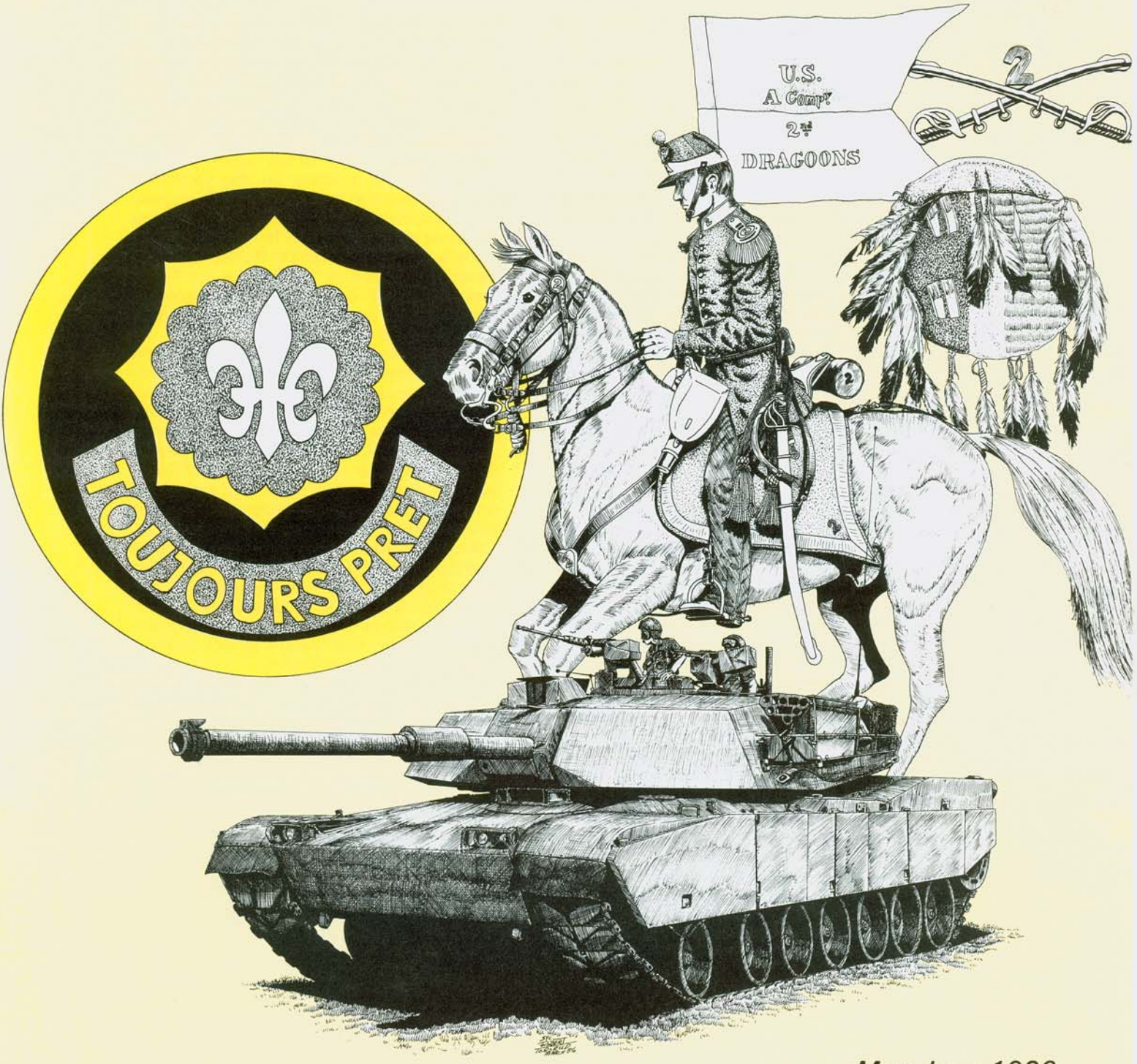
ARMOR

The Magazine of Mobile Warfare



May-June 1986

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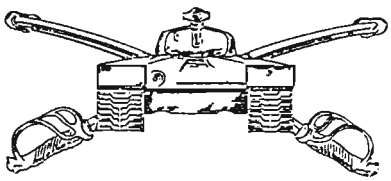

The main feature, and cover story, of this issue of *ARMOR* celebrates the 150th anniversary of the oldest *continuously* serving regiment of the United States Army: the 2d Armored Cavalry Regiment. **Major Christopher Thompson** and **Sergeant First Class Kenneth E. Morrison** provide a detailed and enjoyable history of "The Second Dragoons."

Most of us realize that "blitzkrieg" came to the forefront in the early days of World War II, but few of us have studied the training and testing ground for that conflict: the Spanish Civil War. In "The Role of Italian Armor in the Spanish Civil War," we are able to view the first "modern" use of tanks. This story, written by **Pierangelo Caiti** and **Alberto Pirella,** shows us mechanized warfare in transition from the purely infantry support role of WWI to the mobile "lightning" battles of WWII. The feature was translated for *ARMOR* by **Captain Edward De Lia.**

Smoke operations change the battlefield. Anyone who has fought at the NTC or Hohenfels FRG knows that. In "Countering Soviet Smoke," **Captain Mark Reardon** provides useful information on how the potential threat uses smoke and what we can do to counter it. I commend the article to you; it is "on target."

Since the first tanks appeared on the battlefields of WWI, a constant debate has raged over whether the tank should be heavily armored and gun armed or lightly armored and perhaps armed with missiles. **Craig Koerner** and **Michael O'Connor** believe that "The Heavily-Armored, Gun-Armed Main Battle Tank Is Not Optimized For Mechanized Warfare." They offer some interesting strategic and tactical arguments for a lower silhouette, lighter weight, greater acceleration, and supersonic missiles in the tank of the future.

This issue of *ARMOR* also contains a story on a technology that is rapidly coming to the foreground in a military sense. "Military Applications of Robotics" by **Captains Ricky Lynch and Michael Nugent** describes what until lately sounds like something from science fiction. Used in various primitive ways in the past, robots are time-saving and effort-saving devices that heavy industry has already adopted. Many of them may have life-saving implications for our soldiers on the next battlefield. I commend the feature to you both for thought and as a view of the future.

The need for mobility on the battlefield brought about the need for the tank in great part. Retaining that mobility in the face of obstacles is a requirement for success on the battlefield. **First Lieutenant Randall Grant's** feature, "Minerollers: Mobility for the Armor Task Force," provides us with useful historical and technical views of this way that armor forces use to maintain mobility.

In several issues of *ARMOR* over the past year, you have read briefly about the Excellence-in-Armor Program and the Tank Commander's Certification Test. These two programs will have a major impact on training, promotions, and selection for key leadership positions in armor units. In "Pursuit of Excellence in Armor," the Office of the Chief of Armor has capsulized this program to describe how it works.

Another feature I recommend to you is "Taking Charge," by **Captain Ro Tyson.** This story, part of the how-would-you-do-it series, puts a young officer in the position of assuming leadership of his first platoon under combat conditions. The feature is well-written, challenging, and to the point.

As I mentioned at the beginning of this column, May marks the 150th anniversary of the oldest continuously serving regiment of our our Army. I and the staff of *ARMOR* congratulate the 2d ACR for their long and distinguished service. Their history stretches from the fighting in the swamps of the Seminole Wars to today when they stand as one of the first units to meet any potential Warsaw Pact aggressor in Europe. Happy Birthday Dragoons! — GPR

ARMOR The Magazine of Mobile Warfare

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FEATURES

DEPARTMENTS

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LETTERS

Merkava Debate

Dear Sir,

I read with extreme interest the article by Richard Ogorkiewicz, "Israel's Merkava Mark 2 Battle Tank," in the November-December issue of *ARMOR*. This design is clearly the most innovative in recent armored fighting vehicle (AFV) history.

I was fascinated not only by the incorporation of the various features but also by the realization that the Israelis had adopted a radically new concept in their approach to designing this new AFV. The international trend since WWII in tank design has been simple — more firepower, more speed, and more protection. Each new tank has basically been an improvement on its predecessors. Even our M1, quantum leap that it is, still fits this characterization. The Merkava is also a quantum leap forward but on a new path.

Mr. Ogorkiewicz's descriptions and explanations of the Merkava's design features are excellent. What disturbs me is his insistence it is not "some kind of tank-cum-infantry carrier." It is precisely this capability and the opportunities that this affords that make it such a revolutionary AFV. If we accept Mr. Ogorkiewicz's assertion that the Merkava is first, foremost, and exclusively a tank, then we must evaluate it purely as a tank.

A tank is a weapons system that optimally balances mobility, firepower, and protection. Mobility is speed; how fast a tank can get from a hide position to a firing position, from one battle position to a subsequent one, how rapidly it can sweep around an enemy force's flank, or bypass an obstacle. By current standards, the Merkava is woefully slow. For firepower, the Merkava mounts the M-68 cannon which is fast becoming obsolete for MBT killing. Along with its ammunition it has nearly reached its maximum potential against the current generation of Soviet tanks. This is why the British, then the Germans, and now the Americans have upgunned to a 120-mm cannon. By the author's point-of-view, the .50 cal. machine gun (MG) is an obsolete weapon. In certain respects I agree. Except for a lesser maximum effective range, the 7.62-mm MG is adequate against troops and soft targets. The .50 cal. MG is also inadequate against most of the lightly armored carriers and infantry fighting vehicles (IFV) now fielded. However, the .50 cal. MG is still the best antiaircraft weapon that we can conceivably mount on an IFV or tank. In the protection category I totally agree with Mr. Ogorkiewicz. Indeed, I think the Israelis made this their highest priority and they have succeeded admirably. As our master gunner exclaimed, "I want to go to war with the Israelis — they care about casualties!"

Overall, the Israelis have taken one step forward and two steps backward with the Merkava, if it is used strictly as a tank. Perhaps for their needs it is adequate in the role of a tank. However, for the rest of us who must be prepared to fight in a greater range of contingencies under the doctrine of combined arms, the Merkava is the first truly integrated combined arms fighting vehicle. Who knows, maybe we can persuade the powers-that-be to stretch an M1A1 a couple of feet in length, several inches in height, move the drive train to the front, add some armored bulkheads, modify the rear to accommodate troops, and add a 60-mm mortar. As a tanker who believes in the necessity of combined arms, I want one! I want the infantry with me all the time, I want my own indirect fire support all the time, I want my own air defense all the time, and I want all of my team together for training — all the time!

RAYMOND JOEL REHRER
CPT, Armor
FRG

The Author Replies

Dear Sir,

I was pleased to read that Captain Rehrer found my article on the Merkava Mark 2 interesting. But I shall have to disappoint him by reemphasizing that the Merkava is not some kind of tank-cum-infantry carrier but a battle tank — and a fine one at that.

So far as its characteristics are concerned, mobility is not solely a matter of vehicle speed. In any case, the Merkava is not "woefully slow" when it comes to movement over battlefield terrain and it will be even less so when the higher output engines envisaged for it are available. Similarly, the effectiveness of the main armament is not only a question of caliber, and the gun of the Merkava is no less effective than the 105-mm gun of all the U.S. M1 tanks produced until recently. The M1A1, which is now coming into service, is, of course, armed with a 120-mm gun and the Merkava can be similarly upgunned when this becomes necessary.

With regard to the capability which Captain Rehrer ascribes to the Merkava and which allegedly makes it "revolutionary," it is simply not there. In other words, the Merkava is not and cannot be simultaneously a battle tank and a carrier of infantry. Any hybrid vehicle designed to combine the two roles would be ridiculously large and heavy and at a time when strenuous efforts are being made the world over to reduce the size of the target which tanks offer, even to the extent of reducing the crew from four to three men, it would be foolish to do the opposite by making them larger in order to accommodate some infantrymen.

Moreover, as I have tried to point out already, carrying infantrymen in a tank would contribute nothing to its primary role of engaging the enemy with its main armament, except for increasing the number of potential casualties.

A tank-cum-infantry carrier hybrid is not, therefore, the way to implement the doctrine of combined arms. What that requires is a close combination of optimized battle tanks with separate, properly designed armored infantry carriers.

RICHARD M. OGORKIEWICZ
London, England

"Unacceptable Cover"

Dear Sir,

I find the cover of your January-February 1986 issue fundamentally and personally offensive.

The United States Army stands for values and principles totally antithetical to those represented by the uniformed SS men on your magazine's cover. Consequently, a cover that seems to glorify an SS tank crew prepared to do its deadly business in support of unmitigated evil is utterly unacceptable.

I do not object to historical analysis of military actions such as found on page 26 of the same issue, to which the cover apparently refers. I do not contend that the tank crew depicted was personally responsible for any of the unspeakable horrors undertaken, as a matter of deliberate policy, by the government they served. I do, however, contend that each of us must think beyond the mere technical skills required of armor soldiers and keep clearly in mind the moral imperatives for which we stand prepared to do our deadly business.

If you must give us cover portraits of WWII soldiers in uniforms bearing the swastika, I suggest you choose those soldiers who had not only the courage to fight on the battlefield, but also the courage to risk (and misfortune to lose) their lives in attempting to rid their nation of the evil incarnate that had risen to its leadership.

HARTMUT LAU
LTC, Armor
Boston, MA

German TC Survived, Books Say

Dear Sir,

I just finished reading the article, "The Defense of the Vienna Bridgehead," by First Lieutenant Peter R. Mansoor. This excellent article does contain one error. It states that SS Oberscharfuhrer Barkmann and his crew were killed during the battle when their Panther tank was hit.

While Barkmann's crew may have been killed, he himself survived, according to two books in my possession. *Panzers in Normandy—Then and Now* by Eric LeFevre,

states that Barkmann's last known whereabouts were when he was registered as a POW of the British Army in May, 1945. The other book, *Their Honor Was Loyalty,* by Jost W. Schneider, states that as of 1977, Barkmann was living as a farmer in Schleswig-Holstein, and now goes by the name of Ernst Schmuck-Barkmann.

This mention of Oberscharfuhrer Barkmann's death was the only error I found, and Lieutenant Mansoor is to be complimented on writing such an interesting and informative article.

ROBERT V. HODGE
Bloomington, IL

BMP-2 Comments

Dear Sir,

I read with interest the staff study on the features of the new Soviet BMP-2 and would like to share a few thoughts.

First, I would agree that the Soviets probably have a concern about air defense against helicopters and low-level, fixed-wing aircraft. Very likely the 30-mm cannon could effectively deal with the NATO threat in this quarter, but even a precursory external review of the optics and vision ports on the vehicle suggests that visibility for aerial targets other than those directly ahead of the vehicle (turret orientation) and at or near ground level would be minimal at best. I would suggest that the elevation capability is more likely designed for the purpose of combating troops on higher terrain elevations, including buildings, as combats with Afghan guerrillas have demonstrated the severe shortcomings of the BMP-1 in this regard.

Armor penetration of the cannon is necessarily very limited compared with the PG-9 HEAT grenade. However, as noted in the study, the probability of obtaining a hit, or numerous hits, is considerably higher with the cannon. More importantly, however, the shift to the rapid-fire cannon seems to suggest a move away from the apparent original role of a swimming, self-propelled squad/platoon antitank platform so important to Soviet river crossing tactical/operational doctrine to provide protection for newly-established bridgeheads. The adoption of the new system seems to suggest that the Soviet emphasis on developing multiple meeting engagements with the second echelon BMP-2 force has taken preeminent position as regards vehicle design. In such operations, vehicle speed and limitations on combat halts strongly militates in favor of the rapid fire cannon with fire-on-the-move capability.

One question remains which only time will answer. It is whether or not the BMP-2, with the reduced dismounted squad size of six (or seven, should one occupy the now vacant former commander's seat behind the driver), now without a squad leader — given his new role as combat vehicle commander and primary weapons operator — will be effective enough, given the limitations on Soviet infantry training and performance, to justify the adoption of the vehicle as the new infantry squad vehicle. Although it is certainly too early to frame a definitive statement of intent on the part of the Soviets, recent photographs seem to suggest that the BMP-2 may be a vehicle designed as a follow-on to the first generation BMP-R reconnaissance vehicle. Adopting the two-man turret designed for that vehicle, it may be that the BMP-2 is a "cavalry" version of the BMP-1 infantry vehicle, designed for reconnaissance, advance guard and economy-of-force missions.

The critical shortcoming of the BMP-2 design, as that of the BMP-1, is certainly the limited armored protection afforded the crew. Following long debate in the Soviet military press about this problem and the best means to mitigate the problem, it appears that the only solution readily agreed upon by all involved was to place the vehicle in the second echelon position. Apparently it was felt that by such mission assignment, the armor would be sufficient to allow the vehicle force as a whole to pass through any surviving enemy antiarmor positions at high speed on the way into the NATO rear area. While perhaps true, it is interesting to contemplate how effective the armor would be in the much sought after meeting engagement with the numerous NATO rapid fire cannons most likely to be found in the reserve forces encountered.

My compliments to the *ARMOR* staff for their concise overview of this new and very interesting combat vehicle.

JOSEPH R. BURNIECE
Arlington, VA

Some Cavalry MTOE Changes

Dear Sir,

Thanks for the interesting views presented on Division 86 Cavalry in Major Kindsvatter's article in the September-October 1985 issue of *ARMOR*.

Since his article appeared, we have reviewed pending MTOE changes that will affect our squadron, which is the division cavalry for the 40th Inf Div (Mech), the Sunburst Division. On the basis of the last review of our MTOE, the following significant differences may be of interest to your readers:

There is no provision for either a motorcycle or sensor platoon.

There is a long range surveillance detachment (LRSD) which is a separate paragraph/line in our MTOE. *It is a ranger/airborne unit.*

Unlike the original proposal, we do retain armor; two platoons of four tanks each per troop. A ninth tank is assigned to the troop HQ and manned by separate crew. That totals 18 tanks.

The NBC recon platoon consists of 20 personnel and six vehicles. Original vehicle density was reported to be nine vehicles and the reason for the change is unclear.

The organization of our ground cavalry troop is unchanged insofar as the HQ, mortars and maintenance are concerned. There are two each, tank and scout platoons, per troop.

While some readers may feel this is a hybrid squadron, we can assure you that we have pressed our positions both with the tactical community in our division and through our commander to the highest levels of military review. We feel the retention of armor is critical for staying power on the non-linear battlefield of tomorrow.

But even with the retention of 18 tanks, we lack over one-third of the combat power we enjoyed under the old "H" MTOE, and nearly a ninth less air cavalry power as well. Clearly, we need reinforcement to move outside the division's tactical area, if such missions are undertaken.

Lastly, let me be placed on record that the proponents of the fighting cavalry are not gone nor silent. We expect to meet any change with professional resolve, and we expect the Army leadership to provide adequate tools to do that job well. In our case, the retention of at least a majority of our armor capability reaffirms our trust in that leadership.

DANIEL L. KIRTLAND
MAJ, Cavalry
1/18 Cav, California ARNG

More on C&C Vehicles

Dear Sir,

I hope I am not too late to respond to Major Geier's fine article, "Battalion Command and Control," which appeared in your September-October issue and Captain Sayles' well-researched reply in the November-December letters column...

I most emphatically agree with Captain Sayles that a company-level commander must lead from a fully combat-capable fighting vehicle. It is, as he well put it, his duty to be where he can use his command presence, leadership, expertise, tactical knowledge *and firepower* to influence his portion of the overall battle and accomplish his company's mission. In combat, most of his time will be spent within range (hopefully not within sight) of the enemy and his personal mount is part of his company's firepower.

Unfortunately, comparing his position with that of Major Geier (at a heavy task force HQ) puts us in an "apples and oranges" situation. Captain Sayles has no business "...one terrain feature behind the FLOT...", where Major Geier's TAC CP M577 is located, unless ordered there by his commander. On the other hand, the CO of the 1-13th Armor usually has no business up on the FLOT adding the firepower of his command tank to that of one of Captain Sayles' platoons. His job is to coordinate and orchestrate the activities of half a hundred main battle tanks plus assorted ITVs, CFVs, mortars, antiaircraft he "owns," as well as any attached infantry, engineers, etc. and combat support and service support assets he has supporting him. An LTC has no business

acting like an E-6 except in very unusual situations.

As Major Geier states, successful armor commanders must both lead from up front, where decisions need to be made on the spot, and live long enough to make and announce those decisions. That presupposes a bulletproof and shell-repellent mount; ideally, a tank. Heinz Guderian went into both Poland and Russia riding a *Panzerkampfwagen I Befehlspanzer,* which lacked even a turret. It was basically a bulletproof portable radio and its "main gun" was an MG34 light machine gun. No one I've read has ever called Guderian an unsuccessful armor commander! Later, the *Panzerkampfwagen III Befehlspanzer* came out. It kept the turret but lost the gun for radios. To — in Captain Sayles' phrase — disguise a CP vehicle as a tank, a wooden pole was stuck through the mantlet to look like a cannon! Not until the Panther came out did a German tank battalion or regimental commander get the capability to kill a tank with his own CP vehicle. While the Germans lost WWII, it was not due to their unsuccessful armor commanders. Neither was it due to the reduced ammo capacity of their command tanks.

There is plenty of precedent for senior officers getting "personally involved" in combat. In WWII, Major General Ridgway was once almost shot by one of his outposts while entering his division's lines after a nocturnal visit to the Germans' outpost line with an M1903A3 Springfield for a "sidearm." However, *most* of Major General Ridgway's time was spent running the 101st Airborne Division doing other things than sniping.

Ideally, Captain Sayles is the ace tank commander of his company and, when they go to the range, Captain Sayles takes his tank downrange and shoots a score the rest of his company has to sweat hard to match. That is his job. His proficiency as a tanker is the standard of his company, the same as his shave, haircut and spit-shine are its standard of appearance. The same, however, does not apply to his battalion CO. In Viet Nam from May 1967 to July 1969 (26 months and 6 campaign stars), I was by far the best rifle shot in the scout platoon I led and the SF "A" Team I commanded, not to mention the CIGD/Montagnards we worked with. I've killed more of my country's enemies than any man in either of those units and the two USAR battalions I've commanded since then. I've also got 14½ air hours as a volunteer gunner on pre-Cobra Huey gunships and 105 days in Sam's hospitals. I am entirely willing to "get my hands dirty (bloody?)" when there is fighting to be done. Having established my credibility as a soldier, let me now say that "personal involvement" is no longer my *main* job.

If DA ever allows this unrepentant old SF trooper to command a heavy battalion task force in WWIII (or any other occasion), the C&C procedures in Major Geier's article will form the basis of my command and control SOP; to include the configuration of the two HQ tanks to enable me to talk to all the people to whom I'll have to talk to coordinate the activities of several hundred subordinates, keep my brigade CO informed and tell half a dozen support elements what I need and where I want it put. On the other hand, if Captain Sayles and the others at Ft. Knox can rig me a mount that can blow away T-72s without having to wrestle shells one at a time out of the reserve racks, I shall be most grateful!

All tankers must be able to shoot, scoot and communicate. However, field grade tankers, the kind Major Geier wrote about, have to do a lot of communicating and scooting and minimal shooting. With all the people we have to talk to, we don't have time for much shooting. Of course, when we do need to shoot, it is vital that we be able to do so. Major Geier, thanks for an excellent mini-manual on the running of a heavy task force. Captain Sayles, you hurry and get me that more combat capable iron horse you described so I'll live long enough to do my main job.

WILLIAM L. SMITH
MAJ(P), IN/SF, USAR
Columbia, SC

FIST-V "A Significant Improvement"

Dear Sir,

I am writing in response to Captain Robel's letter regarding the FIST-V in the January-February issue of *ARMOR*. While not having had the advantage of seeing the FIST-V in action, I believe most artillerymen would strongly agree with Captain Robel's contention that a converted Bradley Fighting Vehicle would be a much better FIST-V than the one which the Army has purchased. However, fiscal reality in the era of Gramm-Rudman has dictated that we must settle for something less than the optimal solution for the time being.

All this considered, I believe Captain Robel has missed some of the salient points regarding employment of the FIST and the FIST-V. Captain Robel has expressed the concern that the FIST-V is too underpowered to keep up with its supported company. I contend that not only is it not necessary for the FIST to physically keep up with the maneuver company commander, but is is often times undesirable. We in the artillery community are guilty of schooling maneuver company commanders to keep their FIST "in his hip-pocket." Translated into action, this has meant that the FIST followed the company commander wherever he went on the battlefield. The results have been that the FIST was being "killed" early in the battle or the FIST was unable to properly see the battlefield. The FIST needs to be in hull defilade on a piece of terrain where he can see his company's zone of action; the FIST-V with its hammerhead is ideally suited for this mission. If the FIST has FM-voice with his commander, he is still in the commander's "hip-pocket."

Operating as described above, the FIST's movements must be carefully orchestrated. Much like the movement of the task force's mortar platoon, the FIST should move from one pre-planned position to the next as the battle progresses. Primary, alternate, and supplementary positions should be planned. The addition of a Combat Observation Lasing Team (COLT) to the maneuver company would allow movement of fire support assets in echelon, but continuous fire support can be provided while the FIST—V is on the move without the COLT. First, the FIST officer or NCO could ride with the company commander and provide fire support while the FIST—V is on the move. Second, the platoon leaders of the tank platoons and the forward observer of the infantry platoon will continue to provide fire support for their individual elements.

Experience at the National Training Center, Pinon Canyon Maneuver Site, and here at Fort Carson has shown time and time again that tanks and mechanized infantry operating at high speeds across open terrain will be killed as easily if not easier than those combat vehicles which move more slowly using proper terrain march techniques. In the latter scenario, it is not necessary for the FIST to have a high-speed vehicle which can keep up with the Bradley or the Abrams on the battlefield.

Another problem I have with Captain Robel's letter is his statement that because of all of its internal equipment, the FIST-V "is not suitable to be taken over for command and control purposes, as is a standard M113." The fact of the matter is that the FIST vehicle, whether an M113 or a FIST-V, is a poor choice as a back-up command vehicle.

Not being totally familiar with the TO&E of an armor or mechanized infantry company, I cannot address Captain Robel's contention that the FIST-V's secure radio capability make it an ideal solution for a back-up command track. Yet this seems a poor reason to turn the FIST-V and its occupants into a battlefield taxi, causing the FIST to lose much of its ability to properly support the company. Maneuver company commanders need to thoroughly think this problem through and devise a better solution.

In short, because of its ability to accurately locate targets for both guided and conventional munitions, its excellent communications capabilities, and its ability to be in hull defilade and still see the battlefield, I believe the FIST-V is a significant improvement over the straight M113.

DAVID J. FITZPATRICK
CPT, Field Artillery
Ft. Carson, CO

Because of space considerations, Recognition Quiz does not appear in this issue. Last issue's quiz also contained an error: Photos 1 and 2 were switched when the page negative was assembled. — Editor

COMMANDER'S HATCH

MG Frederic J. Brown
Commanding General
U.S. Army Armor Center

Armor Assessment, Part III: Training and Equipment

The individual officer and noncommissioned officer must be trained to be tactically and technically competent so that he cannot only employ and sustain the force within his charge effectively and efficiently, but also such that he can train his subordinates.

This competence must be accompanied by an ability to focus direct and indirect fire in time and space in the face of unanticipated challenges on the battlefield. This ability to synchronize should be accompanied with a sense of the battlefield — almost a sixth sense for opportunity and challenge.

The commander must also be aware of and sensitive to the intent of his senior commander once to twice removed. This sensitivity should be inculcated within the training base. With it, we would hope to develop a leader who is comfortable with fighting and maintaining new technologies and who is prepared to encourage innovation on the part of his subordinates, an individual who understands standards of excellence and is prepared to nurture excellence in his organization.

Lastly, and as a function of excellence, we must develop leaders who have a burning desire to continue to improve their tactical and technical competence. All of these characteristics must be present in the training system if we are to capitalize on our strengths as a nation and as an Army.

Training: Where We Stand

The training system required is almost in place. It is a fully integrated training strategy which presents a way to train to proficiency and which has been structured to reinforce the assimilation of rapidly changing capabilities. It is fully integrated because it is based upon common tasks, conditions, and standards which are uniformly taught from the individual echelon (officer, noncommissioned officer, and enlisted soldier) through the collective echelon from platoon to brigade. There are common standard operating procedures associated with a common exercise structure, modified as appropriate to the particular echelon being trained through common scenarios. This is reinforced by training practices and procedures within the schoolhouse, which are designed to duplicate how we expect training to occur within the unit.

The training system describes a way to train — a "how to" — that is guaranteed by the School to be successful if it is applied with rigor within the unit. In fact, it is a common tactical base from which commanders are expected to depart, consistent with their individual METT-T (mission, enemy, troops, terrain and time available). *The* way is that which is required within the unit, given METT-T; *a* way is a proven program that is the measure of training within the school.

