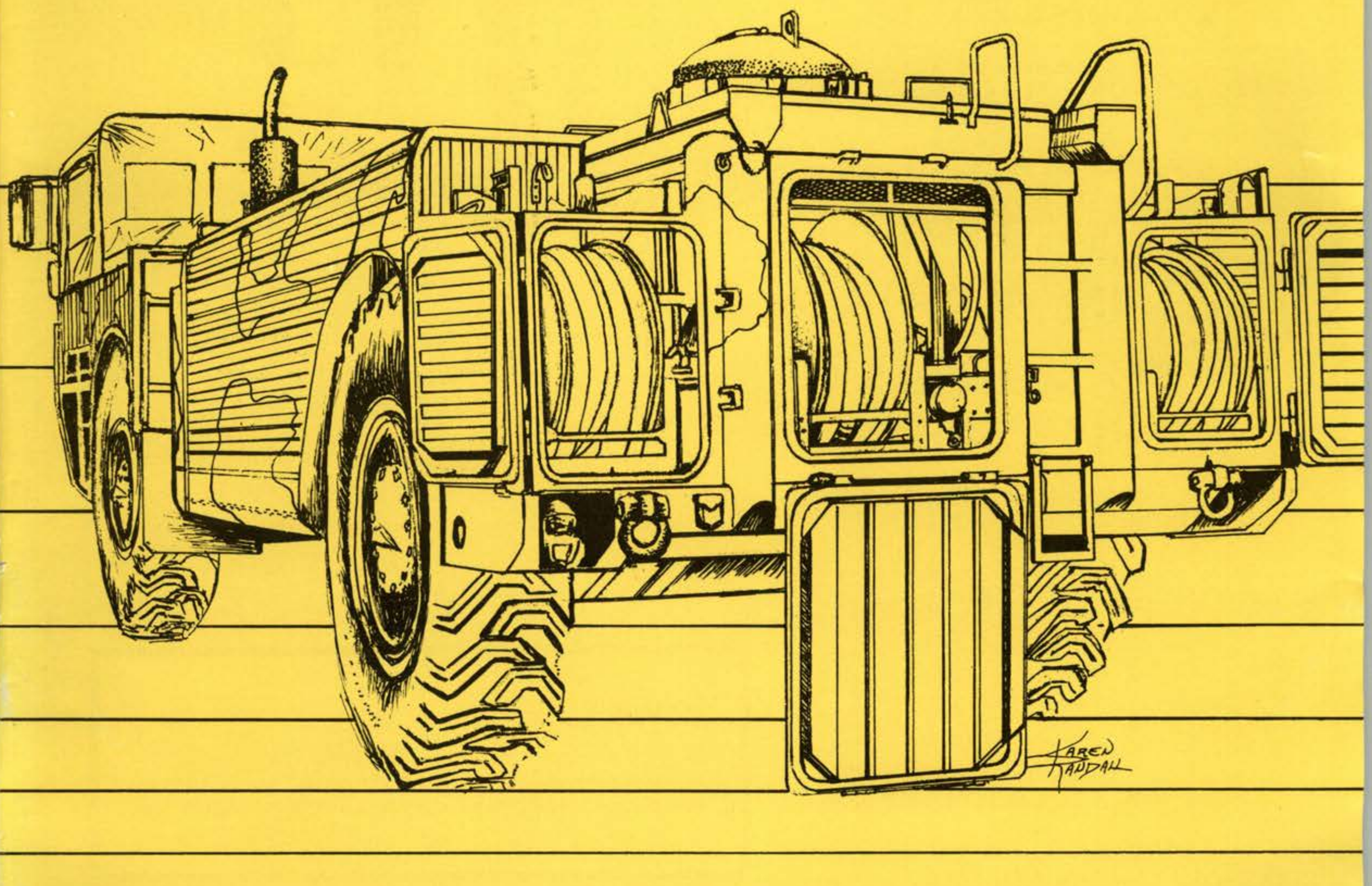
ARMOR

january-february 1979



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"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."

COVER

Beginning on page 30, Captain Thomas G. Pratuch presents a plan for refueling in combat that makes maximum use of fuel handling equipment organic to a tank battalion.

JANUARY-FEBRUARY
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ARMOR

the Magazine of Mobile Warfare

Editor-in-Chief
LTC MICHAEL A. VARGOSKO

Managing Editor
ROYCE R. TAYLOR, JR.

Assistant Editor
W. RICHARD MORRIS

Art Director
KAREN W. RANDALL

Administrative Assistant
JEANNIE BRIGHT

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LETTERS

True Friendship

Dear Sir:

I subscribed to your magazine about 5-months ago and enjoy it very much, especially since I intend on the specific field for my career. I would like to order a subscription of your magazine for a friend.

Steven Thompson
Lynnfield, Mass. 01940

Now, how about those of you who have already made it a career, showing the same spirit and doing the same —MAV.

Winning Combination

Dear Sir:

1st Lt. Charles E. White's story of "One Tiger" was yet another historical example of what happens when a good tank and gutsy crew are combined. His story reminded me of SP4 Pingston's story in the last issue, "Target, Cease Fire!" I think the stories relate, in that both describe the experiences of individual tankers and crews, whether in combat or down Table VIII.

I think these kinds of stories tend to stir more discussion and pride in the Armor Branch, among crew members, than anything else. My appreciation to both of the authors mentioned!

Samuel T. Conn
Cpt., Armor KanARNG
Manhattan Kan. 66502

"One Tiger"

In regard to the recent article in *ARMOR,* "One Tiger," by 1st Lt. Charles White, I have a few comments and elaborations that may be of interest to you, Lt. White, and the readers.

The proper designation of (Wittman's) unit was: "schw. SS-Panzer Abteilung 101," indicating that the unit was still attached to I. SS-Panzer-Korps Liebstandarte SS Adolph Hitler. The change in designation from schw. SS-Pz-Abt. 101 to schw. SS-Pz-Abt 501 did not occur until October of 1944. This change in designation was done in order to make the units Special Troops of the SS High Command (Sondertruppen des Reichsfuhrung-SS).

* * * * *

Wittman's action is a classic of armored action, and yet has not been widely published in any commonly available source. No other single action so dramatically illustrates the effect that one man in the right place, at the right time, and with sufficient battle training and experience can have in battle. Lt. White and *ARMOR* are to be commended for publishing such an article.

Robert C. Smith
Pennsauken, N.J. 08109

SAM

Dear Sir:

Captains Soneira and MacSwords are to be commended for their fine article on SAM and for their interest and enthusiasm which led to the article.

But, whatever happened to good old Sam Morse's system, the one we used to call the Morse Code when I was a Boy Scout? If there is a real world need for line-of-sight, short-range, secure commo, you can't beat Sam's (Morse) system—surely it must be only coincidental that your acronym is his first name. Almost anyone can learn the simple code (most people already know 2 of the 26 required letters—SOS) and with it you have complete command of the English language without having to pass out columns of numbers and words; without being limited in what message you can send by what is in the columns; without having to encode and decode, however simple the task is; without toting a stack of 8 x 10 panels around, which you have to dig out from among the other paraphernalia that was designed to aid the new army in making rapid decisions on the battlefield of tomorrow.

But, opinions are like discharges, sooner or later everyone gets one. Some good, some bad.

Carroll D. Childers
Maj., Cavalry
Fredericksburg, Va., 22401

Armor Training Vehicles

Dear Sir:

As is usual with anything he writes, I found Richard Ogorkiewicz' article on armored training vehicles (ATV's) quite thought-provoking.

While stationed in Germany in the early 70's during the first "energy crisis," our unit utilized ¼-ton vehicles in place of *M-60A1's* while conducting cross-country platoon and company ATT's. These "armor training vehicles" were inherently unsuitable for reasons too numerous to mention. Nevertheless, they did provide a degree of realism that would have been lacking had we been forced to cancel scheduled ATT's. They saved a not inconsiderable amount of fuel, and they were especially considerate of local farmers' fields.

Mr. Ogorkiewicz' idea of a secondary role for ATV's deserves comment: why not design a vehicle which can quickly be fitted with TOW? Then, in the event of a major conflict, we would have a low cost, air-deployable antitank weapons system which could quickly be moved anywhere in the world.

Edgar H. Rawl
Captain, Armor, USA
Charlottesville, VA 22901

A Marine Says Thanks

Dear Sir:

Having forgone the privilege of wearing the U. S. Army's uniform, I have opted for that of the United States Marine Corps. My experience goes back to the *M-4.* It was only through *ARMOR* magazine's knowledgeable information that is put forth in such a readable manner that I was able to keep abreast with the progress of armor throughout the world.

This and access to the nonresident schools of the Corps of Armor and allied fields, in my mind, made my career as a Marine a success and I feel my promotions were speeded along by their help.

Thank you one and all.

Edward J. Herterich
Gy. Sgt. USMC (Ret)
San Marcos, Cal. 92069

Information Needed

Dear Sir:

The Historical Division of the Joint Secretariat, Organization of the Joint Chiefs of Staff, is attempting to compile a photographic record of the activities of the Joint Chiefs of Staff, with a view to the possibility of eventual publication of such a record.

Contributions are invited from those having photographs or snapshots that might constitute a useful part of such a record. Particularly desired are photographs that record any of the activities of the Joint Chiefs of Staff, or of any individual members thereof, in connection with combat operations or with overseas or CONUS training activities.

Copies of photographs, appropriately annotated, should be sent to the Historical Division, Office of the Secretary, Joint Chiefs of Staff, Washington, D. C. 20301. Unfortunately, contributions cannot be returned.

Arion N. Pattakos
Col.

Washington, D. C. 20301

DRS and Maintenance

Dear Sir:

A lot of attention has recently been focused on the Division Restructing Study (DRS) here at Fort Hood. I have recently completed one and a half years as a platoon leader in a DRS tank company, and would like to comment on the DRS maintenance concept.

Under DRS, the mechanics have been taken away from the company commander and consolidated in a separate maintenance company. A team of mechanics is then attached to each line company. However, the maintenance company commander retains control of the mechanics.

This arrangement has caused a breakdown in the DRS maintenance program. Since it is a separate unit, the maintenance company has all of the administrative responsibilities of any other company: police areas, guard commitments, and training of personnel, etc. It is therefore often difficult to get a mechanic when one is needed.

At any given time, a line company's attached maintenance team may be called away from repairing vehicles to take care of maintenance company administrative business.

Many times, I have felt the frustration of having mechanics called away from repairing my tanks to go mow the grass around the motor pool fence, or some other such nonsense. Perhaps what is needed is reordering of priorities.

Line company and maintenance company training programs often conflict, again resulting in lost maintenance time. For example, a line company takes CBR training one day, maintenance company the next. The result is 2 days of lost maintenance time. Multiply this example by other requirements (SQT training, drownproofing, PT tests, etc. etc), and the number of lost maintenance days becomes ridiculous.

A line company commander may develop an outstanding maintenance program, but if he cannot get the mechanics, his SOP becomes just another piece of waste paper. I have seen several excellent maintenance programs go down the tubes because the company commander had little or no control over the mechanics he needed. Catch-22 is that the line company commander is still responsible for the success or failure of his maintenance program.

The net result of the DRS maintenance concept is not a more efficient maintenance program, as the planners hoped, but rather a lot of lost maintenance time. Vehicle crews spend much of their time in the motor pool waiting for mechanics. This idle time causes boredom, which in turn affects morale. Platoon leaders, platoon sergeants, and TC's waste much valuable time chasing mechanics trying to get them to work on vehicles.

In short, returning the mechanics to the line company commander's control would result in more efficient maintenance programs, and hence a higher operational readiness rate.

Marvin BR Rickert
2d Lt., Armor

1st Cavalry Division
Fort Hood, Tex.

...And Getting Better

Dear Sir:

I would like to say that Armor Magazine seems to get better all the time. I really enjoy every publication. The only problem is when I lay my issue down I'm afraid it will come up missing!

The Officers and NCOs in the battalion are always after it. Could you send me some subscription forms because I know I can get most of these guys to subscribe.

WO1 Robert Swadish
HHC 2/6 Inf

APO New York 09742

Correction

Dear Sir:

I was pleased to receive the July-August 1978 issue of *ARMOR* which contained my article on long-range planning of Soviet armor developments. On reviewing table 1 (page 23), however, I discovered a typographical error which alters the meaning of this figure. The creation of the T-72 should be attributed to the 1960-62 program rather than to the 1970 program. At the moment there is no way of knowing for sure the results of the 1970 program and consequently the results of this program should be listed as a question mark.

Andrew W. Hull
Research Scientist
International Studies Center

Columbus, Ohio 43201

Back Issues

Dear Sir:

As a longtime (about 25 years!) member of the Association and one who served a tour on the Executive Council—may I ask your help in tracking down a missing copy of *ARMOR* which I need before I can send out my personal copies for binding.

In getting the last several years of *ARMOR* ready for the bindery I find that I am missing the September-October number for the year 1975. I would be most appreciative of your help and if there is any charge I will be happy to reimburse you.

You continue to do a fine job with the "most professional" of the professional military journals—keep up the good work!

Bruce Jacobs
Col., ARNGUS

Editor & Publisher
The National Guardsman

Many past issues of ARMOR are available at $1.50 each. Interested readers should request them as soon as possible. Mail requests to:
US Armor Association
Box O
Ft. Knox, Ky 40121.
Microfilm copies of all issues are available from University Microfilm in Ann Arbor, Mich.
—MAV.

WE GOOFED

The list of Armored Battalion/Squadron Commanders in the November-December 1978 issue was by no means complete. It will be reprinted in the March-April issue.

The U.S. Air Force Air-Ground Operations School is located at Auxiliary Field 9 (Hurlbut Field) Eglin AFB, Fla., not Keesler AFB as erroneously reported in the November-December issue.

MAV

THE COMMANDER'S HATCH

MG Thomas P. Lynch
Commandant
U.S. Army Armor School

There's been a lot of talk in Threat assessments and even How to Fight manuals about our potential foe's ability to force continuous operations upon us. Having pointed out the problem, though, there's surprisingly little discussion of what we can do about it. It's high time we all took this one out of our "Too Hard" boxes and gave it some serious thought.

To review the bidding, Threat doctrine calls for echeloning his forces in such a way that fresh units are always available to pick up the ball from worn-out or shot-up units, thereby keeping up the momentum of operations around the clock, not just for a few days but for several weeks. Current and near-future improvements in night vision and fire control devices lend further credence to this doctrine. In short, the Threat has the wherewithal to carry out his announced intent of keeping the pressure on us day and night, denying us any lull for rest or maintenence. The problem is complicated by the fact that, in the real world, we will suffer both personnel and equipment casualties, thereby further increasing the pressure on the survivors. How can we avoid such an outcome?

The first thing we can do is to relearn an old lesson: that providing opportunities for rest is just as much a part of command responsibility as planning fire and maneuver. At the crew and platoon levels, since we can no longer count on resting at night, this means simply that *some* members of each crew/squad/element *should* be asleep whenever they are not actually engaged in a fire fight: *even at high noon.* To implement this in training, we need to do two things:

- Conduct our FTXs over a *minimum* period of 5 days, see to it that the scenario and the opposing force keep the heat on around the clock without pause, and insist upon realistic casualty assessments. This will force units to give up "stay-awake drills" and develop and refine their SOPs for redistributing remaining assets and providing rest while continuing uninterrupted mission performance. Those who do not, simply won't hack it much beyond the third day.
- Educate commanders, evaluators, and senior visitors *not* to expect every man to be awake , alert, and busy at something at any given time. So far from "gigging" a unit because some trooper is sacked out at 1030, they should call them to task if several men are *not* sacked out (unless, of course, an actual fire fight is in progress). This applies in all situations short of actual engagement. For example, at least one man per tank crew should be asleep during road marches out of contact and when maintenance or position preparation is going on. If all necessary maintenance and preparation has been completed, then two or even three men per crew should be resting while one or two remain alert to provide security.

These measures, fully accepted and practiced in training until they are second nature, will go a long way toward sustaining the average soldier, but they may not help commanders, key staff officers, or key technicians, and they won't provide the opportunity to integrate replacement personnel and equipment, nor even to perform periodic 2d echelon servicing of equipment over and above routine rearming, refueling and on-the-spot repairs.

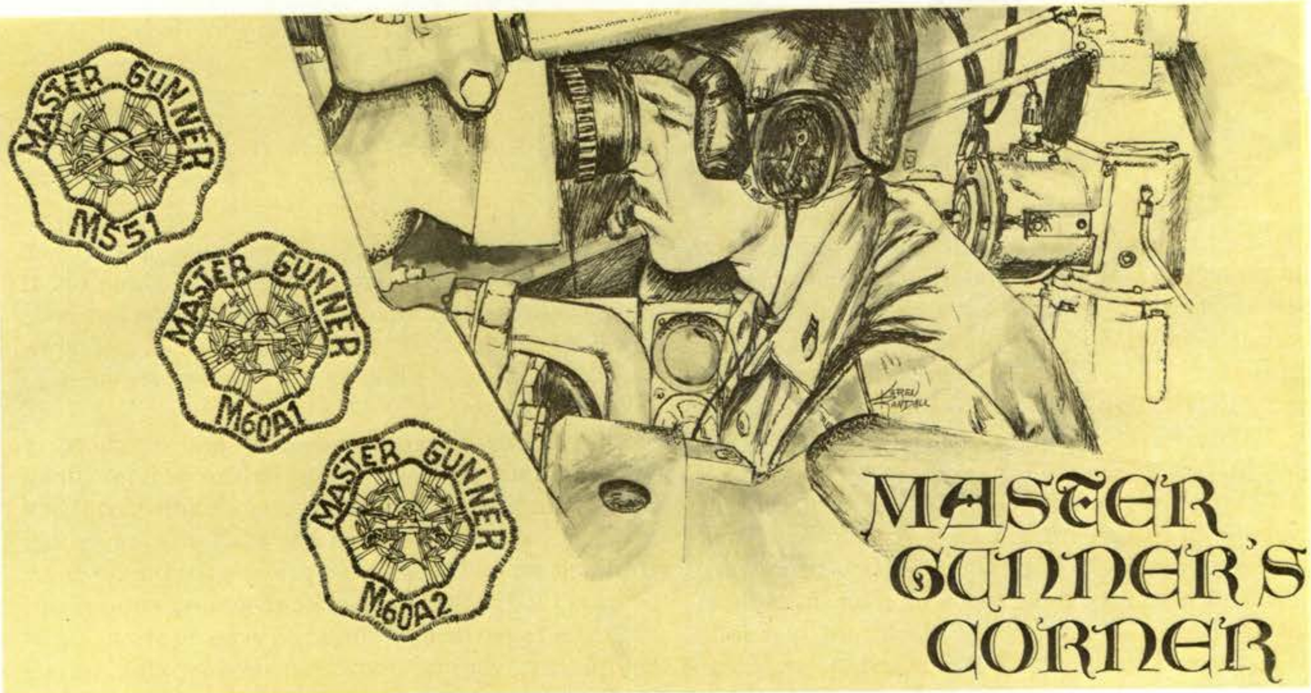
Some things we might do to help in these areas are:

- Commanders must realize that sustaining themselves for the long haul is part of their job. This means developing their deputies or execs so that they can, in fact, take over periodically to let "the old man" catch 40 winks. It also means disciplining themselves to accept and use such opportunities for rest at any time other than actual crises in the fighting. After all, if the CO collapses from exhaustion or is wounded, the XO will have to take over permanently.
- Functional teams—command groups, TOCs, maintenance crews, fire direction centers, ammo transporters, etc.,—must be organized for around-the-clock operations. Resources permitting, this may mean two alternate teams "spelling" each other on a schedule. At the least, there must be one or more "relief men" so that each individual can be given a break in his turn. It is up to commanders to look at their assets and come up with the best functional organization their resources permit.

Even after we have done all these things, there still remains the requirement to pull the unit out of contact periodically, hopefully every 3 or 4 days. Only then can we provide for equipment servicing, reception and orientation of replacements, baths and clean clothes, hot meals, and a *real* rest. Battalion is the optimum level for such rotation, and it is incumbent upon brigade and division commanders to insist that it be done. Admittedly, this will not be easy. It takes real guts for a brigade commander to give up a battalion when the going is heavy, but it's the only way to keep on going.

Many of these thoughts may be controversial. So be it. The problem won't go away, though. Can *you* think of better solutions? If so, let's hear them.

Maintain the integrity of your force.



MASTER GUNNER'S CORNER

We have not generally allowed officer's words to be printed in this Department of the magazine. In this case the officer writes with sincere feelings from his experience. He expresses on paper what we have all expressed orally, how to effectively employ the Master Gunner—MAV

The most significant event in the training year for the tanker is his opportunity to put steel on steel during tank gunnery training. There is a certain magic about this period that separates it from other Armor training and the training of other combat arms counterparts. Gunnery is the tanker's opportunity to master his weapons system with the purpose of destroying the enemy.

How does this goal become a reality for the tanker? How can the unit commander do his best to insure that every tanker has a positive experience with this training and thereby motivate himself to even greater levels of achievement as a tank crewman?

Perhaps these are questions that cross the mind of every commander directly or indirectly as he plans and prepares his unit for the shoot. In the beginning he should be interested and skilled in tank gunnery. From knowledge comes confidence, and from confidence comes steady direction and leadership. All of his subordinates must possess similar traits, and the commander must mold these skills and attributes into a team effort. The unit must be totally dedicated to the principles of tank gunnery, but the commander cannot hope to accomplish this mission alone. He must have the help and support of his officers and noncommissioned officers (NCO). The first sergeant, the platoon sergeants, the motor sergeant, and the supply sergeant by virtue of their positions as key leaders and technicians must have a close working relationship in order that gunnery may be a success for the soldier. It is this combined effort that causes the soldier to realize what his true ability as an armor crewman is during tank gunnery training.

There is, however, one additional NCO in the unit whose activity focuses on the same questions that the commander asks before an intensified training period. His actions mirror those of the commander, ranging from selecting the crew before training to firing the last round on Table IX. He is the Unit Master Gunner. When I analyzed the relative level of involvement of the Master Gunner in my unit training activities, I found that his influence on the training mission was an extremely important one and one that should be recognized by every commander. The training actions in which the Master Gunner is involved are shown in Table 1.

The series of training actions in Table 1, though not comprehensive, illustrate the Master Gunner's involvement in a unit's training. If he is allowed to, the Master Gunner can, and should be, the commander's key advisor on training. It is apparent that an NCO with these responsibilities must be personally selected by the commander and this selection should be accomplished with great care.

These are not all quantifiable skills or attributes, but a unit commander will know who can fill-the-bill in his unit by evaluating the candidates against these standards. These standards were not formulated by the writer. They were established and defined by the actual performance of graduates from the Master Gunner's course.

However, selection of the ideal NCO for the job will not get the job done. Before this body of knowledge can be tapped, the commander must give him guidance and direction. This begins with a job description, an extremely important step in the process of molding and developing a Master Gunner to his full potential. A thought concerning this description; "The Master Gunner can be the best trained tank commander in the unit or he can be the MASTER GUNNER." An example of such a job description follows:

> *Advise* the unit commander in planning, developing and implementing gunnery, tactical, and SQT training programs in the unit. *Act* as quality control NCO of turret inspections and maintenance during scheduled and unscheduled maintenance periods. *Organize* refresher training for unit turret mechanics and other low density MOSs.

Although the job description will normally fit the specific desires of the commander, the important features of the description are that the Master Gunner is integrated into the main stream of unit training as an advisor, a planner, and an organizer. Moreover, once given the responsibility he should be given the latitude to execute his responsibility without unnecessary interference. A Master Gunner who is also serving as a platoon sergeant will find it difficult, if not impossible, to do either job well. My experience has been that unless the Master Gunner is given the chance to test his mettle, he will not have the opportunity to practice the skills he learned at the Armor School. The professional pride these NCOs have upon completion of their course should not be extinguished.

This pride can be sustained by the commander showing that he has confidence in his Master Gunner's abilities. This cannot be a blind confidence. It should be earned confidence that develops over time and culminates with the commander's approval of the Master Gunner's plan for gunnery training and for the longer term annual unit training program.

Likewise, the Master Gunner needs to reinforce the commander's confidence in him by utilizing all of the assets available to him and thereby motivating the entire unit to higher levels of participation in training. He should serve as a melting pot for all training ideas generated in the unit, for, in fact, all members of an armor unit are potential trainers. It is therefore incumbent on the Master Gunner and the key leaders to develop an environment that will cause these ideas to come forth. He must constantly demonstrate enthusiasm for all types of training, not only tank gunnery. With this enthusiasm will come greater participation in training by each member of the unit. This is important because a soldier who becomes proficient in a particular subject can be considered a trainer when he teaches in the form of casual conversation in the barracks or when he is on the platform; he participates more actively because he is more aware of his subject and his personal training mission. The combination of greater knowledge and more confidence causes this to happen. The Master Gunner has, in this case, provided a base of technical knowledge and enthusiasm for training, and every member of the unit has reciprocated.

An illustration can be found by examining the Master Gunner's role in SQT training. By developing an intense and well planned program he answers the soldiers basic questions through instruction by platoon sergeants and tank commanders. The soldier sees professional training being presented and the soldier has a desire to become involved in the training because the stakes are high—PROMOTION. The result of greater involvement in SQT training is normally just that—PROMOTION. Why? Because he was now an actual participant, regardless of rank, as opposed to being the object of training. Again, the base of knowledge was the Master Gunner. The momentum of the program is sustained by the NCOs and officers for they were the primary instructors. The result is that the soldier advances to greater levels of rank, knowledge, responsibility, and confidence. The additional energy for training was realized because of the commander's effective employment of a new leadership instrument in his unit, the Master Gunner.

JAMES A. LARSON
Captain, Armor

AOAC 4-78

Table 1.

TRAINING ACTION	TC	PSG	PL	MG	1SG	CDR
Developing unit battle rosters.	x	x	x	x	x	x
Preparing vehicles for gunnery training.	x	x	x	x	x	x
Developing and planning annual unit training (gunnery, pre-ARTEP, tactical, and SQT).		x	x	x	x	x
Training and preparing unit instructors.		x	x	x		
Approving unit instructors.				x	x	x
Coordinating training aids.		x		x		
Inspecting unit training.				x	x	x
Developing annual SQT training program.				x	x	x
Writing SQT diagnostic tests.		x		x	x	
Administering SQT diagnostic tests.				x	x	x
Recording and evaluating SQT diagnostic test results.				x	x	x
Evaluating individual training progress.	x	x	x	x	x	x
Writing and organizing the gunnery crew skills test.				x	x	x
Administering the crew skills test.	x	x	x	x	x	x
Crew evaluation during home station dry TCQC.		x	x	x		x
Training crew evaluators.				x		
Conduct crew critiques.		x	x	x		x
Developing new training aids.				x		x
Supervise turret maintenance.				x		x
Conducting refresher training for turret mechanics.				x		
Supervising boresight and zero exercises.		x	x	x		
Operating the range tower during the zero exercise.				x		
Preparing range safety briefings.				x		x
Attending gunnery conferences.				x		x
Analyzing results of firing on each range and debriefing each crew.		x	x	x		x
Developing incentives for tank gunnery training.	x	x	x	x	x	x

Table 2. Ten Selection Criteria for a Master Gunner

The NCO must want the job and all of its inherent responsibilities. His motivation to improve himself and his unit should be unsurpassed.

He must be a highly proficient armor NCO.

He must be able to teach the soldier and moreover teach other NCOs and officers how to teach the soldier.

He must be able to interact with the commander and the unit cadre and relate to the unit method of operation.

He must be dedicated to the improvement of training for the benefit of the tanker, therefore, he must have good rapport with the soldiers in the unit. He must be able to identify their specific and general needs.

He should have a technical eye for improving training aids and methods of instruction.

He should be flexible and yet be able to preserve the value of training within that flexibility.

He must be able to express himself well in writing.

He must be able to understand his relationship to his commander as an advisor.

He should have a burning desire to see all of the crews in the unit become qualified crews.

Most members of today's modern tank corps have read about the tenacity of George S. Patton, Jr., the perserverence of Winston Churchill and the exploits of Samuel Rockenbach—but few realize that Sereno E. Brett belongs with this group of early Armor leaders.

In fact, some tankers—past and present—say Sereno Brett can be credited with saving the tank corps after World War I, when many military leaders were willing to scrap the Armor concept.

Sereno Elmer Brett, son of an Oregon rancher, attended Oregon State College and served as a second lieutenant of scouts with the Oregon National Guard on the Mexican border during the summer of 1917.

When the United States declared its entry into World War I, Brett went overseas with the 1st Division, American Expeditionary Forces. During his early days in France he was assigned several duties including what he called, "the unenviable post of Provost Marshal of St. Nazaire."

Finally, Brett was assigned to a machinegun company with the 28th Infantry and he felt sure his next stop would be in combat. It was not to be—not for the moment at least. Brett was greatly disappointed by receiving orders detailing him as the senior instructor in the 37-mm gun section of the Army Infantry Specialists School at Langres, France.

During this same period, Patton was desperately searching for anyone to help him establish the Tank School. He talked to one Cavalry major about joining the tanks, but the major was dubious of his ability and wished to suspend judgment until he could see an actual tank. Patton then went to his boss, Colonel Samuel D. Rockenbach, and asked for the transfer of Captain Sereno Brett, an infantryman, a regular officer, and a man "eager to join the tanks."

The request was approved and Brett was summoned to the center where he served as a chief instructor until he was given command of one of the first two tank battalions in the U.S. Army. Brett, recently promoted to major, was to take the 344th Battalion into battle—forerunner to the 66th Armor.

In a battle report written by Brett, he said:

> Never will the feeling of pride, when orders first came to proceed to the front, be forgotten. Scarcely any of the officers and men had ever been under fire, but everyone knew that the Tank Corps, represented by the two battalions, would make a success. Everyone realized that the two battalions were destined to initiate the history of the American Tank Corps and all grimly set themselves to the initiation of which the American people could justly be proud.

Preparations were quickly made and extreme difficulties were overcome by Brett's tankers, and then came the long-to-be-remembered night of 11 September 1918—the night before the St. Mihiel offensive. The rain poured continuously. The night was intensely dark and the mud knee-deep when the battalion squirmed out of its hiding place at 2100 and its long column began rolling to its battle position.

The next day Brett rode into battle in a tiny *Renault* tank in the first American tank action of the war. His battalion was with the 1st Division and his objective was to lead the infantry into battle. Brett's battalion found the German resistance to be slight, but he did find that the tank was more versatile than expected. On the drawing board it was claimed the *Renault* could cross trenches 6 feet wide, but Brett and his tankers dispelled that notion when they crossed ditches 10 to 14 feet in width.

In fact, the tankers were so good that by 14 September, Brett was out of gasoline since he had used it three times faster than expected. Patton got gasoline to Brett and that day eight tanks attacked the enemy, destroying five machineguns and driving them from their artillery positions.

Upon the conclusion of the Battle of St. Mihiel, Patton wrote a letter to Brett which said:

> I want to take this opportunity of putting in writing what I have long felt in my heart. I consider the enviable record of the 1st Brigade, Tank Corps, both in peace and war, has been due more to your earnest and constant efforts in training and valorous conduct in battle than to that of any other man or officer. Not only did you work here when we had nothing, not hope, without a murmur, but, in battle you fought the Brigade until there was nothing left and even after that, you fought on.

Brett's battalion had learned fast in its first fight, so his preparations for the second show in the Argonne were routine.

On 25 September, he was positioned near the Cote de Forimont in the Argonne. At 0530, he learned that this was a much different fight than at St. Mihiel, and that the Germans had no intention of giving up the landscape they had.

The entire brigade suffered heavily that first day; Colonel Patton was wounded, and Brett was called to command the brigade. Brett hastily reorganized his brigade and sent his tanks forward one position at a time. By 10 November, Brett's brigade had supported nine different divisions and scores of conspicuous acts of bravery were recorded for tankers in the Argonne.

Brett was almost constantly in action with his battalion throughout the remainder of World War I, which participated in 10 different attacks, went 46 days at one stretch without relief, and lost 80 percent of its strength in casualties.

Brett's battles did not end with the cessation of World War I. The period between the wars was one of development and sharp disagreements about the future of tanks. In one corner were the advocates who said the tank should be maintained for the sole purpose of supporting the Infantry. Brett and a few others stood up and claimed that due to their mobility, massed tanks and a well-balanced combat organization could provide decisive results.

Brett wrote extensive articles and crusaded hard for the inclusion of artillery, antitank, antiaircraft, communications, reconnaissance, command, and supply in existing infantry tank organizations to produce a balanced, self-sustaining, and independent tank force. He went so far as to go on record when he said: "existing infantry tank setup would produce little but grief for tank commanders and embarrassment for the high command."

The years passed and Brett pressed harder and harder for full Armor recognition, and by 1935 he was placed in charge of the reorganization of the entire U.S. tank service. As a colonel in 1941, he was appointed to the post of Chief of Staff of the Armored Forces at Fort Knox, Ky.

Brett was decorated with the Distinguished Service

Sereno Brett
A Profile In Armor

by
Major
John H. Raudy

Cross, Distinguished Service Medal, and Silver Star with Oak Leaf Cluster for his service during World War I.

A little known, but highly-regarded pioneer of the Tank Corps, Brett died in Santa Barbara, California on 9 September 1952.

At the end of the World War I Brett wrote:

> And now the armistice has been signed and things are uncertain, but still the old battalion and old officers and men, desire, more than anything else, to take a place where they are needed and where they may again, if necessary, add to the prestige of American Arms.

Few today could argue. Some might even feel that Armor's present triple threat of *Mobility, Firepower*, and *Shock Effect*, would not be a reality had it not been for the undaunted spirit of Sereno Brett.

A LEGACY FROM LENIN

by Joseph E. Backofen, Jr.

Mobility in warfare has always been of great interest and concern to commanders. This has been embodied in the details of cavalry attacks that could sweep the enemy's flanks, attack supply and communication lines, or exploit a battlefield victory.[1,2]

Much has been said about battlefield mobility in the past; and now again it is of interest to armor commanders when discussing main battle tanks and mechanized infantry combat vehicles. However, let us look to the air.

When marauding White Guard cavalry threatened the southern front in 1919, V. I. Lenin said, "Cavalry attacked by low flying aeroplanes is helpless against them. Bottle them up! ... Order (quickly): aeroplanes against cavalry. ... That gives instructions on the principles."[3] Lenin realized that aircraft would be scarcely vulnerable to the weapons of the cavalry. Furthermore, even though the cavalry were quite mobile and could traverse hills, forests, and difficult terrain, they could neither outrun nor outmaneuver aircraft.

In 1936 the Soviets envisioned a similar requirement for armored aircraft to duel with armored vehicles that either had broken through to threaten rear areas or were arriving at the enemy front.[4,5] For this requirement S. V. Ilyushin created the *IL-2 Sturmovik.* Equipped with 23-mm or 37-mm cannons or 20-mm cannon, rockets, and bombs, this aircraft's contoured armor plate fuselage made it an airborne armored combat machine.[6,7] The "shielded" armor system protected the 4,200 kg aircraft from destruction by up to 20-mm shells. And self-sealing composite fuel tanks provided survivability of the fuel system after projectile and fragment impacts.[8]

A total of 36,163 *IL-2's* were built during World War II. When the improved *IL-10* version is included, the number produced was 41,129. Thus, the production of the airborne armored weapons platform was of the same magnitude as that of the famous *T-34* tank.

As could be expected, Soviet literature has noted the effectiveness of the *Sturmoviks* in destroying enemy armor, and other war material.[9-12] The Soviet Union has maintained its requirement for and production of armored ground attack aircraft through the introduction of *IL-10, IL-28, SU-7, MIG-27, SU-19,* and *Mi-24* aircraft. It has also pictured these aircraft in the required roles in journals [13-18] and maneuvers.[19,20]

The U.S. *A-10* has recently been praised by many for its ability to perform antitank missions and to disrupt supply and communication lines. The development of this armored ground attack aircraft has drawn heavily on the German experience of World War II with *HS-129's*[21] and *JU-87's.* But it should be noted that these roles were also the missions of Soviet armored ground attack aircraft such as the *IL-2.*

The *Mi-24, Hind,* helicopter which exists in versions A, B, and D is armed with a gun, rockets, bombs, and missiles. Quite possibly, the crew and vital components such as the engine and transmission are armored in the same "shielded" manner as the *IL-2.* For example, the *Hind* airframe (4,700 kg empty) might be high quality steel and the outer skin aluminum to form "shielded armor" (spaced armor) as explained by Tumanov.[22] Confirming evidence of strong multiple plate structure appears around the engine/transmission area in both the *Hind* and its predecessors, *Mi-6 Hook* and *Mi-8 Hip,* where repair personnel stand on the flat inner surface of the access panels.[23,24,25] From performance data in the table and this evidence emerges a picture of an airborne mechanized infantry combat aircraft with more maneuverability, range, protection, and firepower than the BMP.

There is no comfort in the Soviet descriptions of the roles of combat helicopters. "Modern helicopters are primarily combat aircraft which are able to carry out a wide range of missions for close air support of the Ground Forces, including operations against the enemy rear area,..."[26] "Attack on the move! In sights—tanks. Fiery squalls fall upon the enemy columns. Drawing important losses."[27]

The Soviet investment in combat helicopters in addition to the traditional investment in ground attack aircraft such as the *SU-19* and *MIG-27* may portend a new concept in armored warfare that is not dependent upon ground traction for the projection of armored might. General Hamilton H. Howze, U.S. Army, Retired, has noted that "the helicopter can provide unparalleled battlefield mobility" and "...most of the essential and useful qualities of a military machine, it is simply inadmissible to dismiss it on the grounds that it may be shot down."[28] How much truer is this if it cannot be shot down by less

SOME CHARACTERISTICS OF TWO SOVIET ARMORED COMBAT VEHICLES

	Ground Vehicle	Air Vehicle
Designation	BMP	*Hind-B*
Crew	3	3
Passengers	8	8-12
Speed (km/hr)	60	257
Range (km)	500	360
Weight (tons)	13	11
Armament (ready)	1-*Sagger* 1-7.62-mm mg 1-73-mm gun (HEAT) 8-AKM	4-msl (unk.) 1-12.7-mm mg (4x32)-57-mm HEAT rkts
Armament (man-carried)	1-*SA-7 Strela* 1-RPG-7	?-*SA-7 Strela* ?-*Sagger* ?-RPG-7 ?-AKM
Protection against	12.7-mm	Unk (20-mm?)


Karen Randall

than a major air defense missile or heavy gun system? Could this now yield a new "indirect approach" on the battlefield in the Liddell Hart tradition?

The answers to both of these questions appear to be yes. Pity the poor commander who has broken through to the Soviet rear only to be attacked by these airborne beasts that are far more maneuverable and can tear into his battle tanks and infantry combat vehicles with immunity.[29] This is a true legacy from Lenin.

But by means of a three-wave massed assault, an armored helicopter airborne striking force could possibly actively engage and penetrate an air defense network with its long range guided missiles[30,31] in order to vertically assault such important targets as nuclear weapons stockpiles, missile-artillery positions, tactical nuclear tube artillery, and (if so bold) set troops in a holding position on commercial and military airfields.[32,33] The ability to take and destroy or hold these objectives should not be taken lightly. A reduced load of onboard troops in *Hind B* could allow weight and space for a number of *Saggers*, *Strelas*, and replacements for the 4 guided missiles carried on the outboard pylons. Present commanders just do not have such a surplus of armor and air defense assets that they will be able to quickly counter airborne armor and dismounted ground antitank units in their rear areas. The effect on a war in Germany might be as great as Hitler's use of glider troops and shaped charges on the Belgian fortress Eban-Emael in order to turn the Maginot line.[34]

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15 ___"Hardened in Battle," *Aviatsiya i Kosmonavtika*, No. 2, 1975, pp. 24-25

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32 Wiener, F., and Lewis, W.J., "The Warsaw Pact Armies," Carl Ueberreuter Publishers, Vienna, 1977, pp. 119, 150-153, 161.

33 Bramlett, Maj. D.A., "Soviet Airmobility: An Overview," *Military Review*, Vol. LVII, No. 1, January, 1977, pp.14-25.

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JOSEPH E. BACKOFEN, JR. was commissioned in the Corps of Engineers upon graduation from the Polytechnic Institute of Brooklyn in 1966. While with the 62d Engineer Battalion, his service included Rome Plow Land Clearing Operations in Cambodia and Vietnam. Mr. Backofen is currently involved with the development of advanced weapons technology at Battelle Columbus Laboratories.

AIR CUSHION VEHICLES

by Anthony J. O'Connor

The quest for speed and mobility is of vital interest to the Army and in particular to the mechanized community. The three basic systems normally considered are wheels, tracks, and rotary wings. Each has its advantages and disadvantages as well as its following of supporters.

It may be of interest to explore the possibilities of a fourth type of vehicle in the combat role. The ground effect machine, also known as the Air Cushion Vehicle (ACV), Surface Effect Vehicle (SEV) and hovercraft, is unique among surface craft in that it is basically independent of the surface it travels over and the speed it attains. When compared with aircraft such as helicopters, it has less mobility, since steep terrain features can stop it, but a greater efficiency and carrying capacity.

In the late 1950's, the Army was exploring the possibilities of ACV's as an amphibious tank and reconnaissance vehicle.[1] In 1959, Pegasus I was constructed as a model for further testing of the air cushion concept. The Army's initial performance specifications were for a vehicle capable of rising 100 feet in the air to clear obstacles, mounting a weapons system, and capable of operating in streets. These requirements were unrealistic in view of the ground effect principle and doomed the project to failure.

At this point, a brief explanation of the ground effect may be helpful. The ground effect is caused when air is trapped beneath the surface of one object and the top of another, such as the ground. This trapped air, or air cushion, supports the top object and allows it to glide over the ground with much greater efficiency than if it were not using ground effects. The problem with using ground effect is that while it is a more efficient and powerful source of lift than wings, it is height-dependent and its power drops off rapidly as the distance above the ground increases. For all practical purposes, to rise above 10 feet would require some other form of lift. Unfortunately, any ACV designed to leave ground effect range is usually a large unwieldly craft that would provide an inviting target on the ground and in the air.

ACV's, however, do have several characteristics that are attractive for military uses because they are capable of operating over water or unstable surfaces. In fact, rivers, swamps, deserts, and snowfields are "ideal" terrain. Another advantage of ACV's is their high speed—speeds in excess of 70 mph are not uncommon. Since ACV's do not often come in direct contact with the surface over which they travel, tracks are not left and terrain is not disturbed. In addition, mines may be left undetonated. When compared with helicopters, ACV's have a greater carrying capacity, although they are not as efficient as other surface transport systems. ACV's require about 100 hp per ton[2] while the *XM-1* MBT has about 25 hp per ton.[3] This is still favorable when compared with a helicopter which requires over 200 hp per ton for hovering out of ground effect distances.[4] Additionally ACV's can shut down, remain on station, and occupy concealed defensive positions. ACV's are also capable of operating in poor weather conditions that would ground aircraft.

A report issued by the Office of Naval Research in 1961 examined the possibility of ACV operations in three roles:

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1 1976, Hovercraft Utilized for Mine Detection; *Aviation W.*, V 105, Oct. 25, p. 57.

2 Arkel, B.; 1963, *Helicopter & Hovercraft Design;* London, England; Weidenfeld & Nicolson LTD., p. 91.

3 McMaster, A. W.; 1978, Soviet Armor: a Study in Efficiency, *ARMOR*, Jan.-Feb., p. 31.

4 Saunders, G. H.; 1975, *Dynamics of Helicopter Flight;* New York, N.Y.; John Wiley & Sons Inc., p. 295.

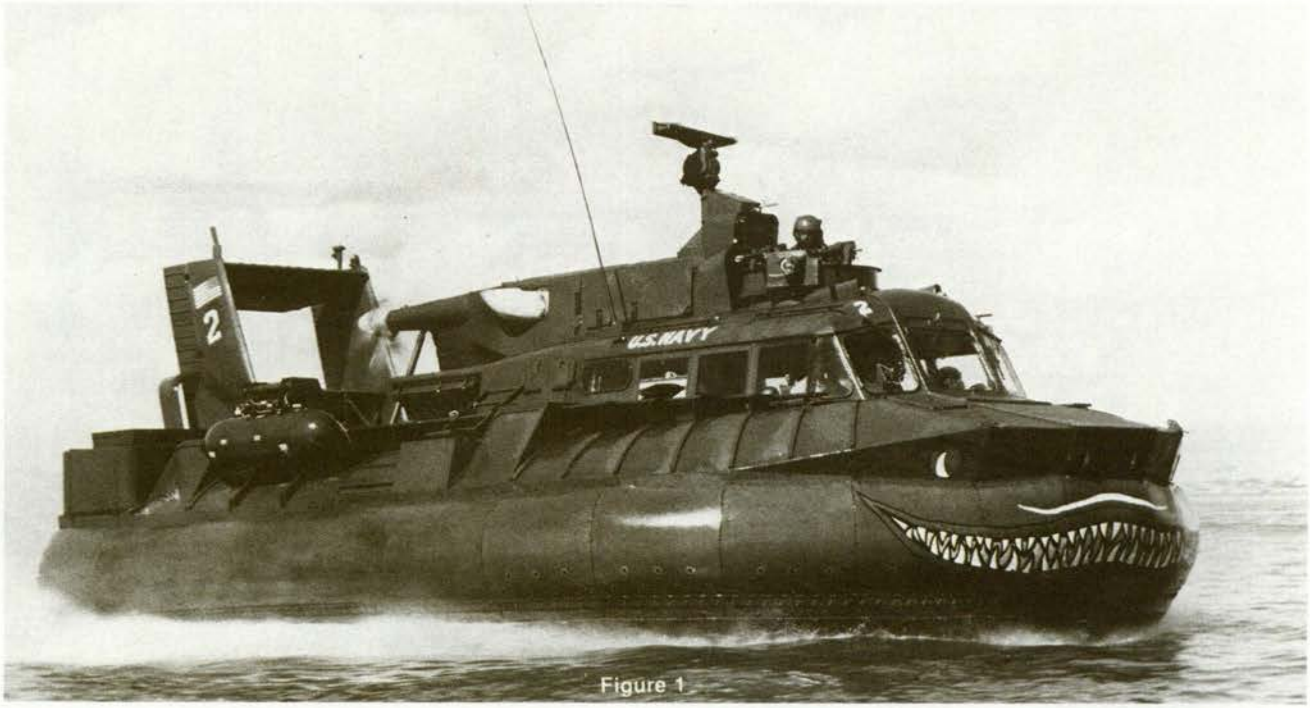


Figure 1

marine, amphibious, and inland.[5] The conclusions reached by this paper were based on vehicle capabilities then available, (table 1), with the concensus being that only a large 30 x 60-foot vehicle would have the desired cross-country capabilities needed for overland use. This size would negate any speed advantages by presenting a large target. The Army seemed to agree with the findings of this study since ACV's were not extensively tested by them for the next 6 years. A large part of the report dealt with the suitability of the terrain for ACV operations. This report was based upon contemporary vehicles and is quite conservative in light of current ACV capabilities. Nevertheless, it shows areas open for ACV operations that were previously impassible to vehicles in the past. It should also be noted that most of the areas of the Third World, where armed conflict is likely to occur, are within ACV capabilities.

In 1964, the U.S. Marine Corps conducted tests on a Vickers-Armstrong *VA-3* to further evaluate ACV's in landing operations. Just before testing, the craft was fitted with a flexible skirt which increased ground clearance of the vehicle without increasing the power requirements. In this case, the ground clearance changed from 10 inches in the unskirted configuration to 38 inches. The report evaluated the marine, amphibious, and inland performance of this ACV. The craft showed real promise in the first two categories. In traveling overland, the vehicle could comfortably move at 30 mph over undulating terrain and 20 mph through brush. It glided over a 2-foot log at moderate speed and, in a display of cross-country mobility, it drove off a 5-foot wall without any discomfort to the passengers (except perhaps the fear of an imminent crash).

Also noted were some disadvantages that plague most ACV's; difficulty in climbing moderate slopes, sideslipping in crosswinds, and poor maneuverability for tight situations.

In July 1965, three British *SRN 5's* were obtained by the Navy and modified for military service in Vietnam's Mekong Delta (page 13). The ACV's were evaluated in three different missions:

- Coastal and inshore patrol
- River patrol
- Operations in marshy areas

In the first two mission categories the ACV's were successful but did not show any great advantage over conventional patrol boats. In the third area, however, the ACV's proved to be extremely successful. After observing the Navy's success with ACV's, the Army ordered three *SK 5's* from Bell built to Army specifications. Firepower and armor were increased and puff ports added to improve maneuverability. These vehicles were a marked advance over the *SRN 5's* operated by the Navy (figure 1).

Army ACV's began operation in Vietnam in May 1968, under the command of Major David Moore. Success in ACV's operations conducted by the Army were similar to those experienced by the Navy. Major Moore reported that ACV's had four advantages over vehicles that had previously been operated in the Delta:

- They could operate in all weather and lighting conditions
- They could remain on station
- They had increased firepower over contemporary helicopters
- They could occupy and hold ground

The weapons systems used on these ACV's were 50-caliber and rifle-caliber machineguns and 40-mm grenade launchers. The possibility of mounting a 106-mm recoilless rifle and ENTAC missiles is discussed, but to my knowledge neither modification was made. The report lists the terrain capabilities of ACV's as good in swamps, rivers, and paddies with dikes less than 6-feet high. Operations in brush, over broken ground and tree lines was limited (figure 2), while jungles and wooded areas were impassable to ACV's.[7] *For another report on ACV's in Vietnam, see ARMOR, July-August 1969.—ED*

[5] 1961, *The Domain of the Ground Effect Machine;* Booz-Allen Applied Research Inc.; Office of Naval Research Contract # Nonr 3375(00).

[6] 1964, *Z A - 3 Air Cushion Vehicle Test Program Final Report;* Republic Aviation Corp. Rpt. 2612; Office of Naval Research contract 4500 (00).

Table 1. Overland ACV Classification

CLASS	SIZE (FEET)	OPERATING HEIGHT (FEET)	JUMP CAPABILITY (FEET)	SLOPE CAPABILITY (PERCENT)	LAND AREA USABLE (PERCENT)	INLAND WATERWAYS USABLE (PERCENT)	ACCESS TO STREAM VALLEYS (PERCENT)
I.	10 x 20	1	2	15	6	90	5
II.	20 x 40	2	4	20-30	18	90	20
III.	30 x 60	3	6	30	34	75	30
IV.	40 x 80	3	6	30	32	60	30
V.	50 x 100	3	6	30	28	50	25

As interest in ACV operations grew, NATO initiated a study of their military applications which provided a concise overview of ACV technology and applications. While operational trials of ACV's had not been conducted extensively inland in Europe, the report suggested possible modifications and applications for European terrain.[8] It also pointed out that Soviet technology is also being applied to ACV's and according to a recent study, the Soviet military has the largest fleet of ACV's of any country.[9] Among the vehicles discussed in the NATO report is the *Terraplane* which has air chambers located below the chassis and wheels on which it relies for propulsion and maneuverability. This craft has the maneuverability and slope performance of a conventional vehicle and has the ability to travel over areas that are prohibitive to land traffic.

[7] 1968, *Trip Report (39-68) Sk-5 Air Cushion Vehicle;* Dept. of the Army, U.S. Army Combat Development Command CDCCS - LV.

[8] 1968, *The A. C. V. Concept & Its Military Application* pts I & II; NATO Advisory Group for Aerospace Research & Development; Advisory Report # 15.

[9] 1975, *Soviet & East European Developments in Surface Effect Vehicles;* Defense Advanced Research Projects Agency, Order # 3097.

Recently a study by Research Analysis Corporation was conducted to determine a possible use of ACV's in the Arctic.[10] The conclusion was that for reconnaissance, rescue, and transportation the ACV had some significant advantages over helicopters and other aircraft. ACV's are capable of searching in more detail because they operate at ground level. They are independent of weather conditions and are capable of larger payloads. The ACV's, at 70 mph on the other hand, are slower than either form of air transportation and are limited by terrain. They are, however, more cost effective than helicopters and have about twice the range. Larger aircraft are more economical than ACV's for cargo transport, but in military operations these planes would require some sort of landing area for the movement of heavy equipment, and these facilities present obvious targets to anyone opposing such a move. When ACV's were compared with other surface transport, including tracked vehicles, they were superior in all categories.

Since the publication of this study, extensive testing has been undertaken by the United States Army in

[10] Sumner, N. R.; 1972, *Transportation System for Military & Civilian Operations in Northern Regions;* Research Analysis Corp. Technical Paper 450; Dept. of the Army, Office of the Chief of Research & Development Project # 011. 618.


Figure 2

Alaska, the Canadian government in its Northwest Territories, and Great Britain in Scandanavia to evaluate the suitability of ACV's in frozen areas. American tests have shown that ACV's do minimum damage to the delicate tundra vegetation and for routine patrolling purposes would not disrupt the ecology as do other land vehicles.[11]

The Army has recently started two projects involving ACV's. The Arctic Surface Effect Vehicle (SEV) Program will attempt to develop a 170-ton Arctic transport system. The second is the lighter, air-cushion vehicle (LACV-30) program which is testing the *Voyager*, a 76-foot ACV, to replace the LARC, a wheeled lighter, for landing cargo from ships. Using *SRN 5's* from Asia, the Canadian tests found that in the cold environment the major obstacle was the brittleness of skirt material at temperatures below -20°F.[12,13] Aside from this problem, which research has solved, the ACV's behaved quite well.

Since cold weather, as well as swamp and river patrol operations, will be part of the Army's mission, it only makes sense to consider developing ACV's as a tactical weapon. The mission of a combat ACV would be to provide a mobile high-speed platform for low-recoil weapon systems. TOW missiles, machineguns, small-caliber automatic cannons, and recoilless rifles would be ideal. Other systems such as field radar units, communications, and antiaircraft missiles could also be mounted on such a vehicle. A possible configuration of a tactical ACV for consideration might have a small two-man turret mounting a 20-mm cannon, coaxial machinegun and TOW missiles (figure 3). The driver would be located in front of the turret in the hull and the rear of the vehicle would have four large air ducts to provide air for the cushion, as well as for propulsion by a jet bleeder system. The vehicle would be about 10-feet wide, 20-feet long and 6-feet high, increasing to over 7-feet when on a 30-inch cushion. Such a craft might weigh up to 4 tons, although every effort should be made to keep that weight down.

In addition to the air cushion, standard wheels might be used. This would increase fuel economy since wheels are four times more efficient than air cushions and would enable the vehicle to negotiate slopes. If the wheels were articulated so that they remain in contact when the air cushion is employed, the vehicle would have the same maneuverability as more conventional craft. The *Terraplane* is a good example of a compromise using wheels and air cushion.

Whether the British skirted or the Bertin system is more adaptable need not be considered at this time. The engine used would probably be a turbine, although ACV's have been sucessful using standard gasoline and diesel engines. The power output would be in the neighborhood of 450 hp, but this would depend upon the weight of the vehicle. Using separated skirts, such a vehicle would have the ability to clear hard objects about 2-feet high and attain a cross-country speed of about 50 mph. The increase in height with the inflation of the skirt would enable the vehicle to move from turret to hull defilade rapidly without changing position, allowing it to maintain a low profile and improve survivability when not moving.

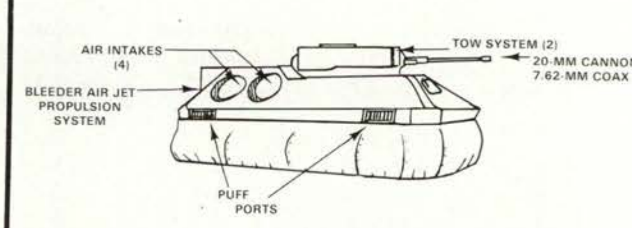


Figure 3

By using only its wheels, the ACV would be able to "crawl" into and out of fighting positions with minimum exposure. The high speed of the vehicle would enable it to survive while moving, although it still should make maximum use of the terrain. In areas that are ideal for tracked vehicle operations, ACV's could provide support by conducting reconnaissances, antitank, and security missions, as well as special operations, such as river crossings. On solid ground the lack of heavy armor and large caliber guns would put ACV's at a disadvantage in a protracted fight with enemy armor. In areas where trafficability is poor, however, combat ACV's would be able to outmaneuver and destroy armored vehicles that bog down. While speculating on the potentials of ACV's in Arctic operations, the Research Analysis Corporation states:

> It is conceivable that entirely new units could be designed around large and small ACV's and helicopters that would combine deployment capability with the tactical vehicles. The tactical vehicles and the cargo vehicles could be much more effective because of their increased speed and performance, thus generally reducing the number of vehicles and men without reducing the combat effectiveness. The goal here would not be the kind of marginal improvement usually associated with a new truck or tank, but a radically smaller, streamlined mobile force that has not sacrificed any firepower or staying power.[14]

[11] Abele, G. & J. Brown; 1977, Arctic Transportation: Operational and Environmental Evaluation of an Air Cushion Vehicle in Northern Alaska; *J. Pressure Vessel Tech.*, V. 99, Feb., pp. 176-182

[12] Kelly, J. J., W. Klenens & H. S. Preiser; 1976, Development & Evaluation of Skirt/Seal Materials for Surface Effect Vehicles; *Hover. C. & Hydrofoil;* V 15, Sept., pp. 20 - 28.

[13] 1976, 2 LACV-30's Undergo Operational Development Tests; *Ar. Res. & Devel.;* V 17, #5, p. 7.

[14] Sumner, N. R.; op • cit p. 7-3.

CPT ANTHONY J. O'CONNOR, Oregon National Guard, was commissioned upon graduation in 1971 from Siena College, where he received a BS in Biology. He received an MOS and MA from State University of New York at Geneseo. He is Science librarian at the University of Oregon, and commander, HHC, 2d Bn, 162d Inf, 41st Bde., a Round-Out unit of the 7th Inf Div.

TERRAIN ANALYSIS

by Lieutenant Colonel Joseph C. Gross III and
Major Harry B. Beam

Is the attention we dutifully give to terrain appropriate to our needs?

Most of us are aware of the acronym, OCOKA, and its meaning—observation and fire, cover and concealment, obstacles, key terrain, and avenues of approach. But we don't apply it to our jobs very well.

