ARMOR

The Magazine of Mobile Warfare

November-December 1983

United States Army Armor School

"To disseminate knowledge of the military arts and sciences, with special attention to mobility in ground warfare, to promote professional improvement of the Armor Community, and to preserve and foster the spirit, the traditions, and the solidarity of Armor in the Army of the United States."

Commandant
MG FREDERIC J. BROWN

Assistant Commandant
BG GORDON R. SULLIVAN

Chief of Staff
COL ROY C. PRICE

Deputy Assistant Commandant
COL MICHAEL H. CRUMLEY

Command Sergeant Major
CSM JOHN M. STEPHENS

INSTRUCTIONAL DEPARTMENTS

Maintenance
COL DONALD S. ZUTTER

Command and Staff
LTC JOE G. DRISKILL

Weapons
COL DAVID V. HARBACH

Committee Group
COL BOBBY J. CARTER

NCO Academy/
Drill Sergeant School
SGM JOHNNIE J. PRESTON

DIRECTORATES

Evaluation and Standardization
COL JOHN E. SWINDELLS

Training and Doctrine
COL DUDLEY M. ANDRES

Combat Developments
COL ROBERT W. DeMONT

UNITS

The Lightning Brigade
COL NEAL T. JACO

1ST AIT/OSUT Brigade (Armor)
COL ROBERT L. PHILLIPS

4th Training Brigade
COL WILLIAM M. MATZ, JR.

194th Armored Brigade
COL FRED W. GREENE, III

ARMOR The Magazine of Mobile Warfare

ARMOR magazine (ISSN 0004-2420) is published bi-monthly by the U.S. Army Armor Center, 4401 Vine Grove Road, Fort Knox, Kentucky 40121. Unless otherwise stated, material does not represent policy, thinking, or endorsement by any agency of the U.S. Army. Use of appropriated funds for printing of this publication was approved by the Department of the Army, 22 July 1981.

SUBSCRIPTION RATES: Individual subscriptions to ***ARMOR*** are available through the U.S. Armor Association, Post Office Box 607, Fort Knox, Kentucky 40121. Telephone (502) 942-8624. **Domestic:** $15.00 one year, $26.00 two years, $37.00 three years. **Foreign:** $22.00 one year, $35.00 two years. Singles copies, $2.00.

CORRESPONDENCE: Address all correspondence to U.S. Army Armor Center, ATTN: ATZK-MAG, Fort Knox, Kentucky, 40121. (Telephone: AUTOVON 464-2249/2610 or commercial (502) 624-2249/2610.)

SECOND class postage paid at Fort Knox, Kentucky and additional mailing office.

ARMOR may be forwarded to military personnel whose change of address is caused by official orders (except at APO addresses) without payment of additional postage. The subscriber must notify the postmaster.
USPS 467-970

November-December 1983 Vol XCII, No. 6

FEATURES

13 Task Configuration for Fighting Vehicles
by Richard E. Simpkin

19 The Soviet Mechanized Corps in 1941
by Michael Parrish

23 Counterattack Planning
by Lieutenant Colonel Sherwood E. Ash

26 Leading a Platoon on the Integrated Battlefield
by Captain Alan W. Watts

32 Improved Company Command and Control
by Major David W. Marlin and Captain Robert N. Sweeney

35 Elements of Tank Design
by Gerald A. Halbert

43 The Training Revolution
by Colonel Andrew P. O'Meara, Jr.

DEPARTMENTS

2	Letters	46	Professional Thoughts
7	Commander's Hatch	50	Recognition Quiz Answers
9	Driver's Seat	51	Regimental Review
10	Master Gunner's Corner	52	Books
12	Recognition Quiz	53	Steel on Target

COVER

The integrated battlefield encompasses the employment and coordination of combat assets that include infantry, armor, cavalry, artillery, and irregular forces, as well as close air support, air defense artillery, and engineers. Beginning on page 26, Captain Alan W. Watts tells Armor platoon leaders how to use this combat power to accomplish their missions. (The cover art is based on a photo made by Sergeant First Class Robert W. Griffin.)

LETTERS

Serve Your Soldiers, Not Yourself

Dear Sir:

During my 6 years of active duty I saw and served under too many career soldiers who were anxious to command and to *make a name for themselves* and who left nothing tangible behind. The big loser in this practice is the Army, and the one who suffers the most is the individual soldier.

Colonel Rilhac, a French armor officer, had this to say about serving his men:

"The day before relinquishing command of my regiment, I had a conversation with the commanding general who asked me what I thought about my time in command. My main feeling, I answered, was that I had spent about two-thirds of my time helping, advising and protecting my subordinates in order that they could perform their duties as well as possible. The general replied, 'Yes, that is the price of leadership.'"

In another article, Colonel O'Meara at Fort Knox had this to say:

"A commander who serves his soldiers earns respect and admiration, and creates an environment of friendship and pride."

Unlike these examples, a commander concerned about making a name for himself leaves nothing behind but bitterness, instability, questionable integrity and unhappy soldiers.

A commander should help, advise and protect his subordinates, allowing them to use their own initiatives, establish policies at the unit level and have input into the system. He should set high standards but he must be willing to allow junior leaders to establish priorities and plans to attain those standards, and he should support those priorities once established.

Assume command and, above all else, serve your soldiers. Soldiers deserve professional leaders—not careerists interested only in making a name for themselves.

JOHN A. FLORIO
Milton, Mass.

Horses In The Falklands

Dear Sir:

I would like to discuss the lack of mobility in the Argentine forces in the Falklands-Malvinas in 1982.

The Argentines in the islands were well equipped but once in place had little mobility. Without the special, all-terrain vehicles and helicopters that the British had, they were limited to "shank's mare" for getting around. Some of their troops were starving within a few kilometers of supply depots. Individual Argentine units could not support one another because of their lack of mobility.

The big question is: Why did not the Argentines use a vehicle they had in abundance to gain that mobility—the horse?

As of 1980, Argentina had some 4,000,000 horses, a large part being the *Criollo* breed, a hardy type that can withstand long periods with little food or water. The three brigades of mountain troops in the Argentine Army, using horses, could have introduced a substantial element of mobility in their garrison's defense efforts. Some gauchos, Argentine cowboys, could have given the British a hard time in the Falklands. The British margin of victory was small and a mobile unit on horseback could have substantially increased British casualties.

Compared to motor vehicles and helicopters, the horse is obsolete. But in remote areas, over rough country, and in poor weather, the horse can perform well in competition with his mechanical supplanters. Indeed, the Falklanders use horses for local transport on their roadless islands.

Most cavalrymen today do not have experience with a horse's capabilities. Let's review some of these: A typical pack or cavalry horse in the American experience is the Morgan. This horse stands between 57 and 61 inches at the shoulder and weighs about 1,000 pounds. It is an intelligent breed, strong and resistant to fatigue. And it often forms a bond with its rider that can heighten the military effectiveness of the unit.

A horse walks at 3 mph, trots at 7 mph, and gallops at 14 mph. In an 8-hour day, a horse carrying a soldier and equipment totaling 225 pounds can cover 25 miles. A pack horse, laden with 250-300 pounds, can cover 20 miles in the same day. A draft horse, pulling 1,600 pounds by road or 700 pounds cross-country, can cover 23 miles a day. These are routine marches, forced marches would cover more distance. And, the horse can travel over terrain totally unsuitable for foot or vehicles.

It is little known, but there is a well-developed chemical warfare technology for horses. The *Wehrmacht* and the Red Army both made extensive use of horses in WW II and had extensive horse chemical-resistant gear including canister gas masks, capes and leggings to protect the animals.

Several South American countries still have horse units with Bolivia having four cavalry regiments and 13 infantry regiments using horses. These are composed of paired motorized and mounted battalions. Perhaps the largest country still using horses in appreciable numbers is the Peoples Republic of China. They use division-size cavalry units for reconnaissance and border patrol work over generally rough terrain. Some NATO countries use horses and/or mules as pack animals, notably mountain units of the *Bundeswehr* and the Italian Army.

The Argentines did not really prepare for their war with Britain, even though they spent lavishly on weapons. Had they, as suggested here, tried an *old* approach—used horses—they might have come off much better than they did. This might be one of the more important lessons of that war for us.

GORDON J. DOUGLAS, JR.
Fullerton, CA

Another Bit of a Byte

Dear Sir:

Major Hanselmann's article "A Computer For Every Orderly Room" in the May-June 1983 issue of *ARMOR* Magazine is right on the mark.

The army has concentrated on the big "megabuck" computer at division and higher levels: a computer that will probably not survive the combat environment in which it will have to operate and that has done very little to make life easier for the commander at the bottom. The desktop computer or, better yet, the newer portable computer, will provide a benefit across the full army organization.

As a member of the 24th Infantry Division (Mechanized), we are taking part in various initiatives as part of the Army's SMART program. One of these has provided an APPLE II Plus computer to the squadron. Since its arrival, the computer has been used almost 16 hours a day. It produces the squadron deadline and, from the deadline, keeps a historical file on each vehicle. It does a daily and monthly percentage operational readiness report. Our medical platoon leader has put all the squadron's immunization records and other key medical data on file. We also use the APPLE for deployment rosters. It allows us to keep track of the large volumes of information on each soldier and this can be rapidly sorted into deployment data; main body, rear detachment, etc.

One of our troop commanders has a portable computer, an OSBORNE I, which he uses in his troop. Its value has aptly demonstrated the wisdom of Major Hanselmann's article. For key control and maintenance operations, he has entered all vehicles, their principal drivers and authorized additional drivers, the non-commissioned officer in charge of each vehicle, serial numbers of all keys assigned to the vehicle and other important vehicle data. This list is used by the troop dispatcher to check drivers and release authority upon completion of their missions, key control during deployment and upon return from field training, and to assist in the maintenance of motor pool records. he has also placed all section

hand receipts on the computer, thereby allowing a quick update and a guaranteed record of all the changes that the "megabuck" computer at division never seems to pick up, even after 6 months of telling it that a change is needed.

As part of the SMART program, the division is testing a paperless Class IX prescribed load list (PLL) operation based on a desktop computer that will eventually go into every troop or company motor pool. This computer will handle all PLL requisitions, update records, keep track of deadlines, handle vehicle dispatch, and should greatly reduce the error rate in processing Class IX requisitions through the system.

Hopefully, this motor pool computer will pave the way, but the Army still has a long way to go in exploiting the equipment that is now available. A portable computer is needed for each troop or company and staff sections at battalion, brigade, and division level that communicate operations orders and voluminous reports. It can provide the Army a great edge in peace or war and is an idea the Army needs to exploit.

DOUGLAS B. CAMPBELL
Lieutenant Colonel, Armor
Fort Stewart, GA

Professional Reading

Dear Sir,

As managing editor of the quarterly journal of the Society of Logistics Engineers, the *Logistics Spectrum*, who in the "ancient" days served as a reserve officer attached to the 19th Tank Battalion (Heavy), then an inactive Regular Army infantry tank unit, I find *ARMOR* Magazine to be very interesting and to point up some very serious logistics support problems, not too unlike those we had with the old Mark VIII's in the 1920's. All seem to emphasize our need for better logistics support in every area.

The article in the July-August issue of *ARMOR* by Lieutenant Colonel Garland titled: "The Case for Professional Reading" seemed to be particularly timely and important. A sound professional background based on reading with comprehension and acquiring a deep understanding of basics is certainly essential for all professionals. History has a way of emphasizing the vital importance of the basic relationships of strategy, tactics, and logistics, essential to effective leadership and command, that continue to apply as weapons change. However, in view of the critical nature of logistics support to armor, I was a bit astonished at the dearth of basic material on logistics in the author's reading lists. Van Creveld's "Supplying War; Logistics from Wallenstein to Patton," was the only included reference that I noted. To facilitate an understanding of the basic concepts essential for a true professional, I would suggest adding the following:

Logistics in the National Defense, by Henry E. Eccles (Greenwood Press, Westport, CT); *The Sinews of War, Army Logistics 1775-1953*, by James A. Huston, Chief Military History, U.S. Army; *Logistic Support of the American European Theater of Operations*, Volume I & II, by Roland G. Ruppenthal, Department of the Army; *Pure Logistics, The Science of War Preparation*, by Lieutenant Colonel Cyrus Thorpe, USMC.

Some of your readers might be interested in sending letters to the editor or brief articles on armor logistics to The Editor, The Logistics Spectrum, 8210 Forest Hills Drive, Elkins Park, PA 19117. These would be most welcome.

With best wishes for your splendid magazine.

LOUIS C. ROSENSTEIN
Lieutenant Colonel, USAF (Retired)
Managing Editor, *The Logistics Spectrum*

New Thoughts on Flank Attacks

Dear Sir,

I read with interest First Lieutenant Ralph Peters' article "Attacking the Attacker" (May-June 1983 *ARMOR*), and while it poses some interesting concepts for offensive operations, I would like to raise a few questions.

Of immediate concern is the reference to the proper employment of such new, high-mobility equipment as the *M1 Abrams* tank and the *M2/3 Bradley* fighting vehicles, the *DIVAD* air defense system and the attack helicopter.

In attempting to disrupt the Threat mobile, armored combat regiment, the solution given is to eliminate the enemy commander by means of a high-speed maneuver to the forward flank, find the command vehicle and destroy it.

Yet, even if this maneuver is successful, several major flaws remain. The first is going to be to *find* the Threat command vehicle in a group of 30 or more similar vehicles. The second is that the command vehicle may very well not have the commander on board; he could well be riding in another, even more indistinguishable, armored vehicle.

Also, though damage to the Soviet regiment would be extensive at the loss of the commander, Soviet operational procedure generally calls for the wide physical separation of the commander and his assistant so that loss of one vehicle does not decapitate the entire head.

Using U.S. radio transmission procedures as an example, and the apparent lack of orders' transmissions signifying loss of the commander, we could expect that some time would expire before orders could be issued by the next senior Threat officer. In the meantime, however, acting on previous orders, an action drill on the part of the Threat column may well result in return fire and a general move to deploy for combat.

This leads to the consideration of just how fast an *M1* would need to travel not only to creep up unseen, but to rapidly overrun and demolish the Threat command vehicle group under the *shallow attack* format of high-speed fire and maneuver. Though the *M1* may prove substantially faster in combat than the *T-62/72* or even the *T-64*, it is questionable that the vehicle could cover terrain faster than could the Threat vehicles turn out of column to face and engage the assault. Moreover, there is no doubt that the turret of a Threat vehicle, tank or BMP, could be traversed and fired far faster than could the *M1* traverse the terrain to fire and destroy enemy vehicles on the move. In short, in direct contradiction to the lieutenant's suggestion, the proper employment of the *M1* would not rest in a flying assault column, but rather in assuming a position on the flank from which to deliver the fire from cover against an exposed formation.

What the lieutenant proposes to do is move the task force reserve and use it as the leading element in an attack with all other line units standing by to await word of the success or failure of the mission. This is the very antithesis of the principles of war taught in FM 100-5. And while the Threat may be initially struck by one such unit and partially disorganized, the very nature of Threat operations would result in several Threat battalion assaults in short order against considerably smaller U.S. line assets, now without any reserve, that are already either directly engaged or awaiting the outcome of the initial attack.

The operation described by the author seems to be not so much one of selectively identifying the weak spots in an enemy formation to permit an attacking force to substantially improve their chances of success, as one of promoting numerous spoiling attacks by the battalion (brigade) reserve task force before a general engagement. The only short or long-term effect of such a move would be the slow bleeding of precious few resources as attack after attack on the main line of engagement withdrew, leaving damaged vehicles and equipment inside enemy territory. This is not only *not* a solution to the current Threat, but was a major failing of the Allies during the first years of WW II.

Though concern for winning the field of honor may no longer apply, the concern for holding the battlefield so that technicians can recover damaged vehicles and equipment certainly holds true.

All this seems to lead to is a search for a means to retain territory at the expense of hurling one company (battalion) of three or four in the parent unit to disrupt the Threat attack and force a delay in the action. This neither solves the problem nor does it destroy the enemy. Only a determined defense, using maneuver within the area, or a deliberate offense, will radically affect the outcome.

On the other hand, if I understand the lieutenant to be seeking a means to actively wrest the initiative from the Threat regiment, then one would perhaps be better advised to place three-quarters (leaving one-quarter in reserve) of the forces in an offensive posture, seeking to establish the kind of free-wheeling action best epitomized by the German *panzer* troops in the early years of WW II, or the way the then Lieutenant Colonel Abrams maneuvered his command around Arracourt, France, in September 1944. Not only will the princi-

ples of war be adhered to better, but the very distinguishing feature that best differentiates Soviet from U.S. command structures — American initiative and competitive pursuit of tactical victory, will be substantially enhanced to our benefit while severely straining the structured response system of the Soviets. It can be done if a plan using terrain, in the form of *territory*, is reduced in importance to seeking terrain in the form of *cover/concealment* leading to *surprise* is adopted.

In any event, the lieutenant's endorsement of the concept of striking an enemy force in the flank from an unexpected quarter using surprise and maneuver are concepts that one would hope would be heartily endorsed not only by the armor branch, but the Army as a whole.

JOSEPH R. BURNIECE
Project on Military Procurement
Washington, D.C.

Supports Cavalry Master Scout

Dear Sir,

I would like to add my support to Lieutenant Colonel Olmstead's and SFC Collins' stand that the time to implement a Cavalry Master Scout Program is long overdue. (See "Professional Thoughts" May-June 1983 *ARMOR*.)

The modernization of the Army makes the scout's role even more critical, if that is possible. He must not only master many complex weapons systems, but the battlefield reconnaissance skills he must master are also growing in complexity with that of our new equipment. To train our cavalry 19Ds in the myriad of firing and nonfiring tasks so critical to the realization of the combat multiplier that our new equipment offers, requires a "master."

The scout must develop information on: enemy locations and strengths, routes, attack positions, and other vital information so that we can exploit the mobility of the *Abrams* tank to strike the enemy in the flank or rear.

Just as each troop and company is authorized a "master" gunner, so should each cavalry troop be authorized a "master" scout.

Hopefully, *ARMOR* and the Armor Center will take the lead in gaining authorization for and training of this critically needed individual for all cavalry organizations.

BRUCE B. G. CLARKE
Lieutenant Colonel, Armor
2d Squadron, 11th Armored Cavalry

Gas Mask Protection Queried

Dear Sir,

Mr. Donald R. Kennedy's article, "Improving Combat Crew Survivability," in the July-August *ARMOR* Magazine is of particular interest to me as I am a platoon sergeant in a tank company in the Texas National Guard.

It is the first article I've seen about the "behind the armor" effects of HEAT or kinetic energy munitions. This is a question that I am asked many times by the younger soldiers in my platoon and a point that some of the old timers and I often talk about: "What happens exactly when a round penetrates the hull of a tank?" Our conclusions have always been a matter of conjecture.

One point I would like to question is the use of gas masks in WW I tanks "to protect against war gases and the gasoline and engine-gas contaminated interiors of the WW I tanks."

My *M25A1* gas mask certainly affords protection against war gases but is no protection "against ammonia or carbon monoxide fumes." In fact, the operator's manual for the *M25/M25A1* states this and also mentions, "Your mask isn't effective in confined spaces where there is not enough oxygen (less than 18 percent) in the air you breathe."

If a WW I gas mask would protect against the gasoline and engine-gas contaminated interiors of WW I tanks, then my *M25A1* is a step backward because of its limitations with ammonia and carbon monoxide fumes. Clarification of the degree of protection afforded by WW I gas masks might be in order as I find it difficult to believe that my *M25A1* is not superior to the WW I mask.

Keep the superlative articles coming. *ARMOR* Magazine has been and is a valuable tool in training my platoon.

DOUGLAS H. BOX
Platoon Sergeant, TXARNG
Tyler, TX

More Professional Reading

Dear Sir,

I read with great interest your July-August 1983 issue and was really struck by Lieutenant Colonel Garland's article, "The Case for Professional Reading." It is an outstanding advisory for all officers, regardless of branch, by why stop there? NCOs should also be required to read professionally. The exposure to other points of view will benefit them, too.

I have a pet peeve. Why limit profesional journals to those of the combat arms and combat support branches. *Army Logistician*, published bimonthly by the U.S. Army Logistics Center, is an invaluable supplement to a professional's reading fare. A common complaint from "our" side of the house is that combat arms officers know too little about the capabilities and problems of their support systems.

Presumably everyone has personal choices in this area, as do I. The following works should be considered by all military professionals for the timeless lessons they give:

The Persian Expedition, by Xenophon. This timeless classic illustrates the massive problems of the fighting retreat; abandonment by the host forces, cut off from all friendly aid, discipline, morale, dealing with neutrals and allies, and the preservation of the will to break free at whatever the cost.

On The Art of War, by Frederick the Great. This volume was relatively unknown until the late 1960s. Frederick's ideas have had influence on Russian military thinking and this alone makes reading this book profitable. His views on limited war, as well, are worth considering because he espouses the absolute necessity of responsive logistics.

Attack and Die, by Grady McWhitney and Perry D. Jamieson. This is a new and unique analysis of the reasons for limited Southern battle success during the Civil War. The crux of the problem was a *disconnect* between technology and doctrine — with frequently disastrous results for Southern arms.

Military Elites, by Roger A. Beaumont. The whole subject of military "elitism" within military organizations has many more facets than rivalries would indicate. This book explores elitism/esprit in a dispassionate manner and forms some unexpected angles.

How to Make War, by James F. Dunnigan. This was originally published as an aid to war gamers, but the revised edition is actually a branch-by-branch, service-by-service, function-by-function summary of major organizations, hardware and operational environment considerations of modern armed forces. It is a primer on warmaking.

BRUCE P. SCHOCH
Supervisory Training Specialist
Fort Eustis, VA

Cavalry Connection Upheld

Dear Sir,

I agree wholeheartedly with Major Dials' assertion that divisional cavalry requires a combination of tanks and fighting vehicles to create a "credible economy force." (See Economy of Force—the Cavalry Connection," July-August 1983 *ARMOR*).

Superior mobility over the enemy and combat power that is sufficient to defeat reconnaissance and security elements are absolutely necessary for effective economy of force operations.

Additionally, I would like to point out that cavalry, given a covering force mission, is expected to not only meet and defeat enemy forces, but to deceive them as to the location of the main friendly defensive effort. A suitable mix of MBTs and fighting vehicles in the cavalry is essential to a viable deception.

Cavalry operating as a covering force will also be called upon to delay enemy forces. I do not feel that helicopters and fighting vehicles alone can generate enough "combat staying power" to achieve a successful delay against armor-heavy Threat formations. Addition of the firepower, mobility, and survivability of the tank will be the major deciding factor.

GUY C. SWAN III
Captain, Armor
Fort Lewis, WA

Murphy's Valentine Report

Dear Sir,

While researching WW I issues of the *Stars & Stripes* I found an item in the "Around the Sibley Stove" column in the 14 February 1919 issue:

"This is the story of Murphy's report. Murphy was in Company A, 301st Tank Battalion. His tank blew up in a minefield and, although he himself was wounded, he helped to get the men in his crew to the rear first. Before they shipped him back, he wrote an accurate message to his section commander, giving his casualties and the map location of his burned out tank. The message was written on the back of the only scrap of paper he had saved from the wreck of the tank. That scrap was a photograph of his wife."

A rather poignant letter for the Valentine's Day issue of *Stripes*, I thought.

For anyone with access to a bound volume of WW I *Stripes*, I highly recommend a leisurely look-through. The pages are filled with pathos and humor of our armor forebearers.

JOHN A. REICHLEY
Major AUS (Ret.)
Fayette, AL

T-62, T-64 Mixup

Dear Sir,

Reference my letter in the July-August issue of *ARMOR* Magazine. The sentence reading: "Several sources including *International Defense Review*, have reported that the predecessor of the *T-64* was identified before the first public appearance of the *T-64* in 1965"; should have ended referring to the *T-62's* first public appearance, not the *T-64's*.

JAMES M. WARFORD
Captain, Armor
Fort Hood, TX

Bardowski Correction

Dear Sir,

It was with great joy that I read Colonel Thomas Dooley's article on the exploits of the Provisional Tank Group in the defense of the Philippines. (See "The First U.S. Tank Action in World War II," July-August 1983 *ARMOR*. Ed.) and I feel compelled to add a few words.

The man credited with shooting down the first enemy aircraft was not Technical Sergeant Temon "Bud" Bardowski, rather he was Technical Sergeant Zenon "Bud" Bardowski. I know this because he is my father, and for the last 30 or so years, people have asked me what my middle initial "Z" (not "T") stood for.

During the attack, he drove his *M3* halftrack out into the open to gain a better field of fire and put a 75-round belt of .50 caliber into a Zero. The Air Corps commander, Colonel Maitland, submitted his actions for a Medal of Honor, but evacuated the Islands before the paperwork was returned. He was also credited with destroying the flame thrower mentioned in the article.

The platoon leader, Lieutenant Edgar Winger, did not trap his vehicle between two trees, Rather, after running blind off the trail, he became disoriented. When he opened his hatch to gain his bearings, a nervous member of the Philippine Army fatally wounded him with a burst from a BAR (Browning Automatic Rifle, Ed).

A painting of the (aircraft) downing has been donated to the Patton Museum.

STEPHEN ZENON BARDOWSKI
D/1-124th Cav, TXARNG
Randolph AFB, TX

New Role for Sheridan Proposed

Dear Sir,

As an armor enthusiast and a former ordnance officer, I hate to see what has happened to the *Sheridan*. Intended as a reconnaissance vehicle, it was armed with the *Shillelagh* missile, a weapon much more potent than the *Sheridan's* role required.

Today, *Sheridans* are used as targets for antitank missiles, some have been remodeled to resemble Threat vehicles, a few have been used as carriers for experimental gun systems and many are in storage.

In my letter on this same subject in the July-August 1981 issue of *ARMOR*, I mentioned the original variations that had been considered for the *Sheridan* chassis, including variations in the main armament. It has been encouraging to read that at least one chassis armed with the *Ares* automatic 75-mm gun has undergone tests at Yuma, AZ, and that the Navy, with Army collaboration, has mounted a 105-mm tank gun on an *M551 Sheridan*, using the existing turret and recoil system.

Our armor doctrine calls for tank-vs-tank combat but, in Europe at least, we are likely to be so out-numbered in armor that our antiarmor needs are being given much study.

Rearmed, the *Sheridan* could be a highly potent antiarmor vehicle. It is hardly likely that the WW II tank destroyer concept will ever be revived, but as a way to even the likely future odds, one can hope that the concept of vehicles such as the German *Jagdpanzer* and the American tank destroyer will not be overlooked. Using surplus *M551s* would seem to be a sensible step at a reasonable cost.

ROBERT J. ICKS
Colonel, AUS (Ret.)
Elmhurst, IL

Rebuts Eyes & Ears Philosophy

Dear Sir,

I found Major Bush's apologia a rather interesting example of the indirect approach. (See "The Division Commander's Eyes and Ears" September-October 1982 *ARMOR* Magazine.) Although the author states his purpose ". . . is not to argue the pros and cons of tanks . . ." that is exactly what his article is all about.

I am not sure why the then Chief of Staff, General Meyer, removed the tanks from the cavalry squadron. I seriously doubt that he did it because he considered its primary function ". . . as detailed ground and air reconnaissance within and to the front, flanks and rear of the division . . .", or that he thought that tanks must be removed to accomplish this mission.

My doubt is based upon the fact that General Meyer approved the operational organizational concept almost a year after he directed removal of tanks from the squadron. At the time of his decision, the organizational concept called for 24 tanks in the squadron and for the squadron to perform traditional cavalry roles.

I am also rather appalled that, as a matter of policy, DA is withholding resources from field commanders because they (DA staff officers?) do not believe the field commanders competent to correctly employ those resources. I consider the elimination of tanks so as ". . . to remove the temptation at all levels of command to readily allow part or all of the divisional cavalry to become decisively engaged," a highly suspect procedure. I am not sure what our division and corps commanders think of that comment on their competency. It is also questionable that the new organization will not be decisively engaged when it is the only force the division or corps commander has left.

I have always considered our most critical resource to be manpower, with our current end-strength ceilings making it even more critical. It, therefore, appears hard to justify a 630-man force of trained combat soldiers used to provide messenger service with their CFVs, to control routes and choke points to ensure navigation is accurate and that priorities are properly observed, and to help control battlefield clutter by monitoring and controlling the movement of CS and CSS elements.

I don't know where Major Bush learned cavalry, but if he thinks that is good use of cavalry soldiers—and he is teaching new lieutenants—then we have a problem.

Major Bush's closing comment is most profound: ". . . there is no other unit(s) specifically designed for the cavalry squadron's roles . . ." Unfortunately, what he fails to say is that there is no unit in Division 86 designed to fulfill the role of cavalry.

DOUGLAS B. CAMPBELL
Lieutenant Colonel, Armor
Fort Stewart, GA

Questions Division 86 Mechanized Infantry Setup

Dear Sir,

I strongly question the ability of the proposed Division 86 mechanized infantry company to carry out its functions in the urban sprawl of the potential European battlefield.

The company will have 116 men (in 13 *Bradley* IFVs) of whom only 63 can fight dismounted. The *Bradley's* armor can stop

14.5-mm projectiles, and while this is marginally better than the armor on the *M113* APC, it is not designed to fight alongside tanks. Yet the company that it carries is designed mainly for *offensive* maneuvers.

However, since the length of time that an infantry unit engages in offensive operations can generally be counted in days while the time spent in defensive positions (generally in built-up areas) can be counted in weeks and months, I submit that this proposed company is overly mechanized, undermanned, and not designed to prepare and hold a fortified defensive position.

The history of war clearly shows how a relatively small, well dug-in infantry unit can delay an attacker and often alter the course of a battle.

In order to increase the number of men who can fight dismounted, I propose that its nine rifle squads have 12 men each, all of whom would fight dismounted. This would add 18 men to the company and would increase the numbers who fight dismounted by 45, for a company total of 108.

The company, in order to accomplish this, would have to exchange 9 of its *Bradleys* for 9 *M113s*, which would be attached when rapid movement was anticipated. When not needed, these vehicles, with drivers, would revert to battalion control. The platoon leaders' *Bradleys* can furnish fire support.

I also propose that each company be equipped with 3 new tank destroyer vehicles. These should have the same gun as the MBTs, but they need not have turrets or gun stabilizers as they would only be used in hull defilade and would not have to fire on the move. They could engage enemy tanks and IFVs at ranges that would prevent the enemy overrunning the company position. Adding these vehicles would increase company strength by 9 men.

Thus, by adding only 27 men, the company can be transformed into a substantial defensive blocking force while still maintaining its ability to move rapidly when required.

WALLACE J. KETZ
Jackson Heights, NY

To Obey Or Not To Obey

Dear Sir:

Lieutenant Colonel William L. Howard's article "To the Last Man, To the Last Round—Why?" was certainly a provocative article. One might, on the basis of the information presented, be willing to go further than simply agreeing—perhaps so far as to make the "proper" decision to disobey direct orders so as to make best use of information immediately at hand. But basing this decision on immediate information (intelligence) can be just as damaging if not carefully weighed in balance with the presumed information being evaluated by higher command.

In the fateful Russian winter of 1941-42, Hitler had taken the decision to enforce a "no retreat" policy on an army rapidly updating itself on Caulaincourt's history of the disastrous retreat of Napoleon's Army 130 years earlier.

On the other hand, it went a great distance in putting an iron ramrod to the backs of otherwise competent and aggressive troops who had suffered a double upset, their first defeat by an army declared "rotten" by their supreme commander. One result of this entire episode, which was to play a major role a year later, was the defense of the Demyansk pocket north of Moscow.

As the Siberian-led Red Army streamed west in January-February 1942, the 12½-month battle for the pocket/salient of Demyansk began. In the course of the battle, 100,000 troops were supplied solely by a 500-plane airlift in the course of the bitter winter. That it took a vast amount of Luftwaffe resources and tremendous effort was perhaps appreciated best (if not singularly) on the line, but the result—the successful defense of the Demyansk highlands—was duly noted by Goering and Hitler.

As the Soviets struck out to encircle the German 6th Army at Stalingrad, Hitler perhaps had every reason to justify his decision to keep troops on the Volga River in spite of the alarming reports filtering back in the first few hours and days after November 19, 1942. Throughout the summer months and up to September 1942 the German Army General Staff (General Zeitzler) declared the Soviets had *no reserves remaining.* Further, the reports from Stalingrad were such that invariably "one more effort" would yield success and that effort was just as invariably only a few days from being prepared. Given as well that not only had the German forces (by hitler's view) survived the winter of 1941 by standing fast, but Demyansk had been a relatively bright star in that period as well, one can readily understand Hitler's intention to once again prove the generals were just on the wrong side of correct in strategic appraisals.

The appearance of two Soviet tank armies and five infantry (combined arms) armies, however, proved Hitler to be quite wrong in the decision. But the *intelligence* prepared for him apparently gave no such warnings until far too late. Then, of course, in the face of the Soviet counter-offensive came the decision, based on Goering's promise to a man *looking for the answer he wanted to hear,* to hold Stalingrad by means of airlift until a relief could be mounted.

At this point—November 25 (2 days after the encirclement of the 6th Army)—precisely the kind of decision and action in the face of direct orders suggested by Colonel Howard was effected by General von Seydlitz, commander of the German L1 Corps in the northeast of the Stalingrad pocket. Forcefully arguing that the 6th Army should abandon their encircled positions and fight their way out to the west, he gave orders for his troops to destroy their heavy equipment, demolish their fortified positions, and commence the proposed withdrawal. The 94th Infantry Division responded as instructed, but the order made no impressions on the other troops in the pocket who awaited orders from both Army Commander Paulus and Hitler. The result was the destruction of the 94th Division by an immediate, massive Soviet attack.