Training must also reinforce the ability of the Army to rapidly assimilate new capabilities; in fact, our training exercises are designed to stretch new capabilities of our equipment — particularly mobility, visibility in limited observation situations, and protection. As a matter of course, leaders are placed in basic tactical situations demanding the aggressive use of new equipment. The training system is admirably suited to accelerate assimilation of new capabilities across the force; and we believe we can, in fact, exercise this capability far more effectively than any other Army.

Training must relate to the entire force — to the total force trained to higher standards with rational resources and justifiable programs. The training has been improved to a notable degree. We have more

efficient and effective training employing the systems approach and our training is combined with excellent simulation devices — the VIGS and UCOFT are fine examples. We have structured the after-action review process to be a positive learning experience as well as an opportunity for significant development between and among peers. The training is more realistic, employing tactical engagement simulation (MILES) in tank combat tables and our situational training exercises. The Combined Arms Live Fire Exercise (CALFEX) has been tied to the multipurpose range complex. All are grounded in uniform, more precise material provided to support quality distributed training.

Simultaneously, we have demanded considerably higher standards in training. Tank gunnery has become considerably more difficult. The detail of the ARTEP and AMTEP has been expanded. There is the absolute necessity of training as combined arms teams and task forces to ensure the synergistic effect that such a combination brings to the battlefield. And, most importantly, there is the rigor of an "uncontrolled" OPFOR.

It has been particularly difficult to establish justifiable training programs. This now has been done. The STRAC is supplemented by an annual training program validated by the 194th Brigade at the National Training Center over a three-year period. This now is in the process of being tied to a responsive, yet flexible, annual training program using predictable resource support. It now remains to tie these programs which train to proficiency to some form of training model. Furthermore, the various training device packages which have been developed need to be tied to specific performance requirements. This is, in fact, now being developed through coordination between TRADOC and AMC.

The end point of training is not responsible consumption of resources; it is the development of individuals and units prepared to fight and win the AirLand Battle. Training, increasingly, must be designed to inculcate and train uniform standards of excellence while at the same time encouraging innovative initiative down the chain of command. We have developed drills which we can use to teach the bricks, the routine exercises which need to be practiced to perfection in time of peace. And we have established a training program requiring multiple repetitions of precise, finite, individual and collective tasks. They are the situational training exercises and the tank combat tables. These should be done with precision and great attention to detail. Simultaneously, however, commanders need to be stimulated to develop flexible, innovative combat operations — a responsibility of the School in training officers, but more critically the fundamental responsibility of the unit.

The Armor School has embarked upon a program to significantly upgrade the instruction by basing content on diagnostic evaluation of the student, and, more critically, by placing the student in an intensely stimulating and rewarding individual learning environment. We at Knox call this Cold Reason. It is a method of bringing the schoolhouse to the field to provide a more realistic officer and noncommissioned officer training environment.

Training in the institution is only the beginning. The true training to readiness must occur in the field in the deployed unit, which trains as the combined arms company team or battalion task force.

To support this, there must be training material designed to extend the precision and quality of the training base to the ever-busy field unit. This has been accomplished by developing uniform procedures for teaching the basic drills — the basic building blocks — for the development of unit proficiency going from individual tank through battalion task force in a series of recommended exercises which have been proven over the past several years. Aiding this process are quality facilities — the National Training Center is a prime example —but it is now joined by the Multipurpose Range Complex in the process of construction, by the exported Tank Commander's Course presently being taught at Gowen Field, by Range 301 at Grafenwoeher, and by the programmed development of a Combined Arms Training Center at Hohenfels, West Germany. All of these quality training support facilities are intended to sustain the rigor of the training base in the field environment.

Training Constraints

The training system, virtually intact today, is now far better understood as a major contributor to our combat effectivensss. The payoff — our readiness to fight — is becoming increasingly evident. There are however, significant challenges which remain. Training is becoming more difficult in Europe. Although the resources differ somewhat, the training environment in USAREUR is now similar to the training environment within the United States, particularly for the National Guard. This comparison is particularly relevant when one examines the days of quality unit training in the field available to the average forward deployed heavy force battalion. It is not grossly dissimilar from that available to the National Guard.

A second challenge is the ground force "flying-hour program." As the cost of day-to-day training increases, there is every-growing scrutiny of Class III, Class V, and Class IX training costs. OPTEMPO is with us, and it will become an increasing factor in our scale of training in the future.

Lastly, because of resource constraints, we will have mixes of tanks on the battlefield. We simply cannot afford to equip our entire force with our most modern capability. We find — both within the Active force and between the Active and Reserve forces — considerable variation in the quality of equipment, a particular challenge to the individual who is expected to be tactically and technically proficient as a competent leader in the tank of the unit to which he is assigned. This may require proficiency in multiple tanks.

But having noted this, the training situation is fundamentally quite optimistic. We are now beginning to reap the fruits of a significant and controversial decision, made over a decade ago, to improve significantly the quality of training in the Army. This has been done. We are the beneficiaries. It is now our challenge to apply this capability to enhance our combat effectiveness vis-a-vis the Warsaw Pact.

People and training are the prerequisites to battlefield success, but

they alone are not sufficient. They must have reliable, capable equipment, equipment designed to take advantage of our strengths. We should capitalize not only on the general mechanical awareness of our population, but also on the remarkable advances in the understanding of data which have been made by young people as they become accustomed to microprocessors in video arcade games. We also need to capitalize on our ability to train, both effectively and efficiently, our officers and higher-skill-level noncommissioned officers, our tank commanders.

From this base, we have developed a concept of employing mobile-protected space within the combined arms team. The rationale is straightforward. As we know from the Arab-Israeli War in 1973, what can be seen can be hit; and what can be hit can be killed. Therefore, it becomes very important not to be seen. This is reinforced as we apply high technology to our fighting systems. The technology is, almost without exception, inordinately expensive. We cannot afford it on all of our vehicles. We need to vary capabilities and we must, therefore, have the ability to conceal the high-capability systems on the battlefield. And as we develop our equipment, we should take advantage of our technologies to develop the sought-after "leap aheads," advantages which keep the Soviet Union off balance. These can serve to invalidate the enormous and ever-building Soviet inventories. We think this is entirely possible.

Combining the power of the microprocessor with the initiative and innovation of the average American, we can develop significant variances in our mounted combat vehicle family. We could vary the killing capability, the protection, the sensor, or the information available to the commander. It is feasible that we could shift the killing mechanism from chemical energy to kinetic energv — as we do today — to other kill mechanisms. The armor could be variable. If it were to be modular, it could be replaced or changed to suit an evolving tactical situation. A move from the classic metal solution to other armor recipes (ceramics) would be acceptable if protection levels are maintained or improved and weight burdens reduced. The sensor could be the human eyeball, as at present, or the FLIR or milli meter-wave radar, an acoustic sensor, or perhaps some other means. Information could be provided using Battlefield Management/Integrated Command and Control Systems to communicate to the leader information concerning the friendly and enemy situations. All of these changes could be made to a vehicle so that the particular capabilities of the vehicle are not apparent to the enemy. In fact, it may be possible with a new family of vehicles to conceal not only the components of the tank, but also to conceal the different missions of the constituent parts of the combined arms heavy force. These are long-term development efforts underway at Fort Knox.

More immediate programs are also being pursued. For two years we have demonstrated improved command and control configurations for the M60, M1, M3 and M113. Validated at Fort Hood and at the Naitonal Training Center, we are confident that we have provided a significant improvement in command and control to the deployed force.

We are also working to affect immediate improvements in combat service support. Coordinating with the Infantry Center, the Combined Arms Center, and the Logistics Center, we have developed improved combat service support organizations, policies, and programs. We intend to test these in the near future and to recommend them for fielding across the force.

These ambitious programs are not without cautions. first and foremost, electrons can fail — in peace through maintenance problems, in war through direct enemy action. We must always have mechanical fallbacks to include direct-vision optics, so that if all fails electrically and hydraulically, we have a direct, mechanically-linked way to fight. The equipment must also be maintainable by average soldiers at reasonable costs. There is great promise in bussing and in vetronics, but we must ensure that what we develop is, in fact, fully supportable. Lastly, we must stress development of equipment which is fully understood by average people under stress who would employ it in war. The rate of acceptance of new concepts is increasing. The thermal sight has effectively brought the processed image into the tank force at the officer and noncommissioned officer levels; we should not underestimate how important it is to develop equipment which is not only understood but also fully accepted by our force.

Organizational Changes

Last — but certainly not least in developing a winning capability — is the integration of people, training, and equipment into organizations which can carry out our doctrine. Our organizations have been under continuing review, particularly since the Arab-Israeli conflict of 1973. Led by the division restructuring effort and subsequently Division 86, there has been a major effort to adapt our organizations to the characteristics of modernized equipment. After considerable study, we moved to the four-tank platoon and standardized heavy Cavalry organizations, based upon the four-tank platoon or the six-vehicle Cavalry platoon. Both were designed to increase the ratio of leaders-to-led and to simplify the leader task by giving them pure organizations. A further benefit of this has been the establishment of the tank and wingman relationship, particularly in a tank platoon. An officer or experienced noncommissioned officer as the platoon leader or platoon sergeant is followed by a subordinate junior noncommissioned officer, who is the buddy watching his leader and doing as he does. In this way, he learns the position of platoon sergeant or platoon leader as he observes.

We've reduced the complexity of requirements placed upon battlefield leadership by moving functions from company to battalion. More battlefield functions are intended to be accomplished at battalion or even brigade level, where there is a staff as well as a more experienced commander. This poses a risk of reduced flexibility; there is less built-in redundancy to respond to unforeseen opportunities and challenges. And this has been a particularly difficult issue as maintenance has been consolidated at battalion, rather than company echelon.

The purpose here is not to support or to oppose any organizational configuration; it is merely to indi-

cate that there are subtle but very important relationships associated with organizational design. We have continuing challenges. For example, many believe that the tank company today is too small, that it is simply not a viable unit in peacetime and does not have the redundancy of trained personnel which would be required for continuous operations in war. We at Knox believe that the security squad should be reinstituted into the tank company to allow for crew replacement. But it remains to be seen whether this can be documented, given present constraints on personnel.

There is also a clear need for more effort in combined arms integration, particularly of the tank-infantry team in both command and control and combat service support. There are discontinuities now between the capabilities of the mechanized infantry battalion and the tank battalion which, when cross-reinforced, can create a very difficult situation if the companies have been further cross-reinforced, creating company teams. The tank company has HEMTTs; the infantry company has 5-tons. The tank company may have the Recovery Vehicle 90; the infantry company will have the M88, of marginal utility with the M1A1. Similar issues like this need to be scrubbed to ensure that we have a fully integrated tank company team capability.

We are also reviewing other more fundamental organizational issues. They include the desirability and feasibility of establishing a fixed brigade, similar to the German organization. The direct support artillery battalion and the forward support battalion would be organic to the brigade, which would be composed of a fixed number of tank and infantry battalions. We are also reviewing combined arms units, potentially at the battalion task force level; that is, a battalion which would consist of a mix of tank and infantry companies. Lastly, we are reviewing different combinations of combat service support responsibility. We have moved the focus of maintenance from company to battalion. There is some analysis that would suggest that we should look at the focus going to brigade, particularly if we were to have a fixed organization. Of course, all of these organizations must be thought through from the standpoint both of the Active force and the Reserve Component. We advocate no particular solution at present; however, we are looking aggressively at the organizational implications of not only our doctrine but also of the new equipment — such as elevated sensors and battlefield management — which we see coming in the near future.

In this series of columns, we have discussed some major forces which are acting on our maneuver heavy force. We have severe challenges, but we also have great strengths. I believe that the strengths far outweigh the challenges if we can exploit them properly. We have indicated some ways that we are moving in the areas of personnel, training, equipment, and doctrine to provide the close combat heavy force our country needs. The path is laid out. The most critical ingredient is skilled leaders who care — leaders who have been educated and trained to innovate responsibly within the intent of their commander. That is the challenge of leadership which must thrive across our force. I am confident as to the outcome.

Forge the Thunderbolt!

P.S. After three and one half delightful years, my tenure as Chief of Armor and Cavalry has come to a close. As I mention above — the path is laid out. Now it needs to be honed and improved by others more capable than I. My successor fits the bill perfectly — a superb mounted force leader and old friend. I ask you to support him as you have me — magnificently.

I have been honored to serve you Armored Force leaders past and present. Thank you.

The Heavily-Armored Gun-Armed Main Battle Tank Is Not Optimized For Mechanized Warfare

by Craig Koerner and Michael O'Connor

Foreward

The tank is the decisive weapon of modern land warfare.[1] NATO's success in a war will depend heavily on the number and tactical capabilities of its main battle tanks (MBTs). Unfortunately, their cost-effectiveness is markedly reduced by the limited usefulness of heavy armor, the tactical limitations imposed by gun armament, and the high costs of both. An unconventional tank design strategy offers NATO the chance to alter the balance of forces in its favor. This can be done by abandoning the heavy armor and gun armament of MBTs, while improving other aspects of tank performance. These changes result in less costly and individually more effective tanks.

Design Philosophy

The art of designing effective tanks lies in finding the mix of technical characteristics that, *in conjunction with enemy responses,* determines the most favorable combination of the tactical relationship and the costs relationship. Analyzing this momentarily in terms of the tanks on the NATO central front, the tactical relationship is formed by the combination of NATO and Warsaw Pact (WP) tanks' tactical capabilities versus an opponent, for example, their frontal arc invulnerability to tank gun fire from beyond a certain range, or their mobility over soft ground. The costs relationship is formed by a combination of cost ratios, such as those of tanks to enemy tanks, or to enemy infantry antitank guided missile (ATGM) units. Both of these relationships are changed by the introduction of a new weapon, and are inevitably changed further by enemy responses to that weapon's introduction.

Tactical Relationship

A new tank design may alter the balance of forces by changing the tactical relationship. A tank's firepower, mobility, and armor determine its tactical capabilities *and its optimal battlefield tactics.* Historically, tanks with a marked superiority in one of these characteristics often possessed tactical options unavailable to their opponents, and were thus able to fight one-sided battles. Such superiority may be achieved *not through any technology unknown to the enemy, but through emphasis on the relevant aspect in the tanks' designs.* Examples are the crushing attacks of the heavily armored British Matilda IIs in France and the desert until 1942,[2] the British Churchills' monopoly on movement in the Tunisian highlands in the Battle for the Hilltops in 1943,[3] and the German Panzer IVs with the long 75 firing from beyond the range of effective British AT fire in the first battle of El Alamein.[4]

Tanks without some marked superiority as exemplified above, rely on weight of numbers for battlefield success unless their design facilitates the stalking and ambush tactics dictated by their tactical capabilities. These tactics are, in essence, the tank hunting tactics of WWII. Thus an effective tank design facilitates and encourages the use of these optimal battlefield tactics. For example, the MBTs used on both sides in the Middle Eastern wars are vulnerable to opposing tank fire at most combat ranges. The US and UK tanks used

Exploiting Tactical Relationships

The German Pzkw IV, right, with a long 75-mm main gun, was able to outrange its WWII desert opponents.
The British Churchill, at right, used its hill-climbing advantage in Tunisia in 1943.
Until heavier AT guns were used against it, the British Matilda, below, exploited its thick armor advantage.

by Israel could depress their guns ten degrees; the Soviet tanks used by Egypt and Syria had only five degrees of negative gun elevation. Israeli tanks fired from defilade, shooting from the reverse slope of a hill with only the gun and turret exposed over the crest, Syrian and Egyptian tanks rode atop the crest, exposing more of the tank for a longer time when firing. Consequently, Israeli tanks were more difficult to detect and hit, giving them marked advantages in stalking and ambushing.[5] A more extreme use of stealth was made by a small German tank unit in Tunisia just after the battle of Kasserine Pass. In a nighttime armor and infantry battle, the Pzkw IIIs faced American M3 Grant medium tanks. Both tanks' armaments were capable of penetrating their enemy's frontal armor at short to medium ranges. The Pzkw IIIs were unusual in being able to move inaudibly from 200-300 meters at minimum speed.[6] They crept up on the Grants and destroyed them by firing at their gunflashes.[7] With both the Israeli tanks and the Panzer IIIs, design features that reduced detectability allowed them to engage in one-sided battles by use of the stealth tactics appropriate to tanks that cannot survive hits from enemy tanks' main armament.

Fighting in the Golan in 1973, Israelis capitalized on the greater depression of their tank guns to engage and defeat Syrian tanks from more survivable defilade positions.

Optimal Battlefield Tactics

The most effective tactics for tanks without frontal invulnerability to the enemy's primary AT weapons are ambush tactics, which minimize movements of individual tanks under fire, firing exposure times and silhouettes, and the predictability of units' movement between engagements. Ambush tactics were exemplified in the defense of North Golan in the first two days of the Yom Kippur War by Col. Avigdor Ben Gal's 7th Armored Brigade. The Syrians, with a five-fold superiority in tanks and a thirty-fold superiority in mechanized infantry.[8] advanced down the road axes of Golan, attacking continuously for the first 48 hours. Ben Gal divided his 100 tanks into two combat teams and a small reserve. The Israeli tanks often moved over the rough terrain between roads, moving north and south to attack Syrian columns moving from east to west. When the ground was too rough or broken for the Israeli tanks, bulldozers cleared a path. The tanks would deploy in defilade on high ground with wide fields of fire; when nature did not supply the defilade, Israeli bulldozers did. During engagements, the tank commanders directed from open turret hatches for greater all-around vision. The Syrians would reply with tank and artillery fire, the latter causing most of the 7th Brigade's casualties, especially among tank commanders. Ben Gal's tanks would then retreat, to evade the artillery fire, draw their pursuers into another ambush, or resupply. In one such engagement, "...more than 40 Syrian tanks had been destroyed for the loss of only half a dozen Israeli. Nor was this ratio unusual."[9] Thus, in many battles, the Syrian strength was eroded. During much of this time, the Israeli Air Force attacked the unarmored Syrian supply columns, interrupting the flow of fuel and ammunition to the advancing units.

After two days, the Syrians broke off their attacks. Ben Gal had lost half of his tanks; the Syrians had lost 260 tanks and perhaps 200 infantry carriers and supply vehicles. It was later discovered that one quarter of the tanks Syria lost had simply been abandoned for lack of fuel, even though Golan is only 17 miles in depth.[10]

Stalking, evasion, and minimal exposures for observing and firing are the optimal microtactics for tanks vulnerable to specialized AT weapons. Ideally, turreted tanks would fire single shots during momentary exposures of the gun and turret above a crest, and would move between shots. Tanks with low silhouette weapons, such as overhead-mounted guns or retractable missile launchers, might safely deploy in defilade positions and fire multiple shots. Tanks moving under fire should jump between points of cover, perhaps maneuvering evasively when in the open. Fire on the move would be of little use, as moving tanks have little chance of finding targets during their brief exposures.[11]

From the above examples and illustrations, the success or failure of tank units depends on the ability of tanks to evade fire from specialized AT weapons, and also of the ability of all vehicles to absorb fire from area weapons, mainly artillery fire, without ill effects. The destruction of fuel supplies by area weapons, and of bridgelaying and mineclearing tanks by direct fire, will stop an armored formation as effectively as the destruction of the tanks themselves.

Inflicting Costs

The second way a new NATO tank design may influence the balance of forces is by inflicting costs on the WP. NATO may change some MBT characteristics by changing the tank's design within the current technology, increasing its performance and raising its cost. The WP may respond by altering their tank design to increase performance, preserving the previous tactical relationship between opposing tanks for a certain increase in WP tank costs. If the change in NATO design threatens to change the tactical relationship drastically in NATO's favor, the WP is very likely to engage in

such a tank redesign, and incur the greater tank costs. These higher tank costs result in fewer tanks, less resources available for other weapons systems, or a greater burden on their national economy. In the words of Richard Simpkin:

> "The need to armor against all weapons on the battlefield, bar the primary antitank attack, is indisputable. Arguably the role of direct protection above this level is not to confer system survivability on the tank that has it but to impose a restriction on the enemy by raising the ante — by forcing him to develop, field and support even more powerful antitank weapon systems."[12]

A NATO tank design change may produce a net improvement in the force balance if the threatened change in the tactical relationship more than compensates for the increase in costs and corresponding decrease in numbers of NATO tanks and/or other weapon systems. It will produce this improvement if it also costs little compared with the WP weapons redesign that restores the old tactical relationship. In this case, the WP is pressed between two unattractive alternatives. The Pact may retain its old designs and suffer the resulting loss of tactical capabilities against NATO tanks. Alternately, it may design new tanks and AT weapons whose costs increase more than proportionately with the costs of the new NATO tanks. This unfavorable change in the costs relationship for the WP would cause a reduction in their numerical superiority. Therefore, a design innovation will be cost-effective, changing the overall force balance favorably, if it yields a net advantage against the current enemy force and if it costs little relative to an opponent's countermeasures. The cost effectiveness of an innovation, in this context, is a measure of the costs inflicted on an opponent relative to those incurred by the innovating force.

A principle of optimal design is that any component of a tank — for instance an extra subsystem or an additional unit of armor thickness — increases costs to the tank buyer by less than the additional cost to an enemy, who must change his counterweapons design to nullify the extra or additional tank component. This criterion does not imply a process of design and counterdesign that occurs over time; rather, optimal design innovations are cost effective even if the enemy reactions are instantaneous.

A part of the tank designer's task is to choose a weapon system that, by combination of long-range accuracy, low mean engagement times, and other factors, gives a high absolute kill probability. Remembering that various aspects of weapon performance also affect indirect protection, it is also critical that the weapon's kill probability be high relative to the opponent's kill probability against tanks armed with the chosen weapon. Another one of the designer's tasks is to identify the weapons against which, given intelligent responses by the enemy, armoring remains cost-effective, provide armor protection against those weapons, and to facilitate within the tank design the optimal tactics for evading the weapons that will defeat the tank's armor.

Current Weaponry/ Current Armoring

The spectrum of weapons facing MBTs in the conventional land battle ranges from specialized AT weapons of high individual lethality against armored targets to area weapons of widespread destructiveness against unarmored targets. The primary AT weapons are tank gun rounds, ATGMs, and developmental homing munitions. In the middle of the spectrum lie artillery and air-delivered, AT submunitions and hull-penetrating minelets, and track-cutting minelets. Finally, there are the area weapons, such as high explosive rounds from artillery and small arms fire from infantry, which carpet the modern battlefield, but have minimal capabilities of armor penetration.

Moving a weapon and its crew through some type of enemy fire is fundamental to the widest interpretation of the tank concept. MBTs are alone among current armored fighting vehicles in having heavy frontal armor designed to degrade the effects of specialized AT weapons significantly. This protection, in theory, increases survivability, which allows movement over a greater portion of the battlefield,[13] and maintains morale, which gives the crewmembers confidence to carry out their mission.[14] It also facilitates repair and reuse of disabled tanks.[15]

A straightforward method of increasing protection is simply thickening the armor, which increases weight and cost if tank mobility is not allowed to decline simultaneously. Cost increases from thickening armor are likely to be significant. The heavy frontal arc armoring of current MBTs in itself accounts for 20 to 25 percent of their weight,[16] not including increases in engine and suspension system size and weight to maintain mobility levels; the total figure is probably around one third of a tank's weight. The cost of these MBTs, excluding optical and electronic fire control gear, increases in direct proportion with tank weight,[17] and the program costs over the expected service lives of western tanks total ten times the tanks' acquisition costs.[18] Therefore, the costs inflicted on an opponent who is induced to up-armor are quite large in percentages of the total tank cost.

"...A straightforward method of increasing protection is simply thickening the armor, which increases weight and cost..."

Optimal Armoring

The appropriate level of armoring is found by comparing the costs of increasing protection with the costs of increasing weapon performance to defeat the increased protection. The costs of increased protection lie mainly in the weight increases from extra armor, while the costs of increasing a weapon's performance depend on its specialization in the AT role.

It is inevitably less cost-effective to armor tanks against specialized

AT weapons than against area weapons. The specialized weapons, by nature of their complex fire control gear and gun or missile systems, have only a small percentage of their costs in the actual warhead, and may thus be upgraded to increase armor penetration for small cost changes in percentage terms. If only the warhead cost, but not the size and weight, is changed in increasing performance, then there is no change in other elements of life cycle costs, and the new warhead costs are the only addition to total program costs.[19] Area weapons, by contrast, have a large fraction of their total system cost in the size and weight of munitions and the vehicles needed to carry them, so increasing the AT effectiveness of area weapons increases their total life cycle costs by a large amount in percentage terms. Therefore, up-armoring against specialized AT weapons is generally not cost-effective, while armoring against area weapons usually is.

Armoring the tank frontal arc against gun rounds is not cost-effective; the costs inflicted on those upgrading weapons to retain AT firepower are far less than the costs incurred by the up-armoring force. Current tank armoring schemes do not confer frontal arc invulnerability against modern tank guns. French tank designers contend that all present NATO 105-120-mm APFSDS rounds can penetrate any current WP tank, and their tests show that up-armoring to attain frontal invulnerability would raise the tank's weight to between 80 and 100 tons.[20] However, even if the WP up-armoring from T62 to T72, with its resulting 12.5 percent tank weight increase,[21] causes NATO to up-gun its tanks, the costs to NATO will be small. Mounting the 120-mm gun instead of the 105-mm gun on the M1 would have raised its program life cycle cost only "two to six percent."[22] Therefore, the costs inflicted on NATO are small relative to the change in life cycle costs of WP MBTs.

Armoring against HEAT warheads in aircraft, helicopter, tank and infantry-launched ATGMs, infantry AT rockets, and in-homing artillery and mortar rounds, ultimately fails for the same reasons. Defense against the larger air-launched missiles is absurdly demanding. Modern tanks with semi-active or active armor, though, may have frontal invulnerability against some current ground-launched ATGMs.[23] If even the present NATO ATGMs have been rendered ineffective by this armor, changes in warhead design that increase cost *but involve no new technology* would reverse this situation. HEAT warhead lethality is increased by using higher-powered explosives, more finely machined warhead components, and by changing the metal used in the charge liner. Missiles become even more deadly if their size is increased, or two to three tandem warheads are used, as on Hellfire.[24] The US TOW and the European HOT and Milan ATGMs were modified in some of these ways when the T64 and T72 were deployed.[25] As increasing the size of a tank's missiles is cheaper than increasing the size and weight of the tank as a whole, the cost of defeating up-armored tanks with such ATGMs is much less than the costs of the up-armoring itself.

This is one fundamental disadvantage in armoring tanks against specialized AT weapons. Up-armoring greatly increases tank weight, with corresponding and disproportionate increases in the costs of procurement, maintenance, logistic support, and other factors. Yet up-armoring may be defeated by redesigned weapons that add little to each of these factors in the opponent's tanks. In the most extreme case, the missile user defeats the up-armored tank with redesigned ATGMs, causing only the most minor changes in the size and, especially, weight of the ATGM launch vehicle. Even a major increase in ATGM cost translates into a relatively small increase in total life cycle costs for an ATGM-firing tank. Thus, the tactical relationship is not changed in the up-armorer's favor, while the costs relationship is altered to his opponents's advantage.

Parallel reasoning shows the irrelevance of armoring tanks against the 20-35-mm autocannons on infantry fighting vehicles (IFVs) and attack helicopters. Virtually all IFVs and attack helicopters also have ATGM launchers; any vehicle capable of mounting the large, heavy, recoil-producing cannon may have an ATGM launcher added for very little cost. Up-armoring against small-caliber autocannon does absolutely nothing to help a tank survive ATGMs mounted on these same vehicles.

There is another fundamental disadvantage to armoring against specialized AT weapons: It is less costly to redesign weapons for attack on the lightly armored areas of tanks than it is to reconfigure tank armoring for protection of these newly vulnerable areas. For example, a new Swedish ATGM has a downward-pointing HEAT warhead to attack the thin top armor of MBTs.[26] Extending current frontal arc protection levels to the roof results in a tank of 150-200 tons.[27] Not only is this in itself crippling; it involves the deployment of what is virtually a new tank in response to a change in enemy missiles alone. This demonstrates the second underlying disadvantage of up-armoring: *It is the least flexible of all weapon countermeasures.*

"It is less costly to redesign weapons for attack on the lightly armored areas of tanks, than it is to reconfigure tank armoring..."

The inflexibility of armoring makes it even less suitable for countering artillery and aircraft-delivered mines and submunitions. Weak aspects of the tank would be phasized in artillery and air attacks, with submunitions for thin top armor, and minelets for thin bottom armor. The inevitable up-armor/up-weapon cycle, played out with armor being thickened over the top and bottom of the tank, would again cost tank producers far more than munitions producers, and result in an unmovable tank as well.

Protection from general purpose area weapons stands in a category by itself; *it is the most critical function of a tank's armored enve-*

lope. Conventional armor protection against small arms fire and high-explosive/fragmentation (SAF-HE/F) is inexpensive[28] and absolutely vital for battlefield survivability. Statistically, the greatest source of personnel casualties in modern war is area weaponry, mainly indirect artillery fire.[29] Infantrymen and vehicles with less than this level of armoring are in the predicament of WWI footsoldiers: All movement exemplifies either stealth or suicide. As shown in Golan, tanks with exposed crewmembers or subsystems such as sighting gear suffer serious performance loss in a high-artillery environment, even if few tanks are destroyed by artillery fire alone. For tanks in an artillery-dense area such as the NATO central front, anything worth having is worth "frag-proofing."