In applying the military aspects of terrain, two distinct perspectives are involved, the planner's and the user's. The planner studies the terrain to develop a general concept by which he can employ units to execute an assigned mission. The user physically employs weapons systems on terrain to execute a specific part of that mission. In doing these tasks, both must take a positive approach to terrain. The thrust is to know what you need and find it, rather than, take what you have and make the best of it. Agreed, you may be driven to the latter by circumstance, but by initially taking the positive approach one stands a greater chance of success.

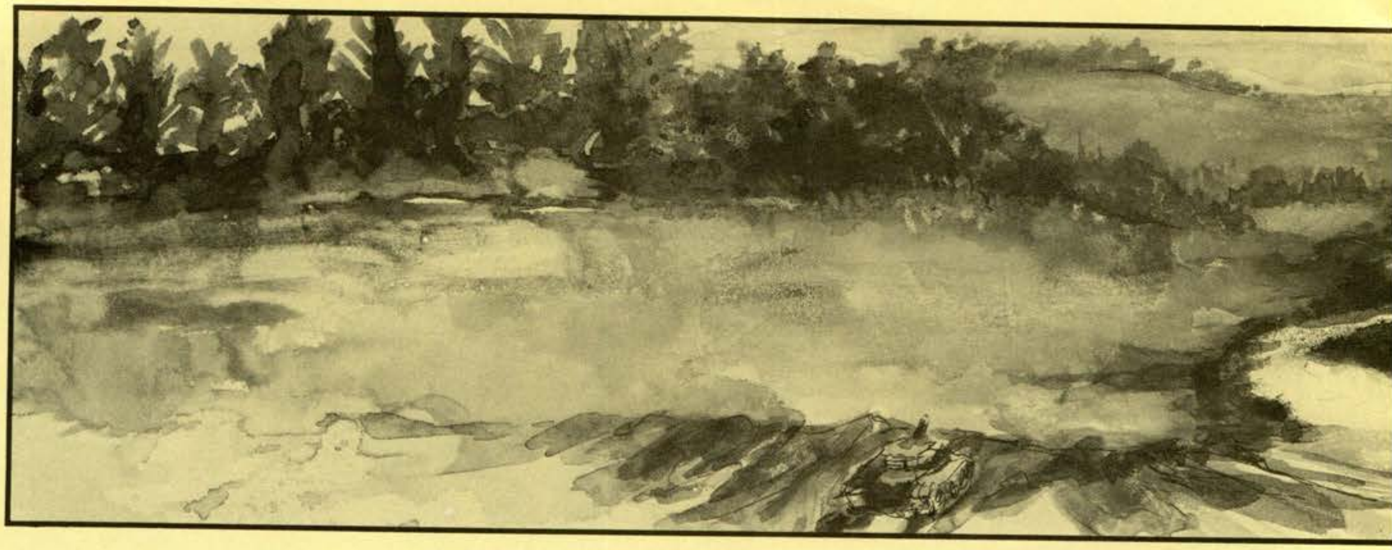
Let's apply this thesis from the corps through the echelons to a tank and a scout. A corps commander, based on a myriad of strategic and tactical considerations, is given an area of responsibility and allotted units for his missions. Let's assume that the corps will defend. The corps planners divide the corps sector into division slices and allocate a number of battalions to those divisions. The divisions are provided with a corps plan which assigns missions and explains the corps concept of operation. The division goes through the same process in assigning brigade sectors and allocating battalions to brigades. The battalions make an analysis, assign company sectors, and allocate resources. In each of these actions, at every echelon, terrain plays the key role in the planning process although all the factors of METT come into play.

Let's look at this process at battalion level as it relates to terrain. The brigade order has assigned a mission and outlined the concept of operation in detail. We know exactly how the brigade visualizes the flow of the battle, and we can translate this information into terrain requirements.

In developing the battalion concept of operations, we must seek out terrain which will facilitate the execution of the mission. In our understanding of the projected flow of the battle, situations will dictate the need to emphasize one or more terrain consideration. For example, to survive the initial enemy preparatory fires, vehicles will be positioned for maximum cover. Subsequently, some vehicles will move to positions affording optimum long-range fires, and others to positions affording the best observation. More on each consideration later. At this point, we are still employing units based primarily on a generalized analysis of the terrain. Even so, the planner must aggressively seek that terrain which suggests mission accomplishment.

But what if the terrain simply won't provide the required resources? The answer is that at each echelon, an accurate assessment of the terrain must be made by the planner before the senior headquarters can tell the user to do the job. Each echelon must analyze the assigned terrain from the user's perspective. We are all planners and users. The boss has already determined it can be done. If he's wrong, the subordinate unit will also be wrong and his commanders only recourse is to gain reconsideration from the boss. Failing that, he must develop his concept for operating on the existing terrain. Sometimes the latter is the final judgment. The planner views the terrain as a resource which will allow him to develop his plan. The user's perspective is to make all his resources fit the terrain. Initially, we all should begin as planners; however, the common factor for the planner and the user should be reconnaissance to ensure optimum use of terrain.

Let's continue down the chain of command. FM 100-5 tells us, "The land battle takes place amid the variances of the ground and the works of man upon it. . . for colonels, captains and other leaders, terrain is mainly a matter of



weapon systems employment." It also states, "Terrain, therefore, provides a combat equalizer or multiplier when the tactician uses its strengths and reinforces its natural advantages through mines, barriers and other obstacles." FM 71-2, *The Tank and Mechanized Infantry Battalion Task Force*, says that relative to the active defense, "Commanders must use every advantage offered by the terrain. . . battle positions which provide long-range unobstructed fields of fire into places where the enemy will be. . .at the same time, battle positions must provide cover and concealment." FM 17-95, *Cavalry*, devotes an entire chapter to movement techniques. It states, "Cavalry must make maximum use of the natural cover and concealment in order to survive and accomplish its mission." In battle, all movement is governed by two basic principles, terrain and overwatch.

Since our earliest tactical training, we have been reminded that in order to succeed, one must consider the factors of METT. Terrain is a very important part of the tactical equation and, as such, deserves and gets a good deal of attention.

The Planners

The G-2 produces the intelligence estimate, and from that analysis the G-3 develops his plan. This correctly portrays division staff functions; however, it usually doesn't happen that way at battalion level. At battalion, it is more likely a joint endeavor by the S-2 and S-3, and possibly the commander, who go through an informal planning process. The analysis will probably consist of a series of discussions during which the S-2 and S-3 exchange information. There is an inherent danger in this procedure. The temptation exists to make the enemy and the terrain fit a concept rather than developing a concept of operation after analyzing the effects of the terrain and the enemy. The interaction between the S-2, S-3 [and S-4] must result in a blending of information about the enemy, terrain, weather, and resources to develop a successful concept of the operation.

Sounds easy, but the process can be complicated unless a systematic procedure is used. The initial phase of the analysis should focus on terrain as viewed from a *Threat* perspective. The following analysis procedure is one which may be used with a map or on the ground to select positions for units in the defense:

Determine Probable Enemy Objectives. To determine where and how the enemy will try to move through our area, we must first determine what his objectives are in consonance with his doctrine.

Analyzes Enemy Approaches. Mounted, dismounted, and air approaches should be considered. Mounted approaches will be the most common and should be the first priority. Approaches for low-performance aircraft and attack helicopters should be considered next. Finally, dismounted approaches should be considered in the event *Threat* forces are stopped on the mounted approaches.

What size avenues of approach are we looking for? As a general rule, we should identify all avenues of approach that will accomodate a force one echelon below our unit's size. For example, the battalion or task force S-2 should identify company-sized avenues of approach and larger because a *Threat* company attacking our flank could be as dangerous as an enemy battalion attacking our front.

The analysis of an avenue of approach encompasses terrain, maneuver space, and ease of movement. It must be emphasized at this point that we are identifying avenues of approach based on the restrictions of terrain, not on the disposition of our force or obstacles we may elect to employ.

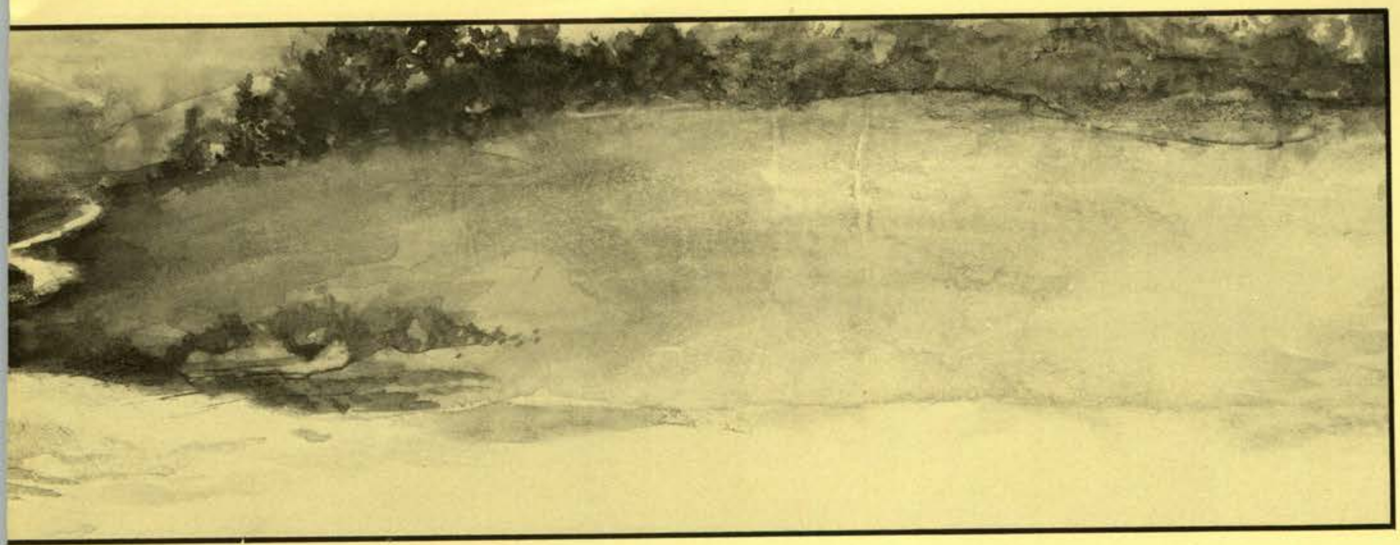
Determine Enemy Possible Courses of Action. Based upon the avenues of approach available to the *Threat*, we should determine all possible courses of action available to the *Threat* force based upon doctrine, terrain, and weather. Having decided what options are available to the enemy, we should rank them in the order which the enemy will adopt them.

Now that we have properly defined the capabilities and limitations of the *Threat* force as they are influenced by terrain and weather, we next consider how they affect our force.

Identify Key Terrain. Key terrain is that piece of ground which gives the occupying force a decided advantage; therefore, we must plan to use key terrain to deny the enemy an advantage. Once we have identified key terrain in our sector, we have identified tentative observation posts, platoon, and company battle positions. It then becomes a matter of determining which positions will best enhance mission accomplishment.

Select Tentative Positions. Based upon the mission and key terrain, the S-3 selects an optimum number of tentative observation posts and battle positions, discarding some as the analysis continues.

Analyze Tentative Positions for Observation. Thus far, we have selected possible positions on key terrain without considering the remaining aspects of the terrain. Now we should analyze each position for observation. Forward



positions in our sector that provide excellent long-range observation will become tentative observation posts, radar, and sensor monitoring sites. Conversely, those positions that offer good observation beyond 3,000 meters but have poor observation at less than 3,000 meters will less likely be considered as positions for our direct-fire weapons systems. For this reason, each tentative position is analyzed in terms of observation independently from fields of fire.

Analyze Tentative Positions For Fields of Fire. Each tentative position is now analyzed for fields of fire from which we will employ our direct-fire weapons systems or units. Tentative positions which do not provide good fields of fire are eliminated from further consideration unless we have the capability for improving them through engineer assets. Obviously, if our mission is to defend, we are looking for those positions that will allow us to place maximum power against the enemy as he advances. Therefore, we are seeking only positions with good fields of fire.

Analyze Tentative Positions for Cover and Concealment. Normally, we will be faced with deciding how to choose between positions that offer cover or concealment as opposed to positions that offer observation and fire. The choice again reflects the mission. If we are given units, weapons systems, and an order to defend, we must have positions with good fields of fire to employ those weapons. However, they must have adequate cover to survive enemy artillery fires. Therefore, our analysis of cover and concealment is not restricted to the tentative positions. It also includes the areas to the rear which would provide adequate hide positions. From these hide positions we can move forward into primary positions when the enemy lifts his artillery fires.

If natural cover for observation posts is not adequate, a well-camouflaged armored vehicle may be used to provide additional cover. In any case, tentative positions and the surrounding areas are analyzed for cover and concealment. Those positions which do not afford protection from observation and fire are eliminated as tentative positions unless they can be improved.

Analyze Tentative Positions for Obstacles. We have refined and eliminated tentative positions based on the military aspects of terrain except in terms of obstacles. The remaining positions should be analyzed to determine what obstacles exist which would impede our movement between positions. Based on this final consideration, we delete those positions which cannot be used. All remaining positions will afford us every advantage of the terrain astride the avenues of approach; subsequently, they will become our primary, alternate, and supplementary positions.

Determine Enemy Arrays on Avenues of Approach. At approximately 3,000 meters, or at the range we can start to engage the enemy from our battle positions, we determine how the enemy will be arrayed. The objective is to determine what size force can maneuver against our selected battle positions. In essence, the array on specific terrain will tell us how many weapons the enemy can employ along an avenue of approach within his doctrine and the terrain limitations. The array or deployment pattern translates to *target servicing.* One or two possible arrays should be developed on each avenue of approach forward of each selected battle position.

Determine Intervisibility Factor. We must now determine how long the enemy will be exposed to our fires, and the effects of all manmade and natural features between our battle position and the enemy force must be considered; for example, vegetation, built up areas, and folds in the ground.

Compute Closure Time for Enemy Force. From our maximum direct-fire engagement range, we determine how long it will take the enemy force to close on our position. When making this determination, it may be more appropriate to make two computations:

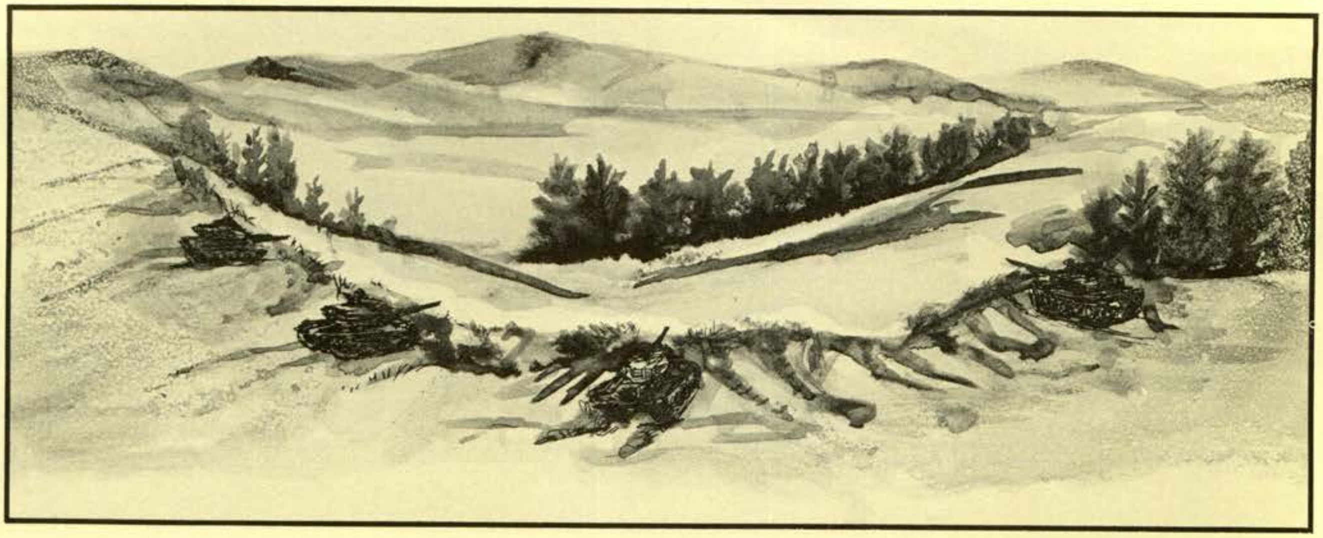
- Time required for the *Threat* force to close to a point where our force is decisively engaged.
- Time required for the *Threat* force to close on our position.

Although the terrain will certainly influence how fast the enemy can move on average terrain, 18 to 20 kph is common for a *Threat* force in the attack.

Allocate Weapon Systems Units to Battle Positions. Now we are ready to task organize and allocate units and weapon systems to battle positions based on the time and number of targets we must service.

The Users

The occupation of positions by each tank commander, scout, and TOW section leader requires an analysis similar to that of the planner. Although not concerned with analyzing enemy objectives and courses of action, they must seek to maximize the military aspects of terrain that will afford mission accomplishment. Obviously, the mission and employment of the tank, scout, and TOW will differ. Therefore, the considerations for terrain utilization are different.



The Tank Commander's mission is to position his tank where he can best kill the enemy from primary, alternate, and supplementary positions that maximize the tank's firepower. Before the tank commander analyzes positions relative to the terrain, he must recognize that he will probably be required to fight from his positions day and night. Hence, the considerations of observation, fire, and concealment will vary in relation to light conditions. The tank commander should not have to consider key terrain. Key terrain and avenues of approach should have been identified by the planner. The tank commander should be concerned with how many and what type of targets he will have to service, and the location at which he will engage the enemy. So, like the planner, the tank commander must begin his selection of positions with an evaluation of his mission and the enemy situation. Subsequently, he seeks positions where he has good fields of fire.

The tank commander should also consider intervisibility because the deciding factor in positioning a tank may be determined by how long the enemy is exposed as he moves on an avenue of approach.

After locating primary and alternate firing positions, the tank commander must analyze these positions for cover and concealment. If adequate protection from observation and fire is not available at the firing positions, *hide* positions must be found which provide cover and concealment. A reconnaissance of routes between positions must be conducted to ensure no obstacles exist which would hinder the movement of the tank from one position to another.

The scout, during a reconnaissance mission, should be concerned with locating positions that provide the best observation and concealment. If a position provides these assets, the scout should be able to accomplish his mission without exposing himself; therefore, cover should not be a necessary requirement for reconnaissance positions.

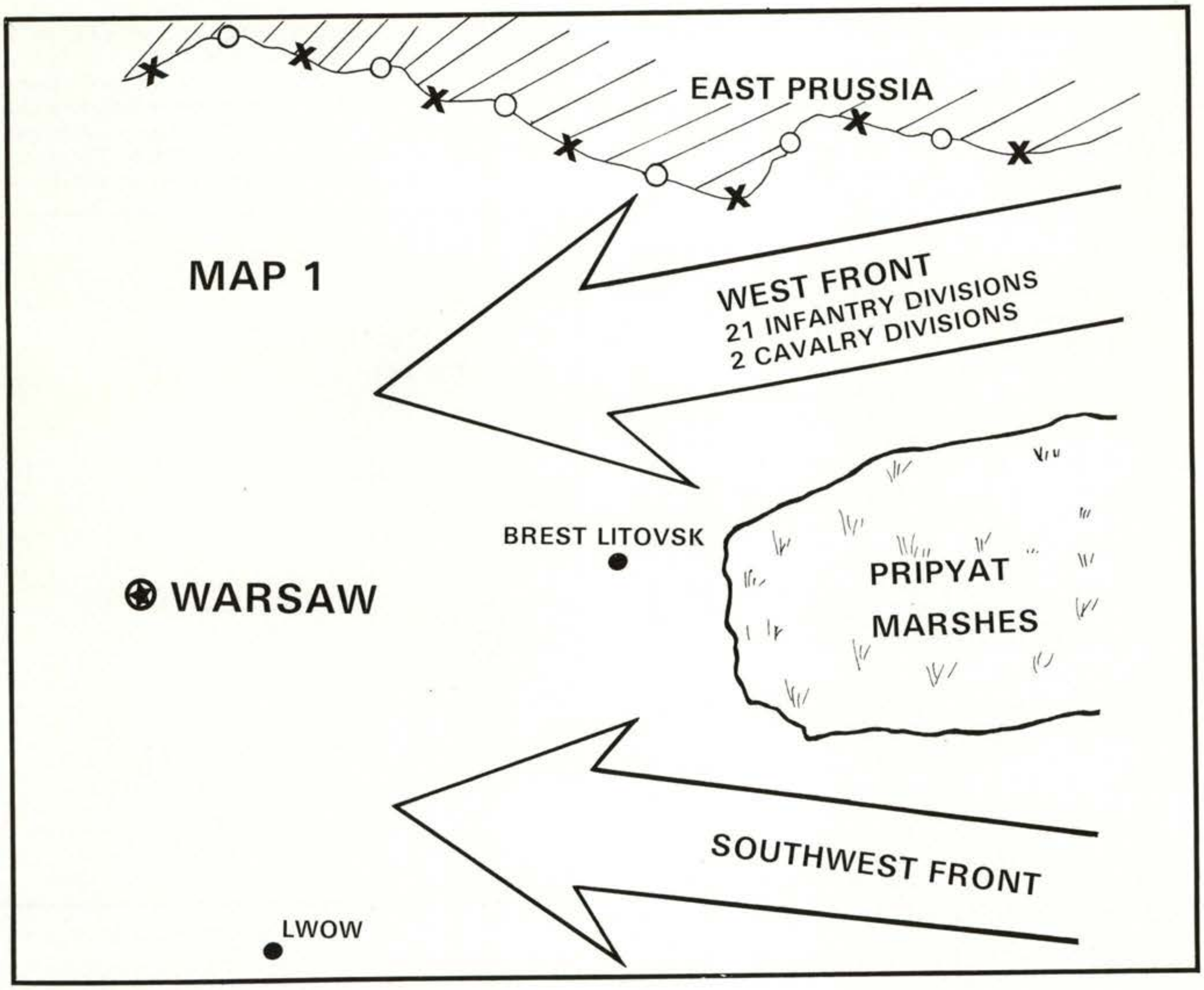
Scouts and other personnel manning observation posts (OP's) should also optimize their field of vision. There is a tendency to establish OP's near unit positions which may provide excellent cover and only fair observation. Like the tank commander, observers or scouts occupying OP's may have to be positioned in well-camouflaged positions some distance from the unit to maximize observation and early warning.

The TOW section leader must position his vehicles in a manner similar to the tank commander. He must locate positions where he can apply maximum firepower. However, his analysis of a position must be even more detailed. Because the missile is much slower than a tank gun projectile, intervisibility becomes a more critical factor. In selecting TOW positions, the leader must consider where the enemy target will be engaged and if it is moving, whether it will still be exposed within the flight time of the missile. Because the TOW is mounted in a lightly armored vehicle the leader must plan to survive by using all available cover. Therefore, primary and alternate TOW firing positions should probably be the first priority of any engineer assets used to improve firing positions.

It is apparent from the discussion of the actions of the planner and user that terrain is a different thing to different people. Hopefully, this discussion will prevent it from being different to the same people.

LTC JOSEPH C. GROSS III was commissioned in Armor through the ROTC Program at Northeast Louisiana State University in 1961. A graduate of the Armed Forces Staff College, he has served as a troop commander in the 101st Abn Div. and as Bn S-3, Bde S-3 and Bde XO in the 6th ACCB. He also served as Chief of Cavalry Branch and Chief of Support Division, Command and Staff Department, U.S. Armor School. LTC Gross is presently Commander 2d Sqd. 9th Cav. 24th Inf. Div. (Mech), Ft. Stewart, GA.

MAJOR HARRY B. BEAM was commissioned in Armor from Infantry OCS in 1966. A graduate of the Armor Officer Advanced Course, he has served as a tank and cavalry platoon leader, and company commander of units in CONUS and USAREUR. He has also served as an S-2 and S-3 air of tank and cavalry units. MAJ Beam is presently an S-2/Intelligence Instructor, Command and Staff Department, US Army Armor School, Fort Knox, Ky.



EXPLOITATION

by Lieutenant Colonel Joseph P. Frankoski

A little known war between the new Polish state and Soviet Russia in 1920 provides a vivid example of the *exploitation.*[1]

After border skirmishing in 1919 and early 1920, the Polish Army invaded the Ukraine on April 25, 1920. On May 8, Kiev was taken. The Red Army began a counteroffensive on May 26, regained Kiev on June 10, and at month's end had driven the Poles back 300 km. On July 4, the Soviets launched another offensive, this time in the north under General Tuchachevsky. The Poles were forced back 450 km in 20 days! In the south a renewed Soviet offensive was halted near Lwow (Lvov).

Polish forces were concentrated in the Warsaw and Lwow regions. The two Red Army offensives were separated by the Pripyat Marshes, a fact noted by the Polish commander-in-chief, Joseph Pilsudski (map 1). While his staff planned the defense of Warsaw he was thinking in offensive terms. Pilsudski withdrew a force of more than five divisions behind the Wieprz River. The Polish Fourth Army (corps-sized), commanded by General Skierski, was to be part of the offensive force, and is the vehicle for this study (table 1).

The 3d Air Squadron of five aircraft, four armored trains, and five Military Police battalions were among the supporting units. Motor transport seems to have totaled about 35 trucks.

The enemy force in the immediate area, the Soviet 57th Rifle Division, was moving in a westerly direction. Its strength on August 1 was about 5,200 infantry, 48 cavalry, 96 machineguns and 22 artillery pieces. Afterwards it took losses, but on August 16 it was reinforced by the 511th Rifle Regiment of 1,100 men and four cavalry troops.

Terrain in the sector was relatively flat. Streams generally ran East-West forming cross compartments.

[1]JCS Publication 1, Dictionary of Military and Associated Terms, defines the Exploitation as taking full advantage of success in battle and following up initial gains.

Large wooded areas and unimproved, often sandy, roads marked the region.

The First Day, August 16 (map 2)

Fourth Army attacked early in the morning on a 50-kilometer front. The 14th Infantry Division, with the 15th Uhlan (Lancer) Regiment attached as left flank guard, delivered the main attack. It routed the Soviet 512th Rifle Regiment by 0345. The Polish 58th Regiment formed the division advance guard. Its commander, learning of an enemy unit at the communications center of Garwolin, took the initiative without orders. He loaded two infantry companies, two machinegun companies and an artillery platoon on trucks and headed for Garwolin. At 1100 hours this detachment attacked the town and took 370 prisoners. some machineguns, one artillery piece and 150 fully-loaded vehicles. Garwolin was more than 140 km from the line of departure (LD).[2] A counterattack by Soviet Cavalry in the afternoon was beaten off. Prisoner interrogation and captured messages indicated one of the 57th Division's brigades was cut off, and the other was retreating to the north.

Meanwhile, the Polish 56th Regiment advanced with an armored train. At Laskarzew, it engaged the enemy, captured six artillery pieces, part of a brigade headquarters, and 300 prisoners. By evening it had advanced over 30 km.

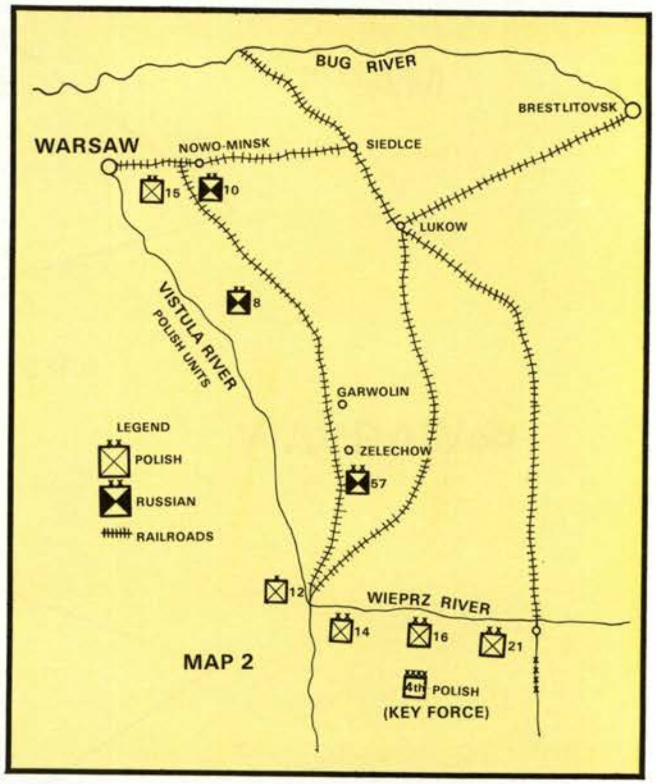
The 15th Uhlans were less fortunate. They were engaged in continuous action from 1000 hours and supported by artillery of another division, took Kackejosicw early in the afternoon. There they suffered heavy losses when friendly artillery failed to lift fires.

An evening attack on Garwolin by the Soviet 72d Rifle Regiment was repulsed. During the day's operations, there was no contact with the Polish 16th Infantry Division. Despite this, the 14th Division took advantage of its early morning success.

The center division, 16th Infantry Division, routed two Soviet rifle regiments by 0600. Thirteen hours later it seized Zelechow, 35 km from the LD. It had no contact with either division on its flanks. But like the 14th Division, it had exploited early success at the expense of flank contact.

The Polish 21st Mountain Division had encountered resistance during the day. By 1600, it took Wojcieszkow; at 2000 hours, its 1st Brigade reached the Bystrzyca River, 25 km from the LD. This division's flanks continued to advance all day without artillery support. Their artillery had been delayed crossing the Wieprz River and didn't catch up until night.

At day's end the units which had moved over the unimproved roads were tired. Artillery horses were exhausted. But troop morale was excellent. They were winning and eager for battle. The populace supported them. The enemy was in retreat. The Soviet 8th Rifle Division and Soviet



16th Army were still facing west unaware of the Fourth Army to their rear.

Polish unit commanders had been quick to capitalize on morning success. The action of the 58th Regiment is noteworthy. The commander on his own initiative had used available mobility resources, taken the communications center of Garwolin, and held it against counterattacks. The 14th and 16th Divisions had taken advantage of morning gains though they did not have contact with each other. In the 16th's case, it had no contact on either flank. The units had taken advantage of success and followed up gains without orders.

Pilsudski had remained with the 14th Division during much of the day. He had elected to personally supervise the most important attacking division.

At 1100, he ordered Fourth Army to continue the attack to the north and seize the Warsaw-Brest Litovsk highway. It was also to make contact with the Polish 15th Infantry Division which would break out of the Warsaw bridgehead.

General Skierski had received information from the 3d Air Squadron reporting strong enemy forces in the Kolbiel and Nowo Minsk areas. These forces did not seem to be in an offensive posture, nor ready to retreat. It appeared they were unaware of the depth of the Fourth Army advance. Thus Skierski ordered Fourth Army to exploit the next day. He ordered the divisions to dash to the Warsaw-Brest Litovsk road and drive the Soviet 8th Rifle Division back to the northwest.

At this point it should be understood the Soviet units had been beaten so quickly they were unable to pass timely, accurate information. The 16th Soviet Army com-

[2]All distances in this article approximate straight line distance. Actual distances in most cases were greater.

Table 1. Fourth Army

UNITS	INFANTRY	CAVALRY	ARTILLERY PIECES	MACHINE GUNS
14th Inf Div	10,000	650	49	230
16th Inf Div	5,400	100	14	94
21st Mt Div	8,000	200	27	106
12th Inf Bde	2,300			31
TOTALS	25,700	950	90	461

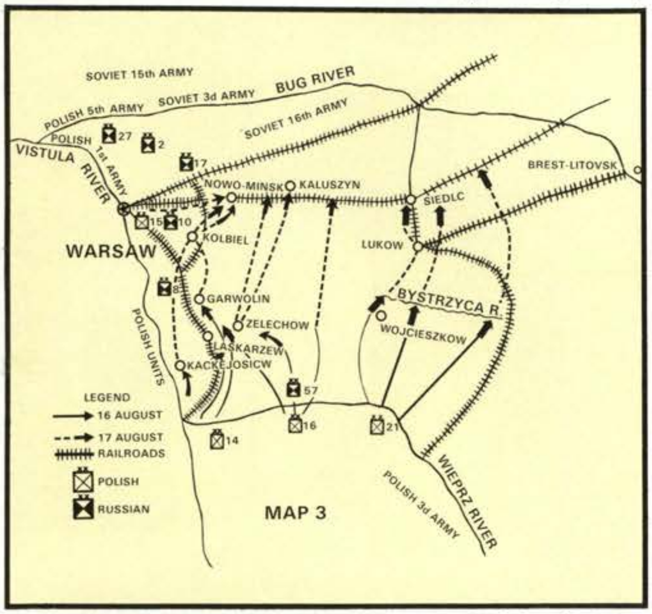
(Note: Other sources indicate 86 artillery pieces and 511 machineguns.)

Not included above is the 32nd Inf Regt which consisted of three battalions.

mander had no idea of the extent of the Polish advance, nor did Tuchachevsky, the commander of the west front. When the commander of the 8th Rifle Division learned of the fight at Garwolin he thought it only a Polish partisan raid!

The Second Day, August 17

Led by the advance guard, the 55th Regiment, 14th Division began its attack at 0500 by inflicting heavy casualties on the Soviet 23rd Rifle Brigade. By 0900,



Kolbiel was occupied. Awaiting the arrival of the division main body, the 55th Regiment was counterattacked by two rifle brigades. Despite bloody fighting and ground lost and won, the unit held out. At 1400, it was relieved by the 57th Regiment. The 55th moved towards Nowo Minsk, brushed aside elements of the Soviet 10th Rifle Division, and entered the town at 1900 hours, having covered over 30 km since morning. In the town it found Polish armored trains which had fought their way in from the Warsaw bridgehead. By 2200, the town had been secured and outposted. Fighting in the division sector continued through the night as enemy units were trying to break out to the east. Division losses at Kolbiel and Nowo Minsk were 15 KIA, 121 WIA, and 15 MIA. But it had taken 18 artillery pieces, 50 machineguns, several hundred trucks and carts, and over 3,000 prisoners!

The 16th Division moved out at daybreak in three columns. Initially, rear guards and field trains retreating to the east were captured. At noon, the 66th Regiment captured part of Headquarters, 169th Rifle Brigade and the transport of the 2d, 8th, and 10th Rifle Divisions. The 65th Regiment advanced all day and night and entered Kaluszin on the morning of the 18th. It had moved 40 km. At 2330 hours, the 64th Regiment reached its objective after a 45 km move.

Also attacking at daybreak, the 21st Mountain Division advanced on Lukow some 18 km distant. At 0700, it ran into resistance at Lukow At 0730, using three regiments and attacking from the southwest, south, and southeast, it drove the Soviets from the town. They left behind three artillery pieces and 15 machineguns. The division immediately continued the advance. Pilsudski reached Lukow and ordered the division to take Siedlce. Siedlce was 30 km to the north and he wanted it taken that day! Part of the division loaded on trucks. At midnight the advance guard, 1st Mountain Regiment, and divisional cavalry, attacked from the northwest and south. Siedlce was taken along with several hundred prisoners and quantities of supplies and transport. Meanwhile, other division units seized enemy field trains which were retreating to the east.

According to Pilsudski, when he awoke on the morning of the 18th, all was quiet. He arrived at Kolbiel to find the 14th Division rear and other units making a forced march on Nowo Minsk. He wondered about the Soviet 16th Army. Where was it? Arriving at Nowo Minsk, he found parts of it—abandoned guns, a large number of corpses, and dead horses along the main road. Local civilians told him the Red troops were fleeing in all directions.

Pilsudski visited the 15th Infantry Division west of Nowo Minsk. Its artillery tubes were pointed north and south. The division commander told him the retreating Soviet troops were everywhere, which required the artillery to fire in all directions.

During this second day, the Polish units maintained the momentum of the advance. The endurance of the infantry was critical. After fighting and marching all day, the troops engaged in combat at night. Darkness did not slow down the momentum as shown by the midnight attack of the 1st Mountain Regiment. Units were given distant objectives and seized them despite obstacles ranging from enemy resistance to unimproved roads.

Attacks were conducted with a minimum of preparation time to maintain the speed of the exploitation. By advancing in multiple columns the Fourth Army reduced the chances of Soviet forces to escape to the east. Soviet units and individuals might be able to slip by one, two, or three columns, but there were more to the east. Polish units like the 15th Division artillery were prepared to engage the enemy in any direction.

The presence of the commander-in-chief in the Fourth Army sector during the exploitation insured timely orders based on up-to-date information.

Convinced the Red forces were beaten, Pilsudski ordered a general pursuit by most of his armies. This general pursuit ended August 25. Polish forces took 66,000 prisoners, 231 artillery pieces, over 1,000 machineguns, and 10,000 supply wagons. In addition about 40,000 Red Army troops were interned in East Prussia.

The change of fortune for the Polish Army in August 1920 has often been called the Miracle of the Vistula. Certainly the ability of the Polish forces to take full advantage of success in battle and follow-up initial gains—*to exploit*—played a vital role in the miracle.

LIEUTENANT COLONEL JOSEPH P. FRANKOSKI, Infantry, was Acting Director of Public Affairs, United States Forces Japan, when he prepared this article. He holds a Master's Degree in History from Old Dominion University, Norfolk, Va. LTC Frankoski has had articles and book reviews published in several military publications.

36 HOURS OF TRUTH

Major General Jean Y. Delawnay

In peacetime, it is very difficult to measure the leadership and professional ability of officer course graduates. A test is required that will provide the classification of aptitudes and final order of merit which governs the officers' selection of battalion or garrison—a test that will influence the outset of an armored officer's career.

At Saumur Armor School the scores of our "on-going checking" during the entire course are added to the results of a "rally-type examination" that each student must complete at the end of the course. The scores of the on-going checks are given a value of 80 percent and the rally 20 percent.

The rally is designed to:

- Be long and physically demanding enough to create the nervous strain and physical demands encountered in wartime.
- Present problems—both practical and theoretical—in a dynamic and realistic manner in the field, which require the preparation and transmission of radio reports. The latter are tape recorded for later evaluation and critique.
- Cover a wide range of situations designed to test the student's professional skills, reaction time, and judgment.

This is how a typical Saumur Armor Officer Basic Course rally is conducted.

H-hour (D-day 0500)—The student is required to run 3 kilometers cross-country, complete a combat obstacle course, cross a river in an inflatable assault boat, and fire his pistol.

H + 1—Equipped with a jeep and a map, the student is directed to proceed to an airfield where a helicopter and pilot await him. Acting as navigator and observer he must conduct a reconnaissance of a specified area and report his observations of enemy positions, composition, strength, and movement by radio.

H + 2—Test of equitation and horse management.

H + 3—Using a motorcycle, the student carries out a long and difficult terrain reconnaissance which ends with a slalom course that tests his riding ability.

H + 4 to H + 24 (D+1 0500)—Using an *AMX 30*, an APC (*AMX 10P*), a *Panhard* EBR, and an AML in four different areas, the student is required to solve leadership problems at a platoon level. These problems involving an attack, a reconnaissance, contact patrolling, and a defensive situation test the student's ability to issue movement, combat, and fire orders, and to submit reports, as he reacts to changing situations. Additionally, as he proceeds from one stand to another, he is subjected to tests on various technical subjects.

H + 24 to H + 35—The rally continues with four reaction tests, transmitted by telephone or radio, concerning three peacetime leadership problems and one operational situation. By now, the student has traveled 100

kilometers on foot, by motorcycle and tank, and even on horseback. He has participated in tactical excercises and solved 30 theoretical and practical problems including the replacement of a tank track, the measurement of radioactivity, and the explanation of certain Cavalry traditions. All of this while on short rations and without sleep.

H + 35—The final push! The weary student must now cover 8 kilometers on foot in less than 40 minutes, wearing battle order, steel helmet and carrying a 20-pound pack.

H + 36—Time for the final radio report—to a foreign officer in that officer's language, concerning a tactical situation that was presented to the student at H-hour. This transmission is designed to test not only the student's memory, but also his linguistic skills, and his ability to use foreign military terms.

A few days later the students participate in the famous Saumur Carrousel which gives the young lieutenants an opportunity to display their horsemanship and their motorcycle riding skills. It is also a demonstration of their discipline and cohesion.

The rally examination of the modern day French Armor Lieutenants, which complements the traditional Carrousel, is for them not only an "hour of truth" but more correctly "36 hours of truth."

MAJOR GENERAL JEAN Y. DELAWNAY, French Armor School Commandant has commanded various cavalry and tank units, including the 8th Hussards and 10th Armored Brigade.

SdKfz 251

Shützenpanzerwagen

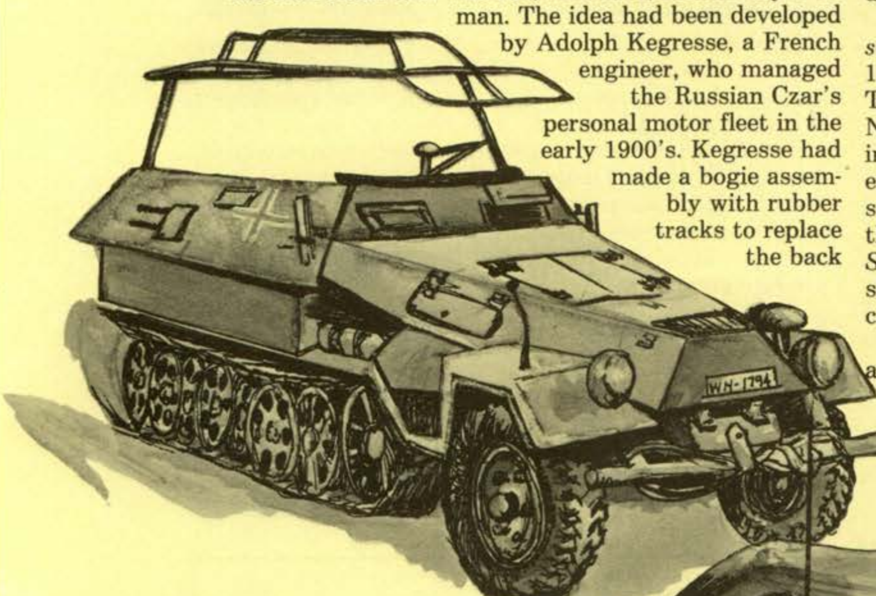
by Robert P. Arnoldt

Mobility has always been one of the keys to victory in warfare. The sweeping, bold moves of General Heinz Guderian's *panzers* in their lighting strike through France in the spring of 1940 is just one example of how numerically superior, but less agile opponents have been defeated by a mobile force in the hands of an able commander.

The mobile warfare practiced by the *Wehrmacht* during the first 3 years of World War II was the result of many separate elements cooperating and meshing, putting the *panzer* spearhead on the target with firepower and punch. The vehicles that provided the mobility and the iron for the tip of the spear were many and varied, but one machine in particular comes to mind when many objectives and missions of the *panzer* and *panzergrenadier* units are considered. That vehicle was the *Schutzenpanzerwagen* (*SdKfz 251* and variants).

This armored, half-tracked personnel carrier saw service from early 1939 to the end of hostilities in a myriad of occupations on all fronts from Leningrad to Tripoli.

The half-track idea was not, of course, exclusively German. The idea had been developed by Adolph Kegresse, a French engineer, who managed the Russian Czar's personal motor fleet in the early 1900's. Kegresse had made a bogie assembly with rubber tracks to replace the back wheels of one of the Czar's motor cars, giving it superior traction in snow and ice. After the Russian Revolution of 1917, Kegresse was out of work and returned to France. The firm of Citroen took up his half-track ideas with commercially successful results.[1]

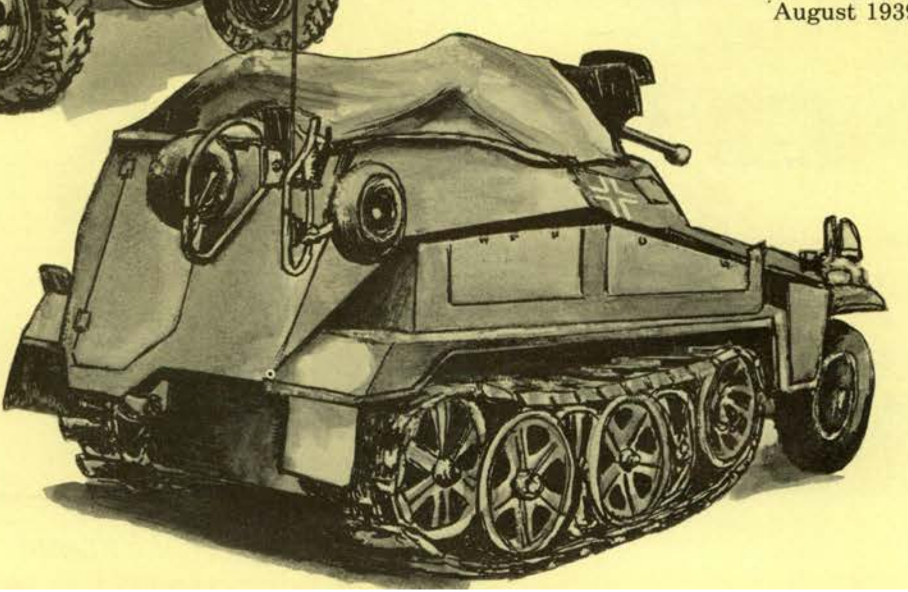


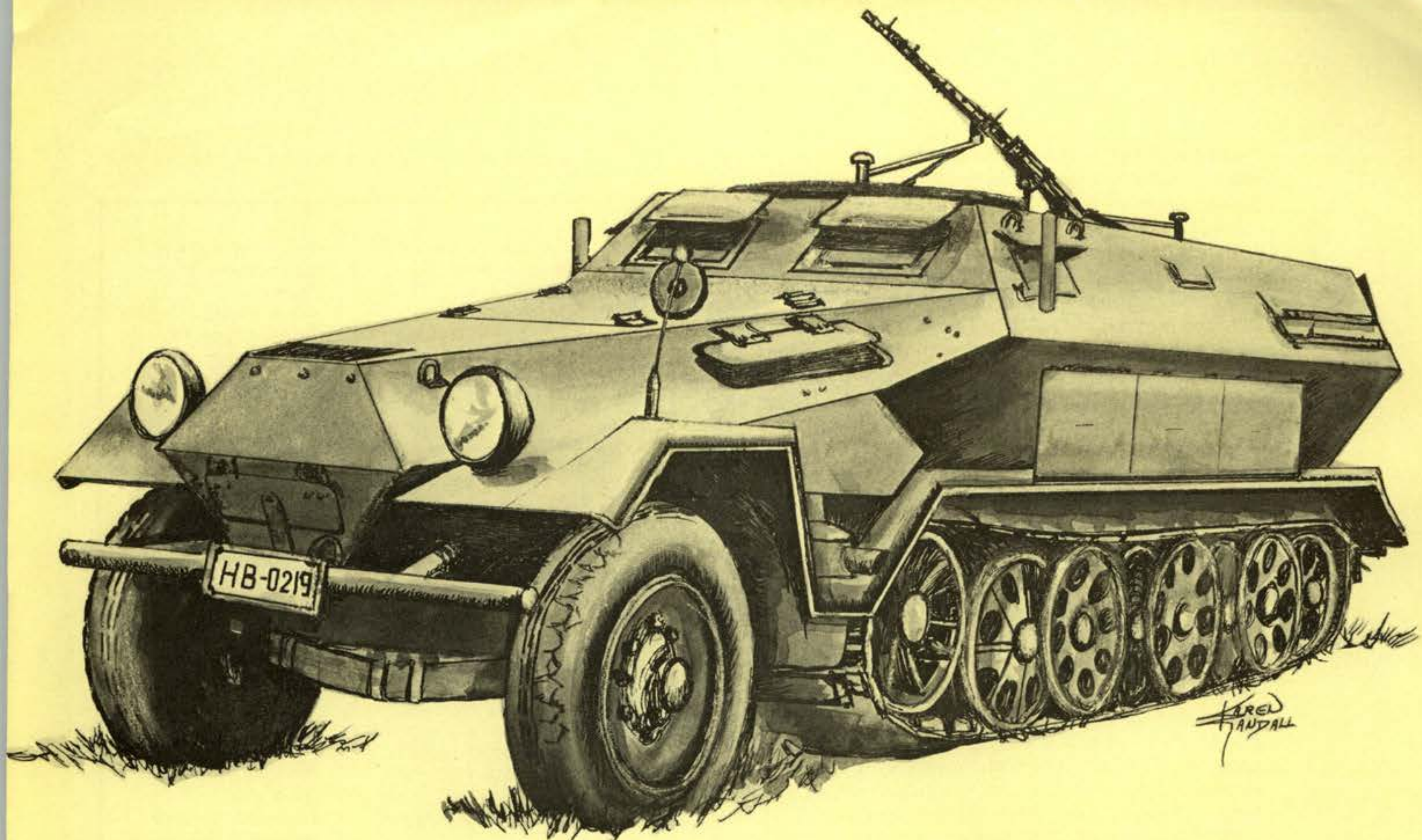
Of course, the British, the American, and the French armies toyed with the armored half-track personnel carrier in the 1920's and 1930's. Germany however, siezed upon the vehicle as a means to move the infantry with the new Mark I and Mark II *panzers.* It must be remembered that during this period, only Germany had perceived the full ramifications of *blitzkrieg* and the entire combined arms concept.

Various German firms, including *Kraus-Maffei* and *Rheinmetall,* were designing off-the-road vehicles for moving artillery, and some of these designs proved to be adaptable for conversion to the armored personnel carrier role. The realization that all arms, not just artillery, would need off-the-road mobility was also a factor in the decision to use the basic 3-ton artillery tractor, with its half-track design for the conversion.

Prototypes, designated *Gepanzerter Mannschraftstransportwagen (GpMtw),* were ready for trials in 1938 and went into production after successful testing. The firm of Hanomag built the chassis, while Bussing-Nag produced the well-shaped armored body. To satisfy increasing production demands, several other firms were engaged in production of the chassis and the armored superstructure. German ordinance gave the new machine the official designation *SdKfz 251,* called it the *Mittler Schutzenpanzerwagen* and sent it to the 1st *Panzer* Division in the spring of 1939 for troop trials with an infantry company.

Upon the recommendation of the troops who tested it and General Guderian, then Inspector General of Armored Troops, more vehicles were produced and integrated into the structure of the 1st *Panzer* Division's infantry and engineer units. Modifications on the basic machine followed, and by the end of August 1939 some





elements of the 2nd *Panzer* Division had also been equipped with the *SdKfz 251*.

On September 1, 1939, the *Wehrmacht* swept into Poland with the first major demonstration of the modern, armored *blitzkrieg*. The new *SdKfz 251's* were with the tanks in the van of the attacks, providing protection and mobility for the infantry.

The Polish campaign also vindicated the ideas of Basil Liddel-Hart and J.F.C. Fuller, both of whom projected combined tank infantry operations, on the scale of the *blitzkrieg*, as early as 1916. The tactical principles of General Fuller's plan for a large-scaled combined tank-infantry-artillery-aircraft assault into Germany in the spring of 1919 were copied later by the German planners. When their plans were executed, the SdKfz 251 proved to be the personnel carrier that was up to the task of closely supporting the tanks.[3]

The vehicle was a straightforward, open-topped design with sufficient armored protection for operations against objectives without specific antitank weapons positions. The front, side, and rear protective plating was well-shaped to deflect small-arms fire, with armor thickness ranging from 8 mm on the sides to 14.5 mm on the frontal plates. The combat weight of the basic *SdKfz 251/1* in 1939 was approximately 7 metric tons.[4]

From the mechanical standpoint, the *SdKfz 251* was well constructed, and became more sophisticated and reliable as it progressed through the first three of its four model versions. The D model, however, was a regression in overall design and quality.

Model A (or *Ausf A*), the first production model introduced in 1939, had three prominent vision ports set into each side of the upper superstructure, an antenna mounted on the right front fender, no external equipment stowage boxes, and one unprotected swivel mount at each end of the fighting compartment for the MG-34 machinegun. The *Ausf B*, introduced in 1940, eliminated the vision ports in the superstructure sides, but left the vision ports in the forward end of the fighting compartment for the driver and commander. The re-arrangement of externally stowed equipment (axe, shovel, engine crank, etc.), the addition of the standard gun shield for the forward MG-34 mount, and the fixing of external stowage lockers above the tracks on the mud guards also marked the B model.

Major changes in the C model, which entered production in mid-1940 and continued all that year, included previous B model improvements and added a one-piece glacis plate to replace the angled two piece glacis on the A and B models, armored engine cooling intakes on the engine compartment sides, and a repositioning of the radio mast. Most B models also received this modification.

The basic D model saw radical design changes, because the German economy in 1942 was in serious trouble in regard to raw materials and transportation. New vehicles and major design enhancements on existing machines were shelved. Streamlining and simplification became paramount. In the case of the *SdKfz 251*, the D model became an all-welded body structure. Vision ports were replaced by vision slits, engine air intakes were abandoned, and external stowage boxes became part of the hull side. Faceted areas, designed as deflectors of small-arms fire, were unfortunately replaced by single-piece armor plate to shorten production times. Examples of this modification were on the back frame with doors and the engine compartment sides. These production changes shortened time on the assembly line, but one wonders at the ability of flat armor to turn the more efficient small-caliber antiarmor projectiles of the 1942-45 period. In spite of these modifications, however, the vehicle remain-

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[1] Chamberlain, Peter; Ellis, Chris; and Batchelor, John. *German Fighting Vehicles, 1939-1945* (New York: Marshall Cavandish Corporation, 1975), p. 20.

[2] Spielberger, Walter J.; and Feist, Uwe. *Halbkettenfahrzeuge-German Halftrack Vehicles* (Fallbrook, California: Aero Publishers, Inc., 1968), (Introduction), p. 3.

[3] Chamberlain, Ellis and Batchelor, *German Fighting Vehicles, 1939-1945*, pp. 21-22.

[4] Spielberger and Feist, *Halbkettenfahrzeuge-German Halftrack Vehicles*, (Introduction), p. 3.

ed capable of performing its basic missions. Production of the D model continued until war's end with in excess of 15,000 *SdKfz 251* vehicles coming into use in the 1939-45 period. The majority of these machines were produced by German firms, but some were produced, under license, by foreign builders such as Skoda of Czechoslovakia.[5]

The power plant, without field modifications, was the well-tried Maybach *HL42 Tukrm* 6-cylinder, water cooled, four-litre gasoline engine found in many German vehicles. The engine produced up to 120 horsepower. The transmission had one reverse and four forward gears which provided power to the tracks. The front wheels were unpowered.[6] The track and suspension arrangement was unique to the general design of half-tracked vehicles. It consisted of six sets per side of disc-type, interleaved, perforated road wheels with solid rubber tires, a forward-mounted drive sprocket, and an idler wheel set in the rear of the assembly. The suspension was by sprung torsion bars and gave excellent flotation. However, as with all other types of German interleaved suspension systems, its vulnerability to packed, frozen snow when parked for long periods was a serious problem.

Strictly speaking, the chassis was a three-quarter track. The standard front wheel and tire arrangement provided steering and some front support, while the long tracks supported most of the vehicle's weight.

A cletrac-type steering unit was fitted within the power train on the front axle of the track suspension. This steering and braking unit, built into the drive system, provided excellent cross-country performance and acted in coordination with the front wheels when they were steered. The steering wheel, located on the left side of the fighting compartment, was sloped with the top of the wheel angled toward the driver to allow the front armor to provide maximum deflection of small-arms fire.

The brake drums were an intregal part of the drive sprockets and provided excellent turning capabilities. The forward-mounted sprocket wheels had rollers on the wheel perimeter rather than actual sprocket teeth to engage the track. The tracks themselves were highly sophisticated, with sealed, permanently-lubricated needle bearings on the track pins, and detachable rubber track pads on the inside of the track links to cushion the wheel paths and engage the sprocket.

These remarkable features gave a long track life and excellent traction, but were expensive due to the intregal high quality. As the economic and raw material situation worsened, later production vehicles had drive sprocket teeth of the conventional type, and dry track pins replaced the lubricated variety. While these changes cut costs and simplified production, they also cut combat survivability and shortened maintenance intervals.[7]

The chassis was the conventional welded-girder type with cross members providing support for the two-piece body and a frame for armored belly plates.[8] The two pieces comprising the hull and superstructure (engine-driving compartment and passenger-fighting compartment) were of welded construction on most vehicles, but a few were riveted due to a lack of welding facilities at some of the manufacturing locations. The volume of production, including all variants, went from 348 vehicles in 1940 to 7,800 in 1944.[9]

There were 22 official German wartime variant production types.[10] They were:

SdKfz		
251/1	*Schutzenpanzerwagen*	Personnel Carrier
251/2	*8 cm Gr W-Wagen*	8-cm mortar carrier
251/3	*Funkwagen*	Radio car
251/4	*le IG-ZgKW*	Ammunition carrier (for the light 105-mm infantry gun)
251/5	*Pioneer SPW*	Assault engineer vehicle
251/6	*Kommandowagen*	Command Vehicle
251/7	*Pi-Geratewagen*	Engineer equipment carrier
251/8	*Krankenpanzerwagen*	Armored ambulance
251/9	*7.5-cm StuK-37 L/24 (Stummel)*	SP 7.5-cm L/24 gun (The *Stump*)
251/10	*3.7-cm PaK*	SP 3.7-cm AT gun
251/11	*Fernsprechwagen*	Telephone line layer vehicle
251/12	*Messtruppgeratewagen*	Survey section instrument carrier
251/13	*Schallaufnahmewagen*	Sound recording-vehicle
251/14	*Schallauswertewagen*	Sound ranging vehicle
251/15	*Lichtauswertewagen*	Shot spotting vehicle
251/16	*Flammpanzerwagen*	Flamethrower vehicle
251/17	*2-cm Flak auf SPW*	SP AA vehicle, 2-cm gun
251/18	*Beobachtungswagen*	Observation post vehicle
251/19	*Fernsprechbetriebswagen*	Telephone exchange vehicle
*251/20	*Infrarotscheinwerfer UHU*	Infra-red searchlight vehicle
251/21	*1.5- od 2-cm Flak-MG-Drilling 151*	SP AA vehicle with triple 1.5- or 2-cm cannon
251/22	*7.5-cm PaK 40 auf SPW*	SP 7.5-cm AT gun

*(For use in night fighting in conjunction with the *PzKpfw Panther* equipped with infrared night sighting main-gun opticals).

Obviously adaptability was built into the design from the track pads up.

In addition to the 22 official types issued from the factories, other changes made in the field produced operational vehicles capable of dealing with particularly unique situations. One such field modification saw the basic *SdKfz 251/1* carrier equipped with six *Wurfrahmen.* These were 28-cm or 32-cm rocket launchers for use against massed troops and armor, especially on the Eastern front.