Though we can certainly agree with the conceptual argument of Colonel Howard's discussion—that decisions must be made *on the scene* promptly by the immediate command—we must never fail to give consideration to the overall situation as well. Every commander, no matter what his position, must give thought not only to written and oral orders of his superiors, he must also give thought and some interpretation to those orders.

Another point that seems relatively simple to state in peacetime is the timely and forcefully-argued appreciation of the circumstances, and the suggested course of action. Troops on the "quiet" front north of Stalingrad had sent back word of impending Soviet moves, all of which Paulus had been privy to, but no one argued the case sufficiently forcefully—especially in the weeks preceding the Soviet counterstroke—to inform Hitler of the folly of his decision.

In short, defying orders may be a means to an end, but it is certainly no long-term solution. Each individual must make his knowledge and opinion known to his seniors in order for them to make a proper decision. This will undoubtedly at times be very difficult as the "neck is put on the block." On the other hand, "foreknowledge is forewarned."

JOSEPH R. BURNIECE
Project on Military Procurement
Washington, D.C.

Battlefield Clutter Unraveled

Dear Sir,

Figure 3 in "The Division Commander's Eyes and Ears" (September-October, 1983 *ARMOR* Magazine), is another example of how perspective and scale can detract from the credence of an otherwise excellent article.

The "obvious" battlefield clutter is not so obvious when one considers 5.3 vehicles per kilometer (square kilo.). This assumes about 188 thousand square meters per vehicle. Even when taken exactly to scale, the small squares that represent vehicles end up being about one-tenth of a square kilometer, or 10,000 square meters.

A small point maybe, but when a picture is worth a thousand words, it shouldn't be misleading.

WILLIAM SOUTHWORTH
Major, USA
Fort Lee, VA

(The graphics used to portray battlefield clutter were, in fact, not drawn to scale. The precision and degree of resolution of the printing process, as well as page space availability, would not permit a more accurately scaled representation of a brigade sector in which individual vehicles are both accurately and meaningfully portrayed.

Additionally, it must be remembered that in most geographical areas where combat may occur only a very small fraction of any given area will likely be suitable for combat occupation by a vehicle, and trafficable road nets (as well as cross-country avenues of approach) will be densely occupied.

Figure 3 was intended to portray the expected difficulties of movement across an occupied piece of the battlefield without showing specific terrain features, obstacles, roads or civilian refugee traffic. The numbers of various types of vehicles shown in figure 2 and figure 3 are accurate. Ed.)

COMMANDER'S HATCH

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

Fielding Viable Units

As Chief of Armor, I am charged by AR 10-41 with providing those items that our operating units must possess in order to perform assigned combat missions. I must monitor the entire personnel, materiel, and training life cycles to ensure that compatible components can be fielded and sustained within the unit. Unit viability, therefore, is always viewed in the *collective sense* as the *overall health of the unit.* Only those units that develop readiness by using the personnel and materiel furnished, within the given organizational framework, in accordance with doctrinal precepts to accomplish peacetime and combat tasks, can be considered as fully viable.

Components Contributing to Unit Viability

Doctrine, organization, materiel, personnel, training, and leadership are the essentials of unit viability. Just as each is vitally important, no single component stands alone, but blends with the others to achieve *overall* viability.

Doctrine. Proper employment of Mission Area Analysis (MAA) provides an understanding of the true nature of the Threat. If we are to break, exploit, and destroy the enemy, we must, as a matter of second nature, know how they and how we will fight. Close Combat Heavy (CCH) and Armor How-to-Fight doctrine is central to the execution of AirLand Battle and AirLand Battle 2000. In concert with the Combined Arms Center, we are developing, testing, and applying doctrine which will serve as our primary basis for moving, shooting, communicating, securing, and sustaining on the battlefield. Within the doctrinal framework, we are rapidly moving toward development of standardized building blocks to be used across the force which, when properly employed, will create the necessary defeat mechanisms based on factors of METT-T. Development of doctrinal manuals such as FM 17-15, standardized vehicle load plans, the CCH Development Plan, and a coordinated maintenance doctrinal framework are examples of current USAARMC efforts stemming from our work during the Armor Conference.

Organization. Knowing how to fight is only the first step. We must also ensure that the correct organizational design is available to support the execution of our doctrine. As branch proponent for the tank battalion, divisional cavalry squadron, scout platoon, and armored cavalry regiment, the Armor Center must ensure that organizational structures work within the context of AirLand Battle doctrine. Where inadequacies exist, prompt action will be taken by the USAARMC to change or refine our TOE to ensure an effective organizational structure is provided to MACOMs for MTOE development and application. At the same time, we are vigorously pursuing actions in support of the conversion to the new Regimental System as well as initiatives to modernize our forces through the use of unit rotation. The USAARMC is now developing a proposed organization for the 1st OSUT Brigade which will reflect and support the training of soldiers affiliated with the Regimental System.

Materiel. Mastery of our equipment in tactical operations and maintenance is essential. As Armor, all are required to execute proper employment of our weapons systems (new as well as old) in the mounted battle. This demands quality performance under stress to an exacting standard of excellence. The Armor Center will continue to improve current weapon systems capabilities by exploiting friendly technological opportunities.

This effort is being pursued on two fronts; first, through well-thought-out product improvement pro-

grams to enhance and upgrade our present materiel capabilities and, secondly, by an aggressive research and development effort which will result in an advanced family of CCH vehicles. Development of the *M1E1*, with its increased capabilities and lethality, is a clear illustration of what we can do collectively in the improvement of existing products. We have now taken actions which will lead to the establishment of a tank test bed program under Armor Center management that assimilates all existing and known future programs under one umbrella system that feeds the total CCH developmental plan. In addition, efforts are already well underway to ensure that our *M1/M3* and *M60-* series vehicles are product improved to ensure adequate material capabilities through this century.

Personnel. As we move to transition our organization in support of emerging doctrine, new challenges are posed for the manning system. Diligent planning is now being exercised to ensure that manning the Armor force results in recruiting, training, and sustaining individuals who contribute positively to cohesive, viable units. Stated briefly, I continue to see our overall goal in force manning as one of increasing the tactical and technical proficiency of our officers and NCOs. To accomplish this goal, we will continue to pursue:

- Recruitment, accession, and retention of the best possible personnel. Proud, disciplined, and properly trained soldiers are without question our most precious asset.
- Initial entry training programs which train soldiers to an acceptable level of combat ready proficiency.
- Assignment and distribution of personnel within the Armor force in such a way as to reinforce our overall combat readiness by giving priority to the needs of the TOE force. Serving repeatedly under competent leadership contributes immeasurably to our overall health as a branch.
- Development and sustainment of professional education programs and alternative assignments that serve to develop leadership and Armor specific skills required by the force.

We are now developing institutionalized programs which will, in effect, provide certification to those officers and NCOs able to demonstrate required competencies. Programs of Instruction are now being developed for officer and NCO requalification to recertify proficiency in tactical and technical skills. In addition, action is underway to develop career patterns for officers and NCOs which will reinforce the need for tactical and technical standards of excellence. When fully implemented, these programs will be used to provide units with trained, certified (warranted) individuals on a timely basis.

Training. Training bonds all the components of unit viability. As evidence of the importance of training, the Commander, TRADOC, has set training as the highest priority to guide the efforts of the integrating centers and service schools. We, at the Home of Armor, intend to be second to none in meeting this obligation.

The increase in battlefield capability, due to receipt of new technology and doctrine, creates new and difficult training challenges. It is only through effective training that units actualize the enhanced fighting capabilities of our new materiel. To meet this challenge, we are making evolutionary changes in the way that we train Armor and, in turn, CCH. To accomplish this, we have developed (and are now validating) improved tank system proficiency tables for gunnery based on the requirement to make full use of our new tank and cavalry capabilities. These tables allow us to take advantage of the superb capabilities provided by the multipurpose ranges and improved training devices such as the Unit Conduct of Fire Trainer. In addition to revising FM 17-12-1/2/3 to incorporate tank tactical tables and the developing of state of the art training devices and simulators, we have published ARTEP Mission Training Plans (AMTP) for platoon, company/team, battalion/task force, and scout platoon which outlines "a way" to train in units.

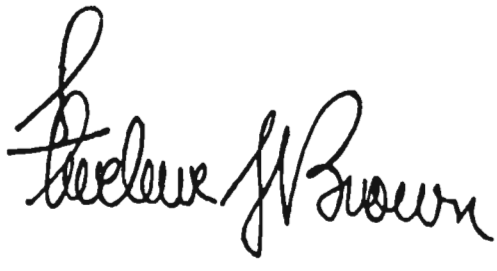
Consistent with the guidance of the Chief of Staff, we are continuing our efforts to develop and refine standardized ways to train both here at Fort Knox and in the units. Standardized vehicle load plans, main gun calibration policy, crew drills, and standing operating procedures (SOP) are the first step. Standardized recommended training strategies, as expressed through the Standards in Training Commission (STRAC), is another. These strategies are now being tested and refined so as to accurately reflect the ability of the unit to implement and will include prescriptions for the use of substitution, simulation, and miniaturization in order to conserve precious ammunition assets.

Leadership. I have previously devoted a full Commander's Hatch to the issue of Armor Force leadership. The fundamental obligation to know, practice, and apply basics of our branch is the very foundation on which we develop and sustain our units. The development of leadership depth in training yourself and your subordinates while reinforcing the chain of command is the very essence of what I am talking about.

Putting It All Together

In my view, the overall goal of the Armor Center is to assist all of the Armor community in ensuring that viable units capable of meeting and defeating the Threat are fielded and sustained. It simply isn't enough to develop pieces of unit viability without looking toward total systems fielding and sustainment. I see our role as one which assists the chain of command and unit leadership by exercising three primary responsibilities:

- The branch chief supports the chain of command to provide insights and advice which derive from the specialized knowledge of the branch center. I remain personally committed that the Home of Armor exists to serve the interests of the total Armor force as a leader within the combat arms.
- The branch chief interacts at MACOM and DA levels to pursue resolution of systemic problems identified within the force. In this effort, it is essential that we all work together in pursuit of this common goal.
- The branch chief corrects deficiencies uncovered in his own operations and coordinates with other proponents to ensure that the total needs of the force are met. I can assure you that this is of primary interest to all elements of the Armor Center. We will continue to work toward the goal of setting an example for the force.



DRIVER'S SEAT

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

First Impressions

We have constantly emphasized to soldiers that their appearance plays a very important role in the gaining unit's perception of what caliber of soldier they are receiving. The soldier who wears his uniform properly, with emphasis on attention to detail, demonstrates his desire to excel. An exemplary appearance also relates to the soldier's desire to sustain basic proficiency. When such a soldier reports to a unit, that unit can be sure that it has received a highly-motivated, competent soldier who is ready to excel.

However, there is another "first impression" that must exist before the soldier and the unit can obtain full confidence in each other's ability. That first impression is the one the soldier gets of the *unit*. We provide good sponsorship programs for our soldiers—transportation, orientations, Army Community Services, and other community and organizational services. But, does the unit possess those basic attention-to-detail standards that readily identify it as a competent professional organization?

Remember, the majority of soldiers reporting to a unit will have 1 to 3 years' service and have been required to live in military billets on military installations. They have been taught, through a succession of training cycles, how to conform to standing operating procedures and squad, platoon, and company inspections, which were once very difficult tasks for them, but are now routine.

The first 1 or 2 weeks that the soldier spends in the unit tells him many things. The first is "Do I belong to a unit that cares?

There are many ways to identify whether or not an organization cares for its soldiers. The introduction of the immediate supervisor and the speedy establishment of a "you belong" relationship with the crew or squad are *musts*. The immediate assignment of a bunk and wall locker to establish the soldier's presence must be made. If you require a soldier to live out of a duffle bag for a week, or even a couple of days when it's not necessary, you not only have one disgruntled soldier, but the unit's other soldiers also become disgruntled. New soldiers also expect to receive standardized procedures on how the area must be maintained, and that standard must be readily available to them. At the start of inprocessing, have incoming soldiers answer the following questions:

- How long were you in the unit before you were assigned a sponsor?
- How long did you wait for a wall locker?
- Were you immediately assigned to a crew or squad?
- Did you immediately receive the SOP for standardized wall locker and area display requirements?

If the unit knows that the answer to these questions are of special interest to the senior commander and the command sergeant major, deficiencies, if any, will quickly disappear.

The appearance of the organization is as important to the new soldier as the soldier's appearance is to the organization. The soldier expects attention to detail in the everyday house-keeping because that is what he has been taught. He expects clean rooms and clean common areas that require the assistance of the entire unit. Just because we do not live in the common areas does not mean we do not use them, especially hallways, latrines, and dayrooms, etc. Any facility that is not monitored for missing screws, leaking faucets, broken windows, faulty door locks, etc., will quickly deteriorate. Soldiers who know they have to maintain their billets to a high standard take better care of the billets. Billets that are maintained properly add greatly to the morale and *espirit de corps* of the organization.

The outside area is as important as the inside. The police and maintenance also require the same attention to detail to achieve the desired high standards. Maximum efforts must be made to ensure that the soldier's first impression of his organization is one that he can be proud of—an organization that demonstrates its desire to want every soldier to belong to it.

The first formation the soldier stands in the new unit also gives him a vivid picture of whether or not he is in a professional organization. The newcomer wants to see highly shined shoes, polished brass, and properly fitted uniforms—that is what he has been taught to expect. The absence of attention to detail by his peers and supervisors in wearing the uniform can be very disheartening. Furthermore, a formation that is not conducted in accordance with FM 22-5 has a strong negative effect because the new soldier has spent much time and effort to learn the right way.

Finally, a soldier expects to be marched to the motor pool or wherever the work assignment is located, and he expects his "chain of support" to march with him.

We must understand that first impressions carry beyond the first meeting. First impressons establish attitudes that are the basic foundation of the discipline, proficiency, and combat readiness of an organization.

(CSM John M. Stephens assumed his new duties as Command Sergeant Major of the U.S. Army Armor Center in August. CSM Stephens was previously commandant of the NCO Academy/Drill Sergeant School at Fort Knox, Ky. Ed.)

MASTER GUNNER'S CORNER

Captain Mark W. Kennedy
Weapons Dept.
USAARMS, Fort Knox, KY

Reserve Component Tank Commander's Course

A pilot Reserve Component (RC) Tank Commander's Course that was developed solely *by* and *for* the RC was conducted for the first time at Gowen Field, Boise, ID in September 1983.

The course is designed to accommodate eight three-man groups, with an assistant instructor (AI) and a driver assigned for each group when they man a tank. The 3 to 1 ratio of students to AI is important because 75 percent of the course consists of hands-on instruction. The POI also emphasizes the need for TCs to train their crews with "hip pocket" instruction by requiring each student to conduct a 30-minute class during the course.

The first class began on 10 September when Lieutenant General David E. Grange, Jr., Commander, Sixth Army, spoke to the cadre and the students about the importance of the course and the fact that *it was to be taught by RC members.*

A day-by-day account of the pilot course activities follows.

During the first day, a 50-question diagnostic test covering primarily skill levels 1 and 2 was administered. This identified student weaknesses and enabled the cadre to mix weaker students with stronger ones when making up the tank crews.

The first day also included the first class on maintenance forms and records. Crew assignments were announced, and the crews linked up with their AI's.

As a point of interest, the primary instructors were up until 2200 hours the night before, working in the Learning Center to clear up any problems or misunderstandings that might arise the following day. The students were at the Learning Center as well, going over field manuals, technical manuals, and Training Extension Course tapes.

The second day's training consisted of preventive maintenance checks and services on the *M60* tanks, and a class on the armament controls and equipment (AC & E).

More time than was initially scheduled for AC&E was needed, so all of the third day and most of the fourth day was devoted to this phase of training, and a briefing on the *M219* coaxial machinegun, with a crew drill, rounding out the fourth day.

During the fifth day, the crews were required to load, unload, clear, disassemble, assemble, conduct a function check, and perform immediate action on the *M85* .50 caliber and *M219* machineguns.

The sixth day was devoted to range estimation and conduct-of-fire exercises. This was followed by a 2-hour practical exercise in range estimation and completion of a 6-hour Tank Crew Proficiency Course (TCPC) on the seventh day.

The schedule for the eighth day was modified to provide more time for more TCPC training, with half the crews completing the TCPC in the morning while the other half worked with gunnery training devices. The sequence was reversed for the afternoon hours.

Commander's time on the ninth day was used to review material presented up to that time.

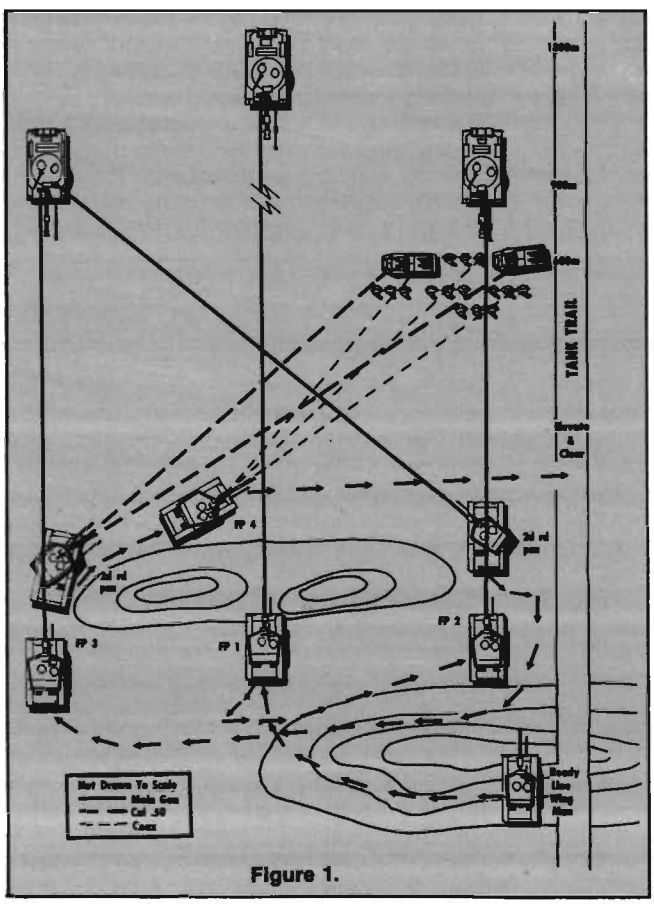


Figure 1.

During the 10th day, the crews conducted prepare-to-fire checks and weapons calibration, and made at least two dry runs to prepare for the live-fire exercise. The day concluded with instruction in auxiliary fire controls.

The live-fire accuracy screening tests of the fire control system calibration were completed so quickly on the eleventh day that more time was made available for additional dry runs and for setting up range card positions on the range.

During the night hours of the 11th day, the crew reoccupied their range card positions and used their range card data to engage targets *without* illumination. Also, each man rotated through the positions of TC, gunner and loader for both day and night firing exercises.

Due to range restrictions, the daylight live-fire battle run scheduled for the 12th day had to be modified to a tactical tank table (table 1) developed by Sergeant First Class Richard Wagner. The table was based on Sergeant Wagner's experience at the National Training Center, Fort Irwin, CA and used the wingman concept to assist the firing tank in adjusting fire. This modified table combined gunnery with tactics by having each crew defend a piece of terrain (figure 1). The TC was scored on his ability to move as well as fire his tank.

When the firing tank came on the range, the TC requested permission from the tower to negotiate the course and never contacted the tower again unless he encountered mechanical problems or to report completing the course. The TC gave the only fire commands, while the AI ensured that safety regulations were followed and also scored the crew's performance.

As the tank approached firing position 1, the gunner was required to clear a lava rock mask to enable the TC to engage the target by using his override. The first round gave a good visual indication as to whether the gunner had properly used his *M105D* telescope to clear the mask because, if he had not, a cloud of dust arose and the round was obviously LOST.

At position 2, the TC moved his tank into a hull-down position and used his override to engage the right-hand tank. He then moved forward somewhat to engage the left-hand tank. This technique enabled him to fire at his first target without being threatened by the second .

After moving to firing position 3, the same procedure was used except that the gunner fired at the left-hand tank first, then at the right-hand tank. While the tank on the right was being taken under fire, the TC engaged the BRDMs with the caliber .50 machinegun.

The firing table was completed at position 4 where the TC engaged a troop target with the coaxial machinegun, using his override.

As soon as the firing tank's crew cleared and elevated all weapons and moved the tank off the range, the wingman tank on the ready line began its run as another tank took up the wingman position.

Even though the firing engagements were scored, a GO was not a requirement for graduation. The primary purpose of the course was to give the students the opportunity to apply the skills and knowledge they had gained in the classroom and to negotiate a rather difficult live-fire run down range that emphasized survival by using fire and movement.

On the 13th day, a 100-question final examination and the tank crew gunnery skills test were administered to the students.

Equipment maintenance and turn-in was completed on the 14th day and the course ended the following day with a graduation ceremony.

The success of this pilot TC course is attributed to the professionalism and enthusiasm of the instructors and the eager, willing-to-learn, attitudes of the students, as well as the hard work by the support troops and the leadership of the headquarters element. Additionally, Master Gunners were considered to be ideal instructors. They were able to pass on vital information to the TCs on how to fight their tanks, which equates to *combat survival.*

Table 1. Tank Commander's Battle Engagements

(Tasks 1-4—day Tasks 5-6—night) Student TC_____

Task	Condition	Ammo	Standards		
			Time	AI Notes	Rating
1 Engage one hull-down T-62 at 17-1,900 m	Precision. From TC's station from hull-down position. (Gunner clears terrain mask with M105D periscope.)	2 TPDS	GO. Hit target within 15 seconds. NO GO. Miss, or hit target after 15 seconds.	Index mechanical stop.	
2 Engage two T-62s at 800-1,000 m	Battlesight. From TC's station. Use vehicle movement to engage one tank at a time. Back immediately after second round is fired.	2 HEAT TPT	GO. Hit both targets within 40 seconds. NO GO. Miss one target, exceed 40 seconds, or fail to back immediately.	Prepare for battle. Load and index HEAT.	
3 Engage two T-62s at 800-1,000 m and two BRDMs at 650-850 m	Battlesight. Simultaneous engagements. (Gunner fires main gun. TC fires *M85.*) Back immediately after second round is fired.	2 HEAT TPT 100 Cal .50	GO. Hit all targets within 40 seconds. NO GO. Miss one BRDM, exceed 40 seconds, or fail to back immediately.	Prepare for battle. Load and index HEAT.	
4 Engage infantry platoon at 650-850 m	From TC's station while moving. No gunner assistance.	200 coax	GO. 4/5th coverage within 15 seconds. NO GO. 3/5th or less coverage, fired from the halt, or exceeded 15 seconds.	Exercise is fired on the move.	
5 Engage one T-62 at 800 m	Use range card data. From gunners station.	1 HEAT TPT	GO. Hit target within 10 seconds. NO GO. Miss, or exceed 10 seconds		
6 Engage one T-62 at 1,200 m	Use range card data. From gunner's station.	1 Heat TPT	GO. Hit target within 10 seconds. NO GO. Miss, or exceed 10 seconds.		

Ratings: Distinguished—6 GOs. Qualified—4-5 GOs. Unqualified—3 or less GOs

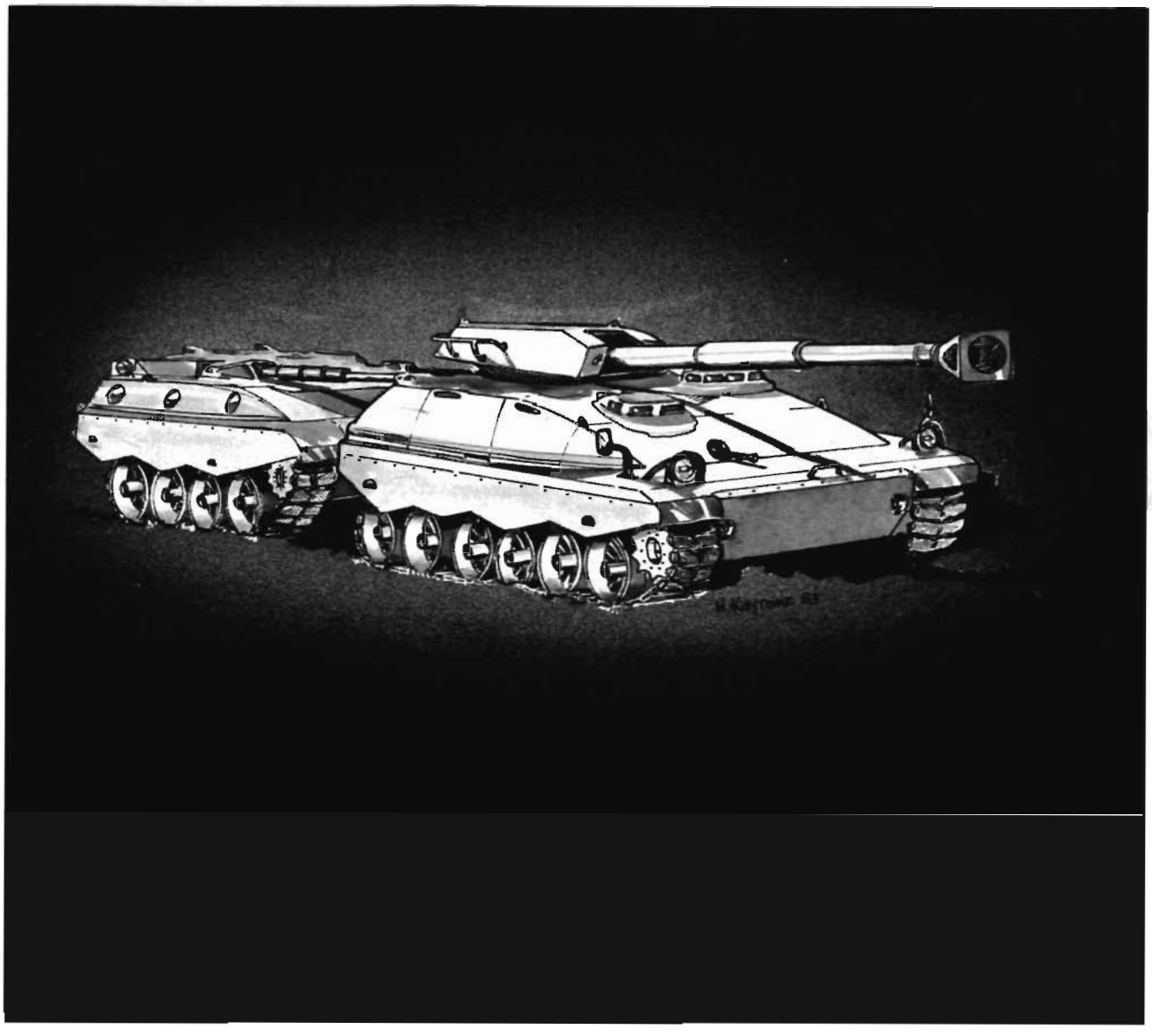
For additional information contact:

The Directorate of Training and Doctrine
U.S. Army Armor Center
ATTN: ATZK-TD-CD (CPT Crevar)
Fort Knox, KY 40121
Autovon 464-5430
Commercial 624-5430

RECOGNITION QUIZ

This Recognition Quiz is designed to enable the reader to test his ability to identify armored vehicles, aircraft, and other equipment of armed forces throughout the world. *ARMOR* will only be able to sustain this feature through the help of our readers who can provide us with good photographs of vehicles and aircraft. Pictures furnished by our readers will be returned and appropriate credit lines will be used to identify the source of pictures used. Descriptive data concerning the vehicle or aircraft appearing in a picture should also be provided.

(Answers on page 50)



Task Configuration for Fighting Vehicles

by Richard E. Simpkin

Two years ago I proposed a modular construction for armored vehicles and closed by flying a kite about "task configuration" — a term pitched into the discussion by your editor. As I see it, "task configuration" means *the ability to optimize the structure and equipment of a task force, formation, or combat team for a particular campaign, operation, or mission.*

The First Leap

On the technological side, the first leap you have to take leads to a tank successor with an external gun, crew-in-hull layout, like some of Cliff Bradley's concepts, the Swedish *UDES 40,* and my own ideas (so excellently interpreted by one of *ARMOR's* artists, Mark Irwin).[1] It then becomes thinkable to base an armored vehicle *family* on the modular construction indicated in figure 1. In further thoughts on the technical aspect[2], I reasoned that this full modularization might be overly extravagant in weight. Given certain design precautions to ensure ease of replacement of the automotive subsystems, elements 1-3 of figure 1 could be combined to produce a hull unit analogous to the standard cab-chassis unit of a family of trucks. As we will see, to give the concept its full scope, in particular, to exploit the "double articulation" development of the Swedish *UDES XX 20,* three levels of modularization are needed: factory modularization for the production of short, standard, articulated hull units; base modularization to obtain maximum flexibility from a limited inventory, and field modularization to allow the exchange of interface and functional modules (elements 4-5 of figure 1) on each of these types of hull unit. For far-flung friends of the wheel, I would point out that both modular construction and the family concept below are valid for either wheels or tracks, but *not* for a mix or for interchangeability

between tracks and wheels.

Advanced technological studies of armored vehicles for the nineties have combined with geopolitical and military trends to spark radical thinking both on strategic mobility, in the context of a mechanized rapid intervention force, and operational mobility[3], [4], this by way of airmechanization. As we will see, it is at the end of long air or sea lines that the notion of task configuration comes into its own. So as the basis for my comprehensive modular family, I am going to assume a maximum individual load of 15 tons and a maximum width of 2.8 meters. This is compatible with nineties transport aircraft, with the derricks of many heavy lift ships and, by a reasonable extrapolation from *Chinook* and Soviet *Hook* helicopters, with the slung or clip-on load capability of future heavy-lift helicopters (HLHs).

Possible Tank Successors

If my argument is not to founder on controversy before it sets sail, I must digress at this point with a brief discussion of the tank successor. As I have discussed elsewhere[5], [6], a crew-in-hull, light mobile protected gun *(LMPG)*, — mounting, say, the Rheinmetall 105-11 gun (a lightweight development of the NATO 105-mm L/51 tank gun) — is definitely to be had at 15 tons. Likewise, an external gun tank, mounting the German 120-mm or Soviet 125-mm smoothbore, or even the Soviet 130-mm rifled gun, could be fielded at as little as 20 tons. But a growing body of evidence and opinion suggests that Sven Berge and his colleagues have got their homework right again, and that a tank of this kind with a maximum indivisible load of 35 to 40 tons *(UDES 40)* represents an excellent payoff point in terms of a tank with a really worthwhile level of direct protection against the future antiarmor threat. This makes the tank unique, putting it outside the comprehensive modular family and the effective scope of airmobility. I leave the reader to weigh this against the alternate solution below and to decide for himself whether a unique military load classification 40 (MLC40) tank is justified.

The Comprehensive Armored Vehicle Family

Table 1[7] and figure 3 speak for themselves. In terms of factory modularization, we can envision the standard hull as designed in four modules. The front two sections, forming the crew/automotive pod (figure 3a-b), are common to the standard and short

Table 1. A comprehensive armored vehicle family

SHORT	STANDARD	EXTENDED
reconnaissance or fire support (cannon)	light mobile protected gun (LMPG)	tank destroyer, gun (TDG)
	medium air defense systems	
tank destroyer (missile (TDM))	INFANTRY SQUAD VEHICLE	armored vehicle launched bridge (military load class 40)
(?) light air defense artillery (gun)	command or support vehicle (includes armored variant)	armored self-propelled and rocket artillery hulls or carriages
surveillance sensor platform	mortar vehicle	heavy air defense systems (launchers and radars)
	command, control, and communication; artillery command post; ambulance shell	
	armored engineer vehicle	heavy support weapons
	armored maintenance and recovery vehicle	
	forward ammunition support vehicle (FASV)	(?) heavy armored reconnaissance vehicles
10 t ±	15 t ±	30 t ±

subfamilies, with standard mountings to accommodate the role-oriented electronics, also in modular form. The rear module, corresponding roughly to the idler and rear roadwheel station and having a strengthened rear section to support the magazines of weapon platforms, long payloads in cantilever, and the front articulation assembly of the extended vehicle, is likewise common to all standard and short variants. The center module corresponds to two roadwheel stations in length in the standard subfamily, and to one in the short. The longitudinal rigidity of this modular hull is an evident problem that should prove amenable to expert structural design.

Looking next at the field modularization of the standard and short subfamilies, we see that these two hull units cannot be broken down and are thus not interchangeable, although they will have virtually 100 percent logistic commonality. Table 1 shows that the short version is required to accept only functional modules of platform configuration for weapons or sensors (figure 1, (5) upper). Even if the mechanical interface is identical, each of these functional units is likely to require its matching interface panel to link up the role-oriented electronics to the dedicated packs in the crew compartment (figure 1 (4)). I see no reason why these short role-oriented modules should not also be compatible with the standard hull (though *not*, of course, *vice versa*).

By contrast, the standard hull unit must accept both platform and box-body type functional modules. It is essential both to restorability and to the idea of task configuration that all standard hull units will accept either category of functional module and its associated interface panel. This means, as hinted at in figure 1, that the internal physical configuration of the interface panels may differ widely. As just mentioned, it is desirable, and probably feasible, for the standard hull to accept short functional modules and interface panels. Looking at the box-body variants (table 1, center column below double line), we see that field modularization can be carried one stage further (as it already is in some armored personnel carrier (APC) families) by a functional module made up of a standard armored shell that accepts plastic liners pre-equipped with dedicated installations for the various communication, command, and control (C^3), combat support, and service support roles. This technique greatly reduces the financial and logistical cost of the numerous variants of this kind, and is itself a major step toward task configuration.