The optimal strategy for tank armoring is not to enable the tank to absorb hits from all or most specialized AT weapons arrayed against it. Optimal armoring forces the enemy to commit units to exposed positions to deliver and subject themselves to direct fire, and/or forces the enemy to attack with minelets, submunitions, and costly homing weapons, all of which are relatively susceptible to countermeasures. Optimal armoring inflicts tactical constraints and disproportionate weapons costs on an opponent; it does not allow tanks to absorb hits from specialized AT weapons.

All of this suggests a new tank design strategy, in which the costly armoring of current heavy tanks is abandoned in favor of mobility, firepower, and stealth. In the new design, the cost and weight savings from reducing the armor level would be used to augment design factors that facilitate the use of optimal battlefield tactics.

Optimal Mobility

Increasing mobility increases survivability. A tank's agility reduces its exposure to direct fire AT weapons, and a tank unit's mobility over rough or soft ground and over rivers aids in evading both line-of-sight weapons and area weapons.[30] In these ways, mobility may be substituted for direct protection.

Tanks with ultrahigh acceleration would be difficult targets in, for example, typical European terrain. The tank could speed between points of cover in less time than is usually taken in locating and aiming at a target.[31] Such mobility, combined with these tactics, radically reduces exposure time. When "movement exposure times start to come down towards mean acquisition time — let alone fall below it —the chance that a (moving tank) target offered will be killed starts to fall dramatically."[32]

An ultrahigh acceleration tank threatens an opponent with a significant, unfavorable change in the tactical relationship. This opponent might resort to an even more capable gun fire-control system than the current sophisticated and complex electronic fire-control gear,[33] which already accounts for between 50 and 60 percent of the basic cost of current MBTs,[34] or perhaps employ an automatic target detection and evaluation system of still greater complexity, vulnerability to countermeasures, and with a reduction of indirect protection.[35] It seems probable that the total costs of supporting such systems exceeds that of deploying ultrahigh acceleration tanks; countering the change in the tactical relationship caused by such tanks results in an adverse change in the costs relationship. An ultrahigh acceleration mobility system is therefore cost-effective due either to its microtactical effects on movement exposure times and survivability, or alternately from its effect on the tank-to-tank cost ratio.

Effective mobility is increased by greater independence from vulnerable engineering and supply vehicles. Under current practices, total engineering and logistic effort probably increases with the cube of tank weight. The logistic tail is difficult to disperse or hide, has lower cross-country mobility than combat vehicles, and is extremely vulnerable to area weapons. All of this decreases an armored unit's capability to fight in, or even move through, areas within range of enemy artillery.[36] Giving fuel and ammunition carriers and light repair vehicles tank-like cross-country mobility and resistance to SAF-HE/F would solve only some of these problems, and at considerable cost.

"Smart" indirect-fire weapons, like the SADARM, seen in tests, above, attack weak top armor.

If there is any single point at which increasing weight abruptly reduces mobility, it would be where the tank ceases to be amphibious, necessitating the use of armored bridgelayers in tank units. The US M2/M3 is armored against SAF-HE/F and is amphibious, so it seems feasible to make a similar vehicle with ultrahigh acceleration, low ground pressure, and large stores of fuel. This results in a highly mobile tank with far less dependence on vulnerable bridgelayers and logistic tail than current MBTs have.

Optimal Weaponry

The attributes of an ideal weapon system derive from the optimal tactics and microtactics for tanks armored against SAF-HE/F. Lethality against heavily-armored MBTs is absolutely vital, but is in fact less demanding on the weapon system than many other factors, such as the capability to locate and hit targets that are at very long range and/or maneuvering evasively. Perhaps even more demanding and important is minimizing the firing signature, exposure time, and presented cross section of the firing vehicle during engagements. Conversely, the microtactics of evasion,

in which the tank darts between firings from defilade positions, *decrease* the usefulness of both the weapon rate of fire and of fire-on-the-move capability. Unless unrealistically high exchange rates are considered, the amount of ammunition that may be useful is far lower than that in modern tanks. This reduces the importance of carrying a large number of ammunition rounds, and thus makes their size less critical.

The long-range accuracy, in-flight guidance, and less conspicuous launch signatures of recoilless ATGMs make them the ideal weapons for a war of stalking and ambushing. Accurate and lethal firepower out to 6,000 meters could be provided by ATGMs, with their relatively inexpensive fire-control systems, and an autoloader could be fitted. The in-flight guidance of ATGMs would aid in hitting ultra-high acceleration tanks. The low flight time of hypervelocity ATGMs, such as ADATS,[37] could further reduce such tanks' ability to evade fire. Also, the "launch signature of an ATGM is — or should be — less prominent" than those from tank-killing guns.[38]

The use of recoilless ATGMs allows the target presented by a tank firing from defilade to be minimized by mounting an ATGM launcher on a telescoping arm mount (TAM) or a mechanical arm similar to that on the Northrop proposal for the Improved TOW-firing Vehicle.[39] Only the launch tubes and sighting gear are exposed while firing TAM-mounted ATGMs from cover. The size of the launch unit would make it very difficult to detect until the weapon was fired.[40] With a retractable weapon "...in an engagement at long range it may actually become impossible for an enemy gunner to score a hit because of his reaction time and the time of flight of the projectile..."[41] The hit probabilities of a 105-mm gun with full fire control gear against a moving, tank-sized target have been estimated at greater than 90 percent at 1 km, 60 percent at 2 km, and just over 30 percent at 3 km. However, the hit probabilities against a weapon such as an overhead gun, or, presumably, an ATGM launcher, are only about 15 percent at 0.5 km, and less than 10 percent at 1 km.[42]

A TOW missile leaves its Bradley launcher. Authors contend that future tanks would be more effective and survivable if armed with missiles.

Additionally, the number of potential defilade positions would be increased.[43] Vertical obstacles, such as buildings, could also be used as defilade, which is an option unavailable to gun-armed tanks. The ability to use buildings as defilade increases tank survivability. One study found that "...in every square kilometer [of German countryside] there is, on average, a village of 230 inhabitants with houses of solid stone."[44]

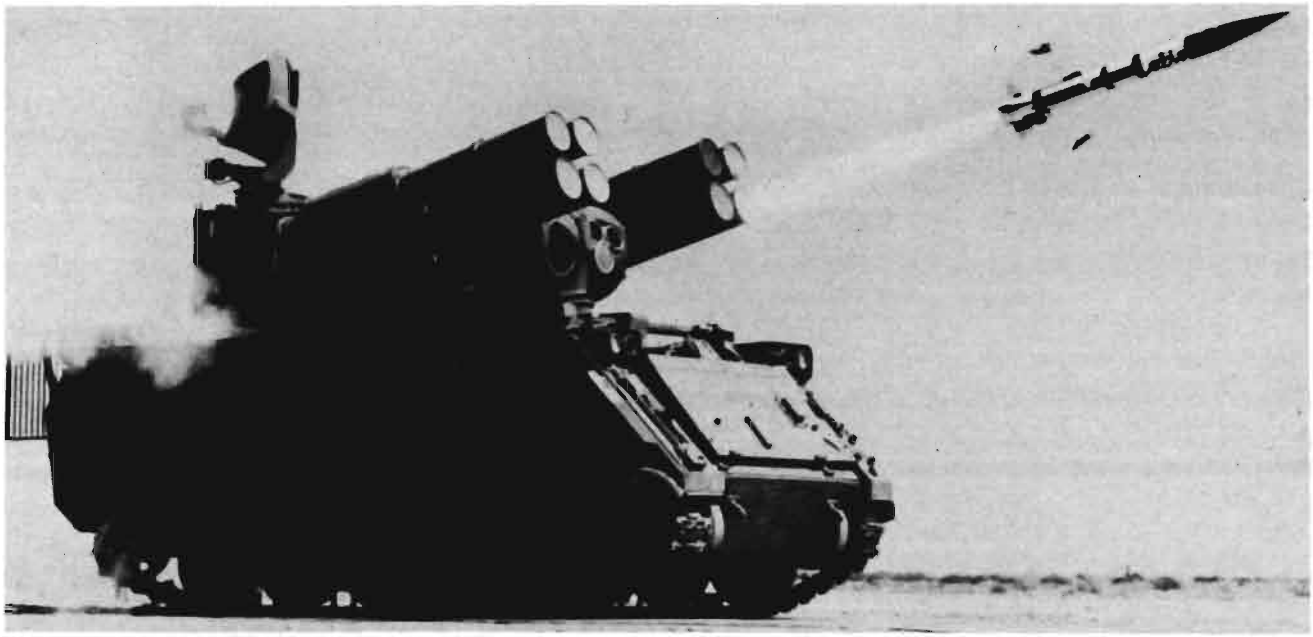
A tank would ideally have two TAMs, a sensor TAM for sighting gear and a weapons TAM with missile launch tubes and, perhaps, sights as well. This assures continual observation while reloading, and allows two crewmen to search for targets simultaneously from behind cover.

ATGM-firing tanks can be equipped with a range of ammunition types comparable to that available for guns. HOT-like missiles with fuel-air explosive (FAE) warheads,[45] having far greater power than conventional HE rounds, can provide general purpose HE firepower. Two-inch rockets would augment this, because they are relatively small rounds useful for anti-infantry missions. They also give the tank greater smoke-laying capabilities than current MBTs possess; for example, a ripple of 19 M259 2.75-inch smoke rockets creates a screen "several kilometers in length" which "will last for more than five minutes."[46] The rockets could be fired from ATGM-sized canisters with several rounds in each, using the ATGM launcher. This allows the vehicle to search with two sets of eyes, fire ATGMs, various HE rounds, and create multi-kilometer long smoke screens, all from behind the cover of defilade or buildings.

The combination of hypervelocity rockets and helmet-mounted sights would minimize total target engagement times at close range. ATGM-guiding sights can be made integral with the crew's helmets, and the approximate direction of a selected helmet can be fed to the controls orienting the launcher, so the missile is fired into the sight's field of view and would be guided from there. This arrangement would be similar to that used to aim the US AH64 attack helicopter's automatic cannon,[47] although less costly since less accuracy is required in orienting the launcher.[48] This system also reduces training requirements, by simplifying the aiming and firing procedure significantly.

Specific Proposals

This is the basic configuration of a tank designed for long-range firepower and the tactics of evading fire from specialized AT weapons. The following specific subsys-



An ADATS missile system, mounted here on an M113-series chassis, can engage air and armor targets with hypervelocity, laser beam-riding missiles which travel 6 km in 6 seconds.

tems, when added to a bae vehicle with a crew of three, would further contribute to the tank's tactical effectiveness and/or inflict costs on a opponent.

ADATS missiles with advanced HEAT warheads, specialized in the AT role, would be used. This specialization would include altering the warhead to arm itself within meters of the launch tube, eliminating problems with an ATGM's minimum range. The ADATS missiles would be fired from a twin autoloaded ATGM launcher on a TAM, minimizing engagement times and exposures. The missile flies down a laser beam that is aimed slightly above the line of sight to the target, and is aimed directly at the target just before impact,[49] making the system almost immune to countermeasures. The missile is said to be smokeless, so firing would not reveal the launcher location.[50] HOT ATGMs, which are less costly, would be mounted on a portion of the tanks in place of ADATS. HOT, TOW, and other second-generation wireguided ATGMs may be modified to fire from behind cover, guided by sights above defilade, thus concealing the launch.[51] This is now being done for developmental helicopter-mounted TOW systems, in which the ATGM is guided by sights mounted above the helicopter's rotor.[52]

The vehicle would also carry a machine gun as secondary armament.

The armor would be semi-active or active, making the tank resistant to SAF-HE/F while increasing protection against HEAT rounds. To provide protected head-outside position for all crewmembers and allow collective NBC-proofing, each crewmember would have a transparent hemisphere, or "bubble," that has the same resistence to SAF-HE/F as the armored hull.[53] All external subsystems, most notably the TAMs and suspension system, would also be armored against SAF-HE/F. The TAMs would thus be armored, and have armored shutters for the sights. The TAM would also be modular, allowing quick replacement of battle-damaged TAMs on the battlefield.

The mobility system would be similar to that of the HIMAG testbed vehicle, but with high cross-country speed sacrificed for still greater acceleration. Run-silent features, which reduce noise and heat signatures at low speeds, would be installed.[54] Tracks would be at least as wide as those on current MBTs to increase this lighter tank's mobility over soft ground such as sand or mud. A bulldozer blade would be fitted for creating paths and preparing defilade positions. The vehicle would be made fully amphibious. A very large fuel supply would be carried, perhaps augmented by jettisonable (and self-sealing) external fuel tanks.

Conclusion

Designers of combat vehicles have a tremendous opportunity: they can reinvent the tank. Current tanks are not designed to facilitate the stalking tactics most effective in mechanized warfare. The modern tank is a product of tunnel-vision, with the focus on the penetration versus passive protection contest, combined with an ill-reasoned preference for guns over ATGMs. The armoring, in particular, has been a phenomenally expensive exercise in futility. The tanks of the Yom Kippur War rode into battle with enough armor to protect themselves against anything — except the infantry AT rockets, ATGMs, and tank guns that faced them. The heavy armoring on tanks has contributed to their vulnerability by prompting a sacrifice of tank-borne vision, concealability, mobility, autonomy from a vulnerable logistical tail, and other characteristics that bring success on the battlefield. This armoring has also increased tank costs to the point at which NATO's numerical inferiority is guaranteed. Simultaneously, weaponry has advanced to make frontal arc invulnerability to specialized AT weapons less feasible than ever before, while threats to other areas of the tank continue to grow. A

more sensible tank design strategy is to replace each heavy tank with many light, scarely detectable, extremely mobile tanks possessing far greater long-range firepower. This will reduce the WP numerical superiority and simultaneously give NATO many new tactical advantages.

Footnotes

[1]Generalleutnant Dr. F.M. von Senger und Etterlin, Introduction, in R.E. Simpkin, *Tank Warfare,* Crane Russak & Co, Inc., NY, 1979, p. 11.

[2]Barrie Pitt, *The Crucible of War: The Western Desert 1941,* Jonathan Cape Ltd., London, 1980, pp. 87, 102-103, 106-107; Alistair Horne, *To Lose a Battle: France 1940,* Penguin Books, NY, 1979, pp. 562-569.

[3]Kenneth Macksey, *Crucible of Power,* Hutchinson of London, London, 1969, pp. 268, 281.

[4]Kenneth Macksey, *Tank Warfare,* pp 191-192; Maj. Gen. F.W. von Mellenthin, *Panzer Battles,* Cassel and Co. Ltd., London, 1956, p. 139.

[5]The Yom Kippur War, *Insight Team of the London Sunday Times,* Doubleday, Garden City, NY, 1974, pp. 292-295.

[6]Simpkin, *Antitank,* p. 42.

[7]Kenneth Macksey, *Crucible of Power,* p. 163.

[8]A.J. Barker, *The Yom Kippur War,* Ballantine Books, NY, 1974, p. 69.

[9]*Insight Team of the London Sunday Times,* p. 178.

[10]*Insight Team of the London Sunday Times,* pp. 134-135, 154-161, 177-183, 292-295; Chaim Herzog, *The War of Atonement,* Wiedenfeld and Nicolson, London, 1975, pp. 67, 80-82, 106-115; Trevor Dupuy, *Elusive Victory,* Harper and Row, NY, 1978, pp. 445-460.

[11]Richard Simpkin, *Antitank,* pp. 50-51, 110; Richard Simpkin, *Tank Warfare,* pp. 97, 145-146.

[12]Simpkin, *Tank Warfare,* p. 119.

[13]Richard M. Ogorkiewicz, "Tanks and Anti-Tank Weapons," *Adelphi Papers #144,* London, IISS (International Institute for Strategic Studies), 1978, pp. 38-44.

[14]Richard Simpkin, *Antitank,* p. 35.

[15]Richard Simpkin, *Human Factors in Mechanized Warfare,* Brassey's Publishers Ltd., NY, 1983, pp. 106-113.

[16]Simpkin, *Tank Warfare,* pp. 135-136.

[17]See, for instance, Simpkin, *Human Factors in Mechanized Warfare,* p. 136.

[18]Paul-Werner Krapke, "A Design Concept for a Heavy Tank Destroyer," *IDR* 3/1983, pp. 467-471.

[19]This was done with Milan, and "The cost of this modification was quite reasonable since no changes had to be made in other parts of the [infantry-portable launcher] system." See: "Euromissile and EMDG," *IDR,* 9/1984, pp. 1379-1381.

[20]Anthony H. Cordesman, "France's Satory IX: The Year of the Tank," *AFJI,* August 1983, pp. 24-30.

[21]Simpkin, *Red Armor,* p. 42.

[22]"120-mm Choice Doubles Gun Costs," *Armed Forces Journal International,* March 1978, p. 14.

[23]Richard M. Ogorkiewicz, "Tanks and Anti-Tank Weapons;" B. Fritz, "The AC300 Jupiter: Luchiare's New Anti-Tank weapon," *IDR* 1/1982, pp. 71-74, see p. 74; Simpkin, *Antitank,* pp. 71-72.

[24]Mark Hewish, "Manhurin's Apilas: A Non-Conformist Weapon," *IDR,* 5/1982, pp. 607-610; "Satory IX: Infantry Anti-Tank Weapons," *IDR,* 8/1983, pp. 1121-1122; "Third Generation Anti-Tank Missiles for NATO," *IDR,* 1/1980, p. 22; R.D.M. Furlong, "Europeans Oppose Single-Type Standardization of NATO Anti-Tank Missiles," *IDR,* 2/1981, pp. 141-142; Hellfire has two tandem warheads. See *US Army Greenbook 1982-83,* p. 408.

[25]"AUSA '81 Part 2: Weapons and Sensors," *IDR,* 2/1982, pp. 105-212; "Euromissile and EMDG," *IDR,* 9/1984.

[26]Mark Hewish, "Bofors RBS56 'Bill': Top Attack to Counter Modern Tanks," *IDR,* 7/1982, pp. 925-926.

[27]Mark Hewish, "Tank Breaker," *IDR,* 9/1982, pp. 1212-1215.

[28]Simpkin, *Tank Warfare,* p. 11.

[29]Indirect artillery fire is delivered without a line of sight between the artillery and the target. See, for statistics, A.J. Barker, *The Yom Kippur War,* Ballantine Books, NY, 1974, pp. 157-158.

[30]Simpkin, *Red Armor,* pp. 48, 112-113.

[31]Paul-Werner Krapke, *op cit.*

[32]Simpkin, *Antitank,* p. 126,; see also pp. 42, 86.

[33]J.M. Ballantine, "The Barr & Stroud DF3 Fire Control System," *IDR,* 4/1980, pp. 536-538.

[34]Simpkin, *Tank Warfare,* p. 97. Admittedly, some of this cost (one fifth of the total cost in the case of the M1) is due to fire-on-the-move capability..

[35]Simpkin, *Antitank,* pp. 52, 126.

[36]Simpkin, *Tank Warfare,* pp. 100-103; See also: Simpkin, *Antitank,* pp. 25-27; Lt. Col. Bloomer D. Sullivan, "Logistic Support for the AirLand Battle," *Military Review,* February 1984, pp. 2-6.

[37]Mark Hewish, "Oerlikon-Buhrle Launches Dual-Purpose Missile System," *IDR,* 5/1981, pp. 512-513. ADATS flies to its maximum range of 6 km in 6 seconds.

[38]Simpkin, *Antitank,* p. 50; Robin Fletcher, "From Tank Turret to Overhead Gun," *IDR,* 1/1984, pp. 43-50. (See material on thermal imagers spotting the hot gun muzzle.)

[39]For some information on the Northrop ITV and its unfortunate rejection, see *Armed Forces Journal International,* November 1976, p. 16; March 1977, pp. 5-6; September 1977, p. 6.

[40]Simpkin, *Antitank,* pp. 110-111 (This is by analogy to Simpkin's discussion of overhead-mounted guns). See also: Simpkin, *Red Armor,* p. 50.

[41]Robin H. Fletcher, "Hit Avoidance and the Tank Gun," *IDR,* 5/1984, pp. 597-602, (This is by analogy to his discussion of raisable guns.)

[42]F. Garner, "The Survival Probability of a Tank in Action," *IDR,* 5/1984, pp. 609-612.

[43]Simpkin, *Antitank,* pp. 110-111. (This is by analogy to Simpkin's discussion of overhead-mounted guns.)

[44]Udo Philipp, "NATO Strategy Under Discussion in Bonn," *IDR,* 9/1980, pp. 1367-1371, see subsection "Uhle-Wettler's Proposals."

[45]HOT: The 175-mm diameter, 4000-meter-range Franco-German ATGM. FAE: Fuel-Air Explosive. FAE warheads on small (5" ZUNI) rockets already exist. See Eric C. Ludvigsen, "Army Weaponry," *Army,* October 1982, p. 386. See specifically: SLUFAE.

[46]Lt. Col. John P. Bulger, "Obscurants: Countermeasure to Modern Weapons," *Military Review,* May 1982, pp. 45-53.

[47]Col. E.J. Everett-Heath, "The Development of Helicopter Air-to-Ground Armament," *IDR,* 3/1983, pp. 321-329.

[48]Robin Fletcher, "From Tank Turret to Overhead Gun."

[49]This operation is done automatically, by a computer with the ADATS flight parameters programmed into it.

[50]Col. E.J. Everett-Heath; Mark Hewish, "Oerlikon-Buhrle Launches Dual-Purpose Missile System."

[51]*Jane's Infantry Weapons,* p. 493.

[52]"AUSA '81 Part 2: Weapons and Sensors," *IDR,* 2/1982.

[53]Richard Simpkin, *Human Factors in Mechanized Warfare,* Brassey's Publishers Ltd., NY, 1983, pp. 134-136.

[54]Simpkin, *Antitank,* p. 42. See Also Avraham "Bren" Adan, *On the Banks of the Suez,* Presidio Press, 1980, p. 340.

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Pursuit of Excellence in Armor

The Armor Force is equipment-oriented with a considerable degree of sophistication, and its mission is to close with the enemy in violent combat, to break through that enemy, and exploit into his rear areas. These are essential capabilities for execution of AirLand Battle offensive operations.

Though the Armor Force is equipment-oriented, man — the soldier —remains the basic element of that force. Rapid modernization is ongoing; however, our war-fighting capability depends on the soldiers who use that modern equipment. Succinctly put, man remains the decisive factor. Armor operations require men with the elan, morale, discipline, and the will to overcome all obstacles to mission accomplishment. Initiative in all grades and the mental alertness, aggressiveness and ability to think, act, and quickly seize the initiative in highly mobile platforms possessing remarkable firepower are absolutely essential to our success on the close combat-heavy battlefield. In order to encourage and reward those attributes, the Excellence in Armor (EIA) Program, begun in late FY 84 as an experiment, now is one of the Armor Force's primary efforts at providing the best possible leaders for our force.

The key points of the EIA program are targeted in the identification of quality soldiers in a concerted effort to develop qualified and competent NCOs quickly. The program identifies the high achiever early on during One Station Unit Training (OSUT), and he receives 50 additional hours of training within the current OSUT Program of Instruction (POI). The specific number of additional hours varies by MOS and type of tank, but consists of gunnery instruction, the firing of additional main gun rounds, the doubling the amount of driving time, and the execution of the moving tank live-fire gunnery tables.

There are rewards for the soldier upon successful completion of the EIA program. For example, he is eligible for early promotion to E3, (based upon his performance, motivation, leadership potential, physical fitness, technical proficiency, and ability to learn) — in other words, his charteristics across the quality spectrum. Additionally, the soldier's gaining unit receives notification of his participation in the program, and his records reflect his successful completion of EIA at the training base in order for him to remain eligible for additional accelerated promotions and training.

Once the soldier arrives at his unit, the chain-of-command must determine whether the soldier continues in the EIA program. If the chain-of-command believes that the soldier's performance does not warrant continuance, they should remove him from the program. Thus the unit is the key implementor of the EIA program, both for continuation for the soldiers entering the unit from the training base and for identification and selection of soldiers assigned to the unit on participation in the Excellence Program.

Briefly stated, the unit process should identify and evaluate potential candidates for EIA by using the same criteria described above, which includes conducting a board for the development of the Order of Merit List (OML) and subsequent selection by the company commander. The commander will then incorporate the unit-selected soldiers with those identified from the training base and ensure that the EIA soldiers receive additional training, primarily in tank gunnery subjects.

In addition to the active component soldiers participating in the EIA Program, the reserve component soldiers attending OSUT training have also participated with 25 percent of the EIA promotions going to reserve component soldiers. Although subsequent promotions in the reserve components (USAR and ANG) will be driven by unit vacancies, the RC EIA soldier should be able to compete successfully for those vacancies, having demonstrated superior levels of performance through the EIA program.

The smart commander will probably use a most valuable company asset to assist and plan the training — the company master gunner. In order to track the soldiers admitted into the program at the unit, the commander should send a letter to Ft. Knox, ATTN: ATZK-AR-P, for documentation and permanency of records, These unit-selected soldiers for EIA will be as closely followed as those selected from OSUT and their progress documented as they advance to potential selection for the Master Gunner Course.

Another major facet of the EIA effort involves the development and sustainment of increased technical and tactical expertise. We have developed a certification program to determine and maintain

the proficiency of tank crews and master gunners. The process — developed in close coordination with the field — encompasses three levels of certification.

The first level is appropriately named Level I, and involves all Armor soldiers from PVT through LTC. Level I is based on the assumption that the abilities of the tank commander must be assured before he is charged with the responsibility of commanding a tank. Essentially, Level I certification is the Tank Commander's Gunnery Skills Tests (TCGST) as stated in the appropriate tank combat tables (FM 17-12) for that tank (e,g., M1, M60/M48, and M60A3). The certification tests are, for the most part, hands-on, technically-oriented, written for field use, and designed to take no more than one day to administer in the unit.

The second level of certification, Level II, is designed to be a written assessment of the tank commander's skills and knowledge. Level II is a comprehensive test of those tasks critical to the performance of the tank commander's duties, to include gunnery, tactics, communications, land navigation, mines and maintenance. It is available only to Armor soldiers in the rnak of sergeant (E5) who have successfully completed BNCOC and who are involved in the EIA Program. Successful completion of Level II certification will mean 50 promotion points to the soldier and the possibility of rapid promotion to SSG. A sergeant (E5) will be permitted to take the Level II test only once for early promotion to SSG. Additionally, any soldier who successfully completes Level II certification will be identified for possible attendance at the Master Gunner Course. In FY87, passing Level II will be a prerequisite for attendance at the Master Gunner Course, and may be attempted more than once by SSGs, SFCs, and MSGs prior to selection for course attendance.

The purpose of Level III certification is to sustain the proficiency of master gunners serving in TOE positions. Senior master gunners (e.g., corps, division, regimental, separate brigade) currently attend a refresher course at Ft. Knox, and upon recertification, these master

"The Armor Center has developed the Level II Certificate of Certification..."