The basic *SdKfz 251* and its many variants performed many of the multiple tasks required by a modern mobile army; but its major task, that of transporting and protecting the infantry, it accomplished best of all. With a spartan interior, the *SdKfz 251/1* could carry the standard 10-man rifle squad, with their *MG-34,* into action. Four vehicles could move a platoon and 10 a regular rifle company. The company commander's machine was usually a *SdKfz 251/10,* and carried a 3.7-cm *PaK-36* mounted on the superstructure over the driver and commander's positions. The *PaK* provided close fire support for the *SdKfz 251/1's* which had only *MG-34's* or *MG-42's* for protection.[11]

When used in its personnel carrier role, the vehicle mov-

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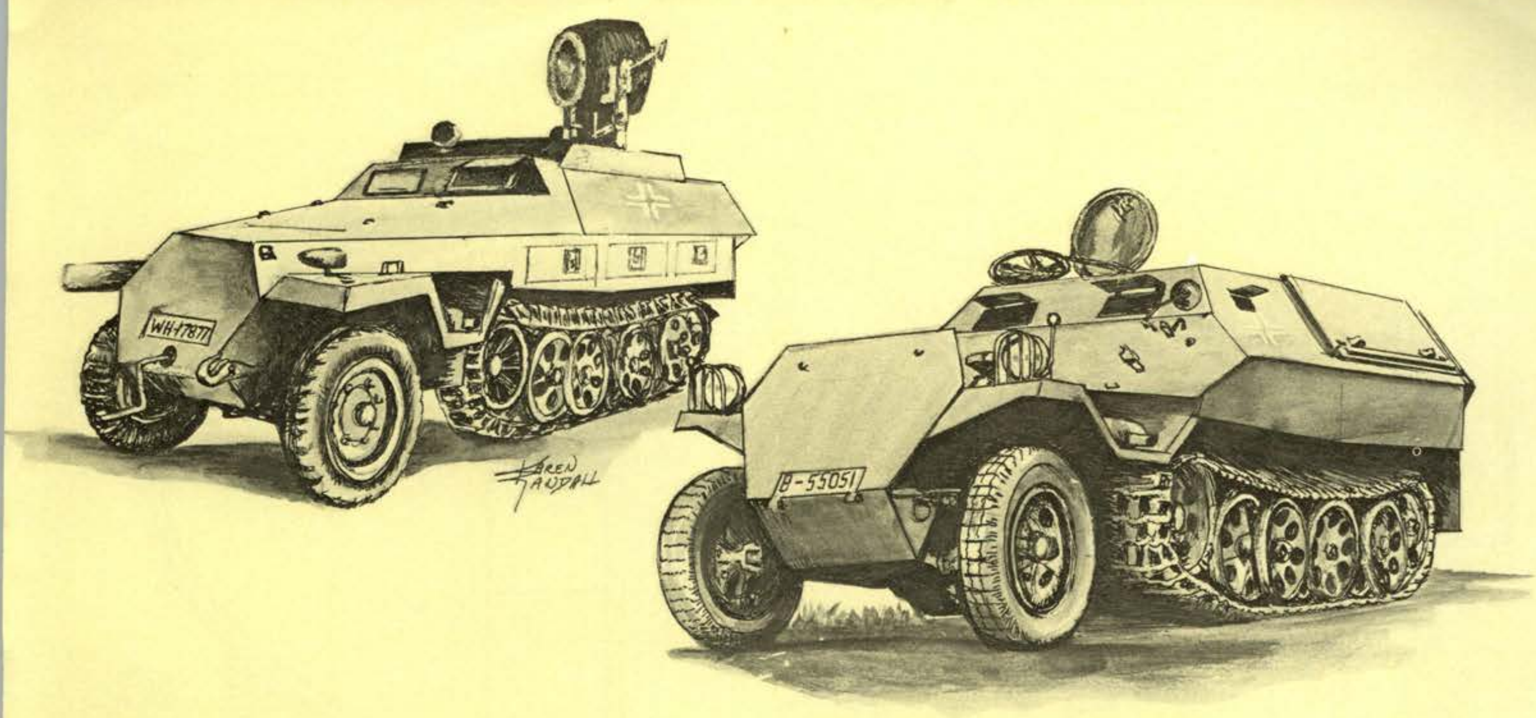
5 Ibid.
6 Ibid., p. 26.
7 Chamberlain, Ellis and Batchelor, *German Fighting Vehicles 1939-1945,* p. 22.
8 Ibid., p. 23.
9 Ibid.

10 von Senger und Etterlin, F. W. *German Tanks of World War II,* trans. by J. Lucas, ed. by Peter Chamberlain and Chris Ellis (New York: Galahad Books, 1968), pp. 142-143.
11 Chamberlain, Ellis and Batchelor, *German Fighting Vehicles, 1939-1945,* p. 23.



ed with the tanks and gave much needed flexibility in the spearhead role of the *panzer* divisions. As the war progressed and eventually turned against Germany, the offensive changed to the defensive, but the adaptability of the *SdKfz 251* made it just as valuable in 1944 as in 1940. There were never enough to go around, with the majority of the vehicles going to *Waffen SS*, *panzer*, and elite *panzergrenadier* divisions; and even in these units not every battalion had all of its grenadier companies in *SdKfz 251's*. Some unlucky souls still rode to war in trucks.

When the Germans withdrew from Czechoslovakia in early 1945, and with the final collapse of Army Group Centre on 11 May 1945, large numbers of SdKfz 251's were abandoned, and then used by the post-war Czechoslovakian army. At that time the vehicle was redesignated *OT-810*. Initially the vehicles were used without modification. Many had been produced locally at the Skoda Works in Pilsen, so spare parts and maintenance knowledge were readily available. But in the 1950's the machines were extensively modified to keep up with changing needs and improved weapons systems. Two models are still in service under the designation *OT-810*—the personnel carrier and the antitank vehicle. The modifications to the personnel carrier include:

- Replacement of the six-cylinder Maybach gasoline engine with a Tetra six-cylinder, inline, air-cooled diesel developing 120 horsepower.
- Armored roof hatches over the personnel compartment.
- Powered front wheels linked to the rest of the drive train by a transmission with four forward and one reverse gear and a two-speed transfer case.
- Provision for an armored, single-piece, rear-hinged hatch for the vehicle commander.
- Mounting of a 7.62-mm machinegun at the commander's hatch position.
- Firing ports in the face of the hull rear.[12]

For the antitank vehicle, most of the above modifications apply with the addition of an 82-mm *M-59A* recoilless rifle on the rear of the superstructure roof. The hull has been modified to allow for ammunition storage and gun service. The weapon can be fired while mounted on the *OT-810* or it can be dismounted and fired from a ground mount. The weapon's HEAT round can penetrate 250-mm of armor at 1,000 meters. Personnel carrier and the antitank versions of the *OT-810* are presently in use by the Czechoslovakian and Romanian armies.[13]

In the almost 40 year history of the *SdKfz 251/OT-810*, one valid, pertinent point comes through to modern military planners and students of armor development. The right vehicle can serve the changing needs of war if the men who plan and build it will only recognize and understand those needs.

The *OT-810* is an opponent to be reckoned with. The modifications made on the basic *SdKfz 251* vehicle have enhanced that machine and should have emphasized to Western students of armored warfare that, when a tried, veteran vehicle is available, *new* does not necessarily mean *better*.

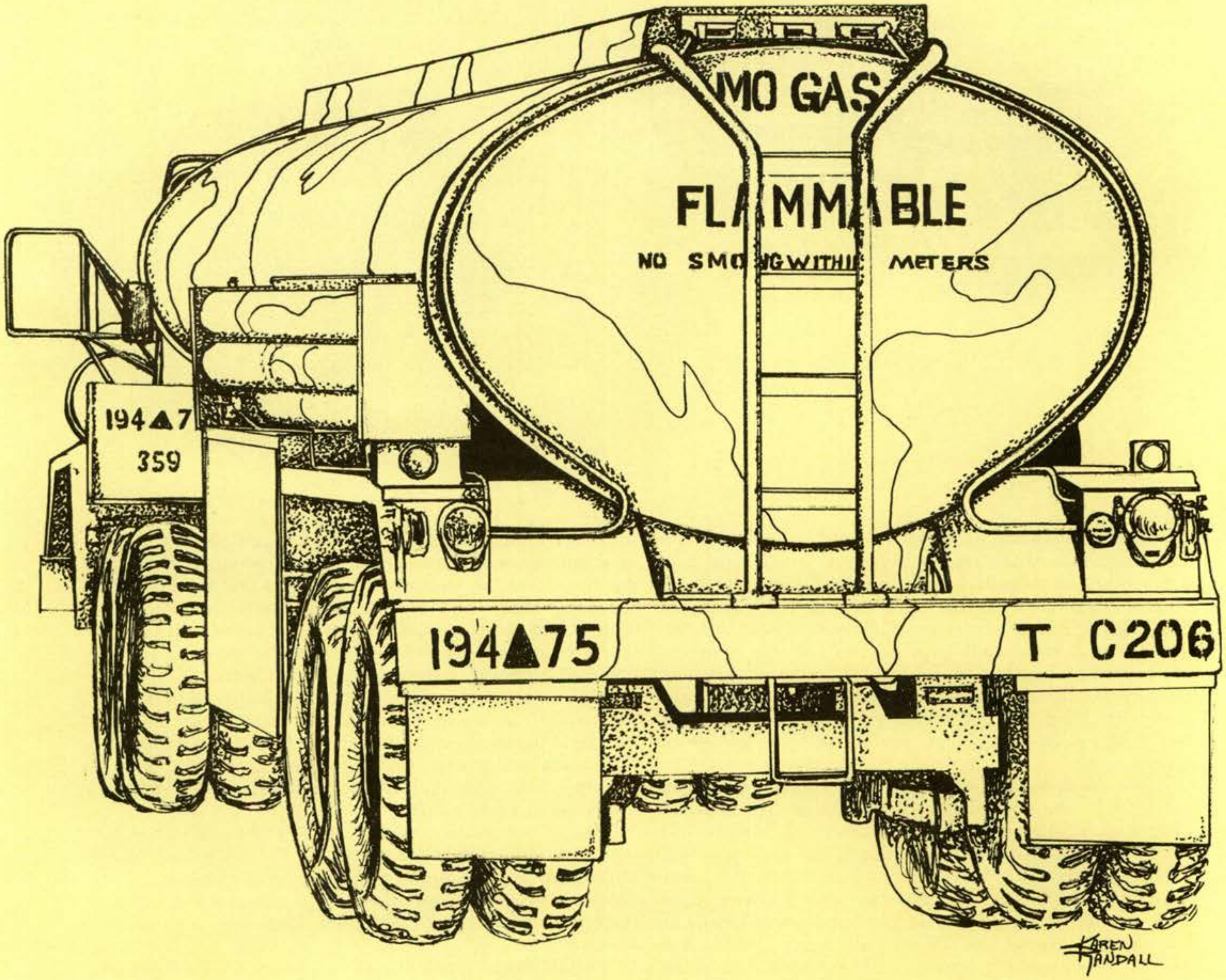
NATO, with many types of newer, fully tracked MICV's and personnel carriers, might take more than casual notice of this dependable veteran presently wearing the colors of the Warsaw Pact. The West might also note that mobility in modern warfare does not have to equate to new, more complicated, more costly weapons, but just to weapons and vehicles that get the job done.

The *SdKfz 251/OT-810* has a long history of doing just that!

ROBERT P. ARNOLDT, a former enlisted man in the U.S. Army, served in Vietnam as an Infantry soldier with the 1st Air Cavalry Division and at Sixth Army Headquarters in California. A graduate of Elmhurst College, Mr. Arnoldt is currently pursuing a Master's Degree in history from Northeastern Illinois University.

[12] Foss, Christopher F. *Jane's World Armoured Fighting Vehicles* (New York: St. Martins Press, Inc., 1976), p. 201.

[13] Ibid.



A PLAN FOR REFUELING

by Captain Thomas G. Pratuch

Jomini described logistics as "the practical art of moving armies."[1] More recent comments by commanders describe logistics as the tail that wags the dog. The problems that cause commanders such frustration arise from the fact that logistical operations have remained essentially unchanged since Jomini's day.

Originally developed to eliminate the problems inherent in obtaining supplies by plundering the countryside, logistical doctrine has failed to keep pace with the changing nature of the armies it supports. This has caused some commanders to wonder if developing "forage teams" may not be necessary again to keep adequate supplies available for combat units.

Part of the problem with logistics is the perennial argument of how long or large the "tail" should be for a combat unit. It is easy to prevent problems when the unit can carry everything necessary for sustained operations. However, increasing the size of support sections in combat units is beyond the scope of this article. What is presented is a discussion of fuel support operations for battalions using *existing* capabilities.

If part of the problem with logistics is the size of the support operation, then the other part is that everyone knows what they want from the S-4. The problem of how to get the supplies to the units is what the S-4 is paid to do and not generally considered a concern for the commanders. This attitude comes from a lack of understanding of the exact situation that anyone taking over a battalion S-4 operation will find.

In presenting a discussion of fuel requirements it is necessary to make certain assumptions. The first is that units will continue to have some vehicles that only use MOGAS and that these will be *M-151* series jeeps. The second is that *M-88's* converted to *M-88A1's* (diesel) will be found in most units within the next few years. The last assumption is that field operations will be characterized by a 20- to 30-kilometer separation between battalion combat trains and brigade field trains.

The process of setting up fuel resupply must start with a look at the available assets in a battalion or task force. Table 1 presents this information. The first conclusion that can be reached is that if all vehicles in a battalion are less than one-half full, resupply will nearly drain the POL section of the support platoon.

The next step is to look at fuel requirements for field operations and start allocating vehicles where needed. Where possible, fuel should be left with the unit that needs it to minimize movement. If movement of the trucks is kept to a minimum, operations will benefit by the decreased risk of enemy observation and reduced radio traffic. Since MOGAS is needed in less quantity than diesel fuel it should be allocated first.

MOGAS is needed for heaters, generators, construction-type equipment, and jeeps, which are found essentially in the battalion CP. Since combat and field trains do not have large capacity fuel tanks, MOGAS is best suited for storage in trailer-mounted pods which can be moved by the battalion section they support. If three pods are used there will be 1800 gallons of MOGAS available, for which the jeeps constitute the greatest single requirement of 510 gallons.

The battalion maintenance platoon is the single unit of a battalion with a constant fuel need—either for the organic equipment or for vehicles that are being repaired and recovered. This platoon should receive a 5-ton fuel truck with a trailer-mounted pod containing diesel fuel. One 5-ton fuel truck of diesel should also be allocated for the other elements of the combat trains and the command post.

Before continuing, it is worth noting that units still possessing *M-88* MOGAS vehicles need only make one change in the above allocation. The MOGAS pods at the CP and trains can be moved forward to support company *M-88's* by a variety of vehicles. The fuel truck with the maintenance platoon can have the trailer mounted pod carry MOGAS instead of diesel. Even with this change the total MOGAS allocation would be less than is found in current practice. A number of battalions have one GOER (2500 gallons), three 5-ton fuel trucks (3600 gallons), and a trailer mounted pod (600 gallons) allocated for carrying MOGAS—over twice the requirement.

Regardless of how the fuel vehicles are loaded, two 5-ton fuel trucks and four GOER vehicles have not been allocated. The discussion so far has been concerned with the armor battalion with no mention of the POL support that is normally given up when cross attaching. So let the two 5-ton fuel servicing vehicles be the allocated fuel to the cross-attached company. Unless the tank company is going to an infantry battalion that has GOER vehicles, there is little merit in giving up a GOER fuel vehicle that cannot obtain the appropriate parts or recovery support. The two 5-ton vehicles represent approximately the same quantity of fuel.

So what remains for the support platoon leader to refuel the three companies/teams and combat support company with is 10,000 gallons in four GOER fuel vehicles. This is less than the needs for three armor-pure companies (20,985 gallons) or three tank heavy teams (16,500 gallons). This brings us to the point of discussing refueling doctrine as practiced.

Currently it is popular to consider one GOER refueling vehicle as belonging to a company/team or in other words part of the company slice of the battalion support. A quick look at a comment in FM 100-5, *Operations,* is worthwhile for it applies to battalion operations as much as to division operations: "...combat service support units *must be flexible enough to support from any base arrangement.*" The practice of this company slice removes any flexibility from the support platoon for two reasons:

- There are still the combat support company assets which require refueling at locations away from any previously mentioned location (primarily the scout and mortar platoons).
- There is no other method advanced in doctrinal writing for the impact of losing a fuel servicing vehicle.

This latter reason is by far the most important consideration for changing refueling procedures as practiced. A look at table 1 again reminds us of the loss of one fuel carrying vehicle. To suffer the equivalent loss in combat units would cause the battalion to lose four to six tanks.

What is proposed is that the remainder of the support platoon POL section of four GOERS be viewed not

Table 1: Battalion/Task Force Fuel Assets

	TANK Bn/Co.	INFANTRY[3] Bn/Co.	TK-HEAVY TF/Tm
Total fuel Needs (Gal)	28,875/6,995	14,228/2370	24,038/5,500
Spt Plt Capability (Gal)	17,200 - -	6,800[2] - -	14,800 - -
%On hand of:			
Total Needs	60	46	67
Diesel Fuel[1]	54	36	56
1 Vehicle equals ?% of assets:			
GOER	14	37	17
5-T w/trl	10	26	12
TO&E	17-35H	7-46H	Doctrine

Notes: 1. See discussion herein about fuel storage allocations.

2. Based on the TO&E authorized vehicles. In actuality there are usually five 5-ton trucks w/pods for a total of 9,000 gals giving 63% on hand of total needs and 52% of diesel fuel needs.

3. Infantry battalion data is shown for comparison.

as being made up as a series of company slices but rather as a battalion asset to be utilized when and where it is required. Experience has shown that even with three company-sized teams operating together in the same area, one or two teams will, by the nature of their particular missions, require refueling before the others. Another source of imbalanced fuel requirements comes from an area not yet mentioned. All of the calculations were for from three platoons to a company/team. The impact of one team being given four platoons must be considered. If these imbalanced POL needs were to be dealt with by a battalion controlled POL section, then units would be closer to following the guidance given in FM 100-5:

"*Support elements should not be deployed before they are required by the weapon system committed to battle.*"

There are, no doubt, many cries that control of the battle is again being turned over to that dog-wagging tail. But this is not the case. A quick check of FM 71-2, *The Tank and Mechanized Infantry Battalion Task Force,* will show the opposite is true. It is the "*...S-3 who, when all the needs of the battalion task force can not be met, is responsible for recommending to the commander ... supply and maintenance support priorities for subordinate units.*"

What is proposed is that refueling be done simultaneously for one or two companies/teams by the 4 remaining GOERS. In this manner several real benefits are gained. First, the companies can be at any onboard fuel level, and the dedicated refuel elements can handle the situation. Secondly the increased number of refueling vehicles at the combat element means that:

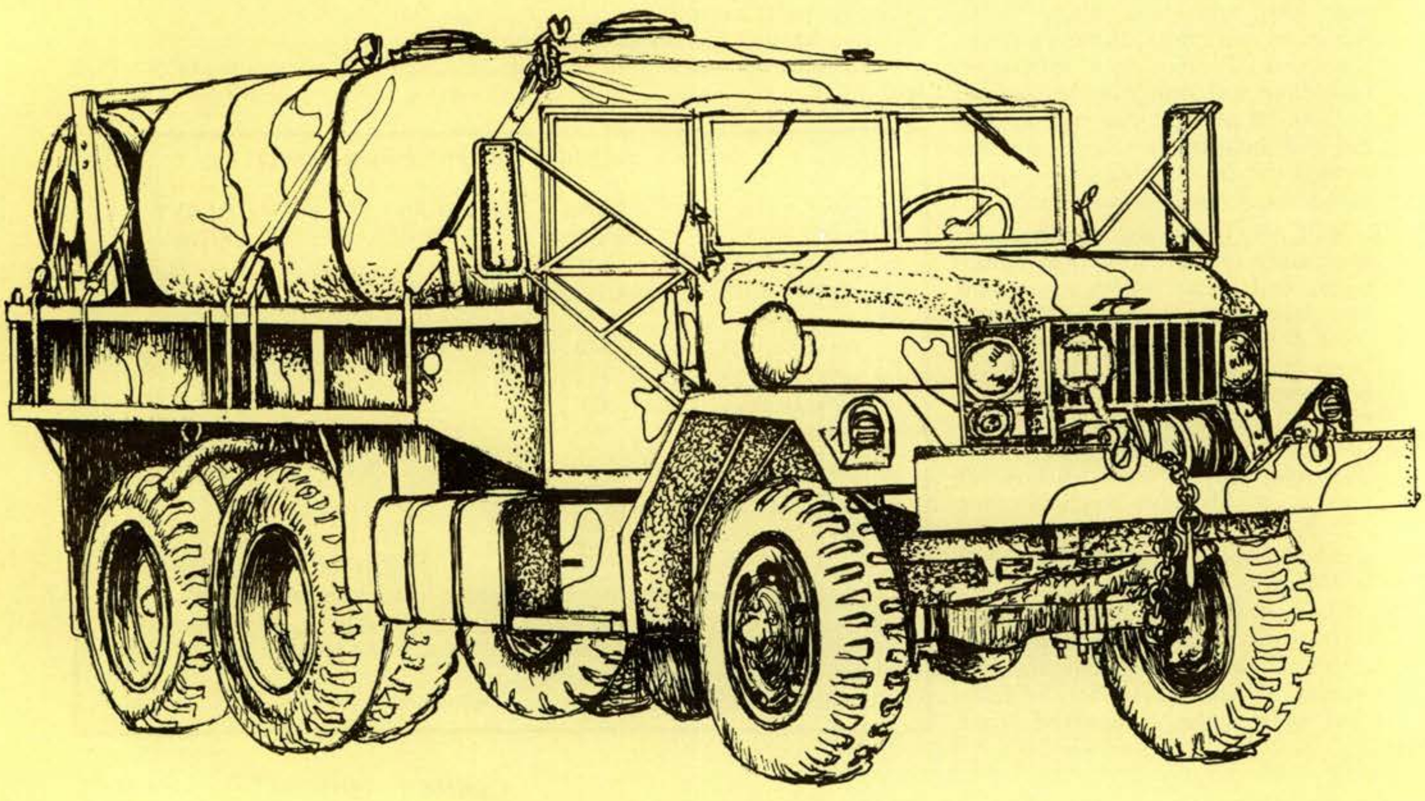
- Refueling time and corresponding vulnerability to enemy fire is reduced by one-half.
- There is less fuel level variation in the combat elements.
- Under the practice of refueling from one vehicle, the time that it takes to refuel the company could see the first vehicle having used 2 to 3 hours of fuel, assuming a fluid battle situation where the engines must be kept running.
- Retains the same capability regardless of support element loss short of a catastrophe.

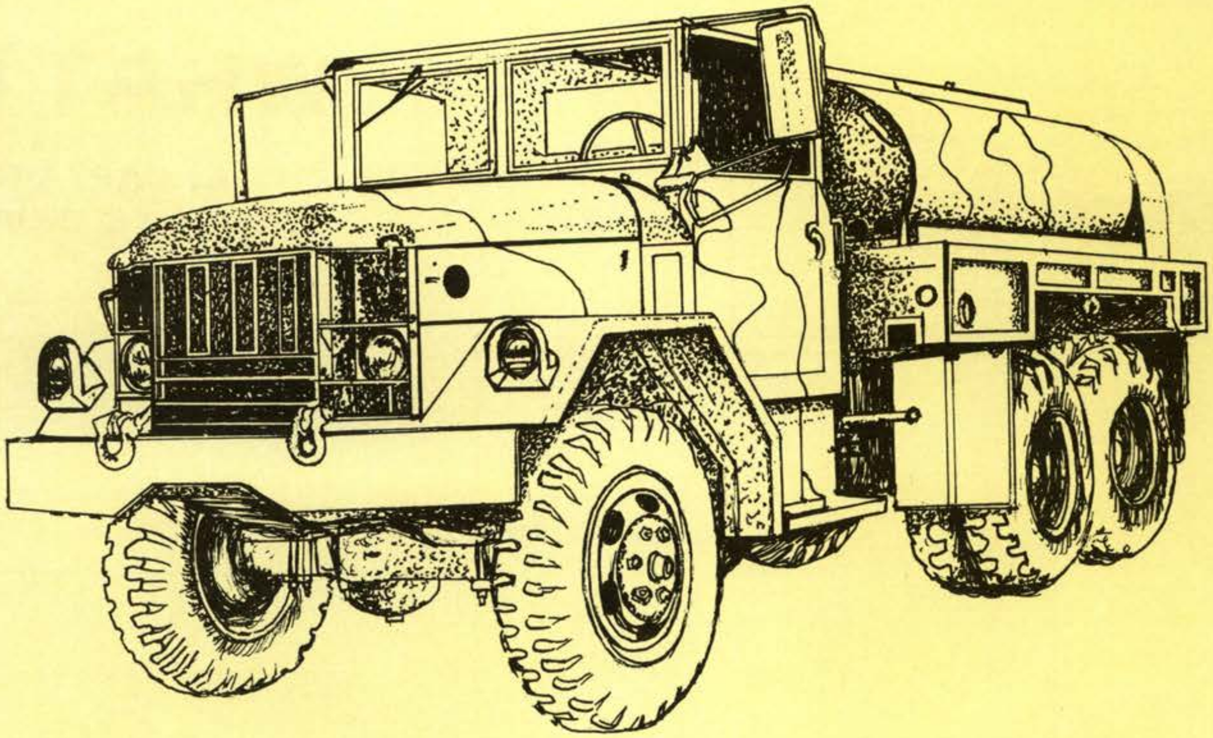
In the best situation, two companies/teams are refueled by two GOER fuel servicing vehicles each. Under the old system, one refueling vehicle caused 2 combat vehicles to be out of their firing positions (one at the refuel point and one moving between the refuel point and firing position). There are now 3 combat vehicles out of position. The manuever company has gone from having 88 percent of its combat power on the line to having 82 percent available, *but with the refueling time being cut in half.* If the refueling is done on the firing position, there is no loss of combat power and refueling time is cut in half. A lucrative target of two tanks at one refueling point is avoided by refueling from two locations. The number of vehicles out of firing positions does not double because the departures of vehicles for the refueling point are staggered.

When refueling of the initial two companies is completed, the GOER fuel vehicles can perform a fuel transfer of any remaining fuel. This avoids needless waste of fuel and time because vehicles can now be sent back to obtain more fuel while all remaining fuel is onhand for the third company/team should it be needed. Heretofore, refueling vehicles retaining partial loads would have been sent to the rear to be refilled.

The GOERS thus freed for obtaining fuel should be available within 4-5 hours *at the maximum,* even if forced to move cross-country. The remaining company should be able to handle this wait if it is given a mission requiring minimum movement. Emergency refueling problems can be handled by using remaining fuel assets until full top-off can be achieved.

In order to increase the flexibility and responsiveness of refueling operations, the battalion field trains should be moved forward to a point between the battalion combat trains and brigade field trains. This will allow the support platoon leader to update the fuel vehicle drivers about changes in the tactical operation. This will prevent refueling vehicles





from being dispatched with information that is several hours old by the time the vehicles reached the location where the combat trains used to be positioned. The alternative to locating field trains forward would be to have the support platoon leader escort the refuel vehicles in order to keep the refueling operation tactically current. However,this removes the only radio to be found in the combat trains and the lieutenant from the equally important resupply of other necessities.

The displacement of the battalion field trains will also decrease the size of the brigade field trains and the vulnerability of the entire resupply operation to detection and interdiction.

At this point it is likely that someone is saying, "All of this is well and good, but how often does a unit need to be refueled from below half a fuel tank. If the vehicles are being topped off on the objectives when they are reached, surely there is only the need for one-fourth of a tank per vehicle". The argument would then continue by using the tables in FM 101-10-1 which show that a tank could move up to 237 km on 180 gallons of fuel. But this is for solid, dry, level ground. Calculations for cross-country movement show a distance of 118 km as possible. But fuel consumption is more than a function of distance traveled. It is also a function of the time that the engine is running.

Engines run for a considerable time without movement in an operation. First the vehicle top-off isn't done in the assembly area less than 3 minutes before movement. It is more likely done a half-hour prior to movement. Then the engines are left on as crewmen check equipment and units are organized. Then during the tactical movement there is the need to halt and place suppressive fires on enemy positions. It takes time to breach an obstacle. There is a wait while Team B secures an overwatch position for the final attack. Then how long does it take to actually clear the objective? And how much longer after that before it is safe to bring the POL vehicles forward? All of that engine idling time creates a POL need that is as great as if the vehicles are moving.

The point is that the current practice of viewing part of the POL vehicles as being part of a company slice of refueling assets creates problems. When the GOER that will later go forward and refuel C Company has been used to put 300 gallons in the scout platoon and 50 in the maintenance 5-ton, nobody will want to send it to the rear to replace those lost gallons. So when C Company's commander wants that fuel *now,* and he's used over half his onboard fuel, some vehicles are not going to be fueled. But if the four vehicles are used to refuel A and C Companies and return to the rear and get fuel for B Company and the Combat Support Company on the next run, a logical system has been set-up. Now when a vehicle loss occurs in the support element, the battalion isn't in a jam because the fuel needs have been staggered and fuel vehicles can be shifted without some company missing its fuel service vehicle. Additionally, reduced time for refueling a company means less of "getting what we can and trying again later." Above all, refueling will be a *planned* part of the operation.

CPT THOMAS G. PRATUCH was commissioned in Armor from Rochester Institute of Technology in 1974. He served as a tank platoon leader and support platoon leader while assigned to the 1st Bn, 68th Armor. Recently graduated from AOAC, CPT Pratuch is assigned to the 1st Cavalry Division, Ft. Hood, Tex.

WHAT DO

by CAPTAIN DONALD B. SKIPPER

"The M-60 family is like a Stradivarius, it gets better with age."

There are few in the Armor community who would dispute this adage. The performance record of the *M-60* family of tanks shows that it is one of the most successful weapons systems ever fielded in the U.S. Army.

However, in the continued upgrading of the *M-60* family through the application of product improvements (PI's), the potential for a myriad of vehicle configurations within any one unit has greatly increased. For example, it is now possible for a tank battalion to possess simultaneously any combination of:

- *M-60A1's*
- *M-60A1's* with add on stabilization (AOS)
- *M-60A1's* with the reliability improvement of selected equipment engine (RISE)
- *M-60A1's* with RISE engine and passive sights (RISE PASSIVE).

Until recently all these various configurations shared the same national stock number (NSN).

The presence of two or more of these configurations within a unit:

- Increases PLL/ASL requirements
- Decreases the unit's ability to generate PLL demands
- Hinders mechanics and PLL clerks in ordering the proper repair parts when the PI is not easily discernable to the naked eye. Additionally, this proliferation of tank configurations has apparently hampered the Publications Directorate of the National Maintenance Point (NMP) in producing timely changes to the applicable operator and maintenance series of manuals.

It's not difficult to understand how such configuration mixes occur within armor battalions. Let's look at a theoretical CONUS tank battalion—the 8-33 Armor.

In 1972, the 8-33 Armor turned in the last of their two *M-60* tanks for overhaul. In return the National Inventory Control Point (NICP) sent two *M-60A1* AOS tanks as the result of the conversion program at that time. The *M-60A1* AOS was the latest, most modern configuration at that time. In 1974, the battalion turned in three *M-60A1's* to the overhaul program and received three *M-60A1* RISE tanks in return. As a result of a change in unit TO&E in 1977, the 8-33 Armor requisitioned three additional "tanks, medium, 105-mm gun" under line item number (LIN) FBV 13101. Since the LIN's for all 105-mm gun tanks is the same, the battalion eventually received three new tanks from the tank production plant in Detroit. In 1977, the tank plant was producing *M-60A1* RISE PASSIVE tanks, consequently the 8-33 Armor became the proud recipient of three new *M-60A1* RISE PASSIVE tanks.

As a result of the above situation, *on paper* the 8-33 Armor consists of:

46 *M-60A1*
2 *M-60A1* AOS
3 *M-60A1* RISE
3 *M-60A1* RISE PASSIVE

To explain the *on-paper* composition of 8-33 Armor, we must review how PI's for tank hulls are controlled and ap-

WE HAVE?

and CAPTAIN EDWARD M. KANE

plied. The NMP at TARCOM in conjunction with the *M-60* Project Manager, manages PI application at:

- The Tank production plants.
- Overhaul facilities in Anniston, Ala. and Mainz, Germany.
- And through the efforts of special teams from TARCOM, that are sent out to apply specific PI's in the field.

The control of these three methods of PI application appears to be effective and workable, but there is one additional method of application that does not receive much attention and is relatively uncontrolled. This last method is PI application through logistical attrition.

For the purpose of our presentation let us define "attrition" as the normal replacement of unserviceable components for a tank through the existing repair parts system. The NICP at TARCOM budgets and contracts for repair parts for the tank fleet. At some point, the NICP determines that it is no longer cost effective to stock parts or components that a PI component has been designed to replace and then contracts for the new PI component. While the NICP can accurately state how many new PI items have been purchased and placed into the repair parts system, no one knows where or how many of the PI products have been installed.

The *AVDS-1790* series of tank engines is a good example of the type of component that the NICP deals with. Prior to 1975, the *AVDS-1790-2A* was the standard engine for the tank fleet. In 1975, the development of the RISE engine (the 2D model) was completed. This engine along with an improved electrical system resulted in a 2C RISE engine. The NICP is no longer procuring the 2A model engine, however, there are still 2A model parts in the repair parts supply system.

If we look at the mythical 8-33 Armor we can see how attrition can exacerbate an already confusing situation. If the 8-33 Armor has to replace an engine on one of the *M-60A1's*, the vehicle is evacuated to the direct support maintenance unit and eventually returns with an operable engine. The log book for this tank only reflects the new engine serial number and the replacement date. Sometime later the same vehicle blows an oil cooler line and the unit mechanic and PLL clerk order the necessary repair parts for that particular *M-60A1* by serial number in accordance with the -20P parts manual. When the parts arrive they obviously won't fit since there is a 2D RISE engine in that particular *M-60A1.* Once this discovery has been made, the pack usually must be pulled to see the data plate to determine exactly what kind of engine they have. Is it a 2C or 2D engine? Even when ascertained at unit level there is no requirement to record what type of engine is powering the vehicle and consequently, this data is again lost to the system. The 8-33 Armor has 5 tanks in various configurations powered by three different engines—the old 2A, the 2D in any tanks that have had engines replaced in the last year, and the 2C engine in the new M-60A1 RISE PASSIVE vehicles. Remember that we have used the engine as only one example of PI application by logistical attrition. Space does not permit us to explore the ramifications of applying T-142 track, passive sights, engine smoke generators, turbochargers or other PI's in

AVDS-1790 Engine Model Identification Logic

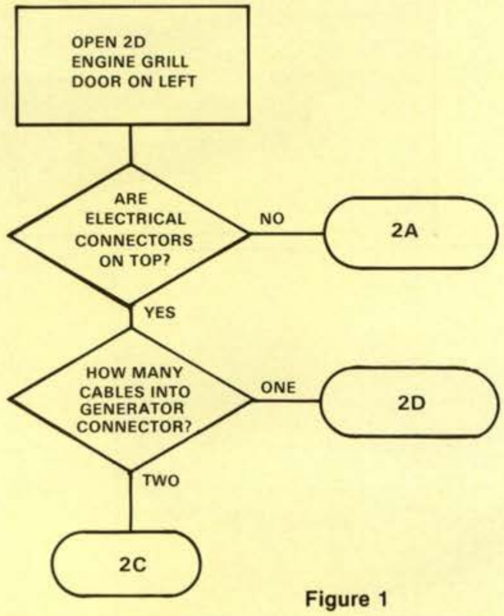


Figure 1

an uncontrolled manner through logistical attrition. Suffice to say that there are over 200 possible significantly different configurations of *M-60* tanks in the current fleet with no easy way to determine exactly what we have i: any one unit.

There are several areas that are affected by this situation. Besides placing a unit commander in the position of having a fleet of vehicles with different maintenance requirements he must determine the best methods of employing a mixed fleet in order to optimize the unique operational capabilities of each configuration. He is also challenged with procuring all pertinent operator and maintenance publications for all of these configurations in order to insure that proper maintenance is performed and the right part is ordered.

How do we train the crews to operate such a mixed fleet? We do the best we can while wondering why the young armor crewman has never even seen an *M-32E1* passive sight much less looked through one. Maybe a better question is—do you know what kind of tanks you have? There are a few ways to determine the type of engine in a tank without having to pull the pack to read the data plate. A simple decision logic at figure 1 will identify the engine configuration. Figure 2 might be of assistance in determining the overall configurations of the vehicle. The attachment of a 2D RISE engine does not necessarily mean that you now have an *M-60A1 RISE* tank. It must be pointed out, however, that with the advent of seperate NSN's for the major different configurations it is now possible to PI a vehicle, through attrition, up to a different NSN classification. Once this need for an NSN change has been discovered it should be accomplished by reporting the change through TAMMS in accordance with TM 38-750.

The *M-60* Project Manager, in conjunction with the Tank Force Management Office and the Office of Armor Force Management, is taking steps to clearly identify what constitutes a tank configuration, evaluate the consequences of partial application of significant PI's, and develop a matrix that will assist field units in properly identifiying vehicle configurations. These actions are critical to the successful conduct of a world-wide tank muster scheduled for CY 79.

A good hard look at our vehicles should reveal several heretofore invisible PI applications and will greatly assist in answering that big question of, "What do we have ?"

M60A1 Tank Evolution

M-60A1+
1971 TLAC
1972 AOS = M-60A1 (AOS)
1974 T142

M-60A1 (AOS)+
1975 RISE ENG
1975 IMP ELECT = M-60A1 (RISE)

M-60A1 (RISE)+
1977 CDR/GUNNER PASSIVE SIGHT
1977 DRIVER'S VIEWER
1977 DEEP WATER FORDING KIT
= M-60A1 (RISE PASSIVE)

M-60A1 (RISE PASSIVE)+
1978 LASER RANGE FINDER
1978 SS COMP
1978 SMOKE GL
1978 M240 COAX MG
= M-60A3

M-60A3+
1979 TANK THERMAL SIGHT = M-60A3 (TTS)
1979 ENG SMOKE GEN

Figure 2

CPT DONALD B. SKIPPER was commissioned in Infantry upon graduation from OCS in 1969. He has commanded both Infantry and Armor units. A former staff officer in the 3d Armored Division, he received a branch transfer to Armor in 1972. He is a graduate of the University of Southern California with an MS in Systems Management and is currently serving with the DPT, Aviation Br, Fort Knox, Ky.

CPT EDWARD M. KANE was commissioned in Medical Services upon graduation from Rutgers University in 1972 and received a voluntary branch transfer to Armor in 1973. He has served with the 2-6 Cavalry as platoon leader, troop executive officer, squadron S-4, and tank company commander. CPT Kane is currently assigned as a project officer with the Logistics Division, Office of Armor Force Management, Ft. Knox.

A Debt That Must Be Paid

SLEEP LOSS

by Captain Richard P. Geier

It is 0230 hours, the team is deployed in a night defensive position on the third night of a joint training excercise. The team commander is in his tank slumped over the M-36 sight box. The radios are turned up. A report from the scout platoon blasts over the radio. A company-sized force is moving toward the team's position. The commander attempts to alert his platoon leaders. One answers immediately, but the others do not respond. Frantically, the commander sends his loader to alert the platoons while he curses himself for dozing, the company CP for not keeping the platoons on the net, and the platoon leaders for not monitoring the radio. Fortunately, the team commander is able to awaken his unit, maneuver, and destroy the enemy force. After the exercise is terminated, the commander wonders what happened to the sleep discipline that had been stressed during the previous month's training and ARTEP. Because of safety constraints, night operations were limited to static defense. The company's SOP called for 50 percent alert during a night defense, which would require two people asleep in each tank at all times. So why were the troops so exhausted? What condition would the unit be in after 4 days and 3 nights conducting an active defense against the Threat in Europe? Could sleep loss lose the first battle of the next war?

Few studies are available on the effects of continuous operations on soldiers. Research conducted by the Navy reveals that sleep loss is the most detrimental factor to extended operations. The emphasis of their research is on the effects of sleep loss on sailor's work efficiency. The results indicate the following:

- The mean duration of sleep under normal conditions is 7.5-8 hours.
- Younger individuals (20-39) require an average of 1 hour more sleep than the older group (40-59).
- The human body is not equipped to anticipate shortened sleep cycles and to adapt accordingly.
- Failure to receive the required sleep results in a backlog or sleep debt. The only way to eliminate this debt is to allow an individual 1 hour of sleep in addition to his normal required amount.
- Performance degradation as pertains to vigilance does not disappear with less than 3 hours of sleep.
- A minimum of 5 hours of sleep is required to enable an individual to maintain an acceptable level of consistent and reliable performance.
- The physical and psychological recovery from the effects of sleep loss is accomplished by the acquisition of the normal, uninterrupted sleep period.
- High stimulus or motivation will readily override the detrimental effects of sleep loss on performance for a short period of time.

Many studies on continuous work have been done by civilian universities under Army contract. These studies were conducted in a laboratory using college students as test personnel and because of this the results are not totally valid for Army use. However, some data can be of use to the Army in predicting effectiveness and perhaps lessening the effects of sleep loss. These effects are:

- The first work performance decrements occurred after approximately 18 hours of work. During the early morning hours of the first night, average performance decreased to approximately 82 percent of the baseline performance. During the first half of the second day, performance improved to about 90 percent of baseline, but decreased again during the second night to approximately 67 percent of baseline. Recovery of performance baseline was complete after a 24-hour period of rest and recovery.
- Following 36 hours of continuous work, 2, 3, and 4 hours of sleep yielded an immediate recovery in performance of about 76 percent, 56 percent, and 75 percent, respectively, whereas 4 hours of sleep following 44 hours of continuous work produced only a 39-percent recovery.

"Commanders must cope with the effects of sleep loss on their own performance as well as their troops. They must train and trust subordinates to command their unit while they sleep."

- A temporary improvement in job performance, speed,and accuracy after sleep loss is common. However, this improvement requires nearly three times the expenditure of energy and over a period of time, work output drops alarmingly.
- Physical strength remains unimpaired until extreme levels of sleep starvation are realized.
- Moderate exercise, especially of the large muscles of the body, tends to increase alertness and helps sustain good performance.
- The most difficult jobs for the sleep-deprived individual are ones which require sustained attention to brief, intermediate signals and those that require complex, swift decisions or planning.
- Sleep loss typically causes errors of omission, not commission.
- Continuous operations can increase an individual's caloric needs to as much as 10,000 calories a day. There is some data to suggest that sleep loss leads to iron deficiency, vitamin B deficiency, dehydration, and an impaired capability to fully utilize glucose as an energy source.
- Prolonged thermal exposure, confinement, noise and vibration stress (all present in armored vehicles) degrade performance and ability to cope with sleep loss.
- The degree of job training may affect continuous work performance. Studies indicate that highly-trained individuals can be expected to work continuously at 50 percent of their maximum for a period of 8 hours, whereas untrained individuals cannot be expected to work at much more than 25 percent of their maximum over the same period.

To minimize the effects of sleep loss, commanders should consider the following action:

- Insure that troops are motivated, trained, and properly led.
- Provide increased rations, water, vitamin B, and iron supplements to sustain troop effectiveness under the stress of sleep loss.
- Increase supervision during the hours of 0100 to daybreak to offset the reduced vigilance during these hours.
- Insure that troops receive some sort of exercise. If possible get them away from confinement, noise, vibration, and excessive heat or cold stress for a period of time. Even stopping the tank, and walking around it to check the track and suspension may help.
- In a lull in the battle, give half of the unit 7 to 8 hours of uninterrupted sleep rather than split the watch and give each half 4 hours.
- Realize that the younger the soldier, the more sleep he requires.
- Accept as a natural law that the human body cannot anticipate shortened sleep cycles or sleep loss. Neither through practice nor any other means can soldiers perform effectively with a sleep debt for an extended period of time.

Most importantly, commanders must cope with the effects of sleep loss on their own performance as well as their troops. They must train and trust their immediate subordinate to command their unit while they sleep. Command decisions in future battles cannot be degraded by sleep loss. We can no longer afford to let our executive officers dedicate themselves to maintenance problems and run themselves into exhaustion doing a motor sergeant's job. They must be aware of the tactical situation, receive adequate rest, and be trained and capable of conducting tactical operations while the commander sleeps.

These "tips" may help reduce the effects of sleep loss for 48 hours or less, but what can be done if troops are required to function for over 48 continuous hours? Drugs to prevent sleep are not the answer, since harmful side effects and individual variation of dose rates seem to be an insurmountable problem. Drugs or devices to induce sleep and give an individual an equivalent 8 hours of sleep in 1 hour or less do not appear to be available in the near future because of harmful side effects.

Will units conducting the active defense against the Threat in Europe have lulls in the battle that will allow sleep recovery? It is not likely. Since 1954 the Threat has made continuous combat operations the main principle of their combat doctrine. Their doctrine states, "the offensive...will be conducted night and day...without letup until the enemy is defeated."

Four days after the battle begins the Threat will have rotated units into the battle. Will we be able to defeat these units or will the Threat forces find American soldiers asleep in tanks, trucks, and foxholes?

Unless our need for sleep is overcome or our force structure is redesigned to rotate units in and out of the battle, sleep loss could lose the first battle of the next war.

CPT RICHARD P. GEIER was commissioned in Infantry from Pittsburg State University, Pittsburg, Kan. He served as platoon leader, company XO, BMO, S-4 and S-3 air in the 1-37 Armor, Katterbach, Germany. He was a platoon leader and company XO in the 1-39 Inf.; CSC commander, 2-1 Inf.; and company commander, 2-77 Armor. A recent AOAC graduate, he is assigned to the Battlefield Automation Management Directorate, CACDA, Ft. Leavenworth, Kan.

CHECK YOUR WHIP!

by Captain David M. Fiedler, N&NG

The *AS-1729* vehicle whip antenna system is probably the most used and possibly the most abused piece of FM radio equipment in use in the Army today.

Mounted on every type of ground vehicle the whip sections of this antenna are constantly subjected to collisions with trees, bridges, and other overhead obstructions. These repeated collisions cause the internal parts of the whip sections to eventually come apart, causing both the transmit and receive path of the antenna to be broken.

Testing the *AS-1729* whip is typically accomplished using an inline *AN/URM-182* wattmeter to determine the amounts of forward and reflected power in the antenna system. When the ratio of forward to reflected power exceeds a certain specified value, the antenna is considered as possibly defective and replaced. If the proper ratio is then obtained with the replacement, the old antenna is definitely defective.

This system works well if the proper test equipment is available, but there is a pronounced lack of this equipment below battalion level.

However, company-sized units can construct the detector device shown in figure 1 for two dollars. This device used in conjunction with DC ma scale of any standard volt ohm meter (VOM) such as the *TS-352* currently available at company level, will allow company communication personnel to measure the radiated radio signal.

By comparing readings from a known good antenna system with other antennas in the unit, defective antennas can be identified.

The detection of the correct radiated signal levels, using this method, will also assure the operator that the transmitter, antenna cable, and antenna matching unit are also functioning properly since defects in any of these components will cause the level of DC ma in the detector device to be reduced when compared to a known good system. Component replacement until proper levels are shown on the VOM will provide a method of further identifying defective components.

The impact of this method of unit-level testing on unit readiness is dramatic. Units using this device and the method of component substitution have successfully reduced the rate of defective installed radio systems from 52 percent of installed equipment to less than one percent.

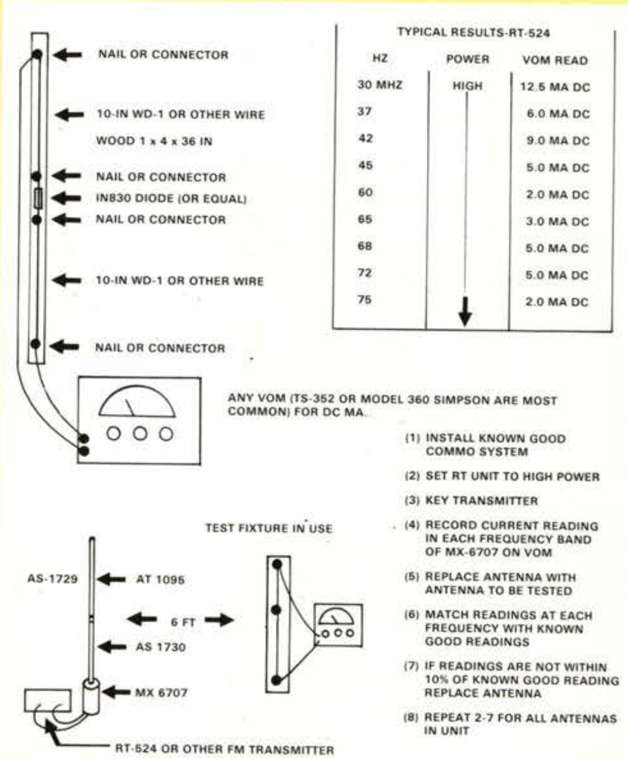
A schematic of a typical, low-cost test fixture and instructions for its use are shown in figure 1.

Technical information pertaining to the test follows.

Keying the radio transmitter results in radio frequency energy being sent via coaxial cable to the antenna base. This energy is then coupled to the antenna whip, which has been electrically tuned by the matching base for optimum signal radiation. A defective antenna will result in little or no signal radiation.

When the test fixture is mounted 6-feet from the transmitting antenna, the strength of the radiated signal can be measured on the VOM. Radio transmission induces a current proportional to the radiated signal in the VOM meter leads and the 10-inch lengths of WD-1 wire on the test fixture. The diode converts this induced RF current to a DC current which is then measured using the DC ma function of the VOM.

By starting with a known good transmitter antenna and coaxial cable, a baseline of signal strength readings for a specific antenna/radio combination can be established at various frequencies. If all components of the system are then allowed to remain fixed except for the known good antenna whip being replaced with the antenna to be tested, the respective signal strength readings (DC ma) can be compared. Defective antennas will have a greatly reduced radiated signal and should be replaced. Antennas with readings close to the established baseline are not defective.



TYPICAL RESULTS-RT-524

HZ	POWER	VOM READ
30 MHZ	HIGH	12.5 MA DC
37		6.0 MA DC
42		9.0 MA DC
45		5.0 MA DC
60		2.0 MA DC
65		3.0 MA DC
68		5.0 MA DC
72		5.0 MA DC
75		2.0 MA DC

When performing this test, care must be taken to:

- Change or move nothing except the antenna whips to be tested.
- Insure that the antenna matching unit base is functioning properly.
- Insure the coaxial cable between the radio and antenna base is properly connected and is not defective.

USAARMS Comment

A test fixture was constructed as suggested by the author, using one diode IN914. Tests were then conducted by the C-E Division, Command and Staff Department, U. S. Army Armor School on antennas AS-1729 and AS-2731. Test results generally substantiated the author's findings. However, slight changes in the relationship of the test fixture to the radiating antenna caused major deviations in the readings on the volt/ohms meter, TS-352. Although the test fixture may be of value for use in conjunction with antennas mounted on wheel vehicles, it was not considered practical for use with antennas mounted on track vehicles. ▲

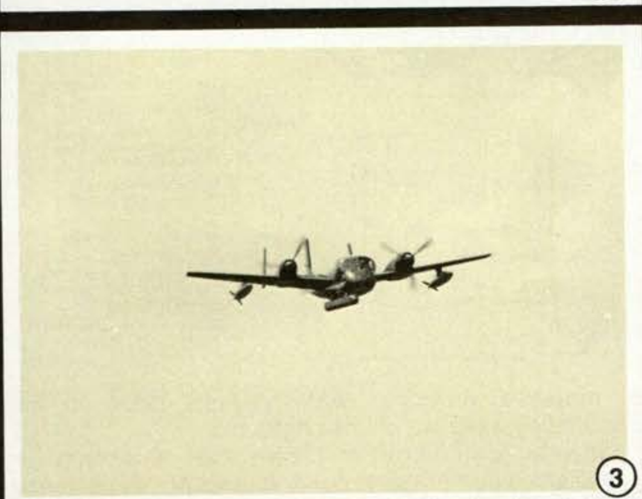
Recognition Quiz

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 59)


1


2


3


4


5


6

PROFESSIONAL THOUGHTS

UNTIL THE TUBES MELT

As a more-than-casual observer of factors affecting the Army's fire support, I'm very concerned and disturbed at the "bad press" the Field Artillery has been getting lately. There have been charges made by sources with great credibility and influence that the Field Artillery is "operating in splendid isolation;" developing a "golden gun" mentality; forgetting the soldier in the foxhole; trying to be all things for all missions, etc.

These charges result from what is viewed as a massive proliferation of munitions in recent years: *Copperhead* and other precision guided munitions; changes in doctrine (counterfire); new organizations (FA Brigade, FIST, dissolution of corps artillery); and new hardware "toys" (GSRS, TACFIRE, *Firefinder,* lasers, hand-held calculators, etc.)

The Field Artillery *is* changing. This is due to the development hiatus during the Vietnam years, the changing threat, lessons learned from the Mideast War, fruits of technology, changing force structures, and many others. Even our branch mission has changed. With Soviet advantages in numbers, we must use technology and our brains to overcome the disparity. But all the furor has not caused the Redleg Community to lose sight of its primary responsibility—to kill as many enemy as possible and by so doing, to save as many friendly maneuver guys as possible. Our *formal* mission statement is more verbose, but it boils down to doing all we can to make the maneuver guys' job easier and less costly in lives. It is absolutely *essential* that Armor and Infantry believe that every change in equipment, organization, and doctrine made by the Field Artillery is directed toward that end. There is no self-aggrandizement intended. We do not want to be prima donnas. We seek no preeminence among the friendly forces on our side of the FEBA. What we do want is preeminence over the enemy.

Two facts about the next war are dominant in our plans and actions:

- Based on analyses of the threat, most American casualties in a future European war would be caused by Warsaw Pact fire support.
- If the second echelon Warsaw Pact armored forces reach the front without suffering *major* losses, we cannot hope to hold them with conventional munitions.

Because of these two admittedly oversimplified statements, the Field Artillery is doing those things which will attack enemy fire support (emphasis on counterfire) and destroy as many maneuver forces per round of artillery as possible (emphasis on precision munitions, extended ranges, faster rates of fire, streamlined command and control, more accurate and rapid target acquisition, more lethal munitions).

Every new organization, every piece of hardware, and every change of doctrine is tied tightly to one of the preceding goals. A prime example of our development effort is the fantastic counterfire capability we have to detect, locate, and return fire on an enemy mortar *before impact* of the first mortar round our *Firefinder* radar "saw."

There is great concern among the frontline troops that, because the Field Artillery is focusing on a belt 8-30 kilometers beyond the FEBA, we (the Field Artillery) have forgotten the direct support of the man in the foxhole. Nothing could be further from the truth. All the man in the foxhole needs to do to correct that misconception is to make a list of the number of Soviet tanks, personnel carriers, and artillery tubes to an area 3 kilometers to his left and right and to a depth encompassing the Warsaw Pact second echelon, and then envision that force rolling through his sector. Only by concentrating our fire support assets at as great a range as possible, as early as possible, and firing as fast and accurately as possible with efficient munitions, can we narrow that list down to proportions manageable by the tank crew, TOW gunner, and rifleman.

Whatever happens, as long as the bullets last and until the tubes melt, there will *always* be those final protective fires for which the Field Artillery has always been known and respected by the soldier.

Also, our maneuver comrades need to keep in mind that the priority of targets the Field Artillery attacks (counterbattery or enemy maneuver) is only *recommended* by artillerymen. The division commander and brigade commander, 95 percent of whom are from maneuver arms, *make* the decisions.

Edmund Burke wrote more than 200 years ago, "All that is required for the triumph of evil is for good men to do nothing." The Field Artillery is doing something!

William A. Cauthen Jr.
Lieutenant Colonel, Field Artillery
Editor, *Field Artillery Journal*

SERVICE INTEROPERABILITY

In much of my recent reading I have seen numerous references to the pressing need for standardization of equipment with our NATO allies to make our defense dollars, marks, francs, pounds sterling, etc. go as far as possible. If standardization cannot be achieved, the flag of "interoperability" is waved; use common fuels, ammo, and spares as much as possible. This is all very commendable, yet the idea of interoperability among our own services has been ignored to a great extent.

Our services use similar small arms and some aircraft cannon are common, usually because one service has purchased an extremely large number of items and the other services use those items that fit their needs. An *M-60* machinegun and a .45 caliber *M-1911A1* pistol serve equally well in the naval boarding party, the army infantry squad, and the marine fire team.

What about the big stuff? Navy dual purpose guns include 3-, 5-, 6-, and 8-inch weapons. The Army and Marine common guns and howitzers include 90-, 105-, 152-, 155-, 175-, and 203-mm.

The ammunition is not interchangeable between the land and seaborne weapons, yet rounds for the Navy 5-and 6-inch guns are probably comparable in design to the Army 155-mm round. Given the tight defense dollar and limited personnel resources, common materials could well help us win the next war.

Present day interoperability may not be easy to reach, but it is possible for the next generation of weapons. For example, reline the 155-mm (6.1 in.) to naval 5-in., 54-caliber, dual-purpose tubes to make the tubes compatible. One may even be able to obtain a number of spare 5-in., 38-caliber gun tubes for use on older *M-101A1* and *M-114* howitzer mounts. However, these are medium- to long-term projects. We must consider a short-term project where Army and Navy cooperation can best serve both services.

From the July-August 1977 issue of *ARMOR*, one takes the 75-mm hypervelocity gun being developed by ARES Corporation to use the AAI Corporations's 75-mm KE round. In 1964, the Italian firm of OTO Melara introduced an automatic 76-mm weapon that has been adopted by the U.S. Navy as the 76-mm, 62-caliber *Mk75* dual-purpose gun. While not all the naval characteristics would be useful in land weapons for tanks, some features would be useful. Consider the 925 m/sec muzzle velocity with a 6.2-kg shell. Range is about 16 km and the rate of fire is 85 rounds per minute. Change the loader to turret use with a three-round "clip" for burst fire and you could have a good tank gun. The Army version would possibly need a strengthened chamber for higher pressure and muzzle velocity. Many parts and manufacturing operations could be made common to Navy and Army versions. Except for APDS the bulk of the ammunition would be common. Think it's worth a try?