With the exception of the tank destroyer gun (TDG), the extended subfamily does not require thickened

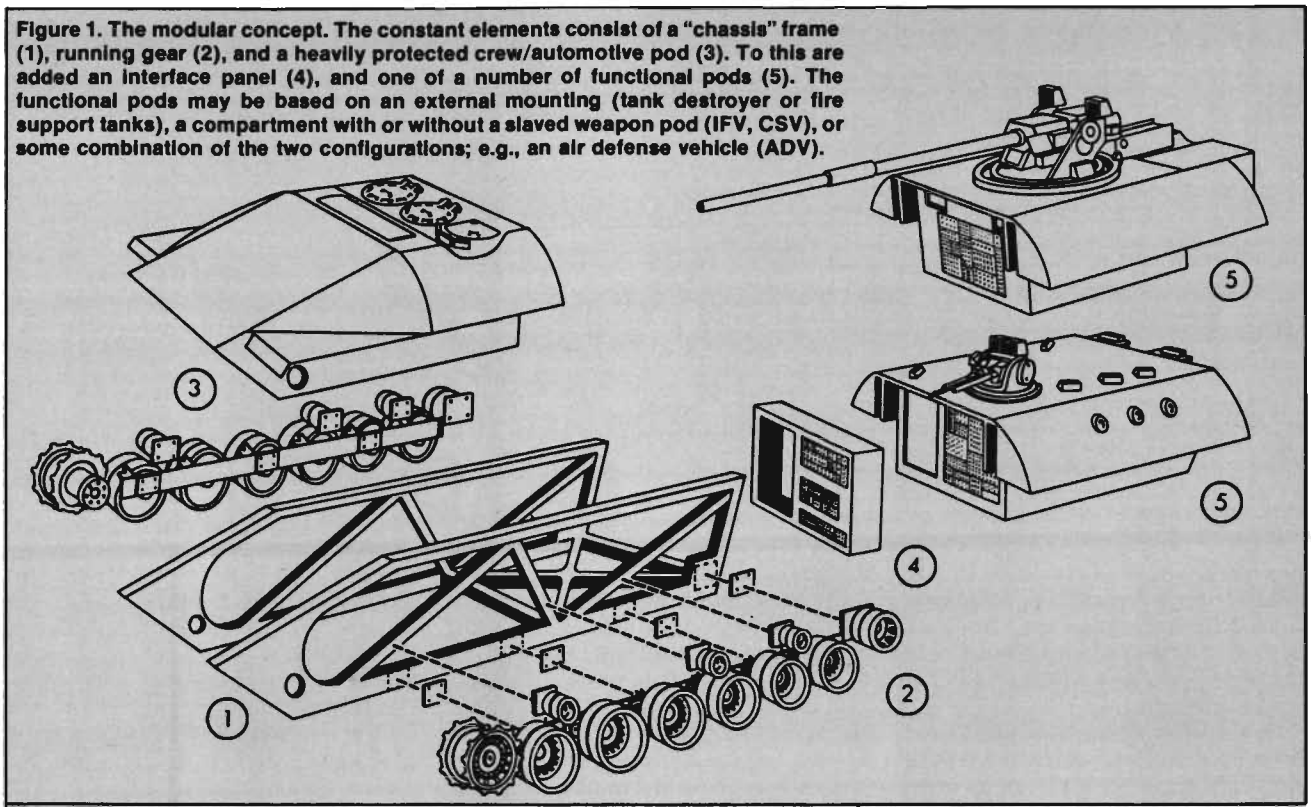


Figure 1. The modular concept. The constant elements consist of a "chassis" frame (1), running gear (2), and a heavily protected crew/automotive pod (3). To this are added an interface panel (4), and one of a number of functional pods (5). The functional pods may be based on an external mounting (tank destroyer or fire support tanks), a compartment with or without a slaved weapon pod (IFV, CSV), or some combination of the two configurations; e.g., an air defense vehicle (ADV).

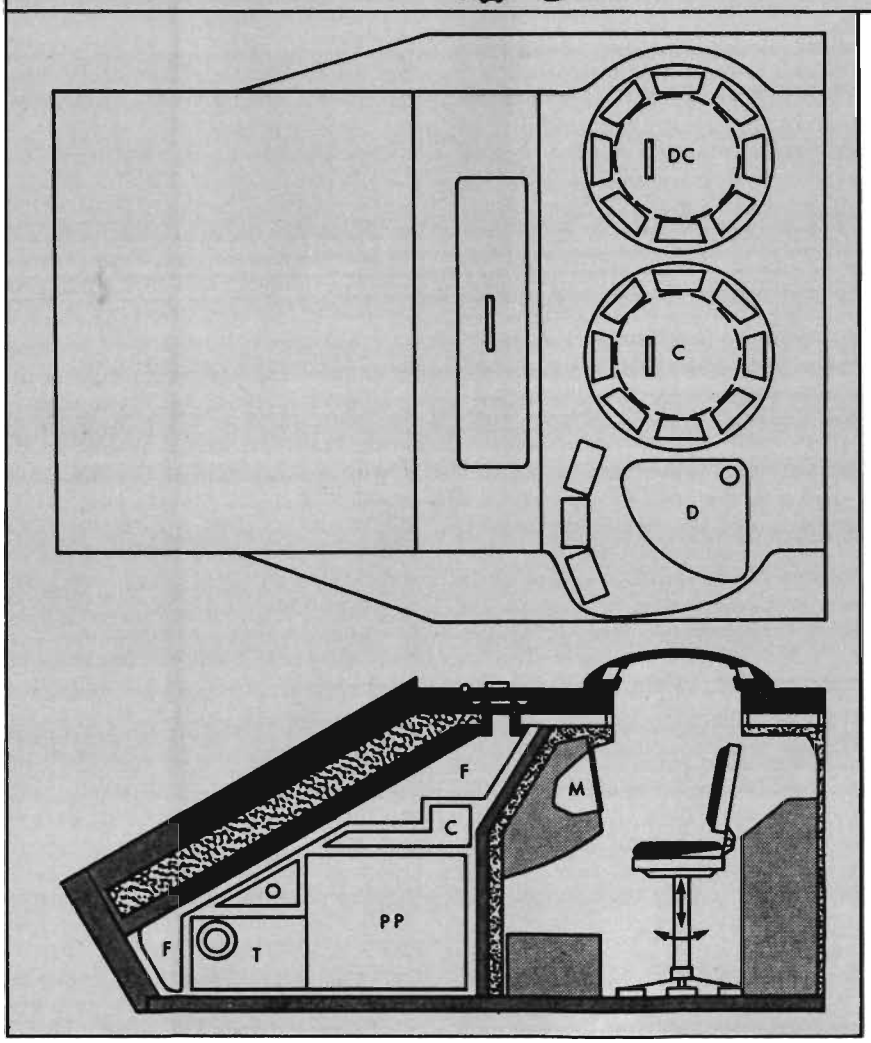


Figure 2. (left) The automotive crew pod. The power train at the front forms part of an integrated compound armor system. The hatched sections are armor steel plates or castings, the heavy outline in a compound array that includes the area with zigzag shading. The stippled rear element is a lining of boronated polyethylene (or such). The crew of 3 is seated in line — D, driver; C, commander; and DC, deputy commander (see text). The optical arrangements indicated for stations C and DC are secondary vision systems, the main input for the optronic sighting vision system coming from multisensor heads at the highest point of the vehicle via an image processor to a monitor (M). The open areas are: F, fuel, O, oil; C, coolant; T, transmission; and PP, powerplant. The shaded areas in the crew compartment are housings of electronic/electrical packs, controls, etc.

frontal armor. Until the driver can be provided with true binocular television — a somewhat intractable problem[8] — he must be at the front; and there are very strong psychological arguments against isolating the crew from one another.[8] Sure, a number of analysts, such as Joe Backofen, formerly with Battelle Columbus Laboratories, and a school of thought in Sweden, favor a rear crew compartment — despite vigorous user opposition. But the bulk of my discussions with the Swedes, and some paper studies of cross-country situations I have carried out, support a forward crew compartment. At least as long as

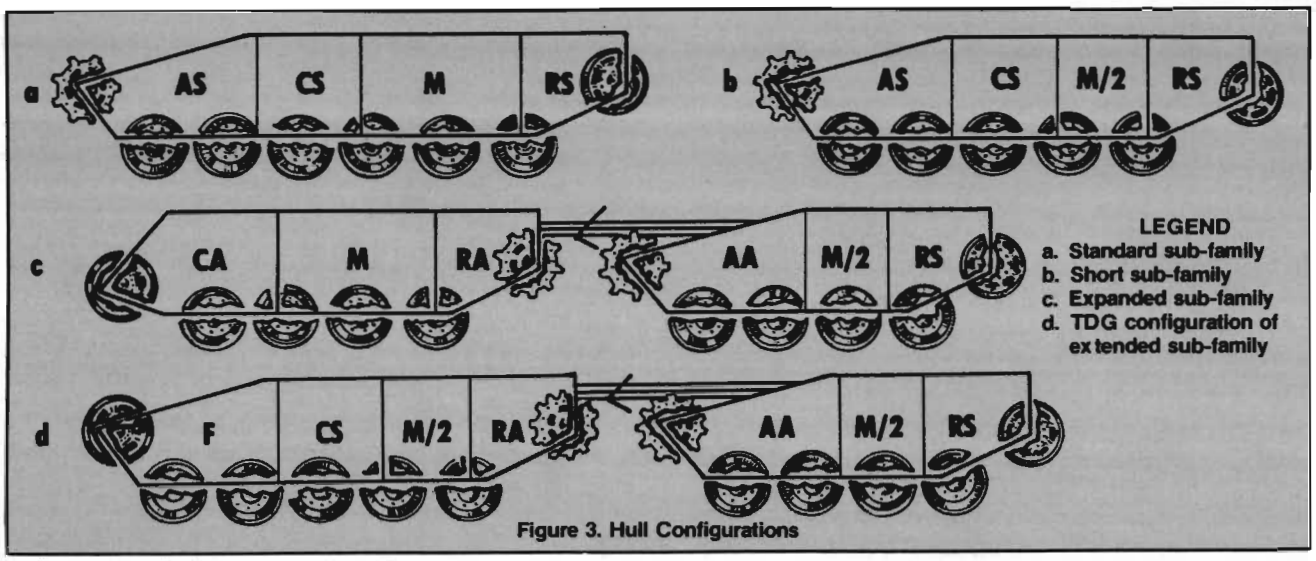


Figure 3. Hull Configurations

hydromechanical (as opposed to electrical) transmissions are employed, space saving dictates that the final drive of the forward unit should be at its back end, adjacent to the rear automotive unit.

Thus, the crew compartment module, with a vertical external plate carrying brackets for the idlers faced up to its front bulkhead, forms the front of the forward unit (CA, figure 3c), backed by a standard center module (M). The unit is completed by a rear module of standard structure but with the rear section (RA), which must in any case be strong enough to support magazines and the like and carrying an assembly that comprises the driven end of the articulation.

The rear unit of the train again consists of three modules. At the back is a standard rear module (RS, figure 3c), with a short center module (M/2) forward of it. At the front is an automotive module (AA) in which the upper front armor array is replaced by an assembly, squared off up to hull roof level, containing the power takeoff and the driving end of the articulation. As in the Swedish project and heavy semitrailer practice, the "dead" unit would be provided with minimal automotive power to facilitate handling. (I don't want to probe the technical aspect deeper at this time, but one might mention in passing the great advantage offered by electric transmission for the entire modular family.)

This configuration (figure 3c) divides the payload into two parts. Most of the weight and armored volume is in the same unit as the crew. This is essential to keep data transmission systems and control linkages, which may be very complex, within the bounds of realism. The spare space in the rear unit, either as it stands or with the aid of a subsidiary functional module, is used for all detachable stores associated with the payload (including reserve ammunition), for the amount of fuel carried in the sponsons of the short and standard hulls, and for the bulk of the general vehicle and crew stowage. On ballpark figuring one might achieve a main payload of 7 to 8 tons, with a further 4 to 5 tons available in the rear unit, around 12.5 tons in all.

I looked at the option of a crew/automotive forward unit and a load-carrying rear unit, but this entails sacrificing a third of *total* payload weight and around a fifth of *total* volume/platform area for no gain in undivided weight and a gain of less than one quarter in undivided volume/platform area. In this discussion of the extended subfamily, I have, of course, been considering factory modularization; field modularization would be confined to interface panels and to main (front) and subsidiary (rear) functional modules.

The need for a TDG only arises if the combined antiarmor firepower of the LMPG and the tank destroyer, missile (TDM) is inferior in a tactically critical degree to that of the MBT/TDM combination; or if a unique *MLC40* MBT is regarded as too expensive despite its combat worth. Although a relatively short-term project, the Swedish *UDES XX 20* provides a general guide. As far as I can see, the TDG would be something of a tradeoff with field modularization confined to replacement of battle-damaged functional modules. Briefly, the rear unit would be identical with the rest of the extended subfamily, the payload space in it being used to relieve the front unit of all possible weight and to carry a re-charge for magazines of deliberately restricted capacity. As I see it, the front unit (figure 3d) would need to be of the same length as the short subfamily. The crew and short center modules would be standard (CS and M/2). Special strengthening would be needed for the rear module (RA), which must now support both magazines and the driven end of the articulation. The shell of the front module (F) could be standard apart from an idler mounting fitted into the final drive hole. Inside, this module would be stripped out down to the subframe and used to accommodate the electronic packs normally carried in the (full-length) center module. The upper front armor would be standard, but I guesstimate there would be enough weight available to provide a useful amount of supplementary direct protection, in passive or dynamic form, to the roof and sides of the crew compartment.

Finally, under this head, the logistic advantages of using a common power train (for instance that of *M2 Bradley*) and common running gear assemblies needs no stressing. Each subfamily requires a different final drive ratio. Given this, the power-to-weight ratios, nominal ground pressures, and steering characteristics of the three subfamilies are excellently matched to their respective groups of roles.

User and Logistical Advantages

Given careful design, two-thirds or three-quarters of the hardware's unit cost and at least 60 percent of the maximum indivisible load of short and standard variants will be contained in the hull elements discussed above. Thus the carriage of reserve functional modules, interface panels, with role-oriented electronic packs in the logistic train, becomes in itself attractive, in terms both of inventory

cost and of sea, air, and road lift. Functional modules would weigh between 4 and 8 tons; together with the ancillaries, they could be carried on normal logistic vehicles and exchanged by crane or by horizontal body-swapping techniques.

On arguments already developed in your columns[1], the functional modules of direct-fire weapon platforms are at much higher risk than their hulls. Thus, the first payoff in terms of combat worth, which I believe should remain the cornerstone of the comprehensive family concept, is "restorability"[1] of battle-damaged vehicles by replacement of the functional module — the complete mounting of an external gun LMPG, for instance. The second advantage, particularly important in long line intervention, is the ability to keep key functional modules, such as guns, or C^3 installations, in service when their hulls suffer battle damage or severe mechanical failure. A less important functional module on a serviceable hull can just be dumped until another hull or a logistic vehicle is available to pick it up. For that matter, some C^3 and service support modules could operate on a logistic vehicle chassis in an emergency.

Task Configuration Implications

All my studies over the past 6 years have indicated the need for an integrated combat arm.[9] Although Fort Knox's recommendation on this subject was rejected for the U.S. Army's Division 86 structure, I and many others are convinced that all advanced armies will take this step in the end. And a single comprehensive armored vehicle family would destroy most of the rational arguments against integration. I stress this because an integrated combat arm is a prerequisite to full exploitation of task configuration. My discussion of this aspect will be based on a composite battalion of the kind indicated in figure 4.[10] But let us next take a first and less conventional bite at this rather bitter cherry.

Force composition. The British, French and U.S. armies are very familiar with the problems of mounting a force for a specific intervention operation or for a sustained campaign in a theater with some kind of extreme conditions. (The Soviet Army, incidentally, is paying a very high price in Afghanistan for its lack of familiarity with this problem.) If a cadre of officers and noncoms with relevant experience exists, and is given proper scope, the orientation, acclimatization and training of officers and men, as well as structuring of the force, can be achieved within weeks or at worst months. The stumbling block is equipment.

Even in the medium technology fields, modern military hardware is too complex and too heavily engineered to offer a sound basis for improvisation. On the other hand, an attempt to hold a comprehensive range of dedicated complete equipments for unlikely contingencies would result in prohibitive capital and running inventory costs. Holding enough functional modules to ensure flexibility is a very different story under both capital and maintenance heads. Thus, given commensurate rationalization in other fields, a modular combat vehicle family of the kind I proposed above would allow an intervention force to be equipped from stock in a way that precisely matched its needs. By the same token, the need for equipment-oriented retraining would be minimized. I guess most readers would agree that the availability of a purpose-designed mix of major equipments, and the direct logistic savings arising from commonality and modular construction, combine to put a new look on inter- and intra-theater airmobility—indeed on strategic mobility and long-line intervention in general.

Regrouping in the field. What your editor and I earlier had in mind, though, was tactical regrouping in the field, specifically changing the "tank-infantry" balance. A balanced composite unit of the kind depicted in figure 4 roughly equates, in combat worth, to a tank battalion *plus* a mechanized infantry battalion. It was in fact designed to split into two balanced combat teams, or one tank-heavy and one infantry-heavy team, if required. The reader will see that it can do this from its own resources. Likewise, combat teams of the required balance can be formed by company-level regrouping from a balanced force of conventional tank and infantry battalions. But even supposing a company headquarters to be capable of handling a company of the other kind, a change in the first line balance of the force as a whole can only be achieved by backloading tanks with their crews, or IFVs with their squads, and bringing forward manned vehicles to replace them. I cannot help feeling that a tank company made up of a mechanized company headquarters and reinforcement crews would be likely to astonish the enemy rather than surprise him. And the same and more goes for an *ad hoc* mechanized company.

Given the progressive training system within composite platoons which I envision for an integrated combat arm[8], [10], it would be feasible for a composite battalion (figure 4) to go at

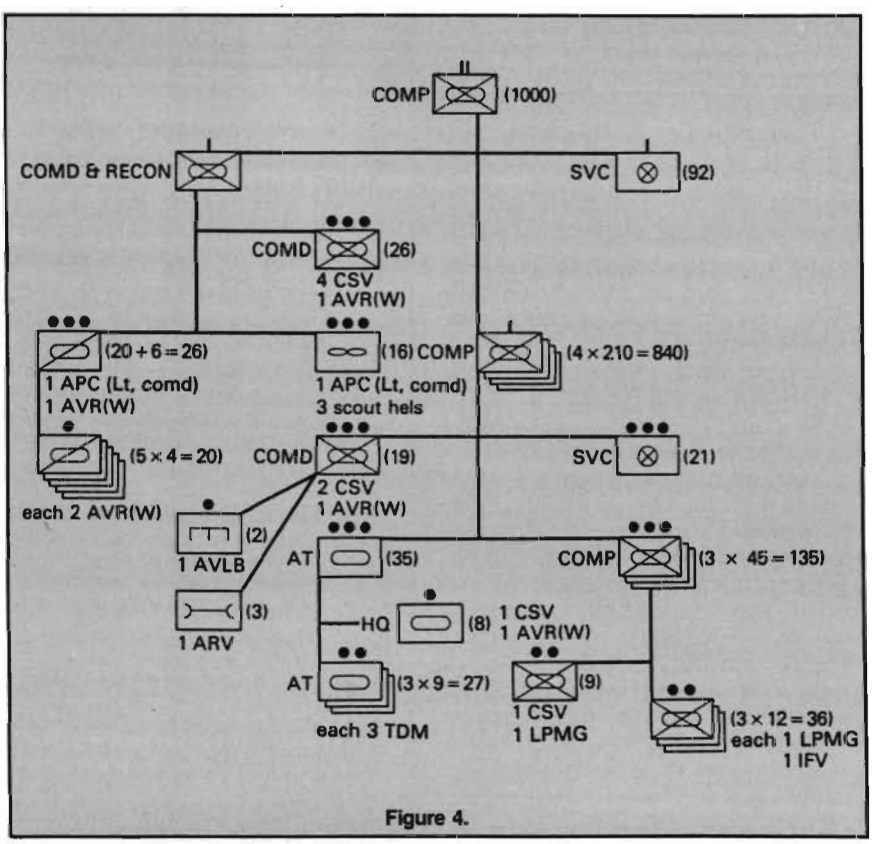


Figure 4.

least 2-to-1 LMPG-heavy (tank-heavy) by giving an LMPG to each deputy LMPG commander, and filling the deputy deputy commanders' (gunners') seats[1], [8] with the trained soldiers in the squad next in line for crew. For a 3-to-1 tank-infantry ratio, this would call for the exchange of 27 functional modules (IFV for LMPG), and would reduce the infantry strength by 162 men. This is thinkable on a limited scale, since the men released might well be required as individual replacements for casualties within the force.

The more probable requirement for going infantry-heavy would entail the converse exchange of functional modules. Again, given the progressive integrated training system, the LMPG crew would be capable of providing the mounted crew and squad commander of the IFV. With a section of two IFVs, two squads or, on latest USMC and infantry thinking, four fire teams, half an existing squad (one fire team) could be switched to stiffen the new IFV load, the new intake being divided between the two IFVs of the section. I guess most readers would consider this an acceptable wartime expedient; many will have experienced or witnessed more extreme disruption brought about simply by losses.

In realism, though, all this runs counter to man-management based on "tribal" relationships and the regimental tradition. In particular, it brings us right back to the brutally familiar problem of how to hold relief and reinforcement of armored vehicle crews well forward yet in reasonable safety. One would almost certainly be forced to adopt the principle of vehicles and personnel staying and moving together. Reinforcements could only be used for restructuring as a very short-term expedient; in any event, they may not be available for this purpose. By the same token, manned reserve functional modules could not be exchanged with damaged modules on fit hulls and crews. This slice of manpower and equipment would be far better placed in coherent, balanced, integrated combat arm units to start with.

Conclusion

Adoption of a modular concept for AFV design would be likely to entail a weight penalty, from known analogies of probably around 5 percent. (The 10 percent weight penalty of articulation would be superimposed on this.) Against this, one must set substantial savings in inventory costs, logistics costs and logistic lift. To my mind, the key argument for a degree of modular construction is "restorability,"[1] the ability to offset attrition very quickly by replacing battle-damaged functional modules on fit hulls with fit crews — even more maybe, the saving in crew casualties that the "restorability" concept offers.

A comprehensive modular armored vehicle family looks to offer a dramatic payoff in flexibility at base level. For a tolerable inventory cost, a task-configured force could be equipped within the time needed to establish and train it. Task configuration saves manpower, increases combat worth, and drastically reduces the lift needed both for deployment and for subsequent logistic backup. In some theaters where there is an absolute limit on a key commodity like water or a key facility such as port or airfield capacity, task configuration could make the difference between the ability or inability to mount the operation.

At factory level, the economics of modularization would turn on production techniques, notably methods of production control, and on the size of the total production run. Certainly automated control and robotized lines favor modular design. In a long war, modular design would greatly ease both innovation and the tuning of production programs to changing needs.

Within a theater, task configuration can evidently make a contribution to operational-level airmobility, but it does not look to offer any advantages over conventional regrouping; in fact, it is less economical and less effective. At this level, flexibility has to be built into the force structure down to unit level. However, this limitation does not affect the argument, because the requirements of field modularization to give "restorability" and for base modularization to permit task configuration are almost identical.

A comprehensive armored vehicle family of the kind depicted in table 1 should and, I believe, could be modularized to the point where any hull of a sub-family will accept any role-oriented kit (functional module, interface panel and electronic packs) designed for that subfamily. Additionally, hulls of the standard subfamily should accept kits designed for the short subfamily. It goes without saying that the whole family should have the highest possible logistic commonality. But the advantages of modularization of hulls are confined to the production level and may well be offset by design penalties and increased unit cost.

Footnotes

[1] "Closing the Survivability Gap," *ARMOR*, November-December 1981.
[2] "The Modular Design of Armoured Vehicles," *Military Technology*, December 1983 or January 1984.
[3] von Senger und Etterlin, General Dr F.M.; "New Operational Dimensions" *RUSI Journal*, June 1983.
[4] In the sense of the German *operativ*, Russian *operativnyi*.
[5] "Tank or Tank Destroyer," *Military Technology*, May 1983.
[6] "The Renaissance of the Light Armoured Vehicle," *NATO's Sixteen Nations*, March 1983.
[7] Previously postulated by me, in slightly different forms, at a Symposium at Combat Training Centre, Gagetown, Canada in March 1983, and in reference 6.
[8] See my book, *Human Factors in Mechanized Warfare*, Oxford, Brassey's (Pergamon) 1983, Part 3.
[9] See my book, *Antitank*, Oxford, Brassey's (Pergamon), 1982, chs 23 & 24.
[10] "An Airmechanized Force for the 90s," *ARMOR*, July-August 1981.

RICHARD SIMPKIN joined the Royal Tank Regiment (British) in 1940, and saw service in the Middle East. He graduated from Staff College in 1951, and the Royal Military College of Science in 1953, specializing in vehicles. He was responsible for user trials of the *Chieftain*, and worked with the *Scorpion* and *Swingfire* development. He was promoted Brigadier in 1968 and placed in charge of equipment policy for the direct-fire battle and all aspects of mobility. He headed the British team on the project definition and operational requirements of the Anglo-German MBT program, where he was closely concerned with the exploitation of Chobham armor. After retiring he set up a language consultancy in 1971, and divides his time between that and writing books.

The Soviet Mechanized Corps in 1941

by Michael Parrish

An important chapter in the history of Soviet armor — the reintroduction and deployment of mechanized corps in 1940-1941 — remains incomplete.[1] This article is an attempt to tell the confused history of the development of the mechanized corps in the Red Army and to point out some of the reasons for its dismal performance during the Summer of 1941. The Soviet Union's current heroic image of the Great Patriotic War makes it difficult to examine all the factors involved in the catastrophic defeats of 1941. The thrust of this article is a historical survey of the development and deployment of larger armored formations in the Red Army and an assessment of the technological and leadership factors that played so large a role in its performance in the early months of the war without being unduly involved with questions of military doctrine. In regard to the latter, it seems that despite their previous inconsistencies by mid-1941 the Soviets had finally come to accept the independent role of armor in modern warfare.

The mechanized corps were first formed in the Red Army in 1932, and the first two of these, the 11th and 45th, were assigned to the Leningrad and Kiev Military Districts. In 1933 and 1934, two more mechanized corps were formed. Each consisted of three brigades with a total strength of 500 tanks, 250 armored cars, 250 trucks, and 60 artillery pieces. In 1938, the Soviets reorganized their four mechanized corps into tank corps, but the change was largely semantic. The new tank corps fielded a rifle and two tank brigades with a combined strength of 12,710 troops, 500 tanks (mostly T-26s and BTs), and 118 artillery pieces. The four units were stationed in the following military districts: No. 10 in Leningrad, No. 15 in Belorussia, No. 25 in Kiev, and No. 20 in Transbaikal.

In July 1939, the Main Military Council established a commission to study the role of armor in the Red Army. The chairman of the commission was Marshal G. I. Kulik, who has since been blamed by Soviet writers as one of those responsible for the Red Army's lack of preparedness in 1941. Other members include S. M. Budennyi, B. M. Shaposhnikov, S. K. Timoshenko, K. A. Meretskov, L. Z. Mekhlis, D. G. Pavlov, M. P. Kovalev, and B. A. Shchadenko. This commission considered the armor question from 8 July to 22 August. Pavlov and possibly Kulik, arguing from their experiences during the Spanish Civil War, suggested that the tank corps be disbanded, an idea rejected by the commission. In fact, in September 1939, two tank corps (the 15th and 25th) took part in the invasion of Poland. This was, however, the only occasion in which tank or mechanized corps as such were used in combat by the Soviets before 1941. None were deployed either at Lake Khasan (1938), or Khalkhin Gol (1939) against the Japanese, or during the Winter War against the Finns.

In November 1939, under circumstances that remain unclear, the Main Military Council (or possibly

Stalin alone) ordered the tank corps disbanded. About this same time new instructions were given to form four motorized divisions (a new designation), and plans were made to form 15 more of these in 1940 and an additional seven in 1941. In the Summer of 1940, having observed the results of the German *blitzkrieg* in Poland and in the West, the Soviets seem to have panicked, with the result that there was another dramatic change in policy. On 9 July 1940, the Minister of Defense, S. K. Timoshenko, ordered the reforming of mechanized corps on a truly gigantic scale.[2]

The inconsistent policy reflected in the deployment of armor was influenced by political as well as military factors. The earlier purge of M. N. Tukhachevskii and others who had been identified closely with armor development made advocacy of independent armor potentially dangerous. It is quite possible that Pavlov and Kulik, the alleged culprits in breaking up the large armored units, interpreted their experiences of the Spanish Civil War in accord with the contemporary political climate — a very commonplace practice during the Stalin era. By mid-1940, however, some of the lessons of the *blitzkrieg* must have become clear to Stalin and his chief military assistants. The reintroduction of the mechanized corps as an independent force would seem to support this contention.

The Soviet mechanized corps of 1940-1941 was the largest armor formation created anywhere, larger even than any of the six tank armies formed during 1942-1945, which usually had fewer than 700 tanks. The 1940 mechanized corps consisted of 37,200 men, 1,108 tanks, 208 armored cars, and more than 300 artillery pieces. In 1941 the number of tanks was reduced to 1,031 and personnel to 36,000. Each corps had one motorized infantry and two tank divisions. It was several times the size of its successor in name which was to appear in 1942 when armored forces were once again reorganized. Incidentally, although in 1942 the name mechanized corps was reintroduced, the titles of "tank" and "motorized" divisions were only revived during the postwar period.

In 1940, nine mechanized corps were formed, and in February and March of 1941, another 20 were added to the Red Army. These corps included in their total complement at least 61 tank and 31 motorized divisions.[3] Each tank division in 1941 consisted of 375 tanks (63 KV, 310 *T34*, 102 *T-26* and BT), 95 armored

cars, 85 pieces of artillery, and nearly 11,000 men. Each motorized division had 11,600 men, 275 light tanks, 51 armored cars, and 158 artillery pieces. (Another source gives respective figures of 11,650, 275, 48, and 98.) Theoretically, on the eve of the war the Red Army had a strength of over 30,000 tanks. At the time of the outbreak of hostilities, German intelligence estimated Soviet armored strength at 15,000 tanks, while other sources cite 24,000 as a more accurate figure.[4] Most motorized and tank divisions were assigned to corps organizations, although there were also a few independent divisions. German tank strength numbered fewer than 3,000. The Soviets, who have shown a reluctance to reveal their total armor strength on the eve of Barbarossa, admit to the following facts: from January 1939 to June 1941, 7,000 tanks were built, including at least 1,860 *T34s* and KVs. The motorized divisions were also only about half-strength, while the tank divisions had a strength of 68 percent. Many of the mechanized corps were considerably understrength, some having no tanks and others as few as 98. In some units only 27 percent were combat-ready, and spare parts were always scarce.[5]

The main question which remains is why the Soviet forces, enjoying such clear numerical superiority, fared so poorly in the field. In their writings, some Soviet writers, including Chief Marshal of Tank Troops, P. A. Rotmistrov, have tended to ignore the early tank battles of the war.[6] Others offer unsatisfactory explanations for failure: that the mechanized corps were not up to strength, that some of the units were in the Far East, and that there was an insufficient number of new *T-34* and KV tanks, even though the older Russian tanks were not much inferior to the German Mark III tank, which was the mainstay of the German armor at this time. Even in the face of Russian excuses, it would not be an exaggeration to claim that the Russians enjoyed a three-to-one superiority against the enemy, and that they had at the very least 1,500 combat-ready *T-34* and KVs — weapons clearly superior to anything that the Germans had at this time. In view of these qualifications to various arguments, it is difficult to question the dissident General Petr Grigorenko's claim that in 1941 the Red Army was superior to the enemy both in quantity and quality.[7]

Then why did the Soviet armor fail so miserably in the Summer of 1941? The element of surprise and early confusion must have played a part, as well as the defeat of the Russian air force by the Luftwaffe, but other considerations obviously extended to the inexperience and incompetence of Soviet commanders who were simply no match for their German counterparts. The typical Soviet mechanized corps commander owed his position to the rapid promotions of the purge years and under other circumstances would scarcely have been qualified to command a regiment. Leading a force of 1,000 tanks, however, was simply beyond him. The average age of six mechanized corps commmanders for whom birthdates are available (Korovnikov, Leliushenko, I.E. Petrov, Riabyshev, Rokossovski, and Vlasov) was about 41. Facing them were German panzer division commanders, each of whom commanded about 300 tanks. A random check of eight contemporary commanders — Kirchner (1), Von Veiel (2), Model (3), Landgraf (6), Hubicki (9), Hube (16), Von Arnim (17), and Nehring (18) — shows the average age to be about 53. Soviet commanders included such men as N. V. Feklenko, a failure with the 57th Rifle Corps in Khalkhin Gol, and I.N. Khabarov, whose leadership of the Soviet 8th Army during the Winter War merited a court martial. A few of the Soviet commanders had fought in Spain, in the Far East and against Finland, but their limited experience, usually at very junior levels, could not match their German opponents.

