Battalion (Sanford), entitled to:

Cited in the Order of the Day of the Belgian Army for action along the MEUSE RIVER (690th Field Artillery Battalion cited; DA GO 43, 1950)