In summary, interoperability between the U.S. services would be every bit as advantageous as such a capability within NATO. As with the 76-mm, 62-caliber *Mk75*, a look at the other guy's toys might be useful.

GORDON J. DOUGLAS
LaHabra, California 90631

DRS AT COMPANY LEVEL

Captain Geishauser's article "Lets Talk DRS" in the September-October 1977 edition of *ARMOR* was a very informative article describing some of the changes that will take place under DRS. However, this article deals primarily with battalion-level changes and as all tankers know, those who must face the enemy "gun tube-to-gun tube" are down at platoon and company level.

For 2½ years, I was the leader of a platoon that, for one reason or another, never had more than four tanks operating at any time. Most of the time I had only three. So, in reality, my platoon had been restructured for 2½ years before DRS.

The major problem I had was that there was no internal platoon overwatch section. I had to rely on another platoon. Of course, control was easier with three tanks, but I did not have the other platoon to train so that I could have a five-tank platoon with a platoon sergeant familiar with the way I operate and move. When I was fortunate enough to have four tanks in my platoon, I could use overwatch internally without relying on another platoon. I also liked having the fourth tank because my firepower was increased. For the increase in firepower and the ability to have internal overwatch, I believe the DRS platoon should have four tanks.

For those that still believe that three tanks per platoon is the answer, why not have four platoons per company instead of three. Reasons for having four platoons include increased firepower (14 tanks to the 11 proposed for DRS), two platoons for overwatching two leading sections, and finally, three platoons could be forward while the fourth platoon acts as a reserve with the XO's tank. (For those unfamiliar with DRS, the tank company XO is in a tank.)

A further reason for the increased number of tanks is maintenance and breakdowns. How many company commanders have left the tank park for field training with the current TO&E of 17 tanks? Suppose for some reason he leaves with only 14 or 15 tanks and conducts a 20 to 25 kilometer tactical road march over rough tank trails. How many tanks were left along the trail with breakdowns? Let's assume three or four were lost. Now he is ready to be committed to battle with 11 or 12 tanks. This sounds like a DRS company still in the tank park. Apply similar percentage losses to a DRS company and he arrives in a forward assembly area with seven or eight tanks. As a company commander, I would hate to face an enemy force with only seven or eight tanks and not yet have lost any to enemy fire. It is for these reasons that I believe the DRS TO&E should be raised from 11 tanks per company to 14.

Another area of comment concerns maintenance. Under the DRS proposal, all maintenance personnel would be taken away from the companies and consolidated in a maintenance company at battalion. When maintenance personnel are needed, a contact team would be assigned to each of the companies. I believe that there are numerous problems with this concept.

First of all, any commander knows that troops who are not in his unit under his command are not as responsive to his wishes as troops that are. A maintenance company commander of lesser ability may tell his contact teams to be back from assignments in garrison by 1630 hours. However, the tank company commander may have further maintenance problems that must be corrected in time for field training early the next morning. In this situation, the CO must waste time in getting the maintenance officer to release the team to work longer. Granted, this may be an exaggerated case, but it could happen.

While I agree that the current TO&E tank company maintenance section appears a bit overmanned, I do not believe all maintenance personnel should be sent to battalion. As a company motor officer, I would like to have a 3- to 4-man maintenance section retained at company level. This section should include one track mechanic, a turret mechanic, a radio mechanic, and a motor sergeant. A track mechanic and a radio mechanic can make minor repairs using their tools and the vehicle's crew without calling the contact team. As turrets become more complex, the turret mechanic becomes indispensable because he can make minor repairs quickly. The motor sergeant should be retained to supervise these men since the XO will be in his tank and unable to supervise their operations. These mechanics should be at least E-5's and have considerable experience because they will not have the highly-trained supervisors that would be available at the maintenance company. This section could save considerable vehicle down-time by being able to make minor repairs quickly, and should the contact team be needed, this section could give guidance in defining the problem thereby saving time and effort in getting the vehicle back on line. This is what the maintenance section's job is all about.

I have tried to bring to light some changes I believe are necessary if DRS is accepted. I sincerely believe that these changes will improve DRS at the platoon and company level. I have purposely kept my comments at these levels since this is where I have spent my time in Armor. I hope that someone in a policy-making position on the DRS staff thought of these comments and possibly feels as I do. If DRS is ultimately accepted and we reorganize, I hope that every thought and comment is made so that the U.S. Army can field the most potent fighting force in the world.

FRED W. BURT
First Lieutenant, Armor
North Carolina Army National Guard
Fuquay-Varina, N.C. 27526

FIGHTING VEHICLES

Rereading the May-June Professional Thoughts article, "The Gut Issue," by Colonel Sidney S. Haszard and the article, "Modern Infantry's Role," by Major B. R. McCaffery condensed from an article in January 1978 *Military Review* published in the same issue, concerning the difference in emphasis in combined arms operations between the Infantry and Armor, I am reminded of events which occurred from 1962 through 1964. These events may not have initiated, but they assisted in bringing about at that time, a reappraisal of infantry-armor operations, which apparently is still a subject of concern.

In the late 1950's and early 1960's, the basic infantry-armor doctrine was that the infantry would be transported in *M-113's* following the tanks as far forward as possible and then dismount to accomplish their assigned mission.

This meant that they would have to go forward of the tanks to destroy entrenched enemy infantry with hand held anti-tank weapons. After their mission had been accomplished, the *M-113's* would move forward, the infantry would mount up, and the attack would continue. This is greatly oversimplified, but it describes the basic doctrine as I generally understood it.

During this period, I was involved with the testing and procurement of the *HS-820,* 20-mm gun, built in the Federal Republic of Germany (FRG) under license from Hispano-Suiza by Rheinmetall and utilized by the FRG Army in the *HS-30* armored personnel carrier and, I believe, also in a lighter scout vehicle built by Hotchkiss.

During trips to the FRG on the 20-mm gun program, I was exposed to the new FRG armored personnel carrier (APC) program which eventually led to the introduction of the *Marder.*

Colonel Kettman, the project officer on this vehicle (who incidentally has since retired and headed the FRG observer team in the U.S. for recent evaluation of the *XM-1* and *Leopard II* at Aberdeen), showed me and other U.S. personnel some training films demonstrating combined German armor-infantry operations.

In these films, which were narrated in German, the APC's were in the same formation with the tanks. As an interim measure, the *HS-30's* had a roof which could be raised to allow the infantry to fire from the vehicle, rather than remain buttoned up as in the *M-113's.* The future German APC would have firing ports.

When dismounted operations were required, the infantry very rapidly and with little exposure to enemy fire as possible, exited the vehicle and made their assault, or moved into position as required. The personnel carriers remained close to them and supported them with their 20-mm guns. When the dismounted engagement was completed, the infantry reentered the personnel carriers and the formation continued to advance.

The specific details of each film are not important, however, the basic concept, and the German implementation appeared to be worth analyzing. The FRG was very cooperative and allowed us to borrow the films. Inasmuch as I had seen them several times and had listened to the translation, I was able to narrate them in English.

At this time, the Army Materiel Command, (now DARCOM) suggested we show them to the DA Staff. We also showed the films to the Infantry and Armor Centers as well as the Combined Arms Group at Fort Leavenworth. The late General Creighton Abrams, who at that time was DCSOPS, was already familiar with the German concept and viewed the films with great interest.

A program evolved to test the concept at CDEC with modified *M-113's* and then produce a few prototypes to be called Mechanized Infantry Combat Vehicle '65 (MICV '65). These vehicles were then to be utilized to establish materiel requirements for the vehicle to succeed the *M-113* and further evaluate the tactical concept.

The MICV Program, now the Infantry Fighting Vehicle (IFV) and Cavalry Fighting Vehicle (CFV) programs evolved from the initial effort. The *HS-820,* 20-mm gun became the interim vehicle rapid fire weapons system. Later it became the *M-139* 20-mm gun and was mounted in *M-114's* used in Europe. The Vehicle Rapid Fire Weapons System Program itself became the Bushmaster Program and produced the weapon to be utilized in the IFV and CFV.

Admittedly this is a very sketchy outline of these activities, but it is an example of the problems involved, and the equipment development time required to introduce a major change in tactical doctrine. Having been away from this program for over 10 years, I am not certain of the current DA guidance for employment of the tank and IFV-mounted infantry team, however, it is evident from the two articles mentioned previously that there are still questions in the minds of the troops in the field.

I think my Professional Thought in this area can be summed up by simply saying that a change in tactical doctrine involves combined arms cooperation, analyses, materiel development, and training, and as shown in a very condensed manner by this discussion, with our present organization, takes a long, long time from concept to introduction in the field.

GEORGE A. TUTTLE
Colonel, U.S. Army (Retired)
Warren, Mich. 48093

WHY THE ARMOR TRAINEE JOINED

by Captain James M. Georgoulakis

In 1973, two great events occurred in the history of the United States military. First, the United States terminated active participation in the longest war of our history, the Vietnam Conflict. This complex struggle in Southeast Asia had been fraught with unparalleled economic, cultural, political, educational, and social problems. The consequences of this controversial war on the nation are being argued by social and behavioral scientists as well as the general population. Secondly, the United States terminated the draft and would now rely upon volunteers to provide for the common defense and maintain a military force second to none.

However, shortly after the inception of the all-volunteer force (AVF), politicians, social scientists, military personnel, and the public began to question its merits. Is the AVF meeting the needs of the country? Is it representative of all the people of the country? Who is volunteering and why? Will we have enough men in the combat arms? Today, 5 years later, the debate has not subsided. It has been fueled by the increasing disagreement of the role of women, the dwindling supply of qualified males, and an assortment of other issues.

In an effort to shed light on some of the questions, the Community Mental Health Activity (CMHA) at Ft. Knox, Ky. has been engaged in a number of research projects. This report concerns itself with the Armor trainee and why he joined the Army.

Table 1. CMHA Basic Trainee Questionnaire

DIRECTIONS: Listed below are 21 reasons why individuals stated they joined the Army.
Please check the ones that apply to you.

Age_____
EDUCATIONAL LEVEL (Please circle one) 4 5 6 7 8 9 10 11 12
HSG ___________ Years of college.

1.	I wanted to help the country	________
2.	I wanted the educational benefits	________
3.	I needed the job	________
4.	I needed the money	________
5.	I wanted the medical benefits	________
6.	I wanted to travel	________
7.	I always wanted to be a soldier	________
8.	My recruiter talked me into it	________
9.	My parents wanted me to	________
10.	I wanted an early retirement	________
11.	I wanted a break from school	________
12.	To get away from problems	________
13.	Either jail or the Army	________
14.	My father was in the Army and he wanted me to come in	________
15.	I came in because a buddy joined	________
16.	I wanted to get away from home	________
17.	I wanted to develop a special skill	________
18.	Just on an impulse	________
19.	I needed something to do	________
20.	To be a man	________
21.	None of the above	________

The sample consisted of 1,068 Armor trainees who underwent training during May through August of 1978. All individuals included in this sample had enlisted for an Armor MOS and were scheduled to undergo their basic combat training and advanced individual training at Ft. Knox.

The instrument that was administered to the trainees consisted of a 21 item, forced-choice questionnaire. (See table 1.) These questions were developed by the author with input from the CMHA staff.

The procedure for obtaining the data was completed in the following manner: After the evening meal on the day before shipping to individual training units, the trainees were assembled and briefed by the author or a senior NCO. Included in this briefing were explanations of the research project and an assurance that no individual information would be passed on. Furthermore, they were told that it would be extremely difficult, if not impossible, to track individuals because age and educational level (either high school graduate (HSG) or non-high school graduate (NHSG), would be the only identifying data. Those trainees who completed a GED prior to commencing their Army training were included in the high school graduate group.

Once the data had been obtained, it was treated by a number of methods. The sample was separated into two groups—HSG and NHSG. Then each of these populations was studied with respect to a frequency distribution for positive responses and age. Following this, percentages were calculated for each reason and age level. Next, measures of central tendency were calculated for age and frequency of responses, and finally a comparison between the two groups was conducted.

The first population studied consisted of those individuals who had completed high school. This group consisted of 860 trainees or 81 percent of the total sample studied.

In terms of frequency and percentage of age levels, the HSG group was comprised as follows:

Table 2. Age Levels of High School Graduates

AGE	FREQUENCY	PERCENTAGE OF POPULATION
17	155	18
18	409	48
19	140	16
20	53	6
21	24	3
22	29	3
23	12	1
24	10	1
25+	26	3
30+	2	1
TOTAL	860	100%

Figures in table 2 show the high percentage of individuals in the 17- to 19-year-old range. As a matter of fact, the individuals in the age groups 17-19 comprised 82 percent of the total population of the HSG group. The next question is, why did these young high school graduates join the Army? Table 3 contains the answer.

The data shows that only four of the 21 statements were positively answered by 50 percent or more of the sample studied. Even more interesting is the fact that the desire to help the country is one percentage point from being the second most popular reason for joining the Army by this particular group of Armor trainees. Only 13 percent of the sample studied credited the recruiter as being an influence on their enlisting.

When reviewing the measures of central tendency for the number of statements answered, the trainees averaged slightly more than six responses per questionnaire. This figure may indicate that the trainees gave some thought as to what statements were applicable to them, or that the statements listed on the questionnaire were not applicable to them. However, based on the low response (77) to the statement, "none of the above," it would appear that the first assumption may be closer to the answer.

Table 3. Reasons for High School Graduates Joining the Army

RANK ORDER

RANK	STATEMENT	FREQUENCY	PERCENTAGE
1.	I wanted the educational benefits	495	58
2.	I wanted to develop a special skill	442	51
3.	I wanted to travel	429	50
4.	I wanted to help the country	428	50
5.	I needed the money	320	37
6.	I wanted the medical benefits	310	36
7.	To be a man	285	33
8.	I needed the job	261	30
9.	I always wanted to be a soldier	260	30
10.	I wanted to get away from home	201	23
11.	I needed something to do	134	16
12.	I wanted an early retirement	117	14
13.	My recruiter talked me into it	111	13
14.	To get away from problems	100	12
15.	None of the above	77	9
16.	I wanted a break from school	60	7
17.	Just on impulse	55	6
18.	My parents wanted me to	54	6
19.	I came in because a buddy joined	49	6
20.	My father was in the Army and he wanted me to come in	44	5
21.	Either jail or the Army	4	.005

The second population studied consisted of those individuals who did not complete high school. A total of 208 trainees comprised this group. In terms of percentages, this group accounted for 19 percent of the total population studied.

In terms of frequency and percentages of age levels, the NHSG group was comprised in the following manner:

Table 4. Age Levels of Non-High School Graduates

AGE	FREQUENCY	PERCENTAGE OF POPULATION
17	57	27
18	75	36
19	32	15
20	12	6
21	17	8
22	7	3
23	4	2
24	1	1
25-30	3	2
TOTAL	208	100%

Again, the figures in table 4 show the high percentage of individuals in the 17- to 19-year-old range who comprise 78 percent of the total population of the NHSG group. The next question is, why did these individuals join the Army? The answer is in table 5.

Table 5. Reasons For Non-High School Graduates Joining the Army

RANK ORDER

RANK	STATEMENT	FREQUENCY	PERCENTAGE
1.	I wanted to develop a special skill	129	62
2.	I wanted the educational benefits	127	61
3.	I wanted to travel	109	52
4.	I wanted to help the country	104	50
5.	I needed the money	99	48
6.	I needed the job	81	39
7.	To be a man	77	37
8.	I wanted the medical benefits	70	34
9.	I always wanted to be a soldier	53	25
10.	I wanted to get away from home	53	25
11.	Just on impulse	48	23
12.	I needed something to do	43	21
13.	To get away from problems	38	18
14.	I wanted an early retirement	34	16
15.	My recruiter talked me into it	26	13
16.	My parents wanted me to	26	13
17.	None of the above	20	10
18.	I wanted a break from school	18	9
19.	I came in because a buddy joined	18	9
20	My father was in the Army and he wanted me to come in	14	7
21.	Either jail or the Army	8	4

Again, only four of the 21 statements were positively answered by 50 percent or more of the sample studied. Also, "wanting to help the country," appears to be a strong stimulus for recruits wanting to join the Army. Only 13 percent of those sampled felt that recruiters influenced their decision.

The measures of central tendency revealed that the trainees averaged slightly more than six responses per questionnaire, and the low response (20) to the statement, "none of the above," indicates that the statements included in the questionnaire appear applicable to this group.

Discussion of Groups

Upon reviewing the data and with respect to the larger number of high school graduates (860 HSG vs 208 NHSG), a number of similarities can be drawn: first, the mean age levels 18.7 for HSG is similar to 18.6 for NHSG; second, the high percentage of 17, 18, and 19 year olds is similar in both groups (82 percent HSG and 78 percent NHSG); third, the number of statements checked as applicable were identical for both groups; fourth, both groups only answered four questions in the 50 percent range or higher, and all of these were the same statements; fifth, they ranked eight of 21 statements in the exact order, and reversed the order on three others, and sixth, they both revealed, (in relation to the other statements) a strong desire to help the country.

The purpose of this investigation was to examine the reasons why Armor trainees joined the Army. The sample consisted of 1,068 Armor trainees who received their training at the U.S. Army Armor Center at Ft. Knox, Ky. during May through August of 1978. The data was analyzed through the use of frequency distribution and measures of central tendency. Four statements were selected as reasons for joining the Army by more than 50 percent of the sample studied:

- I wanted to develop a special skill.
- I wanted the educational benefits.
- I wanted to travel.
- I wanted to help the country.

CPT JAMES M. GEORGOULAKIS was commissioned in the Medical Services Branch from the Univ. of Alabama in 1971 with a BS. He has since received masters and educational specialists degrees from several universities. He is assigned as the Assistant Chief of Community Mental Health Activity, Fort Knox, Ky.

A New Thrust

by Sergeant First Class Leonard E. Wright

Having only 19 years of service, all of which was served in a line unit at or below company level, I have no sympathy for staff types and cannot identify with their problems. What I can do, and with some authority, is discuss problems discerningly at a line platoon level, problems that are caused by staff types looking at the big picture. Big pictures are often quite irrelevant to efficient running of a line platoon, particularly in armor and cavalry units.

A few years ago the powers that be decided to eliminate the use of reference points on maps. Their reasons for this move were sound and based on sincere security reasons. Unfortunately they did not give us anything to take the place of the reference point.

The situation as it now stands at the platoon level of operations is that we receive one, and sometimes two CEOI's for the entire platoon. In an armor platoon we have five tanks, all with radios, and all required to send in reports other than enemy information. For normal operations this may seem sufficient, but I can't recall ever being on a normal operation. The platoon leader may get turned around and not know where he is. One of his tanks may get separated or break down. Many things can happen that require transmitting a location by radio concerning one unit of the platoon.

A few personal experiences emphasize what I am talking about. I have been involved in several REFORGER operations as a tank commander, platoon sergeant, and acting platoon leader. I have found that one of the main problems of controlling at the platoon level has been the timely delivery of CEOI's to our level. CEOI's have been compromised before being disseminated to our level, have been delivered to us out of date, and on many occasions have not been delivered at all. Try to call in a SITREP without a CEOI sometime.

I was broken down once on a REFORGER exercise, but instead of waiting all night for maintenance to come to me, I had a German filling station attendant fabricate a part. With a little ingenuity and determination I was back on the road to where my platoon was supposed to be in about 5 hours. It was only 0300 in a blizzard, and my CEOI had expired at 2400. I reestablished commo with my platoon leader by stopping another unit on the road and getting my new frequency from them. By using our old CEOI (not a good practice) and a little luck, I rejoined my platoon just in time to move out on the next mission.

Another point I would like to make has to do with tankers and scouts. Try to encode a six digit coordinate at 0300, in a moving tank, in a rain storm, with near freezing temperatures. It is very easy to make a big mistake. I have sat in an *M-113* under the above conditions and sent timely and accurate reports, but as an operations sergeant, not as a tank commander.

What is all of this leading up to? I would like to introduce you to a new (old) idea, the thrust line or the WRIGHT way.

When a platoon leader gives his operations order, he will include under para 5a—Thrust line 62916596, inch. (See map).

When the platoon leader states where his thrust line will be he also states what unit of measurement is used, inch, centimeter, etc. The Tank Commanders (TC) draw the thrust line on their maps. When the platoon leader decides where he will put his thrust line, the only rule he must follow is that he keeps the thrust line within his sector and that one end is always higher than the other. This is because you need a north point and a south point. In other words, never draw a thrust line across a longitude. That is all that is necessary, You can draw it hill top to hill top, road junction to road junction, or just about anyway you want. The thrust line is only on the maps within the platoon and gives the platoon the ability to report their positions to the platoon leader. The thrust line is used for just one operation order. The next operation order from the platoon leader will include a new thrust line.

For this method to work, all TC's must carry a 6-inch ruler or some unit of measurement determined by the platoon leader. Now you are ready to report positions.

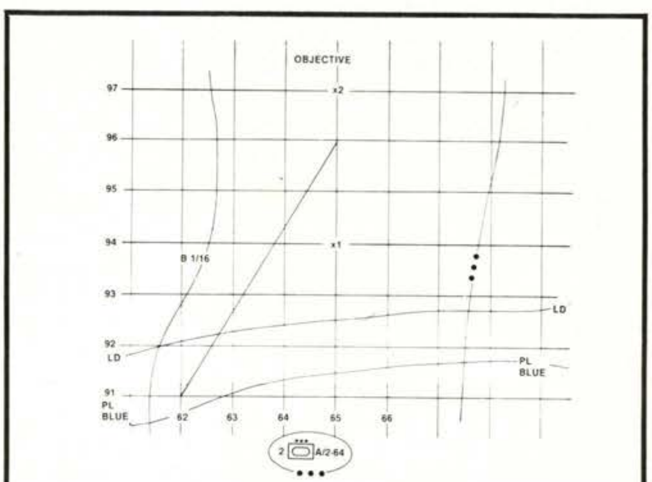
Suppose you are a TC and you get stuck. You need to call the platoon leader to let him know that you are stopped, that you need help, and where you are at. You don't have a CEOI, so what do you do? What you do is call him and state, POSITION NORTH, IN 1.5 RIGHT 1, NEED ASSISTANCE.

To determine this take a ruler and measure back from the north end of the thrust line on the map until you reach a point at a right angle to your position (the X with the one beside it) then measure the distance from that point on the thrust line to you. Basically this is the same principle as the reference point but more secure. Now the same position, but from the other end. You call the platoon leader and report, MY POSITION IS SOUTH-IN 4.5 RIGHT 1, SAME POSITION.

Now look at position two. To report this position just call in and say NORTH-OUT 1, LEFT .5.

The thrust line is simple and safe because nobody but the platoon knows where it is on a map and what unit of measurement you are using. This makes it very difficult to break, along with the fact that it's only in use for one operation. This makes it a secure way to send a message.

I think the bottom line is that armor and cavalry platoons need something they can use. My system works. I know. I have tried it and I like it. I am asking the powers that be to consider the thrust line as a possible solution to a very real problem. Let's put some fire and speed back in the platoon.



CMF 63

The Department of the Army is considering reorganizing the Mechanical Maintenance Career Management Field (CMF 63). If the proposed reorganization is approved, specially trained systems-oriented mechanics will be assigned to perform organizational maintenance on specific major combat vehicles. These technicians will be familiar with every facet of their particular vehicles, from track to turret. They will be known as master mechanics.

Organizational Maintenance

At the organizational level, automotive mechanics and turret mechanics will be trained to maintain one specific major combat vehicle or family of vehicles from among the five now in the Army inventory.

At skill level 1, apprentice mechanics will be trained to perform system-specific specialty tasks and to operate and maintain system-related recovery vehicles. In addition, they will learn to maintain selected support vehicles.

The apprentice mechanics will serve utilization tours in the organizational elements of units equipped with the combat vehicles they have trained to maintain. After reenlisting for a second term, they will be considered for attendance at a skill level 2 course. If accepted, they will receive extensive training in malfunction diagnosis with additional training in recovery operations.

At skill level 2, automotive mechanics for the improved TOW *M-113* tracked vehicles and turret mechanics will begin to cross train on the total system. Upon completing the course, graduates will be given one military occupational specialty (MOS) that represents a merger of their specialties, and they will be designated as system mechanics.

Soldiers will need 7 to 8 years of service to be eligible to attend the skill level 3 course. They will learn advanced maintenance and recovery tasks, malfunction diagnosis, equipment inspection, and battle damage assessment. All mechanics at level 3 will be cross trained on particular weapon systems. Like the *M-113* mechanics, graduates will have a merger of skills into one MOS and be known as systems mechanics.

Due to similarities in *M-60A1* and *M-60A2* automotive maintenance, soldiers in MOS 63N, skill levels 1 and 2, can maintain either vehicle. However, at skill level 3 they will be trained in turret maintenance for only one of the systems and will receive an MOS based on that cumulative training and unit experience.

Master Mechanics

The skill level 4 course will emphasize the maintenance management responsibilities of senior maintenance supervisors at the company, troop, and battalion level. Course graduates will become familiar with each track and turret component on their vehicles. They will be called maintenance supervisors or master mechanics and may be assigned to any E7 maintenance supervisor position designated for their weapon system. In addition to being responsible for organizational maintenance duties, they will lead onsite maintenance teams, train other mechanics, and teach preventive maintenance techniques to equipment operators.

At skill level 5, master mechanics will become senior maintenance supervisors at the battalion and squadron level. They will prepare maintenance operations plans, policies, and procedures. They will also prepare technical studies, evaluations, special reports, correspondence, and records pertaining to organizational maintenance operations and training. These senior master mechanics may be assigned to any E8 maintenance supervisor position designated for their weapon system. At grade E9, all system-specific specialties will merge into MOS 63Z.

Direct Support and General Support Maintenance

While systems-oriented organizational maintenance soldiers will be trained to be specialists, direct support and general support maintenance soldiers will be trained to repair all makes and models of equipment within a given commodity group or subgroup. These persons will receive training similar to that given to master mechanics. Attendance at the various skill level courses will be based upon identical reenlistment and time-in-service requirements.

At skill level 3, support-level repairmen will learn to repair all material in their commodity groupings and to supervise maintenance shop repairmen. If they are cross-trained in merging specialties, they will be called master automotive repairmen or master armament repairmen. They will be available for assignment to any E6 position designated for their MOS.

Cross training at skill level 4 will be required if MOS's merge at that level. Graduates of the skill level 4 course will be called either master automotive repairmen and ground support equipment repairmen or master armament and fire control repairmen. These master repairmen will be assigned to any E7 position designated for their specialty. All support maintenance specialties will continue to merge at skill level 5 into MOS 63Z.

MOS Consolidation

Several specialties in CMF 63 were created from specialties that existed before the proposed reorganization. For example, jobs performed by automotive repairmen, MOS 63H, have been divided between MOS's 63H and 63W. MOS's 63C, track vehicle mechanic, and 63F, recovery specialist, have been consolidated into the system specific 63 series at the organizational level and into 63H and 63W at the direct and general support level.

One new specialty, maintenance administrator, MOS 63X, has been created. This specialist will be responsible for materiel readiness records, preventive maintenance schedules, prescribed load lists (PLL), The Army Maintenance Management System, and shop supply. For the first time, the Army will have an individual above the grade of E5 who is trained in PLL and administration at the organizational level.

Implementation

Obviously, normal development of systems-specialized organizational mechanics and commodity-specialized support repairmen is a long range goal. However, individuals who have appropriate experience and training may be selected for transition training at the skill level where cross training occurs.

Upon approval of the proposed reorganization, the Training and Doctrine Command will prepare instructional material to support the reorganization. The Army expects to begin developing master mechanics and master repairmen in fiscal year 1980.

Condensed from an article in the Army Logistician, September-October 1978.

NEW NEIGHBORS

When the 2d Armored Division (Forward) set up at Garlstedt Kaserne, it became a new neighbor for Northern Army Group (NORTHAG).

What is NORTHAG? What will the relationship be?

Northern Army Group was formed in 1952 at Bad Oeynhausen, Germany. The group was made up of a Belgian, a British, and a Netherlandian corps. A German corps was added in 1957.

NORTHAG has a peacetime force of over 200,000. In the event of war, this force will be expanded quickly to over one-half million.

Headquarters for the group was moved to its present location in Rheindahlen, Germany, near the Netherlands in 1954. The area covered by NORTHAG troops is roughly from Hamburg (north) to Kassel (south) and from the Netherlands to the East German border.

The commander is a British four-star general, who in peacetime is also commander-in-chief of the British Army of the Rhine.

NORTHAG is under the command of HQ Allied Forces Central Europe (AFCENT) at Brunssum, Netherlands, and is commanded by a German four-star general.

AFCENT is part of Allied Command Europe (ACE), one of the four subordinate commands of NATO. The commander of ACE is the Supreme Allied Commander, Europe, a United States four-star general.

The 2d Armored Division (Forward) is also under AFCENT's command.

There are four national forces in NORTHAG, which in peacetime remain under national command. When the situation demands they will be placed under NATO command. The national forces are: 1st Belgian Corps, 1st British Corps, 1st German Corps, and 1st Netherlandian Corps.

The German Territorial Northern Command is responsible for the security and support of the rear areas of NORTHAG.

The 3d Brigade, acting as a forward element for the 2d Armored Division, will strengthen this multinational force.

1st British Corps has four armored divisions, an artillery division, and the 5th Field Force. During peacetime the units occupy 14 garrisons in northern Germany.

Headquarters for the divisions and field force are at Bielefield, Verden, Luebeck, Soest, Herford, and Osnabrueck. The unit at Verden (1st Infantry Division) is the nearest to Garlstedt.

1st German Corps has approximately 86,000 soldiers assigned in the NORTHAG area during peacetime. This number can be increased to 135,000 in time of emergency.

Within the corps are 25,000 combat vehicles: 1,200 battle tanks and tank destroyers; 1,000 armored personnel carriers; 400 antitank guided missile systems, and 300 guns and rocket launchers.

Headquarters for the corps' divisions are at Hanover, Buxtehude, Unna, and Oldenburg. The 32d Panzer Brigade at Schwanewede, the close neighbor and likely partnership unit for 2d Armored Division (Forward), belongs to the 11th Panzer Division in Oldenburg. Schwanewede is only about 7 miles from Garlstedt.

1st Netherlandian Corps has its headquarters in eastern Holland, but the 41st Armored Brigade, 4th Division, is stationed in Germany. The reinforced armored brigade has units in Seedford, Hohne and Langemanshof. The unit in Seedorf, near Keven, is the closest to Garlstedt.

1st Belgian Corps has about 30,000 troops, with 80 percent stationed in the Federal Republic of Germany, and the remaining 20 percent based in Belgium.

In the event of mobilization, numerous reserve units will augment the 1st Belgian Corps, which will then have at its disposal approximately 13,000 vehicles, including approximately 450 tanks, 900 troop-carrying armored vehicles, and 125 artillery pieces.

Based on information provided to EURARMY by the Public Affairs Offices, HQ Northern Army Group and HQ 21st Support Command.

TANK-DELIVERED SCATTERABLE MINES

The complexity and rapidity of technological advancements have rendered future warfare almost incomprehensible. Geometric change and an awesome Soviet threat make management of the next war a sophisticated endeavor. An "active defense" concept has evolved incorporating a strong covering force with considerable antitank capability. Its mission is not to delay, but to conduct a major defense well forward.

Main battle area elements are then to achieve depth through lateral maneuver, concentrating at the decisive time and place and accepting risks elsewhere. The fight will be one of weapons systems—"smart bombs," missiles, lasers, radio combat and computers. The first few hours may be decisive.

Soviet doctrine emphasizes the offensive and blitzkrieg-type mobility. Accordingly, US forces must fabricate a "spring" or "cushioning" effect with which overpowering thrusts may be absorbed until decisive concentration points are identified. Countermobility operations provide excellent economy-of-force measures to accommodate that strategem. In that regard, one of the most innovative and potentially rewarding new concepts is the evolution of dynamic obstacle systems constituting the family of scatterable mines (FASCAM).

Characteristics of the next war preclude reliance on conventional obstacles alone. US forces will be afforded neither the time, materiel nor manpower to establish effective conventional barriers. But dynamic obstacles may be delivered during a battle in direct response to a specific tactical situation. Employment will, therefore, be more timely, responsive and productive, as well as more cost effective.

Higher lev~l staffs may manipulate increasingly complex systems to support the line, but soldiers who face the enemy must always rely on self-sufficiency and immediately available assets. Forces are invariably task-organized into combined arms teams for that reason. Communications and support are undependable luxuries. This rationale should be applied to the FASCAM evolution.

The capability to employ air-delivered, scatterable mines needs to be decentralized to the company/team level. This can best be achieved not by further attachments, but by enabling tanks to deliver scatterable mines by firing in an indirect fire mode just as mines are now delivered by artillery howitzers. Considerable literature exists exalting the attributes of the artillery-delivered remote antiarmor mine systems (RAAMS).

Consider now the advantages of a comparable system available to armor units. Platoon, team, and task force commanders would have tremendous countermobility options with which to influence a battle. Applications include blunting, canalizing, and restricting enemy movements, and protecting flanks in both offensive and defensive situations. Such a capability would also be highly effective in responding to enemy vertical envelopments and would be advantageous in rear area security operations.

Forward-deployed units in an active defense could use the system to reinforce defensive positions, develop kill zones and protect flanks in order to remain longer in the forward-most positions. Minefield locations could be impromptu. Traditional command and control considerations such as problems involved when coordinating support and accepting responsibility for emplaced mines would be unnecessary.

Integration with fire and maneuver schemes would be ensured because the system would be controlled by frontline combat units, not by a rear-based support system. The short life of the mines would not require recording, marking, release authority, fire request channels, or the use of artillery or engineer assets. Mines could be designed to terminate by a combination of self-destruct detonation and variable neutralization times producing more inert mines to further confuse the enemy.

The system could be delivered only minutes before the enemy arrives at the target area. A standard 300-meter by 250-meter RAAMS minefield with a density of .001 mines per square meter is presently available by firing 12 artillery projectiles. Studies have concluded that, in general, low-density minefields are most cost-effective. Accordingly, from one to five tanks firing a total of from two to 10 projectiles, even piecemeal if required by the situation, would be effective.

Because armor projectiles have fixed charge and fuse combinations, range is a direct function of gun tube elevation. An *M-60* tank gun elevated at 20 degrees fires a 105-mm high-explosive plastic round approximately 7,642 meters. An *XM-1* 120-mm gun would have a much greater range. Assuming a FASCAM projectile is developed with comparable ballistic characteristics, armor units could accurately emplace minefields in any direction at sufficient range to influence immediate tactical situations.

Accordingly, a projectile should be developed for use by the *XM-1* tank equipped with a 120-mm gun. The *XM-1* tank is being developed to utilize only two types of projectiles—armor-piercing, discarding-sabot, and high-explosive antitank. Rounds designed specifically for destroying personnel and materiel such as canister, beehive, and high-explosive plastic are not programmed.

Incorporation of a FASCAM delivery means by armor units has tremendous tacticle potential. A projectile to deliver short-life scatterable mines should be developed for use by the *XM-1* tank, and tank crews should be trained to deliver indirect fire support. Such a capability will enhance the ability of the Combined Arms team.

Condensed from an article by Major Michael A. Andrews in Military Review, December 1978.

FORGING THE THUNDERBOLT

Engine Failures

A Case For Clean Air

The most common causes of tank engine failure are turbochargers, cylinder assembly and piston rings, pistons, and connecting rod bearings. Teardown analysis proves that more than 50 percent of these failures are caused by dust ingestion. The cost of these failures with the original side loading air cleaners was $.69 per mile. This cost has been cut to $.52 per mile with the steel top loaders. Proposals have been made that may increase the efficiency of our air cleaners to the point where the cost would be as low as $.25 per mile. This would result in a saving of $20 million over twelve years of use.

That was the past and the possible future. We are concerned with the present. The number of dust induced failures can be dramatically reduced by education and emphasis. This was proven when TACOM published the pamphlet "Operation Clean Air," and sent representatives to field units to clarify procedures. For a year or so afterward dust glutted engines were not so common; now their numbers are creeping up again. If the proper servicing and inspection of air cleaner systems is not done, no system can survive, regardless of how efficient it is. The problems of the burned out blower motors, of perforated hoses, and torn gaskets, are some of the items that we inspect for; simply cleaning the filter element and box is not enough. The entire system must be intact and operational to prevent unnecessary damage to engines.

The clean air pamphlet can be obtained from:

Commander
US Army TACOM
ATTN: DRCPM-M60-L
Warren, MI 48090

Don't forget the procedures listed in TM 9-2350-257-10 and -20-1. They cover the crew and scheduled maintenance services. Educate your tank crewmen and mechanics and then inspect their work. Engines are expensive items, we can keep them in service longer by doing our jobs a little better. The replacement rate in your unit depends mainly on the emphasis you give to *correct* and *timely servicing.*

Directorate of Armor Doctrine

The *Directorate of Armor Doctrine (DAD)* has been officially established as the U. S. Army Armor Center's focal point on all matters of current or future operational or logistic doctrine for Armor, Armored Cavalry, Air Cavalry, and Attack Helicopter units, either alone or as part of the Combined Arms Team. More specifically, DAD's functions include identifying, collecting, collating, and evaluating new ideas, equipment developments, organizational concepts, and threat projections which impact upon current doctrine. Additionally, the Directorate will be concerned with developing modifications to current doctrine, new doctrinal concepts, and position papers on matters of doctrinal materials to the Directors of Combat Developments, Training Developments, and Armor Aviation (also recently established) for testing or development of training materials as appropriate.

Doctrinal studies with which DAD is currently involved include Division '86 and operations involving the *XM-1* tank and the Infantry Fighting Vehicle (IFV) together, or in combination with current equipment such as the *XM-1* or *M-60A3* tank operating in conjunction with the *M-113A1* personnel carrier or the IFV teamed with the *M-60A1* tank. These various combinations will undoubtedly exist as transition to the ultimate *XM-1/IFV* combination takes place.

Although small (six officers and a secretary), DAD has already begun to make its presence known throughout the TRADOC community. The Directorate is located in the Armor School Headquarters and can be reached at Autovon 464-1240/3154 or by mail: Directorate of Armor Doctrine (ATSB-DAD), US Army Armor School, Fort Knox, Kentucky 40121.

NOTES

Firefinder Radar

The U. S. Army and Marine Corps will be equipped with *AN/TPQ-36 Firefinder* radar tracking systems within 3 years. The *Firefinder* pinpoints the location of enemy mortars, short-range artillery, and rocket launchers by scanning the horizon with a pencil-thin electronic beam.

The radar scans so rapidly that it effectively forms a curtain across an area, detecting any projectile rising through the sector and tracking its distance, direction, and height.

When the radar plots an incoming weapon's trajectory, a computer back-plots the track to the firing weapon, the weapon location is relayed automatically to friendly firing units, and counterbattery fire is placed on the hostile firing point.

The system simultaneously tracks projectiles from multiple sources and uses clutter-rejection techniques in its signal processor to filter out ground noise, enemy jamming, and adverse weather conditions.

Three *TPQ-36* systems will be deployed with each Army and Marine Corps division to track mortars and close-in artillery. In addition, each division is scheduled to have two of the larger more powerful *AN/TPQ-37* systems to detect long-range artillery.

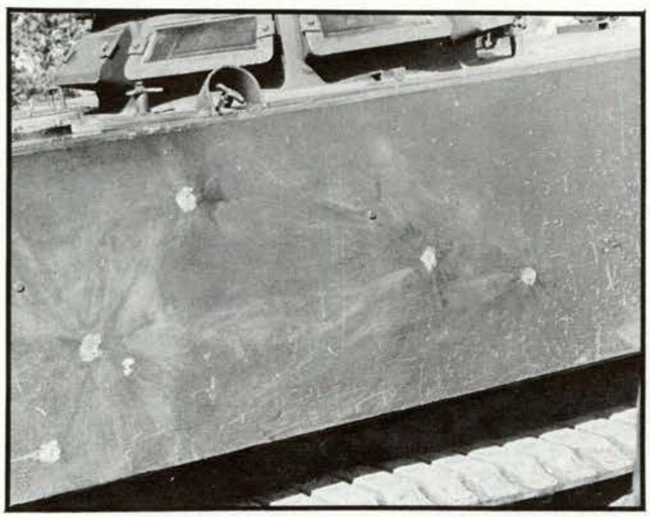
Moving Target for Gunnery

The New Jersey Army National Guard has developed a moving target for tank gunnery that does almost everything except shoot back.

Tankers of the 50th Armored Division previously had only been able to shoot at the broadside of moving targets.

The new training aid, a remotely-controlled surplus *M-114* reconnaissance vehicle, saves time and money. The standard moving targets found at Fort Dix, N.J. move parallel to the firing points on mechanical tracks and cost approximately $160,000 each.

The Jersey Guard's new remotely controlled targets can be set up quickly and cheaply. The surplus *M-114's* cost nothing and the sole initial expense was $20,000 for the figure-eight track.



The armored, tracked reconnaissance vehicle is controlled by radio from a nearby bunker. Firing tanks use .50 caliber inbore devices which do not penetrate the target's armor, nor cause appreciable damage. Subcaliber light antitank weapons and recoilless rifles can also be used with the new system.

Each target vehicle contains a radio receiver, decoder, and control center. The target operator uses a transmitter and encoder while making the target adjust speed, and turn. If contact is lost between the receiver and transmitter, the vehicle automatically stops.

The system can be adapted to control as many as five vehicles giving tank crews the chance to counter a platoon assault.

Maverick Tested

A laser-guided *Maverick* missile is shown in the accompanying picture an instant before it exploded into the side of a tank during development tests for the U. S. Air Force. In a recently completed series of 15 test launches, this latest version of the air-to-surface weapon surpassed the reliability record of 92 percent direct hits established by all Maverick missiles. The missile is guided by reflections from an invisible laser beam which is pointed at the target by either ground or airborne laser designators.

Draper Award Given

The 1st Cavalry Division's Draper Award was given to its first recipient. A Troop, 1st Squadron, 9th Cavalry received the award for their outstanding achievements and their responsive leadership abilities during the past calendar year. Captain Albert L. Patterson III, A Troop Commander, accepted the award on behalf of the unit at a division retreat ceremony on Cooper Field, Fort Hood, Texas. The presentation was made by Maj. Gen. W. Russell Todd.

Israeli *Merkava*

The Israeli *Merkava,* or *Chariot* main battle tank (MBT) (MBT) is of revolutionary design and differs from most MBT's in a number of aspects. Although manned by the traditional four-man crew, the *Chariot* can also carry 10 combat-ready soldiers or four to six stretchers. These attributes enable the *Chariot* to be employed in several roles: as a combination tank and armored personnel carrier, an armored medical evacuation vehicle, or an armored command post vehicle.

A front-engined vehicle, the *Chariot* affords entrance and exit for passengers and crew through doors at the rear, rather than through hatches on top. Fuel storage, water tanks, and batteries are arranged around the sides.

The combination tank and APC design evolved from lessons learned in the 1973 October War. The *Chariot* was designed to ensure maximum crew survivability, including a pressurized crew compartment for protection from gas attacks.

The *Chariot* mounts an Israeli manufactured copy of the U.S./U.K. 105-mm. *M-68* gun. The main armament is stabilized in two planes with a Cadillac-Gage system. The fire control reportedly consists of a conventional mechanical computer and a laser range finder. The commander has the capability to override the gunner, including tracking and firing the main gun. The main gun ammunition load is 62 rounds in the crew compartment with room for 24 additional rounds in the passenger compartment when no passengers are carried.

Despite its 56 metric tons, the *Chariot* has a low silhouette and is reported to be extremely stable in motion. It utilizes a spring-type suspension copied from the British *Centurion.*

It is powered by a Continental Model *AVDS-1790* RISE engine uprated to 900 horsepower. The *Chariot* has completed trials in desert and mountain environments with satisfactory performance.

It appears that the current design of the *Chariot* has some weaknesses and that an improved *MK-2* version is under consideration and may be developed. The *MK-2* will probably feature a larger caliber gun which the turret is already designed to accomodate (130-mm has been mentioned in the past), a hydro-pneumatic suspension which is currently being produced in Israel, and possibly a new gas-turbine engine of 1,000 shaft horsepower.

The production cost of the *Chariot* has been stated to be in the $750,000 category.

OPMD - EPMD ARMOR

PROJECTED ASSIGNMENTS FOR OFFICERS SELECTED TO ATTEND OFFICER ADVANCE COURSES

Early in 1978, the Officer Personnel Management Directorate (OPMD) conducted a limited test program with selected officer advance course classes (OAC) to determine if follow-on assignments could be accurately projected and announced to the officers before entering the appropriate OAC. Results of this test showed that there was an 85% success rate of unchanged assignments, with 90% of the test participants in favor of continuing the test program. With the program's key features thus validated, appropriate policy implementing the Advance Assignment Program for OAC selectees has been announced to field commanders and will affect Armor officers selected for Armor Officers Advanced Course 3-79, 5 July 1979, and for Infantry Officer Advance Course 4-79, 6 June 1979.

Benefits of the Program

The favored feedback from more than 1,100 student officers involved in the OPMD-wide test substantiated the following major benefits associated with the program:

- Eliminates uncertainty regarding the future in that professional and personal planning can be initiated by each officer.
- Allows the officer to tailor the OAC elective program to suit the requirements of the follow-on (projected) assignment.

Because professional development considerations are particularly key for junior company grade officers who are in the formative years of their Army career, close and continual contact with career branches has been essential. Under the advance assignment program, this requirement grows in importance and suggests greater individual involvement on the part of the officer corps. DA Pamphlet 600-3 explains the officer's role in charting out a long-range professional developement plan and provides a sample wooksheet, DA Form 4190-R, for this purpose. All officers, whether or not firm career decisions have been made, should engage in both near-term and long-term career planning. It provides that needed sense of direction and purpose. Further, by appending it to each updated preference statement, it allows Branch Career Managers an opportunity to evaluate stated career objectives and enter into mutual deliberation with the individual officers.

How the Advance Assignment Program Works

Approximately 8 months prior to the start of the OAC for which an officer has been selected, the officer's CONUS command will be notified of the intent of Armor Branch career managers to enter the officer in the advance course. Overseas commands will not be notified as the officer is automatically projected as a loss to the command at 36 months for USAREUR and 12 months for Eighth Army. This notification is necessary to insure that the needs of the respective commands for company and troop commanders is met by OPMD. Any variations that are deemed necessary by the command are discussed with the officer and a mutual decision is reached. At 7-8 months prior to the start of the OAC, the Armor Career Manager will issue a request for orders (RFO) to the losing command. Simultaneously, an information copy of the RFO will be mailed to each officer selected for the appropriate advance course. With the RFO, an advance assignment questionnaire (planning worksheet) and a DA Form 483 (Preference Statement) will be sent. Under the Advance Assignment Program, the projected assignment must be made without the benefit of a face-to-face counselling session with the Armor Branch career manager. The questionnaire and preference statement will therefore play a more critical role in the assignment process. Timely submission of accurate and complete forms is imperative if Armor Branch is to accomplish the goal of meeting Army requirements as well as officer's professional developement needs and personal desires. Officers will be expected to return the completed preference statement and questionnaire within one week of receipt.

Once the career manager has received your preference statement, he will endeavor to develop the optimal assignment that will meet projected Army requirements, officer professional development needs, and personal desires. The ideal assignment action exists when all three criteria are met; however, when there is a conflict, the needs of the Army must prevail. Armor Branch's goal is to begin notifying OAC selectees of their projected assignments approximately 2-5 months before the OAC report date, and certainly not later than departure from their current duty station. Some assignments may not be confirmed until after an officer reports to the OAC. Examples are: officers being considered for advance civil schooling requiring application to, and acceptance by the academic institution; or certain nominative assignments such as ROTC which require concurrence of the gaining activity. Officers in this category will be advised by their career managers that their follow-on assignments are "pending." This exchange will not be the last contact between Armor Branch and the individual officer. Branch trips will continue, with career managers visiting the AOAC during the first or second month of the scheduled class. During the visit, each officer will be formally interviewed and any questions he has regarding career development or progression should be addressed. Any assignment changes will also be finalized during the visit.

OPMD's goal is to honor projected assignments so long as Army requirements remain unchanged, the officers skills can be utilized, and the professional development of the officer corps can be enhanced. Because the foundation of this program is based on projecting requirements 18-20 months into the future, changes will occur. For example, unforeseen strength-level changes within the major commands may be adjusted due to priorities established by the Department of the Army. In addition, higher priority, unprogrammed requirements may surface which were not anticipated when the initial advanced assignments were being projected. Finally, changes in an individual officer's status can affect the projected assignment. Regardless of the reason for change, all assignment changes will be coordinated with the officer. It should be recognized that Army requirements may dictate change; however, careful consideration will be given to both the personal desires and professional qualifications of the officers concerned.

While the 1978 test program revealed that assignment changes were necessary in 15 percent of the advanced assignments made, Armor Branch believes that the Advanced Assignment Program is extremely beneficial to the Armor community and enhances OPMD's overall objective to improve assignments of the Officer Corps.

OFFICER TOUR LENGTHS WHAT'S "NORMAL"?

There seems to be a growing concern as to what constitutes a "normal tour." Although the AR 614 series explains the Army's assignment, detail, and transfer criteria, deviations from established policy occur often enough to "muddy the waters." This article summarizes the Army's tour-length policies and explains why deviations are inevitable.

It is universally accepted that Army requirements have primacy and must be responded to efficiently and purposively. Within the framework of responsiveness to worldwide requirements, Army tour-length objectives have been developed to conserve PCS management funds while also satisfying the additional key objectives of reduced personnel turbulence and professional development. It is hoped that the personal hardships endured by the officer corps and their families will be minimized while simultaneously meeting Army requirements and retaining sufficient flexibility to professionally develop the officer corps through follow-on assignments of increasing scope and responsibility. With this in mind, tour lengths were revised 3 years ago as follows:

- **CONUS**—Tour *objective* is 36 months.
- **Overseas**—Generally, a long tour is 36 months and a short tour is 12 months. Officers are not normally sent overseas unless the tour can be completed within their obligated terms of service.

The new tour-length objectives were accompanied by policies governing schooling, professional development, and personal considerations which would be applied as deviation criteria.

- **Military Schooling**—Defer officers selected for schooling as shown:

  Advanced Course/WOSC/C&GSC.—Until completion of a full overseas tour or until completion of 36-months in CONUS.

  Senior Service College—Until completion of a full overseas tour or until completion of 24 months in CONUS.

- **Command**—Officers selected for brigade or battalion command will be assigned as needed without regard to tour completion. However, every effort will be made to slate command designees at present duty station provided the officer's specialty and projected command vacancies match.
- **Promotion**—Officers will not be reassigned solely on the basis of promotion.
- **Accessions**—Newly appointed lieutenants who serve a minimum of 36 months active duty will receive only one assignment following initial schooling, unless a short tour overseas is received. Officers with 4 year obligations may not receive more than two PCS assignments during the obligated period of service.
- **Stabilized Tours**—Certain tours of duty have been stabilized for continuity due to the critical nature of the mission, and the tour lengths for officers and warrant officers are specified. AR 614-5 provides the current list and specifies, for example, that tours on the HQDA staff will be 4 years.
- **Compassionate**—Valid compassionate and permissive reassignment cases as determined by the Army Compassionate Review Board may be moved without regard to time on station.

Is It Working?

When viewed from an analysis of PCS fund management. it appears the Army's tour-length objectives have improved stability. It is roughly estimated the Army has saved $500 million annually over the past 3 years. Technically, this is a case of cost avoidance, but the significance is clear. As budget appropriations continue to diminish and the Army's missions and readiness requirements remain unchanged, greater utility must be achieved from each budget dollar.

Deviations

While the Army has made progress toward achieving stability, deviations from tour-length objectives are made and are attributable to several major factors. Under ideal conditions, there would be rare exceptions to policy. But, this would imply a perfect match of the officer inventory by grade and specialty to fill an equitable array of authorized positions between CONUS and overseas. Further, it implies the perfect match would be achieved while concomitantly satisfying professional development. Unfortunately, it doesn't work that way.

The officer inventory is not precisely aligned, by grade and specialty, with authorizations (requirements); nor are the authorizations equitably spread between CONUS and overseas; commands have varying priorities of fill for personnel based upon the criticality of their mission; and last, CONUS is the sustaining base in support of overseas requirements. In other words, overseas requirements "drive the train" and any personnel turbulence generated is absorbed by the CONUS sustaining base. Thus, achieving the ideal under these conditions is a significant challenge and OPMD is not always successful. For example, the majority of air defense and field artillery company grade authorizations are overseas. That accounts for those officers rarely exceeding 24 months in CONUS between overseas tours. Conversely, overseas requirements for Operations Research System Analysts, Specialty Code 49, are minimal. These officers could receive two normal CONUS tours, back-to-back, before going overseas.

When professional developement considerations for dual specialty qualifications and individual preferences are added to the equation, one can begin to grasp the combinations and permutations of alternatives an assignment officer wrestles with in arriving at the best selection (available officer) to fill a valid requirement. Therefore, deviations from the tour-length objectives are expected.

They vary according to grade and specialty from 18-24 months time on-station in CONUS, up to and beyond the 36-month tour objective.

A Special Trust

OPMD has a unique responsibility to serve several masters. DOD asks that personnel turbulence be reduced to save money. In the same vein, Army requirements—thus readiness—have primacy and must be satisfied. The requirement satisfaction equation includes the right officer for the specific job. It's a function of professional development. We must have well trained, disciplined, and competent professionals who can serve Army requirements with distinction.

In the face of these objectives, individual preferences and needs must be considered in a rational examination of all possible alternatives as OPMD matches a dynamic officer inventory against requirements generated by a dynamic, worldwide force structure.

To answer the basic question, "What is a normal tour?"—it's that tour which satisfies Army requirements using the tour-objective criteria as a consideration in the reassignment process. The tour objectives are goals—targets we hope to achieve—and achievement varies among grades and specialties.

Although the Army's stability performance has moved substantially in the direction of current tour length objectives for the entire officer population, deviations will continue to occur within individual grades and specialties. *FOCUS, 4 Aug 78.*

EPMD

OPERATIONS/INTELLIGENCE COURSE NOW BEING OFFERED

The Army Institute For Professional Development is now administering a Operations/Intelligence course for operations/intelligence personnel in Armor and other fields. The correspondence course provides supervisor-monitored, performance-oriented training of personnel in or entering Operations or Intelligence duty positions.

The enrollment package for the course contains a supervisor's guide, several enrollment applications, four copies of each of the three different training plans, and franked return envelopes.

The course provides a total of 48 credit hours for Armor instruction for Armor Operations Sergeants and 19 hours for Operations Assistant Specialists, if all subcourses in the student training plan are elected. Intelligence Sergeants can earn 32 hours and Intelligence Assistant Specialists can earn 23 credit hours for Armor subjects. An advantage of the course is that each soldier and his or her supervisor can determine those areas in which training is needed, and complete the subcourses in that area of the training plan selected. In addition, the student has the option of selecting courses that may be part of another training plan.

Students have the opportunity to complete a pretest for each of the subcourses selected. If a student passes the pretest administered by the supervisor, he or she then moves on to the next subcourse. If a student does not pass, he completes the subcourse before taking the posttest.

Enrollment in this course requires enrollment by the student and a supervisor. The supervisor is thus available to help when needed, and to administer the pre- and posttests.

Prospective students may request the enrollment package directly from IPD at Ft. Eustis, Va. by calling Mrs. Paula Dalton, Operations/Intelligence Course Team Chief at AUTOVON 927-4876, COMMERCIAL (804) 898-4876, or by writing to:

The Army Institute For Professional Development,
United States Army Training Support Center (161)
Newport News, Va. 23628.

ARMOR CONFERENCE Will Be In May 1979

BOOKS

HELL ON WHEELS, by Donald E. Houston. Presidio Press, 1977. 466 pages. $14.00.

Hell on Wheels is the story of the 2d Armored Division from Benning to Berlin in World War II; and what a monumental story it is, indeed! Donald Houston has done a magnificent job in putting it together from the bits and pieces of the stresses and strains of Armor Organization Day, July 10, 1940, through all the major maneuvers of the early forties and the blood, sweat, tears, and guts, of 30 months and 1,500 combat miles in the seven major campaigns in North Africa, Sicily, and continental Europe.

A thumb-nail review of this classic history is more accurately portrayed by exerpting a few paragraphs.

> *From the authors introduction,* "It is easy to write about a great division , its combat commands, regiments, battalions, companies, platoons, squads and individual tanks. One too often forgets that the division is not an impersonal, faceless mass but rather an organization of men. When the tanks attacked, the artillery fired, the infantry charged and the other units supported the attacks, it was men, not machines, doing the fighting. And it was the men who were killed, wounded or maimed."
>
> *From Ernie Harmon's foreword,* "It was my great honor to have commanded this great 2nd Armored Division on two separate occasions in combat. During our war experience and after, the division's officers and men always displayed a warmth and affection toward me which I deeply appreciate but can never repay.
>
> One thing I do know is that we could lick anyone of reasonably relative size or larger, given tank terrain on which to operate."

MG George S. Patton, who was an Army teenager saw, felt, and lived the early days of the division through the eyes and heart of his father, and more recently as its commanding general:

> "All of us, and there are tens of thousands, who have been privileged to serve in Hell on Wheels owe a great debt of gratitude to Donald Houston for compiling this splendid story of our division. As one of its peacetime commanders, I am especially pleased to see the division's wartime exploits gathered into a single work.
>
> Don Houston records the past forthrightly and faithfully. The people he writes about—those who etched the Hell on Wheels story before and during World War II, Harmon, White, Brooks, Collier, Hinds, Rose, Merriam, O'Farrell, and Hollingsworth are synonymous with the 2nd Armored.
>
> But there were others, the lesser known of lower ranks who did their full duty. Through the author's efforts in military research, we now know something more of Whittington, Corpron, Prawdzik (the eternal first sergeant), Bennie Boatright, Burt and Robert Lee. They too contributed to our tradition."

The book seems to end somewhat precipitously with a mere mention of the "Third Crossing of the Elbe" on the 4th of July, the entry into Berlin by the 2 AD's 75 mile long column, the initial occupation of the fallen German capital, and the spectacular reviews put on by the division to honor heads of state and ranking dignitaries with over 1,000 armored vehicles lined up track-to-track for over 2 miles along the Potsdam autobahn.