To reach the heart of this issue, one must go beyond the general histories of the war which are laden with propaganda, inaccuracies, and omissions. Our best sources, although far from adequate, are the memoirs of the men who commanded or who were associated with the mechanized corps in the early days of the war. Particularly useful are the pre-1965 memoirs written during a brief period when frankness was not a cardinal sin in Soviet historiography.[8] It is obvious from these memoirs that the atmosphere of command in the early days of the war left much to be desired. In the midst of combat, watchdog commissars questioned the proletarian geneology of the commanders, while at the same time offering medals for success and firing squads for failure.[9] One fanatical commissar, N. N. Vashugin, lacked any armor command experience; nevertheless, he took it upon himself to lead into battle elements of the 8th Mechanized Corps, only to end up mired in swamps. He eventually committed suicide.[10] Not all mechanized corps were involved in combat of uniform intensity. Some, such as Numbers 8, 9, and 15, took part in several pitched battles. Others, such as Numbers 6, 16, and 23, were apparently wiped out in their first engagements — in the case of the 6th Mechanized Corps, on the second day of the war. On 25 June, the 22nd, 19th, and 9th Mechanized Corps were respectively reduced to 33, 35, and 66 tanks. Still others, such as Numbers 10, 18, 24, and 27, never saw combat as complete units and were probably broken up and sent piecemeal to threatened areas. For instance, the 18th Mechanized Corps was attached to the South Front, and yet it was not deployed as a complete unit. On rare occasions when the Soviets used their superior tanks with imagination the results were quite impressive. Such an instance occurred in Mtsensk on 5 October 1941, when the German armor was smashed and Guderian was almost captured.[11] But such successes were indeed quite rare, and by

Order of Battle, Soviet Mechanized Corps, Summer 1941

Unit #	Base	Commander	Additional Readings[15]
1	Baltic Special Military District (Northwest Front)	MG of Tank Troops, M. L. Cherniavskii	"Bessmertnyi podvig"
2	Odessa Military District (South Front)	MG Iu. V. Novoselskii	"Bessmertnyi podvig"
3	Baltic Special Military District (Northwest Front)	MG of Tank Troops, A. V. Kurkin	"Bessmertnyi podvig"
4	Kiev Special Military District (Southwest Front)	MG A. A. Vlasov (executed 8-2-1946)	"Kiev, gorod geroi," E. Dwingrer, "Vlasov"
5	Western Special (Belorussian) Military District (West Front)	MG of Tank Troops, I. P. Alekseenko (executed?)[17]	"Bessmertnyi podvig," "Voenno istoricheskii zhurnal," 7-1971
6	Western Special (Belorussian) Military District (West Front)	MG M. G. Khatsilevich (KIA, 6-24-41)	"Bessmertnyi podvig," I. V. Boldin, "Stranitsy zhizni"
7	Western Special (Belorussian) Military District (West and Central Fronts)	MG V. I. Vinogradov	"Bessmertnyi podvig," V. I. Kazakov, "Na perelome"
8	Kiev Special Military District (Southwest Front)	LTG D. I. Riabyshev	"Bessmertnyi podvig," N. K. Popel', "Natiazhkuiu poru"
9	Kiev Special Military District (Southwest Front)	MG K. K. Rokossovskii, 7/19/41-8/9/41, MG of Technical Services A. G. Maslov	"Bessmertnyi podvig," K. K. Rokossovskii, "Soldaskie dolg"
10	Leningrad Military District (North Front)		
11	Western Special (Belorussian) Military District (West Front)	MG M. G. Mostovenko	"Bessmertnyi podvig," I. V. Boldin, "Stranitsy zhizni"
12	Baltic Special Military District (Northwest Front)	MG N. M. Shestopalov, (died as a POW, 8/6/41). MG I. T. Korovnikov,	"Bessmertnyi podvig," A. A. Sharipov, "Cherniakhoskii"
13	Western Special (Belorussian) Military District (West Front)	MG P. N. Akhliusten	"Bessmertnyi podvig"
14	Western Special (Belorussian) Military District (West Front)	MG S. I. Oborin (executed 1941?)	"Bessmertnyi podvig," L. M. Sandalov, "Perezhitoe"
15	Kiev Special Military District (Southwest Front)	MG I. I. Karpezo, (wounded 7/26/41). COL G. I. Ermolaev.	"Bessmertnyi podvig," N. K. Popel'," "Na tiazhkuiu poru"
16	Kiev Special Military District (Southwest Front)	Komdiv A. D. Sokolov	"Bessmertnyi podvig"
17	Western Special (Belorussian) Military District (West Front)	MG M. P. Petrov (to 7/25/41). MG I. N. Khabarov	"Bessmertnyi podvig"
18	Odessa Military District (South Front)		"Proval Blitskriga"
19	Kiev Special Military District (Southwest Front)	MG of Tank Troops, N. V. Feklenko	"Bessmertnyi podvig"
20	Western Special Military District (Belorussian) (West Front)	MG A. G. Nikitin. from mid-July 1941, MG of Tank Troops, N.D. Vedeneev	A. E. Eremenko, "V nachale voiny," L. M. Sandalov, "Na moskovsko napravlenni"
21	Baltic Special Military District (Northwest Front)	MG D. D. Leliushenko	"Bessmertnyi podvig," D. D. Leliushenko, "Zaria pobedy"
22	Kiev Special Military District (Southwest Front)	MG S. M. Kondrusev, (KIA?) MG V. S. Tamrushi (6/25/41) MG V. N. Simvolokov	"Bessmertny podvig"
23	Western Special (Belorussian) Military District (West Front)	MG M. A. Miasnikov	*Voenno istoricheskii zhurnal, 5-74*
24	Kiev Special Military District	MG V. I. Chistiakov (KIA, 1941)	
25	Western Special (Belorussian) Military District (West Front)	MG S. M. Krivoshein	S. M. Krivosheit, "Ratnaia byl'," A. I. Eremenko, "V nachale voiny"
27	North Caucasus Military District?	MG I. E. Petrov	*Voenno istoricheskii zhurnal, 9-66*
28	Trainscaucasus Military District	MG V. V. Novikov[18]	
30	Far East Front		A. I. Getman, "Tanki idut na Berlin"

the end of August the majority of mechanized corps and their tank and motorized divisions were completely destroyed. Now the largest tank unit operating in any army that had pioneered large armored formations was the tank brigade. These were used almost exclusively in defensive positions in support of the infantry. During the Summer of 1942 the Soviets slowly began to re-form mechanized and tank corps, and eventually a new designation — tank army — appeared. These usually consisted of three corps (in the beginning with additional rifle divisions) and were about two-thirds the size of the 1940 mechanized corps. These first tank armies profited the Soviets little because the lessons of previous defeats had not yet been learned. In July 1942, the newly formed and splendidly equipped 5th Tank Army was in perfect position to stop the German advance towards Voronezh and thus frustrate Hitler's entire Summer campaign, but it was deployed haphazardly and without adequate air and artillery support.[12] Consequently, the 5th Tank Army was annihilated at the gates of Voronezh, with its commander, Major General A. I. Liziukov (one of the early writers on armor), seeking death on the battlefield, although Stalin preferred to believe that he had defected to the enemy.[13]

Farther south, two other tank armies, the 1st and the 4th (named according to its last commander, General P. I. Batov, after the number of operative tanks) failed to stop the German advance toward Stalingrad. The excuses of 1941 could no longer be applied to the failures of armor in the Summer of 1942, and Soviet infantry paid with blood for continued shortcomings in the use of armor. During the Stalingrad counteroffensive, the new 5th Tank Army of the Southwest Front was hampered by the slowness of its accompanying rifle divisions, and in the Spring of 1943, Field Marshal Erich von Manstein easily routed the Soviet 3rd Tank Army and the "Popov Armored Group," which formed the main Soviet armor units in the South. Only at Prokhorovka, during the battle of Kursk in July 1943, did the Russians finally begin to demonstrate mastery of the art of modern armored warfare, at least during those occasions in which they enjoyed numerical superiority. At Prokhorovka the Soviet 5th Guard Tank Army, ably led by the Russians' best armor commander, P. A. Rotmistrov (Chief of Staff of the 3rd Mechanized Corps in the beginning of the war) managed to hold its own against the crack II SS *Panzer* Corps.

In reviewing the military career of the surviving mechanized corps commanders, we discover that most of them did not again command purely armored forces. Further, of the six tank armies that formed the backbone of the Soviet armor during the last two years of the war, only one—the 4th Guard Tank Army—was commanded by a former mechanized corps commander, D. D. Leliushenko. The most distinguished career, of course, belonged to the former commander of the 9th Mechanized Corps, the future Marshal K. K. Rokossovski, who later commanded regular armies and fronts, but never purely armored units. Among the other commanders, A. A. Vlasov, N. V. Feklenko, and I. N. Khabarov commanded regular armies, the first a defector and the last two leaders without any particular distinction. The commander of the 15 Mechanized Corps, I. I. Karpezo, was so badly wounded that he never returned to combat. A. A. Vlasov was of course executed in 1946, a fate which may also have befallen General S. I. Oborin, commander of the 14th Mechanized Corps in 1941.[14] The strangest career belonged to D. I. Riabyshev, the commander of the 8th Mechanized Corps, who started and finished the war as a corps commander, but who also managed to command several armies and for a time the entire South Front without ever receiving a promotion. At a time when a great deal is being written about advances in Soviet weaponry, perhaps it is advisable to remember the lessons of the Summer of 1941 as well as American experiences in Viet Nam, to say nothing of the recent Russian difficulties in Afghanistan: powerful weapons in superior numbers do not necessarily guarantee victory.

References

[1] For a survey of Soviet historical literature see A. Davidenko, "Istoriografiia tankovykh voisk," *Voenno istoricheskii zhurnal,* 10 (1980), 81-83.

[2] A. F. Ryzhakov, "K voprosu o stroitel'stve bronetankovykh voisk Krasnoi Armii v 30-3 gody," *Voennoistoricheskii zhurnal,* 8 (1968), 107-108.

[3] *50 let Vooruzhennykh Sil SSSR,* 236.

[4] "The Development of Soviet Motorised Infantry," *Born in Battle Magazine,* 12 (1980), 43.

[5] For estimates of the strength of various mechanized corps se V. A. Anfilov, *Bessmertnyi podvig,* 115; A. I. Eremenko, *Arduous Beginning,* 40; John Erickson, *Road to Stalingrad,* 63, 143-163; L. M. Sandalov, "Oboronitel'naia operatsii 4-i armii v nachal'nyi period voiny," *Venno istoricheskii zhurnal* (7-71), 22; V. Butkov, "Kontrudar 5-go mekhanizirovannogo korpusa na lepel'skom napravlenni, 6-11 iiulia 1941 goda," *Voenno istoricheskii zhurnal* (9-1971), 60-61; and V. I. Kazakov, *Na perelome,* 5.

[6] P. A. Rotmistrov, *Vremia i tanki.*

[7] P. Grigorenko, *Staline et la deuxieme guerre mondiale.*

[8] *V. I. Kazakov (cinc Artillery 7 MC), Na perelome (1962), S. M. Krivoshein (cinc 25 MC), Ratnaia byl'* (1962), N. K. Popel' (commissar 8 MC), *Na tiuzhkuiu poru* (1959), K. K. Rokossovski (cinc 9 MC), *Soldatski dolg* (1968), D. D. Leliushenko (cinc 21 MC), *Moskva-Stalingrad-Berlin-Prago* (1971), *Zaria pobedy* (1961).

[9] N.K. Popjel, *In schwere zeit,* 161.

[10] I. Kh. Bagramian, *Tak nachinalas' voina,* 144.

[11] M. E. Katukov, *Na ostrie glavnogo udara,* 28-32. Heinz Guderian, *Erinnerungen eines Soldaten,* 210-211.

[12] For two diametrically opposing views of this disaster see (by Marshal A. M. Vasilevskii and General M. I. Kazakov) "Na voronezhskom napravlenii letom 1942 goda," *Voenno istoricheskii zhurnal,* 10 (1964), 34. Also the respective memoirs of the protagonists *Delo vsei zhizni* and *Na kratoi bylykh srazhenii.*

[13] Iu. Zhukov, *liudi 40-x godov,* 225, D. Rodinskii and N. Tsar'kov, *Povest' o brat'iakh,* 50.

[14] Roy Medvedev, *Let History Judge,* 466.

[15] Besides the aforementioned memoirs the primary source for additional readings are the histories of the border Military Districts. These are *Krasnoznamennyi Belorusskii voennyi okrug* (1973), *Krasnoznammenyi Odesski* (1970), *Istoriia pribaltiiskogo voennogo okruga* (1968), and *Kievskii Krasnoznammennyi* (1969). There are, however, some gaps; for example, the history of the Odessa Military District says nothing about the deployment of the 18 Mechanized Corps even though this unit was attached to this district. The history of the North Caucasus Military District also says nothing about mechanized corps deployed there.

[16] The history of the Kiev Military District blatantly omits Vlasov's name and lists the 4 Mechanized Corps under its chief of staff Colonel A. A. Mar'ianov. See *Kievskii Krasnoznammenyi,* 192.

[17] A. I. Eremenko in "V nachale voiny" (497) gives a detailed biography of Alekseenko but omits any mention of his fate after June 1941, which hints that Alekseenko must have fallen victim to Stalin's firing squads.

[18] In July 1941 the 28 Mechanized Corps was dissolved. On its base on the borders of Iran, the 47th Army was formed. This unit took part in the invasion of Iran before being deployed in the north Caucasus. See "Sovetskaia voennaia entsyklopediia," Vol. 7, 449.

MICHAEL PARRISH is director of the Indiana University School of Public Affairs Library (1973) and professor in the same school. A graduate of Indiana University, he is author of numerous publications on Soviet military history and historiography. His two-volume study *USSR in World War II* was published in 1981 by the Garland Press.

Counterattack Planning

by Lieutenant Colonel Sherwood E. Ash

The new FM 100-5, Operations, is soon to be published. This manual emphasizes *audacity* and *offensive* action in defensive operations. Two up and one back—counterattack. Those old concepts are now (again) in vogue. But just how does a commander go about planning and conducting a counterattack? To find the answer you have to look in the obsolete FMs. But to save you the time from researching the old "bibles," and to ease the transition to the "new" defensive doctrine, this article discusses counterattack rationale and planning techniques. First, let us look at some background on the counterattack followed by the planning considerations and, finally, let us look at a sample counterattack operations plan (OPLAN).

Throughout history, counterattack operations have had a significant effect on battle outcomes. And, while it is not the intent of this paper to analyze specific battles, it is instructive to give some examples. For instance, the battles of Cannae and Cowpens resulted in victories for the counterattack forces. In these two battles, the attacking army struck and pushed back the defensive army. Then at the decisive moment, the defense counterattacked from the flanks, and routed the attacker. The term defensive-offensive (not used in current U. S. literature) describes the above battles.

From our own Civil War, the battle of Gettysburg also demonstrated the power of the counterattack. During the defense of the Union left flank at Little Round Top, the 20th Maine found itself low on ammunition and probably unable to beat back another charge. The commander decided on a counterattack as his only choice to prevent the flank from being turned. Only about 250 men participated in the counterattack, but it caught the Confederate Army completely by surprise; it was successful.

The 1920 war between Russia and Poland demonstrated yet another example of the counterattack. In this case, the Polish Army, which was numerically inferior to the Russians, conducted a strategic retrograde movement west toward Warsaw. When the Poles had enough maneuver space, they consolidated their army and counterattacked around the Russian left flank into the rear. This attack so disrupted the Russians that they retreated. If the Poles had been stronger, this battle could have been another Cannae, with the attendant massive destruction of the loser.

During November 1941, the British Eighth Army attacked Rommel in North Africa. In 40 days Rommel was pushed back 400 miles, but then the British attack lost its momentum. Rommel counterattacked and in turn pushed the British back 350 miles in 20 days. By now, Rommel had stretched his supply lines so thin he had to stop.

Besides illustrating the successful application of the counterattack, these examples also demonstrate the different situations where counterattacks have been used. Cannae and Cowpens were *planned* counterattacks; the attacker was deceived and fell into a trap. In the battles of Gettysburg and Warsaw the counterattacks were actually *desperation* types where the alternative (attrition warfare) would have been disastrous to the defender. In Rommel's case, he was an opportunist. He recognized the loss of British momentum and calculated this to be the time for a counterattack. Thus, he let the *situation dictate* the right moment.

"A counterattack is the most decisive element of the defensive battle. It is the only maneuver that can take advantage of enemy vulnerabilities of the moment."

On the modern battlefield, a defensive battle can only be influenced by the commander's uncommitted reserves. Lest this point be misunderstood, it is necessary to digress and briefly review the purposes of the defense. Generally an army defends during one of the following conditions:

- The attacker has superior strength and has taken the initiative.
- Key terrain must be held.
- An economy of force is needed in one area to allow sufficient offensive power to be massed in another area.

In short, the purpose of defense is to buy time until sufficient forces or other conditions (loss of attacker's momentum) exist to conduct offensive operations. It follows, therefore, that only units with powerful reserves have the capability to influence a defensive battle to the extent that offensive activity is regained.

Indeed, some of the great military thinkers of our time have stressed the importance of the reserve in their writing. Major General J. F. C. Fuller in his book *Machine Warfare* says:

> "There is yet one other point which battles between mechanized forces will accentuate—namely, the increasing value of a powerful reserve, because increased mobility carries with it power to surprise. As one of the great difficulties in such operations will be to gauge the enemy's intentions, unless strong reserves are kept in hand, it will be impossible to meet unexpected situations."

Additionally, Field Marshal General Ritter von Leeb has the same opinion. This paragraph from his book *Defense* published in 1943, provides the modern reader with some practical concepts for using reserve forces:

> "The determination of the decisive ones does not depend only on the defender but also on the attacker, at least to the extent that the defender must take his opponent's actions into account. Each attacker knows that against an organized defensive front, be it in a war of movement or a war of position, only an attack led with force and articulated in depth has any prospect of breaking through with its entire gravity. Strong and mobile reserves spare many worries to the commander of an operative defense. But he needs also increased, constant, and far-reaching reconnaissance and observation."

Now that we have seen some examples of counterattacks and established the importance of a reserve, let us turn to the purposes of the counterattack.

Generally, counterattacks fall into two categories—terrain-oriented and enemy-oriented. Terrain-oriented counterattacks could be undertaken to restore a position or reinforce a threatened defensive area as in "restore the FEBA"; securing an objective could also be a purpose. Enemy-oriented counterattacks are employed to destroy the enemy in an area (such as a raid or tank sweep, or to create a trap for the enemy that can then be attacked either by fire (artillery, tac air, direct fire), or by fire and maneuver.

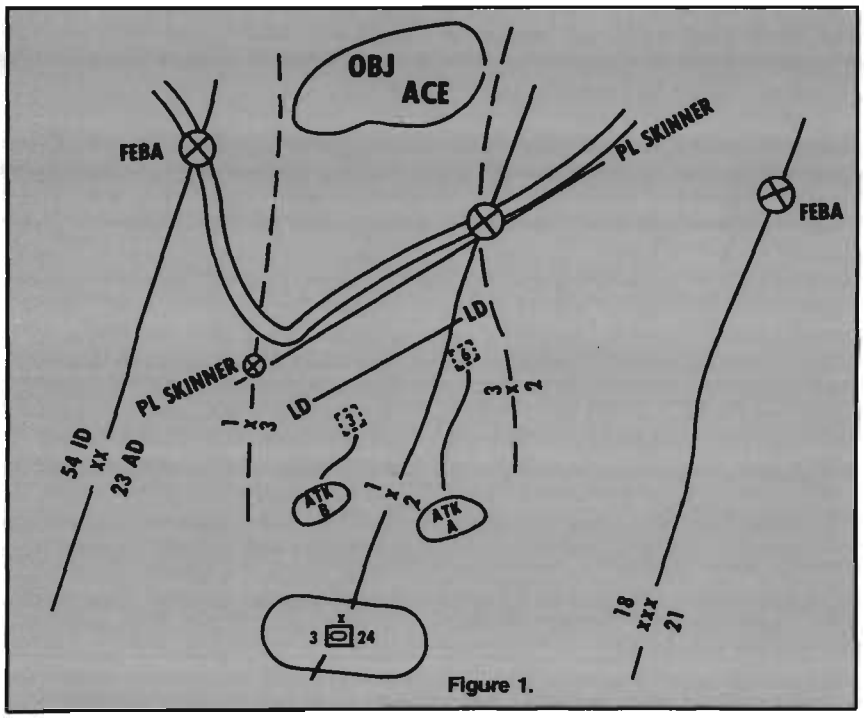


Figure 1.

A counterattack is the most decisive element of the defensive battle. It is the only maneuver that can take advantage of enemy vulnerabilities of the moment. One of the purposes of the defense is to seize the initiative from the attacker by conducting offensive operations. Counterattacks satisfy this purpose.

If counterattacks are so critical to the defense, when then is the opportune moment for this operation? Unfortunately, there are no pat solutions; it is entirely dependent upon the situation. Intelligence becomes a very vital key to the commander's timely decision. Successful counterattacks depend upon surprise and speed. The commander must consider his own power, the rate of the enemy advance, and the weight and location of enemy reserves. Then the commander must decide if he can cope with the penetration (or other vulnerability, such as an exposed gap or enemy loss of momentum) with his own reserves, or if he must hold and call for help. This decision is the most difficult. Thus, it becomes the most critical of the defensive battle.

Now that we have established a firm base for counterattack operations, just what are the considerations for planning this event? The planning factors that follow include the number of plans, organization of forces, counterattack type, time and location, unity of effort, and a contingency plan for failure (table 1).

Plans. As a minimum, counterattack plans are prepared to attack an assumed penetration on each principal enemy avenue of approach. As the intelligence of the enemy develops, other plans should be developed. Initial plans will probably conform only generally to the situation that actually develops. Therefore, the success of the plan *must not* be based upon preselected areas into which the enemy must be canalized before being attacked. We must remember that the only certainty in battle is uncertainty itself.

Forces. Defensive combat forces are organized into security or covering forces, fixing forces, and reserves. The covering force is a minimum force used to gain information, delay, disorganize, divert, and weaken the attack in preparation for the counterattack. Some of these forces may remain as stay-behind-forces to further refine the intelligence already collected. The fixing force uses a combination of holding ground, delay, and limited-objective attacks to further weaken and canalize the enemy attack. Then, when an enemy vulnerability is apparent, or when the attack has been slowed, stopped, or has become disorganized,, the reserve is committed *as a unit* to destroy the enemy.

Types. Counterattack types include the use of fire, local reserves, or the reserves of higher headquarters. A counterattack by fire can be employed in a killing zone or in an ambush. Local reserve counterattacks might be those employed by a brigade commander in a division area. Normally, this would be the type of counterattack employed by fixing forces. Higher-level reserves, division or corps, are the decisive counterattack forces in the overall conduct of defense. Therefore, the most powerful and mobile elements in a defensive area are these higher level reserves.

Timing-Location. Obviously, the timing and location of the counterattack are important considerations of the plan. The counterattack may be against a flank, a seam, or a gap, or against the nose of a penetration. It may develop that the counterattack will have to be launched at night or under cover of other poor visibility. This will affect timing, amount of traffic control, and the effectiveness of combat support units such as air support and attack helicopters.

Unity of effort. A counterattack plan must also provide for unity of effort. All forces must be oriented on the execution of the plan for it to be successful. Unity of effort can be established in one of the following ways:

- Designate a single higher commander.
- Attach units in the area to the counterattack force.
- Have the counterattack force conduct a passage of lines.
- Adjust boundaries.
- Organize a special task force.

Plan for failure. Finally, what if the plan, when executed, fails to achieve its objective? One of the dangers of this situation is a loss of depth, thereby reducing the ability of the defending force to react to enemy initiatives. Commanders will have to decide whether to hold current positions and wait for reinforcements, to try again in another sector, or to conduct some sort of retrograde to regain time and space for reorganization.

To communicate a counterattack plan to his subordinate units, the commander uses the operation overlay and OPLAN formats. The overlay requirements for the counterattack are the same as for a coordinated attack and should have, as a minimum, a line of departure, an objective, an attack position, a direction of attack and boundaries. Additionally, the overlay may have assembly areas, fire support coordination lines, phase lines, coordination points, and contact points.

Figure 1 assumes an enemy penetration on the avenue of approach in the 1st Brigade sector. (This may be one of several, because a plan should be made for *each* enemy avenue of approach).

Copy 1 of 30 copies
HQ, 23d Armd Div
Battleground, somewhere
010001A Nov 19_

OPLAN 84-10A
Reference: Map, series ....
Time Zone Used Throughout the Order: ALFA
Task Organization:

1st Bde
1-91 Mech
1-10 Armor
1-11 Armor

3d Bde
1-95 Mech
1-13 Armor
1-14 Armor
1-15 Armor
C/23d CAB (AHC) (OPCON)

2d Bde
1-92 Mech
1-93 Mech
1-94 Mech
1-12 Armor
D/23d CAB (AHC) (OPCON)

Div Trps
1-22 Cav

* * * * * * *

3. EXECUTION

a. Concept of Operation.

(1) Maneuver. On order, 3d Bde passes through 1st Bde; conducts counterattack to secure OBJ ACE and prep to cont exploitation. 1st Bde assists pass of 3d Bde, reorganizes def pos and prep to fol 3d Bde. 2d Bde fixes enemy fwd of FEBA to prev enemy forces from shifting toward OBJ ACE; Prep to spt exploitation of 3d Bde success. 1-22 Cav fol 3d Bde and perform rear guard as 3d Bde cont exploitation; if counterattack fails, block and cover retrograde of 3d Bde through FEBA.

(2) Fires: Pri of fires to 3d Bde, 2d Bde, 1st Bde; 1-22 Cav; upon retrograde of 3d Bde, pri is to 3d Bde; 1-22 Cav, 2d Bde, on order PL SKINNER becomes FSCL.

b. 1st Bde.

(1) Assist pass of 3d Bde; 1-22 Cav.

(2) Hold left shoulder of penetration.

(3) After pass of 3d Bde; assume msn as Div Res and prep to fol 3d Bde exploitation.

(4) Reorg def after pass of 3d Bde and, if necessary, assist retrograde of 3d Bde; 1-22 Cav.

c. 2d Bde.

(1) Fix enemy fwd of FEBA.

(2) Prevent enemy from shifting toward OBJ ACE.

(3) Prep to atk and spt exploitation of 3d Bde.

d. 3d Bde.

(1) Atk through 1st Bde and seize OBJ ACE.

(2) Prep to cont exploitation to defeat enemy in zone.

e. Fire Support.

* * * * * * *

(3) Field Artillery.

* * * * * * *

b. Organization for Combat.
1-50 FA (155) DS 1st Bde.
1-51 FA (155) DS 2d Bde.
1-52 FA (155) DS 3d Bde.
1-53 FA (8") GSR 1-50 FA.

* * * * * * *

f. Air Defense.

(1) 1-440 ADA(-) GS; A/1-440 (Vulc) atch to 3d Bde when committed.

(2) Upon exec of this OPLAN, prot 3d Bde mov through LD.

g. Aviation:
23d CAB (-) GS pri for airlift to 3d Bde.

* * * * * * *

i. Engineer Support.

(1) General: 23d Engr and 3d Bde coord mobility req from assembly areas to PL SKINNER.

(2) Organization for Combat.
23d Engr.
A/23d Engr DS 1st Bde.
B/23d Engr DS 2d Bde.
C/23d Engr atch 3d Bde.
D/23d Engr atch 3d Bde.
E/23d Engr GS: pri to 3d Bde; 2d Bde.
510th Engr Bn GS: pri to mobility opns during exploitation.

j. Div Troops: 1-22 Cav.

(1) Fol 3d Bde and conducts rear guard opns to OBJ ACE and for exploitation.

(2) Should counterattack fail to regain the initiative, cover retrograde of 3d Bde and delay enemy to FEBA.

k. Reserve: 1st Bde fol 1-22 Cav to support exploitation.

l. Coordinating Instructions.

* * * * * * *

(4) Consider exec during night or limited visibility.

To preclude any misunderstandings about this counterattack plan, let us review its salient features. First, the counterattack force is very strong and mobile; three armored and one mechanized battalion, one attack helicopter company, two companies of divisional engineers, three artillery battalions and a *Vulcan* battery. (Table 2) Additionally, unity of effort is provided by an initial passage of lines, then a boundary change. And finally, a plan is in place to protect the force should the counterattack be unsuccessful (figure 1). Odds are this OPLAN won't be executed as envisioned. But, as the actual location of the enemy attack becomes known, we can make the adjustments with confidence.

Summary

Many readers will recognize that I have borrowed heavily from the old "Mobile Defense" in my example. It is a valid tool for the tactician and it deserves to be resurrected. Indeed, the new FM 100-5 says "the commander may defend . . . by drawing the enemy deep into the area of operations and then striking him along his flanks and in his rear." But the field manual shies away from labeling this type of defense by an old familiar term.

Counterattack planning is an integral part of all defensive operations. Even though modern warfare has shown the defense to be "the stronger form" (Clausewitz), an army can only win *battles* with the defense; to win a *war* that same army must attack and achieve "the positive aim."

LIEUTENANT COLONEL SHERWOOD E. ASH was commissioned in Armor from the University of California. He is a graduate of the AOAC, and C&GSC. He has served in Vietnam, Germany and CONUS in air cavalry troops, armored cavalry regiments, and tank battalions. He is currently the Internal Evaluation Division Chief Directorate of Evaluation and Standardization, USAARMS.

Leading a Platoon on t

by Captain A

The term *integrated battlefield* was not new to the men of Alfa Troop. The actions for chemical and nuclear attacks had long been drilled into them by extensive training. When they received the operations order (OPORD) for the troop's participation in an Army Training Evaluation Program (ARTEP) exercise, they felt confident that it was complete and gave them everything they needed to know. Nuclear and chemical attack, artillery, and close air support (CAS) were all covered in the order and in the unit standing operating procedures (SOP). There were few questions.

The operation seemed to be progressing in an orderly manner the next morning except that inclement weather had slowed the tactical road march. The time to cross the line of departure (LD) would have to be moved back. Then, just as the troop entered the forward assembly area (AA), the platoons were blown right off the air by very intensive jamming. Every frequency and alternate assigned to the troop was so fiercely jammed that any radio communication was impossible.

Oral Communications

The platoon leaders did not panic, but moved smoothly into the AA using arm and flag signals. They dismounted to check with the adjacent platoons to ensure 360-degrees of security and to coordinate fields of fire. Having so far done everything correctly, they proceeded to spend a frustrating and fruitless hour trying to reestablish radio communication with the commander and within the platoons. It was about this time that everyone began to get the feeling that the fun and games were over, and that the rest of the ARTEP would be long and difficult. They were not disappointed.

The troop commander maneuvered his platoons by going from one to another and giving them oral commands. The radio jamming continued all day. The courier system, as laid down in the unit SOP, never survived the departure from the AA. With all the elements on the move and no radio communication to tell each other their new positions, couriers sent out did not return until the jamming stopped and new locations were transmitted. Recognizing that to wait for instructions was to sit and do nothing, the platoon leaders used their own initiative to struggle through their platoon missions alone and without support and, after great effort, reached the troop objective.

The attack on the objective was a ragged, piecemeal affair that was surprisingly successful because the left and right platoons maneuvered to the flanks and rear of the enemy before attacking. Once on the objective, the platoons consolidated their assigned sections and reestablished the courier system.

This story is true. . . . I know, because I was one of those unfortunate platoon leaders who had to struggle through that difficult and exasperating first day of that ARTEP. This experience taught me some necessary lessons about the integrated battlefield.

The integrated battlefield encompasses all the difficult factors that influence the modern battlefield using the broadest possible interpretation of "combined arms." It includes the integration of infantry, armor, reconnaissance (cavalry), artillery, irregular forces, CAS, air defense artillery (ADA), and engineers; and always presents the threat of chemical, nuclear and, electronic warfare (EW)—all of which are affected by terrain and natural or man-made obstacles that impede trafficability and obscure visibility.

Basic Integration

Let us begin with basics, the integration of infantry, armor, reconnaissance, and artillery into a single fighting force. The point was brought out by my former platoon sergeant who said to me, "Sir, I have been in armored battalions most of my Army career. Being in this unit (an armored cavalry squadron) has shown me for the first time what scouts are supposed to do and how tankers are supposed to use them."

Generally, the *M60* tank crewmen in career management field 19E whom we receive in the squadron have had little experience with scouts or with infantry, except as members of an opposing force during field exercises. They feel that their tank is the world's deadliest weapon and

e Integrated Battlefield

n W. Watts

that "ground pounders" are only good for cannon fodder. (I suspect the infantry has a similar, though opposite, opinion.) but after they see how the scouts can be used to exploit the tank's strengths and protect its weaknesses, their opinions become more favorable. Once they see the value of scouts and/or infantry they want them for all future operations.

It is possible for a platoon of infantry and a platoon of armor to work together as a well-drilled team. I have seen it. My troopers and I have done it.

The experiences of armies in recent conflicts (especially the 1973 Arab-Israeli War) have rather graphically shown that any *pure* force will most likely be destroyed in a modern battlefield, while a *combined arms* force will be successful. I had the opportunity to participate in two ARTEPs where the opposing force was a pure armored battalion. In both ARTEPs the squadron felt that not only did we beat the armored battalion, we embarrassed them. We also felt that they were at a terrible disadvantage because they had no infantry assets attached, while we had our scouts. Even the most ardent cavalry trooper among us knew it would have been a completely different ball game if they had had an infantry company attached. Combined arms operations are necessary for victory.

An armor platoon leader must be able to call an infantry platoon leader (and vice versa), or fire support team, and on some occasions, even reconnaissance elements for help if we are to use combined arms effectively. The Threat's doctrine also includes combined arms operations. Therefore, platoon leaders and company or troop commanders must consider what infantry, armor, artillery, and reconnaissance forces are available to both the friendly and enemy forces when they are planning and executing any operation. They must also know how these forces are employed by both sides.