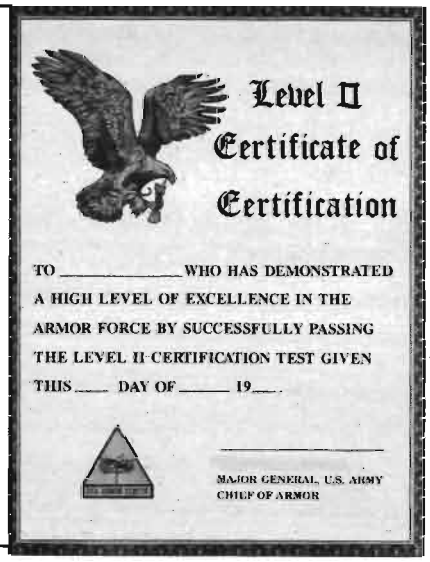


Figure 1

CMF 19 Active Component Tank Commander Certification Programmed

Level	Testee	Test Frequency	Test Location	Benefits
I	E3-E5 Crewmen	Annually beginning FY86 or 6 months prior to gunnery	Unit/Co/Trp	Eligible for reenlistment if SQT passed. Level II Certification eligible.
I	E5-E7: vehicle commander	Annually beginning FY 86 or 6 months prior to gunnery	Unit (Co/Trp)	BNCOC grad requirement Level II certification eligible. (E5 only)
II	BNCOC grad; passing percentile on SQT: Level I pass; CO's recommendation.	Annually beginning FY86	TSO MILPERCEN	Eligible for early promotion to E6 with TIS of 4 yrs, program for master gunner school. Eligible for reenlistment if SQT passed.
III	Master Gunners	Biennial beginning FY86 or thru master gunner transition under force mobilization	USAARMC (for corp division/regt/sep bn master gunners); unit (within the division)	Maintain master gunner ASI

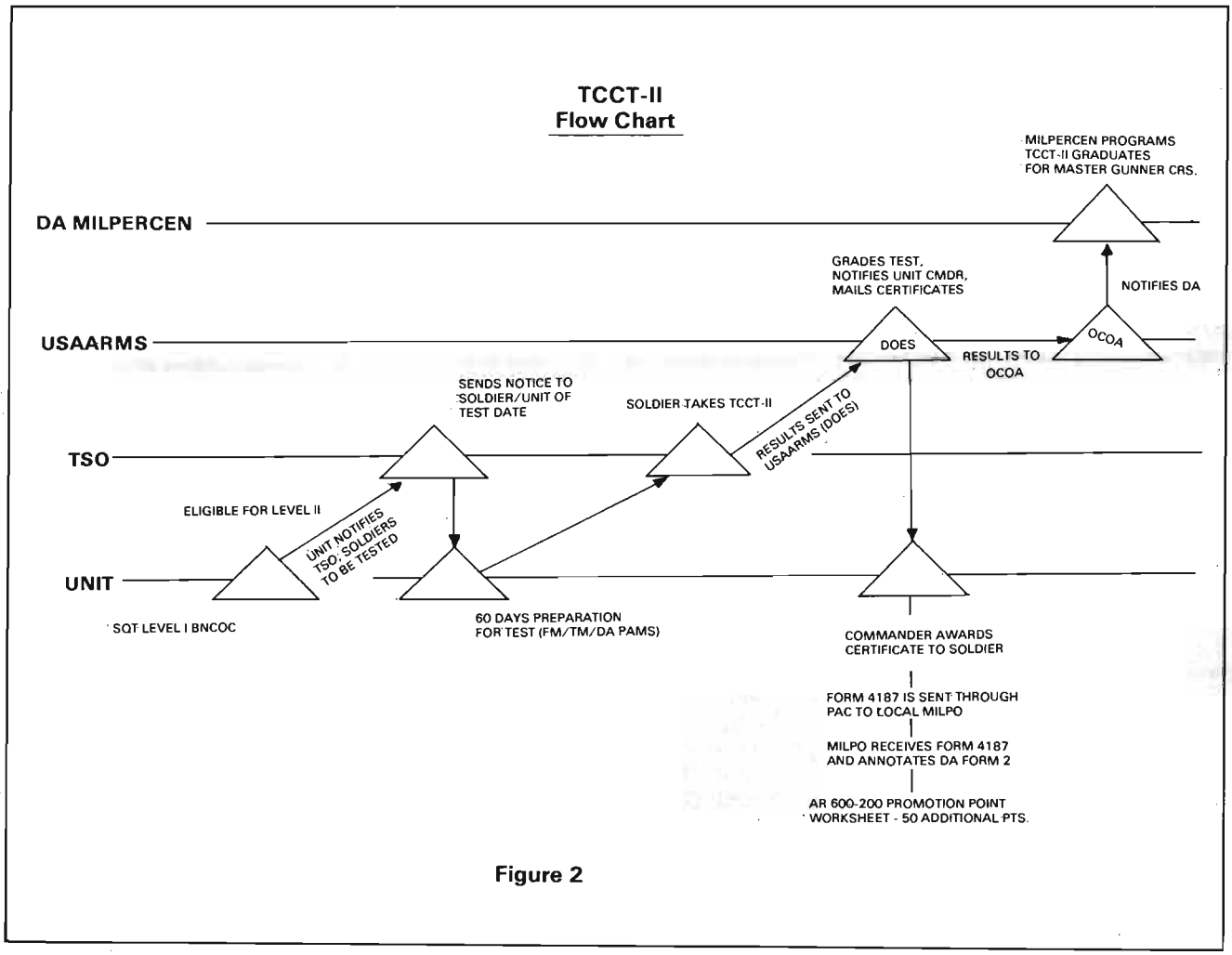


Figure 2

gunners then return to their units with a training and evaluation package for use in the recertification of subordinate master gunners within their units. Certification is conducted biennially (every two years); failure to pass Level III may result in the loss of the ASI.

At Figure 1 is a chart which depicts the Tank Commander Certification Program, Level I through III. It delineates the level of certification with respect to the soldiers involved, level of frequency, test location, and benefits to the soldiers. Since Level II certification is new to the system, at Figure 2 is a flow chart which identifies the responsibilities of the unit, TSO, USAARMS, DA MILPERCEN, and the commander involved. In order to recognize the soldier's accomplishment under TCCT-II, the Armor Center has developed the Level II Certificate of Certification, which will provide formal acknowledgement from the Chief of Armor. Chief of Armor.

Up to now, the thrust of EIA and certification has dealt with Armor soldiers — tankers. Another equally important MOS within CMF 19 is 19D — the cavalry scout. The quality of mission performance that the scout provides is critical to any combat operation. The Armor Center recognizes the importance of this valuable member of the combined arms team and is developing a program for scouts that parallels the one for tankers. The 1st Armor Training Brigade, Ft. Knox, has received the approval from HQDA to test the Excellence in Cavalry (EIC) Program in OSUT.

The certification process and the EIA and EIC programs are designed to function as tools to improve the quality of the Armor Force. To this end, the Armor Center is exploring policies involving the SQT and certification with regard to retention. The purpose is to ensure the sustainment of quality which is so important to the Armor Force. Sustainment of quality, however, ultimately rests with the chain-of-command.

The characteristics of the Air-Land Battlefield, our modern equipment, and the potential threat forces we may have to face, require us —as leaders — to ensure quality in our Armor Force. The EIA Program does just that through efforts in the training base and commander in the field to identify, develop, and certify our Armor Force leaders.

How Would You Do It?

Taking Charge

Situation

After a long plane ride and a never-ending ride in the back of a deuce-and-a-half, you arrive at the battalion S1's track. After a hurried in-processing, you study the battalion and company SOPs in preparation for assignment to Alpha Company. Luckily, both are similar to the Armor School SOPs and you have an easy time relearning procedures. The next day you are finally sent to Alpha Company. A dirty, red-eyed soldier jerks a thumb toward a bombed-out farmhouse when you ask him where you can find the company commander. You find the company commander talking to the 1SG as you enter and prop your duffle bag against the wall. They both look up as you snap to attention and salute smartly. The captain returns your salute with a half smile. He looks tired and strained with dark circles under both eyes.

"Welcome to Alpha Company," he says. "The best company this side of the Mississippi River. Been expectin' ya!"

The sarcasm and thousands of miles between you and the mighty Mississippi River comes through loud and clear.

You drop your salute as the captain continues. "Glad to have ya with us, lieutenant. Have a seat, listen up and take note! I don't have much time. As you've probably heard, we've been in combat about thirty days now and we're to continue the attack tomorrow at 0430 hours. We been pushing forward for the last two weeks against a very aggressive and mobile enemy force. The company has sustained light casualties and continues to function quite well. This is a good unit with an excellent record. All the platoons are led by solid performing lieutenants, except third platoon. I relieved their platoon leader last week for indecisiveness and inability to get along with the platoon sergeant. I'm concerned the platoon is suffering some unnecessary stress and hardship because of the past leadership problems. I want you to take charge of that platoon. Get involved and get it back on its feet. You've got a lot to do before we attack tomorrow, so let me turn you over to the first sergeant and I'll send the XO to take you to third platoon's area. You've got three M1s and nine men. Take care of 'em. You ain't gonna get any more!

"See ya here for the OPORDER at 1300 hours. My watch says it's 0833 hours. Top, you answer any questions the lieutenant has. I've a meeting at battalion in 10 minutes. We'll talk more with the lieutenant after I return."

After a short briefing by the 1SG, you talk to the company XO as you walk to your platoon area. You notice he talks slightly slurred, smokes constantly and never walks out into the open. His eyes dart nervously from object to object, and he walks with his head cocked slightly to the side as if listening for some inevitable sound. He introduces you to your platoon sergeant, SFC Aikens, then hurries off.

You observe the tanks spread out under the trees and covered with camouflage nets. You shift position downwind from SFC Aikens and detect the smell of alcohol. You look at SFC Aikens and evaluate what you see — dirty hands, face and

clothes; red, bloodshot eyes; clean 9-mm pistol; one dog tag attached to the left boot. In talking with him, he informs you about the problems within the platoon and the forthcoming attack. You have him assemble the rest of the platoon, introduce yourself, and speak to them about the mission facing them and of the platoon's responsibility in supporting the company.

As you talk with the men, you hear several things which indicate a need for more Class I, III and IX items, better maintenance support, more sleep, sundry packs, and clean clothes. SFC Aikens is most outspoken and critical. When you promise to look into their concerns, they hardly seem to care.

It is now 1015 hours. You sit down and begin analyzing your situation, the available time and what you want to accomplish by dark.

Problem

1. What are your instructions to your platoon sergeant and your men?

2. What do you want to accomplish prior to 2000 hours?

Solution

Your talk probably had little effect on your platoon. Initially, your soldiers will be apprehensive of your leadership abilities. You must quickly assess your unit's strengths and weaknesses, and take action. You need to demonstrate your competence, concern, and willingness to help your men resolve problems. You need to show strength of character and assertiveness in every way possible without belittling your soldiers' abilities and experience. Recognize that almost everyone is suffering from varying degrees of stress. This overall observation should guide your initial actions. Be aware of the limited time you have and plan to use it to your advantage. In this particular case, it might be best to concentrate on relieving as much stress as possible and trying to solve obvious problems.

1. Talking to the Platoon Sergeant.

a. Does he have soap, razor, comb, etc.? If not, loan him yours and tell him that you want him to set a good example as a leader and to get cleaned up. And caution him to stop the drinking!

b. Discuss with SFC Aikens that

as leaders you don't criticize the system, but make it work. Leaders should not voice criticism among the troops, but seek ways to anticipate and provide for the soldiers' needs. Make him understand that you need and expect his criticism, but just to you. Get the rest of the people cleaned up (use your gear if necessary).

c. Tell him you can see he's good at what he does because of the camouflaged tanks, clean personal weapon and because he has survived. Encourage him to continue to do his job to the highest of standards.

d. Encourage him to be open and honest in all dealings. You need him for his experience and expertise. Together, you can work to make the platoon a continued success and keep all of them alive.

e. Tell him to list all the needs of the platoon and its equipment. You need this information to begin solving its problems.

f. Tell him to continue the preparation for the attack and that you will be back to take him with you to the OPORDER at 1300 hours.

2. What you want to accomplish prior to 2000 hours.

a. Attend the OPORDER.

b. Do a recon (or have SFC Aikens recon).

c. Contact the company XO or 1SG about:

- Getting hot food for your platoon.
- Maintenance support problems.
- Class I, III and IX and why they are problems.
- Inquire if clean clothes are available or can be made available.
- Try to get sundry packs for your platoon.

(These are normally NCO jobs, but in this case you should get involved to demonstrate your concern for the men and equipment under your care.

d. Plan some time to work with your crew. You can't expect to function well if you don't train together. Practice some dry-fire commands and crew drills. Practice laying the gun, etc. Your gunner is probably second in charge of your tank. Talk to him separately about operational procedures and vehicle problems.

e. Make certain you understand company report and operation procedures. Ask SFC Aikens about special procedures not covered in the SOP.

f. Work out your version of the OPORDER with SFC Aikens for presentation to your platoon.

g. Prevent rumors and keep everyone informed — both up and down the chain of command.

h. Start building pride back into the unit by making them feel and look like winners.

i. After dark, consider pulling the vehicles together if permissible. Post guards and get everyone as much sleep as possible.

j. Participate in as many details (like guard duty and cleaning your own weapons) as possible. Show your willingness to share the load of the platoon.

k. Begin establishing mutual trust, respect and confidence between the soldiers and their chain of command. Solve as many of the soldiers' problems as you can. Demonstrate that you care!

l. Work out your method of operation with SFC Aikens. You have similar and complimentary duties, but not the same duties. Get everything straight to start with. This first attack might be best conducted under SFC Aiken's control. Work it out with him.

(If you are interested, refer to Fort Knox FC 17-15-3 (Appendix E) for a precombat inspection checklist, and FC 23-200-1 for M1 Combat Load Plans.)

This problem was developed and written by Captain Ro Tyson of the Leadership Branch, Command and Staff Dept., USAARMS.

Two M1s of the Second ACR maneuver near the Czech border.

"Remember Your Regiment..."

The Second Dragoons Mark Their 150th Anniversary Of Continuous Service

By Major Christopher P. Thompson and Sergeant First Class Kenneth E. Morrison

Preface

"In theory and practice, it (the cavalry) was the arm of mobility, of shock and firepower. It supplied the screen of time and information, denying the enemy that talisman so vital to success — surprise. Conversely, it provided that very same thing itself — the means of surprise, and probably the destruction of the enemy..."[1]

Two hundred and eleven years ago, General Washington led his battered Continental Army on a grueling retreat from New York, through New Jersey, and into Pennsylvania. During that retreat, he had benefited from the services of several *ad hoc* cavalry formations. In a letter to the Continental Congress in December, 1776, he acknowledged this help:

"From the Experience I have had in this Campaign, of the Utility of Horse, I am convinced there is no carrying on the War without them, and I would therefore recommend the Establishment of one or more Corps, in addition to those already raised in Virginia."[2]

Major Elisha Sheldon, commander of the 5th Regiment of Connecticut Light Horse, was commissioned as lieutenant colonel-commanding. He recruited six troops of cavalry that became the 2d Regiment of Continental Dragoons (Sheldon's Horse). Three years later, the 2d was furloughed, and late in November, 1783, the unit was disbanded after having served in ten battles of the Revolution, including the decisive one at Saratoga, N.Y.[3]

The 2d Dragoons' long record of battlefield bravery was established during the Revolutionary War, when Sergeant Elijah Churchill was personally decorated by General Washington with the Badge of Military Merit, today's Purple Heart, which is the nation's oldest military decoration.[4]

After the Revolution, the Army disbanded rapidly, so that by November, 1783, every regular mounted regiment had been officially discharged and the U.S. Cavalry had ceased to exist.[5]

Twenty-nine years passed before the 2d Dragoons were reconstituted, serving from 1812 to 1815 before they were again disbanded.[6]

The unit remained inactive for another 21 years. Then, in May 1836, the regiment we know today as the 2d Armored Cavalry was again raised for service in the guerilla war against the Seminole Indians in Florida.

The 2d Dragoons have been on active service since then, and as they approach their 150th anniversary this month, the 2d is the oldest continuously serving regiment in the United States Army.

Captain Charles A. May's orders to his troops prior to the charge at the Battle of Resaca de la Palma gave the regiment its motto: "Remember Your Regiment and Follow Your Officers."

The Seminole Wars

The 2d Dragoons were reactivated by President Andrew Jackson, with congressional approval, for the fight against the Seminoles, with the first five companies — recruited in New York and South Carolina — arriving in Florida in December, 1836. Five additional companies formed at Jefferson Barracks, MO, were put through the School of the Trooper and joined the rest of the unit in Florida in October, 1837, after riding 1,200 miles in 55 days, much of the way cross-country.

At the unit's reactivation, Colonel David E. Twiggs was appointed the first Colonel of the Regiment. Twiggs was a powerfully-built and robust man, known as "Old Davey" or the "Bengal Tiger." Some troops claimed he could "curse them right out of their boots."

But it was Lieutenant Colonel William S. Harney, Twiggs' deputy, who became the de facto commander, as Colonel Twiggs was absent frequently. It was actually Harney who set the standards and forged the character of the regiment in the hot sun and sweltering marshes of Florida.

(Later, in 1861, General David E. Twiggs — by then a spry 70-year-old, would have the distinction of being named by Jefferson Davis the Senior General Officer in the Confederate Army.)

As in any guerilla war, imagination and deception were necessities in Florida. Understanding this, Harney went so far as to dress some of his scouts as Seminoles in the quest for intelligence. In 1838-39, he privately purchased a total of 100 Colt revolving carbines, and issued them to picked dragoon sharpshooters. Harney's long career ended in retirement in 1863 as a Major General.

President Lincoln later was to write that one of his major errors was his failure to appoint William S. Harney as commander of the Army of the Potomac in 1861. In 1985, the new gymnasium at Fort Leavenworth, Kansas, was named after this distinguished dragoon.

The Seminole war came to its conclusion in October 1841, and by late the following April, the Regiment had departed from Florida with elements either enroute to or already established in the Arkansas Territory.

But in August 1842, the House of Representatives passed a bill to cut military spending, a bill that called for — among other things — the elimination of the 2d Dragoons. The Senate disagreed, and compromised by dismounting the Dragoons and redesignating them as a rifle regiment. After intense lobbying — and a great deal of marching — the Regiment was able to remount itself a year later.

The Mexican War

In April 1846, the Mexican Army crossed the Rio Grande. Two companies of the 2d Dragoons, performing area reconnaissance, unwisely challenged 1,600 Mexican cavalrymen, suffering eleven dead, six wounded, and forty captured. This provided the excuse that President James K. Polk had been seeking to invade Mexico and further the expansion of the United States in the Southwest.

On 8 May 1846, while performing a flank guard mission for General Zachary Taylor's army near Palo Alto, Texas, the Regiment was largely responsible for the success of a counterattack which collapsed the enemy's left.

The next day, at Resaca de la Palma, the words were spoken that give the Regiment its motto. As Captain Charles A. May prepared to charge a Mexican battery guarding the Matamoros road, he issued the order of the day, "Remember Your Regiment and Follow Your Officers." With those words ringing in their ears, May's troopers made a dashing charge, capturing the battery along with a Mexican general.

Action in the West

After a brief period of occupation duty, the Dragoons moved further west to secure new territory for an influx of settlers. In 1854, the 2d Dragoons met and defeated the Brule Sioux at Ash Hollow, Nebraska, and forced a treaty upon them. Colonel Harney, still the second Colonel of the Regiment, became known to the Sioux as "the man who always kept his word."

In 1857, Lieutenant Colonel Phillip St. George Cooke, the third Colonel and the foremost Indian fighter of his day, led the Regiment on a grueling winter march to Utah, part of a successful campaign to bring dissident Mormon factions back under federal control. St. George Cooke shortly afterwards completed a new and simplified version of Tactics and Regulations for Cavalry which served as standard doctrine for Union cavalry during the Civil War.

Colonel St. George Cooke, a Virginian and the only cavalry regimental commander (out of five) who did not side with the Confederacy, would see his entire family oppose his politics. As a general, he would soon meet his son-in-law and fellow cavalryman, J.E.B. Stuart,

Captain Wesley Merritt of the Second Cavalry dashing across Beverly Ford in Virginia, 1862.

more than once in battle while his eldest son would become the surgeon general of the Confederate Army's Medical Corps.

The Civil War Years

In 1861, the 2d Dragoons, newly redesignated as the Second US Cavalry and full of Indian war veterans, headed east to participate in the American Civil War. The Regiment became part of the First Cavalry Division, Army of the Potomac, and participated in the battles at Antietam, Chancellorsville, Gettysburg, the Wilderness, Manassas, Spotsylvania, and Cold Harbor. During the Civil War, five Medals of Honor were awarded to Second Cavalry troopers.

With the end of the Civil War, the Regiment again headed west and was scattered over many states and territories, frequently with but a single troop occupying a post. The Regiment campaigned against the Cheyennes, Bannocks, Nez Perces, and the Sioux. Lieutenant Colonel George A. Custer of the Seventh Cavalry was offered attachment of the "Montana" battalion of the Regiment (so named from the various troops stationed in that territory), which he most unwisely declined. The next day, Custer met his fate on the hills above the Little Big Horn. The Second Cavalry, after assisting in the grisly police of the battlefield, spent the next few years tracking down those responsible for Custer's massacre, as did much of the Regular Army.

The Regiment was also instrumental in the surrender of Chief Joseph's Nez Perce Indians.

During the Indian Wars, fifteen more members of the 2d Dragoons were awarded the Medal of Honor, including one Sergeant — Patrick Leonard — who became a double Medal of Honor winner, one of only five in the history of the award. Another, Captain Eli Huggins, would later become the 12th Colonel of the Regiment. Lloyd Brett, who was awarded the Medal of Honor as a second lieutenant in the 2d Cavalry, in 1927 became the regimental commander of the 3d Cavalry. Such was the cut of man in "dirty shirt blue."

On San Juan Hill

When the war with Spain broke out in 1898, the 2d Cavalry was stationed at Fort Sam Houston, Texas. "Always Ready," they joined Theodore Roosevelt's "Rough Riders," becoming the only mounted U.S. regulars to fight in Cuba. Impressed with their tenacity and drive at San Juan Hill, Teddy Roosevelt declared "The 2d Cavalrymen are everywhere. All day long you see them. All night long you hear their clattering hooves."

Journeying to the Pacific in 1905, the Regiment fought in the Philippine Insurrection against Moro tribesmen as a part of General Pershing's command.

Bandits on the Border

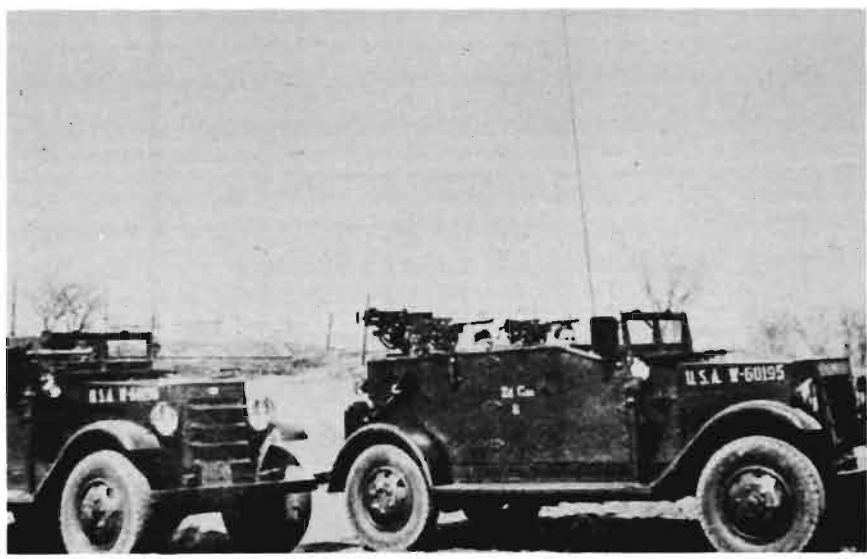
Returning home in 1912, the 2d Cavalry was assigned patrol duty on the US.-Mexican border from El Paso to Presidio, Texas, a distance of 262 miles. In 1915, the Regiment joined General Pershing for the Punitive Expedition into Mexico. Some remarkable riding and fighting by the 2d Dragoons helped put a stop to the exploits of that elusive Mexican bandit general, Pancho Villa.

When the United States entered

Medal of Honor recipient 2d LT Lloyd M. Brett, seen driving off a Sioux pony herd at O'Fallon's Creek, Montana, later became regimental commander of the 3d Cavalry.

The Second Cavalry served in the Philippines in 1905.

Troops of the Second Cavalry are seen in Koblenz Cologne, Germany, as part of the occupation following WWI.



At Fort Riley, Kansas, in the mid-1930s, the Second Cavalry experimented with armored cars.

WWI, the 2d Cavalry again was called to serve with General Pershing, first as his personal escort, later performing military police duties and managing remount depots. A provisional squadron — composed of Troops B, D, F, and H — became the only American unit to fight as horse-mounted cavalry in that war. They were engaged in the Allied September 1918 offensive.

After a brief period of occupation duty in Germany, the Regiment returned to Fort Riley, Kansas, and served as the school training regiment for the Cavalry School.

The Dawn of Mechanization

During the mid-1930s, the Regiment experimented with armored cars and mechanized cavalry, and in 1936, participated in the first joint armored and horse cavalry maneuver held at Fort Riley, Kansas. Teaming with the 1st and the 13th Regiments (Mechanized) in 1938, and with the addition of artillery and light planes, the 2d Cavalry helped to develop coordination in the use of combined arms.

By 1942, oats and hay gave way to gasoline, and grease and oil replaced saddle soap, as horses were exchanged for armored cars, half tracks, and light tanks. In June 1943, the Regiment was renamed the 2d Cavalry Group, Mechanized. In December, it was again reorganized with elements constituted as Headquarters and Headquarters Troop, 2d Cavalry Group, Mechanized with the 2d, (now 1st Squadron) and 42d (now 2d Squadron) Cavalry Reconnaissance Squadrons, Mechanized. Other elements were assigned to several different divisions.

The War in Europe

Landing in France in July 1944, the Regiment soon was performing such daring reconnaissance for Patton's Third Army that the Germans described them as "The Ghosts of Patton's Army," since they seemed to materialize anywhere at almost any time.

When the 5th *Panzer* Army tried to reduce the Nancy salient in September 1944, their attack fell short as a result of alert reporting and the time gained by the 2d Cavalry's

Troops of the Second Cavalry participate in the liberation of Luneville, France, in September, 1944.

delaying action. This was the largest concentration of German armor in the west since June 1944. The enemy's armor losses were so extensive that the Germans were unable to mount another major offensive until the Battle of the Bulge. One reason that this action around Luneville, France, remains obscure today was that the drama of Operation Market Garden was taking place several hundred kilometers to the north. The ill-fated airborne assault in Holland captured most of the press corps' attention.

Other elements detached from the Regiment assisted in the relief of the 101st Airborne Division at Bastogne, crossed at the Remagen Bridgehead, and even island-hopped in the Pacific, fighting in the Philippines and on Okinawa.

In Europe, the 2d Cavalry continued to advance, penetrating well into Czechoslovakia by early May 1945. In a daring raid through Russian lines, the Regiment rescued the world famous Lippizaner stallions. (In 1960, Walt Disney Productions made a full-length, though historically flawed, motion picture of this event entitled *The Miracle of the White Stallions*.) In August 1985, the city of Vienna and the Austrian government formally thanked the Regiment for its efforts during this period.

Postwar Assignments

After the war, the Regiment was first renamed the 2d Constabulary Regiment, becoming finally, in 1948, the 2d Armored Cavalry Regiment. Since the end of the war, the Regiment has had the additional mission of border surveillance, operating first from the cities of Freising and Augsburg. In 1951, the Regimental Headquarters was established in Nurnberg. In 1955, the Regiment participated in Operation Gyroscope, a large scale "Cohort" exchange with the 3d Armored Cavalry Regiment from Fort Meade, Maryland. In 1958, the Regiment returned to USAREUR and the border where it has been stationed ever since.

In May 1963, the 2d Dragoons became the first American unit ever honored by the German *Bundeswehr* with the "Grosser Zapfenstreich," or "Grand Tattoo" ceremony. This centuries-old ceremony has remained Nurnberg's major military event since the end of the war and a fitting honor for the Army's oldest continuously serving regiment.

Creighton W. Abrams, later the Chief of Staff of the Army, was the 39th Colonel of the Regiment.

In May, 1945, troopers of the Second Cavalry Group, Mechanized, cleared a city of Czechoslovakia as the Nazis teetered on the brink of collapse.

The shell-pocked exterior of the Merrell Barracks, damaged in WWII, is now being refurbished, one of the many improvements now being carried out by the Regiment.

An M1 maneuvers in a field near the border, but maneuver damage constraints prevent full tactical employment.