All-in-all, however, Houston has made a significant contribution to history and his book is a must for Armor professionals and required reading for all who would profess a detailed knowledge of an important part of World War II.

Brigadier General (Retired) S. R. Hinds
Former Commander
Combat Command B, 2 AD

A GENIUS FOR WAR: THE GERMAN ARMY AND GENERAL STAFF, 1807-1945 by Colonel T. N. Dupuy, USA, Retired, (Englewood Cliffs, N.J.: Prentice-Hall Inc., 1977), 362 pages, $14.95.

The author has concluded that the German soldier of WW II was about 20 percent more combat effective than his American and British counterparts! Why? Dupuy claims the Germans discovered the secret of institutionalizing military excellence—the General Staff system.

Dupuy explores several myths about the Germans. One is that the "regimented" German performs best when there is not need for initiative. Yet German combat performance in the 19th and 20th centuries indicates the opposite.

The General Staff system was created by Prussian military thinkers including Clausewitz and Scharnhorst after the Treaty of Paris in 1808. Their concept was to form a people's Army created and led by genius. This genius or system, the General Staff, would be self-perpetuating. It would support mediocre commanders by providing them with talents they lacked by means of capable assistants. Scharnhorst's concept was based on the King as commander-in-chief. He would decide peace or war, national strategy and even battlefield tactics. The General Staff would perform the planning and thinking upon which the King would make his judgments and decisions.

In June 1866, Prussia defeated Austria in seven weeks. However, the Prussian Prime Minister, Otto von Bismarck, sought a quick peace. He feared war with France and thought a friendly or neutral Austria was vital.

The General Staff studied the Seven Weeks War and found deficiencies in use of cavalry and artillery. The Chief of the General Staff, Helmuth von Moltke, knew a revolution was occurring in the effectiveness of weapons. He wrote, "...our strategy must be offensive, our tactics defensive."

In 1879, war broke out with France during which Germany was unified. A French commentator wrote, "The Prussian cavalry . . . better trained . . . bold aggressiveness." He commented on the artillery ". . .the Germans had long recognized advantages of great masses of artillery . . . assuring their troops an immediate and insurmountable superiority." But civil military problems surfaced. Moltke believed when war began the military should be in charge of war making with the politician stepping to the background. The Prime Minister disagreed and was backed by the King.

The author believes that at the war's end the military was perhaps the most influential institution in the German Empire.

In discussing Gen. Alfred von Schlieffen and the Schlieffen Plan for war with France, Dupuy claims tactical success against modern firepower is only possible by operating against flanks. The Schlieffen Plan failed in WW I primarily because the right wing of the invading German Army was weakened.

During WW II the General Staff studied battlefield problems and devised new offensive tactics to counter the strength of the defense. Known as Hutier Tactics, they were based on surprise and probing for weak spots by squads supported by their own base of fire. After penetrating the defense, reserves would enlarge the penetration attacking behind and into the newly created flanks. Hutier Tactics were used successfully on the Eastern and Italian Fronts but failed to make major breakthroughs on the Western Front in the 1918 offensives. Reasons included not being able to keep reserves, supporting artillery, and supplies near the assault troops.

The Versailles Treaty eliminated the German General Staff, but a covert General Staff studied WW I. It concluded mobility had not kept pace with firepower. It believed that tanks, self-propelled artillery, and tracked supply vehicles could overcome the mobility lag. The airplane could also be used as mobile artillery.

Chapter 15, which deals with WW II, is of great interest. Dupuy indicates German ground troops consistently inflicted casualties at about a 50 percent higher rate than were received from American and British troops. As late as 1944, the German frontline trooper inflicted 7.78 Russian casualties for each German lost. The percentage was higher at the war's start.

To demonstrate the resourcefulness of the "regimented" German, Dupuy uses several combat examples. These include Eben Emael and Crete where paratroopers and airlanded forces were used with effect. A German defeat, Kursk, is used to demonstrate a determined German attack against a heavily defended area in which they inflicted great losses on the Red Army.

The author suggests that a study be made to determine if a General Staff system is needed for the U.S. He writes that Soviet military education is patterned on that of Scharnhorst and Clausewitz, and although this is not reason to adopt it, it would be folly to ignore it.

A valuable Chronology and interesting appendices dealing with German performance in the world wars are included in the book.

Lieutenant Colonel Joseph P. Frankoski
APO San Francisco 96328

TANKOVYY UDAR: TANKOVAYA ARMIYA V NASTUPATELNOY OPERATSII FRONTA PO OPYTA VELIKOY OTECHESTVENNOY VOYNY (ARMORED THRUST: TANK ARMIES IN FRONT-LEVEL OFFENSIVE OPERATIONS BASED ON THE EXPERIENCES OF THE GREAT PATRIOTIC WAR). Army General A. I. Radziyevskiy. Moscow: Military Publishing House of the USSR Ministry of Defense, 1977. 272 pages. 1 Ruble, 4 kopecks ($3.00 US). Available in the U.S. from Victor Kamkin Bookstore, Parklawn Road, Rockville MD. 20851

A recent Russian-language military historical work prepared by the current Commandant of the Soviet Ground Forces' *M. V. Frunze Military Staff Academy*, Army General A. I. Radziyevskiy, "Armored Thrust" may have as much value for U.S. Army and Allied armor officers as it probably has for their Soviet and Warsaw Pact counterparts. More than a mere, if detailed, analysis of the Soviet tank army, the front's main offensive pursuit and exploitation force, the work places implicit focus on the current relevance of lessons derived from the organizational development and employment of these large, armor-heavy and highly mobile organizations during the Great Patriotic War of 1941-45, the Soviet term for their huge 4-year conflict with Nazi Germany during World War II.

The book is a military historical analysis which, according to the standard Soviet analytical approach, draws heavily on the Red Army's considerable wealth of offensive-oriented combat experiences gained by its six wartime tank armies against Germany in 1943-45 and the Japanese during the 10-day Manchurian campaign of August 1945. According to the author, the principle lessons derived from this wartime experience are of continued value to current Soviet Ground Forces' combined-arms concepts under nuclear conditions at the *operational* and *tactical* (division and below) levels of employment.

Organized into four main chapters, with a solid collection of supporting charts and graphic aids, "Armored Thrust" first treats the rather costly "trial-and-error" development of the Soviet armored forces during the pre-WW II era and under the impact of the June 1941 German invasion of the USSR, as well as the subsequent *panzer*-led offensives on Moscow and Stalingrad in 1941-42. His analysis of the early days of the German invasion contains some universal lessons regarding combat readiness. Although the prewar Red Army had the world's largest tank force and had considerable combat experience from Spain, Finland, and the Far East during 1937-40, it becomes clear from Radziyevskiy's analysis that the Soviet armored forces' posture and performance during June-December 1941 was woefully inadequate to the task at hand from both a doctrinal and technological standpoint. As a key historical lesson, the huge disaster which befell the Red Army can serve as a current warning to Western readers that the Soviets are determined not to repeat the errors of June 1941 and that the West might also learn from this experience.

The Soviet high command reorganized its badly battered tank and mechanized units into divisional-equivalent tank and mechanized corps in mid-1942 and, on that basis, activated its first tank army commands (the 2d and 5th) shortly before the Soviet Stalingrad offensive that fall.

The resultant organizational and tactical adjustments proved more than sufficient during the decisive Kursk-Orel-Kharkov campaign of July-August 1943 in which five tank armies, each with two to three tank and one mechanized corps, participated in *front*-level counterattacks in the defense of Kursk and then as offensive spearheads during the successful drives on Orel and Kharkov.

The remainder of "Armored Thrust" deals almost entirely with the offensive combat experiences of the six wartime tank armies. Chapter 2 emphasizes the importance of thorough preoffensive planning and preparations, including full integration of fire and maneuver elements, well-organized C^3 systems, responsive logistics support and intensive preattack training. Continuing these themes, the next chapter closely examines the precise timing for introducing the tank army into ongoing offensives. Other wartime experiences dealing with meeting engagements, combat in urban and fortified areas, and water-crossing operations also receive similar emphasis. It is evident that the Soviets perceive the tank army and armor, in general, mainly as an offensive capability whose participation in the defense should be limited to that of a highly mobile counterattack force.

The final chapter considers logistical support of the tank army as a major prerequisite for combat success. Although the 1941-45 period hardly approximates current Soviet logistics capabilities, it did result in the adoption of the "delivered forward" system for ammunition, POL and rations as a standard supply principle.

It is possible to draw some interesting parallels between the past and present roles of the Soviet tank army from this work. Considering both wartime and current tactical/technological capabilities, it is possible to deduce that the tank army will commence operations as soon as the first echelon forces have opened gaps in adversaries' main defensive zones in widths of about 15-20 kilometers and 30-40 kilometers deep. Maintaining the initial shock and momentum, it has the capability to exceed the average wartime penetration of 60-70 kilometers on frontages of some 40-50 kilometers. Meeting engagements, rapid water crossings, close cooperation with tactical missile and aviation forces, and linkups with airborne and heliborne forces are among the current tank army's vastly-improved capabilities over those of yesteryear.

General Radziyevskiy's analysis deserves careful consideration for immediate translation and wide dissemination in the West. Although it draws heavily from the past, there is little doubt that this work is aimed at further refining and sharpening the thrust of modern-day Soviet concepts for large-scale armor employment.

Major Joseph E. Thach, Jr.
MI,USAR

WORLD POWER ASSESSMENT 1977: A Calculus of Strategic Drift. by Dr. Ray S. Kline. Published by Westview Press, Boulder, Colorado December, 1977. 206 pages. $12.75. Note: this book is published in cooperation with The Center for Strategic and International Studies Washington, D.C.

Ray Kline is an astute political scientist who understands the value of catchy and carefully packaged advertising. To be frank, "World Power Assessment 1977" is an advertisement and a clever one at that. But it is advertising for the preservation of our most vital product: a strong pluralistic and democratic world. Dr. Kline uses a rather quaint gimmick and a bag of statistics to sell a solid and sombering thesis: the United States does not have an adequate understanding of contemporary world power relationships and thus lacks a clear international strategy. As a result, the U.S. suffers a severe erosion of its potential power and influence, and by any other name an erosion of U.S. power is a Soviet gain.

Kline utilizes continental drift theory's plate tectonics, as a metaphor for world political power zone formation, or politectonics. Just as continental plates surge and collide, forming fault lines and volcanic mountain chains, political power regions collide and conflict, separate, and re-form. But WPA 1977 offers more than a cleverly geologized Machiavelli where Eurasian-sized geopolitical zones are substituted for Italian city-states. Using macrometric analysis, Kline develops perceived power values (Pp) for individual nation-states and their regional and/or ideological zones. Perceived power is the product of a nation's Critical Mass (C)—basically a representation of population and size—plus Economic Power (E)—based on GNP, food production, and natural resources,—plus Military Power (M), multiplied by the coefficient generated by a value given to a nation's National Strategy (S) plus the nation's National Will (W). Or $Pp = (C + E + M) \times (S + W)$. For example, out of a possible total of 500 points for the Concrete Elements of Perceived Power (the sum of C,E, and M) the U.S. receives 468 points. On the subjective ratings of National Will and National Strategy the U.S. receives a 0.5 for Will (based on a max of 1) and a 0.4 for strategy (also a max of 1). The coefficient generated is 0.9 so the overall U.S. perceived power weight is 421 points. This contrasts the Soviet Union which rates 402 points for the concrete elements but receives a 0.5 for Will and a 0.8 for strategy for a coefficient of 1.3 and a final perceived power weight of 523. In other words, a coherent national strategy (in this case, the Soviet effort to separation of the U.S. from its allies), significantly increases a nation's power, while a potentially stronger nation caught in the detente wobblies has its power decreased.

Information concerning the availability of professional books may be obtained from the U.S. Armor Association, P.O. Box 0, Fort Knox, KY 40121.

While similar social science statistical gimmickry has often been discredited and dismissed,(even the author caveats his pseudo-quantitative approach) the big picture Kline's macrometrics portray belie an important truth—America possesses enormous power but unless we organize, direct, and utilize this power it will erode and disappear.

Dr. Kline's proposed American National Strategy consists of creating what he calls the Oceans Alliance, an alliance built on interdependent economic development, trade, and maintenance of sea trade routes. In essence the Oceans Alliance suggests a policy of dynamic containment. Whether this idealized alliance is the correct (or even possible) solution is beside the point. WPA 1977 is valuable not so much as a distinct work of political science as it is a valiant attempt, in the guise of the catchy continental drift gimmick, to focus on the importance of a solution to America's detente-era foreign policy drift.

First Lieutenant Austin Bay
Austin, Tex.

RECOGNITION QUIZ ANSWERS

When preparing the recognition quiz for the September-October issue, Ye Olde Managing Editor activated his typewriter before he engaged his brain. As a consequence, he has been in a hide position ever since. Captain James D. Brown, U.S. Armor and Engineer Board, pointed out our error of saying that the Swedish S-Tank has a Christie rather than a hydro-pneumatic suspension and reminded us that the bellows of the mantlet cover on the U.S. CEV (picture 3) do not a bore evacuator make. And we accept two slaps of a wet noodle from WO R.M. Steedman, Canadian Armed Forces, for having misidentified the OT-62 as the BTR-50PK from which it is derived.—RRT

1) **GERMAN HOTCHKISS APC** (five road wheels with protruding hubs, sharply-sloped frontal armor)
2) **U.S. FIGHTING VEHICLE** (relative flat, angular turret; rectangular TOW Launcher folds down along turret wall in travel position)
3) **U.S. OV-1 MOHAWK** (engines on top of wing, three vertical stablizers)
4) **FRENCH AMX-10** (low turret mounted in center of hull, sharply-sloped frontal armor)
5) **U.S. M-48A5 TANK** (rounded bow armor, 105-mm main gun, 7.62-mm pintle-mounted machineguns at commander's and loaders hatches)
6) **GERMAN LEOPARD I, LOT 1 TANK** (Square search-light, 7.62-mm machinegun mounted at loader's hatch. Photo provided by CPT James D. Brown)

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Views Through the Visor

Our September-October 1978 issue has rekindled interest in the ownership and location of the Remington Cut. From a portion of our September-October 1951 issue, we find:

From the rough sketches of Lannen made in Florida, Remington made two finished sketches, which he presented to the *Cavalry Journal,* probably in 1902. The drawings are reproduced on these pages.

The excellent sketch of a frontier cavalryman appeared on the front cover of the *Cavalry Journal* in January of 1903. It was to hold this position for almost forty years, until July, 1942. The other sketch of the cavalryman riding away appeared on the back cover for a long period, and as a tailpiece inside the magazine.

Always a branch of great *esprit,* and highly conscious of history and tradition, the cavalry took the Remington masterpiece to its heart. Somewhere through the years Remington's cavalryman acquired the name "Old Bill." Today Old Bill stands on our title page, a trademark of mobility in war.

And once again we ask—Where is Old Bill?

What we want to know is—Where are the *originals* of those two drawings?

Here are the findings to date. . .

The report of the annual meeting of the United States Cavalry Association for the year 1903 appeared in the *Cavalry Journal* of April, 1903. In the proceedings, Captain L. C. Scherer, Secretary-Treasurer and Editor, has this to say:

The masterpiece of a frontier cavalryman on the cover of the Journal *and the disappearing rider on the back are contributed to the* Journal *with the compliments of Mr. Frederic Remington, a life member of the U.S. Cavalry Association.*

. . . and further along it was

Resolved, that the thanks of the U.S. Cavalry Association be tendered to Mr. Frederic Remington, a life member of the Association, for the splendid drawings presented to the Association for the cover pages of the Cavalry Journal.

After establishing these facts in our minds we drew a deep breath as we looked back over fifty years of editorship and wondered where to put the finger . . . and wondered why nothing had been done previously. We began to dig further . . .

A helpful little clue came up in the issue of January,1911. The original set of engravings, made from the original drawings, had begun to show signs of wear. Editor Lt. Col. Ezra B. Fuller, in the 1911 issue, noted that "Some two years ago it became necessary to have a new plate made [of the large drawing], as the old one was becoming much worn. *The original drawing was, and is still in the possession of a former editor of the* Cavalry Journal and it was obtained from him for the purpose of making the fresh plate."

Well . . .!

The next step was merely that of checking the editorship for the period from 1903, when the drawings were first published, to 1909, approximate date of engraving of the second set of plates. Our predecessors were:

Captain L. C. Scherer. 1902-- 1904
Captain M. F. Steele. 1904-- 1905
Captain Herbert A. White . . . 1905-- 1907
succeeded by Lt. Col. Fuller. .

A check indicated that only one of the four was still living. He is Matthew Forney Steele, familiar as the author of *American Campaigns.* Contacted at his home in South Dakota, Colonel Steele could give us no information other than the fact that the drawings were never in his possession.

It seems fairly logical to assume that Captain Scherer, editor during the period of presentation of the drawings, may have retained them in his possession.

Someone, somewhere—perhaps a relative or a friend—may know of the whereabouts of the Remington drawings. They are actually the property of the Association. They should repose in the archives of the Association, available to the greatest number of interested people. They might well be slated for later transfer to the Mounted Service Museum now under discussion.

We throw the mystery open to the field. How are you at sleuthing? If you have a clue let us hear from you.

The Editor

The referenced editorial brought the following two responses to ARMOR in the January-February 1952 issue:

Old Bill Turns Up

Dear Sir:

The lost is found! Your editorial in the September-October 1951 issue, recently read, seeks the whereabouts of Remington's pen and ink sketch "Old Bill." To the best of my knowledge I have the front view sketch; I know nothing about the hind sight. "To the best of my knowledge" is used advisedly, because: (1) it has always been my understanding that the picture I have is either the original or a duplicate copy of the picture which my father, Louis C. Scherer, received from the artist, and (2) this picture was carefully packed away in my household things when I last went overseas.

If ARMOR requires the use of the picture, I would be more than happy to loan it (as soon as I can get at it), provided that I can have positive assurance of its safe and early return, somewhat under the same arrangement that it was once previously loaned to the *Cavalry Journal* for remaking the cover plate. I believe that there was no question of ownership at that time.

I am not prepared to donate the picture to an office file or to a museum of the future. Nor do I intend to sell it. I would be willing to donate it to an existing suitable museum when my family and friends no longer enjoy the lively reminiscences which "Old Bill" evokes. Have no fear that he will lack for a good home and admirers once we set up housekeeping again. I don't know what you think of him, but I've never thought of him as much of an office man or as a museum piece. He's always looked most at home with several horseflies talking over old times, with the aid of a couple of short beers and an occasional "Up Garry Owen." But then, I may be wrong. I will say though, when I showed him the first *Cavalry Journal* where he didn't make the cover, I thought that there was a look of foreboding on his face. I haven't been able to ask him what he thought about ownership claims coming up after fifty years of undisputed possession.

COLONEL KARL L. SCHERER
Armed Forces Staff College
Norfolk, Va.

Dear Sir:

My brother, Col. Karl L. Scherer, has sent on to me his letter to you in reply to your editorial on the Remington sketch in the September-October issue. While I feel that he has covered the situation and am in accord with what he has said, I wish to add what I know of the picture's history, particularly since I was once the owner of it.

The pen and ink sketch of the mounted soldier was in my father's possession when I first saw it and was seen, no doubt, by those who visited our home. The artist and my father were friends and I was told that Remington at some time around the turn of the century gave the sketch to my father and that when my father later became editor of the *Journal* he decided to use it on the cover of the magazine and asked permission of the artist to do so.

This would account, perhaps, for the entry in the Association meeting proceedings in 1903.

I recall that my father told me that the Association had borrowed the sketch on what I thought was more than one occasion to have new plates made. When he gave me the picture after his retirement in 1928 he reminded me that it should be made available if the Association wanted it for this purpose again. The sketch was one of my prized possessions from that time until I transferred from the Cavalry in 1935. I then passed it on to my brother who was still a Cavalryman. During the period I had the sketch it was seen by many persons familiar with it, including, I am reasonably certain, several members of your persent Council. No question of ownership was raised then, nor had it been during my father's lifetime.

COLONEL HARRIS F. SCHERER
Headquarters Seventh Army

The editor-in-chief at the time then withdrew his statement about ownership with the following answer to the above letter:

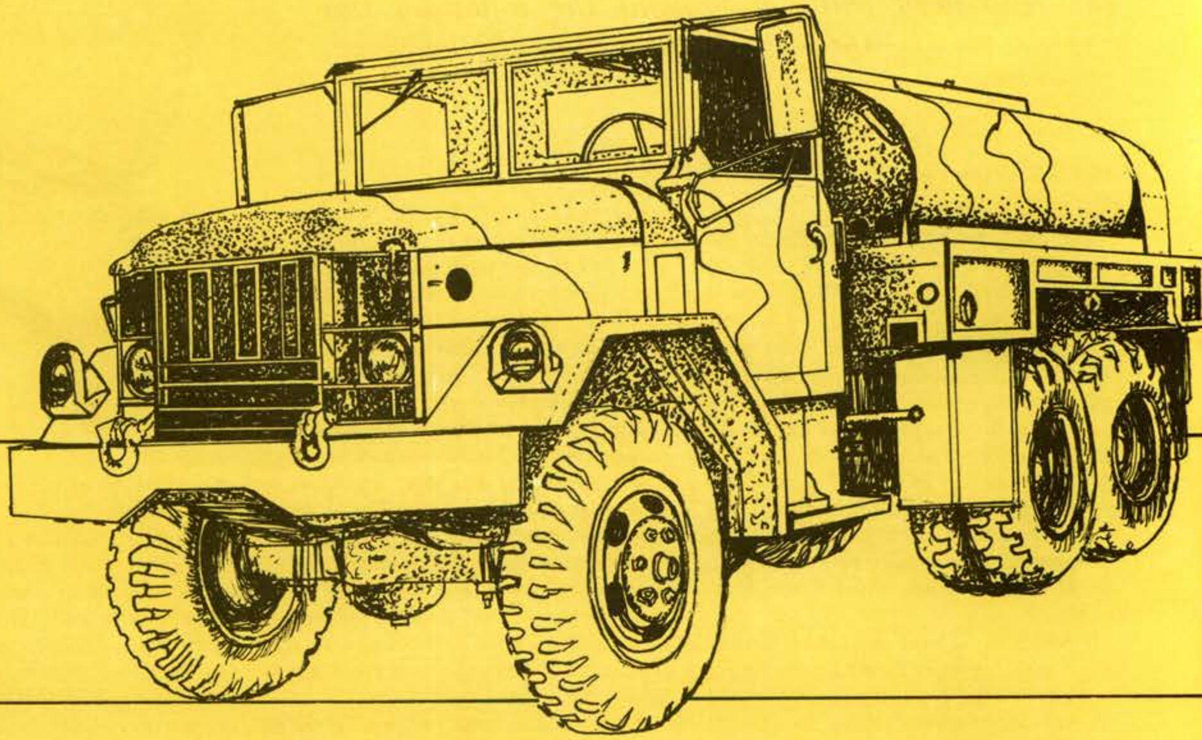
• ARMOR set out on the search for Old Bill with visions of the poor fellow lost in some attic, unknown and unrecognized though the years. With Association records as the only documentation to come to light after a long and careful search, it was somewhat disconcerting to have the answers to a difficult question appear so close to home. ARMOR (and certainly the Remington Museum and historians) is gratified to round out an interesting story on a subject of such general interest to the branch, and trusts that, in its enthusiasm to promote the history and tradition of the mobile arm, no reflection was cast where none was intended.
—Ed.

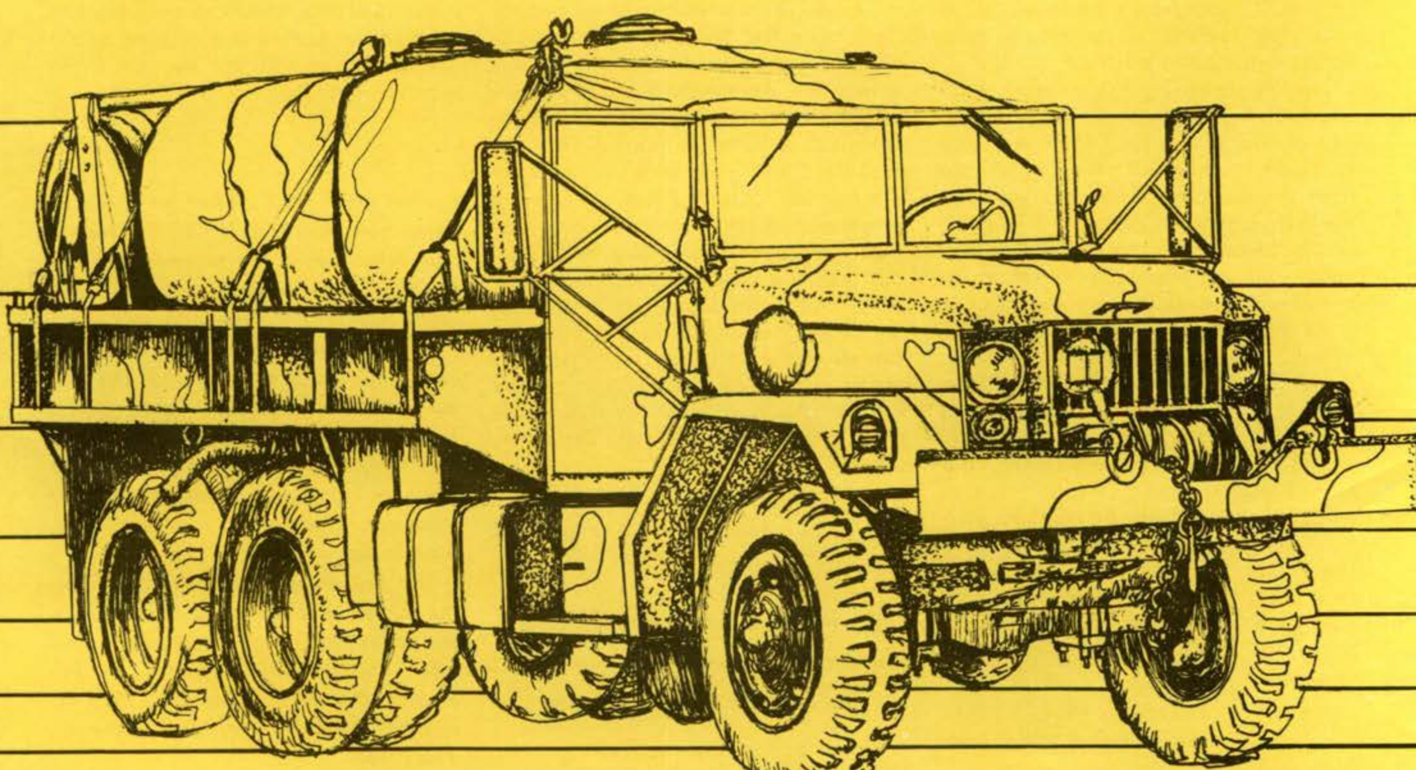
That was 1952. What we need to know now is, where is Old Bill today? And what about the second drawing? Perhaps some reader somewhere will share new information with us.

To the many irate readers who have called me about a rumor that Old Bill will be replaced in your professional journal, the U.S. Army's oldest, the answer is NO, he will not be replaced. We have considered a younger brother joining him, but replace him, blasphemy.

Old Bill enlisted in 1870. He roams the Fiddler's Green and these pages. We want him to be properly looked after, and recognized, just as he has looked after these pages since 1902. He is here. You can feel it. Come visit. You'll see.

MAB





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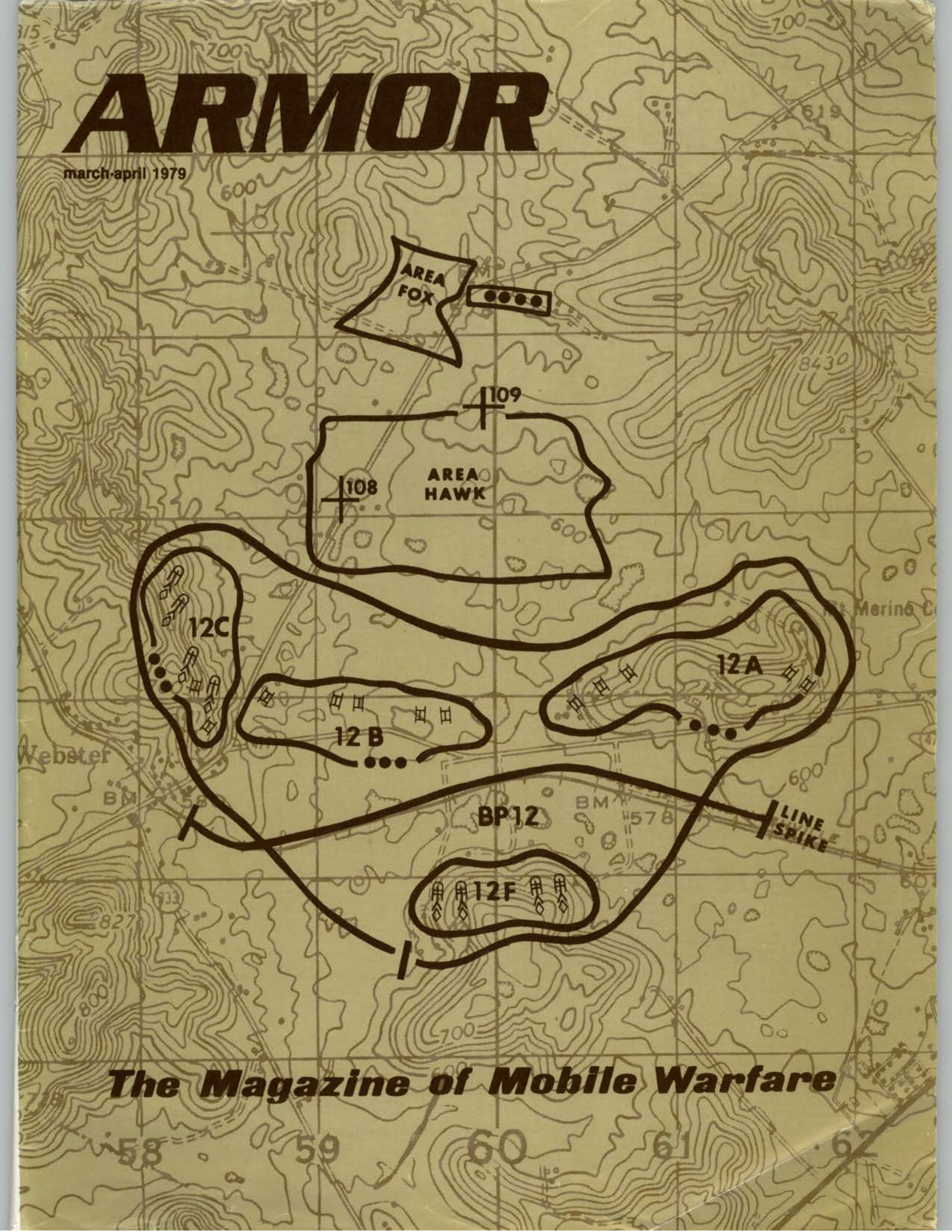
march-april 1979



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COVER

Beginning on page 5, Major Patrick J. Bodelson and Captain Dwight C. McLemore describe techniques for planning battle positions by making a thorough study of terrain presented on a topographic map and confirming the findings of that study through an on-site reconnaissance.

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the Magazine of Mobile Warfare

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LTC MICHAEL A. VARGOSKO

Managing Editor
ROYCE R. TAYLOR, JR.

Assistant Editor
W. RICHARD MORRIS

Art Director
KAREN W. RANDALL

Administrative Assistant
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LETTERS

Combined Arms

Dear Sir:

I have been a reader of your magazine for many years, and without doubt the quality of the magazine has been improving all the time, especially with the emphasis being given to "Combined Arms".

CHRISTOPHER F. FOSS
Editor
Jane's Armour and Artillery

Helping

Dear Sir:

I would like to say that your magazine has helped me understand the role of Armor in the Combined Arms concept. As a young soldier and junior NCO I've learned quite a lot about the different phases of Armor and how each type of armor unit or cavalry unit will be utilized in future conflicts. Once again, keep up the good work.

HOWARD K. HANTEY
Sergeant A/1-64 Armor

APO NY 09301

Why?

Dear Sir:

I would like to know why, in this day and age when every other major NATO nation has excellent reconnaissance vehicles such as the British *Scorpion*, German *Luchs*, French *AMX-10RC*, and Canadian *Lynx* designed specifically for reconnaissance, the Army continues to saddle its Cavalry scouts with oversize, under-armed, hand-me-down *M-113's* from the Infantry and modified Infantry Fighting Vehicles (IFV) (i.e. the Cavalry Fighting Vehicle XM-3) that are loaded down with electronic gadgetry and missile systems that the scout does not need.

I know I don't speak for all Cavalrymen, but from those I have associated with I know that a good many do agree with me. We need a *recon vehicle*, not obsolete Infantry hand-me-downs or modified IFV's.

There are four areas that should be addressed in such a vehicle. They are *size, firepower, mobility,* and *simplicity of design and operation.*

Both the *M-113* and the Cavalry version of the IFV fail miserably in these categories. Both are far too large and make good targets. Both are much larger than their NATO contemporaries, except the *Luchs*. Specifically, they have much taller silhouettes, which make them easier to spot and engage, and harder to hide.

We need a vehicle that is smaller and has a lower silhouette. The *M-114* was the right idea but poorly powered and of poor reliablity. A vehicle of its size is what we need, and could be powered by a turbine engine. These engines have shown immense horsepower potential for their compact size. This power plant would give the vehicle the mobility to evade what it could not destroy.

The *M-113* is deficient in firepower while the IFV has more than necessary. The scout's mission is reconnaissance, *not* killing tanks. He fights only in self-defense or to extricate himself from a position. For this he does not need the TOW missile system. The most he needs is a powerful, reliable, yet simple automatic cannon.

Lastly, he does not need half an infantry squad (the Cavalry version of the IFV is slated to have a crew of five) for a crew to accomplish its mission. Past experience in Europe and elsewhere has shown me that time to accomplish the mission seldom allows the scout the luxury of dismounted patrolling. Thus the argument for the larger crew to allow the scout to better perform this role is not valid since it will be of very little practical advantage to him. Keep the crew size down and you can keep the vehicle size down. A three-man crew is adequate.

I realize the above is wishful thinking and even if it were not we'd test it to death before adopting it anyway; but it does make for some pleasant fantasizing.

DALE T. EWING
Staff Sergeant, Cavalry

APO New York 09091

Good Reading

Dear Sir:

I truly enjoyed CPT Paul A. Leonard's article on the new *M-735* and newer *M-774* APFSDS-T ammunition in the September-October issue. His concise, understandable, and comprehensive work really nailed down [answers to] my questions.

I don't think that we in the Reserve Components have as many chances to get to know the capabilities and limitations of the 105-mm *M-68* family of rounds. An article like this one really fills the gap.

We look forward to the next issue of the ARMOR Magazine!

SAMUEL T. CONN
Captain, Armor, KanARNG

Manhattan, Kans.

Pride

Dear Sir:

I recently rode in a tank for the first time as a 2nd Lieutenant attending the Armor Officer Basic Course at Fort Knox. It was also the greatest experience in my life.

My tank was third in a convoy of 17 tanks. In front and behind me rolling in perfect formation were those iron monsters. As I watched, I felt what can only be described as a tremendous surge of pride for the men and machines of the Armor Branch. After operations maintenance at the washracks lasted until 0230 and it was bitter cold, but my classmates and I were still warm from the thrill of the day.

DANIEL R. BARNETT
2nd Lieutenant, Armor

Fort Knox, Ky. 40121

Aim—Fire—Fire Again!

Presently under FM 17-12 all targets are given somewhat equal treatment with regard to the number of rounds fired. This tactic is deficient in that some targets are more difficult to kill when hit. The technique of waiting to see if there has been sufficient penetration to cause a *K-kill* of an enemy tank can waste valuable seconds with disasterous personal consequences.

While the situation may be within acceptable bounds, new, future tanks will no doubt have improved armor. This will certainly demand a different method of engagement.

I would propose that an "insurance" round be fired when engaging the frontal arc of a tank. This round would automatically be fired after the initial sensing of TARGET unless there was a clear indication of a catastrophic kill.

This technique can nullify errors made in target indentification of different models of Soviet tanks and should be incorporated into gunnery training.

D.W. McCLELLAN
Major, Armor

Aberdeen Proving Grounds, Md.

Defense of Stealth

Dear Sir:

Although I fear I may provoke the passions of the "heavy tank for the Cav" enthusiasts, I feel I must raise my voice in defense of stealth. I am a cavalry troop executive officer and proud of it.

I feel that arming divisional cavalry squadrons with *M-60* series tanks is a mistake. The primary mission of cavalry is reconaissance, by stealth. The 54-ton behemoths the cavalry would receive will effectively destroy that stealth.

Given *M-60A1/3's*, a cavalry squadron takes on all the characteristics of a tank battalion with more firepower. To the uninitiated that is how cavalry would be employed. Even now, with *M-551's* and *M-113A1's* my cavalry squadron has never been given any of the "classic cavalry missions." Any mission my squadron receives is considered a cavalry mission. Given tanks, I shudder to think how cavalry would be employed.

A suggestion that has been heard many times is to take that too-large 152-mm gun/launcher and electronic hardware off the *Sheridan*, put a 76- or 90-mm gun on it and let the cavalry do its thing—reconaissance.

The 76- or 90-mm gun gives adequate overwatch firepower. The use of improved ammunition and a smoothbore weapon would eliminate the need for a complex ranging system. The gunner could fire battlesight and use BOT if necessary.

I realize that everyone will shy away from putting more money into an officially acclaimed "turkey." However, rearming the *Sheridan* cannot be more expensive than equipping 25 squadrons with *M-60's*.

The *Sheridan* rearmed would provide the cavalry with adquate firepower on a fast recon vehicle. Let the cavalry do its recon mission, using stealth.

KEVIN C. BENSON
Second Lieutenant, Armor
Ft. Polk, LA 71459

Thank You

Dear Sir:

This letter is written purely to laud the magnificence of your publication and the great strides it has made in becoming the finest military publication in my library. I recently resigned from the Army and can say that by maintaining my subscription to *ARMOR*, I will be kept current on the strategy and tactics of today's everchanging Army.

Thank you for your professional journalism. Keep us "Weekend Warriors" current.

JOHN R. DREWIEN
Captain, USAR
Mobile, Ala.

T-?

Dear Sir:

I believe the photos on page 60 in the November-December 1978 *ARMOR* are of *T-72* test models.

GLENN BROWN
Attica, Mich. 68412

Tank vs. Helicopter

Dear Sir:

I wanted to extend my congratulations on the quality and pertinence of the November-December issue of *ARMOR* which arrived at my home last Friday. As an individual with some experience with helicopters (as a passenger), I found the articles about the tank vs. helicopter scenario to be fascinating. Keep up the good work.

ROBERT P. ARNOLDT
Oak Park, Ill. 60304

Lion Eating

Dear Sir:

The article in the Professional Thoughts section of the September-October 1978 issue of ARMOR entitled "Telfare or Inbore" by Major James A. Broderick is a classic example of "being eaten up by one's own lion." Major Broderick alleges in his article that "In our view, the test program was developed with the conclusion that the *Telfare* device was superior already in mind. We offer these points in rebuttal:" At this point the lion starts to chomp away as the rebuttal, in its efforts to disdain both the evaluation and the *Telfare* device itself, in actuality, proves that the Army made the correct decision in adopting the *Telfare*.

I am most assuredly not an R&D type, but I was under the impression that a good evaluation should be designed to accentuate any differences between items being evaluated rather than to negate or obfuscate those differences by manipulation of conditions. Major Broderick states that the device he champions should have been allowed to engage at closer ranges or fired at larger targets than the other device being evaluated. This rational (or irrational?) methodology permeates the remainder of the article as the lion continues to eat his way through a discussion of differences in reloading times, loader training, accuracy, modification and installation of the device, safety,and target durability.

Witn over 2 years experience building, evaluating, and using the entire family of main gun sub-caliber devices *(Brewster, Nacca,* Inbore (cal. 50 and 20-mm), and *Telfare (M-85* and *M-2)* and all things considered, I applaud the Army's decision to adopt the *Telfare* concept as the "standard" device for tank gunnery half-scale ranges. In all fairness however, I must admit that we have found some fault with the mounting system of the *Telfare*. We have redesigned the mounting system to reduce the mounting time by 50 percent and, when mounted, the machine gun is so close to boresight that you can eliminate the boresight procedure and go directly into zeroing. We have, naturally, labeled our device the "Montana Device," as the regiment that I advise belongs to the Montana Army National Guard. At this point I will close before my own lion gets loose and starts eating on me.

DELBERT M. STRAUB
Major (P), Armor
Montana National Guard

Mobility vs. Training

Dear Sir:

I would like to address speed and maneuver versus armor protection and training.

Speed and maneuver can't, and most likely won't, be used unless you know you are going to be shot at and have a good idea where it is going to come from. If you know this, you expose yourself anyway. There are times when you can't maneuver going down a forest track in Germany. I have my driver zigzag if I have to cross an open area, but cover and concealment are the best substitute for lack of armor plate. Speed means more to me in moving from point to point on the battlefield to out maneuver the enemy.

On training there is much to be said. Few if any crews, what stable crews there are if any, ever learn to maneuver a tank to its maximum potential. Driving over 15 mph is frowned on or strictly enforced for tracked vehicles. Fine, some commander can say he has the lowest accident rate, but his crews can't operate their vehicles to their maximum capability. Doing it once or twice a year doesn't accomplish anything. All the speed in the *XM-1, 2,* or *3* will most likely never be utilized to its fullest.

The *M-60A1* will do 45 mph. I would like to know how many drivers could drive buttoned up, at 40 to 45 mph along a mountain road and slide around a corner. The ability to move units from one point to another on the battlefield will be critical and will depend on the driver's ability.

CHRISTOPHER F. SCHNEIDER
Sergeant, B Trp 3-12 CAV
APO NY 09076

THE COMMANDER'S HATCH

MG Thomas P. Lynch
Commandant
U.S. Army Armor School

This year's Annual Armor Conference will be at the Home of Armor in May. I extend my personal invitation to each of you to attend.

Registration will be on Tuesday, 15 May, at the Brick Mess from 0900 to 2400 hours. That evening, conference festivities begin at my home at 1830. We'll gather at Quarters 1 for a cocktail buffet. Dress is casual and the affair ends at 2100.

The theme for this year's conference is "Supporting the Combined Arms Team," a logical followup to last year's update on how the Combined Arms Team fights.

We launch right into our theme Wednesday morning at 0815 in Gaffey Auditorium. My opening remarks will be followed by General John R. Guthrie's Keynote address. The remainder of the day's presentations will be made by the:

- Home of Armor
- Infantry Center
- Field Artillery Center
- Tactical Air Command

The day will close with the annual banquet at the Brick Mess.

On Thursday, the theme continues. In addition to a co-sponsored presentation titled, "Command and Control for the Combined Arms Team," by the Armor Center and Signal Center, there will be presentations and discussions by the Logistics, Admin, Aviation, Air Defense, and Engineer Centers. In addition, we will have the Armor Association's General Membership Meeting.

The evening hours of the 17th are open for visiting friends, renewing old acquaintances, and decorous discussion.

On Friday morning, there will be updates on material developments concerning:

- AAH
- XM-1
- M-60A3
- XM-2
- ITV

Friday afternoon will be available for visiting the various departments, directorates, and agencies as desired. If you wish to, you may attend the Air Cavalry/Attack Helicopter Symposium scheduled from 1300 to 1500 hours.

The Annual Armor Conference has always been a treasured experience; last year's conference was, and this year's will be. The professionalism displayed is always gratifying. Many opinions are traded and every participant benefits. If you came last year, come again. If you couldn't make it last year please make every effort to attend this year. The complete agenda for the conference appears on page 35.

You are the ones who make the Combined Arms Team work. We want your ideas.

BATTLE POSITIONS

Major Patrick J. Bodelson **Captain Dwight C. McLemore**

Figure 1.

At the micro level of firepower management, success on the battlefield will depend on how efficiently and how fast can we destroy the enemy. This article is an attempt to enhance and refresh your understanding of what has to be accomplished at the company level.

Two basic assumptions have been made. First, common sense tells us the time element alone between command or troop experience versus time spent in other career assignments severely limits the experience of most U.S. Army officers. What may have

Figure 2.

been the "right way" in the past may now be unacceptable when fighting outnumbered in the active defense. Second, we have assumed that the battle will be fought at company level. We further purport that only when you have a clear understanding of how the company fights can you effectively plan the entire battle and concomitant support requirements at higher echelons. Put yourself in a captain's shoes in the following problem and remember, the objective is effective combat-proficiency training.

The procedures depicted in this article should be considered in terms of a *thought-process* rather than any physical notation made by an individual on a map. The intent is to break one commander's intuitive planning procedures down into an analytical, step-by-step process as a means of reinforcing the critical teaching points for preparation of a battle position (BP) at company or team level.

How do you destroy a massed enemy? If possible, you locate your subunits so they see only a certain part of the formation and only the number of targets that particular unit can effectively destroy. Terrain, weapons analysis, and enemy avenues of approach will dictate the selection of battle positions to support the destruction of the enemy.

Now, put yourself in the platoon leader's position and think about your fire commands. Who shoots what? Where do you start? How do you divide it up? Do each of your tank commanders (TCs) see the same view? It is not easy, and it should tell us to do our homework and train for it!

The massed threat target advancing on a battle position has special meaning to the company or team commander in terms of fire control and concentration of his weapons systems. Specifically, it pertains to the time the commander has to make a decision to concentrate his weapons systems for maximum destruction of the enemy. It also dictates the number of times he can repeat this procedure and still maintain positive control without being decisively engaged or overrun. From the standpoint of control, the critical point is reached when an advancing enemy has closed to a given range, and the platoon leader becomes so occupied giving engagement instructions to his elements that he doesn't have time to rapidly react to the instructions from the team commander. A further awareness of this fact is when individual tank commanders are confronted with such a massed target array at close ranges that a survival brawl takes place; therefore, they cannot respond to commands given by the platoon leader. This point in time might be considered decisive, and its impact on the team commander is in his ability to recognize that this loss of control can occur and subsequently plan his engagements to avoid it.

With that in mind, we join the commander of Team C/2-12 Armor for a step-by-step analysis of his technique in the preparation of battle positions. He begins his preparation with the receipt of the mission from the task force OPLAN/OPORD.

* * * * *

TM C:

(1) Occ BP 15; orient on TRP A1 and A2 .

(2) Prep BP 16.

(3) Recon BP 17; prep as time permits.

* * * * *

Initial Team Battle Position

The initial battle position is of primary importance. It will be the position from which the team has a reasonable chance of successfully killing the enemy. It will be allocated the most preparation time, and it will be the position where the team commander will be able to exercise the most positive control over his platoons and sections during the fight. Therefore, planning should be as detailed as possible and all efforts made to ensure that all personnel understand just what their role is within the scheme of maneuver in the coming fight.

Avenues of Approach

The commander first looks at the initial position in its relation to the avenues of approach into his position given by the TF S-2 and refines these approaches into the *multiple routes* that the enemy can use. Considering these routes, the commander further identifies the type of force that might possibly use them. He now has a base from which he can select platoon and section battle positions. The commander determines that there are four routes near his position, only two of primary concern. All routes can accommodate tanks and motorized rifle units in assault formation.

Using this information, the commander draws the initial platoon and section positions. Although he keeps in mind the potential unit that may occupy these positions, he is essentially thinking of blocking or covering each approach with some type of graphic symbol for a position (figure 1). Normally, he will draw one platoon position for each maneuver unit in his task organization. After he has selected the initial positions, he plans for subsequent positions while still maintaining constant fire on the enemy. Once this action is complete the commander now has a *base* from which to continue his analysis of the battle position.

Intervisibility

This term means the degree of visibility that is imposed on a specific position by terrain. When considering a company or team battle position this term takes on the following additional meanings:

- The point where the array will first be seen.
- The distance, in open ground, that must be crossed to reach the battle position.
- The effect that intervening terrain will have on the observation of the enemy force as it advances.

When considering intervisibility, the commander asks himself:

- How far can the element in each position observe and fire?
- What type weapon system would best utilize the range afforded from each specific position?

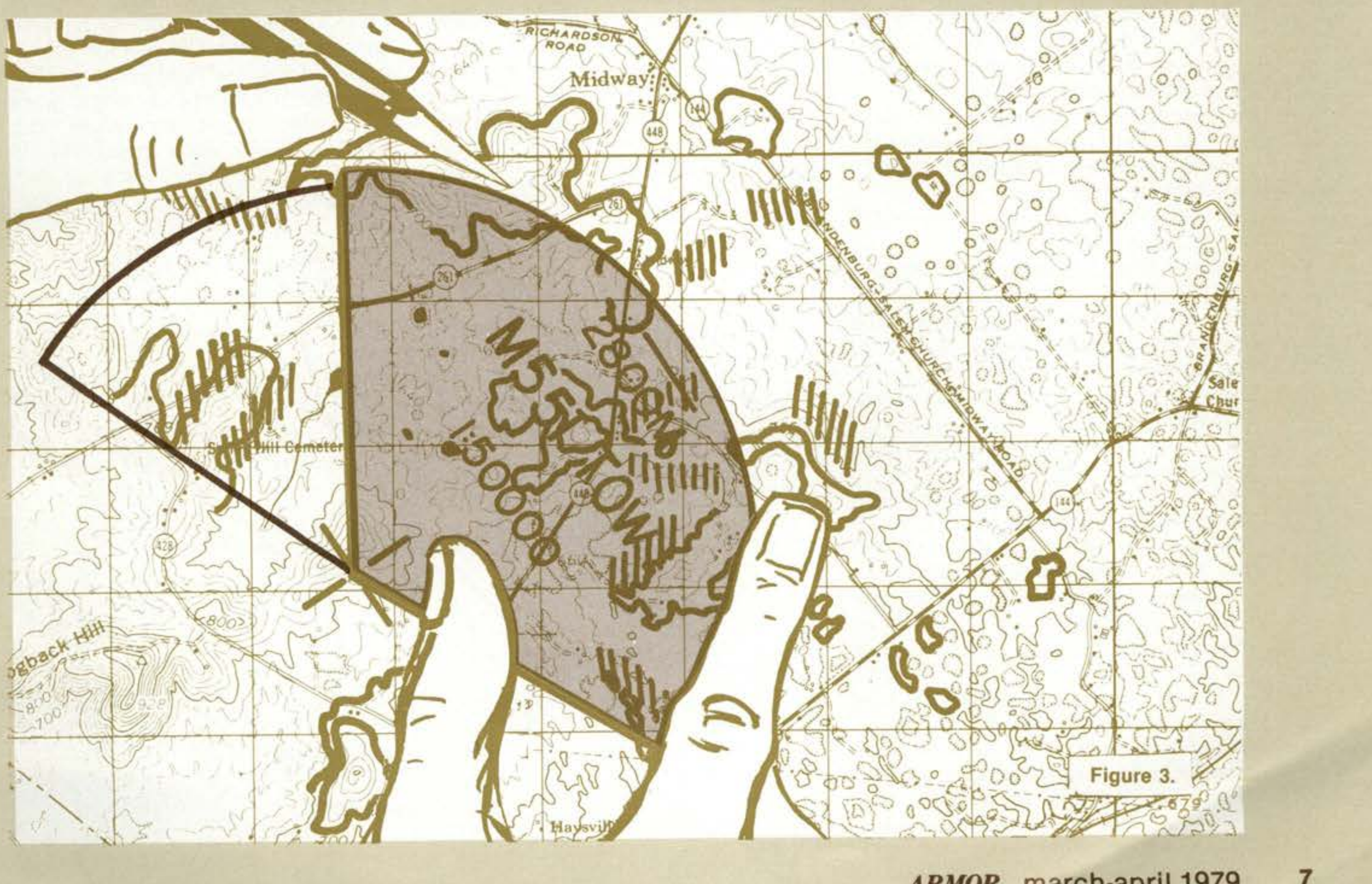
Remember antitank (AT) weapons need several seconds to fly to the target. In arriving at the answers to these questions the commander determines the average elevation for the positions. Then he outlines all terrain that is within this average elevation along the avenue of approach into the position. He also outlines any small hills or spurs that might create dead space. Vegetation and wooded areas are indicated by a series of hatched lines (figure 2). When he has completed this process a rough estimate of the intervisibility of the battle position can be made. The commander uses the intervisibility guide in conjunction with the range capabilities of his various weapon systems to develop an estimate of where specific platoons should be sited.

First, he uses a range template for the weapon that has the most effective long-range fire to identify any terrain that will limit the sector of fire for each position (figure 3). Then, he draws the right and left limits of the positions, overlapping the limits if necessary. Next, an arc reflecting the maximum range of the selected weapon is drawn to connect the sectors. Now, the intervisibility plan and the range are combined to give the commander an estimate of what he can or cannot see from each platoon position for the specific weapon system of that unit (figure 4).

After connecting each sector with the arc of the maximum range, the commander looks at the terrain that falls within the arc and asks himself:

- Where can I optimize the effective ranges of the available weapon systems and from what location will I have to site a weapon to effectively fire at that range?
- What terrain limits my observations and fields of fire?
- Are there any wooded areas that lead into my position that would make ideal infantry approaches?
- Where can I best service only that number of targets that are within our capabilities to kill at one time?

After he has answered these questions, the commander has a basis for effectively siting the platoons and sections within a position that will adequately use the advantages of specific weapon systems. Although he will initially occupy and, at some point, possibly fight from the positions he first selects, the



commander's continuing analysis will produce additional positions from which he may elect to fight. These additional positions will include hide positions that afford protection from enemy artillery fire.

Target Servicing

Once the commander selects his initial battle positions, he continues his analysis in terms of *target servicing,* the process of destroying an advancing enemy force through skillful fire and maneuver.

However, accurate shooting and fast maneuvering contribute only to half of the solution for target servicing. Understanding the terrain and how it affects fire from a specific battle position is the other half.

The commander must consider the following questions in evaluating his deployment within a battle position from the target servicing viewpoint.

- What size force will the avenue of approach accommodate?
- How many targets will I see and at what range will I first see them and be able to engage?
- How must I initially deploy within the position to best engage this array?
- How will I divide up the array into sectors of fire?
- At what point in the fight should I begin to concentrate weapons systems on a particular target area, and at what point will I not be able to accomplish this without great risk?
- At what point must I destroy the enemy force or be forced to move to another battle position?
- What type of targets should I consider to have priority?

Continuing his analysis of his battle positions in terms of *target servicing,* the commander evaluates the following factors that affect his ability to service a given number of targets along a given avenue of approach.

- The intervisibility plan for each position.
- The number of targets that the avenue of approach will accommodate or the size of enemy units.
- What effect will the shifting or concentration of forces within the battle position have on the ability of the unit to service a given number of targets.

Simply stated, this analysis procedure is being used by the commander of Team C/2-12 Armor to find the optimum locations for killing the maximum number of targets with minimum risk. However, a few observations and cautions are in order before we proceed.

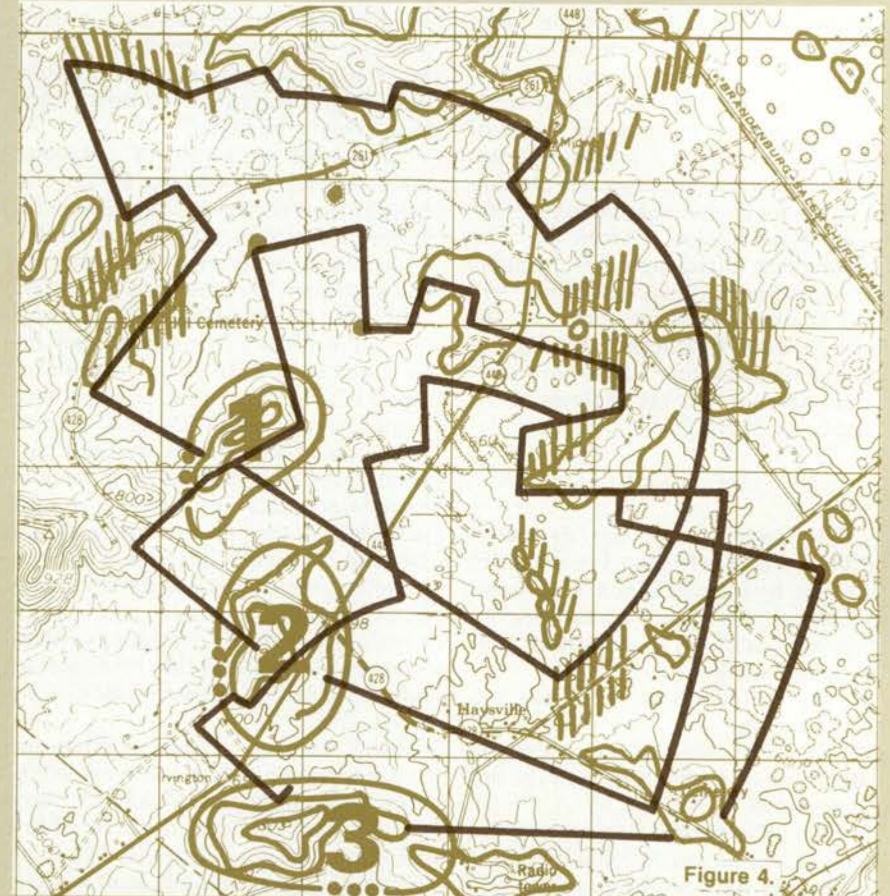


Figure 4.

Remember the tactical employment of platoons to control enemy avenues of approach is based on weapons and terrain analysis. You must select positions that will enable you to service only the number of targets that you are capable of handling at one time. The speed and accuracy of our fire during a given time frame must be considered at all times.

Don't be surprised if you have to move down onto the avenue of approach in order to fight properly. The *top of the hill* may be the worst place to locate, especially when the enemy's suppression capability is considered. Limiting visibility factors such as smoke, rain, fog,

Figure 5.

darkness, etc. will probably cause you to move closer to or onto the avenue of approach. Rolling terrain can provide just as effective cover as a hill, and in many situations it might be harder for the enemy to pin your unit down with suppressive fires when you're maneuvering.

Another factor affecting the selection of battle positions is the state of training and skill of the crews. Some considerations will be rates of fire, most effective ranges, ranges for the best probability of kills, target acquisition capabilities, and night versus day capabilities. Combat efficiency is increased by putting the correct crew, section, or platoon in the right place to support the battle plan.