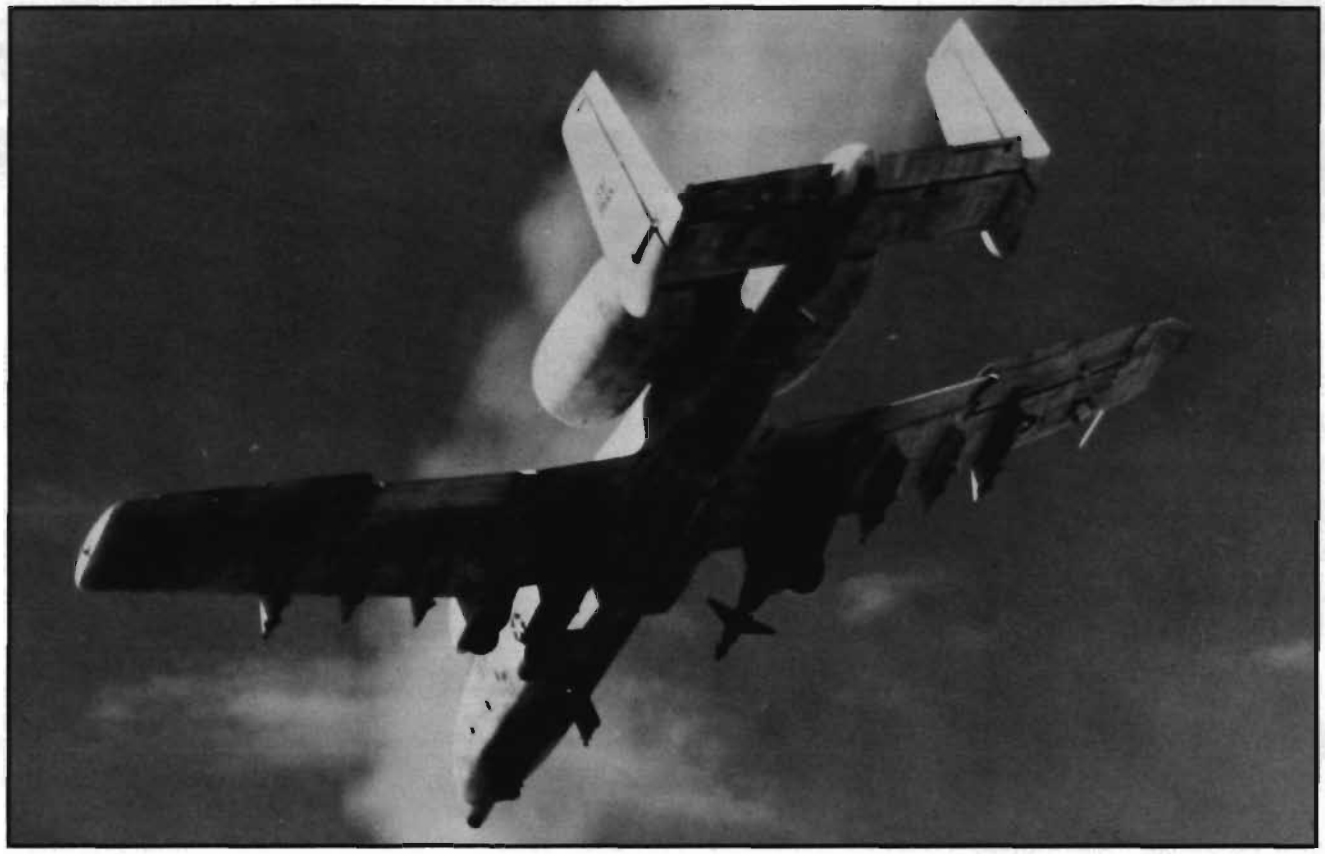
SOP for Fire Support

Field artillery is an important part of combined arms. Most of the time, indirect fire is only a radio call away. But someone has to make that call. The platoon will be in contact with the enemy and able to see the battlefield. The platoon will, therefore, be best able to see where and how artillery needs to be employed. Since there is no artillery forward observer with an armor platoon, more often than not it is the platoon leader who must call for fire. The *AN/VRC-12* radio enables him to preset the frequency necessary to call for fire and rapidly switch back to the platoon net when he is finished. No one else in the platoon, except the platoon sergeant, has this capability. This situation puts the platoon leader in a peculiar, but all too familiar, dilemma. His platoon is in contact with the enemy and he must stay on the platoon net to maneuver it. At the same time, he must leave the net to get the fire support he needs.

The solution to this problem requires that the platoon have an effective SOP and that all members of the platoon know how to use it. This was how we did it in my platoon:

> If the scouts were detected by the enemy and fired upon when they made contact, the tanks would suppress with direct fire while the scouts determined the size, composition and location of the enemy. As we had several battle drills to cover various situations, I told the platoon what action I wanted taken. I then told the platoon sergeant (PSG) that I was leaving the net. He immediately took over to carry out my orders while I called in the spot report and the call for fire. As soon as possible, I would return to the platoon net and ask the PSG for a situation report (SITREP). This informed the platoon that I was back on the net and in control. The PSG's SITREP informed me what had happened while I was off net so I could issue additional orders if necessary.

The key parts of this procedure were handing off the platoon to the PSG while I left the net so that command and control would not be lost; alerting the platoon that I was back on the net by asking for a SITREP so that they would know who was in charge and that I would know what was going on; and having SOPs, battle drills, and well-trained NCOs who could run the show while I was off the net.



A platoon leader must often leave the platoon net for a multitude of reasons. Handing-off the platoon to the PSG and *vice versa* is identical no matter for what reason the platoon leader must leave the net.

The Battlefield Is Three-dimensional

The platoon integrated battlefield is three-dimensional and includes the skies above. In preparation for our exercises, our S3 was told there would be attack helicopters training in our maneuver area and they would be moving generally west to east. The S3 checked his overlay and made a note in the OPORD that the helicopters were friendly to the attackers. We took it for granted that the helicopters were conducting a completely separate operation that would only affect the defenders, who would have to hide from them. Well, nobody told the pilots that. While I was conducting a zone reconnaissance in bounding overwatch, a *Cobra* came up behind us. He set up on line with my tanks and started watching the valley. When my scouts reported everything clear, the tanks bounded up. When the tanks were set, the *Cobra* moved up, passed us, and disappeared into the trees. A few moments later he popped up, spun around to look at us, spun back around, and dropped back into the trees. My scout section leader radioed me that the *Cobra* was telling us all was clear ahead and to move up. We played bounding overwatch with that pilot all day.

I also learned a lesson in humility and attention to detail from our friends in the Air Force. Incorporating air boxes and other control measures for air support had become meaningless map exercises for the platoon leaders, because they neither got aircraft nor their radio frequencies; nor were they able to coordinate with the Air Force to show them where the air boxes were located. As a platoon ARTEP evaluator, I found that things had not changed. Listening in on the troop net, I learned that the other two platoons were stopped by a large enemy force they could not dislodge. After about one-half hour, the commander called his platoon leaders to say that there were "fast movers" on the way. One of the newer platoon leaders who had not lost his enthusiasm had prepared some control measures for aircraft. The commander called for the aircraft and directed them to the target area, using the lieutenant's control measures, and 45 minutes later I heard that the objective was secured after we had received a proper lesson on CAS from four *F-4s* and four *A-10s*. We cannot afford to ignore or forget the air space above the integrated battlefield, and must always use it to our advantage.

Air Defense

But this third dimension holds menace as well as opportunities. Most of the soldiers I have observed realize that on the integrated battlefield, cover and concealment includes concealment from aerial observation and attack. Unfortunately, the .50-caliber machineguns and small arms have been neglected as air defense weapons. The prevailing opinion is, "I don't care what the book says. They move too fast for me to hit with my 'fifty.'" Sometimes, this may be true for high performance aircraft, but it is certainly not true for helicopters. Appearances can be deceiving. An aircraft may just look too fast when, in reality, you are able to track, lead and hit it.

Our *kaserne* was a favorite practice target for many NATO air forces, so we were buzzed quite often by high performance aircraft. The first and sometimes second aircraft usually surprised us, but they established the direction the aircraft were using for their approach. So, when the third aircraft made its run, we were ready for it and our guns were already aimed at the air space where we knew it was going to fly.

If you scare off enemy aircraft so that you can continue your mission, that is just as good as shooting them down.

Modern air defense weapons have forced helicopters down close to the ground and low altitude flying has slowed their operations. This presents many opportunities for organic weapons to be used in air defense in such incidents as this one recounted by a tank platoon leader.

> An OPFOR scout helicopter was trying to find his platoon hidden under the trees. The pilot had been given the platoon's position by the umpires, so he knew they were there. He kept getting closer and closer, and lower and lower. When the pilot finally found the platoon he was hovering 10 feet off the ground only 200 meters from the platoon, which surrounded him on three sides. The umpires ruled he had been shot down without having time to radio the platoon's position. On a battlefield where both aircraft and ground forces are using terrain for maximum cover and concealment, close-range engagements will be common and the ground forces may well have the advantage.

Another experience was related to me concerning air defense:

> A platoon leader was setting his platoon into a battle position when a self-propelled *Vulcan* came up to him. The track commander/gunner hopped off his *Vulcan,* trotted over to the platoon leader and said, "Hello sir! I'm attached to your platoon. Where do you want me?" Suddenly, air defense had become another factor for the platoon leader to consider on the integrated battlefield.

Vulcan and *Chaparral* platoon leaders will often have their platoons spread out over a large area, possibly even split into sections for greater coverage. A tactical plan that does not integrate air defense is no good. The platoon leader nearest to the air defense unit may have to do some of that integration.

Using Engineer Support

Engineers also have a habit of coming out of nowhere. One track commander told me that while he was on an observation post, expecting to see the enemy at any moment, a track appeared, going like a bat out of hell, and towing a 1½-ton trailer. When it got close enough he stopped it and challenged its commander. It was an engineer squad attached to the troop that had been forward emplacing obstacles when they spotted an advancing enemy force.

Engineers will be up front with the platoons, either clearing obstacles for the attack or putting them in for the defense. For this reason company, troop, and team commanders will often attach them to the nearest platoon so the engineers will have a tie-in with the platoon's parent unit. These attachments are also made so that the commander can be sure, through his platoon leader, that the engineers accomplish the right things at the right places. From the other point of view, there are few things more depressing than to see a well-trained enemy engineer unit go through an obstacle in 15 minutes that took your platoon 1 hour to set up. The enemy knows how to use his engineers. Do you?

Operating During Poor Visibility

Two factors that will influence the integrated battlefield are so obvious that most of us forget to consider them. They are poor visibility and weather.

Our night vision devices, no matter how good, will never turn night into day. These devices don't provide the depth perception, peripheral vision, detail, and confidence that daylight vision gives you. These shortcomings produce an

adverse psychological effect. At night, we relax security, slow down, or cancel activity, and sleep. Unfortunately, troops will continue this behavior in the field—in training or in war—unless steps are taken to remedy this weakness in our operations. At night I have found I have to worry about the entire crews of two or three vehicles going to sleep rather than two or three individuals in the platoon as in the day. Our confidence decreases as darkness closes in and our knowledge of our surroundings is limited to a device's narrow beam.

Once, while conducting a night attack, my scouts (who were leading) could not determine where they were or how to get to the objective. I thought I knew where we were and the way to the objective, but due to the uncertainty and confusion we were all feeling, I put the platoon into a defensive position and left to reconnoiter the area and the route. It turned out that I was right, but we lost about 2 hours because I had lacked the confidence to take the platoon with me.

Operations at night take on a wholly different character. Like a blind man who relies much more on his hearing, I rely much more on my radio at night to tell me where my people are and what they are doing since I cannot see them. In daylight, I usually look at the map only when I need a coordinate, or once every kilometer to check my location. Mostly I keep my eyes on the terrain and on my troops. At night, I stay inside the track with a flashlight, huddled over my map, popping up only every 15 minutes to examine the terrain to find out which grid square I am in. Generally, I act like a person playing chess by telephone. Other platoon leaders have related similar experiences to me.

Remember that these problems affect the enemy as well. If our doctrine, training, and equipment gives us the edge in fighting at night or during periods of poor visibility, we must exploit this advantage with night operations.

Using Inclement Weather

Weather has many similar effects. It tends to degrade the leader's vision and mobility, and has an adverse effect on the spirit of his soldiers—they will want to stay where it is dry and warm. One of my former commanders liked bad weather because it had these effects on the opposing forces. He warned us that if the weather turned bad, he was going to attack. True to his word, when a damp, cold fog rolled in and cut visibility to less than 100 meters, we attacked. During the previous day's reconnaissance I had found a rough but passable way into an isolated valley that let out just behind the enemy's rear. The squadron commander told me to take this route and then continue to penetrate into their rear. I would then face about and set up in a defensive position near the suspected location of a bridge that the enemy must cross while withdrawing. The other platoons (and troops) would be pushing them toward us. We were able to do all this without being detected because of the reduced visibility. All the enemy units were caught completely by surprise. The platoon destroyed a tank company before the umpires stopped the play so the enemy battalion could get across the bridge and set up a new defense.

EW Countermeasures

Let us not forget the lesson of EW. We have already seen some of the havoc it can cause through radio jamming. Offensive EW remains largely with the Signal Corps and Military Intelligence and will seldom be seen at the platoon or company level. There are, however, a variety of defensive measures you can take.

Using the procedures and codes we already have will go a long way to protecting us from offensive EW. OPORDs, whether written or oral are going to be rare gems on the fluid, integrated battlefield. Therefore, ensure that if you issue or receive one, that it has all the instructions necessary so that all the units involved can completely accomplish their missions in a coordinated fashion without once using the radio. For example, control measures could be timed; do not rely on the radio if a unit gets ahead or behind. "All elements will hold at PHASE LINE BLUE until 1030. No one will cross before that." Coordinate an assault, using time. "All units will assault OBJECTIVE LUCIFER at 1230." Use pyrotechnics. "Assault OBJECTIVE LUCIFER when you see purple smoke." Couriers and wire communications can be made SOP and very effective if the situation is right.

Hand and arms signals are also effective and cannot be emphasized enough in platoons. When I first joined my platoon they wondered if there was something wrong with me because I was always waving my arms around. Nine months later I watched with great pride as the platoon moved for an hour and a half in bounding overwatch without once using the radio. They used hand and arm signals.

One more point: nothing beats face-to-face contact for long conversations. It is a lot of work to move over to

someone's position, unhook, climb out of your track, and climb up on his (and reverse the process when you finish). But there is no substitute for it. This became the preferred method for my scout section leader, my platoon sergeant, and I when the need arose for direct consultations.

Finally, there are the chemical, nuclear, and biological warfare factors of the integrated battlefield. The preparations, precautions, and countermeasures associated with these types of attacks have been well described in Army publications. My purpose here is not to make you an expert in these aspects of the integrated battlefield, but to make you aware of them so you can prepare for them by establishing battle drills and SOPs.

Good SOPs Are Invaluable

Innovative thinking founded on the Principles of War, especially the principle of the *objective*, coupled with training to the standards of unit SOPs will get you through every crisis. SOPs or battle drills are vital to a unit's success.

Deciding how to react to events on the battlefield before they occur has several advantages. Instead of reacting hesitantly, or reacting before you have had a chance to give the situation careful thought, you already know how to react, and you react with a carefully thought out plan. This also gives you the opportunity to tap the experiences of others who have been in similar situations before and who know a successful drill and how to employ it. The best drills in my platoon were those that incorporated the ideas of the platoon's NCOs. The drills were seldom exactly what they suggested, but did include their ideas and experiences and produced extremely effective results.

Another advantage is that during peacetime training we can determine whether our SOPs and battle drills work or whether they need to be improved.

After the platoon has an opportunity to use the refined SOPs and drills, the engagements must be reviewed to see if drills and procedures are adequate and if individuals properly implemented the drills. The review will indicate the need for additional instruction and training to bring the platoon up to standard.

A final advantage to SOPs and battle drills is that in an emergency everyone knows what to do and does it because it has become routine. Success and survival of the platoon no longer depend on one person giving the correct commands or instructions. The instructions have already been given. If the situation is not quite what the OPORD predicted, everyone will still know what to do and what the other members of the platoon are going to do. This enables individuals to act with much greater confidence, initiative, and aggressiveness.

Command and Control

It is entirely appropriate that the U.S. Army Armor School's Command, Staff, and Doctrine Department is housed in Boudinot Hall at Fort Knox, KY, because Brigadier General Truman Everett Boudinot was one of the early shapers of American armor tactics and doctrine. He discovered early that mechanization extends the battlefield to much greater distances and that for mechanized units to function effectively over these distances, command and control must also be extended.

For the platoon leader, this means that not only must he respond to mission-type orders and then use his initiative, he must also allow his sections and tanks to use their initiative as well. It always dismayed me when the scouts on the far right saw and reacted to a situation that I could not see. I was forced to follow their lead in maneuvering the platoon. But, the scouts and tanks on the far right never let me down.

Another of General Boudinot's principles was that tanks had to be supported by coordinated infantry and artillery; in short, combat arms have to be combined to be effective.

Key on the Objective

It is unlikely that anyone can become an expert on all the factors of the integrated battlefield, but if you keep one principle of war firmly in mind—the objective—you can control these factors so they contribute rather than detract from the successful accomplishment of your mission. Direct all efforts toward a clearly defined, decisive, and attainable goal. If you let one factor of the integrated battlefield prevent you from accomplishing your mission, that factor has made you 100 percent ineffective, even though you have suffered no casualties.

I have seen many units when hit with a chemical, nuclear, or even artillery attack rapidly go through their countermeasures. They will complete them quickly, completely, and competently, then sit there as if to say, "The war is over for us. What's next?" First, next, last, and always is your mission and your objective.

I served under a commander who answered 90 percent of the transmissions I sent to him with, "Roger, continue the mission." I loved it at the time because it gave me the latitude I needed to do what I already knew must be done. If I was not doing what I was supposed to, it gave me the "encouragement" I needed to get off my duff, square my shoulders, and press forward.

What I did not realize at the time was that he was also reinforcing the principle of *objective*—that all my efforts should be aimed at a specific goal, and secondary objectives should get only secondary efforts.

When jamming makes your radios useless, you will continue with your orders and reach the objective. If you get attached to an infantry company, you will execute your mission with aggressiveness. If an ADA team asks you where to go, you may not get them in the best spot, but you will get them in a place that contributes to the successful completion of the mission. If hostile aircraft threaten, you will evade them, destroy them, or drive them off. If obstacles interfere, you will get engineers to clear the way. If irregular forces harass you, you will inflict as much damage as you can and then drive on. And if, heaven forbid, you are hit with a simultaneous chemical and artillery attack at the moment you are making contact with enemy attack helicopters and ground reconnaissance elements, you will not sit there in dumbfounded confusion or throw a fit of frustration. Rather, you will remember your mission, determine what you must and can do to reach your objective, and lead the way!

CAPTAIN ALAN WATTS was commissioned in armor from West Point in 1979. He is a graduate of the AOBC, JOMC, AOAC and the Joint Firepower Control Course. He served as a cavalry platoon leader, squadron adjutant and executive officer in Germany and is currently assigned as a systems coordinator in force modernization with the 1st Cavalry Division, Fort Hood, TX.

Improved Company Command and Control

by Major David W. Marlin and Captain Robert N. Sweeney

The tank company single radio net system offers the company commander improved command and control capabilities. With this system, the commander is able to report and use accurate intelligence, make quick, timely decisions, and rapidly deploy his forces. The single radio net system decreases redundant transmissions and breaks in communication, while enhancing the company's communication security, reaction time, unity of effort, and the ability to operate with no radio communications. Without these capabilities, rapid tactical maneuver on the electronic battlefield will remain an unpracticed theory.

The Division 86 tank company, a smaller organization with its improved leader-to-led ratio, will continue to rely on the radio as its primary means of communication. When using a single radio net system, each company vehicle and all supporting elements dedicate one radio to the tank company radio net (figure 1). The company commander, XO, NBC operations sergeant, platoon leaders, and platoon sergeants monitor the battalion command net on their second radio, or auxiliary receiver.

Similarly, the first sergeant, supply sergeant, and motor sergeant monitor the battalion administrative and logistic net. This gives *every vehicle commander* in the company the ability to keep abreast of the situation and to transmit and receive on the company net. Furthermore, this allows *every key leader* in the company the ability to monitor the battalion net.

The company commander and the XO work as a team. The company commander receives all radio transmissions immediately, as does the rest of the company. As enemy spot reports are received, the company commander makes brief acknowledgements, as do his platoon leaders. The XO compiles those spot reports in detail and transmits them to the battalion command post. The company commander concentrates his communications on maneuvering his platoons during the fight, while monitoring the battalion command net. By monitoring the single radio net, the company commander receives immediate updates on the platoon's actions and status. The XO remains on the company net when the commander is transmitting on the battalion net. As second in command, the XO leads the unit, filling the void created by the commander's communication absence. With the company single radio net system, the XO is constantly in a key position to take charge during the commander's absence, or death. When deployed forward, the XO can also assist in controlling the company through visual signals.

During the fight, the NBC operations sergeant operates from the commander's wheeled vehicle. Able to communicate on both the company and battalion command net, he monitors, coordinates, and reports nuclear, biological, and chemical activities from lower to higher and higher to lower. On this single radio net system, this critical data is speeded through the chain of command from individual vehicles to battalion headquarters and vice versa. Chemical alerts are expedited throughout the company. In addition to providing more timely advice and information to the commander, the NBC operations sergeant is in a better position to assist in coordinating and supervising the company's survey, detection, and decontamination efforts.

Platoon leaders and platoon sergeants also monitor the battalion command net. This, in effect, provides them a warning order in virtually every situation. After hearing the company commander receive instructions from battalion, they can anticipate the more specific instructions that will be forthcoming. In the absence of the company commander and XO, the succession of command remains unbroken as platoon leaders are completely informed of the battalion's status and higher headquarters' last instructions. Platoon leaders and platoon sergeants no longer serve as relay stations for spot reports and calls for fire. They simultaneously fight their tank, communicate with the company commander, and maintain continuity with their platoon. However, visual signals, battle drills, and platoon SOPs are stressed as the platoon leader applies a "do as I do" style of leadership. This better enables the platoon to fight during radio silence, jamming, or electronic magnetic pulse (EMP) damage. Platoon leaders are also able to communicate with other platoon leaders during the fight. Potential opportunities created by one platoon leader can initiate actions by another in situations that the commander is unable to oversee.

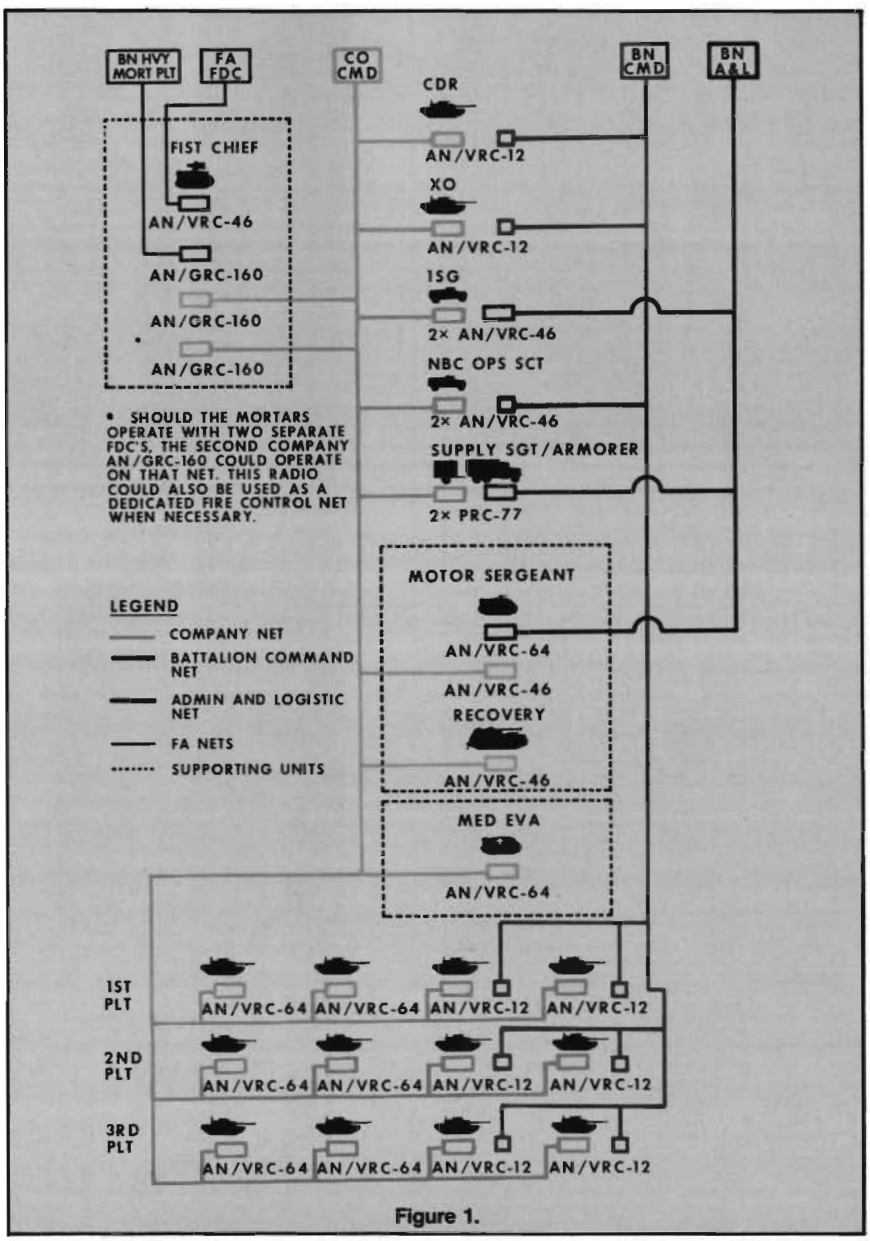


Figure 1.

Each tank commander monitors the company commander's instructions. In the same manner that the platoon leader and platoon sergeant receive warning orders from the battalion command net, tank commanders receive like warning orders. The tank commander can send a spot report or a call for fire with the full realization that he is notifying each member of the command. While monitoring the company net, tank commanders, along with all crew members, also are kept abreast of the other platoons' and the company's situation. Unit integrity, an intangible feature of the company single radio net system, is achieved both during training and battle.

The fire support team (FIST) is also linked to the company single radio net system. The FIST is prepared to move to any vantage point to support the company fight. By receiving spot reports and calls for fire spontaneously, the FIST team is able to reduce their decision-making and steel-on-target time. In addition to maintaining one radio on the company net, the FIST has a radio configuration to support either split battalion mortar sections on separate nets, or provide a dedicated fire control net to the company. During complete radio blackouts, the FIST serves as the company's contingency messenger or liaison to battalion until radio communications are reestablished.

The first sergeant is the primary administrative and logistical leader. Like the supply sergeant and motor sergeant, the first sergeant maintains a radio on both the company net and the battalion administrative and logistics net. By keeping abreast of the company's fight, the first sergeant can push forward logistical and maintenance support available at the company trains and coordinate additional support from the battalion. The supply sergeant and motor sergeant are thus totally aware of the battalion's administrative and logistics situation and are prepared to succeed him when necessary.

The *key* to the tank company, single radio net systems is *radio discipline.* In order to achieve all these

advantages, *all* personnel must comply with correct and proper use of radio telephone procedures (RTP). In addition to the ground rules laid down by RTP, personnel must become intimately familiar with the company's tactical SOP and be aware of the situational priorities.

Companies using the tank company single radio net system for the first time will notice a significant change in their radio discipline within a very short period of time. This will be driven home by the fact that the company commander and key leaders will be in a position to remind personnel of the need for and to reinforce the practice of radio discipline.

With the reduction of 75 percent of the company's radio nets and correct RTP and the potential for redundancy of transmissions, overall security violations are decreased. The battalion's radio net requirements can be decreased by 12 nets and the division can decrease its requirements by 72 radio nets.

The single radio net system can be adapted to other tank company TOE's as well as that of the Division 86 tank company (figure 2).

Even the novice observer would discover quite a disparity between the U.S. Army's tank company communication system and that of our allies. West German, Canadian, British, Australian, and Israeli tank companies operate on a tank company, single radio net system with approximately the same number of vehicles as U.S. companies operate.

The tank company, single radio net system is not a new system or concept. However, the realization that modern armored warfare executed on an accelerated, lethal, battlefield emphasizes the need to simplify the primary means by which a tank company commander and platoon leaders will command and control their units during the fight.

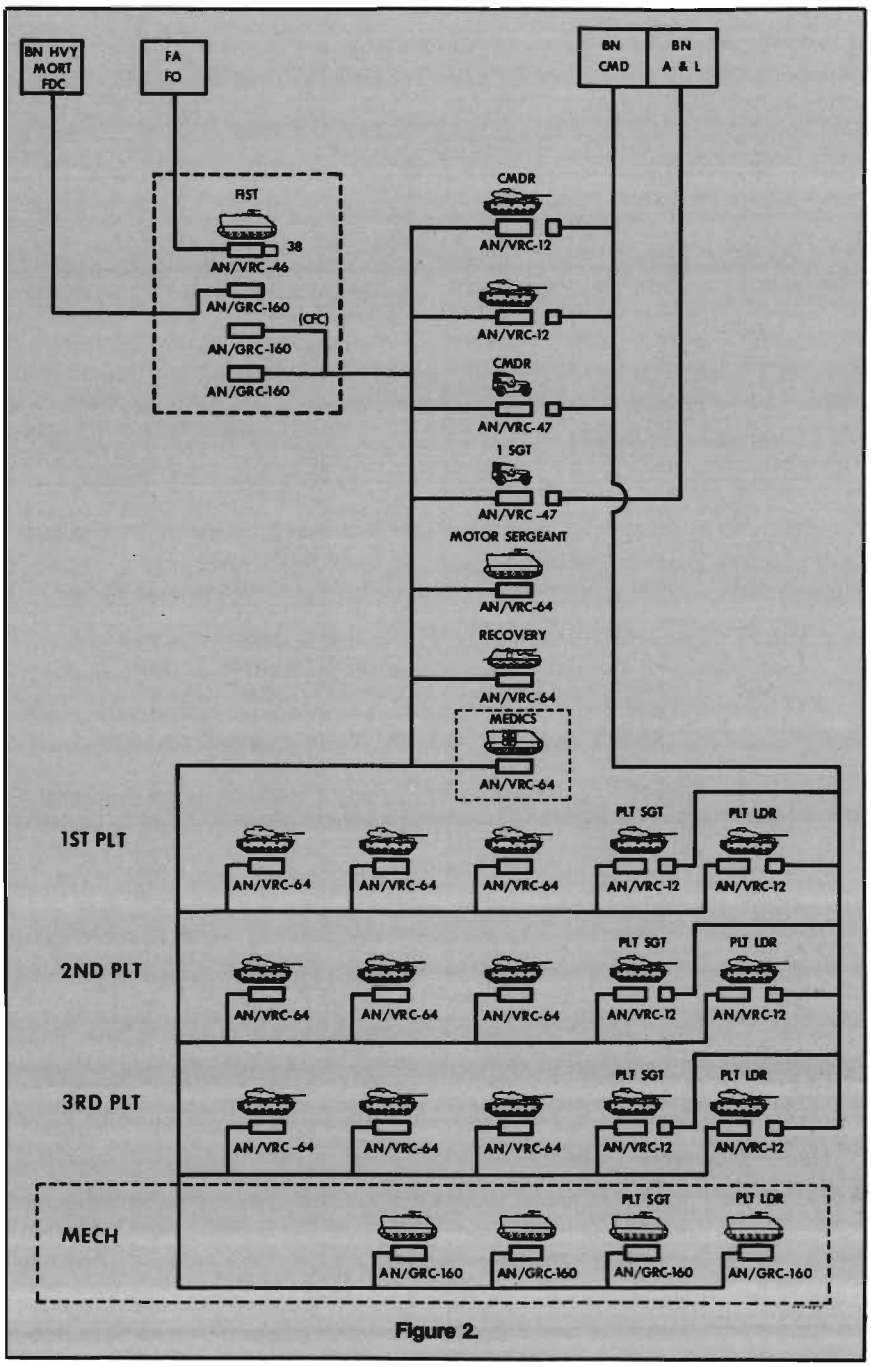
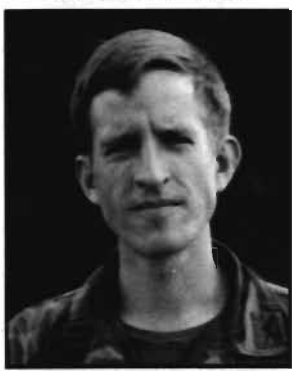
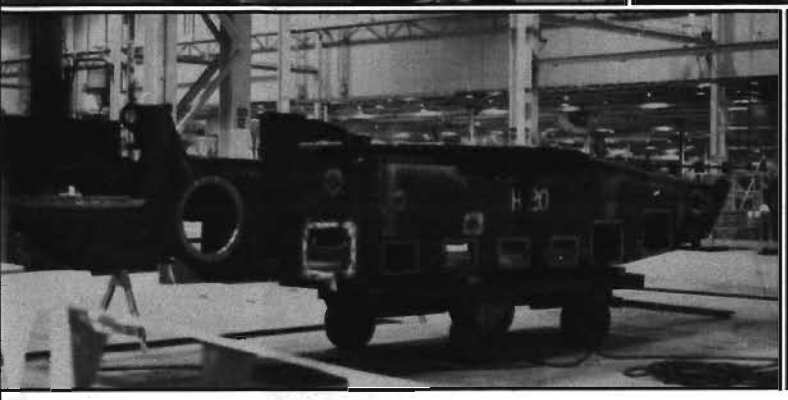


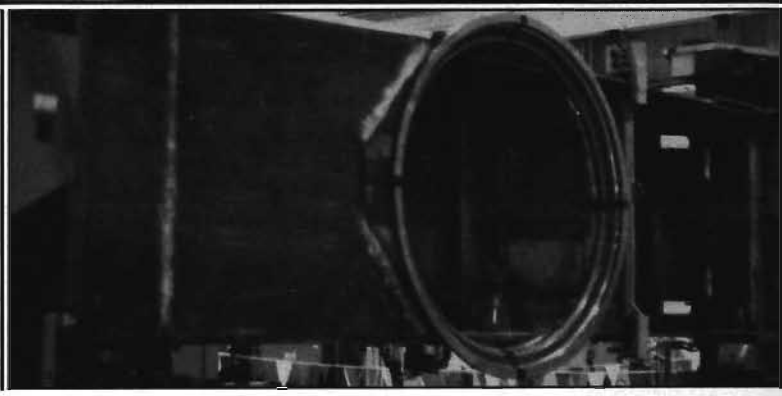
Figure 2.