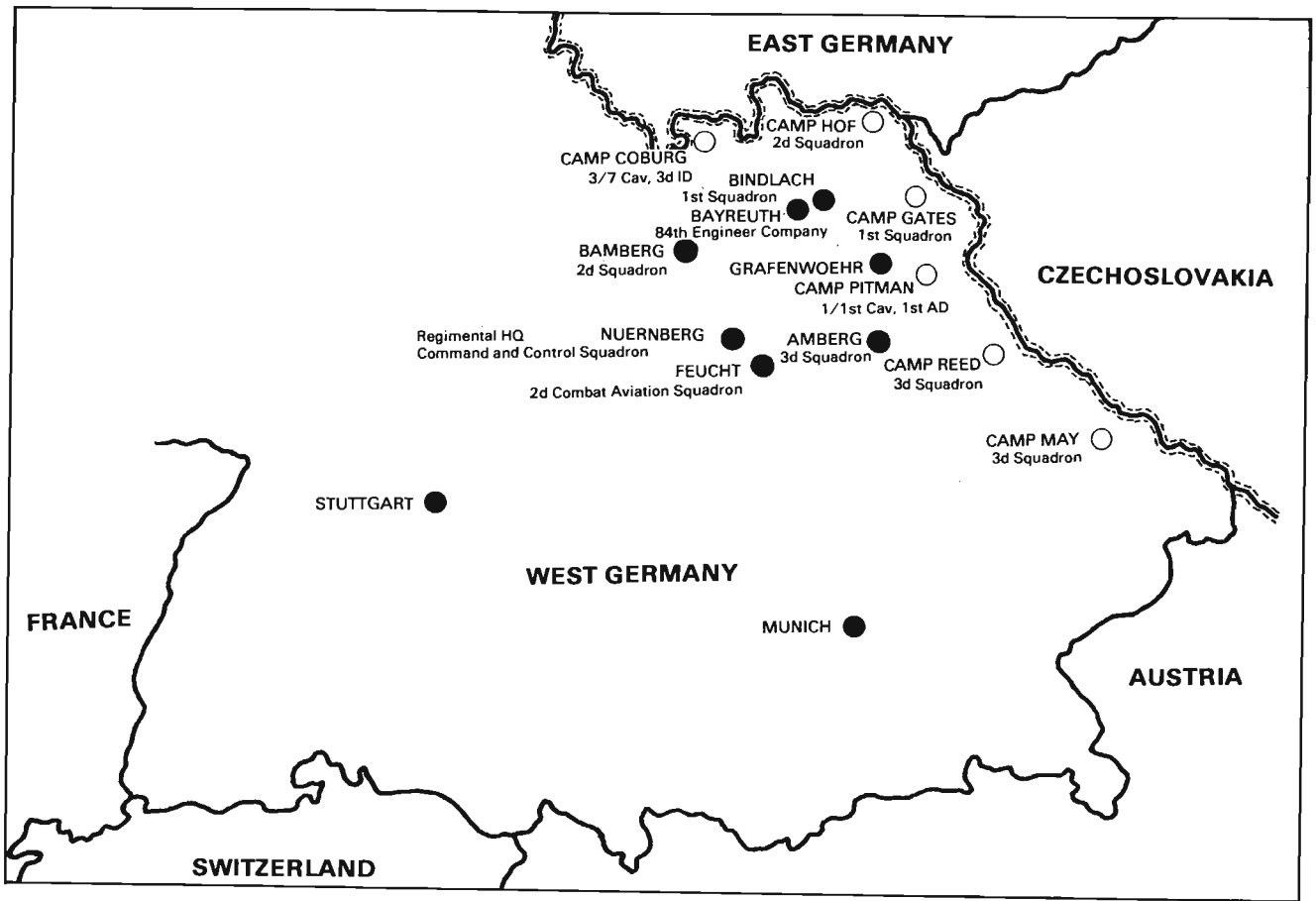
Two of the 2d ACR's M1s rumble through a village in Germany.

Today and Tomorrow

In recent years, the Regiment has undergone tremendous changes in equipment and training. The 2d Dragoons will soon receive the M3 Bradley Cavalry Fighting Vehicle to complement their M1 Abrams main battle tanks, TACFIRE and M109A2 howitzers, AH1S attack helicopters, and sophisticated electronic warfare equipment. With the addition of the Bradley, the traditional ability of cavalry to move fast and strike hard will be greatly enhanced. The Regiment will also receive the HEMTT and FAASV systems during 1986. The 2d Combat Aviation Squadron (2CAS) is scheduled to receive the UH-60 Blackhawk helicopter in the near future.

A support squadron will be activated in 1986 also, and will consist of a headquarters and headquarters troop, a materiel management center, a maintenance troop, a medical troop, and a supply and transportation troop. With the addition of its support squadron, the Regiment will become a self-contained, self-sufficient, fighting force consisting of three armored cavalry squadrons (each with a tank company and a howitzer battery), one combat aviation squadron, one command and control squadron (headquarters and headquarters troop, combat engineer company, chemical company, and CEWI company), and one support squadron. The Regiment will then total nearly 5,000 soldiers and will possess the firepower of half a heavy division.

Regimental headquarters is located in the historic city of Nurnberg, at Merrell Barracks. With the exception of the 84th Engineer Company, located in Bayreuth, all of the command and control squadron units and the soon-to-be-formed support squadron are also located at this Kaserne. The 2d Combat Aviation Squadron is located at Feucht Army Airfield in a suburb of Nurnberg. The First Squadron is located at Christensen Barracks, on a high bluff overlooking the city of Bayreuth. Second Squadron shares the military community of Bamberg with the 3d Brigade, 1st



Armored Division, and other non-divisional units at Warner Barracks II. Third Squadron is the furthest south at Pond Baracks in Amberg.

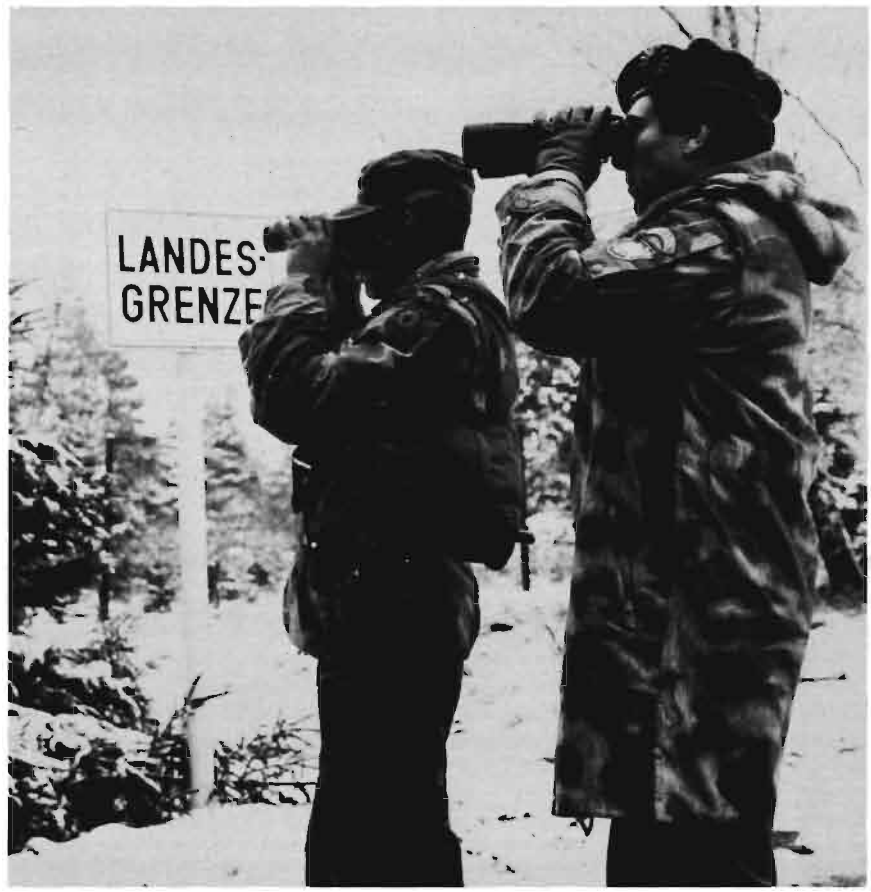
On "Freedom's Frontier"

In addition to home station gunnery programs, qualification, live-fire exercises, and tactical maneuver exercises common to any armor or armored cavalry unit, the Regiment is also charged with the continuous surveillance of "Freedom's Frontier."

The Regiment controls border operations from five "Border Camps" with sectors tracing along 651 kilometers of the East German and Czech border.

The border, at first glance, is deceivingly serene and peaceful. Closer examination, however, reveals a system of fences, minefields, guard towers, and booby traps all located systematically to prevent anyone from leaving the Eastern zone. The deadly efficiency of the border fortification is reflected by the fact that there are generally fewer than 25 successful escapes per year in the Regiment's sector.

Reports are sent from border patrols up through troop and squadron operation centers to the Regimental Operations Center in Nurnberg. The border surveillance mission also ties the Regiment to our NATO Allies. Both the German Federal Border and Customs Police also conduct daily, and sometimes joint, patrols and exchange intelligence information with the Regiment, as do the Bavarian Border Police.



Map at left shows location of the 2d ACR's subunits. At right, a trooper and an officer of the Federal Border Police conduct a joint patrol along "Freedom's Frontier."

Below, left, a view of Czechoslovakia is a common sight for 2d ACR troopers serving along the border. Below, East German border guards can be seen photographing activities of a patrol near Blankenstein, Germany, a small, divided city in the Hof sector.

Continuous border surveillance, rigorous combat training, active force modernization, and a strong concern for quality-of-life issues represent the focus of today's 2d Armored Cavalry Regiment. Duty in the 2d Dragoons is fast-paced, exciting, and realistic.

The 2d Armored Cavalry Regiment has written a full and eventful history in the past 150 years. From the swamps of Florida to the plains of Central Europe, the Regiment has been and will continue to be "Always Ready" — "Toujours Pret."

Footnotes

[1]S. E. Whitman, *The Troopers: An Informal History ofthe Plains Cavalry, 1865-1890,* pp. 10-11. Hasting House Publishers, New York, 1962.

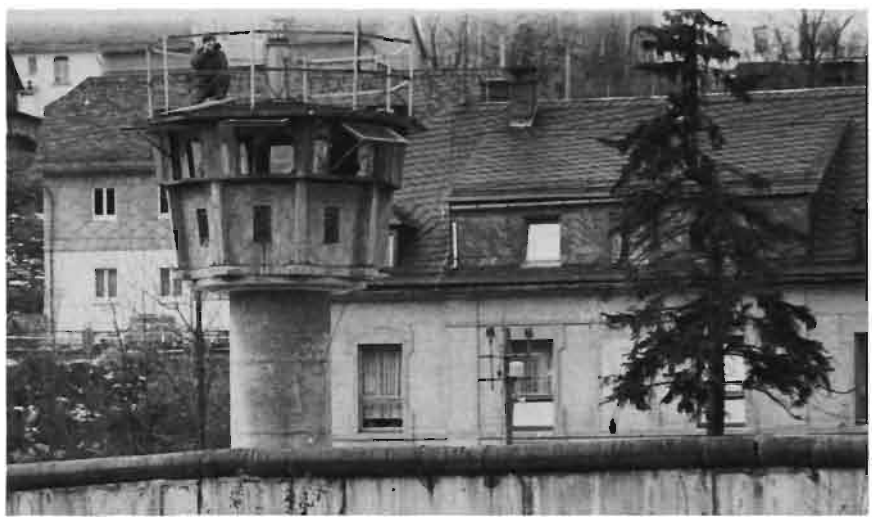
[2]Gregory J. W. Urwin, *The United States Cavalry, An Illustrated History,* p. 13. Blandford Press, Poole, Dorset, England, 1983.

[3]*Army Lineage Series,* pp. 345-346. U.S. Army Center for Military History, Washington, D.C.

[4]*The United States Cavalry, op cit.,* p. 29.

[5]A. G. Brackett, *History of the U.S. Cavalry,* p. 23. Greenwood Press, New York, 1968.

[6]MG John K. Herr (USA, Ret.), *Story of the U.S. Cavalry, 1775-1942,* p. 29, Little, Brown & Company, Boston, MA, 1953.



MAJOR CHRISTOPHER P. THOMPSON, now assigned to the 1st Brigade, 3d Armored Division, FRG, was the RS-5/PAO of the 2d ACR. A 1972 graduate of Indiana University, Bloomington, Indiana, he has served in command and staff assignments in armor and cavalry units in CONUS, Korea, and the FRG, and with Infantry units in the RVN.

SERGEANT FIRST CLASS KENNETH E. MORRISON, a German linguist, is RS-5/PAO NCOIC of 2d ACR. A cavalry scout, he has previously served in a variety of armor and instructor assignments and possesses an associate's degree. SFC Morrison is an avid historian and has done extensive research into cavalry equipment, organization, and tactics used during the Civil War period, and has been a frequent participant in Civil War reenactments throughout the southeast United States as commander of the 51st Alabama Cavalry (Partisan Rangers) (Reactivated).

Current Tracked-Width, Tank-Mounted Mine-Clearing Roller evolved after a long period of experimentation beginning in WWII.

Minerollers: Mobility For the Armor Task Force

by First Lieutenant (P) Randall L. Grant

An apparent contradiction exists between U.S. Army offensive doctrine and Threat defensive employment of mines. AirLand Battle, the current U.S. Army operational concept, stresses continuously seizing and maintaining the initiative by attacking the enemy to the depth of his defenses; indeed, this is the very hallmark which distinguishes AirLand Battle from its predecessor, Active Defense. This new doctrine repeatedly emphasizes rapid maneuver and fast-paced operations which will prevent the enemy from taking effective countermeasures (i.e. massing forces to blunt the attack). "Speed has always been important, but it will be even more important on the next battlefield..."[1]

Threat forces, however, are not unprepared for such eventualities. The Soviet Army stresses the extensive use of mines in the defense, particularly antitank (AT) mines. These mines are spaced 4 to 5.5 meters apart, and typical AT minefields have densities of 750-1,000 mines per kilometer of front.[2] Minefields are planned throughout the depth of the Threat defense and are most often covered by fire. Although the major purpose of minefields is to stop or slow an attacking enemy force, Threat doctrine has further designated that minefields function to "strip away the [enemy] infantry's supporting armor."[3] How, then, will attacking U.S. armored forces overcome these extensive Threat minefields?

Mine Warfare in WW II

American forces faced a similar impasse during WW II. The German Army, one of the leaders in the pre-war development of mine warfare devices and techniques, made extensive use of mines, which they considered "a most effective defensive weapon."[4] Their efforts were particularly noteworthy in North Africa and Italy, accounting for a large percentage of British and American tank losses. In fact, the Germans laid more mines (500,000) at their El Alamein positions prior to the battle than the Russians did (400,000) at their positions prior to the great battles of Kursk and Orel.[5] While the employment of these mines did not win the battle for the Axis, they did reduce British battlefield and tactical mobility "to the point of near-containment"[6] and induced caution into future advances. The Allies developed a wide variety of countermine equipment throughout the war; one of these was the tank-mounted mine-clearing roller.

The first American-built mine-roller system was the T-1 Roller. Developed in 1942 from a similar French design,[7] the device consisted of three sets of five articulating steel discs. One set was pushed in

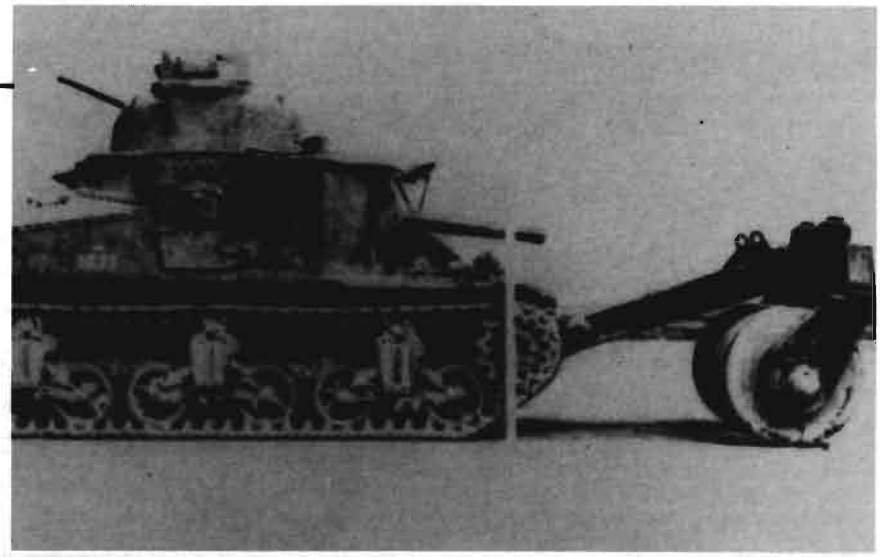
front of each track and the other set trailed behind the tank. The T-1 was approximately 50 percent effective against mines buried up to three inches deep. Its main shortcomings, however, were its speed (1½ miles per hour) and lack of maneuverability, and the device was thus never mass-produced.[8]

The next version of the T-1 family of minerollers, the T1E1 Mine Exploder (nicknamed "Earthworm"), eliminated many of the deficiencies of the T-1. Manufactured in late 1943, this system was mounted on an M32-model Tank Recovery Vehicle and consisted of three sets of six solid armor-plate discs, with one set in front of each track and the third set centered between and forward of the other two sets. As was the case with many of the T-1 series of minerollers (T1E1, T1E2, T1E3, T1E5), the disc assemblies in front of the tracks were connected to the sprockets on each side of the tank. The third set was connected to the tank recovery vehicle by a yoke, the movement of which was controlled by the boom and hoist cable of the vehicle; this greatly improved the ability of the system to negotiate rough terrain. The discs were practically indestructable, and testing of the system went so well that 75 modified T1E1 Mine Exploders were sent to the European Theater of Operations.[9]

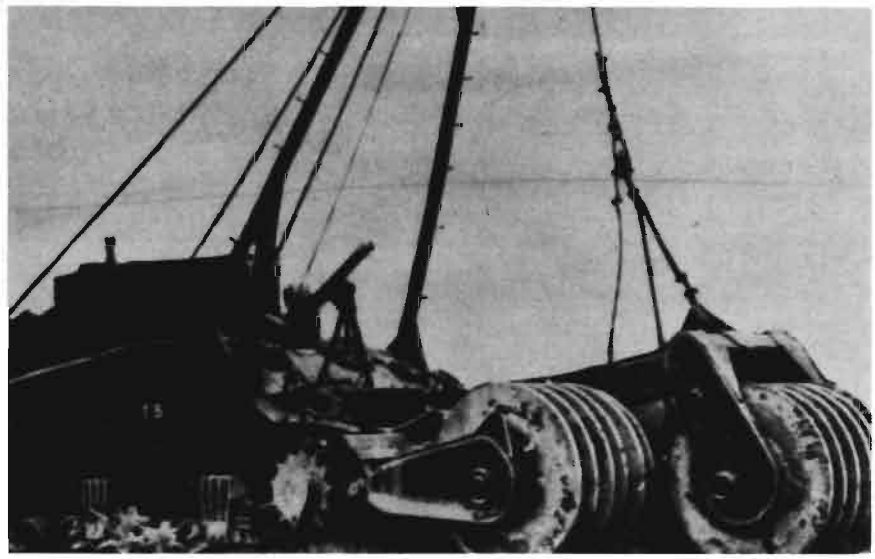
The only other member of the T-1 family to see action during WW II was the T1E3 (nicknamed "Aunt Jemima"). Propelled by an M4 (Sherman) tank, this system consisted of two sets of five discs — one set in front of each track. Each disc was eight feet in diameter, and the entire system weighed 29 tons. Unlike the earlier T-1 model rollers, the T1E3 would only clear an area 2.8 feet wide in front of each track. Another major difference was that each set of discs was driven by a mechanism attached to the final drive shaft of the tank; this arrangement greatly improved the mobility of the mineroller. Aberdeen Proving Ground personnel reported highly satisfactory test performance of the device and, in 1944, 100 of the minerollers were purchased and sent to Europe.[10]

Postwar Research

The end of the war saw the end of the T-1 series of mine-exploding

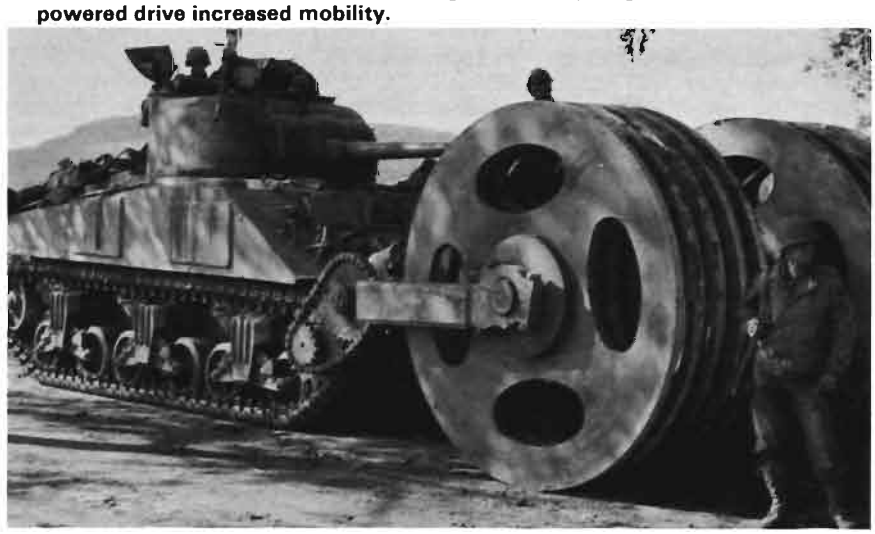


The 1942-era T-1 mineroller also included a trailing section.



The T1E1 mineroller set, used in WWII, was mounted on the M32 Recovery Vehicle. The boom attachment greatly improved performance on rough terrain, despite weight of armor discs.

The T1E3, below, another WWII design, had very large roller discs, but powered drive increased mobility.



rollers. The remaining minerollers in this category were never accepted into the U.S. Army inventory, the T1E8 being the only exception. Although in some cases substandard performance played a part in this, the main reason for abandoning the T-1 series program was the development of the M46 (Pershing) medium tank.[11] The M46 was wider than the M4 tank which had propelled the T-1 family of rollers, and thus required a wider roller device. In order to satisfy this new requirement, the T1E8 mineroller was developed.

The T1E8 Heavy, Tank-Mounted, Mine-Clearing Roller — later nicknamed "High Herman" — consisted of a five-ton boom attached to the front of an M46 tank and a 31-ton exploder assembly. The exploder assembly — a frame containing 25 individually-articulating armor-steel discs — was towed in front of the tank by the boom. The device cleared a 15-foot path in front of the tank, and it could be jettisoned from the tank in an emergency by use of explosive cartridges.[12] Performance testing of the device in 1951 indicated that it had a minimum efficiency of 86 percent against pressure-activated mines and that it was impervious to blast effect. The tank could load and unload the exploder onto and from a 60-ton trailer under its own power, and assembly of the unit by the crew took two hours. However, there were several drawbacks to the device: visibility of the tank driver was severely limited; the great weight of the unit (36 tons) placed a severe strain on track suspension, transmission, and final drives; and, with regard to maneuverability, soft soil, heavy woods, narrow roads, large ditches, and grades greater than 22 percent effectively rendered the roller useless.[13] In spite of this, a few copies of the roller were sent to Korea in early 1952 for additional testing, the results of which were "encouraging."[14] The Engineer Research and Development Laboratories personnel recommended in *Report 1231,* dated 13 May 1952, that "the roller be procured on a limited basis until a more satisfactory device is available," and that "development of mine-clearing rollers continue with the view toward lightening the load on the tank."[15]

The T1E8 was developed for the wider M46 "Pershing" tanks.

The "Larruping Lou" Era

Based on those recommendations, design and testing were begun on an improved model: the Light, Mine-Clearing Roller, nicknamed "Larruping Lou." Model I weighed 21 tons and consisted of two sets of eight discs, with each set clearing an area of 1½-track width. Each disc was able to articulate plus or minus 20 inches and the entire assembly could move vertically plus or minus one foot. The discs were suspended from a cross-arm which, in turn, was connected to the front of the tank by a "tongue" attachment. Weaknesses were found in the structure of the device, however, and Model II was, therefore, developed. Model II had only six discs per set, a more reliable jettisoning system, and a strengthened tongue and cross-arms.

Further tests were conducted involving M46, M47, M48, and, finally, M60-series tanks, with extremely satisfactory results: minimal damage to the device from blast; minimum 94 percent effective against mines buried up to eight inches[16]; excellent maneuverability in turns and over rough and varied terrain; and able to obtain speeds up to 26.4 miles per hour.[17] The Larruping Lou remained the standard against which other minerollers were tested for almost 20 years, but it was never procured in any great numbers.

Beginning in the mid 1950s, research began on an "expendable" mine-clearing roller (i.e. one that consisted of low-cost roller parts which, when destroyed by blast, could be easily replaced while leaving the nonexpendable weight transfer mechanism undamaged). The basic designs which the U.S. Army Engineer Research and Development Laboratories tested in the late 1950s were Model I, a drum-roller assembly, and Model II, an articulated tank road wheel assembly. Initial reports indicated completely unsatisfactory performance by these devices.[18] Research on tank-

The mid-50s "Larruping Lou" roller was a standard for 20 years.

mounted minerollers lapsed until 1967, when interest in them was renewed due to Viet Cong mining activity in the Republic of Vietnam. Despite its many shortcomings, the Model II expendable mineroller (redesignated Model Ib) was retested and determined to be of value in a limited war scenario. In early 1970, several rollers were shipped to the 11th Armored Cavalry Regiment Republic of Vietnam, where they performed with mixed results.[19] After 1972, work on the expendable mineroller ceased. As a 1968 report explained: "Against the simple pressure fuzes used by the enemy there (i.e. in Vietnam), the roller is very effective, but it would be practically useless against sophisticated European mine fuzes."[20]

Soviet Designs Studied

In 1973, the U.S. Army obtained a copy of the Soviet-made mineroller, PT-54, and began operational testing of the roller. In one such test of mobility and reliability, the PT-54 was pitted against the "Larruping Lou" and another mineroller system developed by Southwest Research Corporation. The conclusions of the study indicated that the performance of the PT-54 (attached to an M60A1 tank) was far superior to the other two rollers both in terms of mobility (greater cross-country speed, slope-climbing, and turning ability) and reliability (blast energy dissipation, ease of jettisoning, and maintenance).[21] In 1975, another version of the Soviet mineroller, the KMT-5, was obtained and underwent limited testing. Using the best features of the two Russian designs, the U.S. Army Mobility Equipment Research and Development Command (MERADCOM) developed the current Track-Width, Tank-Mounted Mine-Clearing Roller.[22]

The new mineroller system is designed for mounting on M60- and M1-series main battle tanks. The M60-series tanks accepting the mineroller must be previously fitted with both a retrofit kit and a mounting kit, while the M1 tanks require a Roller Adapter Kit (RAK) onto which the minerollers attach. The mine-clearing roller consists of a left side pushbeam and roller assembly, a right side pushbeam and roller assembly, and a "dog bone" and chain assembly suspended between the roller banks.

Each roller assembly, consisting of five articulating armored roller wheels, operates independently of the other and is able to freely follow the contour of the terrain. The rollers are capable of neutralizing tilt rod and single impulse, pressure-activated mines buried up to four inches deep; the dog bone and chain are designed to detonate tilt rod mines between the roller paths. Each roller bank can be released from the tank by means of a quick disconnect mechanism, operated either hydraulically or manually. The total system weighs approximately ten tons and, when not mounted, is transported by a tractor-trailer combination.[23] Currently, there are seven mineroller sets in Europe and one set in Korea. Initial fielding of minerollers to Korea, POMCUS stocks and war reserve, will be in 4th Quarter Fiscal Year 1986 (4QFY86).

The track-width, tank-mounted mine-clearing roller incorporates many improvements over previous designs. Mine-clearing capability is, of course, the primary criterion by which all minerollers are gauged. An evaluation report, published in 1983, indicated that minerollers had a neutralization capability of more than 97 percent[24] against those mines *which they encountered* (i.e. all mines in the path of the roller wheels and tilt rod mines contacted by the dog bone and chain). The minerollers successfully cleared lanes through simulated minefields at a mean speed of 6.4 miles per hour (MPH) for the M60 and 7.5 MPH for the M1. Also, mounting time had been greatly reduced over previous models — under 14 minutes average — as well as faster disconnect times — consistently less than 3 minutes.[25] Clearly, the new mineroller will provide armor units with an effective and highly mobile countermine capability.

As with all items of equipment, however, the new minerollers are not without their limitations. Although their mine-clearing record is impressive, testing indicated that a significant number of mines — up to 40.9 percent[26] — still remained in the "cleared" lane. These mines include those pressure-activated devices which pass between the two roller banks, as well as any mines with more sophisticated methods of fuzing (i.e. multiple impulse and magnetic). These mines would be encountered by those following vehicles — such as an M113 — which possess track-spacing narrower than the 72-inch uncleared center lane, or those wandering out of the path cleared by the roller banks. Another disadvantage is the severe degradation of cross-country speed caused by the rollers. Since minerollers would be required for any attack on a deliberate Threat defense, this factor would seriously impact on the mobility of the armor task force.

Mineroller Limitations

Two other significant factors influencing mineroller effectiveness are blast effect and roller path signature. Due to its relative light weight and system configuration, each roller bank is only able to explode up to four antitank mines (equivalent of 22 lbs. high explosive) before it is considered unserviceable, thereby limiting its usefulness as a breaching mechanism. The second factor, roller path signature, refers to the visible ground trace created by the mineroller as it clears a path through a minefield. Testing has shown that, unless the ground is somewhat soft, those vehicles following the roller tank will have great difficulty in finding the entrance to the cleared lane and the path that the rollers create.[27] This would result in unnecessary casualties and delay for the attacking force.

The System Solution

Recognizing these limitations, the U.S. Army Armor and Engineer Board, in cooperation with other research and development agencies, has decided not to depend on any single item of equipment, such as the mineroller. Instead, an entire countermine package, called the Armor Organic Countermine System, will be fielded. This system will consist of the following items: one M818 five-ton tractor; one M172A1 low-bed trailer; one each left- and right-side roller banks; three mineroller mounting kits (or RAKs); three Track-Width Mine Plows (TWMP); and one Cleared Lane Marking System (CLAMS).