Rejoining the CO of C/2-12 Armor, we find him redrawing the enemy avenue of approach, which was identified by the battalion S-2 to reflect any restrictions that terrain will place on the enemy element moving on it (figure 5).

After he has redrawn the avenue of approach, which the S-2 has estimated to be capable of supporting a battalion formation, the team commander sets about to determine the points in the approach where the enemy will:

- Be canalized and limited to a narrow axis of advance.
- Will be able to fully deploy portions of units.

The commander uses a 1:50,000 template of a threat motorized rifle battalion deployed in an assault formation as an aid in determining the points mentioned above. The template, however, is only a measuring device that gives an approximation as to how vehicles will fit into any given piece of terrain.

Once he has determined the number of vehicles that will fit into the redrawn avenue of approach, the commander uses his intervisibility plan as a guide and moves the template along the route looking for those locations where he will see the maximum and minimum number of targets (figure 6).

Note: *He does not want to see all the targets all of the time. He has to select those points in which he can effectively and efficiently service the targets without subjecting his unit to massive counterfires.*

Once these locations are identified, he begins to make specific notations of those that begin to fall within his intervisibility plan. These locations are then indicated with graphic symbols as engagement areas (figure 7).

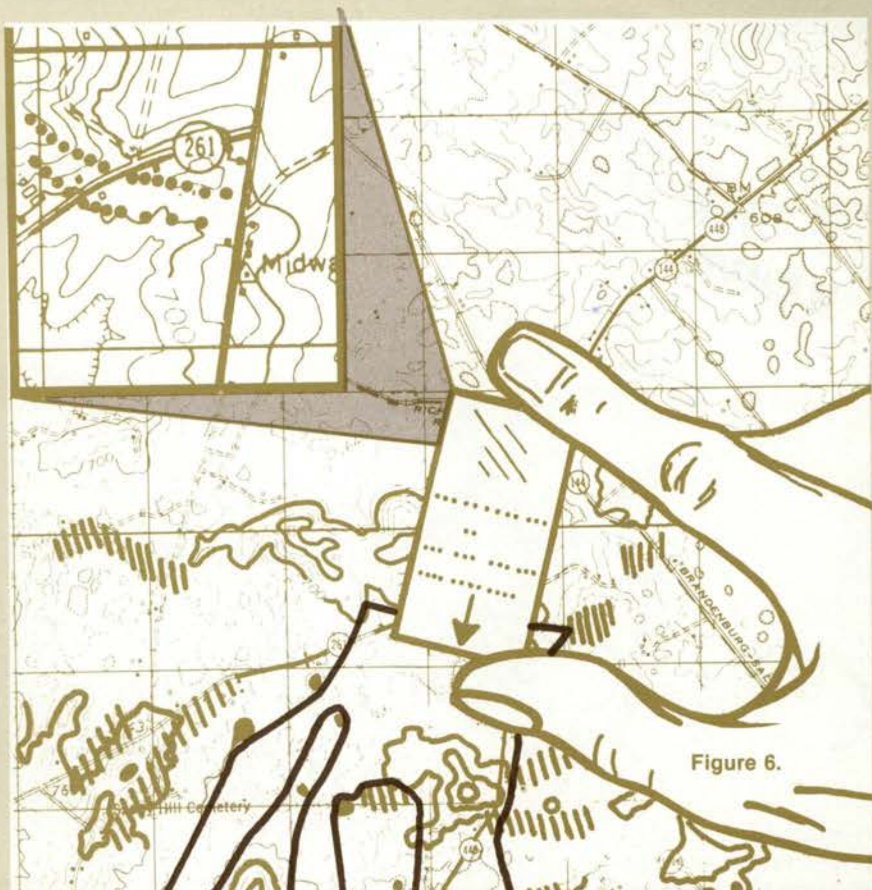


Figure 6.

The commander now reviews the intervisibility plan and the limits of fire, including range, of the initial positions and adds additional positions that will afford better servicing of specific target areas. These additional positions provide the commander with the option of shifting units forward to bring a specific enemy unit under fire as it closes on a specific engagement area.

The commander repeats this process for each avenue of approach until his analysis is completed.

He then adds control measures that will assist him and his platoon leaders in controlling and directing fires on enemy elements that may advance along the predetermined avenues.

The first measure he will use is the

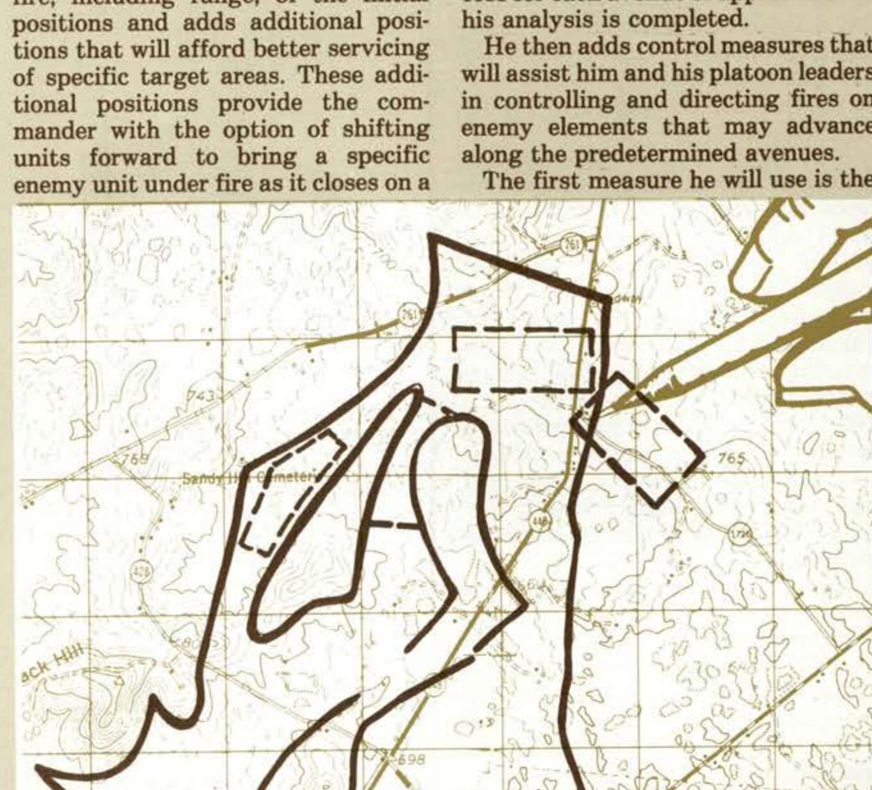


Figure 7.

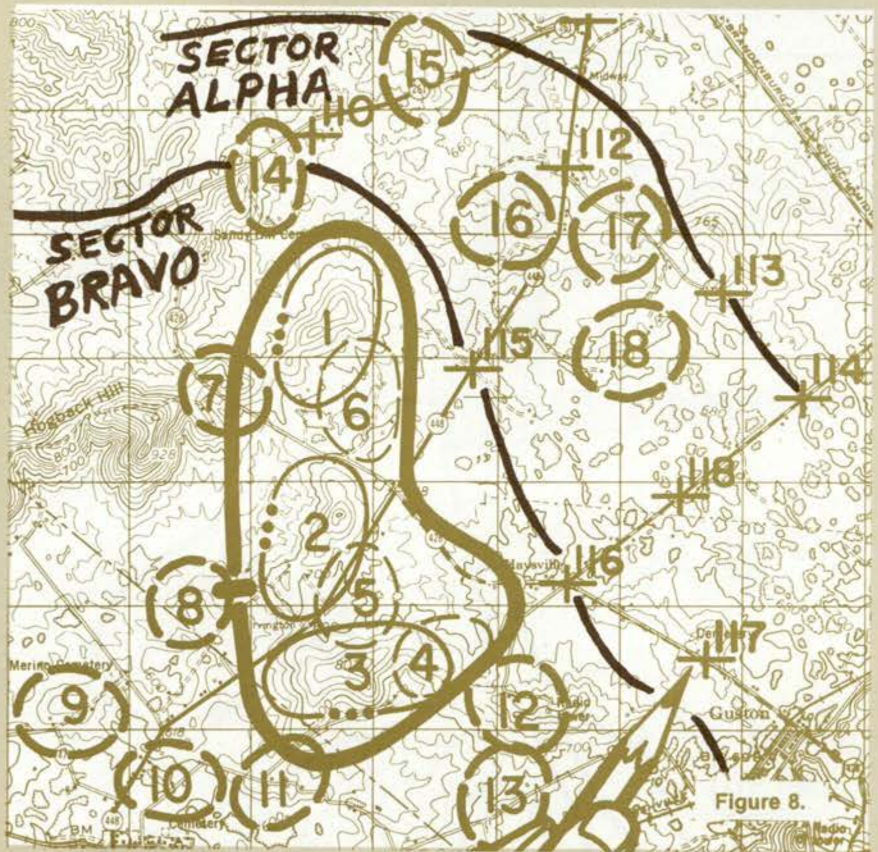


Figure 8.

target reference point (figure 8). In applying this measure, he again turns to the intervisibility plan to accurately locate TRP's that can be observed by the majority of his platoons and sections. He also uses the intervisibility plan to make an early estimate as to whether he will be able to see the TRP's assigned to him by the task force.

The designation of target sectors to delineate between long- and medium-range fires in front of the battle position is another control measure used primarily to report enemy movements, but it also serves as a guide to all platoons for target acquisition and selection of weapons systems for long- and medium-range engagements.

Dividing an engagement area into specific sectors of fire for each platoon that may fire into a given area provides another control measure for the graphic presentation of the battle positions.

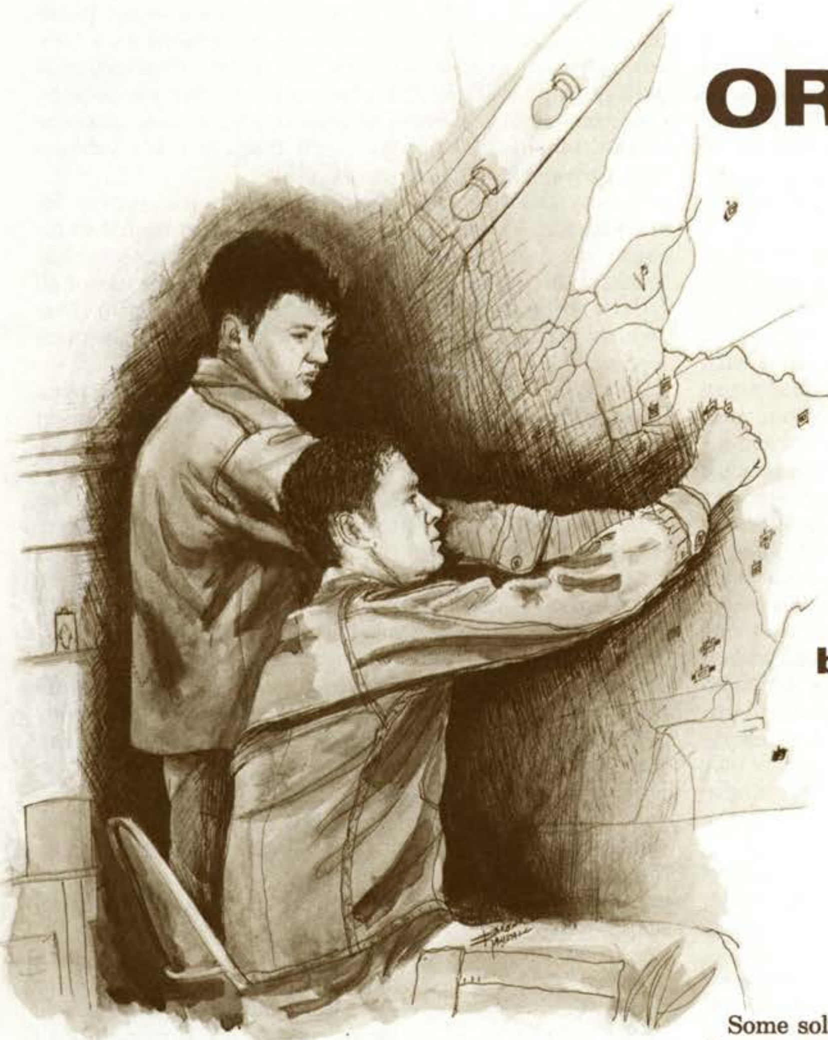
That completes the team commander's own graphics and he turns to refining pertinent parts of the task force Fire Support and Obstacle Plans. This done, it is time for the commander of Team C to review his work. As he does, he finds he is still confronted with four questions that he had asked himself earlier.

- How must I initially deploy within the battle position to best engage the enemy on a specific approach?
- At what point in the fight should I begin to concentrate weapon systems on a particular target area?
- At what point must I destroy the enemy force or be forced to move to another battle position?
- What target types should I consider to have priority?

The answers to these questions will reveal themselves as the commander envisions how the battle will flow along a given avenue of approach. *The sequence of events presented in this article is an analytical "layout" of the intuitive process a commander may apply in developing a battle position and it is only one of the many different methods for accomplishing the task. However, when time does not permit a gound reconnaissance, the analytical process presented in this article will provide a fairly accurate means for placing the proper unit or weapon system in the best possible location for optimum use of its range and characteristics. It should also be understood that this is an analysis based on a map reconnaissance and the conclusions drawn can only be confirmed on the ground.*

MAJOR PATRICK J. BODELSON was a 1965 DMG from the University of North Dakota and commissioned in Armor. He attended Airborne School, Rotary Wing Flight School, *AH-1G* Helicopter Transition Course, IOAC and C&GSC. His assignments include duty as a tank platoon leader, tank company commander, and commander of D/1-10 Cav (Air) in Vietnam. He was an attack helicopter platoon leader in Vietnam and served as S3 of an air cavalry squadron and tank battalion there. He is currently assigned to the C&S Dept., USAARMS.

CPT DWIGHT C.McLEMORE was commissioned in Armor upon graduation from Northeast Louisiana State College, where he earned BA and Master of Education Degrees. A 1976 graduate of the Armor Officer Advanced Course and the Canadian Squadron Commander's Course, he has commanded TO&E tank companies in Korea and West Germany. He is currently assigned as a tactics instructor in Command and Staff Department of the U.S. Army Armor School.



ORGANIZE TO OPERATE

by Captain Arthur B. Alphin

In most Army and unit schools, instruction for junior officers teaches hardware and tactics. Most tactics instruction consists of repetitive drill on platoon-level overwatch techniques, the five-paragraph field order, and map symbols. This is all well and good; however, there is a disturbing trend evident to the student who experiences such instruction. Many things constituting the "nitty gritty" details of commanding a company or platoon are glossed over. References are made to occupying assembly areas, taking prisoners, detection and decontamination of chemical agents, evacuation of casualties, and submission of reports, but no specifics are given. The student officer is left wondering how such jobs are to be done when he takes command.

There are many solutions to the problems mentioned. Various jobs can be assigned to assorted personnel, but a few threads of continuity run throughout. First, there must be a well defined organization that all personnel can understand. It must provide for division of labor, be simple, and require a minimum of communication to initiate or operate. Operation on a 24-hour-a-day basis for extended periods must be possible, reports must flow readily up and down, and it must cover all foreseeable emergencies and be flexible enough for individual initiative to compensate for unforeseen problems.

Some solutions are presented herein. All of them work for some commanders though the converse is not necessarily true. These solutions are based upon a line company commander's view, and appropriate modifications must be used for varying unit sizes and types. Also note that control and execution is decentralized to the maximum extent possible. For example, survey for chemical agents must take place throughout a company area, but organization and control of this effort at company level would constitute one more headache for the commander. Decentralization of this function to platoon level still covers the company area but reduces the commander's control problem and capitalizes on the initiative and enthusiasm of platoon leaders and platoon-level NCO's.

At platoon level, six "tactical teams" are formed from among the platoon members. They are the quartering party (one EM, one alternate), mine clearing team (one NCO, three EM), medical team (two EM), POW team (two EM), survey team (one NCO, three EM), and decontamination team (one NCO, three EM). Personnel should be selected so that, in so far as possible, each man on any one team comes from a different tank, squad, or vehicle. Assignment of NCO's is at the discretion of the platoon leader based on personnel density, education, and leadership ability. It is important that each team has an internal chain of command, functions as a unit, and reports directly to the platoon leader. Alternates are used only for the quartering party due to its one-man nature and so as not to give a soldier two different team assignments. Reporting and functioning of the teams are tied to the company field SOP (more on this later). Codes can be used to set the teams in motion, but this is a source of confusion and not necessary as most soldiers know what to do and when to start anyway. Training for the teams must be detailed and continuous, and can be centralized at company level. Team assignments must be considered in selections for unit, post, or higher-level schools; and platoon leaders must ensure that opportunities to excercise the teams are not lost.

The quartering party requires a minimum of equipment. On alert for quartering party the individuals report with flag (line platoons designated by colors red, yellow, and green), submachine gun, roll of toilet paper, and a marker per vehicle. Tent pegs mounting a can lid painted with bumper numbers are excellent markers. The quartering party picks a travel path within the new position, puts markers along it, and then goes to a pick up point. On arrival at the new area lead vehicles of each platoon pick up their man (identified by flag) and the platoon vehicles drop off in reverse march order as they pass their markers. Toilet paper indicates direction, but tank commanders pick the exact position and then coordinate left and right. The quartering party must be in good physical shape, have a good sense of direction, and the memory and intellect to plan based on pre-determined road march order. Requiring the quartering party to pick exact vehicle positions is unrealistic in terms of time available to plan and occupy, and in terms of relaying the party's desires to trail vehicles. These trail vehicles do not see him, must clear the road, and can't be allowed to blunder about looking for the exact position designated by the quartering party.

Mine clearing equipment includes probes, grappling hooks, markers, and if possible, a mine detector. Rudimentary demolitions training is valuable, for in combat C-4 and other demolitions materials would be freely available. Training opportunities abound when competition between clearing teams or between layers and clearers is instituted. If possible, do the clearing at night so marks of fresh digging cannot be seen. Organization within the team is a matter of preference based on mission, and is best left decentralized to the team leader.

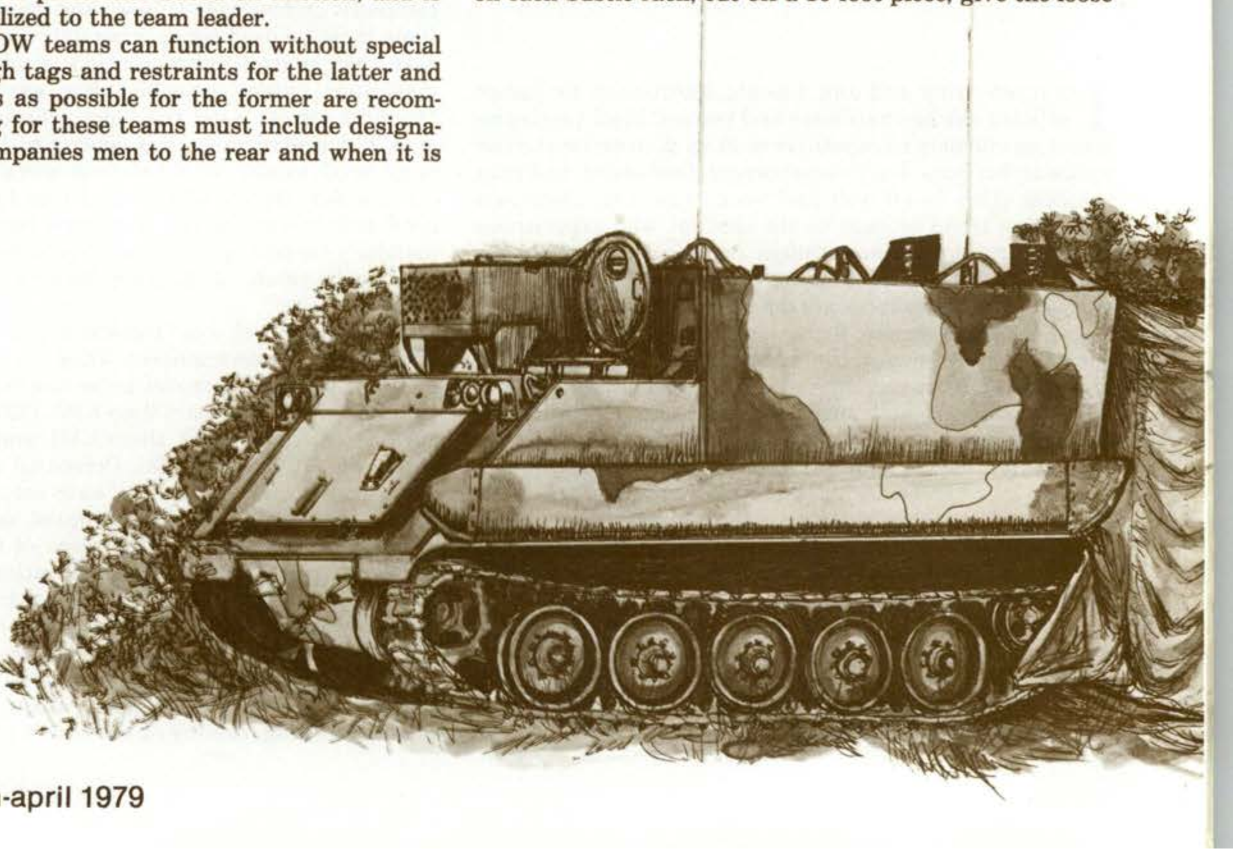
Medical and POW teams can function without special equipment, though tags and restraints for the latter and as many supplies as possible for the former are recommended. Training for these teams must include designation of who accompanies men to the rear and when it is done. In cases where immediate evacuation is not possible, one of each team's vehicles is designated as a temporary repository for the patient or POW. Evacuation of patients and POW's from platoon to company is done by the same means. In order to retain fighting personnel forward, it should be done by medic track or other vehicles sent forward from company level.

Survey teams handle chemical and nuclear survey for all elements. Their equipment should include an *IM-93* for each team member, an *IM-174* and a chemical detector kit. Training for all members should include proper use of all NBC equipment plus reports (NBC 1 through 5). Procedures within the team are best decentralized to the team leader.

As with the survey team, the decontamination team handles chemical and nuclear strikes, and must be expert in the use of all decontamination equipment. They also carry all crew and larger decontamination equipment and supplies, except the *DS-11* units and brushes. Coordination must be effected at the team level between decontamination and survey teams for final decontamination check out and unmasking. Once again organization within the team is best left to the team leader. The idea of having a damage control party for nuclear strikes must be avoided. For ordinance and chemical units such things may sound fine, but they fritter away scarce maintenance and recovery assets and, through duplication, sow confusion in abundance. All equipment damage or casualties must, after survey and/or decontamination, be handled by the normal unit maintenance and medical procedures.

One final word on tactical teams. They are vital to efficient platoon operations and must be emphasized. Training must be frequent and repetitious. Officers must make continual checks and every opportunity to excercise the teams must be taken advantage of.

A final point for platoon leaders. The designer who dropped the "Little Joe" from the *M-60A1* didn't have to worry about dead batteries, but you do. In a defensive posture for a night or longer period try turning off all power and radios save for the *AM-1780.* With a *DR-8* tied on each bustle rack, cut off a 10-foot piece, give the loose



end of the spool to the loader, and send him to the next tank. Hookups can go to the telephone control box on the right rear fender (preferred) or to the *AM-1780.* The 10-foot piece connecting the core of the spool to the same hookup as the next tank's loose end completes the hot loop. This is easily and rapidly set up and only requires casting loose the neighbor tank's loose end to break it down.

At company level a host of problems flow about the commander, all demanding his precious time. The only real solution is a division of labor that is simple and clear-

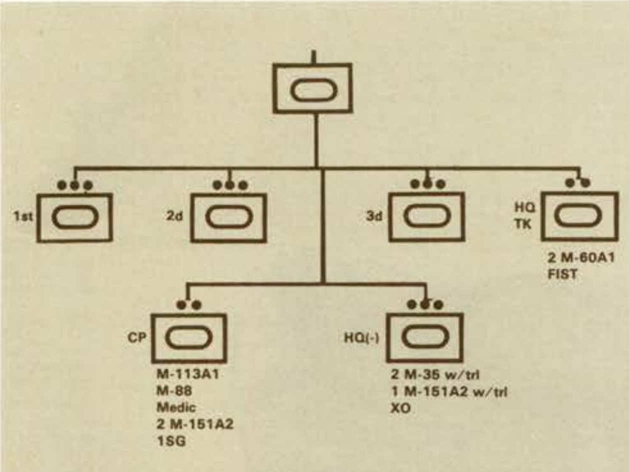


Figure 1.

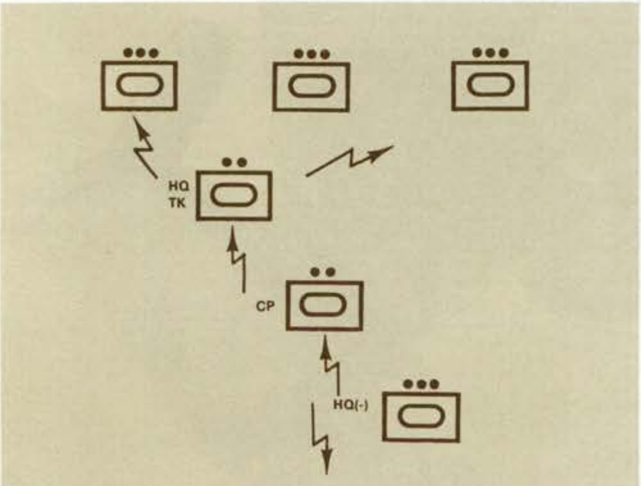


Figure 2.

ly understood by all. A means of doing this as an organization as at figure 1. The commander deals by message, radio or in person, with his platoon leaders, XO, CP, and FIST. Each of these control certain company elements and each have well defined jobs. The platoons and their handling need no explanation here. As for the FIST, if he comes with an armored vehicle he initially shadows the commander, as does the second tank (blade tank) of the headquarters tank section. If he does not have an armored vehicle of his own and he happens to be a good tanker he may be able to act as commander of the blade tank and still be the FIST. In all probability, especially if the FIST has no tank experience, this course of action will result in a wasted tank (as the FIST is preoccupied calling fires) or in the premature destructiuon of the blade tank as it encounters enemy tanks with fully qualified crews. Instead, a full crew should be mounted in the blade tank and the FIST should ride as a fifth man, in the loader's hatch and operate the radios from the loader's control boxes. The blade tank commander will not need or use the radios, for his job is to be a "silent wingman" for the commander, and to protect the FIST as he calls for the fires. Should an extra control box be present the loader can be hooked into the intercom. Five men in an *M-60A1* is unorthodox, but it works and obtains full use of the FIST and the blade tank in their primary roles.

Although not provided for in the TOE a command post (CP) is sufficiently vital to warrant a few changes in the headquarters platoon. First, the *VRC-46* is removed from the *M-88* and mounted in the *M-113A1*. The interior of the *M-113A1* is fitted out with whatever combination of map boards, suspense files, and battalion and company report formats that the commander needs. It can be staffed as the commander desires but good choices are the first sergeant (1SG), track driver, commo chief, and field C-E mechanic. Accompanying the CP track should be the *M-88*, medic track, commander and 1SG jeeps, and the headquarters tank section. In combat the company then moves as shown at figure 2. Platoons are placed wherever the commander desires, with control of movement decentralized to platoon leaders. They remain linked on the right and left, orient their movement on objectives, and dress on themselves. When the commander goes forward of the CP he goes in his tank with the blade tank and FIST following. All other vehicles at the CP are controlled by the 1SG one terrain feature behind the rearmost platoon. Medics and the *M-88* are sent forward as necessary and the jeeps are used as messengers, to carry wounded or as otherwise required.

In action the CP system facilitates control of the company. First, it eases the immediate control problem within the company and secondly, it takes the reports-to-battalion monkey off the commander's back. For example, lets say that the leftmost platoon in a defensive posture reports that he is engaging four *T-62's* and 10 *BMP's*. The answer from the commander is simple (note: with names substituted for call signs), "Roger, engage, I'm coming, FIST shoot, CP report, out." In 5-seconds the commander has done many things. He has told the platoon leader what to do and has dispelled the platoon leader's doubts that firing (or whatever else he might be doing) may be the wrong thing to do. He's on the way to check it out, is adding two more main guns to the fray, and is placing himself in a position to evaluate further action. His FIST is bringing indirect fire to bear and the CP keeps battalion informed. All this is also done with a minimum of confusion and a short electronic signature.

Proper reporting to battalion cannot be overemphasized. Higher headquarters must be informed of the situation at all times; to do otherwise inhibits their ability to make proper, timely decisions. Should a commander assume the duty of reporting and then get embroiled in heavy action, battalion not only will not know what is going on, but will probably not send support for they will not know that it is required. Reporting therefore becomes a form of life insurance. It is a fulltime job. A CP must be set up to handle it.

Another area where the CP plays a vital role is resupply. The supply sergeant or XO contacts all support agencies and organizes a serial on the appropriate supply convoy going forward. This serial is broken out of the convoy at a designated point where linkup is made with the 1SG who takes over and starts the resupply function. At the same time, cross-leveling of personnel can be accomplished and, as the 1SG visits each platoon, personnel actions are brought up to date. While this goes on the XO is free to get about other jobs in the rear. Upon termination of the resupply effort, the 1SG gets the supply vehicles organized and on the road to the rear.

I'd like to take a quick aside and answer the charge that I'm too wrapped around the axle of reports, records, and administrivia. General Abrams maintained that a tank or mechanized unit that couldn't handle its administrative details could not long remain in combat. We do not have throw-away units. They must be able to fight over the long term, and they must be able to continuously cross attach per current doctrine. It is not uncommon for a tank company to be attached to an infantry battalion and possess, due to previous cross attachment, one tank platoon and two infantry platoons from another infantry battalion. Imagine how many people went where, and how easy it would be to lose control of men and vehicles.

As changes are made, cross-leveling is accomplished, vehicles go down and up, casualties go out, and replacements come in, the unit that is not administratively straight will soon collapse.

In a word then, the CP acts as a clearing and control point. Everything coming into or going out of the company area (be it messages, reports, casualties, POW's, supplies, etc.) passes through the CP. This coordinates effort, increases efficiency, improves company morale and performance, and takes a great load off the commander's back.

This brings us to another item, the company field SOP. The SOP must be geared to the reporting system. Battalion level reports formats are too unwieldy to use at tank, platoon, and company level. In addition, regardless of what signal security people say, one doesn't have time to shackle rounds of ammunition, gallons of diesel, or names of dead at tank and platoon level. At figure 3 is a sample page from a company field SOP. A call of "Duckburg, line B, 5373, out" from a platoon leader to a commander tells him that there is one WIA. The CP knows who it is (SM with a last four of 5373), automatically sends the medic track forward, initiates paperwork, and enters the data on the sheet for the next personnel report to battalion. The next time the 1SG visits that platoon he can carry forward the witness statements, with headings already filled out.

"DUCKBURG"
Personnel and Evacuation Report
Submit As Required

Line A----	KIA
Line B----	WIA
Line C----	MIA
Line D----	POW's taken, non-WIA
Line E----	POW's taken, WIA
Line F----	Captured documents requiring immediate evacuation

Answer lines A, B, and C with last four of SSAN.
Answer lines D and E with number
Answer line F with "affirmative."

Delete lines not required.

Figure 3.

In size the company field SOP is close to the CEOI. Run off on a mimeograph machine and bound with fasteners, it is used down to vehicle level. A suggested, but by no means the only, content would be a section of policy on road marches, a section of "reaction checklists," and a section of company reports formats. Emphasis must be placed on the fact that the CP translates from company formats to battalion formats.

Lastly, some attention must be devoted to the role of the XO and the divergence of this role with current thoughts on the XO being "battle captain." Though having the XO present at the CP and ready to assume command may be nice to have, I don't feel it is an overriding consideration. Observation indicates that for certain periods of time, NCO's are perfectly capable of running a company in combat. The commander and the XO must sleep sometime.

Beyond this, however, there are very cogent reasons for having the 1SG in the CP. To do so creates commonality with the garrison situation, training, and tradition. The 1SG is the head people manager, he knows the duds and the heroes. He can care for his men, build their morale, and ensure that the maximum number of men stay forward. Recommendations for awards, punishments, handling of personal effects and personnel reports are old hat to him. His presence in the CP maintains the dual chain of command, complementing the CO on the people side and makes a better "full-service" team at company level.

Likewise there are good reasons for having the XO handling everything to the rear of the CP. He has commonality and familiarity with the workers and workings of the company maintenance section, battalion service support platoons, and the service support agencies located in brigade field trains. With the supply sergeant and armorer working in the field trains and marshaling their company serial of any resupply effort, they complement the XO's hardware repair expertise. The motor sergeant and his mechanics, mounted in the truck and traveling the area rearward of the CP, provides 24-hour supervisory coverage (with the XO) of the repair effort. Once again, this maintains a complementary effort and preserves a dual chain of command from the rear to the CP.

Coupled with this are a few other factors. No one is going to repair anything forward of the CP. This could conceivably place a larger number of tanks in stages of disrepair and misorientation behind the CP than are fighting forward of it. Dual supervisory effort is therefore more attractive. Should the XO have to replace a dead platoon leader, he'll have a time lag as he "regroups" and boards a tank, even if he were at the CP. The blade tank goes with the commander regardless of where the XO is, for with the two tanks and a FIST the commander can influence the action.

These ideas are one man's thoughts on handling multiplicity of implied missions for a company in combat. Though each commander may change names, jobs, or personnel designated for each job, the principles will remain. Organization at platoon level to accomplish tasks, simplified company SOP's, and division of labor at company level (incorporating a CP) will be used, in one form or another, by every commander who operates successfully in the field.

CPT ARTHUR B. ALPHIN was commissioned in Armor upon graduation from the United States Military Academy in 1970. He has served in and commanded tank units and has been a Battalion S-3, aide to CG, 2d AD and commander of an MP Company. CPT Alphin is currently studying for a Master of Arts degree in History at Rice University, Houston, Texas.

MASTER GUNNER'S CORNER

During the past year, a large number of inquiries directed to Master Gunner Branch, Weapons Dept, Fort Knox, Ky. generated a revalidation of the procedures for mounting, boresighting, and zeroing the *Telfare* device that are outlined in FM 17-12-7. Some of the procedures were found to be vague or not totally correct. Therefore, a more detailed and comprehensive procedure has been written, and will be incorporated in FM 17-12-7.

The ammunition recommended for the *Telfare* is cal .50, *M-20* API-T. The dispersion factor is about half that of *M-17* tracer ammunition. HEP *M-393* should be indexed in the *M-13* ballistic computer. The superelevation requirements and muzzle velocity is more evenly matched between cal .50, *M-20* API-T and HEP *M-393* than that of HEAT *M-456*. The boresighting procedures have also been altered to increase the probability of hitting the zero panel with the first round.
time ana money.

The following procedures should be used when mounting, boresighting, and zeroing the *Telfare* on all *M-60A1, M-60* and *M-48A5* tanks.

MOUNTING THE TELFARE

1. Park tank on level ground.
2. Perform END-FOR-END test to level the main gun.
3. Adjust top four screws on the mount to half-thread distance. (This will provide a start point from which the mount may be adjusted.) Bottom pads should be flush with the *Telfare* mount.
4. Mount the top part of the device on the gun tube, flush behind the bore evacuator and set the device as straight on the tube as possible so as to eliminate cant.
5. Secure the two bottom straps to the top straps.
6. Place the *M-1* gunner's quadrant on the top flat part of the mount (the brass deflector may have to be removed) and adjust the *top four* pads until the mount is level with the main gun. This step ensures that the machinegun mount is on the same plane as the main gun.
7. Lock the top pads in place by securing the locknuts on each top pad.
8. *Tighten* the four bottom pads so the mount will not move, then secure the four locking nuts. Insure that the bottom 4 pads are *tight.*

PREPARE THE M-2 MACHINEGUN FOR FIRING

1. Ensure the *M-2* is complete and assembled for right hand feed.
2. Mount the *M-2* on the *Telfare* mount, securing the front pin to the mount and the rear pin to the elevating mechanism.
   Note: Ensure that there is even travel on both the traversing and elevating mechanism to allow the weapon to be adjusted left, right, up, or down with relative ease.
3. Check headspace.

4. With the timing gage in place, remove the back plate and time the weapon if necessary.

5. Attach the single shot device to the 113B or 113C wire leading to the main gun firing relay.

6. Find a good ground without paint—preferably on the breech ring.

7. Attach the other lead to the machinegun solenoid.

8. Attach the extended charging handle to the weapon.

9. With the FIRE gage side of the timing gage in place in the weapon, place the main gun circuit on, place the main gun safety in the fire position, and pull the main gun trigger. If the firing pin is activated by the solenoid, the weapon is prepared to fire. If not, adjust the solenoid by loosening the jam screw on the rear and rotating from minimum to maximum until it fires. Then add 3 additional clicks and tighten the jam screws.

BORESIGHTING THE TELFARE

1. Turn the computer off and remove superelevation by using the handcrank.

2. Rotate rangefinder range knob to known range—preferably 1,000 meters.

3. Manually depress the main gun until resistance is met (without forcing) to charge the manual accumulator.

4. Lay the crosshairs of the *M-32* primary sight on the upper, left-hand corner of a 6 x 6-foot panel at a confirmed range of *950 to 1,050 meters*, by manually traversing and elevating the main gun. Do not disturb boresight knobs.
   Note: If a 6 x 6 panel is unavailable, use a larger panel and mark it to 6 x 6 specifications.

5. Remove the backplate, buffer, bolt, etc., and sight through the bore of the cal .50.

6. Loosen the lockscrews on the traversing and elevating mechanism with a 5/16-inch Allen wrench.

7. Adjust the traversing and elevating mechanism until the center axis of the cal .50 bore is aligned with the *bottom* left-hand corner of the 6 x 6 panel (Figure 1).

ZEROING

1. Turn the computer on.

2. Insure that HEP is indexed.

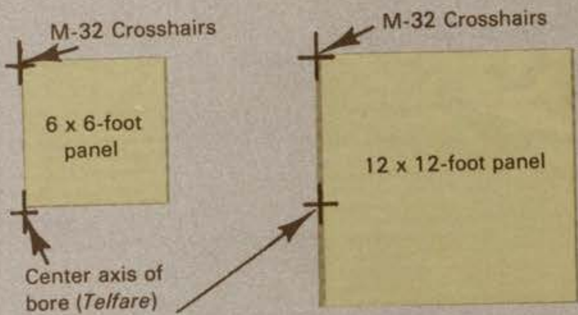
3. Push in the computer reset button.

4. Insure that the actual range to target is indexed into the computer.

5. Move the *M-32* reticle to the center of a 1,000 meter target by manually elevating and traversing through a "G" pattern.

6. Fire a 3-round shot group, re-laying each time on the center of mass with a "G" pattern.

7. Re-lay on the center of mass and refer the *M-32* reticle to the center of the 3-round shot group by turning the boresight and zero knobs. Using the "G" pattern, re-lay on the center of mass and fire a confirming round.
   Note: If the *M-32* primary sight is zeroed for the main gun, record the settings before turning the knobs.



Align the *Telfare* sight picture on the bottom left corner of the 6 x 6 panel instead of the upper left as with the *M-32* sight picture. This will help reduce the superelevation error caused by the difference in superelevation for HEP *M-393* and *M-20* API-T. There is a positive bias of 1.3 mils with HEP calling for a superelevation of 12.9 mils at 1,000 meters. *M-20* API-T calls for 10.3 mils at 1,000 meters. By using a 6 x 6 panel or equivalent and boresighting the *Telfare* 6 feet lower than the *M-32*, the error is reduced by 2 mils (1 meter at 1,000 is 1 mil—6 feet is approximately 2 meters, equaling 2 mils). This leaves only .6 mil difference in superelevation.

8. If the reticle won't move far enough to reach the shot group, you must:
   a. Turn the *M-32* sight's boresight and zero knobs to their center of travel.
   b. Loosen the 5/16-inch Allen retaining screws on the traversing and elevating mechanism.
   c. Adjust the traversing and elevating mechanism the estimated amount of distance to allow the strike of the rounds to be referred to with the *M-32* sight reticle.
   d. Fire a new 3-round shot group.
   e. As mentioned earlier—refer the *M-32* sight reticle to the center of the shot group as in step 7 above.
   f. Using the "G" method, lay on the center of mass and fire a confirming round.
      Note: If proper boresighting is accomplished correctly, the procedure in step 8 should not be needed.

PROBLEMS TO LOOK FOR

1. Solenoid adjustment—the weapon must be timed first.

2. Slippage of mount— the bottom four pads must be *tight* and locked down.

3. Round-to-round dispersion—if excessive, look for loose mount or worn barrel on the machinegun.

The procedures above will insure maximum efficient and effective training with the *Telfare* device.

SFC LAWRENCE G. MILLER
Senior Instructor
Master Gunner Branch, USAARMS

TACTICAL LOGISTICS

by Lieutenant Colonel David D. Skidmore

Trained logistical specialists support the field forces at division, corps, theater, and national levels. They manage the wholesale logistic support programs for generals. The tactical commander at the fighting edge does not have this degree of staff support. He has an S-4 with limited knowledge in general logistics, and only an idea about tactical logistical requirements. The tactical S-4 is trained to be a battle captain—not a logistician; and the logistics instruction provided him is heavily pointed toward garrison procedures, with property accountability and stubby pencil drills leading the way.

Strategy, tactics, and logistics are the fundamental elements faced by every tactical commander and staff. The forces found on the modern battlefield use systems in conjunction with these elements rather than a man-on-man approach in combat. Under current doctrine, generals concentrate the forces (systems), colonels control and direct the battle (using systems), and captains fight the battle (again using systems).[1] The battle captains employ their systems according to the strategy and tactics best suited for the situation, and use the logistics resources provided. The tactical S-4 provides those logistic resources!

Modern technology and excellence in combat skills have essentially eliminated the question of hitting a target on the battlefield. If it can be seen, it can be hit! The question is, "Can we service (kill or disable) all or at least a majority of the mass of targets made available by our adversaries' tactics?" The logistician, as observed in the last two Israeli/Egyptian conflicts, was hard pressed to provide the volumes of essential materials and services required by the combat units. The essentials were Class VII (major systems), Class III (petroleum), Class V (ammunition), and repair services for battle damage.[2] Our tactical logisticians will be equally hard pressed in any future conflict, and must be trained to meet the challenge.

[1]U.S. Government, Department of the Army, Command and General Staff College, Reference Manual 100-5-1, *Operations*, Fort Leavenworth, Kansas, July 1976.

[2]U.S. Government, Department of the Army, Field Manual 38-1, *Logistics Management*, Government Printing Office, March 1973.

Current Methodology

Our officers are currently trained in logistics at their respective service schools using programs of instruction prepared inhouse. Guidance for the programs is provided by the doctrinal centers at Fort Leavenworth and Fort Lee in the form of baseline curriculums. In their instructional programs, each service school gives logistics a different level of priority. A comparison of the logistical hours of instruction for selected basic and advance courses by subject area highlights the differences (tables 1 and 2).[3] The baseline curricula for both courses stress supply while a majority of the service schools stress maintenance, and infers that the baseline does not address officer logistic training needs, and that tactical logistics is seen as even less important by the service schools.

Recommended logistics course input is provided to the U.S. Army Logistics Center by its associated technical service schools. The Logistics Center processes the information, and distributes it in the form of a logistic baseline curriculum to all service schools. This method has rear-echelon oriented institutions developing curriculums for the combat-oriented institutions who must train their officers to operate in the forward areas of the combat zone. Field research on the adequacy of tactical S-4 training indicates that many of the tactical S-4's, and numerous instructors feel that the service schools are providing an inadequate logistic curriculum that does not meet the needs of their graduates.[4]

The Need

The combat arms S-4, like the tactician, must be trained to understand certain basic principles and their application in combat. Just as the S-3 of a combat arms battalion must know the tactics used by the brigade, companies, platoons, and squads, so must the S-4 know the application of logistics procedures at similar levels. He must know the service support resources and methods available at his level to determine viable courses of action. This is not unlike the tactician's requirement to know the capabilities of his weapons systems to enable him to outshoot and outmaneuver the enemy. The S-4 must know how to organize and control combat trains, where the assets for the trains come from, and where to place them on the ground. He must understand cross attachment and its

Table 1. Basic Course Comparison

School/ Center	Hours on Logistics	Percent Baseline	Major Course	Least Emphasis	Emphasis
Baseline	69		N/A	Supply	Services
Infantry	47.5	69	6.8	Maintenance	Services
Armor	110	160	20.3	Maintenance	Services
Field Arty.	39.5	57.2	9.9	Inspections	Services
Quartermaster.	74	107.2	10.4	Supply	Transport
Average/Mode	67.8	98.2	11.9	Maintenance	Services

Table 2. Advanced Course Comparison

School/ Center	Hours on Logistics	Percent Baseline	Percent Course	Major Emphasis	Least Emphasis
Baseline	79		N/A	Supply	Services
Infantry	83	105	7.7	Mat. Rdns.	Supply
Armor	109	138	9.1	Maintenance	Services
Field Arty.	46.9	59.4	4.5	Maintenance	Services
Quartermaster	70	88.7	6.5	Supply	Services
Average/Mode	77.2	98	6.9	Maintenance	Services

Note: Course Curriculums as of 1977.

[3]Research Report, Tactical Unit S-4 Training, LTC David D. Skidmore, Florida Institute of Technology, Fort Lee, October 1977.

[4]Ibid.

impact. When an infantry unit receives an attachment of armor, what is the logistics burden?

The inadequacy of tactical logistics training was particularly noted while observing combat battalion S-4's participating in CATTS[5] at Fort Leavenworth, Kans. The actions of most S-4 participants were reactions to the tactical plan rather than actions anticipated during planning. Seldom did an S-4 become involved in the development of a tactical plan or even have an opportunity to comment on one before adoption. They were simply given the operations plan and were told to support it. Tactical commanders soon learn the constraints of logistics, but they also need to learn how to use the S-4.

To be effective the S-4 needs to understand the basics of tactical logistic operations, and how to formulate courses of action that will support tactical plans while making the best use of available resources. This entails teaching our prospective S-4:

- The basic principles of supporting forward, and ensuring that the combat service support operations are responsive to tactical demands.
- To identify and organize assets to meet the unit's needs based upon organic and attached combat systems, employment techniques, and environmental conditions.
- To match requirements and assets, identify shortfalls, and develop service support plans that accommodate them all. We cannot expect the combat arms or combat support arms officer to function as a logistician in the tactical realm if we do not teach him the basics. Mistakes made in training cost dollars and inconvenience—in combat they cost lives.

A Proposed Concept

Our logistical training should give priority to the Army's business—tactical preparedness and operations. This means placing tactical logistics instruction on an equal plane with tactics and strategy. This does not infer that the requirements for garrison logistic operations should be omitted, only that they be placed in perspective.

The key to this concept is the identification and presentation of the basic principles and critical tasks applicable to tactical logistics by our service schools. The principles and tasks are constants, and as with tactics, their application varies according to the situation.

Tactical logistical operations start with a mission analysis. Both the directed and implied missions are extracted from the orders received. This includes both the tactical and logistic operational requirements. The S-4 must be able to analyze the situation and mission from a support perspective. Then, and only then, can he develop sound courses of action for the commander to choose from. Logistics do not and should neither control the tactical plan, nor drive its development. But, the S-4 must proffer the best use of available resources early in the planning stage, and well before the tactical plan is finalized. The S-4's recommendations should be those that will best support the commander's concept of the operation, and ensure accomplishment of the mission. The tactical logistician tailors his assets to provide maximum support of the tactical plan selected, and advises the commander of any logistic changes that materially affect that plan.

[5]CATTS (Combined Arms Tactical Training Simulator) is a computer model designed to train and evaluate the integrated operations of a battalion staff under simulated combat conditions in a mid-East scenario.

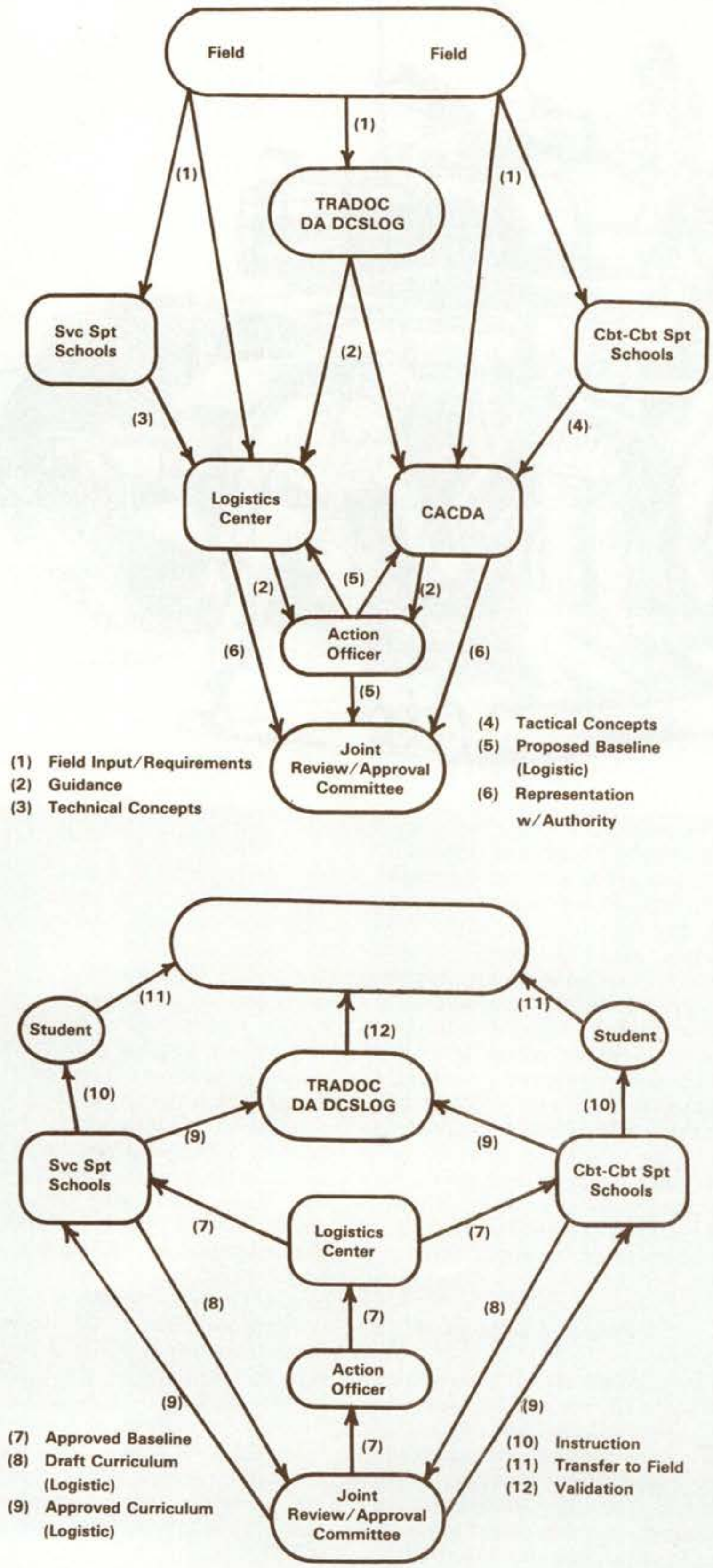


Figure 1.

Training our officer corps requires a uniform baseline and program of instruction in the logistics area. The development of the baseline must begin with the agency that represents the army as a whole, TRADOC and its doctrine centers. A proposed model (figure 1) provides a systematic and balanced development technique for baseline curriculums by the doctrinal centers. It provides the checks and balances so necessary for a coordinated effort between the tactical and logistical schools of thought, field feedback as to adequacy, and credibility as to need. It is a system to ensure that what is provided as a baseline is what is needed in the field.

The tactical commander at the fighting edge requires a competent S-4, one trained to do the job. A specialized course is neither required nor justified in light of the low density of tactical S-4 positions. Fielding of competent, well trained S-4's can be accomplished by improving the adequacy of our service school logistics instruction.

LTC DAVID D. SKIDMORE is assigned to Army Readiness Region I as Maintenance staff augmentee to the 94th U.S. Army Reserve Command, Hanscom Air Force Base, Bedford, Mass. He is a 1977 graduate of the Command and General Staff College, Fort Leavenworth, Kans; and holds a Master of Science Degree in Logistics Management from the Florida Institute of Technology where he conducted research into the tactical training of combat unit S-4's. He has served in a variety of troop assignments. and was the S-4 of the 172d Inf., Alaska for 30 months.

Pages from the Past

POSSIBILITIES

The troop carrying helicopter has enormous possibilities, some of which may prove truly revolutionary. The veteran need only to ponder briefly on the delays imposed in World War II by terrain features such as rivers and escarpments to visualize what might have been done with helicopters capable of ferrying the first combat units to the far side before the enemy was to meet the threat. And what great possibilities lie in the use of copters to permit seizure of small, critical important areas, either in the pursuit of a retreating enemy, or the protection of the flank of a rapidly moving Armored column! How effective the helicopter in moving troops to exploit the effect of our own airpower, missiles, and artillery! And finally, should our forces be on the defensive, how useful to the commander will be the capability of moving tactical reserves quickly from one place to the next in meeting or counterattacking the points of enemy thrust.

ARMOR
September-October 1955

MUSEUM PIECE

The place for the heavy tank is in the Smithsonian Institution. The future of armored vehicles lies in lighter, much lighter, equipment. These lightly armored vehicles must mount the most highly penetrative guns available for reasonable ranges, say, 2,000 to 3,000 yards. They must have enough armor to protect the crew from flak, small arms, and air bursts. Magnesiums and silicates must be used for lightness of construction wherever possible. Shaped-charge and recoilless features must be incorporated in the artillery. Such vehicles should not weigh more than four or five tons.

Armored Cavalry Journal
November-December 1947

THE MAN BEHIND THE GUN

Battle is the symphony of destruction. It is men using weapons to destroy the enemy. Always man, his willingness to sacrifice for the common aim, his urge to fight for his aim, will be the dominant factor in victory. There are not now, and never will be push-button wars. As weapons become more potent, it will take greater courage and steadfastness to use them aggressively and to withstand the weapons in the hands of the enemy. The culminating factor will be the man behind the gun.

No one understood this principle better than General George Smith Patton, Jr. He knew that war is man and man is war, and that leadership in battle is the most important function of an officer. Men may be so led that they will overcome other men with superior weapons. The finest weapons are just so much hardware in the hands of men who are not trained and inspired to fight.

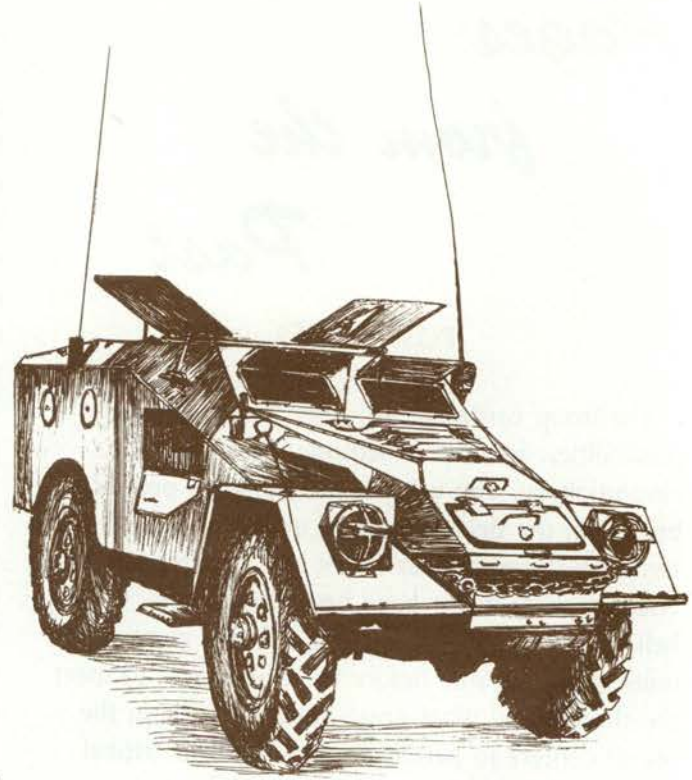
ARMOR
May-June 1955

SMOKE

Smoke developments employed by the United States during the war helped materially to hasten victory. Screening smoke was used to blanket ports, harbors, and cities in an attempt to prevent accurate bombing and to effect wall-like screens to blind frontline enemy observation.

Employed on all American fighting fronts, smoke was a particular vital factor in keeping down American casualties in its adaptability to both offensive and defensive combat. It greatly reduced the effectiveness of enemy air operations by obscuring targets. River crossings were shielded by artificial fog and enemy mortar and artillery fire was disrupted by smoke screens which served as protection for our enemy advances.

Armored Cavalry Journal
January-February 1947



Standardization in the Warsaw Pact

by Dr. Arthur G. Volz

Standardization of weapons and equipment in the armies of NATO is a familiar object of criticism in the West. The impression is that the Warsaw Pact armies have reached an incredible degree of standardization through Soviet insistence on large-scale issue of the most modern Soviet weapons to all armies of the Pact. Is this in fact true? What is the real situation?

Standardization is influenced first of all by the relationship between the size and industrial strength of a country or an alliance, and the size of the forces maintained. A large and industrially powerful country can easily maintain an army equipped with modern weapons, provided that army is small. On the other end of the scale, small and industrially weak countries with relatively large armies find it extremely difficult to maintain such forces at a modern level unless a rich benefactor is at hand.

Second, standardization within an alliance is hampered by national pride. This may result in the adoption of inferior weapons, just because they have been designed by native sons and can be produced in local plants. National pride likewise may force the adoption of high quality items, even though they can be produced only in small quantities at great unit cost. Naturally, national pride is not always labeled as such. It usually appears in the guise of: better design, supporting our economy, or national self-sufficiency. No country, regardless of political system, is free from these problems—not even those of the Warsaw Pact.

The Warsaw Pact is a large alliance supported by a powerful industrial base. It maintains large active peacetime forces and is capable of raising and maintaining even larger ones in time of war. Nevertheless, the sheer size of these forces imposes limitations on finding a balance between a high level of standardization and maintenance of stocks of modern weapons. Further, the age-old national pride in the various East European countries plays an ever increasing role in spite of the overwhelming dominance by the Soviet Union.