MAJOR DAVID W. MARLIN was commissioned in armor from Old Dominion University, Virginia in 1971. He has served in various command capacities in Europe, Australia, and the CONUS. He received his masters degree in systems management from USC in 1982 and presently is assigned as Chief, Offense Branch, Command and Staff Department, USAARMS, Fort Knox, KY.



CAPTAIN ROBERT N. SWEENEY was commissioned from Lehigh University in 1976. He has served as platoon leader, 2-5 Cavalry and at headquarters, 2-5 Cavalry and as company commander in the same unit. He is presently assigned to the Command and Staff Department, Advanced Tactics, at USAARMC, Fort Knox, KY.





Elements of Tank Design

by Gerald A. Halbert

To a tank crewman, *a tank is a large complex track-laying vehicle that requires a great deal of maintenance, mounts a monstrous cannon, armored to resist battlefield threats, and capable of negotiating rough terrain and running over most obstacles.*

To an enemy foot soldier, *an attacking tank is a large, awesome, noisy, frightening, invincible machine capable of instilling terror in spite of what his leaders have told him about the capabilities of his weapons against the "weaknesses" of the tank.*

To a tactical commander of armor units, *a tank is the ideal instrument for employing mobile protected firepower in the aggressive assault role so vital to offensive land combat.*

To a commander of combined arms, *the tank is the centerpiece of land combat—the optimum combination of firepower, shock action, mobility and protection when employed with other close combat units.*

To a tank developer, *a tank is, in essence, a response to certain demands created by a tactical role. These demands are functional and can generally be described by a set of requirements or system capabilities derived from the interaction of the threat, technology, and the intended operational concept, and can be related to design in terms of configuration and characteristics.*

To a force structure analyst or military economist, *a tank is a unit of firepower, whose cost and performance can be quantified and assessed in realistic combat scenarios in comparison with other existing systems or possible new systems in a force structure.*

A tank may be viewed by various people, but no one can question that this combination of firepower, mobility, protection, and shock action called a tank is the most effective instrument of aggressive assault in land warfare today, and will continue to be in the foreseeable future.

Cliff Bradley

Much study has gone into tank design since the first tank entered combat in the WW I Somme offensive. At least two books, R. M. Ogorkiewicz's *Design and Development of Fighting Vehicles,* and Richard E. Simpkin's *Tank Warfare,* have discussed tank design in great detail. Obviously, while a magazine article cannot discuss all those tank design factors covered in the above books, it is possible to cover some of the basic factors. Most writings on tank design stress those factors that distinguish tanks from one another and focus primarily on engine power, armor, and main armament. There are, however, other perspectives that must be considered such as length-to-width ratios, ground-pressures, length limits, and width and height. The tank designer must be aware of these limitations when he reads the Staff Requirement (UK), Required Operations Characteristics (US) or Tactical Technical Requirement (USSR), that establishes the basic design of the tank,[1] plus those specific requirements peculiar to the desired tank. They generally do not specify how the finished product will look nor how it will be built.[2]

Theoretically, a tank designer can start with a clean sheet of paper. In practice, however, there are several design constraints that will affect the tank design. Briefly stated, tankers desire a tank that can, with a single shot, kill any possible opponent at all possible combat ranges; that can survive a hit from any opponent at any angle of attack, at any range; that can move rapidly across any type of terrain at the fastest possible speed, and have the greatest possible road range. Logisticians desire tanks that cost little, can be transported on a pickup truck, require little or no maintenance, and consume little fuel and ammuni-

tion. Unfortunately, it is not possible to accomplish all this in any single vehicle, and features must be traded off to produce a balanced tank design.

Dimensions

Width is perhaps the most critical dimension on a tank because it governs the tank's capability to move along highways, cross bridges, be transported, and maneuver. For example, special timbers had to be laid on WW II Bailey bridges to protect the bridge curbs from damage by *M-26 Pershing* tanks, which were 20.3 inches (516 mm) wider than the *M-4 Shermans* that acould traverse the spans with ease.

The width of tank transporters, aircraft, and railroad cars also affect the design width of tanks. The USSR limits width of cargo transported by rail to 3,414 mm (134.4 in). This in turn establishes the maximum width of Soviet tanks.[3]

The U.S. Army originally set a maximum width of 144 inches (3,658 mm) for the *M1* tank, which is now being produced with a width of 141 inches (3,588 mm). Factors influencing the width specified by U.S. tank designers include the Berne International Railway Gage, which prescribes a maximum width of 3,150 mm (124 inches) or the maximum width of highway load limits, which generally range from 2,438 mm (96 in) to 2,591 mm. Both limits can be waived. The standard U.S. Army Heavy Equipment Transporter is 99.5 inches (2,438 mm) wide, but a transported tank overhangs each side. The limit of 144 inches specified in the original Material Need Document for the *M1* was established as an arbitary, but reasonable, limit based on the most efficient use of space aboard cargo vessels.[4]

The width of a tank hull is also affected in part by the diameter of the turret ring.[5] The turret ring must allow the gun breech to swing down to aim at an elevated target and must allow enough room for the gun to be loaded with a long main gun round. Turret rings for U.S. tanks have varied in size from 60 inches (1,524.6 mm) for the *M4 Sherman* medium tank, mounting either a 75- or 76-mm gun, to 85 inches (2,159-mm) for the *M-48 Patton* and *M-60* tanks mounting 90- or 105-mm guns.[6] Table 1 gives the turret ring diameters for several tanks.

Height. Three factors influence a tank's total height: turret height, hull height, and ground clearance. If the overall height is controlled and kept low, the tank becomes harder to see and therefore harder to hit. A critical element in Soviet tank design has been controlling the height of the tank to reduce weight while maintaining the maximum level of protection with frontal armor. Reducing the height to the minimum has the most payoff in reducing weight because the frontal armor is thickest and requires more weight to maintain a given level of protection.[7] Therefore, if the height of a tank is lowered and if the weight is kept at a constant, the frontal armor can be thicker because it need not cover as great an area.

Ground clearance is normally specified by the user, and for the US *M60* tank is 18 inches (457 mm).[8]

The height of the hull is normally limited by the space required by the engine height and by the average height of 1 meter for the seated driver. The height of the turret is controlled by the size of the main gun and the main gun depression angle.[9] The turret roof height is also governed by the need for the loader to stand, and load main gun rounds. There must be at least 66 inches (1,676 mm) from the hull floor to the inside turret roof for the loader to stand. One method of determining the minimum height of the tank is to add the thickness of the turret roof armor, thickness of the flooring, thickness of the torsion bars (if used), thickness of the belly armor, and the ground clearance. An alternative method is to add the ground clearance, 40 inches (1,005 mm) for the seated driver, and 26 inches (660 mm) for the turret (additional space is always required for gun depression) to set a minimum height for a conventionally designed tank of about (2,122 mm).[10] This compares to a height of 94 inches (2,400 mm) for the Soviet *T-62*.

Length. A tank's length is generally not as critical as its height or width. However, tank length is governed to some extent by tank width. The ability of a tank to turn is greatly influenced by the ratio of the length of the track on the ground to the width of the track. If the ratio becomes too large, turning is impossible because forward thrust is offset by the power lost in the skid of the tracks. For tanks with simple transmissions having only one steering radius, the length to width (L/W) ratio should not exceed 1.5. Tanks with more sophisticated transmissions (with a variable turning radius) have L/W ratio limits ranging from 1.7 to 1.8. The location of the tank's center of gravity (CG) has a major effect on the ability of a tank to cross obstacles. Ideally, the longitudinal CG should be located above the geometric center of the supporting tracks to create a uniform distribution of weight on the road wheels.[11]

Ground Pressure and Weight

Perhaps one of the most critical factors affecting the mobility of tanks is the ground pressure of the tracks. The USSR sets a limit of 0.85 kg/cm^2 for dead (non-rubber bushed)track.[12] However, the Soviets have not fielded main battle tanks with a ground pressure greater than 0.81 kg/cm^2, including the *T-64* and *T-72*, that have live track (table 2). U.S. tanks normally have higher ground pressure than do Soviet tanks.

Generally speaking, the lower the ground pressure, the easier-it is for a tank to travel over poor terrain. For example, the very low ground pressure of the British *Scorpion* armored fighting vehicles (0.35 kg/cm^2) allowed them to traverse very soft ground in the Falklands that was impassable to almost any other ground combat vehicle.[13] The less the tank track penetrates into the ground, the less power is required to drive the tank. In addi-

tion, softer soil does not accept thrust as well as harder soil.[14]

Allied to the problem of ground pressure is that of tank weight. Modern battle tanks range in weight from 39.6 to 60.6 tons (36 to 55 metric tons). It used to be that high weight equated to less mobility. However, with modern technology, today's tanks can actually have better mobility than older tanks of lower weight and with less powerful engines. The higher weight does make it harder to transport tanks by rail or by truck. Higher weights also limit the bridging that a tank can use.

Armor

The heaviest component of a tank is its armor envelope.

As mentioned above, Soviet tank design controls the height of the tank to reduce weight by reducing the area that requires the maximum level of armor protection.[15] Table 3 lists the areal density of various armors. The ideal properties of conventional armor are that it be hard, ductile, and stable.[16] Although titanium armor might be attractive from a weight point of view, it is much more expensive than steel. Although aluminum is one-third lighter than steel, for an equal amount of protection it must be three times as thick as steel. This means that a steel armor hull and an aluminum armor hull giving equal protection would weigh the same. The thicker aluminum is also more rigid. However, aluminum armor can significantly reduce overall structure weight because an aluminum hull requires less reinforcement than does a steel hull. Aluminum is therefore very suitable for lighter vehicles.

Chobham armor recently developed in the United Kingdom gives significantly better protection, weight-for-weight, than any other existing armor, and it can be tailored to meet threats presented by different types of penetration.[17]

Almost as important as the type of armor is its placement on a tank. Armor is distributed on the tank based on the probability of being hit. Thus, the heaviest armor is on the frontal arc,[18] and the area that is normally most heavily protected is the 60-degree frontal arc.[19] Figure 1 illustrates some of the 60-degree arcs that are possible on tanks. Due to weight considerations, most tanks would place the centerline of the 60-degree arc at the rear of, or tangential to, the turret.

The protection provided by a given thickness of armor is enhanced by sloping the armor to increase its effective thickness (figure 2).[20,21] Additionally, greater angles of obliquity will heighten the chances for attacking projectiles to ricochet.

Armor also offers radiation protection. Unclassified literature offers little data on neutron degradation by armor, but there is considerable information indicating that gamma-ray attenuation is affected greatly by the length of time following a nuclear detonation. Initial radiation, which has much higher energy levels, occurs at the moment of explosion, whereas residual radiation comes from fallout or induced (secondary) radiation. Table 4 shows how different materials shield against radiation. It can be seen that steel is the most effective radiation shield. Using the formula K=V/2 X VP where K=the degree of gamma activity, V=the thickness of the material and VP=the half value layer, it can be seen that 1.5 inches (38 mm) of steel drops the level of radiation to one half, 3 inches (76-mm) to one-quarter and 114-mm of steel to one-eighth.[22] Thus, if one must be exposed to a nuclear attack, it is best to turn the front of the hull and turret toward the blast.

Although recent advances in armor have significantly improved protection, it is impossible to defeat every

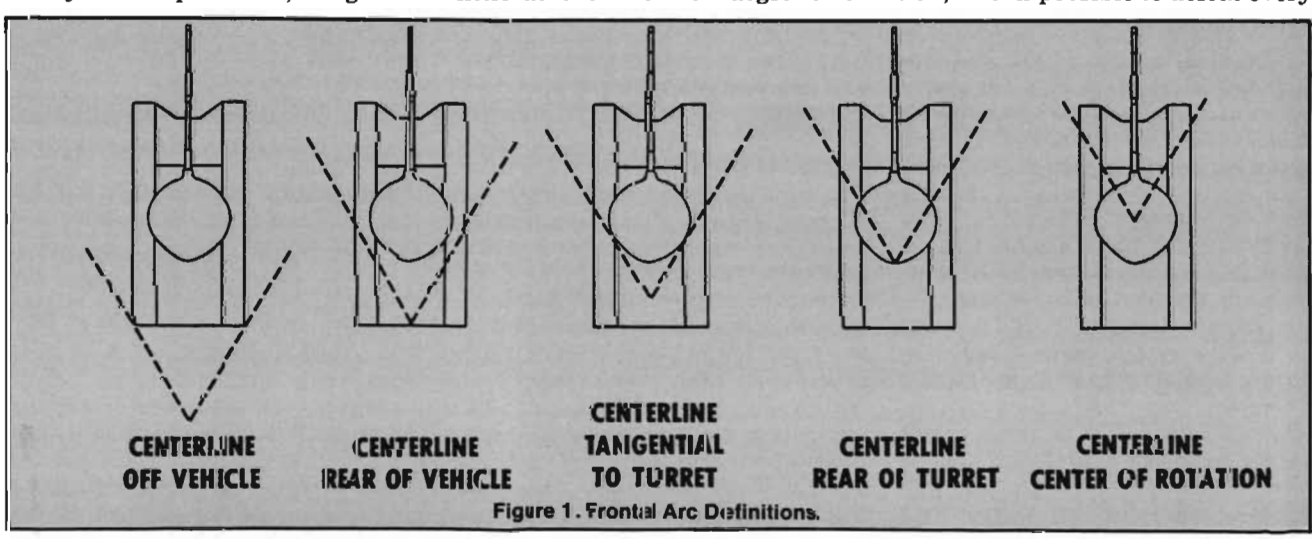
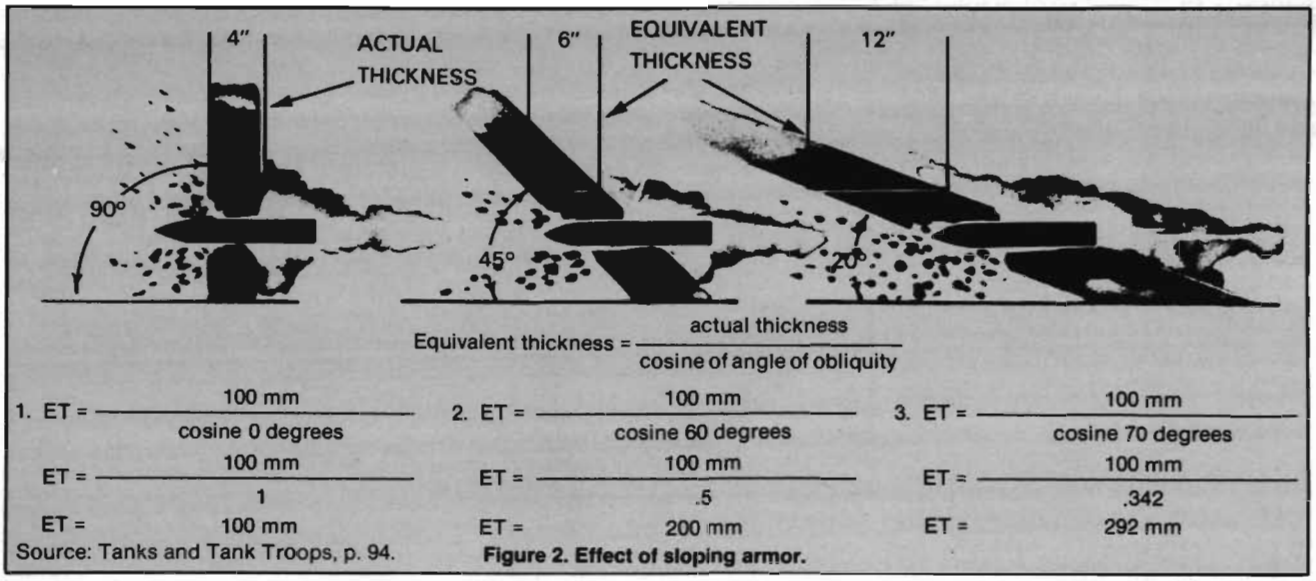


Figure 1. Frontal Arc Definitions.



Source: Tanks and Tank Troops, p. 94.

Figure 2. Effect of sloping armor.

possible threat. Armor alone is not the only factor to consider when evaluating a tank's survivability.

Survivability

A tank should have protection against being destroyed even if the armor is penetrated. After a tank is penetrated, fire is the biggest hazard. Recognizing this, the *M1's* designers equipped it with seven sensors to detect a fire and extinguish the flame growth before it can cause an explosion.

In older tanks with gasoline engines, the probability of fire was very high if there was a hit in the engine compartment or near a fuel tank. In such cases, the fire spread faster than would a diesel fuel fire. Additionally, vapors from a leaky gas tank were much more likely to cause a secondary explosion than were diesel fumes. Besides lowering the likelihood of fuel fires, and thereby improving survivability, the shift to diesels increased the tank's mileage between refuelings. The gasoline-engined *M-46 Patton* tank had a range of 70 miles (113 km), while the *M60A1* (with increased fuel aboard) has a range of 300 miles (483 km).[23]

Ammunition propellent charges are the biggest fire hazard in the tank because they ignite instantaneously when struck by a penetrator. However, the risk of a propellant fire can be significantly reduced by using stowage racks filled with liquid, such as was done in the *M-4 Sherman* and the *Chieftain*. An alternate method is to use blow-off panels as in the *M1*.[24]

In addition to armor and fire protection, other measures that can enhance survivability include smoke grenade launchers or other smoke generating devices for screening purposes; self-entrenching devices that permit the tank to dig itself in;[25] and design features to lower visual, infrared, or audio signatures to protect against detection. Thus, the need for survivability helps determine how the tank is laid out.

Tank Layout

Tank layout (or how the engine, transmission, gun and crew are placed in the tank) is an example of form following function. A tank's layout is driven by the tank's operation on the battlefield. The tank must move across country at comparatively high speed, carry powerful armament, and protect the crew and the entire system. Tank configurations vary from year to year, but most countries have settled on a design that can be traced back to the *T-34* tank.

The tank hull is normally divided into three compartments: the driver's compartment, turret area, and the engine compartment. The engine of a tank is normally compartmented to reduce the chance of a fuel fire spreading into the crew areas. The engine is normally found in the front or rear of the tank, but the first real tank, the British *Mark 1,* had the engine in the middle.[26] Although most tanks produced since WW II have the engine and transmission in the rear, many tanks were built before and during WW II with the engine in the rear and the transmission in the front.[27] There are several disadvantages to the rear engine/front transmission layout. The vehicle height must be increased to allow the driveshaft to transfer power to the transmission and, since a transmission requires maintenance, the front of a tank with a front-mounted transmission must have access hatches or removable armor to gain access to the transmission.[28] Furthermore, front-mounted transmissions are vulnerable to mines because most mines detonate under the front of the vehicle. If this happens to a tank with a rear engine and transmission, an idler may be destroyed, but the tank can be short-tracked and moved away under its own power. On the other hand, if a front-mounted drive sprocket is hit, the tank cannot be moved and must be recovered by some other means. Yet another disadvantage of front-mounted transmissions is the necessity for mounting final drives close to the hull, thereby making it difficult to give the glacis plate a slope with a large angle from the vertical to provide the greatest possible effective thickness for the frontal armor.[29]

The only tanks in service today that have front-mounted engines and transmissions are the Israeli *Merkava* and the Swedish *S-Tank.* The *Merkava* was designed with a front-mounted engine and transmission as additional frontal armor.[30] The *S-Tank's* front engine compartment also provides additional crew protection. However, its front engine/transmission layout was really a byproduct of the requirement for an autoloader that filled the space where the engine would have been placed.[31] As for maintenance of the *S-Tank*, if the

Table 1. Turret Ring Diameters

Tank	Turret Ring Diameter (in)	(mm)	Main Gun (mm)
M3	54.5	1,384	37
Panther	65	1,650	75
M4	69	1,753	75/76
M26	69	1,753	90
Tiger I	73	1,850	88
Centurion	74	1,880	83.4/105
M48/M60	85	2,159	90/105
Chieftain	85	2,159	120

Sources: *Design & Development of Fighting Vehicles;* p. 74; Hunnicutt, *Pershing;* p. 201; *Tank Warfare,* p. 67.

diesel engine must be replaced, not only must the glacis plate be removed but the gun barrel must also be dismounted.[32]

With development of thermal imagers, front-mounted engines may increase the likelihood of the tank being detected in defilade, while the location of cooling radiators up front may also contribute to uneven main gun barrel heating and gun barrel droop.

In addition to the disadvantages just mentioned, the problem of keeping the driver cool when he is located next to a hot engine or transmission is aggravated. However, keeping exhaust gases or noises out of the crew compartment is greatly simplified.

A significant advantage of locating the fighting compartment in the rear of the tank is the reduction of the overall length of the tank/hull/gun combination, which lowers the chances that the gun will strike the ground when moving across country with gun forward.[33] The rear fighting compartment configuration can also accommodate a longer gun, which increases muzzle velocity, and improves the penetration of armor-piercing, discarding-sabot (APDS) projectiles.[34]

Table 2. Ground Pressure

Tank	kg/cm²	psi
Scorpion	.35	4.9
S-Tank	.45	6.4
PT-76	.49	7.0
T-64	.72	10.2
T-62	.75	10.6
AMX-13	.76	10.8
AMX-30	.77	11.0
T-72	.79	11.2
T-34/85	.81	11.5
T-54	.81	11.5
T-55	.81	11.5
M60A1	.86	12.2
PZ-68	.86	12.2
Chieftain	.90	12.8
Leopard 1	.90	12.8
M1	.92	13.1
Vickers MBT	.95	13.5
Centurion	.95	13.5
M4A3E8	.96	13.7

Source: Pierangelo Caiti and R.A. Riccio. *Modern Armor.*

Most tanks mount the engine and transmission in the rear, avoiding the disadvantages of the front location, but this complicates the installation of controls because they must pass from the driver's compartment, through the turret area, and into the engine/transmission compartment.[35]

With the major exception of the *S-Tank,* most tanks have a single turret. The *S-Tank* has a fixed 105-mm gun mounted in the vehicle hull with an autoloader behind it that gives the system a 15-round-per-minute rate of fire.[36] Gun elevation of -10 to +12 degrees is obtained by using the hydropneumatic suspension to change the hull's pitch.[37] The gun is traversed using a very sophisticated transmission to advance or reverse the tracks to change the gun's deflection. The system allows the gun to be traversed as rapidly as most tank turrets.[38]

Drawbacks to the *S-Tank* concept are rarely mentioned but obvious. The first is the total inability to fire the main gun on the move or from some positions. Since the entire hull must move to traverse the gun, an *S-Tank* commander cannot orient the gun while in turret defilade, order the driver to move forward, engage the target as soon as the gun is exposed, and then return to defilade.[39]

Although virtually all modern tanks have a single turret it is not impossible that in the future the crew will be positioned within the hull and the main gun mounted externally.

The turret may be outmoded, but it offers advantages that no other system can match. If the commander is mounted above the hull, he has a better view of the terrain, is better able to spot targets and give specific instructions to the driver. Currently, the viewing systems necessary to do this are relatively simple, but mounting the commander and gunner in the hull would require complicated optical or electro-optical systems to ensure that vision would be at least as good as it is in a conventional turret.

Armament

The choice of a tank's main armament is governed by many factors. Among these are the tactical doctrine of the country developing the tank, the potential enemy's armor protection, and the requirement to destroy a variety of targets. In the 1960s, it appeared that future tanks would be equipped with anti-tank guided missiles (ATGM) because of their long-range and high kill probability. In the U.S., the *Sheridan* and *M60A2* were designed primarily to fire ATGMs from their main gun. The French Army started to develop the ACRA, a 142-mm missile fired from a gun, but terminated the program after several firings.[43] Although missiles may have some advantages for long-range engagements, their disadvantages include a low firing rate, inability to fire on the move, a long minimum range, and reduction of the basic load because of their large size.[44] In addition, because of their high cost, the crews of AGTM weapons systems fire very few training missiles.

Table 3. Areal Density

Armor	psf	g/cc
Rolled Homogeneous Armor	40.4	7.713
Titanium	23.2	4.429
7039 Aluminum	14.4	2.749

Notes: 1. Areal density is the weight per unit of surface area for a given thickness of material.
2. psf = Pounds per square foot of a one inch thick plate.

While the ATGMs were being developed, significant advances were made in tank gun fire control, permitting the gun to shoot more accurately at the ranges likely to be encountered in combat. Thus, all recently-fielded tanks mount guns as their main armament.

Ammunition

Tanks carry large volumes of ammunition for the main gun, coaxial machinegun, roof-mounted machinegun(s), the crew's weapons,

Table 4. Radiation Shielding

Material	Density (g/cm³)	Half Value Thickness (cm)	
		Initial	Residual
Steel	7.8	3.8	1.8
Concrete	2.3	15.2	5.6
Earth	1.62	19.0	8.4
Wood	0.55	58.4	21.4

Source: *Tanks and Tank Troops,* p. 96.

Table 5. Basic Loads for Tanks

Tank	Main Gun	Secondary Gun	Coaxial MG	Roof MG	Year IOC
Mark I (male)	332 57-mm		6272		1916
Mark IV	204 57-mm		5646		1916
St. Chamond	106 75-mm		7500		1917
A7V	250 or 500 57-mm		36,000		1918
T-34/76	77 76.2-mm		3900		1940
M-3 Medium	50 75-mm	178 37-mm	9200		1941
M-4 Medium	97 75-mm		4750	300	1942
T-34/85	56 85-mm		2750		1944
T-44	56 85-mm		2750		1945
M-26	70 90-mm		5000	550	1945
Centurion	64 83.4-mm		4750	600	1949
T-54	34 100-mm		3500		1949
M-47	71 90-mm		4125	440	1950
M-103	38 120-mm		5250	1000	1953
M-48A2	64 90-mm		5950	1365	1953
T-55A	43 100-mm		3500	500	1958
M60A1	60 105-mm		5950	900	1960
T-62	40 115-mm		2000-3000	250	1961
Chieftain	64 120-mm		6000		1963
Leopard 1	60 105-mm		5500		1965
T-64	40 125-mm		3000	500	1970?
M60A2	33 152-mm	13 msl.	5560	1080	1974
T-72	40 125-mm		3000	50	1975?
Leopard 2	42 120-mm		2000		1979
M1	55 105-mm		11,400	1000	1980

Sources: Duncan Crow, *AFV's of World War I;* (Duncan Crow), *American AFVs of World War II,* Ray Bonds, *Modern Tanks and Fighting Vehicles,* (Salamander Book, Arco Publishing Inc), NY 1980, "Ordnance Tank Automotive Command Characteristics Data, Tank, Combat, Full Tracked, 90-mm Gun, *M-48A2," 22 Dec. 58.*

smoke grenades, and sometimes hand grenades. The most critical ammunition is that for the main gun. Historically, the number of main gun rounds aboard tanks has fluctuated greatly. For instance, the WW I *Mark I* tank, carried 332 57-mm rounds, and the WW II, *T-34/76* carried 77 main gun rounds (table 5). Since WW II, the number of main gun rounds carried by main battle tanks (MBTs) has decreased in most countries. In the West, the consensus appears to be that 50-60 rounds are required, while the Soviets appear to accept about 40 rounds as the basic load.

The weight and bulk of ammunition directly affects tank design and configuration. If more, or larger rounds, are to be carried, a penalty must be paid in equipment, crew space, or armor protection. Some examples:

- Increasing the basic load of an *M-47* from 71 to 105 rounds required the removal of the bow machinegun and elimination of the bow gunner's station.[45]
- The 75-mm round for the *M-4 Sherman's* main gun weighs 20 pounds (9.04 kilos) and the tank's basic load weighs 1,931 pounds (875.88 kilos). By contrast, the *M-60A1's* 105-mm main gun round weighs 41 pounds (18.6 kilos) and its basic load weighs 2,460 pounds (1,116 kilos) (table 6).

Empty cartridge cases add another problem for both the tank and ammunition designer. After firing as few as five rounds, the empty cases hinder the loader's operations and the residual propellant gases held in the cases begin to pose a breathing problem for the crew.[46] Some tanks have been designed with a port in the side of the turret for loading ammunition and disposing of spent cartridges, while ammunition for other tanks must be loaded through the loader's hatch and empty cases thrown out through the same opening. The cartridge case disposal problem has been partially solved in tanks such as the *T-64, T-72,* and *Leopard 2* by using combustible cartridge cases that leave only a relatively small obturator that resembles a very short cartridge case. The *Chieftain* is the only production tank using ammunition that does not have an obturator but has a completely combustible propellant bag instead.

Crew

The cubic volume of the tank devoted to the crew is a very important consideration in tank design. A seated man needs .52 cubic yards (0.4 cubic meters) of space when wearing nuclear-biological-chemical (NBC) gear. A loader needs 1.04 cubic yards (0.8 cubic meters), while the driver needs about .78 cubic yards (0.6 cubic meters). Allowing 10 percent extra for room and essential movement, a four-man crew requires about 3.3 cubic yards (2.5 cubic meters) of space.[47]

Many people wonder why tanks must have four-man crews. Modern electronics and engineering allow driving controls to be operated by either the commander or gunner. An automatic loader can replace a crewman, Indeed, the commander can, in most tanks, lay and fire the main gun. So why have more than one or two crewmen?

Table 6. Weight of Main Gun Ammunition

Country	Caliber (mm)	Designation	Weight (kg)
US	37	APC *M-51*	1.58
UK	40	2 Pdr *MK 1*	2.22
USSR	57	APHE	3.10
UK	57	6 Pdr APCBC-T	6.30
US	75	APC *M-61*	9.04
USSR	76.2	APHE	6.50
US	76.2	APC *M-62*	11.25
UK	76.2	17 pdr *MK 8*	17.01
USSR	85	APHE	9.30
US	90	APC *M-82*	19.39
US	90	Shot *T-43*	23.22
USSR	100	APHE	15.90
US	105	APDS M392	18.60
USSR	115	APDS BM-6	22.50
FRG	120	APFSDS	19.00
US	152	HEAT M409	22.59

Sources: R. P. Hunnicutt, *Sherman, A History of the American Medium Tank,* (Tarus Enterprises), Belmont, CA, 1978, pp. 559-567; Ezio Bonsignore, *Anti-Tank Warfare, Technology, Trends, Weaponry (I), Military Technology 23, p. 31;* R. P. Hunnicutt, *Pershing,* (Feist Publications), Berkeley, CA 1971, pp. 230-231, Christopher F. Foss, *Jane's World Armored Fighting Vehicles,* (Mac Donalds and Jane's), London, 1976, pp. 94-95.

Table 7. Road Wheel Travel	
T-55	85
Chieftain	120
AMX-30	186
T-64	203
Vickers MBT	203
Leopard 1 (1st wheel)	260
M60A1	300
T-72	310
M1	381
Type 74	*400
Leopard 2	530
S-Tank (last wheel)	543
MBT-70/KPZ-70	550

Sources: F. Shrier, *International Defense Review (IDR) Special Series: Main Battle Tanks (MBT), pp. 42-43; International Defense Review Special Series 11, Armored Vehicles, p. 22*

There is a fairly strong argument for a separate driver, particularly during an attack when the commander finds targets, the gunner shoots, and the driver maneuvers the tank with minimal supervision by the commander. And, in some cases, the driver can acquire targets and hand them off to the crew. Then there is the indisputable fact that the fourth crew member reduces the strain on the crew by spreading out the workload of operating and maintaining the tank during 24-hour-a-day operations. However, the case for a separate loader is weaker. The Soviets have fielded two MBTs equipped with automatic loaders that offer a higher sustained rate of fire, but have the disadvantage of occupying as much space as a man. Furthermore, the automatic loader is subject to failure and requires maintenance to ensure reliability.

The question of crew size will undoubtedly be raised again when new tanks are designed for the 1990s and the year 2000 since the watchwords will be smaller crews and greater mobility.[48]

Power Plant

The power-to-weight ratio developed by the tank is widely regarded as the most critical measure of the tank's ability to move with some agility. Power-to-weight is normally expressed as the ratio of horsepower-per-unit of vehicle weight and is found by dividing the gross power developed by the engine by the gross vehicle weight in tons. Power-to-weight ratios were in the 14-16:1 area during WW II and have risen to 27-28:1 with the *Leopard 2* and *M1* tanks (table 8). These ratios provide rapid acceleration and sustained higher speeds that translate to improved agility and mobility, which in turn increase survivability. For example, according to a chart in *International Defense Review*[49], a WW II tank with a power-to-weight ratio of 15:1 could accelerate from 0 to 10 mph (16 km/hr) in about 5 seconds, whereas a modern tank with a power-to-weight ratio of 28:1 can reach the same speed in 2 to 3 seconds.