The Armor Organic Countermine System will be fielded as a package, beginning 2QFY88 to M1-equipped units and sometime thereafter to M60-equipped units. Current allocation is one system per tank company/armored cavalry troop (with tanks). In addition, the Armor School and Ordnance School will each receive one system for training.

The Track-Width Mine Plows (TWMP) are 3½-ton systems which, unlike the mineroller, attach directly to the front of either an M60- or M1-series tank without modification to the tank itself. This system consists of left- and right-side skids (to control depth) and moldboards with tines (to extract and cast mines to the side). The plow does not have to be dismounted from the tank after use, since it causes little or no degradation of speed or maneuverability while in the carry position. Most significantly, the mine plow clears *all* mines from the path of the tank tracks, regardless of type of fuzing, leaving only a 26-inch uncleared center lane. Also, the visible trace left by the plow is much easier to identify and follow than that of the mineroller. For these reasons, the TWMP, working with the tank-mounted mineroller; has been designated "...Armor's primary organic minefield breaching system."[28]

The Cleared Lane Marking System is a device, attached to the rear of the mineroller tank, which dispenses markers at preset intervals into the center of the cleared lane of the minefield. These markers are weighted chemiluminescent light sticks (chem-lights), which improve the nighttime observability of the cleared lane. The entire system consists of a dispenser, a refill kit of 150 individual markers, a mounting kit and an operator's control assembly. Testing has proven the utility and value of this device.[29]

Employment of the armor Organic Countermine System will significantly improve the speed of breaching operations, thus allowing armor units to maintain the initiative and reduce tank losses. Although the fundamentals of breaching operations remain the same, the actual conduct of the breach will be radically altered. Initial detection of the minefield(s) should be made by the mineroller tank. Due to the loss of momentum which occurred in testing when minerollers were mounted only after the discovery of a minefield, doctrine now states that the preferred method of employment is for rollers to be connected to the tank prior to the attack.[30] Because the roller has a certain degrading effect on the cross-country mobility of the tank (and, hence, the unit), battalion task force commanders will have to decide whether mounting of the rollers will be a worthwhile option.

Rather than being a purely doctrinal question. This decision should be made on the basis of accurate intelligence data gained from aggressive reconnaissance. These recon elements should be trained to seek out enemy defensive obstacles and pinpoint their locations and dimensions, to include existing lanes and gaps. Combat engineers, if available, should be attached to these elements. This reconnaissance philosophy is part of Threat doctrine, and the opposing force (OPFOR) unit at the National Training Center (NTC) practices this with great success.[31]

Upon detection of the minefield, the mineroller tank will move back to a defilade position where it can support the breaching force by fire. If bypass is either impossible or not desired, then the tanks equipped with mine plows begin clearing a usable lane through the minefield. The plows are followed by the mineroller, which proofs the cleared lane for any remaining mines and marks the lane with CLAMS. The company/team/troop then continues its tactical movement.

An expedient means of minefield clearance which is already fielded is the M9 tank-mounted bulldozer, currently issued one per tank company. The dozer blade can scrape a path 160 inches wide, and use of it in a mine-clearing role was actually tested in 1982 and determined 57.9 percent effective against surface-laid mines.[32] While the results are far from desirable, the tank-mounted bulldozer represents another item of equipment with a countermine capability.

Training to Breach

As with all other forms of tactical maneuver, the key to successful countermine operations is proper training. As a basis for this training, it is essential that each company/troop have an SOP for breaching operations, to include: crew drills; platoon battle drills for the breach force, assault force, and support force; the use of smoke and other obscurants; and company/troop command and control tasks. Even more vital is that each unit rehearse those techniques regularly. Information on countermine operations is available in the following references:

The Handbook of Employment Concepts for Mine Warfare Systems; ST 17-15-15 Countermine Operations at Battalion Level; FM 71-1J (Draft) Tank and Mechanized Infantry Company/Team; FC 17-16-1 Division 86 Tank-Heavy Company/Team ARTEP; FC 17-15-1 Tank Platoon ARTEP Mission Training Plan, and FM 17-15 (Test) Tank Platoon Division 86.

In order to accomplish their missions during offensive operations, U.S. Army armor units require an effective, highly mobile countermine capability. Once deployed, the Armor Organic Countermine System will provide those units with the ability to successfully attack a deliberate Threat defense. There again — as it was in WW II —in the forefront of that attack will be a tank-mounted mineroller.

A "Larruping Lou" roller is seen at left, mounted on an M48-series tank. At right, the test vehicle strikes a mine in demonstration.

Footnotes

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[15]ERDL, *Report 1231,* p. 11.

[16]USAMERADC, *Report 1924,* pp. 62-64.

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Countering Soviet Smoke

by Captain Mark J. Reardon

"SSG Zanol bent down at the commander's thermal sight to watch the Soviet reconnaissance troops working along the distant woodline. What were they doing? He was soon distracted by the whine of distant turbine engines as four Sukhoi jets swooped low over Soviet lines to lay a long, dense white cloud. Traversing the turret slowly, he focused the sight on the smokescreen. To his surprise, the TTS could not "see" through the obscuration. Artillery began to drop along the ridgeline where he was situated. Frenzied efforts to don protective mask, gloves, zip up the MOPP suit, and connect the mask intercom system, interrupted his view of the unfolding battle.

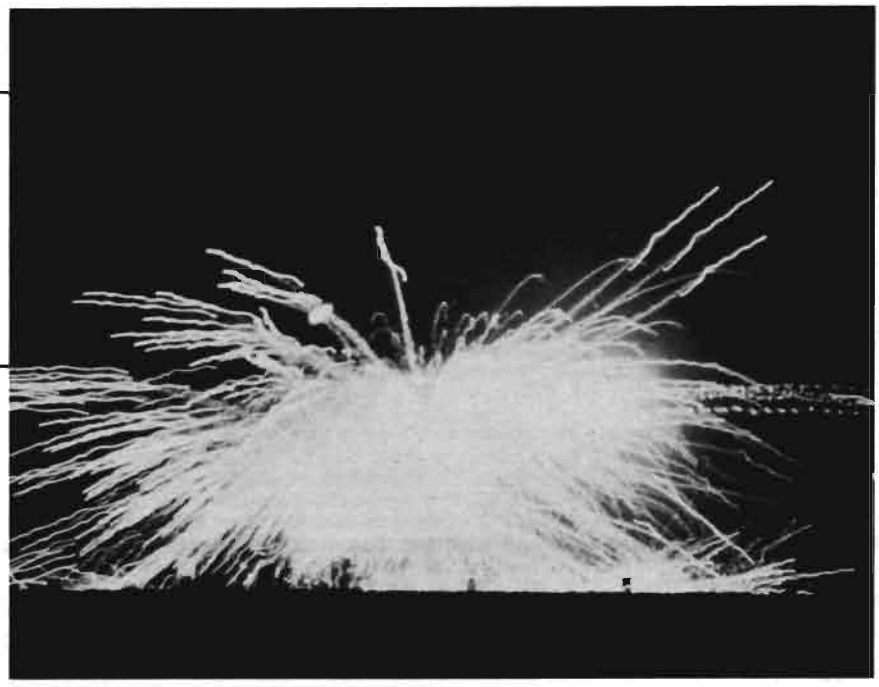
When he resumed his scanning, he was surprised to note that the Soviet reconnaissance troops had been emplacing smoke pots, for a thick cloud of gray smoke was pouring from the trees and drifting across the engagement area. This smoke also was opaque to thermal viewers! The artillery fire was increasing in tempo when smoke rounds started impacting 1,000 meters forward of friendly positions. Being white phosphorus, the thermal sights could see through it. Enemy tanks and BMPs began to emerge from the impenetrable smokescreen some 2,500 meters away.

"Gunner, Sabot, Tank!" "Identified, lasing." "9995." "Re-lase!", "9995!" "Great! The laser rangefinder is bouncing off the smoke! Manually index the range into the fire control computer." At this time, artillery HE and smoke began falling directly onto SSG Zanol's position. The radio was rendered useless by jamming, and obscuration prevented anyone from spotting the Green Star cluster used to signal movement to the next battle position. The unattrited Soviet regiment overran the company team and continued on to their next objective.

NATO, and particularly the United States, has eagerly embraced the notion that high technology fire control and acquisition will offset any enemy superiority in numbers. The Soviets, in countering this wide-range of lethal NATO anti-armor systems, have come up with a low technology, cost effective, answer through extensive employment of battlefield smoke.

Soviet planners have realized that dust, smoke, and obscurants degrade — and often defeat — laser designators, beam-riding missiles, and electro-optical fire control systems currently deployed by Western armies. Soviet tactical doctrine has been modified to take full advantage of this fact. Their forces are well-equipped with smoke producing devices, to include smoke grenades, vehicle engine exhaust smoke systems (VEESS), smoke barrels, drums, and pots, spray smoke generators, mortar and artillery smoke rounds, fog oil generators, and aircraft-delivered smoke systems. Such an investment in non-lethal munitions is more apparent when Soviet tacticians calculate a "blinded" NATO force becomes 10 times less effective in the defense. Thus, Soviet tanks are able to traverse kill zones with far fewer losses. Western combat developers have found that target acquisition through a smoke screen is reduced by up to a factor of four and offensive casualties are twenty-five percent less.

Several types of smoke are used, based on probable courses of employment. Smoke can either screen friendly movements, blind enemy positions, or be used in tactical deception operations. Screening smokes are usually generated by ground or aerial systems and are bi-spectral in nature. This type of



At left, the OPFOR at the National Training Center lays down a smokescreen to obscure its vehicles until reaching engagement range. At right, a new type of infrared screening smoke is tested at a NATO exercise area.

smoke obscures the visible through far-IR spectrum, which defeats thermal viewers.

The purpose of blinding smokescreens is to reduce efficiency of enemy gunners, target acquisition systems, designation devices, and observation posts, which restricts the enemy's ability to engage Soviet units. The obscuration properties of this type of smoke, coupled with dust, HE combustion effects, and burning phosphorus, create an environment in which fear and confusion become additional factors. The Soviets will use an S4 mixture (aerial-delivered) and white phosphorus delivered by artillery, mortars, or rocket launchers.

A combination of screening and blinding smokescreens are used by Soviet deception units in order to produce false assumptions by enemy planners, cause them to move units or to reveal their positions by opening fire, and generally creating a more favorable tactical atmosphere for Soviet forces.

The typical Soviet regimental-level deliberate attack will begin with artillery preparatory fires. Successive smoke lines will be emplaced using smoke pots, aerial-delivered smoke, VEESS, smoke generators, or projected smoke. Initially, a screen will be laid to conceal the approach of assault columns. A bi-spectral cloud is projected closer to the enemy so Soviet units can deploy unobserved from march into assault formation. A third "phase line" consisting of artillery smoke is delivered within 1,000 meters of suspected enemy positions to deny long-range fires and observation. A final blinding barrage is fired atop enemy units, allowing Soviet forces to overrun the objective without being subjected to massed aimed fires.

HIND helicopters may hover on the smoke's periphery, enabling them to obtain flanking fires against NATO forces withdrawing from the obscured area. The HINDs may also use the smoke to overfly blinded friendly ADA systems and attack high-value targets in the battalion/brigade rear.

Soviet smoke thus has a twofold purpose, the first being to reduce or negate long-range attrition and, second, as a control measure. Each smoke "phase line" marks a tactical transition point, from march column to assault formation, a 1,000-meter marker at which the tempo of advance is increased, and the last barrage which marks the objective. The engagement will then turn into a violent, short-range encounter in which the attackers' mass and momentum will prevail.

In the defense, the Soviets use smoke to disrupt overwatch elements and to silhouette attacking forces. They also try to use smoke in screening reference points, withdrawals, conceal movement of reserve forces, and to portray deception activities such as a dummy flank attack.

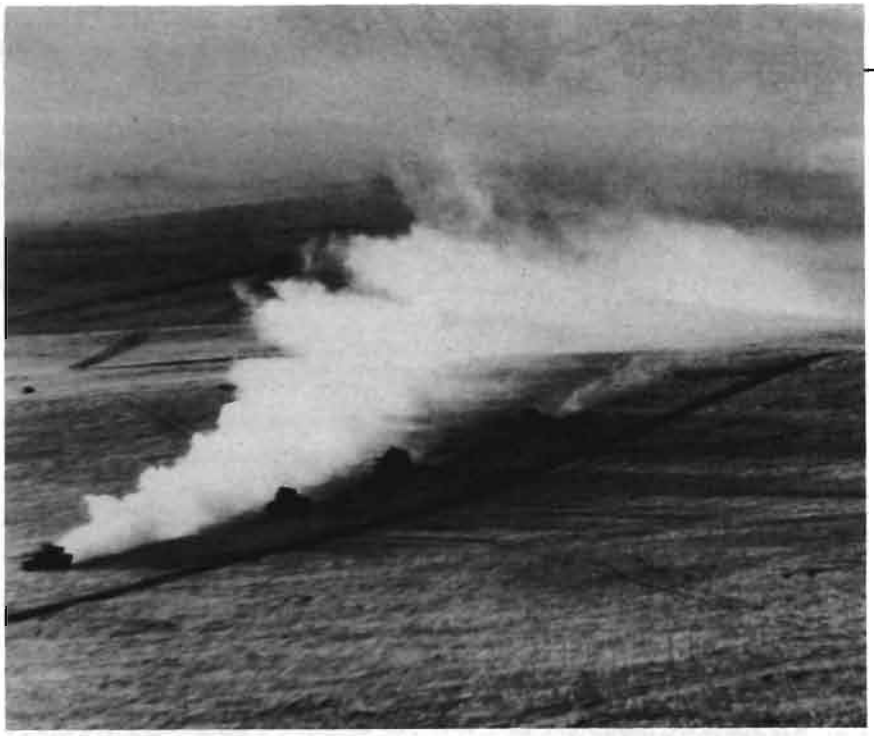
Armor trainers must become aware of the tactical and technological effects Soviet smoke will have on their conduct of the fight. Ultimately, they must train their soldiers to overcome the difficulties associated with Soviet smoke employment on the AirLand battlefield. This can be done by teaching them to recognize the optimal conditions for smoke employment by using heavy smoke in selected exercises to "familiarize" their soldiers with it; conducting force-on-force, MILES exercises while operating under obscured conditions, degraded systems gunnery; and by devising smoke "battle drills" (i.e. training as we will fight).

The most efficiently developed smoke screens are ineffective if employment and weather considerations are not heeded. Warning categories for enemy smoke are established (in much the same manner as MOPP levels) and specifically addressed in the operations order. Close coordination is maintained with weather or aviation units in order to obtain an accurate forecast. Optimal conditions for Soviet smoke use are:

- Winds 3 to 5-meters per second in direction of NATO forces.
- Air and ground temperatures the same.
- Overcast skies.
- No precipitation.
- Relatively high humidity.

Remember that these are the best conditions for employing smoke. Intelligence acquisition systems that pinpoint smoke generating equipment being moved closer to the front, may prove more accurate in forecasting the use of enemy smoke.

Training in a smoke environment can be accomplished in local training areas as well as during field training exercises. Additional smoke munitions, to include smoke pots and smoke grenades, must be



forecasted in advance by the battalion S3. Training is accomplished in consonance with the crawl — walk — run philosophy. Individuals and crews are taken to a flat area with few obstacles in order to learn the effects of smoke on movement and navigation. This training period is also used to teach techniques of moving while using a compass for direction. Safety and familiarization are paramount issues during this phase. These individual tasks can be expanded to include observation post drills, masking criteria (Soviets employ smoke loaded with toxic agents.), and determining the approach of tanks by sound.

The next phase consists of training in unit tactics under obscured conditions. During this phase, platoons train on how to move into and out of smoke-hidden positions. Soldiers are taught to mark limited visibility routes, make range cards while masked, disengagement sequences for platoon retrogrades, calling final protective fires, etc.

Once basic platoon drills are absorbed, a MILES, force-on-force maneuver phase is implemented. Tactics (to include firing on range card targets, station-keeping while advancing, navigation, disengagement criteria based on slower movement rates, and degraded gunnery are emphasized. This type of exercise takes place in a small (1 km wide x 2 km long), well-defined maneuver box for safety considerations and limited availability of smoke munitions.

These skills are imbued in our tankers until company-level proficiency tasks can be run. These are difficult to orchestrate because they will require chemical company support and tend to obscure large areas. Safety considerations are many and difficult to control.

The exercise itself should evolve around conducting a company defensive scenario, testing engagement techniques (through live fire or against MILES-equipped SAAA Targets), displacing from a smoked area (with and without use of radio as a control medium), using the forward observer in a smoke environment, and employing ground surveillance radar (GSR) at company level to detect enemy forces moving behind bi-spectral smoke.

A "Smoke Battle Drill" should be developed at platoon level and fully refined during company operations. It contains instructions for company/team actions when the battle position itself is effectively obscured and jamming prevents the commander from contacting his platoon leaders.

If bi-spectral smoke is used, headquarters tank section, 1st, 3d, and 2d platoon, respectively, fire 5 rounds HEAT at TRPs X, Y, Z using range card data and move to the closest unobscured battle position (BP). The company XO initially occupies the subsequent positions and calls in final protective fires as friendly platoons move out of the smoke. At the conclusion of the FTX, effective countermeasures are examined and included in the battle drill.

GSR becomes a definite asset in the bi-spectral smoke environment. It can spot enemy concentrations and assist the commander in predicting threat avenues of approach. Indirect fires are placed on that area to slow movement and impede enemy engineers trying to remove obstacles. The GSR is mounted on an M113 for survivability and mobility. It is positioned where side lobes will be absorbed by trees or hills and then "blinks" into the smoke screen. Once the enemy is detected, or after a specified time in one location, the GSR moves to alternate location to minimize detection by Soviet EW systems. Coordination with divisional MI units will lead to effective multi-echelon training during force-on-force exercises.

An appreciation for the Soviet tactical employment of smoke also should rest at echelons above company/team. Smoke directly or indirectly affects where and how engineers emplace obstacles. Even limited countermobility obstacles such as short AT ditches constructed perpendicular to the enemy advance are useful. Enemy tanks encounter these unexpectedly and are hindered. Bypasses constructed by enemy engineers are less effective due to limited visibility. Soviet tanks and BMPs have trouble locating the breach and may offer lucrative targets. If heavy use of bi-spectral smoke (TTS defeating) is predicted against initial defenses, the obstacles plan is weighted to support movement to aid defense of subsequent battle positions. Friendly forces move behind the second line of obstacles when they discover that they cannot effectively engage the enemy; the smoke and initial barrier efforts slow the Soviet advance to allow for this.

Army aviation units in support of a ground maneuver brigade face operational constraints when the enemy uses obscurants. The smokescreen itself may be up to 400 feet high. Should aviators assume instrument flight characteristics and ascend from nap-of-the-earth and very low-level contour flight pro-

files, they would offer a lucrative target to Soviet AD gunners. Attack helicopters currently lack thermal sights; thus, acquisition and engagement is severely degraded by smoke. They use their inherent mobility to find an area through which they can observe targets. Coordination with the aviation company commander to support a smoke countermeasure plan would quickly displace aviation units along the flank of any obscured area. In this manner, they can react to enemy attack helicopters and fire upon Soviet tanks emerging from and silhouetted by the smoke. These fires will buy time for ground forces to establish themselves in subsequent BPs.

Included among the combined arms team affected by smoke is the field artillery. Laser designation for guided munitions is degraded, and target location accuracy is severely limited. FO's could require access to a thermal viewer, and this may necessitate a FIST's temporarily occupying, for example, the XO's M60A3/M1 gunner station. In this manner the FO can observe a smoke-shrouded battlefield and transmit targets to the FIST vehicle's digital message device (DMD) for targeting.

A more viable alternative is to train tank platoon leaders to adjust fire while the FIST team monitors the net and sends back those fire missions that the company commander approves. Tank battalion FSOs and brigade FSCOORDs must be able to advise the commander on artillery use and become involved in the training of FIST teams in Smoke Battle Drill.

Through retention of indirect smoke assets (4.2" mortar smoke, etc.), we can erase or alter Soviet smoke "phase lines" and confuse, stall, or mislead his advance. Finally, artillery disrupts Soviet formations by seeding smokescreens with short duration FASCAM munitions. This calls for decentralized execution authority based on obscuration criteria and GSR data. FASCAM may have the effect of delaying enemy movement long enough for the smoke to clear and permit fires on a stalled, mass armor array.

Air defense weapons found at maneuver battalion/company level are dependent on optical acquisition and guidance. Enemy smoke will have a detrimental effect on these systems and the overall defensive scheme. Care must be taken in placing AD weapons so they will not be obscured and can engage enemy helicopters taking advantage of smoke to transit the FLOT unscathed.

The use of smoke by opposing forces has a technical impact on armored units as well. Individual gunnery skills and crew drills must be taken into account when training to overcome the difficulties imposed by obscurants. A gunner must be prepared to compensate automatically for smoke effects that degrade the fire control system.

Tank gunnery can be affected by smoke in many ways. These include:

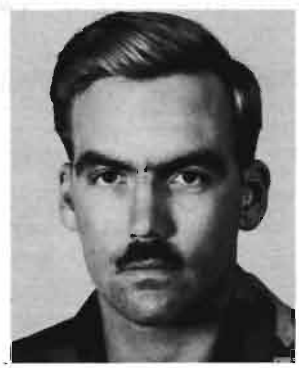
- Toxic effects on the crew.
- False range readings or multiple returns on the laser rangefinder.
- Ineffective laser rangefinders.
- Obscuration in the daylight channel, M105D, and other electro-optical sights.
- Total obscuration of all sights.

Some of these effects are addressed by existing 17-12 series degraded gunnery solutions applied when a portion of the "full up" fire control is inoperative. Others require an innovative approach and a careful evaluation of methods which overcome failure of the LRF and thermal sights.

One method which takes into account both systems is renewing tactical emphasis on the range card. When the LRF is unable to feed range data into the fire control solution, a series of pre-designated reference points are used for manual range input. All vehicles are required to make a range card to include laser rangefinder readings to various landmarks along a probable armored avenue of approach. When faced with "9995" readings on the LRF, the tank commander announces, "Switch to manual" and chooses a reference point close to the target. The gunner identifies the correct landmark and indexes known range into the computer, then engages the target.

Thermal sight obscuration occurs when bi-spectral smoke is employed to screen the approach of Soviet units. This smoke will reduce the effectiveness of long-range fires by a factor of ten or greater. In this instance, battle drill can be applied. Integrated with pre-planned obstacles, artillery fires, and GSR input, platoons/sections engage avenues of approach with range card data and sequenced HEAT volleys. These complement the violence of artillery fires and do not concede the long-range initiative to the enemy. At the conclusion of these platoon fires, the commander decides if movement to subsequent BPs is warranted, or if circumstances support defending at present positions. This decision is communicated to subordinates by delineating an "obscuration line." If aimed fires cannot be placed on "X" point due to smoke, the platoon/sections will volley fire and move back to alternate positions.

Eventually, technology may provide an answer to Soviet smoke employment, or make its use more hazardous than helpful to the attacker. Until then, sensible precautions, reinforced by realistic training, will prepare our soldiers for the threat.



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The Role of Italian Armor in the Spanish Civil War

by Pierangelo Caiti and Alberto Pirella
Translated by Captain Edward De Lia

On 17 July 1936, the Nationalist Rebellion, provoked by the results of the general election held several months earlier, spread from the port city of Melilla to all of what was then Spanish Morocco, thus initiating the Spanish Civil War.

The Italian Fascist government, though sympathetic to the Nationalist cause, did not provide any assistance until 29 July. On that day, 12 S-81 trimotor aircraft left their bases in Lombardy for Cagliari, on Sardinia, and Nador, in Spanish Morocco. Since the direct participation of Italian troops in the conflict was prohibited, the planes were unmarked and their crews wore civilian attire. The mission was simply to deliver the aircraft and to train Spanish military personnel in their operation. However, through the persistent efforts of General Francisco Franco — who was by this time undisputed leader of the Nationalists — the Italian expedition received permission from Rome to enroll in the Tercio de Extraneros — the Spanish Foreign Legion. Accordingly, it was through the use of this technicality that the Nationalist enjoyed Italian personnel and materiel support during the initial part of the conflict.

On 5 August, the first Nationalist convoy from Spanish Morocco reached the port of Algeciras, in Spain. This marked the beginning of large-scale operations on the Iberian Peninsula, which until then had been the scene of only limited hostilities. On the night of 6 August, the first Italian armored vehicles, a platoon of five CV 3/35 tanks, accompanied by an officer and 10 tankers, left the Italian port of La Spezia bound for Melilla. (CV stands for Carro Veloce, or "fast tank".) From Melilla, they were sent to the Galician port of Vigo, and made available to the Spanish military commander at Valladolid. Because Italian troops were still barred from combat, the Italian crewmen began to train their Spanish counterparts in the operation of the vehicles. Due to the intensification of the hostilities, the platoon — mixed with mixed Spanish and Italian crews — was added hastily to the Nationalist army structure. On 12 September, it participated in the occupation of San Sebastian, though without seeing any action.

Initial Tank Attack

On 29 September, an Italian transport ship arrived at Vigo with a complete company of 10 CV 3/35s (three of which were equipped with flamethrowers) manned by three officers and 25 soldiers. This unit, augmented by the tank platoon mentioned earlier, became the First Combat Tank Company of the Spanish National Army. Though initially used only for training Spanish crews, the company — led by Captain Oreste Fortuna — offered to enroll in the *Tercio* to assist the Nationalists in their advance on Madrid. The unit set out by rail for the Torrijos-Talavera zone, where it was joined by several artillery batteries.

The first trial by fire took place on 21 October, during the battle of Navalcarnero. The opposing Republican troops, surprised and frightened by the attacking armored vehicles, soon retreated, though not before knocking out one of the tanks. On the 24th, the unit was involved in fighting around Borax and Sesena, including a brief but bloody clash against three Russian T-26B tanks, the first of 15 supplied to the Republicans by the Soviets at Cartagena. After charging the Nationalist infantry, the enemy vehicles were counterattacked by three CV 3/35s. One of these was hit and was subsequently overturned. A T-26B, also hit on the right track, was forced to a halt but later was moved behind a nearby wall where it continued to fire from hull defilade. One of the Italian flamethrower tanks, manned by a Spanish driver and an Italian gunner, moved up boldly to within several meters of the enemy, but it was soon destroyed by a direct hit. Thirty minutes later, one of the Republican tanks was also hit and destroyed by Nationalist artillery, killing the entire crew as well.

There was a second tank skirmish on 29 October as Republican forces attempted a counterattack in the Sesena sector. Three Soviet tanks were immobilized by artillery fire and incendiary grenades; however, as several CV 3/35s (equipped only with their 8-mm armament) moved forward in an attempt to capture them, they were kept at bay by the 45-mm guns still firing from the T-26B turrets. As a result, only one tank was captured by the end of the day. Additional tank skirmishes took place during the month of November at Cubas, Griuon, Torre-

joncillo, Torrejon de Velasco, and Villaverde, but they were of little or no significance to either side.

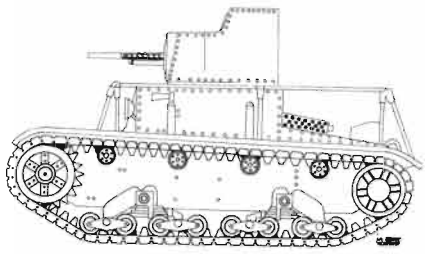
Formation of the Italian Armored Force

By early November, a second company of Italian tanks had been delivered to the Nationalists. In the meantime, Franco secured commitments for additional Italian aid in the form of arms, materiel, and cadres to be used in the formation of mixed Spanish-Italian detachments. On 13 December, the Italian government finally agreed to send their organic units to Spain, although by now it was evident that the Nationalists would not be able to take Madrid by the end of the year. Later that month, a company of 26 Lancia 17M armored cars landed at Cadiz. In January, 1937, they were joined by two more tank companies and several thousand Italian volunteer troops. Thus was formed an armored battalion of four companies of 10 tanks each. This, together with a second battalion and the armored car unit, formed the nucleus of the armored force for the CTV (Corpo Truppe Volontarie, or Italian Volunteer Corps). A third battalion, manned completely by Spaniards, was added later. By the end of the war, a total of 149 CV 3/35s had been delivered to the CTV.

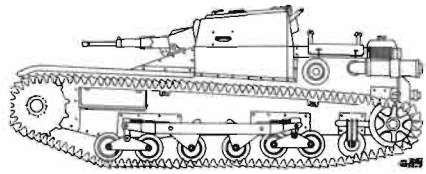
The Guadalajara Offensive

On 5 February, Italian detachments took part in operations around the city of Malaga, part of a new Nationalist offensive along the entire front. Malaga was taken on the 8th, and Italian units occupied the nearby towns of Nerja and Motril. As a result of their success here, the Italians overestimated the chances for a quick, decisive victory, and launched a major offensive on 8 March. Two infantry divisions, each supported by two tank companies, took the field to find that the terrain had become a vast expanse of thick sticky mud because of heavy rains that fell the night before. This considerably limited the mobility of the Italian armor.