The USSR can develop and produce weapons of all kinds on a large scale, but the other Pact members vary greatly in their capabilities. The only country with an equivalent qualitative capability to develop and produce conventional armament, although on a smaller scale, is Czechoslovakia. Poland, the largest non-Soviet member of the Pact, has built up a considerable arms industry and has a small research and development capability, but still must depend on the Soviet Union for modern designs in most fields. Like Czechoslovakia, it produces all types of conventional arms ranging from pistols to tanks. The German Democratic Republic (GDR), with its highly developed industry, would be capable of a similar effort, but its arms production is limited to pistols, rifles, grenades, and mines because of Soviet distrust. Even the manufacture of heavy trucks has been blocked.

Among the weaker countries in the so-called "southern tier," Hungary has the most diversified arms industry, dating back to before World War I. It has continued to build up its production capacity although, like Poland, it relies on Soviet designs. However, it has not been permitted to manufacture tanks, one of its pre-1945 products, although light, wheeled armored vehicles of native design are turned out. Rumania also inherited an arms industry that had produced light artillery and small arms. It was less diversified than Hungary's, but had good potential. Since 1945 its capacity has been expanded, especially as a result of the independent line taken in recent years by the Rumanian government. Nevertheless, most arms produced in Rumania are of Soviet design. Finally, there is Bulgaria, an industrially weak country of little current significance for arms production.

One would think that as a result of this situation Soviet weapons and equipment would be standard throughout the Warsaw Pact armies, perhaps supplemented by a few select items developed in countries such as Czechoslovakia. While this is indeed largely the case as far as weapons are concerned, there are many significant exceptions, especially in the case of the Czechoslovak Army.

In the motor transport and engineer fields there is, on the other hand, a strong tendency to procure native equipment. Furthermore, because of the sheer size of the forces and the need to hold immense mobilization stocks, even those Soviet weapons and equipment items in issue are not standardized to the degree that the press of those countries or some Western observers would have us believe. To achieve this would require a full-scale mobilization of the Pact economies. Not even the USSR can afford such an effort during peacetime.

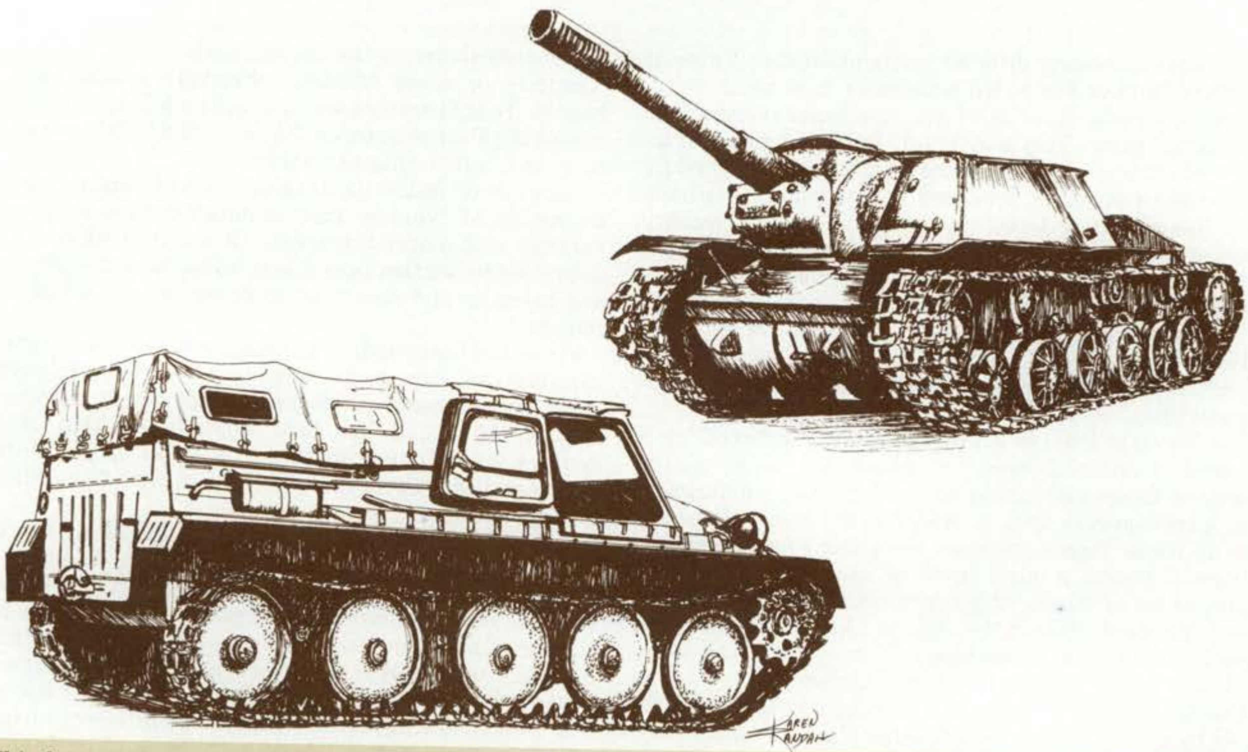
Because of space limitations we will confine our examination of Warsaw Pact standardization to armored vehicles and motor transport, although small arms, artillery, mine warfare equipment, construction equipment, and bridging and stream crossing equipment are of equal interest.

Much has been made of the standardization advantages that Warsaw Pact armies have over NATO in the field of main battle tanks. Disregarding the small number of Belgian *M-47's*, it has been pointed out that NATO deploys six different main battle tanks in the central region and that these tanks are armed with five different main guns.

On the other hand, until recently the opposing Warsaw Pact forces deployed four main battle tanks including the *T-10M*, armed with three main guns. In fact, the Warsaw Pact did have an immense advantage in main battle tank standardization, especially if one disregards the limited numbers of *T-10M's*. The *T-54* and *T-55* mediums are essentially the same tank armed with the same basic gun. The *T-62*, mounting a different gun in a different turret, is otherwise very much a *T-54/55* with the same basic engine and running gear. Even the *T-10M* uses the same basic engine. Thus the vast number of Soviet medium tanks developed prior to the *T-64* used only two main guns, two different 7.62-mm machineguns, a single 12.7-mm machinegun, one basic engine, and a single running gear—a remarkable degree of standardization for such a huge force.

The standard medium tank engine was also used in a wide variety of other tracked and wheeled vehicles including the *MAZ-537* tank transporter. In addition the Soviet light tank engine (model V-6) was essentially a in-line, six-cylinder version of the medium tank powerplant, and was used on numerous tracked vehicles, resulting in a high degree of powerplant standardization so that a mechanic trained on one engine could easily work on many others. In fact, had he been trained on Soviet World War II medium and heavy tanks and assault guns, he would find little difference since they already used the same basic engine. But this was the sore point. Although the USSR had achieved considerable standardization in engines for tanks and other armored vehicles, it had been done at the price of sticking to a proven, but aging design first produced in 1940! These engines performed well, but were inadequate for further development. As a result entirely new models had to be developed with better performance and more highly standardized models of the past. Without them the new main battle tanks and infantry combat vehicles could not have been fielded.

There was a similar problem with running gear components. The dead track used on most Soviet vehicles is reliable and proven, but better performance and track life are needed today. In spite of the awareness by Soviet designers of improved track components, the sheer number of existing vehicles with a remarkable degree of standardization acted as a brake on introducing radical improvements. For many years logistical advantages outweighed technical progress. Now the pendulum has begun to swing the other way. The *BMP* infantry combat vehicle has new running gear, as do the new main battle tanks, *T-64* and *T-72*. In addition, the Warsaw Pact forces are refitting their older medium tanks with track components using rubber-metal track pins similar to those used on most Western tanks for years.



This latter step sounds like a simple and logical one, merely requiring replacing older components as new ones become available. Compared with the introduction of a complete new tank it is indeed simple; however, there are problems. The new track has certain handling characteristics that differ from the older models, requiring special driver training and certain changes in maintenance procedures. Greater care must be taken in the treatment of the track since the rubber elements are sensitive to oil and flame. Even the paint used to blacken the track shoes had to be changed, and new type drive sprockets had to be mounted. This retrofit makes all of the older stocks obsolete, since the new and old track components are not interchangeable. When you consider the tens-of-thousands of medium tanks in the Warsaw Pact inventory, the immensity of the undertaking becomes evident. Also, until the changeover is complete, the former high degree of standardization has been impaired. The degree of compatibility of the new type *T-54/55/62* track components with those of the newer *T-64* and *T-72* models is also open to question since it appears that these new tanks also have differences between them.

The introduction of complete new tanks results in a much more complex problem. The older medium tanks had many common features. The evolutionary changes incorporated in the various submodels (night vision equipment, main gun stabilization) could be easily absorbed in production, supply, maintenance, and training. The only significant change was the introduction of the 115-mm smoothbore gun on the *T-62.* The new tanks, however, represent a greater break with the past. They have a new 125-mm smoothbore gun, new fire control systems, automatic loaders, new powerplants, and new running gear. These changes were necessary to field improved main battle tanks, but they effectively destroyed the once highly vaunted standardization of main battle tanks and related vehicles. What the reported *T-80* will bring is still open to question, but it will certainly not improve the standardization picture.

In addition to main battle tanks, the Warsaw Pact forces have tens-of-thousands of tracked armored vehicles based on the *PT-76* amphibious tank: the Soviet *BTR-50P* and Czechoslovak/Polish *OT-62 TOPAS* series APC's, the *ASU-85* airborne assault gun, the *ZSU-23-4* self-propelled air defense gun, the 122-mm self-propelled *M-1974* howitzer, the launch vehicle for the *SA-6 GAINFUL* surface-to-air guided missile system, and many others. The use of common engines, suspension, and running gear components assured a high degree of standardization. But here too, change necessary for progress has destroyed standardization. The new *BMP* is not a member of the old light tank family, and it uses different track components and a new engine. Although it will probably replace the *BTR-50P* series and the *PT-76* in most roles, the recent introduction of other vehicles using the older light tank running gear (122-mm self-propelled *M-1974* howitzer and *MT-LB* armored utility vehicle) indicates that two different light armored vehicle families are in existence, and will remain for years to come.

Special vehicles such as the older *AT-P* semiarmored artillery tractor, the *ASU-57* airborne assault gun, and the new *BMD* airborne combat vehicle have been disregarded since they are in relatively limited issue. The *ASU-57* and *AT-P* have powerplants taken from standard older vintage vehicles, and details are lacking on the *BMD* engine. The *BMD* does have the same turret as the *BMP.* Running gear in all three vehicles is non-standard.

The Warsaw Pact has its greatest variety of armored vehicle types in the light wheeled class. The original *BTR-40* (4x4) and *BTR-152* (6x6) series of nonamphibious armored personnel carriers had a high degree of standardization with standard trucks since they were nothing more than armored versions of these. The more sophisticated *BRDM* scout car was also nothing more than an upgraded, amphibious version of the *BTR-40.* The amphibious *BTR-60P* series (8 x 8) represented a greater change, but here too the same basic *BTR-40/BRDM* engine was employed. During the 1960's greater changes took place when the *BRDM-2* scout car was introduced using the same basic engine of the now obsolescent *Chayka* passenger car. The *BRDM-2* also introduced a new turret with 14.5-mm *KPVT* and 7.62-mm *PKT* machineguns, which were also fitted on the *BTR-60PB.* Previously, except for special air defense variants, Soviet APC's and scout cars had used only pedestal mounted machineguns, generally the 7.62-mm *SGMB.*

Today the *BTR-40* has virtually disappeared while the *BTR-152* series is confined to second line units. The original *BRDM* is also passing out of the picture. The most common wheeled armored vehicles in first line Soviet units are the *BTR-60P* series and the *BRDM-2*, which gives a rather high degree of standardization.

This would be an ideal picture if one did not take into account the colorful mixture of light, wheeled armored vehicles used in the other armies of the Warsaw Pact. Here one can find many of the older Soviet scout cars and APC's along with the newer ones, in addition to native designs or variants.

Each army presents a different picture. The *BRDM-2* is used in Poland, the GDR, and Bulgaria, but not in Czechoslovakia. The *BTR-152* can be found in some Polish and East German units, but was never issued in Czechoslovakia. The newer *BTR-60P* series is found in the GDR, Bulgaria and Rumania, but not in Poland, Czechoslovakia, or Hungary. The latter three countries have developed their own wheeled armored vehicles which are issued in place of Soviet models. For example Poland and Czechoslovakia jointly produce an amphibious 8 x 8 APC resembling the *BTR-60PB* but differing considerably. Assembled in Poland, it uses a Czechoslovak diesel engine. Water propulsion is by propeller instead of waterjet. This vehicle, the *OT-64 SKOT*, also has armament peculiarities. Hungary first developed an amphibious scout car resembling the *BRDM* in the early 1960's. It is still used in both the Hungarian and Czechoslovak armies under the names of *FUG* and *OT-65*, and to a limited extent in Poland. Although based on the Soviet *BRDM* the *FUG/OT-65* is powered by a Hungarian diesel engine. From this scout car Hungary then developed an amphibious APC, the *PSZH* (4 x 4), which is also used by the East German border troops, and is powered by a Hungarian produced diesel engine manufactured on license from a West German firm.

Turret with armament	Vehicle
PT-76 with 76-mm gun *D-56T*	*PT-76*
BMP with 73-mm cannon *2A20* & 7.62-mm machinegun *PKT*, plus *SAGGER*	*BMP, BMD*
Soviet turret with 14.5-mm *KPVT* & 7.62-mm *PKT* machineguns	*BRDM-2, BTR-60PB*, some Polish *OT-64*
Polish turret with 14.5-mm *KPVT* & 7.62-mm *PKT* machineguns	Polish *OT-62* & *OT-64*, some Polish *BRDM-2*
Rumanian turret with 14.5-mm *KPVT* & 7.62-mm *PKT* machineguns	Rumanian *BTR-60PB*
Hungarian turret with 14.5-mm *KPVT* & 7.62-mm machineguns (model unknown)	Hungarian *PSZH*, East German *PSZH*
Czechoslovak turret with 7.62-mm *M59T* machinegun & 82-mm recoilless gun *T-21*	Czechoslovak *OT-62* and *OT-65 (FUG)*
Soviet turret with 7.62-mm *PKT* machinegun	*MT-LB*

Table 1.

An oddball is the Czechoslovak *OT-810* half track, an upgraded German World War II *SdKfz 251* with a Czechoslovak diesel engine. It is employed primarily as the self-propelled mount for 82-mm recoilless guns, *M59A*, in the Czechoslovak Army. *(For more detail of the SdKfz 251, see ARMOR, January-February 1979—ED.)*

Disregarding oddballs and relatively rare models such as the *BTR-40, OT-810,* and *BMD*, we find a total of two basic light tracked vehicles and seven wheeled models using nine basic engines, two different fuels, two different tire sizes, and engines originating in three different countries. This is a far cry from the much advertised standardization, although one of the track systems, both of the tires, and most of the engines are also used in a wide variety of other vehicles as well. A serious problem, however, is that many of the engines are of an old basic design. Like the medium tank engine, the straight six of the light tank family dates back to 1940. The engines of the *BTR-152* can be traced to 1934 in the USSR, and even earlier in the U.S., while those of the *BRDM* and *BTR-60P* also go back to 1940. Those in the latter three cases were once widely used in Soviet motor vehicles, but have been replaced in currently produced trucks and sedans by newer and better powerplants. In many ways, it is as if the U.S. Army would still be forced to stock spare parts for World War II vehicles along with those for current models.

The armament picture is also rather mixed in the light armored vehicle field, although there is a clear dominance of certain Soviet light weapons systems and a complete interchangeability of ammunition. Table 1 shows this clearly.

This does not take into account the various specialized weapons systems, such as antitank guided missiles and *SA-9 GASKIN* surface-to-air guided missiles, which are mounted on modified *BRDM* and *BRDM-2* scout cars.

A brief mention should also be made of the former widespread standardization in the main armament of tanks, assault guns and towed weapons, which was especially noticeable in the matter of interchangeable ammunition (76-mm, 85-mm, 100-mm, 122-mm, and 152-mm guns). Today this has virtually disappeared with armored vehicle guns having no towed counterparts in normal active service (disregarding the two self-propelled field artillery cannon and the two self-propelled air defense guns).

The standardization picture in the field of motor transport is not as favorable as that with armored vehicles. Soviet trucks are used in all Pact armies, but often only in specialist roles. There is in fact a definite trend to using locally produced vehicles of non-Soviet design, except in the GDR. Perhaps the most widely used Soviet vehicles are light models similar to Western jeeps. Here the *GAZ-69* and *UAZ-469* are universally employed. Czechoslovakia tried to develop its own model, but gave up early, while the GDR is phasing out its own *P3* in favor of the *UAZ-469*.

Czechoslovakia has always supplied the mass of its military trucks from local production, and its military vehicles have been exported to other Warsaw Pact countries such as the GDR, Hungary, Poland, and Bulgaria. Western influence is now coming into the Czechoslovak automotive industry, which is producing a light civilian truck of French origin powered by an engine of West German design. Soviet trucks have generally been limited to jeep types and specialist vehicles, although an increasing number of Soviet *ZIL-131's* (6 x 6) are appearing, possibly as replacements for the native *Praga V3S* (6 x 6). Unfortunately for the Czechoslovak Army the *ZIL-131* has a reputation as a gas-eater!

Poland, which used to produce Soviet designed trucks, is now turning out models of native design. In spite of the presence of larger numbers of Soviet trucks than in Czechoslovakia, the Polish Army is primarily equipped with Polish produced models. Interestingly, the heavier Polish trucks are powered by diesel engines made on license from a British firm.

In spite of the fact that the GDR is using more and more Soviet trucks in its military forces, large numbers of East German *LO-1800A* (4 x 4) and *W50L* (4 x 2 & 4 x 4) are issued. In addition imported Czechoslovak heavy *Tatra 813* (8 x 8) models play an important role in the East German forces as artillery prime movers, multiround rocket launcher carriers, and other special purposes.

Hungary uses large numbers of Soviet trucks, but the growth of the native automotive industry in size and quality in recent years has brought about a definite shift in favor of native models. Hungarian trucks were once marginally effective models based on an obsolescent model made on license from an Austrian firm. In recent years Hungary entered into close cooperation with a West German firm resulting in the production of *MAN* truck models with diesel engines. Further, there is an exchange of parts with Rumania, which also produces *MAN* trucks. For example, Hungarian made *MAN* engines are shipped to Rumania. The result of this injection of advanced Western technology has been the development of improved military trucks which are now preferred in Hungary over equivalent Soviet models. As noted earlier *MAN* diesel engines are also used in the Hungarian *PSZH* wheeled armored personnel carrier. A further complicating factor in the Hungarian motor transport picture is the use of large numbers of East German light trucks, *LO 1800A*, and specialist Czechoslovak *Tatra* heavy models. Hungary has also moved into the production of light military trucks by obtaining the license to produce the Swedish *Laplander.*

At one time Rumania used Soviet military trucks with a few locally produced models based on Soviet designs. As in Hungary, however, recent years have brought many changes. The first results of these changes was the introduction of the *Carpati* and *Bucegi* trucks, patterned on U.S. models. This was followed by jeep-type vehicles based on Soviet designs, but now using engines developed from those used in the *Carpati* and *Bucegi* trucks. Then came the licensing agreements with *MAN* of West Germany and the associated cooperation with Hungary. The result has been a vast improvement in Rumanian truck models and a growing tendency to use them in place of Soviet models. In addition, the production of light wheeled armored vehicles may have begun.

Finally in Bulgaria, which originally did not have an automotive industry, assembly of civilian trucks of Czechoslovak and Soviet design is taking place. The military, however, still relies on Soviet and Czechoslovak all-wheel-drive models.

It is clear that there is a decided tendency to become nationally self-sufficient in truck production and design, thereby precluding a comprehensive standardization within the Warsaw Pact forces. Full wartime mobilization would further complicate the matter since masses of obsolete and obsolescent models would be requisitioned. Certainly there is a limited degree of component and parts exchange, even with the Soviet Union, but the publicity given to this in the Warsaw Pact countries cannot hide the diversity of military models now deployed and destined to be in service for many years. There are growing national differences, and the additional unavoidable presence of two or even three generations of motor vehicles in all of the armies complicates supply, maintenance, and training.

NATO standardization is certainly deficient, but Warsaw Pact standardization is certainly far from ideal. The Warsaw Pact countries are best off in main battle tanks and least well off in soft-skinned vehicles. Nevertheless, the pressures of national pride and the need to develop modern items is heavy. You cannot have perfect standardization and progress at the same time. Whatever decision is made, it must be a compromise. The Soviet leadership is aware of this and has decided on a combination of quality and quantity. Since mass is so important in Soviet military thinking, the presence of older weapons is not looked on as despairingly as might be expected. An East German military writer has expressed this most clearly:

> "Under the present conditions of stormy technical development, the time intervals in which the new supplants the old are very much shortened. However, at all times the new and old remain alongside of each other for a period of time and supplement each other. He who is only oriented towards new material and neglects training on other weapons shows that he does not know the objective operating laws of development in military affairs. Such a sin of omission leads in the final result to the weakening of the defensive strength of our state."[1]

This is a lesson which applies to NATO as well as to the Warsaw Pact. Standardization or progress is a dilemma for all armies.

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[1]Karl Dittmar, *Uber den Einfluss der Entwicklung der technischen Kampfmittel auf die Kampffuhurung* (East Berlin: 1957), p. 36

DR. ARTHUR G. VOLZ received his BA and MA from the University of Michigan and his PhD from the University of Frankfurt (Germany). He served as an officer in the US Army during World War II and as a Department of the Army civilian in Europe as an intelligence research specialist. He is currently teaching Soviet military affairs at the US Army Institute for Advanced Russian and East European Studies.

The Swedish Armor Battalion

photo courtesy of Swedish Supreme Command

Captain F.R. Thomas and
Captain P.I. Olsson

The idea of a combat team, consisting of tank and infantry subunits with an artillery subunit in direct support, is familiar to most Western World combat arms officers. The difficulties of achieving the close teamwork required between different branch subunits in such a tactical grouping has frequently led to the suggestion that tank and infantry subunits should be placed together in the same battalion-sized organization. In Canada the idea surfaced among World War II veterans but quickly disappeared as regimental traditions asserted themselves in a peacetime army. The idea has appeared from time to time in *ARMOR* and other military magazines and was put into practice in the American armored cavalry organizations where platoon-sized elements of tanks, scouts, infantry, and mortars were joined in squadrons. The French also have a battalion-sized unit integrating infantry and tank subunits, but the latter are not equipped with France's main battle tank (MBT), the *AMX-30,* but the light *AMX-13.* The country where MBT tank companies and mechanized infantry companies are integrated in armored maneuver battalions is Sweden.

The Swedish Armored Battalion

The Swedish armored battalion is a true armored unit as opposed to a tank unit. It consists of two tank companies, two mechanized infantry companies, an artillery battery, a staff company, and a logistics company. Figure 1 shows the organization of the tank and infantry companies. The MBT used in the tank platoons is the so-called turretless *S-tank* with its autoloading 105-mm gun although some modified *Centurion* tanks are also utilized. The tank platoon normally consists of 11 men, nine of whom are found in the three-man crews of the three tanks in each platoon, and two remain with the reserve section of the company. The mechanized infantry platoon of the tank company has 33 soldiers carried in three of the Swedish designed and built *Pbv-302* armored personnel carriers (APCs). The three platoons of the mechanized infantry company are identical. The antitank platoon of the mechanized infantry company is currently equipped with four jeeps, each carrying a 90-mm recoilless rifle with a range of up to 800m. The logistic elements of both mechanized infantry and tank companies have cooks, medical sections, and mechanics. The reserve element of the tank company includes the eight crewmen from the tank platoons, a recovery vehicle, and a bridgelayer. It is normally used to help the tank platoons with maintenance.

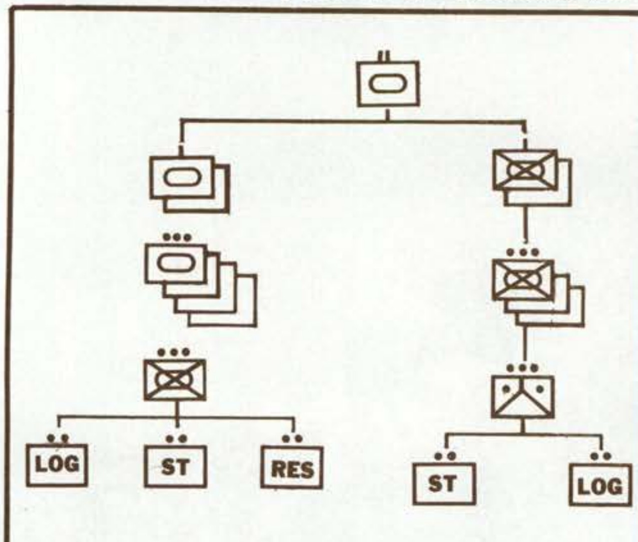


Figure 1. Swedish Armored Battalion—Tank and Mechanized Infantry Companies.

The three other companies are shown in figure 2. The artillery battery of the battalion is organic to the unit and consists of four towed 105-mm howitzers of Swedish design. This organization always remains under the control of the battalion commander. The main task for this battery is to support the battalion with smoke. This battery can deploy six forward observer parties in three APCs and three jeeps. The staff company, in addition to a signals platoon and a staff platoon, also has three identical reconnaissance platoons of 17 soldiers each, mounted in three Volvos and two motorcycles. The logistic company includes: a fuel section, a medical troop with two medical officers, a pioneer platoon of 35 soldiers, three trucks, and bridging equipment.

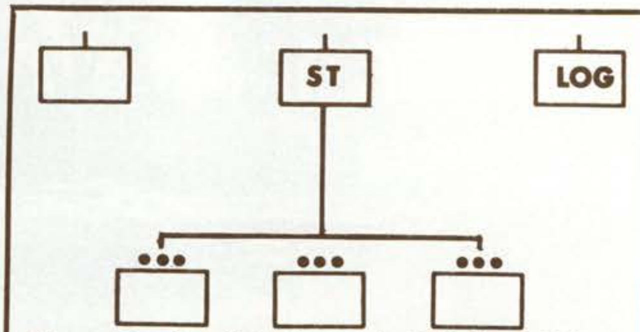


Figure 2. Swedish Armored Battalion—Other Companies.

The total strength of all seven companies in the armored battalion is 1,050 personnel.

Grouping is still required within the armored battalion and figure 3 illustrates some of the groupings that might occur depending on terrain and objectives. Tanks or infantry lead according to the requirements of the ground as taught in NATO doctrine.

The Swedish Armored Regiment

There are three armored battalions in the Swedish armored regiment which has a personnel strength of 5,500 soldiers. Some of the other organizations found in the armored regiment are outlined in figure 4. There is a reconnaissance company of four reconnaissance platoons, two similar to those found in the battalions, and two equipped with *Pbv-302 APCs*. Also in this regimental reconnaissance company is an antitank platoon similar to those of the battalions. There are two antitank companies in the armored regiment. Each of these antitank companies has a missile platoon presently using the *Bantam,* an antitank platoon of the battalion pattern with 90-mm recoilless rifles, and a platoon of truck-borne infantry to protect the

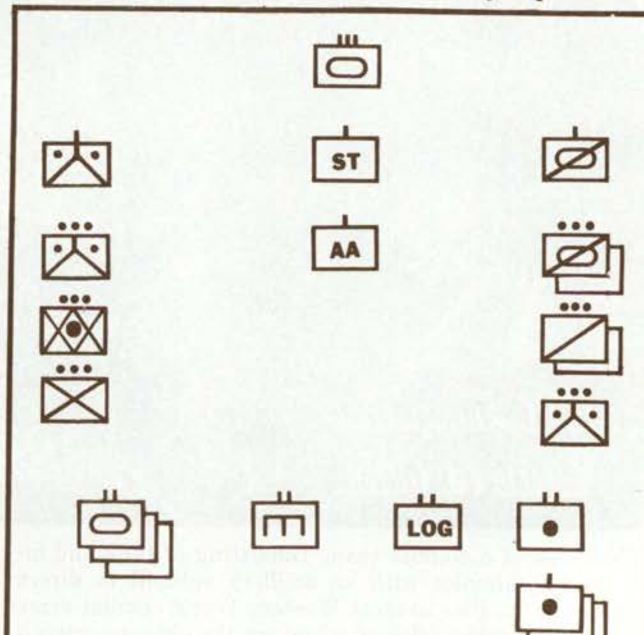


Figure 3. Units of the Swedish Armored Regiment.

Table 1: Platoon Breakdown of Swedish Armored Regiment

Serial	Platoon Type	No. Plat in Regt	Remarks
1	Tank	24	72 Tanks in regt.
2	Mech Inf	24	
3	Truck-borne Inf	2	
4	Antitank	11	36 Recoiless rifl in 9 plat. 72 *Bantams* in 2 plat.
5	Reconnaissance	13	11 with Volvos 2 with APCs
6	Arty Btry	6	3 105-mm 3 150-mm or 155-mm 4 guns to btry
7	Engineer	Battalion plus 3 Pioneer plat	
8	Antiaircraft	3	6 20-mm towed guns each plat

All APCs considered to have good AA capability with their 20-mm autoguns.

antitank men. The artillery battalion is equipped with towed 150- or 155-mm howitzers, organized in three batteries of four guns each. The regiment also has an engineer battalion, a logistics battalion, and an antiaircraft company consisting of three platoons, each with six towed 20-mm AA guns. The regiment has considerable resources to support any one of its three armored battalions. Table 1, giving a breakdown of the regiment by platoon types, can be used for comparison with other organizations of brigade or regimental size.

Table 2. Additional Antitank Weapons

Type Company	Carl Gustavs	Antitank Mines
Reconnaissance	6	50
Antitank	7	220
Staff	4	
Armor	3	50
Mech Infantry	9	Some
Logistics	3	400
Artillery	2	Some

Summary

The following can be noted about the Swedish armored battalion and its parent, the Swedish armored regiment:

Antitank strength. Not only does each mechanized infantry company have its own antitank platoon, but there are two regimental antitank companies. As an added feature these antitank companies have their own organic riflemen to provide local protection. Additional antitank weapons held in company-sized units are shown in table 2.

Number of reconnaissance platoons. Armored battalions have three reconnaissance platoons while the regiment has four additional platoons in its reconnaissance company, which also has an organic antitank platoon.

Engineer resources. There is a battalion-sized engineer unit in the regiment in addition to the pioneer platoons and bridge layers found in each armored battalion.

Organic artillery battery in each battalion. Each armored battalion has its own four gun battery. There is also an artillery battalion in the regiment with three batteries of four guns each. These batteries are considerably smaller than equivalent batteries in Western nations, but the difficulties of observing artillery fire in forests may account for this modest artillery support.

Air defense weapons. At the moment there are only 20-mm antiaircraft guns within the regiment, however the introduction of the *RB-70,* similar to *Blowpipe,* will change the AA organization and capability. The main air defense support comes from missile-equipped AA battalions sited to cover Sweden.

Suggestions from the Swedish Model. The study of the Swedish armored battalion suggests the following:

• Combined arms training. Integration on the Swedish model would alleviate many grouping "hassles" with codes, rations, POL, etc., not to mention the joint/combined training problems. The Swedish organization may not be right for multi-role units, but it does illustrate the requirement to train and live together as much as possible.

• Organic smoke in the battalion. Some veterans of Northwest Europe have cited the usefulness of smoke, particularly to tankers and they would be delighted to see the armored commander with his own dedicated source. Organic indirect smoke is perhaps an idea NATO organizations should consider, or at least they should develop an increased capability for provision of smoke.

• Motorcycles. While useless under fire, motorcycles may be very handy for conveying information during periods of radio silence or enemy jamming, particularly in reconnaissance organizations.

The future. The Israeli *Merkava* tank with its capability to carry infantry will necessitate integration at an even lower level than the Swedish armored battalion. It will be interesting to see how this mix of infantry and tankers in one vehicle is organized.

CPT F.R. THOMAS, Canadian Forces, has served as a tank platoon leader in Canada, reconnaissance platoon leader in Cyprus, and as an operations officer of a reconnaissance regiment in Canada. He has served tours with United Nations Forces in Cyprus, Syria, and Israel. A graduate of the Tank Technology Course in England and the Canadian Land Forces Staff Course, he has served staff tours with various headquarters in Canadian units.

CPT P.I. OLSSON, Swedish Army, has served with Swedish armored battalions in a variety of assignments. Recently, he was a member of the United Nations Forces on the Golan Heights.

The Command Sergeant Major

by Command Sergeant Major John W. Gillis, 3d Armored Division

When you assume command of your first battalion you will establish your *first* commander/command sergeant major (CSM) relationship. No matter how many command sergeants major you have worked *with* in the past, this is the first one that is *your* CSM. It will be a learning experience that all other former battalion commanders have gone through; and based on their comments concerning their command sergeants major, they really knew how to properly utilize a CSM only after they had changed command and reflected on their experience.

Although thousands of words can be written about the commander/CSM relationship, its foundation is frankness, integrity, and absolute trust between both parties. If these basics do not exist between you and your CSM due to *his* failure—get another CSM.

Treat your CSM as a professional. Should you have the misfortune of having one of the *very few* command sergeants major who cannot or does not perform in a professional manner, be sure to give the *position* the respect it demands, even though you are forced to relieve him. The way you handle this situation will be common knowledge within your command. If you do not separate him from the prestige of the position, you will create the probability of his becoming a "Lame Duck."

The first individual you should talk to after taking command is your CSM. You should meet with him in your office, shortly after your assumption of command reception. This meeting should be private and uninterrupted. Seek his opinions about key officer and enlisted personnel by name and position, problems within the battalion, things the battalion does well, and the relationship between your battalion and higher headquarters. His comments will be an accurate base for you to use as you seek the same information from others to evaluate the state of your battalion. His comments will be the most accurate you will hear since it is his duty to tell you the unvarnished truth. His career depends on fulfilling this duty with openness and complete candor. Others have the same duty, but it is questionable if their careers depend on such.

During the initial meeting with your CSM, have him tell you what his specific duties have been. Do not become concerned if the list is not too long. It is important for your CSM to be *free* to:

- Have time to initiate plans and implement actions and ideas to improve the battalion.
- Visit the companies daily, especially training sites.
- Check specific trouble spots that you have identified and desire his opinion or action.
- "Put out the fires" that are best handled through sergeant major channels.

Talking with your CSM and other principals in your battalion provides information for you to evaluate your battalion from within. Once you have done this, visit the brigade command sergeant major. He is an excellent source of information concerning your battalion's strengths and weaknesses in comparison to the other bat-

talions in the brigade. He can also provide you with an evaluation of your CSM and his performance in relation to other command sergeants major in the brigade. This visit will open the channel of communication between you and the brigade CSM and provide a sound basis for later interaction. You should communicate randomly with the brigade command sergeant major, but be selective. Do not undercut your own CSM.

Define the CSM's position both verbally and by your actions. Some actions and policies that will enhance the CO/CSM relationship follow.

Advise your CSM in private that there is no one between you in the chain of command. This is a basic point, but must be stated early to provide a clear understanding for both of you. Advise your staff officers, also privately, that the CSM's position is that of a special enlisted advisor to you, with direct access and accountability to you.

Allow your CSM free access to you at all times. He will have information that you should know *now* and will exercise the proper judgment before interrupting whatever else you are doing to advise you. There is nothing like knowing a *hot* call is forthcoming from the brigade commander and being prepared with answers when he calls. If your CSM has a good relationship with the brigade CSM, this type of action will be routine.

Explain to your CSM that once you have made a decision, after considering his and all other recommendations, you expect him to support your decision. This, again, is basic, but it "clears the air" when restated.

Give your CSM's opinion the consideration it merits. When a company commander proposes an action and the CSM is in opposition, listen to both sides in private without making the officer/enlisted distinction. Remember that while the company commander is advocating what he believes is right for his company, the CSM is advocating what he believes is right for the battalion. The company commander is responsible for anything his unit does or does not do, therefore, consideration must be given to his command prerogative. However, the experience factor of your CSM must receive equal consideration. What is right and/or what is best should be the only criteria for your decision, not *who* presented which course of action.

Require your company commanders and staff officers to voice their complaints about your CSM to you *only!* If they desire to work out any problems with your CSM, that may be a choice of theirs. To insure differences are handled professionally, only the battalion commander is qualified to make a decision in this type of situation.

Require your CSM to meet privately with all new company commanders. This works best if done at least 2 days before they take command. However, circumstances may not always make this feasible. This will accomplish two things. It will make your CSM more effective, and company commanders will have a better understanding of their relationship to the CSM. Some of the things about which the CSM can offer advice to the new company commander are:

- The company commander/first sergeant (1SG) relationship.
- The CSM/1SG relationship.
- The CSM/company commander relationship.
- The battalion commander/company commander vs the company commander/battalion staff relationship (green tab relationships).
- Insights pertaining to your methods as battalion commander.
- Utilization of the CSM, through the company 1SG to "keep the fires out."
- Availability of the CSM to the company commander.
- Insight into the senior NCO and personnel in his company.
- The strengths and weaknesses in his unit as viewed by the CSM.

Require your staff to coordinate with your CSM on matters within his realm of experience, (e.g. plans for ceremonies and change of commands). The CSM has been involved in drill and ceremonies all his life.

Listen receptively when your CSM brings officer problems or failures to your attention. He will or may have already tried to tactfully solve it and failed. When he has brought it to your attention in private, he will have met his responsibility, (e.g. an officer with an unauthorized mustache that is affecting the standards of appearance of the enlisted soldiers). He will not presume to recommend disposition. That is your responsibility. He will, however, provide sound advice, if solicited, pertaining to the development of young officers.

Make your CSM responsible for assigning incoming noncommissioned officers to the companies. He is impartial and concerned with the needs of your command. His objectivity and professionalism will guarantee that noncommissioned officer assignments will be based on the unit need, rather than personal desires.

Require your CSM to review and concur or nonconcur on all recommended judicial and nonjudicial actions taken at battalion level. He will guarantee that you have *all* the information prior to your decision.

Require your CSM to concur or nonconcur on all awards for enlisted personnel. He will give you the insight that you need to recognize the deserving and weed out the undeserving.

Require your CSM to make frequent inspections. One billet a day and one inspection of troops in formation a month is a recommended minimum requirement. His presence will provide valuable feedback and will activate the noncommissioned officer chain of command.

Require your CSM to inspect or check training daily, especially Skill Qualification Training.

Require the CSM to sit as president of your battalion's E5 Promotion Board. First sergeants should sit as other board members. This is an outstanding method of placing the responsibility for your battalion's NCO Corps where it belongs, with the senior NCOs of your battalion.

Require your CSM to participate totally in your battalion's reenlistment program. As your senior enlisted advisor, he is concerned directly with career development. To be effective in this role he must involve himself in every aspect of reenlistment.

Require your CSM to work closely with your race relations/equal oppurtunity NCO. Together they can solve most problems before they escalate, and they can insure that you have all the available information before *you* must take action in this area.

Consider briefing your CSM, privately and immediately upon your return from a commander's call at brigade. He will then be able to get going or gain information for you on subjects you desire, prior to your commander's call.

Require your CSM to keep the brigade CSM advised. Good communications between them will *put out fires* that otherwise might escalate to brigade commander involvement. You may get the brigade CSM on your side, or he may offer advice to your CSM, either of which may *ease the pain* when it becomes of interest to the brigade commander. This is, of course, a selective process.

Continually seek feedback through your CSM from the noncommissioned officers of your unit. With his sources of information he will keep you abreast of developments that will enable you to measure your battalion in relation to others in the brigade. Your command sergeant major will also have vital information obtained through his relationship with the brigade CSM and through command sergeants major call at brigade. Have your CSM brief you after each CSM call. This gives valuable insight into your command.

Just as there are many things that you must do in establishing your commander/CSM relationship, there are some things you should not do.

Don't routinely include your CSM in officer social functions. There are certain ones (e.g. dining ins, New Year's receptions, a unit Christmas ball, etc.) that are traditional and proper for him to attend. Remember, your CSM is the senior *enlisted member* of the command, and his credibility with the enlisted soldiers of your battalion lies in maintaining that identity. *He* knows and is proud of his enlisted status. Treat the position with the respect it demands but not in the "officer vein."

Don't allow intrabattalion reassignment of noncommissioned officers without the recommendation of your CSM. He will know, or be able to find out, the real reason for a proposed reassignment. You should have this information before making your decision.

Don't let your CSM become desk bound! Part of the duties of a CSM as stated in AR 611-201 is to take corrective action in the name of the commander—a clear indicator that he is a doer not just an advisor. Insure that all your officers know your CSM is able to go anywhere, talk to anybody, and see everything in your battalion.

Don't use your CSM as an adjutant trainer, but require the adjutant to seek your CSM's advice on enlisted matters. The CSM is duty bound to *advise* and *assist* staff officers in their various areas. This is a two-way street on mutual respect and accomplishment of responsibilities of all concerned.

It is not enough that you and the CSM understand your relationship. Your staff and most particularly your subordinate commanders must also understand it. While he is first and foremost *your* CSM, he is also *their* battalion CSM. Encourage them to use his advice and counsel. A healthy open relationship between your CSM and your key officers will make them more effective. The ultimate payoff will be stronger companies and, correspondingly, a more combat ready battalion.

Plan to Attend

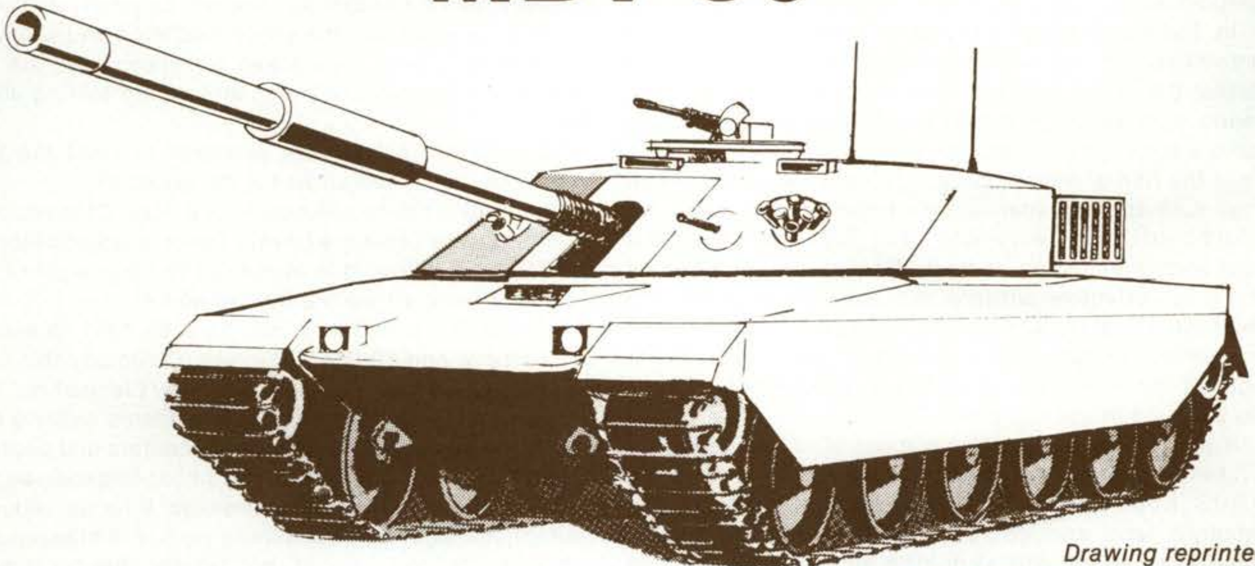
ARMOR CONFERENCE '79

"Supporting the Combined Arms Team"

May 15—18

At the Home of Armor

MBT-80



Drawing reprinted from February 1979 Military Review

Britain is proceeding with independent development of a new main battle tank to begin replacing *Chieftain* by the end of the 1980's. Known at present by the project number, *MBT-80,* the tank will be the same weight category as *Chieftain* and similarly will have a conventional turret and be operated by a crew of four. Main armament will be provided by the new 120-mm rifled gun, linked to a computer-based fire-control system coupled with a laser rangefinder.

Protection will be by Chobham armor and power will be from either the Rolls-Royce Motors *CV-12TCA* (possibly yielding more than the 1,200 bhp at 2,300 rpm which it currently delivers for the *Shir 2*) or the Avco Lycoming *AGT-1500* gas turbine specified for the American *XM-1* tank. Power-weight ratio will thus be around double that of the *Chieftain,* though still slightly below that of the *Leopard 2.* Maximum cross-country speed should be one-third higher than *Chieftain's.*

Design will be by the Military Vehicles and Engineering Establishment, and is expected to resemble the *Shir 2* in important respects. Prototypes should be available in the early 1980's. Development costs may well prove to be moderate, probably no more than 100 million British Pounds. Chobham armor and the *CV-12* are already in production. The new gun, on the other hand, requires a lot of work and substantial expenditure to bring it to production status. Selection of the *AGT-1500* may cost more in development funds than if the *CV-12* is chosen, and in a war of maneuver its higher fuel consumption could create problems of resupply. Around 1,000 tanks will be required, costing about 1 million Pounds apiece. Hull and turret will be built by the Royal Ordinance Factory (ROF) Leeds, now beginning manufacture of the *Shir 2,* and the gun at ROF, Nottingham.

The Ministry of Defense (MOD) announcement of a go-ahead for *MBT-80* was careful to stress the "possibility of closer association" between the British project and its German and American counterparts in the interest of achieving standardization and interoperability, Whether this represents more than lip-service will be followed closely both in Washington and Bonn; the latter is committed to the 120-mm smoothbore for *Leopard 2,* and the former has selected the same gun to equip later models of the *XM-1.*

By deciding to proceed independently with the *MBT-80,* the MOD indicated its determination that the *Chieftain* replacement should first and foremost fulfil the British Army's own requirements. Clearly, any cooperation with Britian's NATO partners will not be allowed to be to the detriment of that prime aim. The specification for *MBT-80* reflects the Army's perception of what will be required for the defense of the North German Plain in the 1990's and into the early 2000's. It takes account of the need to stop the new Soviet *T-80* tank, now expected to be fielded from the early 1980s instead of the middle of the decade, and other forms of armor. If there is to be a large measure of standardization between the main battle tanks of Britain, Germany, and the United States (perhaps France should not be totally written out of the picture) it is only likely to result from a change in the perception of the threat rather than from the incantation of a widely favored ideal.

Reprinted from Defense Attache, September-October 1978

THE ANTITANK BATTALION

It has recently become popular to describe the antitank (AT) helicopter as a maneuver element and full partner in the Combined Arms Team. This represents a significant departure from the current usage and would require changes in the TOE and placement of AT battalions.

In Europe, through innovative means such as the active defense, we have been able to predict an ability to defeat the entire first echelon of the threat force. It is tenuous, however, from that point forward. It seems we have a staying power problem.

At the risk of being overly confident I would contend that with the full realization of the AT battalion, we could not only eliminate the first echelon, but succeeding echelons as well. We have at our disposal the most effective antitank system ever employed on the battlefield. How then can we organize with current equipment to face the threat in a continuous battle against the first, second and even third echelon? How do we build in staying power?

It just so happens that our most effective antiarmor system is also our most mobile system. We have, in the *AH-1S Cobra*, the ability to strip the threat of the enemy's tank and *ZSU-23-4* force within the first 5 minutes of action with very little loss on our part. This seems a bold statement, but it is in fact a very down-to-earth assessment of our own proven capabilities.

This brings us to the point. We organize into Combined Arms Teams and carry this organization to brigade level in peacetime.

In Europe, we have measurably upgraded our ability to occupy forward positions in a timely manner. Our troop leaders are knowledgeable of the plan of action and know their respective areas intimately. Can we then say that we have done our best in preparation? No indeed—we have organized only part of the Combined Arms Team. We thoroughly prepare our defense with tanks and infantry yet we have no clear concept on how we will even employ our attack helicopters. We have left our most efficient antiarmor system out of the fight by oversight.

According to current plans and current organization we intend to defeat the first echelon of the threat force. We then will be at about 50 percent strength and very possibly out of ammunition. We will be poorly disposed to effectively counter the second echelon and will, very likely, meet it with only token resistance. We are not talking about weeks of defense—we are talking about days!

Could it be that we are prepared to fight the first battle but can't even show for the second?

My intent is not to sell a particular TOE. If the need for joining up the Combined Arms Team is acknowledged, the TOE will follow. It is important to keep sight of the number of aircraft we are talking about.

Each antitank battalion will have 65 *AH-1 Cobras*, 4 *UH-1 Hueys* and 10 *OH-58 Kiowas*. Obviously this is at least three times the number currently planned for. It is here that we meet the resistance. It seems unlikely that we will be given that number of helicopters and pilots. If we assign attack companies to combat brigades we will degrade their combat effectiveness through reduced training management and maintenance effectiveness. In other words, we should not assign helicopters to brigade at company level for the same reason we don't assign tanks in that manner.

To be a full partner in the Combined Arms Team, you must be a full-time partner. You must have a clear concept of how the ground battle is to be fought and how you fit into this battle. You will not be like an artillery unit that is in direct support or general support, but a maneuver element with mission requirements. We have the capability now to sustain combat, it is our responsibility to ensure that our capabilites are realized and exploited.

Condensed from an article by Major Dennis Carlin in the December 1978 issue of Aviation Digest.

TALAFIT

The Tank Level Aiming and Firing Trainer (TALAFIT) developed by the Belgian firm SABCA for use with the *Leopard* tank enables an instructor to monitor a gunner's dexterity and manipulation of the gun controls and the accuracy with which he lays the gun and activates the rangefinder.

TALAFIT also allows realistic competitive engagements among several gunners, each using his own tank but without expending any ammunition.

Major components of the system are the optical simulator unit (OSU) and the instructor's control box (ICB).

The OSU displays a battlefield scene which the gunner can see through his sights. The OSU is mounted on the turret roof over the window of the gunner's sight and is connected to the sight by an optical deflector.

The ICB gives the instructor the capability to control engagements and monitor student performance by providing the following functions:

- Control of the simulated battlefield in the OSU.
- Zeroing of the gunner's eyes to the equipment during initial alignment.
- Display of aiming, tracking, and firing errors, and elapsed time and gunner's actions.
- Display of the result of the firing sequence by illuminating the hit indicators in the gunner's sight and the instructor's panel when a hit is scored.

During an exercise, the gunner performs four operations: target acquisition, laser range finding, tracking, and firing.

The exercise begins when the instructor gives a fire command and activates the ICB. The gunner's field of view illuminates, and he observes a tank moving across the battlefield. He then:

- Acquires a target which may be moving anywhere within his field of view.
- Lays on the center of the target and activates the laser rangefinder.
- Maintains his point of aim on the center of the target, then presses the LEAD LOCK button. When this is done the reticle "jumps" in the opposite direction from the movement of the target.
- Keeps the LEAD LOCK button pressed, lays back on the center of the target, and presses either one of his firing switches.
- If a hit is scored, the word HIT will appear in the gunner's field of view approximately 2 seconds after firing. A miss causes the field of view to go dark at the instant of firing.

The instructor sets the battlefield conditions in accordance with the exercise objectives and evaluates the student's performance accordingly. The ICB allows the instructor to control the following factors:

Battlefield scene. Six targets may be exhibited one at a time and the instructor may vary the speed of a moving target in azimuth or evaluation. Lighting conditions of the battlefield scenery may be varied for each exercise.

Conditions for determining a hit. The instructor has the capability for presetting engagement conditions and a hit is scored only if the gunner has performed within the established constraints. A hit is indicated on the gunner's field of view and the instructor's board.

Range finding and firing. The instructor sets the allowable error for the exercise and the error in azimuth and elevation is identical for ranging, identifying, tracking, and firing.

Time. Maximum time allowed for completing a firing sequence is preset. If the time is exceeded, an OVERTIME light appears on the ICB and the student's battle scene goes off.

Firing modes. The instructor may program the equipment to simulate firing from either a stationary or moving tank with stabilization on or off.

During the exercise, the instructor evaluates the student gunner's performance by monitoring indicator lights on his control panel. When the exercise is completed, a printed record of the gunner's action serves as an indicator of progress being made and identifies repetitive errors.

To meet the exercise objectives, the gunner must complete an engagement against a stationary target in 6 seconds and a moving target in 9 seconds.

The TALAFIT, which operates from the vehicle's power supply, has proved to be reliable, accurate, and simple to install and operate.

Condensed from an article by WO2 W.T. Burton in the first annual issue of the Royal Australian Armoured Corps' magazine, Ironsides.

ARMOR CONFERENCE AGENDA

Fort Knox, KY — 15-18 May 1979

Supporting the Combined Arms Team

Tuesday, 15 May 1979

0900-2400	Registration, Brick Mess Officers' Club/Visit Patton Museum (0830-1630)	SGS, Protocol
1815-1830	En route Quarters 1 Garden (Inclement Weather: Brick Mess)	
1830-2100	Cocktail Buffet (Casual Dress)	SGS, Protocol

Wednesday, 16 May 1979—Gaffey Auditorium

0815-0830	Opening Remarks	CG, USAARMC
0830-0900	Keynote Address	CG, DARCOM
0900-0930	Threat Update	ACSI
0930-1000	Break	SGS, Protocol
1000-1100	Mounted Combat Operations, Ground and Air	USAARMC, USAIC
1100-1145	Cavalry Operations within CAT, Ground and Air	TBD
1145-1300	Lunch (Bldg 2442, Brave Rifles Regt Ave)	SGS, Protocol
1300-1345	Attack Helicopter Operations within CAT	TBD
1345-1430	FA Fire Support for CAT	USAFAC
1430-1500	Break	SGS, Protocol
1500-1545	Tactical Air Command Fire Support for CAT	TAC
1545-1630	Discussion and CG Summary	CG, USAARMC
1630-1815	Free Time	
1815-1830	En route to Brick Mess	
1830	Cocktails and Banquet (Dress, Coat and Tie/Greens)	SGS, Protocol

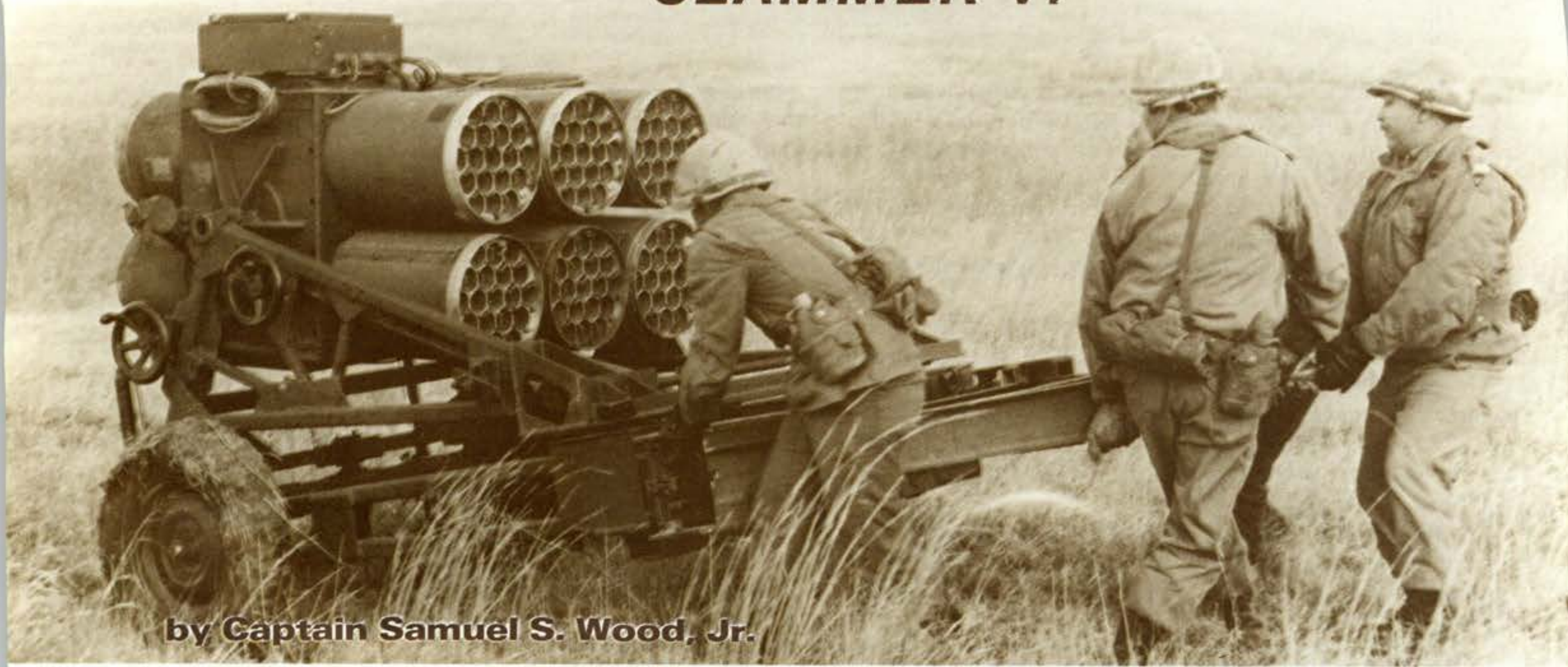
Thursday, 17 May 1979—Gaffey Auditorium

0800-0845	Air Defense Support for CAT	USAADC
0845-0930	Engineer Support for CAT	USAEC
0930-1000	Break	SGS, Protocol
1000-1130	Logistic Support of CAT	USA Logistics Center
1130-1200	Armor Association General Membership Meeting	President, Armor Association
1200-1315	Lunch (Bldg 2442, Brave Rifles Regt Ave)	SGS, Protocol
1315-1400	Personnel Considerations in Support of CAT	USA Admin Center
1400-1445	Command and Control for CAT	USA Signal Center
1445-1515	Break	SGS, Protocol
1515-1600	Deployment of Combat Aviation and the "EYES" of the Commander	TBD
1600-1615	CG Summary	CG, USAARMC
1615	Free Time	

Friday, 18 May 1976—Gaffey Auditorium

0800-0845	TASVAL Combined Arms Team	TBD
0845-0915	AAH-Update	PM
0915-0945	XM-1 Update	PM
0945-1015	Break	SGS, Protocol
1015-1045	M60A3 Update	PM
1045-1115	XM-2 Update	PM
1115-1140	ITV Update	PM
1140-1200	Closing Remarks	CG, USAARMC
1200-1300	Lunch (Bldg 2442, Brave Rifles Regt Ave)	SGS, Protocol
1300-1500	Air Cavalry/Attack Helicopter Symposium or Open Time for Visits with USAARMC Agencies	DAA, USAARMS

SLAMMER VI



by Captain Samuel S. Wood, Jr.