Not only an engine's power, but its volume and weight as well affect tank design because they are among the factors that determine a tank's size. When comparing volumes and weights of different systems, the total weights of engine, cooling system, filters, transmission, and fuel need to be compared because different types of engines have different requirements for space for air intake and ducting, fuel, and cooling. For instance, a turbine engine is lighter than a diesel engine, but the diesel engine requires less fuel for a given operating range. Then, when all weights are added up, the turbine system in the *M1* weighs less than the diesel engine in the *Leopard 2*, but the volume of the *Leopard 2's* diesel is only 5.19 cubic meters compared to the *M1* turbine's 5.48 cubic meters. However, most of the difference between the *M1* and the *Leopard 2* weight and space requirements for the propulsion systems of the *M1* and the *Leopard 2* lies in the volume of fuel that must be carried aboard the *M1*—a problem that was solved by placing it in specially-shaped tanks to best use the available space.[50]

Complicating the problem of comparing different engine power ratings is the difference between gross horsepower (the power produced by an engine with no accessories) and the net horsepower (the power available to the transmission, after deducting cooling, electrical generating, and other losses). A case in point is the *M48*. Its AV-1790-5 gasoline engine developed 825 gross horsepower, while the diesel version developed 750 horsepower, but the diesel version produced 630 net horsepower compare to the gasoline engine's 625 net horsepower.[51] Some observers are now beginning to believe that it is more important to quote the power-to-weight ratio at the sprocket rather than the gross power to weight ratio to account for these differences.

The Soviets believe that the factors to be considered when picking a tank engine are the compactness and reliability of the engine, its accessability for maintenance, and the ease of installation.[52]

It is now generally agreed that V-type diesels and gas turbines will probably be used in future MBTs because rotary and "flat" engines have not proved themselves capable of reliably producing the power level of more than the 1,500 hp required.

Another very important consideration in selecting a tank engine is that it should have a low installed volume. A larger engine (even at a lighter weight) requires more armor to protect it, driving up the tank's size and weight.

Table 8. Power-to-Weight Ratios	
Tank	HP/ metric ton
Centurion	12.5
Chieftain	13.92
M-4A3	13.96
T-54	14.4
M60A1	15.3
T-34/85	15.6
M48A5	15.9
T-55	16.1
T-44	16.2
M47	17.54
S-Tank	18.7
T-72	19.0
T-62	19.2
Leopard 1A3	19.6
T-64	20.0
Leopard 2	27.5
M1	28.1

Sources: Pierangelo Caiti and R. A. Riccio, *Modern Armor, A Comprehensive Guide*, (Squadron/ Signal Publications), Warren, MI, 1978, pp. 21-22, 25, 97, 106, 126, 130, 137, 143, 149.

Suspension

One of the aims of any suspension system design is to produce a smooth ride by absorbing the shocks and jolts that occur when the tank maneuvers over varying terrain.[53] Such forces are initially taken up by a springing medium consisting of either torsion bar, coil springs, Belleville washers (disc springs), or hydropneumatic springs.[54] In the hydropneumatic system, nitrogen gas in a sealed container is compressed when road wheel movement actuates a piston that forces oil against the gas. Then, as the road wheel clears the obstacle, the gas expands to move the wheel back to its normal position. Tanks without hydropneumatic suspension use shock absorbers to absorb the force that is not taken up by the springing medium.

Regardless of what suspension is used, the designer's primary objective is to provide the smoothest ride possible. The smoother the ride, the

easier it is to stabilize the gun, permit the crew to operate more efficiently, and increase system reliability by reducing stresses.

When considering the human factor in suspension design, it should be noted that motion sickness sets in when the hull's pitching motion reaches 4 to 5 cycles per second.[55] The desired goal is about .7 to .8 cycles per second, which can be achieved by increasing road wheel travel (table 7).[56]

Human Engineering

Although the Soviets are frequently believed to ignore human engineering when designing tanks they do, in fact, consider the following factors closely:

- Provision of comfortable headrests.
- Attention to layout of gunner's and commander's station for ease of operation.
- Good depth of field for sights, thereby making them easier to use because placement of head is not as critical.
- All controls sensibly laid out.
- Removal of noxious fumes (mostly generated when the gun fires).
- Good ventilation.
- Bore evacuators for quick removal of propellant gases from the gun tube.[56]

Also, the Soviets have included several design features not found in U.S. tanks that affect tank operation. On both the *BMP* and *T-62* there are lights that warn the driver when the main gun is traversed over a line extended from the tracks forward. The vision blocks are electrically heated to demist them, and a spraying device is used to clear the vision blocks of mud or dust. On the *T-62*, the main gun cannot be power-traversed when the driver's hatch is open. The *BMP* has a light to warn that the rear doors are open, and a light that tells the driver that the gunner has applied power to the turret controls. Both the *BMP* and *T-62* have marker lights to maintain formation while maneuvering at night. The lights facing forward are green, side lights are yellow or orange, and those in the rear are red. In addition, *T-62* tanks have a removable hood with a vision block, windshield wiper, and electrical defroster that is placed over the driver's hatch in bad weather.[57]

Summary

Tankers worldwide will probably always insist that the guy who designed his tank "blew" the design of one particular feature. While this may possibly by true, the tankers should be grateful if only one minor feature is faulty. Then, instead of griping among themselves, they should share their firsthand experience with equipment shortcomings through articles or letters to the editor of their professional journals. After all, who knows better about the quality of a tank than "the man who owns one?"

Footnotes

1 Arthur J. Alexander, "Decision Making in Soviet Weapons Procurement," *Adelphia Papers, 147-148,* (IISS), London, 1978, p. 31.
2 P. Aileen O'Brien "Generation of Weapons Requirements in the Soviet Ground Forces," *Army Research, Development and Acquisition Magazine,* January-February 1980, p. 21.
3 A. Kh Babdzhanyan, ed., *Tanks and Tank Troops* (Red Banner of Labor Military Press of the Ministry of Defense of the USSR, Moscow), 1970, translated by the US Army Tank Automotive Command, Warren, MI, NTIS Number AD-762 557, 1970 (hereafter cited as *Tanks and Tank Troops),* p. 50.
4 F. Clifton Berry, Jr., "Solving the 144-inch Mystery," *Armed Forces Journal International,* July 1970, p. 18-20.
5 *Tanks and Tank Troops,* p. 58-59.
6 Peter Chamberlain and Chris Ellis, "M-3 Medium (Lee Grant),"*Armored Fighting Vehicles of the World. Volume 4. American AFV's of World War II* (Profile Publications, Limited, Windsor, Berkshire, England), 1972, p. 48. R. M. Ogorkiewicz, *Design and Development of Fighting* Vehicles (Doubleday & Company, Inc., Garden City, NY), 1968 (hereafter cited as *Design of Fighting Vehicles),* p. 74.
7 *Tanks and Tank Troops,* p. 96.
8 *Design of Fighting Vehicles,* pp. 196-197.
9 *Tanks and Tank Troops,* p. 58.
10 *Design of Fighting Vehicles,* pp. 73-74.
11 *Tanks and Tank Troops,* p. 50.
12 *Tanks and Tank Troops,* p. 45-50.
13 William Fowler, "Battle for the Falklands (I), Land Forces," (Osprey Publishing, London), 1982, p. 19
14 *Design of Fighting Vehicles,* p. 96.
15 *Tanks and Tank Troops,* p. 96.
16 *Tanks and Tank Troops,* pp. 94-96.
17 *"Improved Chieftain for Iran," IDR Special Series, Battle Tanks,* 1976, pp. 96-97.
18 *Design of Fighting Vehicles,* p. 82.
19 *Tank Warfare,* pp. 111-113.
20 MG I. Krupchenka "Characteristic Feature of the Development and Employment of Tank Troops," *Military History Journal,* (Moscow), No. 9, 1979, pp. 26-27.
21 *Design of Fighting Vehicles,* pp. 82-83.
22 *Tanks and Tank Troops,* pp. 103-104.
23 *Design of Fighting Vehicles,* p. 91.
24 Fred Schreier, "A Tank Designed to Cost —The US Army XM-1," *IDR Special Series-11, pp. 21-24.*
25 "Details of the Soviet T-72 Battle Tanks," *IDR Special Series*-11, p. 31.
26 Chris Ellis and Peter Chamberlain, "Tanks Mark I to V," Duncan Crow, ed., *AFV's of World War One,* (Profile Publications Limited, Windsor, Berkshire, England), 1970, p. 24. (hereafter cited as *AFVs*).
27 *Tanks and Tank Troops,* p. 51.
28 *Tanks and Tank Troops,* p. 56.
29 *Tanks and Tank Troops,* p. 51-52.
30 "An Israeli Tank Ready for Series Production: The Merkava, Mk I," *International Defense Review Special Series-11, Armored Vehicles,* 1980, (Hereafter cited as *IDR* Series-11), pp. 35-38.
31 *Main Battle Tanks,* pp. 88-90.
32 *Main Battle Tanks,* p. 90.
33 *Tanks and Tank Troops,* p. 57.
34 *Main Battle Tanks,* p. 87.
35 *Tanks and Tank Troops,* pp. 52-55.
36 Duncan Crow, *Modern Battle Tanks,* (Arco Publishing Company, NY), 1978, (hereafter cited as *Modern Battle Tanks,* p. 87.
37 *Modern Battle Tanks,* p. 83.
38 *Modern Battle Tanks,* p. 83-84.
39 *Tank Warfare,* pp. 145-146.
Footnotes 40, 41, and 42 are not shown because material that referred to them in the text was deleted.
43 *Tanks and Tank Troops,* p. 90.
44 *Tanks and Tank Troops,* p. 62.
45 *AFVs of WW II,* p. 229.
46 *Tanks and Tank Troops,* p. 87.
47 *Tank Warfare,* p. 135.
48 The discussion of crew size was based in large part on Simpkin's *Tank Warfare,* p. 122-125 and 127-133. The opinion on reasons for retention of the driver and loader are the author's.
49 R.M. Ogorkiewicz, "Gas Turbine or Diesels for Tanks," *IDR Special Series - 11,* p. 85.
50 *IDR Special Series - 11,* p. 83.
51 *Design of Fighting Vehicles,* p. 89.
52 *Tanks and Tank Troops,* p. 133.
53 *Tanks and Tank Troops,* p. 135.
54 F. Schreier, "The Modern Battle Tank, Part 3: Mobility-3. Suspension," *IDR Special Series, Battle Tanks,* 1976, (hereafter cited as Suspensions), p. 41.
55 *Suspensions,* pp. 41-42.
56 *Tanks and Tank Troops,* pp. 87-89.
57 "Tank Driver Hood," *Military Review 1972,* p. 100 and "Modificantions to the T-62," *Armies & Weapons #35,* June, 1977.

GERALD A. HALBERT graduated from California State University—Fullerton in 1974. He served with the 101st Airborne, 9th Infantry, 82d Airborne divisions, I Corps (ROK/US) Group and XVIII Airborne Corps, 66th MI Group, and Hq. USAREUR. Prior to his retirement, he was assigned to Studies Division, Directorate of Combat Developments, USAARMS, Fort Knox, KY.

The Training Revolution

by Colonel Andrew P. O'Meara, Jr.

Over a decade ago the army initiated comprehensive plans to revamp training. Under the leadership of General William E. DePuy, Training and Doctrine Command (TRADOC) set in motion changes that were to revolutionize training throughout the army. Although the origins of the revolution predate General DePuy's arrival at TRADOC, his leadership brought the revolution to each company, battery, and troop in the Army.

General DePuy played an important role in marketing and implementing the ideas associated with the new training methods that were initially known as systems engineering of instruction and were made mandatory in 1968 by CONARC Regulation 350-100-1. The revolution employed the analytical tools of the systems engineer as well as the latest educational techniques from the civilian educational community in order to improve institutional and unit training. Earlier methods of army training were simpler, built upon years of experience, and consisted of techniques of the trade passed from generation to generation through example in a manner best described as military art.

The yardsticks formerly used to measure unit performance as well as the equipment our soldiers carried into battle were relatively simple. Army training consisted of techniques practiced for generations in basic training (BT), advanced individual training (AIT), the Army Training Program (ATP), and unit tests known as Operational Readiness Tests.

As more complex weapons systems began to enter the Army's inventory it became apparent that the army was on the threshold of a period of profound change. The advanced tools of the systems analyst and of civilian educators offered better ways to master tasks, skills, and missions.

The DePuy initiatives came at a time when the need for modernization was long overdue. The Army had brought to a close a decade of involvement in revolutionary (insurgency) warfare. Preoccupation with revolutionary warfare had overshadowed preparation for conventional warfare and deferred procurement of new weapons systems needed in order to dominate modern battlefields. Faced with a massive challenge to achieve combat readiness and to preserve peace through deterrence in a more dangerous world, it was apparent that the army would need to modernize rapidly through the acquisition of a vast array of new equipment, as well as to scientifically engineer our methods of training in order to ensure maximum return on the nation's investment in modernization.

New words entered the vocabulary of army trainers. A hierarchy of individual training tasks composed of five skill levels was developed for each MOS. The skill qualification test (SQT) was inaugurated in order to provide a yardstick to assess soldier proficiency at each skill level. Detailed analysis based upon a comprehensive field assessment identified the individual tasks performed within each MOS at each skill level. Designated the "front-end analysis," these field assessments were designed to ensure the training was focused upon the actual tasks and skills required by the soldier in order for him to perform effectively at each successive skill level.

Unit mission training was redesignated collective training in order to identify group tasks which were oriented on performance of combat missions. Assessment tools to evaluate unit performance—the Army Training and Evaluation Program (ARTEP)—were designed that recognized both the individual tasks and the collective tasks necessary to achieve full unit proficiency. Training developers employed the tools of the systems analyst to design instructional materials through a logical sequence of performance-oriented training to ensure mastery of skills and knowledge. Criterion-referenced instruction composed of tasks, conditions, and standards became the norm to enable trainers to ensure that training accomplished its intended purpose and to clearly establish the efficacy of training performance.

Mastery of the new training systems posed an awesome challenge for the Army. It entailed the training of personnel involved in design and development of training materials, as well as the retraining of trainers throughout the Army. Moreover, modernization necessitated the simultaneous integration of new equipment and weapon systems into the army training system.

The need for a system of professional schools for our noncommissioned officers was also recognized. Front-end analysis enabled training developers to clearly define thresholds of proficiency and critical skills needed by small unit leaders and first line supervisors at each skill level. The systems engineering of courses such as basic and advanced NCO courses through the Instructional Systems Development (ISD) process is gradually transforming our noncommissioned officer corps into the most proficient body of small-unit troop leaders in the world.

In the years that have followed the introduction of the new training system, comprehensive change has been at work within the TRADOC institutional training base and within army units in the field. Assessment of the effectiveness of the new training tools is important so that we can understand the profound change that has taken place throughout the Army, as well as the great potential of a training system that is raising soldier skills to performance levels unheard of in the past. These changes have been complemented by the enhanced attractiveness of the military profession, *vis-a-vis* the civilian job market. Consequently, the Army has been able to recruit and retain highly qualified individuals to complement the enhanced effectiveness of army training. The combination of tougher training and volunteers with the abilities to master more difficult training standards have enabled trainers to achieve a significant increase in soldier performance.

The Hierarchy of Army Training Functions

The complexity of the new training system and its comprehensive scope have necessitated new approaches to updating trainers throughout the Army. The Battalion Training Management System (BTMS) and the Commander's Training Management System (CTMS) have been introduced to assist trainers throughout the Army in understanding the new system and to effectively employ the training management tools developed by TRADOC. Figure 1 shows the hierarchy of training management functions within the new training system. Each of the training tools is relatively simply to employ. Beginning at the lowest level at which initial entry individual training is executed through the performance of collective tasks at the unit level, the system is composed of a logical progression of task building blocks to ensure complete mastery of the unit mission. Each higher level

Training Function	Example Activity	Responsibility	Skill Development	References
Management of Training and Doctrine Development	Preparation of Army Training 1990 Study	TRADOC and Proponent Schools	SSC, C&GSC, ARMY STAFF, TRADOC	FM 25-1; Threat Assessments, Combat Developments, and AR 350-1
Write Doctrine	Preparation of How to Fight Manuals	Directorate of Doctrine and Proponent Schools	TRADOC Senior Managers Course	Military History, MAA, and Combat Developments
Design Training (ISD Process)	Preparation of Individual and Collective Training/ Test Materials	Deputy Assistant Commandant for Educational Technology, Directory of Training Developments, and Proponent School	TRADOC Senior Managers Course	TRADOC Regulation 350-7, How to Fight Literature, and ISD Handbook
Training Management	Allocate Training Resources and Prepare Long-range Training Plans	Brigade or Battalion Commander, S3, and Operations Sergeant	CTMS, BTMS, and Proponent School	FM 25-2, FM 25-1, FM 25-3, FM 25-4
Program Training for the Unit Level	Produce Training Schedule	Company Commander and First Sergeant	BTMS, AOC, and ANCOC	*ARTEP 71-2, FM 71-1, ARTEP 17-55, and FM 17-95
Collective Training Assessment	Annual or Semi-annual (ARTEP) External Evaluation	Brigade and Battalion Commanders and Subordinates	BTMS , C&GSC, AOC	*FM 71-1, ARTEP 71-2, ARTEP 17-55, and FM 17-95
Conduct Collective Task Training	Unit Training: Final Assault	Company Commander, Platoon Leader, Platoon Sergeant	AOC, OBC, and ANCOC	*ARTEP 71-2, FM 25-3, FM 25-4, FM 7-7
Assessment of Individual Task Proficiency	Conduct Individual or Unit Training: Combat Movement	First Sergeant, Platoon Sergeant, Squad Leader, and Vehicle Commander	ANOC and BNCOC	* SQT, FM 7-7, FM 25-3, ARTEP 71-2, ARTEP 17-55
Conduct Training for Individual Task	Combat Movement Training of Individual Soldier	Drill Sergeant, Platoon Sergeant, Squad Leader, and Vehicle Commander	Drill Instructors School, BNCOC, and PLC	*FM 25-3, FM 7-7, FM 21-2, FM 21-3, and FM 17-19E 1/2

Figure 1. The Hierarchy of Army Training Functions

*These references pertain to training in Armor or Cavalry Units and CMF 19 Initial Entry Training.

aggregates more advanced individual and collective tasks. Through BTMS workshops, trainers gain practical experience in the organization of unit training programs and assessment of unit training effectiveness. In view of the fact that the logical progression of functions becomes more abstract at the higher levels within the hierarchy, it has been necessary to focus upon the specific functions of the trainer in BTMS workshops.

BTMS workshops allow trainers at every level of the organization to understand their role in the development of their individual skills, as well as their responsibilities as trainers to develop the full range of individual and collective tasks within the organization. Appreciation of the full range of management responsibilities and training tasks is essential so that units design their training programs in harmony with concomitant training programs being conducted at Basic and Advanced Noncommissioned Officers Courses (BNCOC) (ANCOC), and Initial Entry Training (IET), as well as at higher echelons within the tactical organization. The beauty of the system rests upon the hard logic made possible through the systems engineering approach as well as the significant increase in soldier proficiency currently being achieved in the institutional training base.

Credit for the great changes in levels of soldier performance, which we have observed since the DePuy initiatives were implemented, must go to the far-sighted architects of the system, who were bold enough to borrow advanced training techniques from the civilian sector and apply them to army training. Suffice it to say that our soldiers today are achieving levels of proficiency on the *M1* tank that we had not dreamed possible on older and simpler weapons systems. Let us examine some of these changes as they apply to Career Management Field (CMF) 19 in the training base.

Systems Engineered Armor IET

In the summer of 1980, General Donn A. Starry directed that the Armor Center revise its program of instruction in order to eliminate seat-specific training that produced a separate MOS for the tank driver. Moreover, General Starry directed the Armor Center to system engineer all courses of instruction, including CMF 19K *(M1)* as well as existing IET courses. The Deputy Commanding General of the Armor Center charged the commander of the 1st Training Brigade with the responsibility to act as course manager for IET in CMF 19 and to initiate ISD of the new courses in cooperation with the Directorate of Training Developments. A task force composed of officers and noncommissioned officers with firsthand experience in conducting of IET was formed within the 1st Brigade. The task force operated directly under brigade S3 and augmented the efforts of the training developers of the new courses of instruction. The Deputy Assistant Commandant for Educational Technology provided advice to the course manager, and members of the task force attended the Staff and Faculty Development Course to prepare for their new responsibilities in the development of course materials.

The objectives of the training development effort were to transform the courses of instruction using criterion-referenced instruction that was performance oriented as well as interactive, a technique that forces the student to demonstrate mastery of skills and knowledge during the block of instruction. These educational techniques demand that the soldier provide undivided attention throughout each block of instruction and they require him to perform the task at the completion of the training. This serves to assess the effectiveness of the trainer as well as soldier performance during training.

Insistence upon performance-oriented training meant elimination of the former lecture techniques and required that each student be allowed the opportunity to demonstrate his performance of the task being taught. Consequently, the task force recognized that the new programs of instruction would entail higher start-up costs in terms of instruction support equipment.

In order to compensate for the anticipated higher costs, the developers simultaneously worked to identify cost-saving approaches whenever possible in the developmental effort. Specific approaches employed to reduce costs included selection of local training areas and close-in training

facilities whenever possible to hold down fuel costs as well as the wear and tear on equipment in the movement to distant training locations.

Numerous subjects that were formerly taught were identified as being unnecessary because they did not contribute to a specific task identified in the front-end analysis. Convoy driving, training with the *M16*, and firing Table VIIC were expensive to conduct and contributed no skill required by individual tankers at Skill Level 1. Consequently, major savings were achieved by the elimination of training activities that did not contribute to the skills required to prepare the soldier to achieve MOS mastery. This decision caused some misgivings because trainers had achieved considerable skill in conducting the excluded classes.

Additional approaches to achieve cost savings through the employment of simulation devices were identified during the developmental process. Inasmuch as the new systems were coming on line during a period in which simulation technology was available through simultaneous development efforts at the Army Training Support Center (ATSC) and Materiel Development and Readiness Command, (DARCOM), the training developers at the Armor Center integrated plans for acquisition of driving and conduct-of-fire simulation devices, and improved driving courses to achieve increased opportunities for operator performance and the capacity to expand training significantly during mobilization.

The sequence of individual instruction was designed to ensure that basic skills were mastered before progressing to more complex individual skills and crew duties. Test plans and test instruments were produced before individual lesson plans were prepared to ensure the methodology of instruction was consistent with expectations of soldier performance during testing. Classes were piloted with small groups before commencing trial instructional cycles to identify weaknesses and to perfect each block of instruction.

The new courses of instruction for 19K, 19E, and 19D are now being taught. Advantages identified by the trainers include harmony between SQT requirements and IET. Trainers now teach each block of instruction in accordance with evaluation test requirements for end-of-course comprehensive tests, which reduces the demands upon the drill sergeants to conduct reinforcement training. Soldiers receive comprehensive instruction that is designed to prepare the individual to master each of the crew duties associated with each position in the tank. Television tapes have been produced that allow an increase in standardization of instruction and ensure that interactive techniques are effectively presented to the soldier. Further increases in soldier performance and cost savings are anticipated as simulation devices now in production become available to reinforce the training programs, Finally, the production of a systematically designed program of instruction allows us to anticipate resource requirements and harness our instructional efforts to the resources allocation programs of the Army that are not geared to support programs that have not been developed by ISD. The Army Modernization Information Memorandum (AMIM), Modernization Resource Information Submission (MRIS) and *TRADOC* Review of Manpower (TRM) processes constitute little burden in additional staff work once the ISD tools have been employed. On the contrary, these Army resource allocation tools are designed to program recognized requirements that have been approved in the resource annexes of the TRADOC course of instruction. The greatest return for our investment in training development, however, cannot be measured in dollars and cents. Soldiers who are subjected to "hurry up and wait" as well as instruction that cannot be clearly justified in terms of eventual job-site performance become cynical and question the direction of the "green machine."

Conversely, soldiers who are worked hard to master meaningful requirements that challenge them mentally and physically at each block of instruction gain a profound respect for the order and disciplined environment in which they are trained.

Upon my arrival in June 1980 in the 1st Training Brigade, 28 percent of our soldiers in training possessed a high school diploma. Today 90 percent of our active component soldiers are high school graduates. We hear no complaints today from soldiers regardless of their level of civilian education. Each man works hard and is required to master tough training that is relevant to effective MOS performance. A by-product of the rationalization of CMF 19 instruction is a marked increase in the level of soldier discipline. The individual soldier accepts his instruction and is prepared to perform in accordance with the standards demanded.

In the operation of complex weapons systems such as the *M1* tank, it is vitally important that soldiers faithfully perform their sequential checks for putting the equipment into operation in order to preclude damage to the equipment. In the past we have experienced great difficulty with the operation of systems such as the *M60A2* tank, the *M551* reconnaissance vehicle, and even simpler equipment such as the *M151* ¼-ton truck, because soldiers were not sufficiently disciplined to operate the equipment in accordance with directed startup and shutdown procedures. The indiscipline of the operators resulted in burned-out radios and destroyed electrical components. The disciplined approach to training, which the ISD approach provides, has resulted in a much higher level of soldier confidence and discipline that has drastically reduced equipment failures.

Trainers and testers at the Armor Center also recognize the magnitude of the change that has taken place in IET. They are enthusiastic about the changes because they recognize the consistency and discipline which has been achieved. Moreover, these instructors are acquiring a far more sophisticated mastery of items of equipment upon which they work as a result of the detailed instructional materials provided for their use in training. Comments from the field concerning the quality of our recent graduates attests to the validity of the new training methodology.

COLONEL ANDREW P. O'MEARA, JR., was commissioned in Armor in 1959 from USMA. He has served in various capacities in Vietnam, Germany and CONUS and commanded the 1-67th Armor, Fort Hood, TX. He is a graduate of the U.S. Army War College and from 1980 to 1983 was commander, 1st AIT/OSUT Brigade at Fort Knox, KY. He is currently assigned as president of the U.S. Army Training Board, Fort Eustis, VA.

Dunn-Kempf Is Still a Valuable Training Aid

One of the most versatile, and overlooked training aids available to the armor unit leader today is the Dunn-Kempf wargame. It was invented by two army officers interested in using military miniatures to improve training skills. The Dunn-Kempf wargame employs realistic U.S. and Threat miniature vehicles on representative terrain to simulate armored combat between a Threat reinforced tank battalion and a U.S. tank/mechanized team (or armored cavalry troop).

There are many advantages to this type of simulation. The only resources required to use Dunn-Kempf are the time of the personnel involved and the space to lay out the game, approximately 10 feet by 15 feet. The game itself can be set up anywhere from a unit day room to a general purpose medium tent. Leaders are given the opportunity to make tactical decisions while confronted with realistically portrayed and sized Threat units. Good decisions are reinforced by success (attrition of the enemy). Incorrect ones are underscored by the destruction of friendly forces. Combined arms training is emphasized and leaders can enhance their map association skills. The only limiting factors are the imagination and innovative skills of the armor leader.

As with all forms of training, proper prior planning, vigorous execution, and reflective critique are essential elements for success. The following ideas are designed to supplement the instructional manual provided as well as the initiative of the players themselves.

In determining what scenario to play, examine the wartime mission of your unit (if you are stationed overseas) and/or a recent Army Training Evaluation Program (ARTEP) to determine what missions require additional emphasis. Armored cavalry units would probably choose some variation of the covering force battle, while armor units might decide to emphasize defensive actions at the company team level. If this is the first time your unit has used Dunn-Kempf, it is best to keep the mission uncomplicated.

Once the scenario is determined, decide who will participate. Physical space around the playing board will probably limit participation to the unit commander, executive officer (XO), platoon leader, platoon sergeants and section sergeants, and the mortar section leader. If your unit habitually cross-attaches with the same infantry unit, invite those mechanized platoon leaders and platoon sergeants to take part. Other worthwhile participants might include a fire support team and an engineer squad leader if you are assigned one. The first few sessions with Dunn-Kempf should "train the trainer."

Now that you know who will play the U.S. side, it's time to visit your battalion or squadron S2 and get him involved as the Threat player. Realism will be enhanced by using radio comunications. Establish a communication net by using any *PRC-77* radios borrowed from cavalry scouts or the combat support company commander, and equip everyone with combat vehicle crewman helmets, or the *H-161/U* headsets used for tank gunnery training. One communication net should be established for each platoon, one for fire support, and one for the troop or company command net. To give participants a feel for the problems inherent in monitoring a platoon net as well as a unit command net, position an *AN/GRA-39* remote unit centrally located for use as the unit command net. Require your troop or company command post (CP) to set up in the motor pool complete with maps, and monitor the battle by radio. The XO can either play as the acting unit commander in the CP (using the "fall-out one" concept), or can serve as your battle deputy in a location near the terrain board. If you require players to render spot reports to the unit CP, and connect the CP by radio to a participating battalion or squadron S2 cell located nearby, you can verify the accuracy of the tactical picture painted by your unit's spot reports and passed on by your CP to the next higher headquarters. This simple procedure will graphically illustrate whether or not your unit provides the battalion or squadron commander with information he needs to fight his unit.

Before conducting the game, gather your subordinates around the playing board and check their terrain association skills. Can

- They associate map graphics to the playing board and locate phase lines, target reference points, lines of departure, etc.?
- They determine the maximum effective ranges of their weapons systems and relate them to the board?
- Leaders correctly draw section or platoon fire plans?

Once players have examined the rules, demonstrate on the terrain board how to move and engage targets. Ensure they can recognize terrain advantages and are familiar with any special rules you want to employ, such as how to conduct armored ambushes or simulate vehicle hide positions. And to make life particularly interesting, consider playing all or part of a game in chemical protective clothing. The loss of efficiency displayed by all players will be revealing.

Before you begin, don't miss the chance to practice troop leading procedures. Issue a warning order to your subordinates before you give the detailed operations order (OPORD), then give them time to conduct a leader's reconnaissance of the battlefield as well as issue their OPORD to their soldiers. This will allow you to evaluate their proficiency as leaders as well as the thoroughness of your own OPORD.

If your local Training Aids Support Center is the energetic and cooperative type, you can enlist their help in producing terrain boards that represent your local maneuver areas or general defense plan positions. Conducting the simulation on representative terrain boards before you expend fuel and blank ammunition is a tremendous way to maximize training value from field maneuvers.

The best role for the troop or company commander to assume is that of umpire and trainer. As the senior leader present, he is best suited to arbitrate conflicts and keep a handle on the natural competitive spirit that might scuttle the training value if not controlled. If play gets out of hand, he can stop the action, redirect the scenario and continue the war. (A slight digression: Many people are frightened by the size of the Dunn-Kempf rule book. The CO, as umpire, can simplify or modify the rules, as required. Remember, simulation rules are a guide, not an absolute law.) Finally, he can keep play moving swiftly, halting only to reinforce a

learning point or emphasize a training situation.

The nature of a simulation allows the unexpected to be introduced without long term adverse effects for the players. The possibilities to test the training, initiative and resourcefulness of the players by new and unanticipated situations are endless. Enemy jamming can be simulated by turning off selected radios. The Threat's use of chemical warfare can require friendly forces to use gas masks and chemical clothing. Introducing fresh Threat maneuver battalions from unexpected directions can put player flexibility to the test. (Insist that Threat players use Threat tactics and not U.S. tactics.) Threat maneuver doctrine, properly demonstrated, will graphically portray how the enemy relentlessly advances, and how the small unit leader must adapt to those tactics—move or be overrun!

Play should be periodically halted so the acting unit commander and the battalion or squadron S2 cell receiving the spot reports can assemble at the terrain board and compare what they think is going on, as a result of spot reports, with what is actually happening.

As stated earlier, Dunn-Kempf is a training vehicle. Key events or subtle mistakes can be used for their learning value. Did friendly forces compromise their positions by prematurely engaging the advance detachment of a Threat battalion, or did they wait until the main body was in the kill zone? Was good fire control and distribution used, or were too many rounds wasted on already destroyed vehicles? Can subordinates use properly adjusted friendly smoke to isolate follow-on Threat echelons from the direct fire battle? The teaching points are endless. Successful tactics and good initiative are reinforced by the destruction of enemy vehicles; the opposite can be illustrated by friendly casualties. Once the din of battle has subsided it is time for constructive criticism.

A tremendous benefit can be obtained from a thorough critique. The final question to be asked is whether or not the unit accomplished its mission. In examining that question, each platoon leader should explain his concept of the operation gleaned from the unit OPORD and relate it to what did or did not occur on the battlefield. Were weapons systems used to best advantage after considering inherent weapons strengths and weaknesses? Were TOWs used too close to the kill zone, and *Dragons* not given covered routes of withdrawal?

Each subordinate who suffered casualties should explain why he thinks his vehicles were destroyed and what steps he would take to prevent recurrence. Information reporting can be examined from the perspective of the acting unit commander and the battalion or squadron S2 response cell, both of whom had to rely on spot reports rather than visual observation.

After the players have had the chance to comment during the group critique, the next step is to determine the areas that require more training. These might include radio telephone operator procedures, platoon fire distribution and control, use of supporting artillery and mortars, obstacle planning and employment, Threat vehicle recognition, and map-to-terrain association.

The final portion of the critique can be held in the unit commander's office and may involve as many leaders as desired. With the performance of the key leaders during the simulation as a frame of reference, unit standing operating procedures, battle drill procedures, and report formats can be examined and modified as required.

The Dunn-Kempf simulation has been in the training aids inventory for several years. Too often, it has been left to gather dust or cannibalized to create vehicle displays for forward observer training. The only additional ingredient needed for some outstanding and interesting training is some old-fashioned armor leader ingenuity.

The overall benefit will be to better prepare the unit to execute its mission during ARTEP exercises in the intense and realistic environment of the National Training Center, or in the ultimate test of combat.

HENRY S. SCHARPENBERG
Captain, Armor
Headquarters, USAREUR

Five-Point Platoon Training Program

The new lieutenant graduating from his branch basic course and arriving in his new company finds all too often the platoon he has been assigned is not proficient in the basic fundamentals necessary to perform its combat mission. And while many factors go into preparing a platoon for combat, the basic resources, especially equipment and men, necessary for developing an efficient, well-trained, unit are present. It is the lieutenant's responsibility, as the leader and as a trainer, to ensure his platoon is prepared to perform its mission in a capable manner.