On the following day, two Italian tank units advanced to a point about 30 kilometers outside Guadalajara. In various skirmishes, the Republicans lost nine of the 22 tanks they employed. Both sides



Two tanks commonly used in the Spanish Civil War were the Russian T-26, at left, and the Italian CV 3-33/35, seen below.



consumed enormous amounts of fuel because of the difficult terrain, and fuel supplies were often delayed because of congestion along the supply routes.

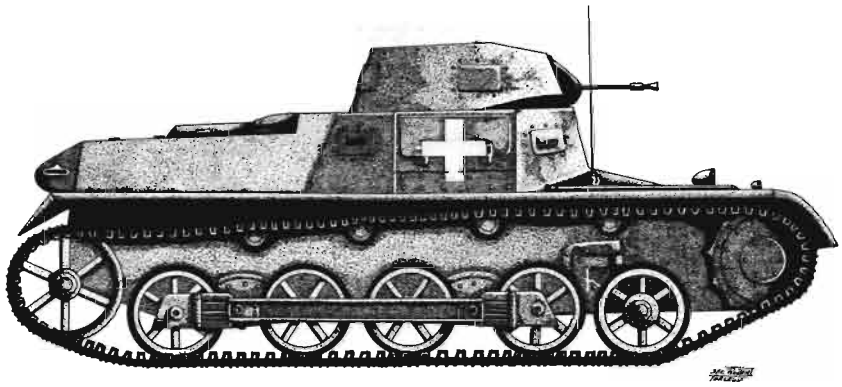
In an attempt to slow the Italian advance, the Republicans placed two BT-5s along their withdrawal route as part of their rear guard, but one of these was destroyed. By 9 March, the Italians had occupied Brihuega, but on the same evening, six BT-5s set up an ambush in the outlying forest. No sooner had the Third Italian Division, supported by two tank companies and the armored car company, begun its movement at dawn the next day, but they fell into the trap. The Soviet tanks fired their cannon and machine guns at nearly point-blank range. They destroyed two tanks and inflicted many casualties. The Lancia armored car company, functioning as a reconnaissance unit, also suffered heavy losses — at least three of its vehicles were captured and used by the enemy.

On the next day, 11 March, three flamethrower tanks rushed to assist an infantry column that had run into a series of enemy machine gun nests near Trijueque. One tank was hit after having suppressed some of the positions, another overturned when it rolled off the roadbed, and a third was destroyed by an antitank round. A second lieutenant moved up in his own tank in an attempt to extract any survivors. Hit by a round from a BT-5, which severed his arm, he managed to bring his vehicle safely back to friendly lines before he died. Another tank conducting reconnaissance operations in the direction of Torjia was also hit, but it too was brought back into operation. Two other tanks were destroyed by 45-mm rounds from the BT-5s. Obviously, the Italian tanks with their 8-mm machine guns were no match for the BT-5s once they got within range.

The Italians then launched a combined attack of armor and infantry, but this was stopped by Republican heavy artillery and air forces. By 12 March, Palacio Ybarra was the point of maximum penetration towards Guadalajara. It was here that the pro-Republican "Garibaldi" Battalion, made up of anti-Fascist Italian volunteers, routed the Nationalists with the help of two BT-5s. Not far away, at Los Yebenes, the 4th Italian Division (Littorio) relieved the 3d. On 13 March, two BT-5s again ambushed the Italians, although they were eventually destroyed.

On 18 March, the Republicans began a counteroffensive. In preparation, they had drawn men and materiel from other units to amass at least 60,000 troops and 60 tanks. The Italians facing them totaled about 30,000 men. The Republicans immediately moved their tanks up front, placing about 40 of them in the Brihuega area. Well-supported by artillery and about 80 aircraft, they began their attack that afternoon. That night, the Republicans reoccupied Brihuega and forced the Italians to fall back several kilometers. Meanwhile, the Italian tanks stood idle for lack of fuel. The fighting stopped in a stalemate on 21 March, even though the Italians had advanced about 20 kilometers from their original positions of 8 March.

After reorganizing at Villasante, the Italians also participated in operations along the Bay of Biscay, an area stubbornly controlled by pro-Republican Basque forces. The Basques had established a strong defense around the city of Bilbao. The Italians attacked on 28 April, beginning a long battle around the city. On 15 June, Italian tanks attacked the Basque defensive posi-



The German Pzkw I light tank, at left, saw service on the Nationalist side in the Spanish Civl War. The WWI-era Renault FT-17, at right, was also used by the Nationalists.

tions at a weak point that had been revealed by a deserter. On 19 June, they entered and occupied Bilbao, which had already been evacuated by its defenders.

An Italian Commitment in Force

The Bilbao operation was the prelude for another Nationalist offensive on Santander and Oviedo which saw the most extensive commitment of Italian troops in the entire conflict. It began on 14 August, spearheaded by three divisions and two tank companies. There were numerous clashes against enemy armored vehicles, among them Trubia A4s, which were built in Spain at Santander. There was heavy attrition of men and equipment, but the Italians secured the Escudo Pass on 15 August. On the following day, a tank company supported by a motorized machine gun platoon occupied Arija and helped to isolate a Basque strongpoint at Reinosa. Reinosa was successfully captured, followed by San Pedro del Romeral, on 19 August, San Vincente on the 21st, Torrelavaga on the 23rd, Abadilla on the 24th, and finally the port city of Santander on the 25th. Towards the end of the war, Italian tank units also took part in battles in the Aragon region. Skirmishes around the town of Huesca continued until adverse weather conditions forced all military activities in the region to halt in October, 1937. Fighting continued in March, 1938, with both sides suffering heavy losses in materiel and equipment until Madrid finally fell to the Nationalists on 1 April 1939, the date which marks the end of the Spanish Civil War.

Armor Limitations

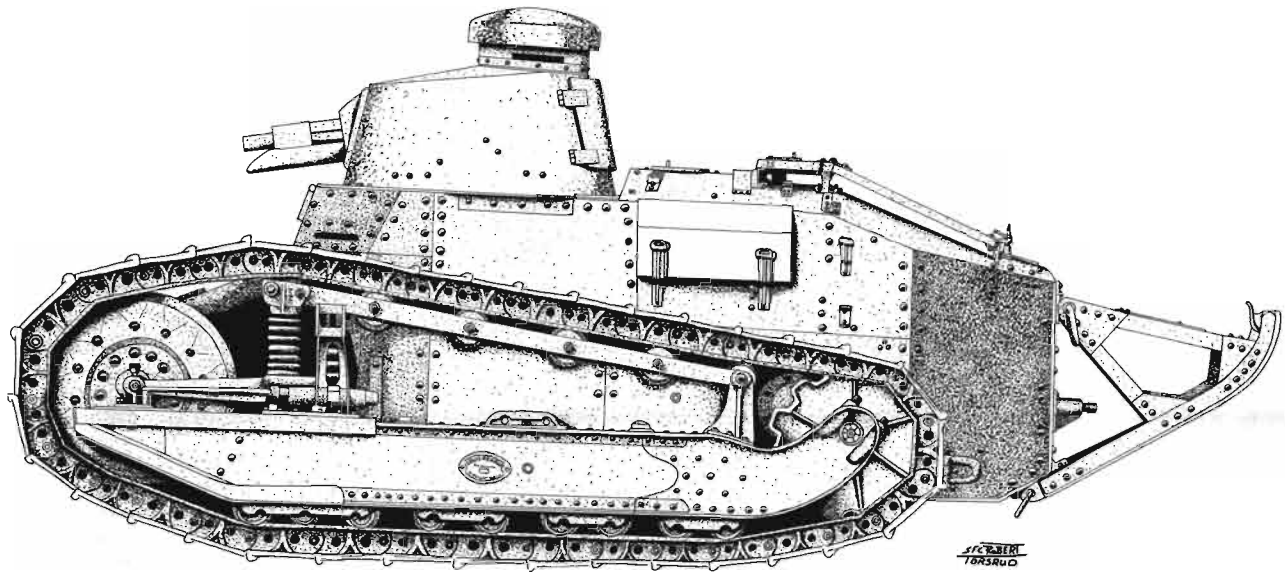
In general, Italian combat vehicles used in the Spanish Civil War were handicapped by the inferiority of their armament. They were no match for the heavier enemy tanks, armed with rapid-fire 37-mm and 45-mm weapons on rotating turrets. There were other equipment problems as well; for example, the air intake systems on the tanks and armored cars were not equipped with appropriate filters to protect crewmen from the fine dust so prevalent in the Spanish countryside. In an attempt to protect their faces and mouths from the dust, the Italians adapted their gas masks to serve as dust protectors, but to little avail.

Italian tankers in Spain faced conditions radically different from those of the Ethiopian War of 1935-36, in which the poorly-equipped Ethiopians were overwhelmed by a relatively modern Italian Army. The Italians found the tables turned against them in Spain, and this was reflected in the relatively high level of their casualties. Even more significant, however, was that the Italian General Staff failed to draw any useful lessons in tank warfare from the Spanish experience. Accordingly, when Italy entered WW II in 1940, her armored units — still comprised mainly of CV 3/35s, although they were renamed L3s — would face tanks even more formidable than the BT-5 or the T-26B, and the results on the battlefield were to be disastrous.

The Organization and Employment of Armor

When the Spanish Civil War began in 1936, there were few Spanish armored units, and these were made up, for the most part, of obsolescent and poorly maintained vehicles. There were two regiments — one at Madrid and the other at Zaragoza — each including (on paper) a tank battalion made up of three tank companies. Each company, in turn, was comprised of five Renault FT-17s, two armed with Hotchkiss 8-mm machineguns and three with 37-mm cannons. Although this would make a total of 90 tanks, only 12 were in any kind of operating condition by 1936 — six per regiment. At Madrid, the Republicans did have six Schneider CA1 M16 tanks, each armed with a 75-mm howitzer and two 8-mm machine guns. There were also several armored cars of the "Latil" or "Bilbao" series as well as three Trubia A4s, Spanish prototypes. This brought the total number of tanks in Spain at the start of the conflict to 21, eight of which (all FT-17s) were in the hands of the Nationalist rebels.

Besides the 149 CV 3/35s supplied by Italy, the Germans contributed a total of 150 Pzkw IAs and IBs to the Nationalist cause. While the first of these tanks were arriving in September, 1936, the Soviet Union and the COMINTERN began supplying materiel to the Republicans. First, there was a shipment of 15 T-26B Soviet tanks, followed by FT-17s from Poland, by way of intermediaries. In October, the Soviets sent 58 more T-26Bs, 40 BA32 armored cars, and 46 FA-1s, which were smaller than the BA32. The Republic of Poland, in a token show of support, followed with a direct shipment of six FT-17s. The republicans used this group of vehicles to form an armored brigade comprised of four T-26B battalions and a company of BA32s. They



entrusted the organization of their armored force to the Soviet General Pavlov. Meanwhile, the first Combat Tank Company of CV 3/35s was being organized by the Nationalists at Caceres. This was soon followed by a battalion of Pzkw IAs, trained by German instructors and placed under the control of the "Angel" Infantry Regiment. Though initially made up of only two companies of three sections each, with five tanks per section, the battalion received a third complete company in December, 1936.

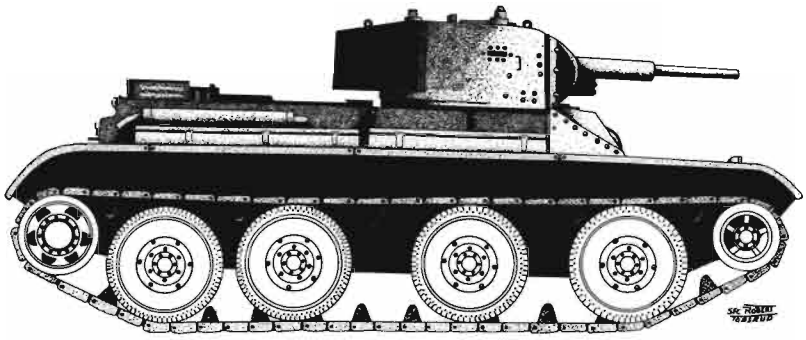
By the end of 1936, the Republicans had already surpassed the Nationalists in total number of armored vehicles, with 250 tanks and armored cars and about 100 other vehicles of various types. Early in 1937, they activated a second armored brigade made up of four BA32 battalions, each comprised of three companies of 10 cars each, and a battalion command section of two vehicles. Later that year, the Soviets delivered 312 more T-26B and BT-5 tanks. This delivery resulted in the activation of several other armored brigades, each organized into four battalions and including both types of tanks. Subsequently, the Republicans again reorganized their armor into two large brigades and a heavy tank regiment of BT-5s. A company of T-26Bs was allocated to each infantry brigade and a reconnaissance section of three BA32s to each infantry division.

In August, 1937, the Nationalists had obtained enough tanks to reorganize their Pzkw Is into four companies, a company of captured T-26Bs, an antitank company, and a transportation company. The battalion was placed under the control of the aforementioned Zaragoza Regiment and again reorganized into two groups of three companies each, 15 tanks per company. Four of these units were made up of Pzkw Is, the other two of T-26Bs.

Tactics and Politics

The tactical employment of armor during the Spanish Civil War reflected, for the most part, the contemporary doctrines of the nations providing materiel and training assistance to each side. Accordingly, the Nationalists used a version of German "blitzkrieg" tactics or — at other times — an Italian method of combined arms operations integrating infantry and armor. The Republicans were heavily influenced by the Soviet practice of massed armor attacks. It is interesting to note that the Soviets were notably reluctant to let Spanish crews operate their vehicles. Because they were unfamiliar with the peculiarities of the Spanish terrain, this attitude caused them to be overly cautious with their tanks, and operations orders initially reflected a high degree of indecisiveness. The Soviets finally agreed to mixed crews for political reasons, but this often caused more problems and resulted in considerable squabbling which sometimes degraded mission accomplishment. Furthermore, the Republicans were often known to move their tanks without any artillery preparation and without the support of infantry. This made them vulnerable to enemy antitank weapons and even to hand grenades or incendiary devices. Thus, results on the battlefield were often disappointing, even when the Republicans held as much as a three-to-one vehicle advantage. They were most successful in those situations in which their more powerful, onboard weapons gave the Republican tanks no chance either to close or to withdraw — for example, when blocking known Republican avenues of approach or when conducting armored ambushes.

On the other hand, Nationalist armor and antiarmor tactics were generally more sophisticated and effective. Armored attacks were preceded by a thorough analysis of the enemy and the terrain. The Nationalists compensated for the smaller caliber of their tank weapons by falling back at the appropriate time to bring enemy tanks within range of the 17-mm guns of the CTVs, which proved to be excellent antiarmor weapons. The Breda 35, firing its 20-mm perforation



The Russian BT-5, while fairly primitive by WWII-era standards, served effectively on the Republican side, mainly because of its turret and relatively large gun (45-mm), which enabled it to fight at standoff ranges.

round, also proved to be an effective antitank weapon in dealing with enemy tanks armored with only 13-15-mm of protection. This machine gun, only recently fielded by the Italians, quickly acquired an excellent reputation because of its success against both ground and aerial targets. Its popularity was such that the Germans refitted several of their own Pzkw Is with the Breda 35, and Franco asked the Italians to manufacture a modified CV 3/35, equipped with the Breda, for the Spanish Army after the war.

Improvised Armor

It is appropriate to note here the many initiatives taken by the Spaniards — especially the Republicans — to manufacture or improvise their own armored vehicles. Local militia units in Catalonia and the Basque regions were known to cover almost any vehicle they could lay their hands on with metal plates, often bolted or soldered together by local blacksmiths. Although little real protection was offered by this method, it did help give Republican sympathizers an advantage (even if only a psychological one) in their initial clashes with the Guardia Civil and the Falangists. But it was only in the larger cities, where there were relatively modern factories and workshops, that military vehicles of any significance were produced. The Constructora Field and Vulcano Works in Barcelona had a limited output of armored cars. Of greater significance were the Union Naval de Levante workshops in Valencia, where both Soviet and Spanish engineers and technicians came up with the BA20, an armored car with a chassis similar to the Soviet 3Hc truck made from parts interchangeable with those on the FA1 and BA32 cars. After Valencia suffered a series of Nationalist and German air raids, production was shifted to Elda, where at least 20 vehicles per month were built until the end of the war. Meanwhile, an assembly plant at Sabadell contributed a substantial number of BA32s, which were modified from the original Soviet model to meet specific requirements.

Spanish Tanks

Finally, four types of tanks were manufactured in Spain during this period. There was the Trubia, an offshoot of the FT-17. Four prototypes were built, but only six tanks were ever manufactured. Another was the Sadurni de Noya, built in the Catalonian city of the same name during March and April, 1937. The few that saw any action were mainly used to tow artillery pieces. The Verdeja, built in 1938, was apparently a good tank, but it was never sufficiently tested on the battlefield. Only about 30 were ever produced and little is known about how they performed. The Nationalists later modified the Verdeja to serve as a self-propelled artillery piece, but even this model never really passed the prototype phase. Finally, there was the Euzkadi light tank, built at Bilbao in 1938 to support the defense of the Basque zone. About 20 of these tanks were manufactured, but they were often paraded through city streets to give a psychological boosts to the defenders under seige. The Euzkadi was the victim of constant mechanical problems, which often forced its crew to restart it with an outside crank. The Spaniards dubbed it "the toy tank," and it is doubtful it was ever used in combat.

(This article originally appeared, in Italian, in Rivista Italiana Difesa, and is reprinted with permission.)

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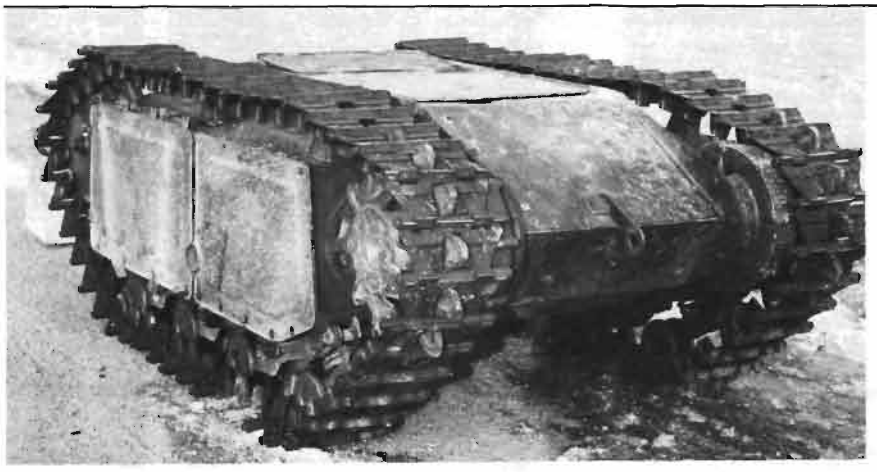


The "Goliath", a German WWII invention, was controlled by a trailing cable, carried up to 125 pounds of high explosives, and was intended to destroy fortifications and clear minefields. It was not very successful.

Military Applications of Robotics The USAARMS Approach

by Captain Ricky Lynch and Captain Michael F. Nugent

Tomorrow's battlefield will be a horrifying experience. The lethality of the weapons in the world's arsenals today is unsurpassed by that of any previous conflict. The most precious commodity that exists in today's Army is the trained soldier. He must be protected at all costs. The expanding field of robotic technology can be used to protect him. Robotic devices can be used to perform specific functions in areas that would be hazardous to human operators. The very nature of the machine — it doesn't tire, *experience fear,* or become bored with repetitive tasks — ensures that it can be used to increase efficiency and effectiveness of operations.

Military Uses of Remote Control

The idea of removing man from hazardous situations and of operating weapons systems by remote control is not new. Numerous military devices have been teleoperated in the past. In 1918, Mr. E. E. Wichersham of the Caterpillar Tractor Company designed and built a remote control demolitions carrier called a "land torpedo," powered by batteries and controlled by a cable that trailed from a drum. Although this device was never employed in combat, the Germans used a similar unmanned tracked vehicle called Goliath in WWII. Slightly over 5 feet long and weighing 650 pounds, Goliath was produced in two versions, one powered by an electric motor and one by a small gasoline engine. Remotely controlled via 2,000 feet of wire cable and capable of carrying 100 to 125 pounds of high explosives, it was developed to clear minefields and destroy fortified positions. Approximately 5,000 of these vehicles were built and used in Italy, France, and Russia. They were generally unsuccessful due to their slow (6-10 MPH) speed and easily penetrated light armor. The Germans also developed a more advanced robotic vehicle, the 4 ton B IV which could deliver a heavy (800 pound) demolition charge to an objective, jettison the charge and be retracted prior to detonation. This vehicle, controlled from a 4 watt transmitter, is one of the earliest examples of remote control or "teleoperation" via radio communication.

Remote control technology was not confined to ground combat. Also developed by the Germans, the unmanned V-1 "Buzz Bomb" featured an autopilot and the V-2 rocket incorporated the basic components of modern space vehicles, including an inertial guidance system. In England, the British called attacks by these weapons the "Robot Blitz." In the United States, General Electric developed the fire control system for the B-29 heavy bomber, which used electronic remote control to swing the guns around as the gunsight was aligned on a target.

WWII saw the birth of several other systems incorporating automatic control, including the development of radar and its use in the high-speed aiming of antiaircraft guns, pioneering efforts in jet propulsion, and ultimately, the development of the atomic bomb.

Modern Military Robotics

In more recent years, robotic technology has contributed to the design of autoloaders and stabilized fire control systems found in the combat vehicles of nearly every nation. Remotely piloted vehicles

Above, an M114 APC robotized for use as a noncooperative target tank.

At right, robotic mine-clearing vehicle is equipped with minerollers and line charge which deploys from large box in turret ring area. The vehicle also marks the cleared lane.

Artists conception, at left, shows General Dynamics Land Systems' concept for Advanced Ground Vehicle Technology program.

(RPVs) and unmanned aerial vehicles (UAVs) are a reality, and the feasibility of using teleoperated vehicles to emplace and breach minefields and obstacles has been demonstrated. In recent years, Fort Knox investigated the feasibility of using the remote controlled M114 armored personnel carrier as a noncooperative target.

It is important at this point to delineate between remote control technology and true robotics. Remote control devices do indeed remove the man from the hazardous environment, but man is still involved in controlling the device fulltime. Robotic technology is designed to gradually eliminate man from the control loop (autonomous operations).

Robotics can be defined in a number of ways, but the definition of Michael Brady of MIT — "the intelligent connection of perception to action" — contains many subtleties. The fact that the connection is "intelligent" implies that the robotic device must be able to make decisions based on available information. This is called artificial intelligence, in itself a rapidly expanding field. "Perception" in the definition implies that the device must be able to pick up information from its environment via some form of sensors tailored to specific tasks. "Action" implies that the robotic device must then be able to somehow affect its environment.

The first question that one must answer when deciding whether true robotics has a place in the military is whether the advantage that a robotic device gives the user is desirable. As indicated above, this is indeed the case. Common sense dictates that a machine is more expendable than a man, and if an can be replaced by the machine, then that should happen. The actual question that should be posed to the user community is "what do you want to do with a robotic device." The answer to that is a myriad of tasks.

A robotic combat vehicle could be developed that could be used to perform reconnaissance missions, act as a tank-killer, breach or emplace obstacles, perform a suicide mission, etc. A robotic manipulator could be used to expedite the ammunition processing procedure in rear areas, unloading pallets of bulk ammunition and breaking them down to smaller user-oriented packages. A robotic platform with a manipulator mounted on top could be used to perform specific EOD tasks. The use of robotic devices is only limited by the imagination of the user.

The next obvious question is whether or not the state-of-the-art of robotic technology supports the proposed military uses of robotic devices. The answer to that is a definite *no*. Until recently, research in the realm of robotics has focused on industrial applications. The industrial robot is mounted on the warehouse floor and is programmed to perform tasks in which most of the operating conditions are well-known, i.e., spray paint a car or perform a spot weld. The military environment is totally different. For example, a robotic manipulator mounted to a semitrailer with the required tasks of unloading ammunition pallets faces a variety of problems. When the manipulator moves, the flexible base upon which it is mounted also moves, which creates a hostile dynamic for

"...Common sense dictates that a machine is more expendable than a man..."

the manipulator controller. Something is happening which the controller didn't expect. The pallets being manipulated may be of varying weights, depending upon the type of ammunition and number of rounds. This is also an unknown situation.

The Armor Center is currently pursuing many different programs in the hope of making a robotic combat vehicle a reality. An operational and organizational (O&O) plan that calls for a family of robotic combat vehicles was drafted at the Armor Center and is awaiting approval by headquarters, TRADOC. This O&O plan calls for a generic robotic chassis which could carry a variety of mission modules, depending on the specific mission. Ideally, the robotic chassis would be capable of totally autonomous navigation, but unfortunately, the state-of-the-art will not support a totally autonomous vehicle in the immediate future.

The O&O plan recognizes this shortcoming and provides for a supervised autonomous vehicle. It would be capable of a certain degree of autonomous operation, but would require a human operator to enter the control loop to issue commands or teleoperate the vehicle to critical positions. The human operator would operate out of a command and control vehicle, and could supervise the operation of many vehicles. Modules that would be placed on the vehicle would provide direct fire capability, reconnaissance, obstacle breaching/emplacement, etc. Realizing the goals outlined in the O&O plan and expediting the acquisition process of a robotic vehicle is the ultimate objective of the Armor Center's robotic combat vehicle program.

The Armor Center is an active participant in TACOM's Advanced Ground Vehicle Technology program. This program provides for the demonstration of a military robotic vehicle in a route reconnaissance mission in the fall of 1986. The program has two different contractors, FMC and General Dynamics Land Systems, each developing their own version of the vehicle. Both contractors are tapping the technological breakthroughs of the Defense Advanced Research Projects Agency (DARPA) Autonomous Land Vehicle ALV Program in order to provide their vehicle with an autonomous navigation capability. The demonstrations will be user-oriented and will be designed to demonstrate the potential of the military applications of robotics. The demonstrations will also serve to highlight many critical issues in the continued development of a robotic combat vehicle, the most important being:

- The issue of the robotic combat vehicle's mobility and its inherent autonomous navigation capabilities. The ideal robotic combat vehicle chassis would be highly mobile, relatively small and lightweight, and very reliable.
- Data-link issues, focusing on the best way to communicate tactically with the robotic combat vehicle from the robotic command center. Ideally, this data link would be secure with a low probability of intercept.
- Soldier-machine interface issues to resolve some of the problems associated with remote operation of a vehicle, and

The FMC test vehicle in the Advanced Ground Vehicle Technology program is an M113-series personnel carrier, shown here with its sensors mounted on front slope.

• Mission module issues that arise when focusing on specific mission applications of the robotic combat vehicle.

The Armor Center is also working with DARPA on administering a contract that provides for the conduct of a robotic combat vehicle mission analysis. This analysis would focus on three major areas of concern.

Initially, it would address the issue of exactly what does the user community want to do with a robotic combat vehicle? Once these missions have been identified, they would be placed in an order of priority based on which missions are deemed the most essential. The missions statements would then be broken down into specific subtasks to provide the researcher all the parameters of the problem to enable him to address specific problem areas.

The second issue to be addressed would be, what degree of autonomy does the user desire for each mission? Contrary to popular belief, the user does not always want total autonomy in every instance.

The third issue would take the first two issues into consideration and would determine cost figures for a vehicle that would provide those capabilities and at the same time provide an estimate as to when that type of vehicle could be fielded.

An additional area of activity at the Armor Center is the establishment of relationships with key players in the robotic arena (government, industry and academia) to ensure that they are aware of the sincere desire of the user community to pursue military applications of robotics, and to spur industry interest in research to expedite the fielding of a truly robotic combat vehicle. Many major contractors are interested in developing robotic devices for the military, but they must be assured that an interest exists within the military to use the devices.

Specific applications of robotic technology do exist in the military, but technological advances must be "pulled" to make this a reality. Research and development efforts must be properly focused on a specific goal — building a robotic combat vehicle that will increase the U.S. Army's combat effectiveness on tomorrow's battlefield while at the same time protecting the soldier, the most precious commodity we have, from dangerous situations. Aggressive pursuit of technological advances is the key to success.

CAPTAIN RICKY LYNCH was commissioned as a Combat Engineer from the United States Military Academy in 1977. He served with the 17th Engineer Battalion 2AD from 1977 to 1983, commanding both a Mobile Assault Bridge Company and a Combat Engineer Company. A graduate of the Armor Officer Advanced Course and CAS³, he recently received his Master of Science Degree from MIT where he concentrated in the area of robotics. He is currently assigned as the Robotics Project Officer in the Technology Developments Branch of the Directorate of Combat Developments, Fort Knox, Kentucky.