To properly train his men is a difficult task for the platoon leader for, in many cases, little scheduled training time is allotted to him solely for his use to train specific tasks. Add to this the distractions of maintenance, post support activities, taskings from higher headquarters, details for the first sergeant, and equipment and personnel shortages, and the result is a severe restriction on time, equipment and men. Thus, it becomes evident the platoon leader must carefully plan his training to take advantage of the resources he has available and to make maximum use of every opportunity for training. A platoon leader should use a five-point training plan to maximize his efficiency as follows:

Standardize

To begin, the platoon leader should attempt to *standardize as many procedures and actions as possible.* Standing operating procedures (SOPs) reduce confusion and hesitation thereby allowing the platoon to react quickly and effectively to changing requirements. By reducing the platoon's response time and assisting in coordinating its actions, SOPs enhance the combat power of the unit.

Further, they allow the leader to predict how his men will react in different situations thus lessening the need for communication and enabling him to direct his attention to other requirements.

When formulating platoon SOPs, it is imperative that they be clear and concise to ensure understanding by all members of the platoon. Wherever possible, emphasis should be placed on making the majority of the unit's actions repetitive for each SOP rather than having a specialized plan for every scenario. Platoon SOPs should be developed as a group in order to draw on the experience of the noncommissioned officers. They possess much broader backgrounds and sources of knowledge than the young lieutenant. This expertise needs to be incorporated into every platoon plan. During this, and all other training, consult the platoon sergeant and listen to his advice.

Additionally, ensure that platoon plans and procedures conform to higher level SOPs and required reports to ease reporting procedures. This will allow section leaders to know when reports are due to the platoon leader/sergeant and what information is required. Since reports will automatically be compiled and forwarded up the chain of command, valuable time will be saved which might otherwise be wasted in collecting needed information.

Once the draft SOPs are finished, conduct a terrain board exercise with the platoon, or use sand tables to test these plans. During this phase, modify SOPs as necessary and develop any new ones as needed. Finally, compile all SOPs into a booklet to be carried by all members of the platoon. Periodically review and update these plans and ensure all new members of the platoon become familiar with them.

Practice Crew Teamwork

Next, the platoon needs to practice crew drills by using SOPs that are designed for specific actions that crews may be forced to undertake during combat situations. Abandoning a tank, engaging targets, and decontaminating a vehicle are examples of actions requiring the crew to act in a coordinated effort. Many are everyday events or are practiced during specific training. Others may be practiced in the motor pool or any time the crew is on the vehicle. These drills need to be done on a recurring basis to maintain crew proficiency as individuals change positions and new members join the platoon. Use skill qualification test (SQT) results and job books on individuals along with leadership observations of the crew to identify crew weaknesses and plan your training to strengthen them. Getting personnel to *work together as a crew* is the key building block in the process of developing the platoon.

Develop Subordinates

Concurrent with practicing individual and crew tasks, the platoon leader must *develop his subordinate leaders.* The platoon leader cannot run the entire platoon himself and must use his noncommissioned officers to achieve maximum efficiency. The designated chain of command needs to be exercised and *made to work* within the platoon. Many leaders are hesitant to let their subordinates run the platoon field exercises due to pressure from above to perform well. The platoon, however, must be able to function in the absence of the platoon leader or platoon sergeant. With the introduction of Multiple Integrated Laser Engagement System (MILES), the possibility of the platoon leader being removed from the play of a problem becomes much more likely. Therefore, subordinate leaders have to be allowed to practice running the unit in a field situation where they can gain experience and be critiqued by the platoon leader. Plan platoon exercises to simulate the loss of the platoon leader to actively encourage the noncommissioned officers to take the initiative and to accept the responsibility of running the platoon.

In line with having an established chain of command, the platoon leader must *train subordinates to be proficient in leadership tasks.* Among these should be spot reports, map reading, basic tactics, radio procedures and use of communications-electronics operation instructions (CEOI), and the use of artillery. The platoon leader must add any further skills depending on the unit's mission and the level of experience. These skills may be taught during NCO development classes and then built upon during field training. Additionally, encourage junior noncommissioned officers to enroll in army correspondence courses that have been prepared to help them teach themselves leadership tasks. This will enhance their knowledge and proficiency while also earning them promotion points. Thus, subordinate leaders will possess the basic skills necessary to continue the platoon mission in the event the platoon leader becomes a casualty.

Exercise the Platoon

The next step in the training process is mastering selected platoon-level ARTEP tasks. These actions require the platoon to function in a coordinated effort. Prime examples would be tactical movement, night refuel/reload operations, distribution of fires, and breaching a minefield. SOPs, crew drills, and well-trained noncommissioned officers are merged together to provide the basis for effective platoon operations.

An illustration would be a tank platoon's occupation of an assembly area. The platoon should cross the release point in a traveling formation and pick up the platoon ground guide of the advance party without stopping. Certain actions should automatically occur while moving into individual vehicle positions. SOPs must provide vehicle order and identification signals thus allowing the ground guide to easily pick out his platoon. Also, tank commanders must know the general area their vehicle should be located in relation to the platoon leader's tank. Vehicle sectors of responsibility should be provided to allow 360 degrees of observation and fire.

Again, SOPs and crew drills must dictate actions once the vehicle is in position. Which crew member collects camouflage, which member does basic vehicle maintenance, who monitors the radio and provides local security from the tank cupola and who runs communication wire to adjacent positions are basic items that must be decided. Further considerations are what reports need to be sent to the platoon leader/sergeant; where the platoon leader will be located; how the platoon will shut down all the engines at one time; how soon range cards must be made; and which vehicle crewmen will be used for dismounted security.

The list goes on, but the idea is clear. Actions must automatically occur in a consistent pattern under the supervision of the platoon's noncommissioned officers. The platoon occupies the assembly area in a rapid, smooth fashion. The platoon leader is free to look after his own vehicle, and coordinate with adjacent platoons and the company commander. He is able to react quickly to any mission changes.

Platoon-level training is generally conducted during field training exercises (FTXs) or during combined arms live-fire exercises (CALFEXs). FTXs provide the platoon leader the opportunity to identify platoon weaknesses. *The platoon trains as a complete unit in a tactical environment* and mistakes can be pointed out as they occur. This allows

the junior leaders to make immediate corrections. When a major teaching point needs to be made, such as maintaining vehicle dispersion, stop the platoon momentarily and use the radio to point out the problem. This tends to highlight a deficiency and reinforces the corrective action taken. Also, battle drills need to be practiced. Battle drills are specific platoon actions that occur when enemy contact is made and the platoon must react immediately with a minimum of communication. An example of this type of drill would be platoon actions during an ambush.

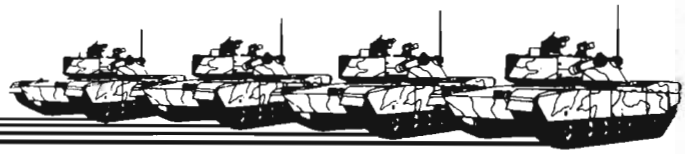
CALFEXs take platoon-level tasks a step further from the simulation provided by an FTX by incorporating actual firepower. Along with expanding the tasks a platoon may practice, CALFEXs are an excellent morale builder. Calls for fire, distribution of platoon fires, and coordinated activity with air support can be realistically practiced. Crews gain a better understanding of the total capabilities of their vehicle and the entire platoon. Along with this, weapon system limitations and the problems of operating in a live-fire environment are made evident.

Review the Results

Unfortunately, many platoons immediately return to garrison after being in the field and do not conduct an after-action review of the lessons learned during the exercise. The platoon needs to regroup as soon as possible in a classroom environment and *discuss the field training conducted.* This is the time to refine SOPs, develop plans for improving crew and platoon weaknesses, and analyze the platoon tasks practiced. This prevents mistakes from recurring and contributes to the development of all members of the platoon. Ultimately, the platoon should evolve into an efficient, smooth running organization.

The new lieutenant has a hard job preparing his unit to perform properly. Many obstacles will hinder his efforts. However, he can draw upon the experience of his noncommissioned officers and other officers assigned to his unit. Also, he has his own abilities and determination to complete the job. So, even while faced with a difficult task, training the platoon up to realistic standards is possible. And that is a major step in the ultimate mission of preparing the platoon to fight and survive in combat.

PERRY R. CLAWSON
First Lieutenant, Armor
Fort Stewart, GA



Is AirLand Battle a Paper Tiger?

The U.S. AirLand Battle doctrine depends on the ability to strike Warsaw Pact (WP) forces throughout the depth of the battlefield—from the line of contact rearward to their second echelon. This doctrine emphasizes a nonlinear defense because penetration is now possible through sophisticated weaponry and mobility, including nuclear and chemical weapons. The new doctrine expects not only to blunt the initial momentum of WP spearheads, but at the same time to strike their follow-on forces with air and ground weapons.

There is merit in the AirLand Battle doctrine—*if it can be carried out.* WP soldiers are trained to stick to a battle plan and, admittedly, they have not yet proven to be very good at improvisation if that plan is disrupted. They depend largely upon their mass and momentum to overcome an opponent. Therefore, the probability exists that *if* U.S. forces can disrupt and fragment the first echelon of WP forces and *if* they can strike the follow-on forces with telling effect, they *could* win the battle.

There are, however, holes in the AirLand Battle plan. These holes and possible WP counters raise the following questions and considerations:

- Can U.S. forces disrupt and fragment the WP first echelon attack in order to provide the time and space for a "deep strike" into their follow-on forces? To do so will require reserves, a particular resource of which the U.S. forces in Europe are in short supply. In fact, if the WP forces intensify their first-echelon effort, thereby lessening the time and space between echelons, U.S. forces may have to use their "deep strike" force just to prevent the destruction of their main force in the main battle area (MBA).
- Can the U.S. commander in Europe position a "deep strike" force to hit the WP second echelon? To do so, the "deep strike" force must be extremely fast and capable of violent, destructive combat to counter elements that it cannot bypass. The "deep strike" force must have reliable communications, must cover long distances and arrive at the WP second-echelon area in a strong enough condition to perform its mission of destruction. It must never be forgotten that WP follow-on forces will be moving continuously, like a relentless tide, which will complicate the U.S. "deep strike" force's targeting and intelligence collecting efforts. The second echelon will not be stationary and can hinder the "deep strike" forces progress with conventional weapons, and with nuclear and chemical weapons if required. Additionally, the WP second echelon forces can create physical obstacles in the path of the U.S. "deep strike" force and with its excellent electronic counter measure capabilities can disrupt the "deep strike" force's command, control, and communications (C^3). Also, intervening WP formations can make the "deep strike" force expend large amounts of fuel and ammunition by forcing it to fight every meter of the way to the second-echelon environment. These same forces can block the resupply of the "deep strike" force so that it quickly becomes a toothless tiger.
- WP leaders are admittedly sometimes slow to learn, but what they do learn they learn well—and they never forget. They know all about intelligence gathering and they will know exactly where the U.S. "deep strike" force is at any given time and what it is doing. WP agents, ground and air reconnaissance, and space surveillance satellites will tell them. Moreover, they may well adopt the U.S. policy of "aggressive delay" in countering "deep strike" forces. Among these delay tactics will undoubtedly be special armored *soyedineniye* (light, mobile and essentially antiarmor task forces) to nibble away at the flanks of the "deep strike" force, much as the Cossacks of old harassed the flanks of Napoleon's armies. Masses of WP artillery will hit at the "deep strike" force and WP commanders may well designate special rear area combat *soyedine-*

niyes (armored forces) to slug it out, toe-to-toe, with the unsupported "deep strike" force. These measures will ensure that the "deep strike" force will not be able to divert the WP's second echelon from its task of moving through its first-echelon forces and rolling over the MBA.

• Can the U.S. deliver a successful deep attack by other than ground forces? WP forces hold no monopoly on air tactics, and some air and missile attacks will get through. No one can maintain continuous or 100 percent air superiority and knock down every plane and missile, but WP planners continue to emphasize the destruction of U.S. air fields and nuclear delivery means to degrade that capability. Even so, U.S. air and missile strikes can destroy large concentrated forces and fixed combat service support (CSS) facilities. Therefore, WP planners will not present such large targets. Combat forces above battalion level will be dispersed, and CSS facilities will be dispersed and kept in motion as much as possible.

• Can such a "deep strike" force be resupplied? As stated, it will be incumbent upon the WP forces to make that "deep strike" force expend its combat supplies on its way to the WP second echelon. Conventional and unconventional resources will be used to destroy or disrupt U.S. support activities in its own rear areas or in transit to the forward elements. The U.S. commander may well find it extremely difficult to resupply his "deep strike" force, let alone his MBA forces, because of the tonnage involved and the ubiquity of the in-depth WP air defense systems. The toal U.S. force CSS structure may be considered a shaky leg upon which to stand because much of it will consist of reserve components who must be fully operational in Europe within days or even hours after the opening shots have been fired. WP planners have undoubtedly taken all this into consideration and, even if the Reserve Component CSS forces arrive in Europe unscathed, they must still face formidable challenges. Even though some of their units periodically deploy and train at their wartime operational sites, most are not sufficiently familiar with their operational areas in Europe, not with the personnel with whom they must work under wartime conditions to be fully effective for some time after arrival.

• Can the U.S. even sustain its already deployed force in Europe in the face of ground attacks directed against our CSS facilities? Western military forces will face a formidable threat in the form of Soviet Operational Maneuver Groups (OMG) that operate much as do the U.S. "deep strike" force. WP planners have used these OMGs from battalion to corps level in their maneuvers. Such forces will advance on multiple routes and will seek to destroy or render ineffective the U.S. nuclear weapons and facilities, command and control points, communications centers, and CSS assets, some of which in Western Europe are conveniently sited for such attacks. If the WP version of the "deep strike" is successful, the U.S. support of the MBA will be tenuous, for not only will the OMGs attack U.S. support forces and facilities, they will sow confusion, disorder and panic in our rear areas.

WP political leaders believe that in view of world opinion and its propaganda value, the U.S. forces should be the first to use NBC weapons if they are employed. With nuclear parity, there is no clear theater strategic advantage to WP "first use" given their numerical superiority in conventional forces. That would put the onus for "first use" squarely on the shoulders of the U.S. commanders. However, WP forces are better trained and otherwise prepared to use NBC weapons. WP attacks then, will be violent, launched with surprise, and pushed forward rapidly with the first echelons closing so fast that the use of tactical nuclear weapons would endanger U.S. forces as much as WP forces. Since U.S. planners visualize a nonlinear battlefield in which opposing forces will be intermingled, the use of NBC weapons can only be to the advantage of the numerically superior force.

An American officer laid out the tasks of the American corps commanders in the AirLand Battle. He says that the commander must:

• Provide subordinate force commanders the forces to accomplish their missions in the covering force and MBA.

• Prevent or delay the employment of enemy follow-on forces sufficiently to allow friendly forces in contact to maintain the forward defense.

• Unhinge or disrupt the integrity of the enemy's operational scheme sufficiently to seize the initative, go on the offensive, and force the enemy to ground, or destroy him.

The officer's ideas are basically sound. In question, however, is the ability of the U.S. forces to execute those ideas. There should have been a fourth task listed in the officer's article—that of fighting the *rear area* battle. U.S. military and paramilitary publications estimate that there are some 20,000 pro-Soviet agents and provocateurs in Western Europe. Add to that the WPs OMGs and it is easy to see the U.S. rear areas will be subject to constant enemy attack. Support echelon troops will be so busy protecting themselves they will be barely able to perform their primary missions. Indeed the main focus of enemy efforts may well be located deep in the U.S. rear area.

Therefore, can the U.S. realistically conduct the AirLand Battle? Can we make good our "shield of blows?" Can a hive of bees keep the bear out of the honey? The fast, mobile bee, even in swarms, rarely does so. The bear usually wins.

ROBERT T. SAUNDERS, JR.
Fort Lee, VA.

Recognition Quiz Answers

1. **BTR-60 (USSR).** This 8x8-wheeled APC is armed with a 14.5-mm heavy machinegun and a 7.62-mm coaxial machinegun. It has a 2-man crew and carries 8 passengers. Its maximum road speed is 80 km/hr and its maximum road range is 500 km.

2. **BRDM-2 (USSR).** This 4x4-wheeled amphibious reconnaissance vehicle is manned by a crew of 4. It is armed with a 14.5-mm heavy machinegun and a 7.62-mm coaxial machinegun. Variants include the SA-9, the AT-5, the AT-3 and 2 and the Rkh models.

3. **GAZ-69 (USSR).** This 4x4-wheeled half-ton truck is used as a prime mover for small antitank guns, rocket launchers and for personnel. Its maximum road speed is 90 km/hr and it has a road range of 530 km.

4. **UAZ-469B (USSR)** This 4x4-wheeled half-ton truck is the replacement for the GAZ-69. It was introduced in 1973 and has a maximum road speed of 100 km/hr and a maximum road range of 700 km.

5. **YP-408 (Neth).** This APC was introduced in 1964 and is armed only with a 12.7-mm machinegun. It has a 4-man crew and carries 10 passengers. Its maximum road speed is 45 km/hr and its maximum road range is 230 km.

6. **OT-64C (CZECH).** This 14.3 ton 8x8-wheeled APC has a 2-man crew and carries 15 passengers. It is armed with a 14.5-mm heavy machinegun and a 7.62-mm coaxial machinegun. It has a maximum road speed of 94.4 km/hr and a maximum road range of 710 km.

Prepared by Threat Branch, DCD, USAARMC, Ft. Knox, KY.

REGIMENTAL REVIEW

The following announcement is reprinted from the March-April 1938 issue of the Cavalry Journal. Throughout almost 98 years of publication, the Cavalry Journal and ARMOR Magazine have included news of regimental activities. Regimental Review will renew that tradition. As units are designated under the new Regimental Manning System, ARMOR intends to publicize their activities in this department. Ed.

9th Cavalry—Fort Riley, Kansas

LIEUTENANT COLONEL GEORGE S. PATTON, JR., *Commanding*

Lieutenant Colonel George S. Patton, Jr., joined the regiment and assumed command February 10, 1938, relieving Lieutenant Colonel Terry del la M. Allen, who assumed command when Lieutenant Colonel Cuthbert P. Stearns, was relieved to join the first Cavalry Division as Chief of Staff.

Lieutenant Colonel Patton made a brief address to the regiment at a Regimental Party in the Post Gymnasium on St. Patrick's Day.

The Regimental Boxing Squad is holding its own in the Post Tournament by leading the C.C.C. Squad by fifty points. Private Sidney G. (Ace) Rucker, Troop E, fighting in the light heavyweight class has won three bouts out of three by the knockout route.

The season for Baseball is at hand and the familiar sounds of cracking bats and popping gloves are all around. We look forward to a splendid team and a successful season.

First Segeant Charles E. Pearson, Headquarters and Service Troop, having completed the course of instruction prescribed for the Noncommissioned Officers' Course, The Cavalry School, for the year 1937-38, was graduated February 24th. Due to Sergeant Pearson's ability as a horseman he was selected to remain in the Noncommissioned Officers' Advanced Equitation Class.

From the progress being made in the remodeling of our barracks, all indications point to a set of modern barracks by summer.

6-32d Armor First To Be Realigned in 4th ID

"Thunderbolt" troops from the 6th Battalion, 32nd Armor will be the first 4th Infantry Division (Mechanized) unit to be realigned under the Division '86 plan with the creation of a fourth line company, said a recent article in THE MOUNTAINEER, the Fort Carson, CO newspaper.

Under the realignment, the combat support company lost its scout and mortar platoons to headquarters and headquarters company. The number of *M60* tanks in the three companies will be reduced to 13, and the spare tanks will go to the new D company.

Town North Lions Club Honors Armor

The Town North Lions Club, Dallas, TX, under the direction of its President, Ralph W. Widener, Jr., featured a salute to Armor on 17 October 1983 as part of its ongoing program of recognition of the contributions made by the many branches of the armed forces. Mr. Widener, a member of the U. S. Armor Association, prepared a brochure for club members that included a background of the branch, a report on the *M1 Abrams* tank and a short history of the 2d Armored Division, Fort Hood.

Commanders Update

Following are command changes as of 25 August 1983:

COL Alvin Kremer
1st Bde., 1st Armd Div.
Illesheim

COL Dennis Crumley
1st Bde., 3rd Armd Div.
Kirchgoens

COL Jerry Rutherford
3d Bde., 3d Armd Div.
Friedberg

COL Jon Collins
1st Bde., 1st Cav Div.
Fort Hood, TX

COL James Taylor
3d Armd Cav Regt.
Fort Bliss, TX

COL David Armstrong
1st Bde., 2d Inf Div.
Camp Casey

COL Robert Phillips
1st AIT/OSUT Brigade (Armor)
Fort Knox, KY

2-70th Armor Faces Soviet Armor at Fort Stewart

Men of Company A, 2-70th Armor Battalion, were impressed with their first sight of genuine Soviet armor vehicles during recent exercises at Ft. Stewart.

"At first they didn't know what it was. Then, when they recognized the Soviet armor, they'd go wild," said First Lieutenant Cliff D. Stiles, battalion S-3 (Air) and chief controller of the exercise.

"One thing the men pointed out to us after the exercise," he said, "was that we need to work more on vehicle identification. It's one thing to see a vehicle on the cards, and it's another to actually see it, especially when it's coming right at you."

Postal Registration

1. Date of Filing: 13 October 1983.
2. Title of Publication: ARMOR Magazine.
3. Frequency of Publication: Bimonthly.
4. Location of Known Office of Publication: U. S. Army Armor School, Bldg 2369, ATTN: ATSB-DOTD-MAG, Fort Knox, KY 40121.
5. Location of the Headquarters of the Publication: U. S. Army Armor School, Bldg 2369, Fort Knox, KY 40121
6. Publisher and Editor: Major Charles R. Steiner, Jr., U. S. Army Armor School, Bldg 4401, Fort Knox, KY 40121.

BOOKS

MILITARY BALLISTICS — A BASIC MANUAL by C. L. Farrar and D. W. Leeming. Pergamon Press, Inc., Elmsford, NY. $17.50.

This is volume 10 in Brassey's Battlefield Weapons Systems and Technology series and provides an overview of ballistics including interior, intermediate, exterior, terminal and wound ballistics. It provides the professional soldier with a background sufficient for good comprehension of the processes and problems involved in ballistics of all types.

It is written in textbook fashion with self-test questions and answers. It is an excellent introduction to military ballistics. It is not a designer's handbook but is highly recommended for soldiers and weapons designers.

DONALD J. BUTZ
Battelle Columbus Laboratories
Columbus, OH

FAINT PRAISE: AMERICAN TANKS AND TANK DESTROYERS DURING WORLD WAR II by Charles M. Baily. Arachon Books, the Shoestring Press, Hamden CT. 196 pages. $24.00.

The story of the ill-fated tank destroyer force provides fascinating juxtapositions of personalities, doctrine, technology, and combat experience and Charles Baily brings them all together in this volume in a manner to please the historian, the armor buff, or the general reader.

Tank destroying guns were first looked on as towed weapons, but combat proved the need for self-propelled guns that could maneuver to get flank shots at the heavy German tanks *(Panthers and Tigers)* met during the war's closing months.

The book covers the bureaucratic battles that culminated in the demise of the tank destroyer concept in favor of the proponents of the main battle tank.

Recommended for both professional and lay readers.

ARMOR Staff
Fort Knox, KY

CUSTER VICTORIOUS: THE CIVIL WAR BATTLES OF GENERAL GEORGE ARMSTRONG CUSTER by George J. W. Urwin. Fairleigh Dickinson Press. 1983. 308 pages. $27.50.

Mr. Urwin's book is based on the premise that a clue to Custer's performance and death in the Indian Wars can be gleaned from his performance in the Civil War. The idea is great. The book is a total failure.

Documentation is impressive at first glance but is terribly flawed. Over 62 percent of all citations are from eulogies and other biased items collected by Mrs. Custer from 1876 to 1906. These items were originally and solely intended to glorify the deeds of her *Beau Sabreur.* The remaining citations are similarly flawed, or manipulatively selected.

This documentation problem leads to Mr. Urwin's claims that Custer "beat" General Robert E. Lee; that Custer did more than anyone else to win the Civil War; and that Custer "won" the battles of Gettysburg, The Wilderness, Cedar Creek, Five Forks and Appomattox. Of course, the Custer letters and *Times* told Mr. Urwin that this was so.

Custer Victorious has no sense of scope. A supposed biography, most of it rehashes the campaigns where Custer was present. The author presents no analysis of Custer's actions and Custer appears almost a passenger in a book out of control. Other flaws and errors abound. The message is simple . . . ignore this book.

ARTHUR B. ALPIN
Major, Armor
USMA, West Point, NY

COCKNEY, by Robert W. McCormick. Cottonwood Publishing Co., Worthington, OH. 219 pages, $22 ($15 paperback).

Cockney was the code name for the 696th Armored Field Artillery Battalion (105-mm SP howitzers on M-7 chassis), and this book is that unit's history in WW II. Dr. McCormick was a medic with the 696th and is now a professor emeritus at Ohio State University.

The 696th was an independent battalion attached to a number of divisions, including the 4th Armored Division in the Saar offensive and later in the Ardennes. It was also attached to the 2d Armored Division in the advance to the Rhine River and finally to the Elbe River.

The 696th derived from the New Jersey National Guard and was inducted into Federal service in 1941 as the 2d Battalion, 112th Field Artillery Regiment and became the 696th Field Artillery Battalion in 1943. Currently it is listed as the 4th Battalion, 112th Field Artillery, 50th Armored Division, NJARNG.

The unit was originally horsedrawn and later truck-towed and in 1943 was reorganized as armored field artillery and was eventually mounted on the M-7 chassis.

While these chassis, with their limited traverse, often called for frequent vehicle displacement to change fire direction, they provided the required mobility and only SP guns could maintain the momentum of armored warfare and the frequent changes of firing positions.

Studying the operations of such armored artillery units is valuable in understanding the principles of the combined arms team that is today's armor forces.

A. HARDING GANZ
Associate Professor of History
Ohio State University

BULLETS AND BUREAUCRATS: THE MACHINEGUN AND THE UNITED STATES ARMY, 1861-1916 by David A. Armstrong. Greenwood Press, Westport, CT. 1983. 239 pages, illustrated $27.50.

This small, well-written and researched volume examines the role of the machinegun in the U.S. Army from 1861 to 1916.

Like so many revolutionary weapons, the machinegun was a victim of bureaucracy during its infancy and only the insistence of President Lincoln led to its use in the Union Armies during the Civil War. Neither artillery nor infantry nor cavalry officers could, or would, see a use for the new weapon in their ranks. Lincoln said it was "worth the attention of the government."

The book details use of the Gatling and other early versions of the machinegun during the Spanish-American War and the Philippine Insurrection and the attempts of Lieutenant John Henry Parker to gain military acceptance for the sophisticated weapon. Parker claimed that the machinegun represented "A massed fire in reserve," and promulgated that theory to the Infantry and Cavalry School at Fort Leavenworth as early as 1897.

Armstrong's book also provides an informative discussion on the landmark reform program for the modernization of the American military system as initiated by Elihu Root, Secretary of War following the Spanish-American War.

This volume, then, represents a thoroughly comprehensive study of the relationship of early military technology to the bureaucratic process and is an important work in understanding the development of one of the Army's major infantry weapons systems.

MICHAEL E. LONG
Captain, Infantry
Fort Shafter, HI

STEEL ON TARGET

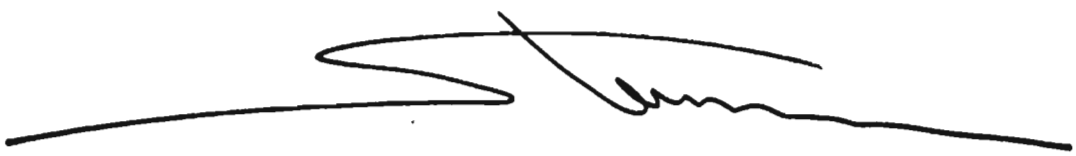
It has been said that if buggy makers had known they were in the transportation business they'd be thriving today building automobiles. In the pre-World War II years, a debate ensued between those who saw Cavalry in the business of horsemanship and those who defined its role as the proponent of mobile warfare. The realities of World War II put that debate to rest.

What is our business today: Are we tankers, or armored cavalrymen, or attack pilots — or are we proponents of mobile ground combat? Those who retain a parochial view may argue the merits of one weapon system over another and lose sight of the bigger picture. That picture demonstrates that in the span of 40 years, the United States Army as a whole has adopted the business of mobile warfare. First was the Armored Force in 1940, followed by the motorization, mechanization, and air mobilization of the Infantry, Artillery, and support branches. And, while those branches have retained their own character and missions, they have become as inexorably tied to the concept of mobile warfare as the Cavalry. Those who placed Cavalry in the business of mobile warfare could now, in a sense, conclude that the whole Army has taken on the character of our branch. While Armor could rightfully take credit for some of the Army-wide conversion, much of it came about in response to the armored threat faced by our forces in Europe.

If we define our business as mobile ground combat, then we in the Armor community have much to offer our brothers in the other branches, for our business encompasses theirs. We have a stake in the design of practically every weapons system, and in the configuration of almost every combat and support organization or unit whether heavy or light.

Armor is a way of thinking more than a branch. To stay on top of things as we move toward the second millenium, we must utilize emerging technology but not become wedded to a particular system or way of doing things. We must be sufficiently open minded to imagine new ways and means to get about our business of mobile warfare. Today, they may include turreted tanks or fast attack dune buggies. Sometime in the future they may include Star Wars Landwalkers for surface mobility, hovercraft for near surface operations and high speed boring machines for subsurface maneuver. As Armor goes, so goes the Army.

Good Shooting.



Symbolism

The dinosaur, with its scaly armored hide and dangerous tail capable of destroying everything in its path, is symbolic of the destroying functions of the regiment, and the flaming sword represents the zeal of the men in the performance of their duties.

The uprooted tree stands for the regiment's action in the Hurtgen Forest in World War II, for which the unit was awarded the Presidential Unit Citation. The lion, from the arms of Belgium, is symbolic of action in the Ardennes, for which the unit was awarded the Belgian Fourragere. The portcullis with five spikes symbolizes the fortifications of Europe and the regiment's five campaign credits. The portcullis and fir tree also stand for postwar service of battalions of the regiment in Germany and Alaska, the portcullis alluding to the Iron Curtain in Germany and the white fir to the snow-covered forests of Alaska.

Distinctive Insignia

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

40th Armor

(By Force And Valor)

Lineage and Honors

Constituted 13 January 1941 in the Regular Army as 4th Armored Regiment and assigned to 3d Armored Division. Activated 15 April 1941 at Camp Beauregard, Louisiana. Redesignated 8 May 1941 as 40th Armored Regiment. Inactivated 1 January 1942 at Camp Beauregard, Louisiana, and relieved from assignment to 3d Armored Division. Activated 2 March 1942 at Camp Polk, Louisiana, and assigned to 7th Armored Division.

Regiment broken up 20 September 1943 and its elements reorganized and redesignated as follows: Regimental Headquarters and Headquarters Company, 1st Battalion, and Company D as 40th Tank Battalion, an element of the 7th Armored Division; 3rd Battalion as 709th Tank Battalion and relieved from assignment to 7th Armored Division; Reconnaissance Company as Troop E, 87th Cavalry Reconnaissance Squadron, an element of the 7th Armored Division; 2d Battalion (less Company D) absorbed in 40th Tank Battalion; Maintenance and Service Companies disbanded.

40th Tank Battalion reorganized and redesignated 25 July 1945 as 40th Amphibian Tractor Battalion and relieved from assignment to 7th Armored Division. Inactivated 22 February 1946 at Camp Kilmer, New Jersey. Redesignated 25 June 1948 as 40th Heavy Tank Battalion and assigned to 4th Infantry Division. Activated 6 July 1948 at Fort Ord, California. Redesignated 18 November 1950 as 40th Tank Battalion; concurrently, transferred (less personnel and equipment) from Fort Ord, California, to Fort Benning, Georgia, and reorganized. Inactivated 1 April 1967 at Fort Lewis, Washington, and relieved from assignment to 4th Infantry Division.

709th Tank Battalion inactivated 10 April 1946 at Camp Kilmer, New Jersey. Redesignated 30 July 1948 as 86th Heavy Tank Battalion, assigned to 3d Armored Division, and activated at Fort Knox, Kentucky. Redesignated 15 April 1953 as 709th Tank Battalion. Inactivated 1 October 1957 in Germany and relieved from assignment to 3d Armored Division.

Troop E, 87th Cavalry Reconnaissance Squadron, Mechanized, inactivated 9 October 1945 at Camp Shanks, New York. Disbanded 4 November 1950. Reconstituted 15 October 1957 in the Regular Army.

Headquarters and Headquarters Company, 2d Battalion, 40th Armored Regiment; Companies E and F, 40th Armored Regiment; and Service Company, 40th Armored Regiment, reconstituted 15 October 1957 in the Regular Army.

40th and 709th Tank Battalions; Troop E, 87th Cavalry Reconnaissance Squadron, Mechanized; and the reconstituted elements of the 40th Armored Regiment consolidated, reorganized, and redesignated 15 October 1957 as 40th Armor, a parent regiment under the Combat Arms Regimental System (Headquarters and Headquarters and Service Company, 40th Tank Battalion, redesignated as Headquarters and Headquarters Company, 40th Armor).

Campaign Participation Credit

World War II

Normandy	Rhineland	Ardennes-Alsace
Northern France		Central Europe

Decorations

Presidential Unit Citation (Army) Streamer embroidered *Hurtgen Forest* (709th Tank Battalion (less Company C) cited; WD GO 21, 1947)

Belgian Fourragere 1940 (40th Tank Battalion and 87th Cavalry Reconnaissance Squadron cited; DA GO 43, 1950)

Cited in the Order of the Day of the Belgian Army for action in the *Ardennes*

Cited in the Order of the Day of the Belgian Army for action in *Belgium*