CAPTAIN MIKE NUGENT was commissioned in Armor from Indiana University of Pennsylvania in 1980. He has served as a tank and scout platoon leader, company XO, and S-3 Air in the 3d Armored Division. A graduate of the Armor Officer Advanced Course, he is currently assigned as a project officer in the Technology Developments Branch of the Directorate of Combat Developments, Fort Knox, Kentucky.

Tactical Operations Center Site Selection

On today's modern battlefield, with its extensive electronic signatures and lethal weapons systems, no issue is more critical than the selection of the site for a unit's command and control cell, the tactical operations center (TOC). The Soviets' sophisticated electronic detection equipment, coupled with their extensive artillery capability, make TOCs extremely vulnerable.

The ideal TOC location must meet three essential requirements. First, it must facilitate command and control for the unit commander. Secondly, it must ensure communications to all levels, both up and down. Finally, it must provide survivability. Unfortunately, the majority of today's units place their emphasis on the first two requirements and tend to ignore the last. In our unit, survivability is the most important: unless our TOC can survive, effective communications and command and control become moot points.

A survey of battalion and higher units within the 8th Infantry Division (Mechanized) revealed that better than 80 percent position their TOCs on top of the highest, heavily-forested hill in the area of operation. These locations meet the requirement for effective communication and command and control, but fail miserably to meet the survivability criteria. There seems to be a false sense of security about "hiding" in the woods. In reality, nothing could be further from the truth.

It is our experience that the optimum site for the TOC is within a town or village. The 4th Battalion 69th Armor has positioned its TOC in a village for the last 12 months. The S3 Air is responsible for selecting a site that meets all three of the previous criteria. What we look for first is a village that is at a relatively high elevation within the tactical area of operations. Next, a quick communications check is made to ensure that we have effective communications. Finally, a barn or garage that will accommodate three 577s is located and borrowed or rented. (We have been very successful in obtaining barns for little or no cost.) The ideal facility is a large garage built of concrete or stone, but a viable alternative is the standard wood barn.

Locating the TOC in a barn within a village offers several advantages to the traditional forested hill:

- Locating in a village allows the unit to blend in with the local community. Soldiers can easily be confused with local civilians; generators and engine noise blend in with cars or tractors; smoke from stoves could be from furnaces; and light at night could come from any building.
- Placing the 577s within a barn provides complete concealment from aerial observation, satellite detection, or long-range visual observation. In short, you can't find it.
- The barn protects the TOC and its personnel from indirect fire. Six inches of concrete block or three inches of wood provide significantly more protection than a canvas extension. Additionally, with antennas erected among farm buildings, their survivability increases dramatically.
- The barn prevents detection by IR or thermal imagery since the local surroundings give off the same signatures. The enemy will be unable to tell military from civilian sources.
- A barn provides for quick set up and tear down should a move be required. All a unit has to do is back the 577s into the facility, drop the ramp, place 3 map boards on the wall, and the TOC is fully operational within 5 minutes. Setting up in the woods requires at best 30 minutes or longer to become fully operational.
- While the barn offers significantly more artillery protection, merely locating within a village probably precludes any artillery fire at all. The likelihood of the Soviets firing on civilian communities unless they receive direct fire from the village is remote. Therefore, even if the TOC is detected in a village, we are convinced the Soviets will shoot the closest wooded hill, believing the hill rather than a village is the location. We are equally convinced that the Soviets will target most hills with their artillery, simply as a matter of practice because we place so many TOCs on these locations.
- Trafficability within a village is seldom a problem. Conversely, on the hillside trafficability often becomes difficult and frequently provides a signature that gives away the location.
- Locating the TOC in a village allows the soldiers who man the facility to live in a protected environment. It is our experience that a second barn or house is easy to acquire to billet those soldiers who work in the TOC. This automatically means a warm, dry, protected place to sleep and easy access to water, latrines, and hygiene facilities. Soldiers appreciate these small conveniences and generally perform better because of them. Nowhere in Army doctrine is it written that we have to practice being miserable.

The one significant disadvantage to locating in towns or villages is, of course, the exposure of your operation to the local inhabitants and the potential of that being passed to enemy sources. TOCs located in the woods run the same risk, but probably not as overtly.

The principles presented here are applicable at any level. They can be used at company level for a CP. As pointed out above, villages work extremely well for battalion TOCs and are equally adequate for the BSOCs. Brigade, regiment and division TOCs can also be accommodated, but require several facilities and careful organization. Survivability is the key to success on the battlefield. If TOCs are to survive so they can communicate and provide essential command and control, they must be located in a town or village. Any other choice is suicide!

LTC STEWART W. WALLACE
Commander, 4/69 Armor
FRG

Your Records Speak For You

How can you improve your Permanent Military Records File? How can you make yourself more competititve when your records are being reviewed for promotion, NCOES, or a special assignment? How can the chain of command be more supportive in preparing records for boards? How can the NCO-support channel be more supportive in assisting soldiers for boards?

Do the questions sound familiar? They should! Everytime there is a promotion or school selection board, an after-action report is developed, and each proponent receives a review and analysis of the records that were reviewed. The review and analysis is then sent to major organizations by the chief of branch. Let's review some of the problems in the Armor Branch review and analyze them and suggest some solutions.

First, let's look at individual problems, because unless the individual ensures his file is complete, any other action will be useless.

The change in requirement from a negative to a black and white photo was a great improvement, but it requires the individual to pay more attention to detail. Remember that your photo is your only visual representation before a board. It directly reflects the standards the soldier is expected to meet.

Make sure the uniform accouterments are properly placed and the uniform fits well. Don't assume. Use the regulation (AR 670-1); let a peer or your supervisor inspect you and, if possible, have him accompany you to the photo lab. Don't depend on the photographer!

Education, both military and civilian, is important. The NCOES was established to improve the technical and tactical competence of the noncommissioned officer and the quality of the NCO corps. Why would anyone want to avoid a school that improves their chance to get ahead? Yet a lot of NCOs have not attended any school. The chain of command must also get involved in this and ensure that NCOs get the school. The chain of command must not support or encourage an NCO's deletion from a school assignment.

As you complete military schooling, challenge yourself and enroll in college courses, time permitting. If time is not available, try taking the CLEP tests, available at education centers. Your education counselor can assist you in working toward two years of college. Also have your military schools experience and MOS evaluated for college credit.

If you are not being selected for school, a low GT score may be your shortfall. We have dedicated time to help first-termers improve their GT scores, but we have done little for our NCOs.

Don't shy away from other programs that are considered career-enhancing. Drill sergeant, recruiting, reserve component, and master gunner assignmets are considered very challenging assignments in Armor. Seek one out, but remember that one tour in any of those positions is all you need or want; selection boards don't look at repetitive assignments favorably. Usually, it's the soldier who asks for the assignment the second time. The chain of command needs to review the individual's previous assignment before approving such requests. Master gunners, especially, must be given the opportunity to serve in leadership positions.

Instructor positions are important assignments, but don't make a habit of them. Instructor assignments, in particular, appear to be repetitive more frequently than others. (Fort Knox to 7th ATC to Fort Knox is an old path traveled by many.) Repetitive assignments are a chain-of-command problem, more than an individual problem, because the chain approves or disapproves the assignment. Again, the best career route is a one-time shot and back tc a TOE unit.

As you can see, the chain of command always plays an important role in a soldier's career. The chain of command and NCO-support channel have the responsibility to ensure that soldiers do what is best for the Army and the soldier's career. The most important tool at hand is the Enlisted Evaluation Report and the Senior Enlisted Evaluation Report. If you really want to help an outstanding performer, remove all the big words and tell it like it is!

First, accurately describe the NCO's job. If he is a platoon sergeant and master gunner, don't try to impress the world by stating he is a master gunner and omit his duties as platoon sergeant. Discuss his performance as it relates to the mission of the organization. When discussing an individual's potential, remember the potential of serving in positions of greater responsibility as well as the schools. A lot of NCOs receive substandard SEERs in their first assignments as platoon sergeant and first sergeant. The rater should leave room for mistakes: comparing a new 1SG to your last 1SG, who had 4 years experience, is not really fair.

The best guidance a leader can give a subordinate is to urge them to serve in a demanding *leadership position.* Require a sustained performance in the position. There is no magic number, as far as years go, but it should continue over successive rating periods.

The Personnel Qualification Record, DA Forms 2A and 2-1, need to remain updated. A few corrections on the PQR are understandable, but some PQRs arrive in illegible condition. Maintaining and updating records is not an easy task today, but periodic reviews, conducted in the unit, allow us to not only review our records but add important documents to our file.

Every year, each of us should request a copy of our microfiche from Fort Benjamin Harrison to ensure our permanent file is accurate. (You can do this by writing: Commander, USAEREC, ATTN: PCRE-RF-I, Fort Benjamin Harrison, IN 46249.)

The chain of command is responsible for ensuring every soldier has the opportunity to reach his full potential. The proper management of his permanent records will enhance that potential and ensure a strong army for the future.

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

REGIMENTAL REVIEW

"Thunderbolt" Reunion Scheduled

The 11th Armored Division, "Thunderbolt," will hold its annual reunion from 13-17 August at Teaneck, NJ. Interested personnel may contact: Mr. Alfred Pfeiffer, 2328 Admiral St., Aliquippa, PA 15001. Phone (412)375-6295.

Attention Cavalrymen!

The U.S. Horse Cavalry Association's annual bivouac will be held on 3-5 October 1986 at El Tropicano Hotel, San Antonio, TX. All former horse troopers and supporters are welcome. For information, contact Colonel John R. Hall, 741 Winfield Circle, San Antonio, TX 78239.

Big Red One Reunion

The Society of the First Division, composed of veterans of the Army's First Infantry Division (Big Red One), has announced the group's 1986 reunion in Buffalo, New York, on September 3-7.

Previously, the reunion had been announced for Charleston, South Carolina, but delays in the completion of the selected hotel prompted the change. The 1987 meeting will be held in Charleston. Information about either meeting can be obtained from Society of the First Division, 5 Montgomery Avenue, Philadelphia, PA 19118.

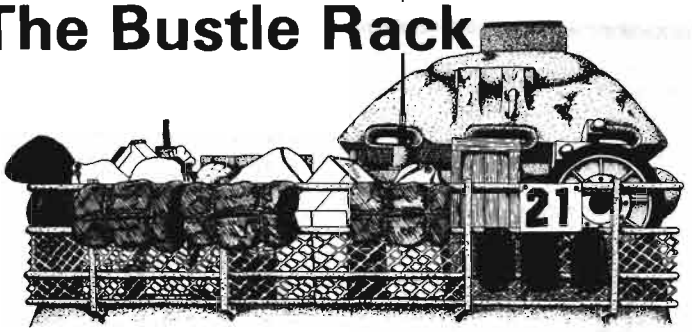
Viet-Cambodian Vets Reunion Set

The 11th Armored Cavalry's Veterans of Vietnam and Cambodia announces its reunion at the Rodeway Inn Convention Center in Arlington, TX (Dallas-Ft. Worth Suburb) on September 5, 6, and 7, 1986. Contact the "Command Track" c/o Ollie W. Pickral at 1602 Lorrie Drive, Richardson, TX 75080 for all the details.

704th TD Battalion Reunion

The 704th Tank Destroyer Battalion Association will hold its reunion in Pittsburgh, PA, on 26-28 September. Interested personnel should contact Walter C. Righton, Secretary, 29 W. Wilkins Lane, Plainfield, IL 60544.

The Bustle Rack



Armor Branch Notes

Regimental System

By the end of FY86, all armor soldiers will be affiliated with a regiment. Affiliation means long-term identification with a particular regimental color and crest, as well as the perpetuation of the regiment's history, customs and traditions.

Armor soldiers must understand that while every effort will be made to provide recurring assignments within their regiments, this can't be guaranteed. Soldiers can indicate their preference by notifying the servicing MILPO or by completing the individual preference statement.

Lieutenants can affiliate now or wait until AOAC attendance, when they must affiliate. First-term enlisted soldiers can affiliate now or wait until they reenlist. Armor and Cavalry units currently under the US Army Regimental System are:

8th Cavalry (Armor)
32d Armor
33d Armor
34th Armor
35th Armor
37th Armor
40th Armor
63d Armor
64th Armor
66th Armor
67th Armor
68th Armor
69th Armor
70th Armor
72d Armor
73d Armor
77th Armor
81st Armor (Training)
1st Cavalry
2d Armored Cavalry
3d Armored Cavalry
4th Cavalry
7th Cavalry
10th Cavalry
1th Armored Cavalry
12th Cavalry (Training)
13th Cavalry (Training)
15th Cavalry (Training)
16 Cavalry (Training)

"Armor in Battle" is Published

Fort Knox Supplemental Material 17-3-2, *Armor in Battle,* has recently been published by the Armor School. This 240-page military history anthology revolves around small-unit armor actions, starting with the very first armor battle in 1916. The five chapters cover World War I, World War II, Korea, Vietnam, and the Arab-Israeli Wars. Copies of FKSM 17-3-2 may be obtained from the Army Wide Training Support Branch, Fort Knox, Kentucky, AUTOVON: 464-2914/5715; COMMERCIAL: (502)624-2914/5715; FTS: 354-2914/5715.

Leadership Handbooks for Armor Officers

A three-volume set of leadership handbooks has been published for Armor officers, the result of a six-month revision of the Handbook for the Armor Leader.

Volume I: "Thoughts on Leadership" was designed to more completely prepare the junior officer for duty and command. Volume II: "Headaches, Heartbeats and Hamstrings: A Guide to Company Level Duties and Functions," provides a guideline for many of the administrative actions and details that comprise a significant portion of a leader's time. Coverage includes checklists, additional duties and the fundamentals of staff position responsibility.

Volume III: "Company Command: Your Men, Your Mission, and You," will help prepare the officer for command and its attendant responsibilities.

Copies of the three-volume set may be obtained from Army Wide Training Support (AWTS), ATZK-DPT-NRT-AWTS, Fort Knox, KY 40121-5000. Copies will also be available through the Defense Technical Information Center (DTIC).

BOOKS

HIGH TREASON: ESSAYS ON THE HISTORY OF THE RED ARMY, 1918-1938, by Vitaly Rapoport and Yuri Alexeev, Duke University Press, NC, 1985. 436 pages. $35.00.

To remain silent about the destruction of the Red Army is to abuse the memory of the innocent dead. To be silent is to betray the interests of the Motherland. Without the publication of such events — without a merciless analysis of them — it is impossible to reach conclusions vital to us, to our children, and to our grandchildren. Without such an analysis, there is no reason to study history.

— High Treason —

Once every few years there emerges a book so significant in content that it changes the very way we perceive the world around us. This is such a book.

High Treason is a collection of essays on the history of the Red Army prior to and during the purges inflicted by Stalin. It is significant in that no single history of the early days of the Red Army has been published to date. It is monumental in that it was researched, documented, and written in the Soviet Union by a Soviet citizen with considerable information available to him. Smuggled out of the Soviet Union by an undisclosed student, it offers us a picture of the attitudes, knowledge, and understanding of history by a segment of that society.

The early history of the Red Army is brought together in a single, well-integrated narrative, bringing to light new facts and interpretations on developments such as Stalin's role in the Polish Campaign, the early purges of military academicians and theoreticians, and the role of Stalin's cronies from Civil War days. The book offers numerous fascinating anecdotes — most of them "unverifiable but credible." Depicted are events such as the abortive attempt by security forces to arrest Budenny (he dug himself in with machine guns at his country dacha, then opened fire on the Chekists); details of the elimination of the security head, Ezhov; Voroshilov's endless blunders, and more. *High Treason* is a wealth of information about the Red Army, the Party, and the personalities that ruled both.

That is not to say that this work is without shortcomings. The book is, perhaps, too sympathetic to the Red Army military professionals and hostile to the political party and political generals of the period, exaggerating the capabilities of the Red Army. It is hard to imagine a Red Army capable of faring significantly better against a battle-tested German Army that had the advantages of surprise, mass, and concentration of force in the initial stages of the war.

High Treason is not a definitive history of the Red Army. It does, however, offer us an important new and comprehensive picture of this history as well as valuable insights into the understanding and knowledge of this history by the Soviet public. It clearly shows that Soviet censorship has not been particularly successful in suppressing or distorting historical events for those with the courage to seek the truth. This underlying message is the book's most important. Truth cannot remain hidden forever. There is truth in the Soviet Union, and those with the courage to seek it. May they grow in number.

GILBERTO VILLAHERMOSA
Captain, Armor
Fort Bragg, NC

THE M2 BRADLEY: INFANTRY FIGHTING VEHICLE by Steven J. Zaloga. Osprey Publishing, 1986.

This volume, Number 43 in the Osprey-Vanguard series on military units and weapons of 20th Century warfare, offers an accurate, concise treatment of the evolution, characteristics, and doctrinal place of the Bradley Fighting Vehicle. Mr. Zaloga, although publishing from England, is an American well versed in current weapons development experience within the United States Army. While not a military professional, his scholarship is such that he captures the essential forces behind the development of this particular vehicle and dissects neatly the controversies that surround it.

The book is timely, addressing the most recent press — Congressional inquiries into the wisdom of the M2/M3 Bradley. The author is an advocate of the M2/M3, faces each of the criticisms leveled in recent months head on, and makes the logical and accurate defense against each one. Moreover, he places the evolution of the weapons system in historical perspective quite clearly. As he points out, the debate as to the survivability of the armored infantry vehicle is a timeless dilemma. To give the infantry the armor protection it needs to equal that of the tank it must accompany is to give it a weight structure that will inflate the costs beyond the finances to support it. To negate the armored infantry vehicle because it cannot defend against the anti-tank weaponry it will eventually face on the battlefield, is to expose the infantry to lesser weapons, such as artillery or small arms, while still leaving the requirement to keep him apace with the tank with which he fights. Mr. Zaloga does not resolve that dilemma, but he does offer the view that the Bradley is the best thing around right now to mitigate it.

While there is a section devoted to Bradley doctrine, it barely goes beyond the wiring diagram level of the Table of Organization Allowances. Accordingly, this is not the source for doctrinal appreciation of fighting the Bradley. Nevertheless, it is a succinct treatment of the place of the Bradley in modern warfare, and a concise primer for a defense against some of the more shallow arguments criticizing the Bradley. The book is worth an evening's browse through its forty-eight pages.

JAMES R. MCDONOUGH
LTC, Infantry
Fort Hood, TX

RACE TO THE SWIFT: Thoughts on 21st Century Warfare, by Brigadier Richard Simpkin. Brassey's Defence Publishers, London. 375 pages. $32.50.

Brigadier Richard Simpkin's thoughts are original, but based on sound military principles. They are innovative, but realistic and controversial, yet convincing.

The book is in five parts, all of which live up to their titles. Part one, "The State of the Art," outlines the tactics/technology cycle by exploring the blitzkrieg and the tactical evolution to deep battle. Part two, "The Physics of War," is a scholarly study with unique geometrical depictions of terrain, mass, attrition versus maneuver theory, combat leverage, combat worth and battlefield simultaneity and tempo. Part three, "Luck Management," explores technology and chance, surprise and stratagems and intelligence, risk and luck. Part four, "The Round Boulder," is taken from the Sun Tzu quote: "Thus the potential of troops skillfully commanded in battle may be compared to that of round boulders which roll down from mountain heights." This was the part of the book judged to be most informative and entertaining, for it addresses the human factor in military leadership.

This book is not for the casual student of military science. The many arithmetical and geometric models and concepts presented in the first two parts could put off a less-than-dedicated reader. But once deciphered, these models accurately express intuitive tactical truths and insight into past, present, and future battlefields.

This book is a must for the serious student of the military art and science. It contains a wealth of material that will be discussed by military professionals, worldwide, and will be the subject of further study at high-level military schools. The author's predictions on the nature of future warfare will be controversial. However, if the quote by Dr. Wernher von Braun — "That most prophecies err because they are not bold enough" — is true, then Brigadier Simpkin's predictions could indeed come true.

RICHARD P. GEIER
Major, Armor
Fort Lewis, WA

The Father of the Armored Force

General Chaffee visits his troops training at Fort Knox

Like father, like son. If ever that proverb applied to two U.S. Army cavalry officers, it most certainly was the fitting description of Lieutenant General Adna R. Chaffee, Chief of Staff, U.S. Army from 1904 to 1906, and his son, Major General Adna R. Chaffee, Jr., the "Father of the Armored Force." The younger Chaffee was the heart and soul of Army mechanization. His valiant, career-long efforts were recognized with his deathbed promotion to two-star rank and the award of the first oak leaf cluster to the Distinguished Service Medal he had won in France in WWI.

Adna R. Chaffee, Jr., was born on 23 September 1884 at Junction City, KS, and was commissioned a 2d Lieutenant of Cavalry at West Point, NY, in 1906, the year that his distinguished father retired after a cavalry career that spanned 45 years. Between them, father and son served the U.S. Army for eighty years and saw the rise of the Cavalry arm during the Civil War and the Indian Wars, and its decline and eventual demise in WWI and in the early 1930s, when horseflesh succumbed to horsepower.

Adna Jr. served his first eleven years as a cavalryman and in a variety of leadership positions of increasing importance until the U.S. entered WWI in April 1917. During this period, he served on the staff of the Army War College and attended the French cavalry school at Saumur.

During WWI, Chaffee, as a General Staff officer, rose from captain to the temporary rank of colonel and was awarded the DSM for his service with the III Corps in France.

The "lean years" that followed WWI saw Chaffee reverting to his substantive rank of captain, and it was not until 1935 that he rose again to full colonel. Two years after he had graduated from the Army War College in 1925, Chaffee's career made its first step from horse cavalry to mechanization when he was assigned to the Operations and Training Division of the War Department General Staff. The following decades were to see Chaffee becoming increasingly involved in the Army's mechanization process. He recommended at an early date a permanent, independent mechanized force complete with tanks, mobile artillery, and motorized infantry — a combined arms force. His astute recommendations were adopted by the War Department, and in 1930 that body organized a permanent mechanized force and named Chaffee as its executive officer. Within a year, however, the Chief of Staff — General MacArthur — disbanded the force and ordered all branches of the Army to carry on mechanization independently. It was a blow to the early armor advocates, but progress, fueled by such dedicated officers as Chaffee, Van Voorhis, Grow, and others, was maintained.

In June 1931, Chaffee became the executive officer of the first cavalry regiment to be mechanized — the 1st Cavalry. He moved to Fort Knox with the regiment and became the post executive officer, as well. Wearing his two hats with demonstrated capability, Lieutenant Colonel Chaffee began a facilities improvement program at Fort Knox and planned and supervised the 1st Cavalry's exercises and maneuvers that tested new armor tactics, equipment, and doctrine. The horse soldier was beginning to give way to the tracked armored fighting man, but the process was slow and fraught with opposition from diehard cavalrymen. It was a time of decisiveness for those officers who foresaw and believed in armor, but that decisiveness had to be tempered with caution, for a too-headstrong advocacy of tracks over horse could lead to delays not only to the slowly-developing armor program, but to the careers of the officers concerned.

Adna Chaffee demonstrated time and again, to all levels of command, his persuasiveness in argument for a separate armor force and his tact in dealing with both superiors and subordinates. In 1936, he was vindicated when a second cavalry regiment, the 13th Cavalry, was mechanized. In June 1938, Colonel Chaffee was named commander of the 1st Cavalry, and in November of that year he was promoted to brigadier general and given command of the 7th Cavalry Brigade (Mechanized). The brigade was composed of the 1st and 7th Cavalry regiments. In 1939 and in 1940, Brigadier General Chaffee led the 7th Brigade in the first large-scale Army maneuvers since WWI.

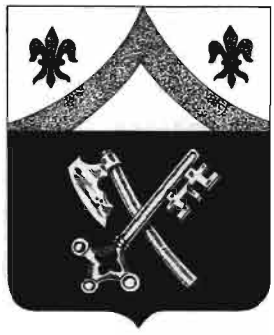
Europe was now at war, and General Chaffee, along with other officers advocating mechanized forces, saw in the German panzer successes in Poland the need to step-up the mechanization of the U.S. Army. Such expansion could only be accomplished by the creation of a new and independent organization. On 10 July 1940, the War Department ordered the creation of the Armored Force with General Chaffee as its first commander.

The letter creating the Armored Force and naming Chaffee as its chief, reads in part:

"The I Armored Corps will consist of a Corps Headquarters and Headquarters Company and the 1st and 2d Armored Divisions. Brigadier General Adna R. Chaffee, United States Army, is designated as the Chief of the Armored Force and the Commander of the I Armored Corps."

In less than a year, at the age of 57, General Adna R. Chaffee was dead of cancer. His memory and his legacy live on in Chaffee Avenue at Fort Knox, the road that leads directly to Armor Center Headquarters, and in the M24 light tank that bore his proud name from 1944 to the early 1950s.

General Chaffee is remembered as one of the true proponents of the armored force. While he recognized the ability of cavalry, he made it clear that infantry and artillery had to assume their roles in a combined arms force that today is the Army's combat arm of decision. His obituary in the New York Sun, dated 23 August 1941, says: "He was the heart and soul of mechanization in the Army..."



Symbolism

The gold of the shield is the color for armor. The fleurs-de-lis symbolize the Normandy and Northern France Campaigns. The chevron in point embowed recalls the Battle of the Bulge during the Ardennes-Alsace Campaign. The key (occurring frequently in the civic arms of the towns of Rheinprovinz) symbolizes the Rhineland Campaign; symbolic of the successes of this campaign, it allegorically represents the "Key to Victory" in Europe. The battle-axe, a favorite Teutonic weapon, signifies the Central Europe Campaign.

The red lion's head is adapted from the arms of the Duchy of Luxembourg, and the gold tower alludes to the successful mission in that area. The oak leaves symbolize honor, victory, and valor, and the shield, in the colors of the Luxembourg Croix de Guerre, alludes to the award of that decoration.

Distinctive Insignia

The distinctive insignia consists of the shield and motto of the coat of arms.

81st Armor

Supero Omnia

Lineage and Honors

Constituted 28 August 1941 in the Army of the United States as 81st Armored Regiment and assigned to 5th Armored Division. Activated 1 October 1941 at Fort Knox, Kentucky.

Regiment broken up 20 September 1943 and its elements reorganized and redesignated as follows: Regiment (less 3d Battalion, Band and Maintenance, Service, and Reconnaissance Companies) as 81st Tank Battalion and remained assigned to 5th Armored Division; 3d Battalion as 707th Tank Battalion and relieved from assignment to 5th Armored Division; Reconnaissance Company as Troop E, 85th Cavalry Reconnaissance Squadron, Mechanized, an element of the 5th Armored Division; and Band, Maintenance and Service Companies disbanded.

81st Tank Battalion inactivated 8 October 1945 at Camp Myles Standish, Massachusetts. Redesignated 18 June 1948 as 81st Medium Tank Battalion, Allotted 25 June 1948 to the Regular Army. Activated 6 July 1948 at Camp Chaffee, Arkansas. Inactivated 1 February 1950 at Camp Chaffee, Arkansas. Activated 1 September 1950 at Camp Chaffee, Arkansas. Inactivated 16 March 1956 at Camp Chaffee, Arkansas. Relieved 3 February 1962 from assignment to 5th Armored Division.

707th Tank Battalion assigned 12 July 1945 to 7th Armored Division. Inactivated 8 October 1945 at Boston Port of Embarkation, Massachusetts. Redesignated 4 November 1950 as 94th Medium Tank Battalion, allotted to the Regular Army, and remained assigned to 7th Armored Division. Activated 24 November 1950 at Camp Roberts, California. Inactivated 15 November 1953 at Camp Roberts, California. Relieved 3 February 1962 from assignment to 7th Armored Division.

Troop E, 85th Cavalry Reconnaissance Squadron, Mechanized, redesignated 16 June 1945 as Troop E, 85th Mechanized Cavalry Reconnaissance Squadron. Inactivated 11 October 1945 at Camp Kilmer, New Jersey. Converted and redesignated 18 June 1948 as 505th Replacement Company, allotted to the Regular Army, and assigned to 5th Armored Division. Activated 6 July 1948 at Camp Chaffee, Arkansas. Inactivated 1 February 1950 at Camp Chaffee, Arkansas. Activated 1 September 1950 at Camp Chaffee, Arkansas. Inactivated 16 March 1956 at Camp Chaffee, Arkansas. Relieved 3 February 1962 from assignment to 5th Armored Division.

81st Tank Battalion, 94th Medium Tank Battalion, and 505th Replacement Company consolidated, reorganized, and redesignated 3 February 1962 as 81st Armor, a parent regiment under the Combat Arms Regimental System.

Campaign Participation Credit

World War II
- Normandy
- Northern France
- Rhineland
- Ardennes-Alsace
- Central Europe

Decorations

Luxembourg Croix de Guerre, World War II, streamer embroidered LUXEMBOURG (81st Tank Battalion cited; DA GO 44, 1951)