In a time when targets outnumber artillery tubes there is a need for a multiple rocket launcher. Combat-proven on the battlefields of the Pacific and in Europe during World War II and later in Korea, the multiple rocket launcher provides the user with the ability to blanket the target area with a tremendous amount of firepower. As an area weapon that complements artillery, the rocket can provide the combined effects of many battalions of massed artillery. Rockets can provide the commander with an advantage he should not be denied, and the 2.75-in rocket fired by the *Slammer VI* is a system that can provide a variety of support to the frontline combat commander.

Fundamentally, the rocket is a self-contained warhead and propellant that needs only a simple launcher. You cannot expect the accuracy of a rocket to be the same as conventional tube artillery. However, what it loses in accuracy is outweighed by the volume of fire it can produce within seconds.

Rocket artillery has had a rather short but impressive history. The United States' use of rockets to augment artillery had its birth in 1846. William Hale developed a rocket which was used by the army of General Winfield Scott in the siege of Vera Cruz! Except for signal rockets, rockets did not reemerge as a weapon system until World War II. Rockets were developed to defeat armor, aircraft, troops, and radar-directed fire control and communication equipment. During the Battle of the Bulge, rockets were used to break the German counteroffensives. Rockets were also used to pulverize beach areas during amphibious assaults in the Pacific, and rockets are credited as being instrumental in securing Okinawa. On the beaches of Normandy, rockets were also equipped with chaff warheads that created a window of jammers that moved the radar controlled fire from German guns away from Navy ships.[1]

In the Korean War, the rockets of U.S. Marines found a 1,000-man Communist Chinese battalion located in a 1,000- by 500-yard area, and over 400 were killed and 600 wounded. This was accomplished in a matter of 14 minutes with 57 rockets.[2] This was an area target that would have required a TOT mission of many battalions of supporting artillery.

In Vietnam, rocket artillery was off the ground and in the air, but little work was done to improve the Korean War vintage ground rocket launchers in the inventory. Conventional artillery support was more than adequate to support maneuver forces and with the addition of the helicopter rockets and aircraft rockets, the commander could bring a large amount of firepower to bear on a relatively small area. With a very limited counterbattery threat, or air threat, the delivery of 2.75-in artillery and aircraft rockets was almost unrestricted.

At the end of the Vietnam War, the United States did not have a ground platform rocket launcher for the 2.75-in rocket, but warheads for the rocket had been adopted for helicopter and aircraft delivery. The warheads included high explosive, shaped charge, flechette, and white phosphorus. The rocket's range was about 6,000 meters, and because it had only 1,700 more meters range than the 107-mm mortar, multiple rocket launchers remained on aircraft.

Events in the Middle East brought renewed interest in a multiple rocket launcher, and the need for it resurfaced. Commanders wanted fire support to defeat a multiplicity of targets and when the cry went up in 1974 to field a multiple rocket launcher, concepts were developed and tested. As a result, the general support rocket system was approved for fielding in the early eighties. Another system, the *Slammer,* was locally fabricated at Fort Campbell, Ky. and the *Slammer VI* at the Redstone and Allegheny Arsenals.

Since the Department of the Army's tests of the *Slammer VI* were concluded in April of 1977, additional emphasis has been placed on the need to field a multiple rocket launcher. The *Slammer VI* system can be fielded now! To better understand its availability, a description of *Slammer VI* is necessary.

The *Slammer VI* concept was developed at the Redstone and Allegheny Arsenals after the 101st Air Assault Division tested a two-pod version mounted on a ¼-ton vehicle.[3] *Slammer VI* was made with an *M-91* chemical rocket launcher, *M-200* rocket pods, and 4.2-in mortar sight. The *M-91* rocket launcher, which was in the

[1]John E. Burchard, *Rockets, Guns, and Targets,* (Boston: Little, Brown and Company, 1948), pp. 8, 133, 179, 202.

[2]*Reexamination of Requirement For An Area Saturation Weapon Such as The 4.5-in Rocket,* (Fort Sill, 1952), p. 6 C.

[3]Neely S. Harrison, *The Need for a Rocket Launcher,* Fort Sill, 1976.

inventory in the early 1960's as a chemical rocket launcher, was modified for *Slammer VI* by changing the rocket racks to accommodate *M-200* rocket pods. The *M-200* rocket pods are the standard 2.75-in rocket pod in the Army and Air Force inventories. A 4.2-in mortar sight was added for fire control. Fired by a 24 volt system, the rockets can be rippled one at a time or fired in a 114 rocket salvo. Tests revealed that a system could be assembled for only $7,500.[4]

The testing and evaluation of the system was conducted at Yuma Proving Grounds, Redstone Arsenal, and Forts Sill, Campbell, and Bragg. There were no firing tables available, and the testing units swagged the proper settings on the launcher for the desired ranges.

Test firings showed inaccuracies in the rockets that could easily be overcome by changing the firing sequence of the pods. Range limitations were overcome by improvements in the 2.75-in rocket motor which increased the range from 6,000 to nearly 11,000 meters.

Developed in response to a demand from the field, the *Slammer VI* answered the call for an area saturation weapon and product improvements and an increase in research funds could have provided the maneuver forces an effective weapon with many capabilities that are not available in other fire support systems.

The system's light weight and easy towing capability could have given either armor or mechanized infantry an inexpensive weapon system that could be fired, and then discarded if necessary.

However, *Slammer VI* was shelved after only 6 months of testing before its impact on the Army could be evaluated. The tests included immediate smoke, area saturation with high explosive warheads, and infrared illumination missions. In an illumination capability test, *Slammer VI* provided over 3 hours of continuous infrared illumination for TOW gunners.[3] As an area fire weapon, two *Slammer VI* systems produced more target destruction on a 400- x 600-meter area than a battalion of 155-mm artillery pieces firing dual purpose improved conventional munitions.

In tests at Forts Bragg and Campbell it was found that *Slammer VI* could fill the gap between the 4.2-in mortars and division artillery assets. After TRADOC withdrew funds for testing, these posts drew from their own resources and conducted further tests. Through their efforts, the system's advantages were weighed against its disadvantages, with the major problem being the ammunition available. Test reports stated that if the range dispersion, limited range of 6,000 meters, and lack of varieties of warheads were overcome, *Slammer VI* would be reconsidered for fielding.[5]

Presently, problems with the ammunition are being or have been corrected and the 2.75-in rocket has been *revolutionized.* An improved rocket motor has increased ranges from 10,000 to 11,000 meters, new ammunition packaging has reduced the logistical burden, and improved fire control has provided the desired accuracy.

Further, the new warheads can provide the commander with some remarkable fire support. One-sixth of a *Slammer VI* load of 19 rockets can provide a 400-meter smoke screen for 4½ to 5 minutes after only a 30-second buildup. A complete *Slammer VI* load of smoke could screen or

RESUPPLY FOR 1-HOUR SUSTAINED FIRE

	ROUNDS	5-TON LOADS
SLAMMER VI PLATOON	1,368	2.1
81-mm MORTAR PLATOON	1,440	1.4
155-mm HOWITZER BATTERY	414	2.6

AREA SUPPRESSED (SQUARE METERS) PERSONNEL STANDING IN OPEN

	SLAMMER VI PLATOON	81-mm MORTAR PLATOON	155-mm HOWITZER BATTERY
7 SEC	190,836	2,628	51,216
75 SEC	190,836	14,454	307,296
15 MIN	381,672	157,680	1,229,184

obscure 2,400 meters.

The chaff warhead can screen attack helicopters from Threat radar-directed fire control systems and provide a window for close air support or attack helicopters.

The submunition warhead equipped with a new fuze, scatters nine submunition projectiles over the target area. Each shaped charge submunition can penetrate 3½ inches of armor and detonation of the warheads creates a casualty producing blast with a radius of 15 meters. Armored vehicles and infantry coming under fire from a *Slammer VI* submunition salvo would be exposed to 2,072 subprojectiles in a 500-meter square area in a matter of 8 seconds. These three warheads could make a difference in any attack.

The *Slammer VI* was ahead of its time, but the concept is sound and its mission is ever apparent. With the application of sound tactics, proper employment, and the addition of improved warheads, the *Slammer VI* in the hands of the artillery, infantry, or armor could provide the commander with smoke, a jamming window to defeat electronics, dual-purpose munitions, and other types of warheads. Above all, it could provide the commander with an almost instant response to his call for fire, and near-instant firepower for that decisive time and place where the need for an area saturation weapon is available. There are 2,500 chemical rocket launchers that are potential *Slammer VI* systems sitting in depots. They are already paid for, and properly reconfigured as *Slammer VI* systems, they could provide the commander with massive fire support for area saturation missions.

CPT SAMUEL S. WOOD, JR. graduated from the Citadel and was commissioned in Field Artillery. He has attended the Field Artillery Advanced Course and commanded C Battery, 1-39 FA. He is currently attending the Defense Language Institute.

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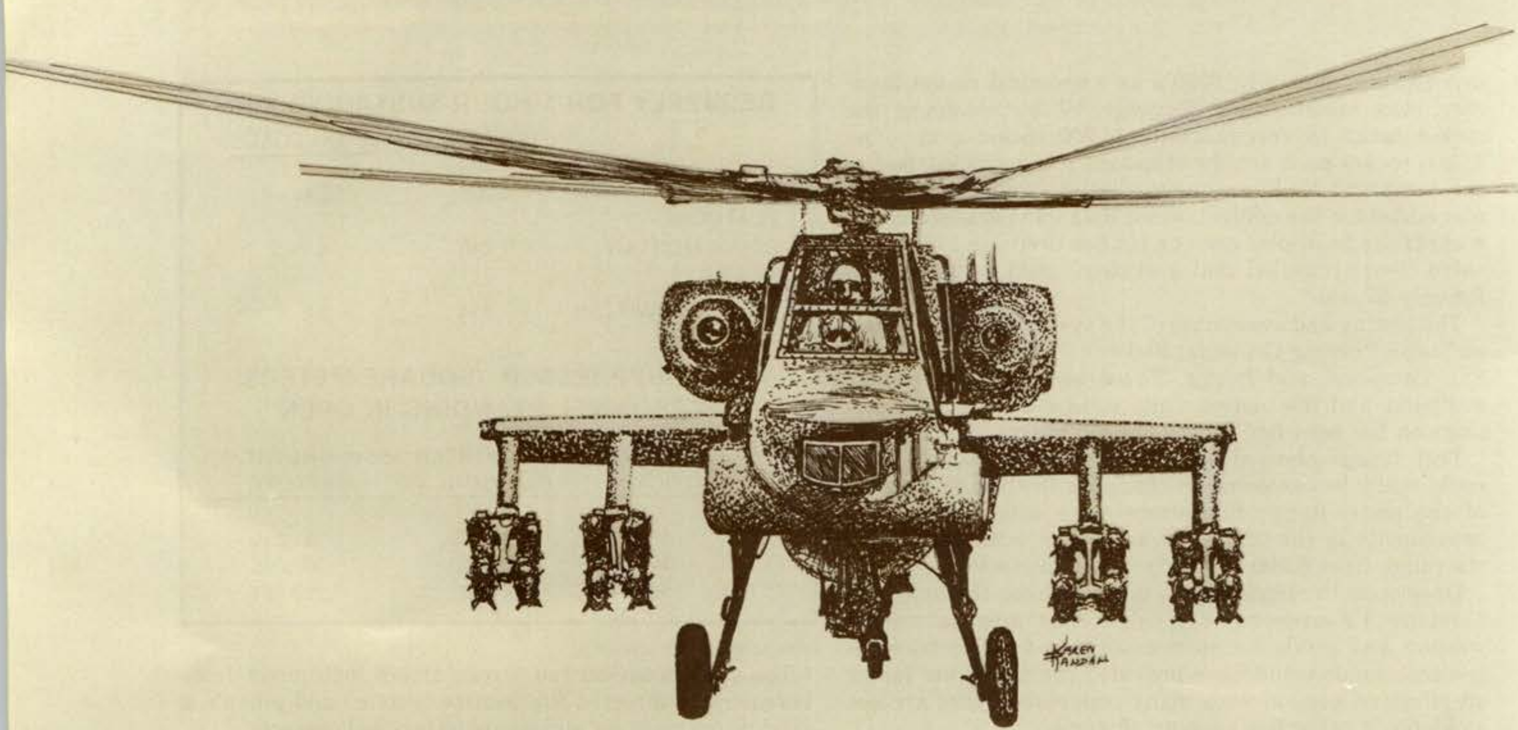
[4]Captain C. Connoly, 2.75-inch Rocket Department at Redstone Arsenal, interviewed by Sam Wood (telephone conversation) 1505 hours, 2 June 1978.

[5]Information Paper, "Slammer," XVIII Airborne Corps Evaluation (Fort Bragg, 1977), p. 2.



AAH

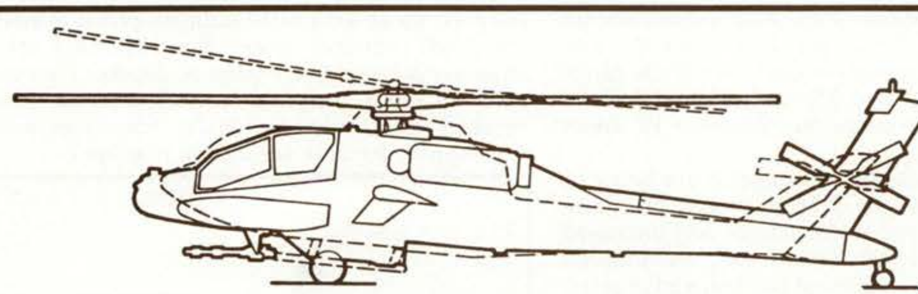
by Lieutenant Colonel Stanley E. Grett

The *AH-64* is the advanced attack helicopter (AAH) of the 1980's and beyond. It will replace the *AH-1* series in some attack helicopter companies and air cavalry troops. Attack helicopter units have traditionally been members of the Combined Arms Team.

As a member of the Combined Arms Team, the attack helicopter must be hard hitting, highly mobile, and survivable against numerically superior forces. The AAH will be able to live, fight, and survive to fight again because of its built-in toughness, optimized weapons lethality, and tactics designed for future battlefields.

The subsystems that make the AAH a total system for battle are the HELLFIRE Modular Missile System (HMMS), the 30-mm Area Weapon System, 2.75-in Aerial

AAH/AH-1S SIZE COMPARISON



	YAH-64	AH-1S
ROTOR DIAMETER	48'0"	44'0"
OVERALL LENGTH (ROTOR TURNING)	57'7"	52'11"
WIDTH	17'2"	10'8"
HEIGHT	12'7"	13'5"

AAH........OPTIONS

MISSION				PERFORMANCE VROC	V CRUISE	ENDURANCE
ANTIARMOR (DEFENSE) MID-EAST PRIMARY MISSION 4000'/95°F	4 HF	320 RDS	4 HF	700 FPM	146 KTS	1.83 HRS
EUROPE ALTERNATE 2000'/70°F	8 HF	1200 RDS	8 HF	600 FPM	146 KTS	2.5 HRS
COVERING FORCE (AIR CAV) MID-EAST ALTERNATE 4000'/95°F	4 HF	777 RDS	4 HF	450 FPM	146 KTS	1.83 HRS
EUROPE ALTERNATE 2000'/70°F	4 HF 19 RKTS	1148 RDS	4 HF 19 RKTS	450 FPM	146 KTS	2.5 HRS
AIRMOBILE ESCORT MID-EAST ALTERNATE (4000'/95°F)	19 RKTS	416 RDS	19 RKTS	450 FPM	146 KTS	1.83 HRS
EUROPE ALTERNATE (2000'/70°F)	38 RKTS	788 RDS	38 RKTS	450 FPM	146 KTS	2.5 HRS

Rocket System, Target Acquisition and Designation System (TADS), Pilot Night Vision System, (PNVS) which includes the Integrated Helmet and Display Sight System (IHADSS), and the Aircraft Survivability Equipment (AAE).

The AAH, although more sophisticated and with greater ordnance payload capability than the *AH-1S Cobra*, is not much bigger than the *AH-1S*. While the width is greater at stub wings, the cabin is only a foot wider. The greater frontal aspect is the result of having twin engines separated for survivability. (See figure 1.)

The characteristics of the AAH include:

- The 145 to 175 knots true airspeed.
- Mission endurance of 1.83 hours in the primary mission configuration.
- The 450 to 500 feet per minute vertical rate of climb on the Army standard hot day of feet density altitude and 95 degrees Fahrenheit.
- A lateral acceleration of .25 to .35 Gs.

The AAH is armed with 8 to 16 HELLFIRE missiles, or up to seventy-six 2.75-in rockets and the 30-mm area weapon subsystem with 320 to 1,200 rounds of ammunition. Armored protection is provided to the crew of pilot and copilot/gunner. The *AH-64* has a lightweight doppler navigation system and a night vision system for both crew members. Self deployability is capable of up to 800 to 1,000 nautical miles with the use of external fuel tanks.

The armament options available are varied. (See figure 2). The first option represents the primary mission configuration at the Army standard hot day. With 8 HELLFIRE missiles, 320 rounds of 30-mm ammunition, and fuel for 1.83 hours at the design gross weight, performance is well above the requirements.

The alternate configuration, at the standard European day with 16 HELLFIRE missiles, 1,200 rounds of 30-mm ammunition, and fuel for 2.5 hours, performance is also well above requirements.

TADS/PNVS

The TADS, through the multiplex system, interfaces with the HELLFIRE Modular Missile System, the Aerial Rocket System, the 30-mm Area Weapons System, the fire controls and displays, IHADSS, the doppler navigation system, and the fault detection location system.

The major components of the TADS are the turret which houses the stabilized platforms, laser rangefinder, common FLIR modules, laser spot tracker, direct view optics, vidicom television system, and the optical relay tube which contains the controls and displays. The TADS provides the capability to detect and engage targets at far greater ranges than current systems as well as at night and during adverse weather.

The PNVS, through the multiplex, interfaces with the IHADSS, the 30-mm Area Weapon Subsystem, the 2.75-in Rocket Subsystem and their respective controls and displays.

The major components of the PNVS are the turret assembly, the IHADSS, common FLIR modules, and the symbology generator. The field of view of the PNVS is 30 by 40 degrees, which relates to a vertical area of 268 feet by 364 feet at a distance of 500 feet.

The IHADSS includes the helmet mounted display and the helmet mounted visor which provides weapons sighting and flight symbology. The primary functions of the IHADSS are to display the NOE night flight, point the TADS, PNVS, and missile seekers, and to provide weapons launch window displays in order to align the aircraft for rocket and HELLFIRE missile firings.

HELLFIRE Missile System

The HMMS consists of the missile, the family of seekers, and the ground support and training equipment. The laser seeker is the primary seeker currently being developed for the HELLFIRE missile. The Infrared Imaging Seeker and the Radio Frequency/Infrared Seeker are also under development for the future.

The HELLFIRE system provides an increased attack helicopter standoff capability by laser guidance which permits the acquisition of reflected laser energy at long ranges. A reduced missile flight time and increased missile maneuverability over the TOW increase the probability of hitting the target at extended ranges as well as reducing helicopter exposure.

The many firing options for the HMMS allow maximum flexibility to the commander and the operator. HELLFIRE missiles can be delivered by the AAH with autonomous designation or in the cooperative mode with remote designation by another AAH, an ASH, or a remote ground designator providing both direct and indirect fires.

In the direct fire mode, multiple targets can be engaged by employing rapid fire, which allows having several missiles in flight at one time. Multiple targets can also be engaged with ripple firings in the cooperative mode with remote designation.

The HELLFIRE missile is programmed for two flight altitudes in the indirect (cooperative) mode. A low-altitude mode is provided for low cloud conditions and a high altitude is available for a clear day and high terrain between the AAH and the target area.

Aerial Rocket System

The primary components of the 2.75-in Aerial Rocket Subsystem are the IHADSS, TADS, the air data sensors and the fire control computer. The primary sighting station is the IHADSS, but the IHADSS and TADS can be used jointly for a more precise firing capability. The system provides for the inflight selectivity of up to five warhead and fuze combinations with automatic inventory.

The system has the capability of carrying four fully loaded 19-round pods for a total of 76 rockets with the capability of an effective range of up to 6,000 meters. Two developmental items that will truly enhance the folding fin aerial rocket are the Mark-66 motor for more accurate long range fire and the *XM-261* multipurpose submunition warhead which has seven submunitions per round and is reported to be much more effective than the current 10-pound warhead.

30-mm Weapon System

The primary components of the 30-mm Area Weapons Subsystem are the chain gun in its flexible turret, the ammunition drum, and the feed system.

Note: *Chain Gun* is a registered trademark of the Hughes Helicopter Company.

The rate of fire for the *XM-230E1* chain gun is 725 shots per minute with a muzzle velocity of 760 to 800 meters per second. Coupled with the fire control system,it is extremely accurate. Delivery of this accurate fire capability is provided by the TADS or the IHADSS.

Two 30-mm rounds are being developed for the Army, the *XM-788* training practice and the *XM-789* high explosive dual purpose (HEDP) rounds. The HEDP has exceptional terminal effects against personnel and lightly armored vehicles.

The *XM-230E1* chain gun and the 30-mm ammunition are compatible with the French and British manufactured 30-mm guns.

Survivability Equipment

The Aircraft Survivability Equipment (ASE) consists of both active and passive systems. The *AH-64* will be delivered with the *AN/APR-39* Radar Warning Receiver installed. Various levels are programmed which will allow the incorporation of the family of ASE systems being developed by the U.S. Army Aviation Research and Development Command.

Survivability/Invulnerability

The AAH's survivability and invulnerability are enhanced through greater standoff capability, redundant engines and flight controls, infrared paint and passive suppressor, armor protection, ballistic-tolerant components, and crashworthy design which results in low attrition.

Major User Milestones

The major milestones that should be of concern to the user community are the production award (DSARC III), scheduled for December 1980, and delivery of the first production aircraft in December 1982. The last production aircraft is due for delivery in March of 1989.

During the development program, there are several tests that involve user personnel. User personnel are required to participate in the TADS/PNVS fly-off in February 1980, and operational testing (OT). Operational testing is conducted in two phases which allows for an early production decision. OT IIA is designed to allow the user to test and evaluate the total weapons system in support of the ASARC/DSARC process for the production decision. The emphasis in OT IIB will orient on the evaluation and development of tactics and doctrine and the final maintenance concepts for the AAH.

LTC STANLEY E. GRETT, a dual rated Senior Army Aviator, was commissioned in Armor from Infantry OCS in 1962. A graduate of C&GSC and the TWI program, he has served with the 1st Avn Bde, 173d Abn Bde, 6th ACCB and the 1st Cav Div; and commanded an air cavalry troop and an attack helicopter company. LTC Grett has served in various armor and aviation related assignments. Including duty with the Combat Development Command's Aviation Agency. He is presently assigend as assistant program manager for requirements for the advanced attack helicopter, DARCOM, St. Louis, Mo.

Fact or Fiction?

Tow Gunner Qualification

by Captain Bill F. Jeanes

The current program for qualifying TOW gunners relies heavily on the scores achieved with the *M-70* training set. From these scores a gunner is evaluated and, if appropriate, awarded a qualification. A candidate gunner may be eliminated or denied qualification because of his failure to achieve a prescribed minimum score. In the spring of 1978, the Training and Doctrine Command Combined Arms Test Activity (TCATA), Fort Hood, Texas, conducted an evaluation of TOW gunner training utilizing the *M-70* trainer set with the *M-151E2* ground mounted TOW weapon system. The evaluation produced two significant findings. First, the group which trained using the *M-70* did not show significant superiority over a group which trained during the same time without the *M-70*. Second, gunners' *M-70* scores did not correlate with their performance in live fire. Here is how TCATA arrived at these findings.

TCATA conducted the TOW weapon system training effectiveness analysis for the U.S. Army Infantry School (USAIS). The investigation of the TOW missile covered three basic areas:

- Selection of the best TOW training program,
- Determination of gunner selection and elimination criteria

• Comparison of dry tracking and live-fire tracking proficiency.

The USAIS wanted to know if the training syllabus shown in change 3 to *TC 23-23* was the best program in terms of gunnery proficiency and cost effectiveness. This program was to be compared with two other programs of different design, an 8-hour program in which only dry tracking is used, and a 14-hour version of the current *M-70* trainer tracking program.

The test results showed the 8-hour program as being the optimum training program. Some question remained as to the total utility of the *M-70* trainer in a TOW training program. To address this question, an add-on test was designed and executed using a comparison style test of two 54-man groups. One group was trained using the *M-70*, and the other group used dry fire techniques similar to those used in the 8-hour program.

During the add-on test, the scores from the first subgroup using the *M-70* were far below anticipated results. Based on experience, there is usually a failure to qualify rate of 10 percent for a group of gunners training with the *M-70*. Of the first subgroup of 18 gunners, 14 failed to qualify. After a side experiment in which TOW instructors fired, it was found that the unpaved road surface caused the low scores. Change 3 to *TC 23-23* states that the tracking road should be smooth. The tracking road used for the test was on the *M-70* range at Fort Hood. It was a grass road that was free of pot holes and deep ruts. An informal survey of 13 CONUS installations showed that more than half of the stateside posts use the same type road for *M-70* ranges. The balance have access to a paved road. When a paved road was used, the scores came closer to the expected results. The *M-70* comparison group used both grass and paved roads. Table 1 shows that as the road surface improved, so did the *M-70* scores.

Table 1.

Subgroup (treatment)	Sample size	Number unqualified	Road surface Trained on	Road surface Qualified on
1	18	14	grass	grass
2	18	10	grass	pavement
3	18	4	pavement	pavement
Total	54	28		

Each gunner in the *M-70* comparison group ran through one repetition of Table VII and six repetitions of Task A, Table VII, *TC 23-23*. Table VII was executed again for qualification. The candidates were then moved to the firing line and fired one inert warhead missile at a remotely controlled tank at 2,900 meters. The results of those firings are shown in table 2. There were four hardware failures which were dropped from the sample. The radial distance from the center of mass (RDCM) of the tank shows the average distance from the bull's eye for that group. There is only a .19 meter difference between the very best distance (1.10 meters) and the very worst (1.29 meters). This is only a 7½-inch difference at a 2,900-meter range! Twenty-five out of the 28 unqualified gunners hit the target and had good scores (1.17 meters average radial distance). Each subgroup had a gunner who scored a miss on live fire. It may be assumed that those gunners who did not qualify with the *M-70* may have eventually qualified after repeated efforts on Table VII. The question then becomes, "Is the gunner learning to fire the TOW, or is he learning how to beat the *M-70* trainer and the tracking road?" The fact that 25 unqualified gunners hit the tank with the first live round suggests the latter.

Table 2. *M-70* Prediction Live Fire Results

M-70 gunner classification	Number	Actual performance Hits (No.)	Actual performance RDCM (Mtrs)
Expert	2	2	1.10
First Class	10	9	1.25
Second Class	10	10	1.29
Unqualified	28	25	1.17

Another phase of the test required comparing the *M-70* scores to the RDCM, i.e., does the higher *M-70* score relate to a shorter RDCM? It was found that there was no direct correlation between *M-70* scores and live fire performance for those who trained and qualified on smooth paved roads. The fact a gunner did or did not do well on the *M-70* did not predict good or poor performance at the live fire range. There was an indication of prediction capability from the *M-70* for those who trained on grass or smooth dirt roads. However, the sample size was too small to validate a correlation between the two variables.

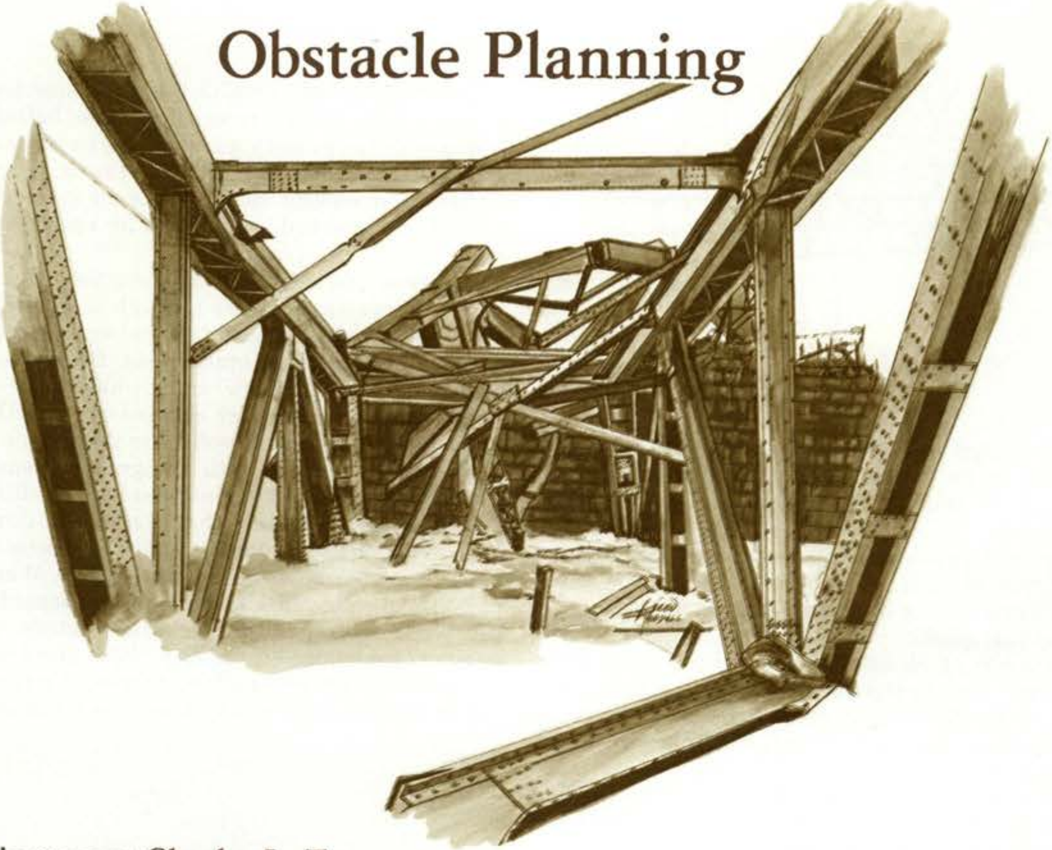
Other aspects of the test show that given a training program utilizing only dry tracking and good coaching, at least 85 percent of the gunners will get a first round hit. This dry tracking program is currently under investigation.

The purpose of this article is to enable the trainer to best train and use his manpower resources. The antitank mission of the TOW gunner is crucial in our forces. To use the *M-70* scoring results as a sole measure of gunner proficiency is not wise. Less dependence on a machine to identify our tank killers is the order of the day. A successful tank killer will be required to select tactical firing positions, and to take note of winds that might add to visual obscuration of the target due to missile blow back and smoke. He will need to be conscious of dominant terrain and fields of fire. The ability to do these kinds of things has surfaced as the prime discriminator of a successful TOW gunner.

Where does this leave the trainer and the commander? If the *M-70* predictions are not reliable, what options do you have in evaluating a candidate gunner? The Army is working on this question right now.

CPT BILL F. JEANES was commissioned in the Transportation Corps from Texas A&M in 1970. After flight school and AMOC, he served with the 129th AHC in RVN in 72-73. Returning to Ft. Hood he served in various duties including brigade maintainance officer for the 6th ACCB. CPT Jeanes is a graduate of the Transportation Officer Advance Course and holds an MS degree in Operations Research. He is currently assigned as an ORSA officer in the Training Developments Test Directorate, TCATA, at Ft. Hood, Tex.

Obstacle Planning



by First Lieutenant Charles L. Toomey

In western Europe NATO forces will be met by an enemy whose attacks will be characterized by speed and massed firepower. The enemy will attempt to break through our covering forces' areas in a relatively short time period. Once these security zones have been compromised the NATO commanders will then be forced to deal with the containment of the enemy's forces in the ensuing running battle. In order to deny the enemy the decisive superiority he is seeking in our Main Battle Areas, commanders at all levels must reinforce rapidly and continuously.

The commanders' rapid redeployment will require that mobile forces be moved into the enemy's path of advance, artillery be concentrated, and terrain be reinforced by obstacles. Armored and mechanized forces can move, artillery also, but obstacles cannot. Obstacles *must* be planned meticulously.

The Commander's Mission - Corps and Division Guidance

A corps or division obstacle plan does not exist when a mission is given to a subordinate unit. References to obstacles from division and higher units will initially take the form of *guidance.* Obstacle plans get specific at a level no lower than battalion or task force and are integrated and reinforced by the brigade.

The corps commander will set responsibilities and provide specific instructions as to the execution of primary targets. The guidance in the corps plan will identify those specified targets which will be executed only on the authority of the corps commander.

The corps commander will also make an allocation of corps engineer assets to major subordinate commands and other coordination and completion dates and times will be established. Corps may designate gaps to be held open by subordinate units, but the responsibility for closing such gaps will rest with that commander whose unit is to pass through them.

Division headquarters will provide instructions that will expand corps guidance as it applies to the division mission. This guidance will be based on the time available for obstacle work.

Designated division targets will be identified and authorization to order the execution of targets may be delegated to subordinate commanders. Completion times and preplanned execution times will be established.

With such general guidance from higher echelons the brigade commander and the brigade engineer can begin the difficult tasks of planning specific obstacles in support of the scheme of manuever and constructing the obstacles that will have a direct influence on the battle. Once the commander has made the appropriate decisions, the engineer officer must begin his in-depth work.

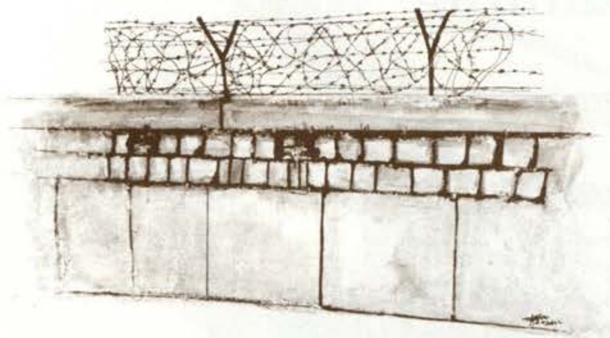
Responsibilities of the Engineer

The engineer, as a special staff officer, is principle planner of the obstacle plan and he must be involved in every stage of its development and execution. It is his primary task to locate and determine the effectiveness of existing natural and cultural obstacles and, where necessary, reinforce those areas that lack sufficient existing barriers.

The engineer must function in close cooperation with the supported staff. He assists the S-2 by developing and studying terrain analyses. He also provides reconnaissance data by evaluating roads, tunnels, bridges, dams, and any other significant cultural features. His work with the S-3 is extremely close for he must coordinate and consider the scheme of manuever, fire support plan, withdrawal and counter attack plans, and subordinate unit displacement. He must provide the S-4 with the requirements of all obstacle materials and recommendations as to the transportation for those materials.

Planning Considerations

The battalion commander, his staff, and the engineer, having determined a course of action must then consider the following parameters that may have a direct influence on obstacles for supporting that course of action.



•*Mission.* Corps and division policies and guidance must be adhered to. Implied missions from the division order or plan must be understood and *never* underestimated.

•*Current and future plans.* Consideration must be made as to ease of repair or bypass of an obstacle in the event of a counterattack by friendly forces or their movement on the battlefield.

•*Requirements of friendly forces.* Will obstacles affect friendly supply lines in the battle area? What provisions must be made to allow egress routes? Lanes and/or gaps must be planned, coordinated, and made known to all subordinate units.

•*Terrain analysis.* Soil trafficability to wheeled and tracked vehicles, forest density, and line of sight are but a few factors that must be considered.

•*Enemy capabilities.* Enemy breaching capabilities are of prime interest to the engineer. Can friendly forces cause the enemy to commit his limited breaching resources so that they can be exposed to friendly fires?

•*Weather.* The time of the year can greatly influence our ability to reinforce the terrain to impede the enemy's mobility. For example, the spring rains of Germany may swell a stream that, during the winter, could be easily forded by wheeled vehicles.

•*Fire planning.* Every obstacle and every probable enemy overwatch position must be covered by fire.

•*Effect on local population.* If necessary, the destruction of built-up areas will be authorized by higher command. What effects would programmed destruction have on the local economy after hostilities had ceased? What effects would refugee traffic have on supply routes?

•*Time, materials, equipment.* Are adequate materials available? How will they be transported? How much effective time is available for obstacle construction? Time is crucial, for much has to be done in a relatively short period!

These are the major planning considerations, but local situations may demand reflection on others.

The Battalion Plan—Objectives and Guidance

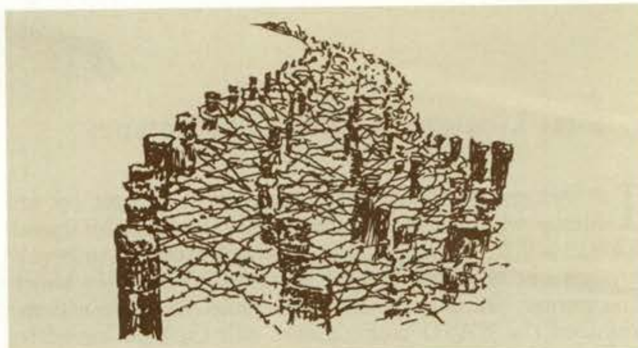
The purpose of an obstacle is to confuse, delay, canalize, and disrupt enemy battle formations. An obstacle is not guaranteed to stop an enemy. A determined opponent will have made operational plans for the breaching and subsequent neutralization of an obstacle. Obstacles will slow the enemy and provide more time for friendly observation and optimum use of our weapons. Therefore, the primary objective of obstacles is to increase the effectiveness of friendly antitank and indirect fires.

The battalion commander, his S-3, and the engineer decide where to place obstacles that will support the tactical plan. Obstacles will be sited in positions that enhance the capabilities of all antitank weapons. Types of obstacles and the extent of their employment will be recommended by the engineer based on an analysis of the surrounding terrain, resources available, and time.

The engineer will establish a timetable based on the commander's target priority in the battalion sector. Along with the priority guidance the commander will also delegate the authority for the execution of battalion targets and ensure that targets of interest to higher echelon are reserved until orders for execution are received.

Adjacent units must coordinate the establishment of gaps and routes of egress through the lines of the planning unit. This is especially critical for those elements of a covering force that must pass through a prepared obstacle. Commanders must have an undisputed understanding as to which element will give the execution order for obstacles that will close those gaps or routes.

Then the engineer will assign the construction or preparation of the different obstacles to different units. Engineer assets other than brigade's direct support engineer company should be under the operational control of the brigade engineer regardless of size. When they complete their sector tasks they will be released to assist in the obstacle preparation in other sectors. The brigade engineer must also ensure that those units having heavy equipment begin evacuation of forward areas before they can be subjected to enemy long-range weapons.



The Engineer Planning Sequence

The intelligence officer will provide the engineer the basis for an initial estimate of the situation. A preliminary map reconnaissance will provide a minimum obstacle plan that will satisfy only the minimum requirements of the commander. The engineer can get extremely important supplemental information from the S-2 in the forms of ground or aerial reconnaissance reports and aerial photographs. Terrain analyses that describe the trafficability of soils and forested land and fordability of streams and rivers are invaluable to the engineer. The S-2's description of enemy force size and capabilities for breaching will add another variable that will impact on the final plan. Much must be provided by the supported intelligence officer; however, the engineer must not forget that a wealth of information is available to him in his parent battalion's intelligence section.

After studying all S-2 information, the engineer can, for the first time, sit down and prepare an initial operational overlay. This overlay will convey to the commander and S-3 the best obstacles that can be employed in the sector

18XXX 0055

82XX 1030

Unit Designation Target Number

Reserved Target Number Blocks*

Corps	0001-9999
Division	0001-0999
1st Brigade	1000-1999
2nd Brigade	2000-2999
3rd Brigade	3000-3999
Attached additional units	4000-as required

*Target number blocks should never be broken into sub-blocks for subordinate units.

Target numbers should not incorporate additional prefixes or numbers to identify obstacle type or status.

Figure 1. Target Numbering System (FM 90-7).

Minefields (M57 Mine Dispenser)	100m	400m	1000m
Mine, AT, M15	55	220	550
Mine, AP, M16	55	220	550
Total Wt (tons)*	2.1/1.6	7.5/5.4	18.6-/13.4

*Includes mines, wire, pickets; weights show mines crated/uncrated

Road Craters (with mines)
Relieved face....... 710 pounds
Hasty............... 540 pounds

Bridge Demolitions (with mines)
Major Four-Lane..... 948 pounds
Primary Two-Lane... 520 pounds
Secondary Two-Lane470 pounds

Abatis (explosive with mines)
.... 350 pounds

Wire Obstacles:
General purpose barbed tape obstacle (300m).... 2075 pounds
Triple standard concertina (300m).. 4820 pounds

Figure 2. Explosive Material Weight Per Type of Obstacle.

under relative optimal conditions. Having completed this, the engineer informally has the commander or S-3 make modifications that could, for example, support a specific weapons system.

With the initial overlay completed and approved or refined as necessary, the engineer then assigns a target reference number to each obstacle. The target numbering system should be simple, allowing effective communications on both overlays and in radio traffic (figure 1).

A final overlay can now be prepared and distributed to subordinate units and brigade and division engineers for planning and coordination. At any time a commander may request that an additional obstacle be constructed in his sector. This request should be handled by the engineer and, if feasible, assigned for construction and included on the overlay and subsequent target list.

Manpower and Equipment

The engineer's next step is the calculation of manpower and equipment resources needed to construct or prepare the obstacles. The basic planning figure for manpower is the squad-hour. Very rarely should an engineer unit be broken down into elements of less than squad size. Equipment usage is planned by calculating the estimated "equipment team" hours (for example, an equipment team may consist of one bulldozer and one front loader). Each obstacle is evaluated and total requirements weighed against the total engineer assets available for obstacle preparation. If the computed requirements can be fulfilled by the brigade's engineer company and its additional supporting units, then assignment of tasks can be made. If not, the commander must be informed immediately.

In the case where the engineer determines that requirements exceed assets the commander must apply one of three courses of action. He must attempt to acquire additional engineer assets from higher headquarters or; if not succesful, reduce the extent of individual obstacles, such as minefields or tank ditches or, as a last resort, make a decision to delete selected obstacles from the plan.

Targets

The next task will be the preparation of the target list. When completed, this list will become an appendix to the engineer annex of the battalion and brigade plans. As a minimum it will include the target reference number, priority, location, unit to construct, and remarks that may describe minefield dimensions or scatterable mine employment (figure 2). An excellent addition is a list of Target Reference Points covering each obstacle if known at the time of publication.

At this point engineer units begin preparing the targets, using basic loads of munitions and materials and prepare and submit a bill of materials of all Class IV and V stocks that will be required by the constructing units. These quantities of mines and related materials can be extremely large as figure 3 demonstrates. Other considerations for the S-4 will be discussed later.

While the planning mentioned thus far is in progress, the engineer must also perform simultaneous coordination with supported staff sections.

Staff Coordination

The battalion S-3 and engineer must work closely throughout the planning and construction phases. The scheme of manuever for friendly forces within the battle area must be clearly understood by the engineer; likewise, the S-3 must understand the restrictions on movement that may be imposed by the obstacle system. Maneuvering within an area impregnated with obstacles is an exercise in coordination and control that leaves little room for error.

During the planning and coordination phase the S-3 must ensure that all subordinate elements are aware of the authority for execution of the different targets. Normally an engineer unit would prepare such targets for demolition and, when completed, hand over the firing instructions and necessary equipment to elements covering that obstacle. When this changeover of target responsibility takes place, the undisputed understanding of the execution order should go with it. When the order for demolition is issued it *must* be acknowledged. It is the responsibility of the operations officer to inform his subordinate units of the status of all targets. This would help to prevent a disasterous situation in which a friendly unit may become "boxed in" when the course of the battle drastically changes.

Fire Planning

Fire support coordination is an absolute must in obstacle planning. Every obstacle, including probable enemy overwatch positions near the obstacle, should be referenced through the fire support officer. An obstacle *must* be covered by fire and observation in order to be effective. If the engineer sees any obstacle uncovered he should immediately request a target reference point on that location for possible future use.

Another point that should be made with the fire support officer is the capability of supporting artillery to fire scatterable mines and their priority of fires. Artillery delivered antitank and antipersonnel mines add a new dimension to the modern battlefield that should never be overlooked or underestimated!

Yet another member of the family of scatterable mines (FASCAM) that should not be forgotten is the *M-56* system of helicopter-delivered mines. These antitank mines can provide a measure to counter rapid changes of direction made by enemy forces. Priority of employment within the sector and number of sorties available should be considered by the engineer before he advises the commander in the use of the *M-56* system. The engineer will also rely on the aviation representative when contemplating the use of this system because the survivability of friendly aircraft in the battle area will be a determining factor in its employment.

Logistics

Coordination with the S-4 goes well beyond the initial request for materials. Transportation must be requested to haul the munitions from the forward ammunition supply points (ASP) to the working areas. Transportation can become a major operation in itself; for example, to haul the crated material for a sector total minefield frontage of 10,000 meters with average depths of 50 meters (a combined weight of 186 tons) a total of seventy-five 2½-ton truck missions are required! Add to this number a substantial amount of truck missions for bridge destruction explosives and one can begin to see the critical demand for transport.

Another supply problem that is unique to obstacle construction operations is the establishment of forward ASP's for engineer related munitions. It would be ideal if all minefield material, mines, and demolitions could be delivered to an ASP operated by an engineer element, specifically the engineer company headquarters. Such an ASP near a major highway or railway could receive material directly from Pre-Positioned War Reserve Material Stockage facilities and Operational Project Stocks. The engineer and S-4 should coordinate a location for this ASP that would be as close as possible to the majority of the more time-consuming obstacles, minefields in particular. The engineer should plan for mines arriving at the minefield locations to still be in their packing material. Time will not be available at the ASP to unpack mines when it is very probable that the transportation unit may have to make round-the-clock trips in order to move all munitions to their assigned locations. Packing material should be centralized and well-concealed at the minefield location: the residue of 100 x 50 meters of minefield produces about 1,000 pounds of crates and packing material!

Maintaining Effectiveness—Constant Monitoring

Throughout the planning and coordination phase the engineer must never forget the guidance given regarding the civilian population. During the construction phase he must be kept well informed on the movement of refugees in order to advise the commander on possible rerouting of evacuation lanes to prevent needless casualties in and around friendly obstacles.

The engineer must also be constantly alert to the quick reaction demands of subordinate commanders that may require additional resources. He may have to provide technical expertise to assist those subordinate units that desire to use any basic loads of mines to bolster their defensive positions.

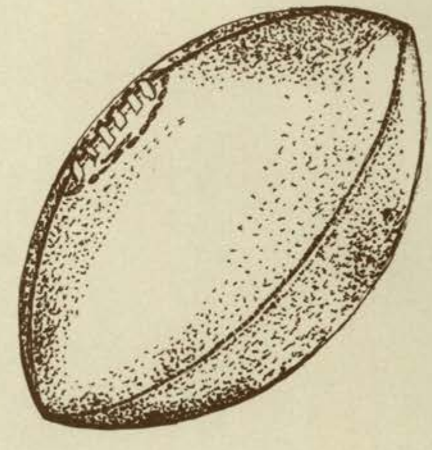
Summary

Indeed, one can see that the job of the combat engineer officer during obstacle employment is one that encompasses many areas. The engineer can only plan. The staff, its coordination with the subordinate units and supporting arms and services, and the individual troopers of the command all combine to make it work.

An obstacle plan is more than a paper representation of what is to be accomplished. It is not complete until every available resource has been used to its fullest capacity and a good, solid fire support plan is known throughout the entire command.

Obstacle planning is a difficult task even during peacetime exercises when a lack of urgency does not demand compensation in blood; but in combat, in the rapid change of events that will characterize the next major conflict, obstacle planning and all of its intricacies *must* be performed effectively and efficiently in order to ensure success.

1 LT CHARLES L. TOOMEY holds a commission in the Engineers, and has completed the Engineer Officer Advanced course at Fort Belvoir, Va. He has served as a brigade engineer liason officer in the 82d Airborne Division, and is currently assigned in USAREUR.



Competitive Sports

Preparing for Battle

by Captain Stephen D. Westbrook

The value of competitive sports in preparing the soldier for battle has long been recognized. Two famous testimonials to this effect come from two of the most famous soldiers in the history of the English speaking peoples. The first,"The Battle of Waterloo was won on the playing fields of Eton," was provided by the Duke of Wellington. Years later, and with considerable more eloquence, General Douglas MacArthur said, "Upon the fields of friendly strife are sown the seeds that upon other fields, on other days, will bear the fruits of victory."

It is significant that neither of these great commanders stated that battles are won by running 2 miles and doing the "daily dozen" every morning. And yet, physical training in many units of the Army today consists almost totally of just that—running and conditioning drills.

Physical training serves two principle functions in the Army. The first is to develop physical fitness, and its importance to combat effectiveness needs no explanation. The second is to develop mental fitness—qualities and habits of the mind which help prepare a soldier to face battle. It is the latter function to which Lord Wellington and General MacArthur were referring. In many Army units this second function of physical training is often overlooked in practice, and in theory.

Purposes of Physical Training

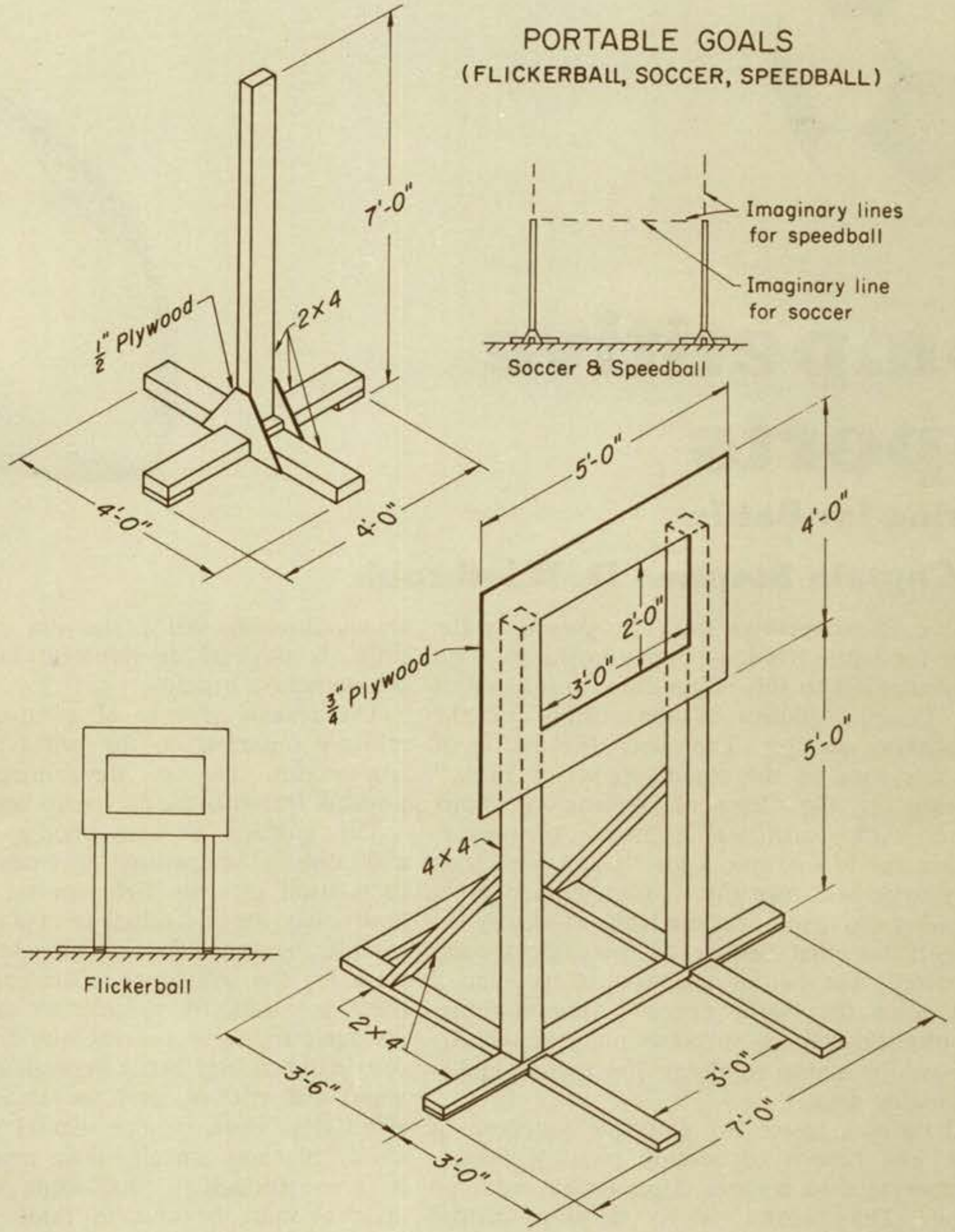
There is no better way to build a unit's physical fitness than through a sound program of running and conditioning exercises. These activities also produce certain mental qualities which are beneficial in preparing the soldier for combat. For instance, the soldier who refuses to drop out of a run develops mental self-discipline and endurance, pride in not failing, and comradeship. He learns the value of group support and experiences the psychological power of group cohesiveness. However, the primary value of running and related group activities, such as conditioning drills, guerrilla exercises, and grass drills, is physical development; mental development is a derivative benefit.

The reverse is true of competitive sports. In a military organization the primary value of athletic competition lies in developing mental fitness; physical fitness is the derivative benefit.

The analogy between modern armored warfare and athletic competition is easily drawn, especially in relation to team field sports such as soccer. In both cases the individual is operating in a relatively complex and hostile environment. There are many ways for the individual to accomplish the goal, and there are similarly determined and like-minded individuals trying to prevent him from doing so. Success in sports and battle depends on teamwork, command and control, and the ability to communicate effectively. Both require mental endurance and the ability to think imaginatively even when exhausted. It is not enough to plod along when tired—the individual must be able to think and react rapidly. Both require that the individual overcome fear of pain and injury. The soldier who hesitates on the athletic field because he is afraid of injury or pain is likely to hesitate under fire. Success in sports and battle depends on a mixture of careful planning as well as audacity and aggressiveness.

Through vigorous athletic competition the soldier develops such valuable characteristics as aggressiveness, courage, and initiative. He has a chance to distinguish himself, and he takes pride in individual achievement. He learns the value of optimism and perseverance, even in the face of probable defeat. Also, the elation of victory and the feeling of waste and agony that accompanies defeat is impressed upon the soldier.

The physical value of competitive sports cannot be overlooked because they develop physical endurance, strength, and coordination. However, purely in terms of physical development, competitive sports are probably not as efficient as a sound program of running and conditioning exercises. But in



terms of mental development, these activities cannot compete with athletic competition.

Mental development is infinitely slower than physical development, and this is one of the principle reasons very few units have sound, comprehensive, regular competitive sports programs in which all soldiers participate. Given the pressure to perform on a short-term basis, few commanders are willing to put a great deal of effort into a program to develop an intangible asset which in the absence of combat, they may never have the opportunity to fully exploit. However, with a thoughtful selection of sports and a little imagination, a great deal of effort is *not* required. In fact, athletic competition can be integrated into the unit's physical training program as easily as the daily run.

Building a Competitive Sports Program

There are a number of criteria which must be met for a commander to be willing to include a particular sport in his physical training program.

- The sport must lend itself to being set up quickly and easily. If it requires elaborate administrative support such as scheduling of gyms, pools, or athletic fields; the arrangement of transportation; or the drawing of equipment from outside the unit, the sport will not be scheduled on a regular basis. It takes too much of the leadership's time. Simplicity is, after all, one of the most important advantages of the traditional program of running and conditioning drills—fall in, remove shirts, move out. Competitive sports must be as easy administratively.
- The sport cannot involve much equipment. In most places the equipment necessary to outfit an entire company to play many sports is just not available. If a large amount of equipment is available in a central post location, then it must be scheduled, drawn, and returned. Thus the first criteria of administrative simplicity is violated.
- The sport must be able to accommodate everyone

in the company at the same time in generally the same location. A commander is not going to regularly split his company. If he does, he will lose control and athletic competition is likely to turn into recreation and relaxation rather than physical training. Thus the sport must be adaptable to a variety of conditions. For instance, three or four 100 x 60 yard, smooth, level athletic fields are rarely available in the same location near a company's area. A field sport must, therefore, be adaptable to whatever terrain is available; it must be capable of being played almost anywhere.

- It cannot require a consummate amount of skill to play. The purpose of the entire program is to develop mental attitudes and physical fitness in everyone, not just in a few skilled athletes. Moreover, if a sport requires a great deal of training or instruction, it becomes an administrative burden and will not be included in the program.
- The sport cannot be too dangerous. If it is, it becomes too expensive in terms of lost man-hours and personal suffering to play regularly. This is a problem with the so-called "combat" sports.

Because running and conditioning drills meet all the above criteria, their popularity is not difficult to understand. Another activity which meets all these criteria is touch football, the sport most frequently played in most units. All it takes is a relatively level field of virtually any dimensions, a group of men, and a ball. Unfortunately, a competitive sports program based on touch football usually becomes recreation and relaxation. This sport is just not vigorous enough, and the action is concentrated in a few skilled players. This type of football is of little value in conditioning the mind or the body. Its only real value is that it provides the chance to relieve frustrations and to have a good time.

Lacrosse, water polo, football, boxing, wrestling, tennis, basketball, handball, and many other sports are eliminated by one or more of the above five criteria. There are at least three sports that do not violate these criteria—soccer, speedball, and flickerball. Soccer is played by moving a ball toward and hopefully into a rectangular goal by kicking, body tapping, or butting it with the head. Speedball is similar, with the major modifications being in scoring and in the fact that the ball can be thrown as well as kicked. Points are awarded for kicking the ball through the goal, over the goal or endline, and for completing a pass into the end zone. Flickerball is played with a football, the object being to advance the football by passing it and eventually throwing it through a 2 x 3 foot hole in a backboard suspended some distance above the ground. A detailed description of each sport and rules for playing them are in chapter 23, FM 21-20, *Physical Readiness Training.*

Soccer, speedball, and flickerball are sports of relatively continuous motion where the ball changes hands frequently and where many people have the oppurtunity for direct and constant involvement. Each produces a maximum of individual participation as well as the conditions which are conducive to developing the soldier mentally for combat. Moreover, because players are constantly moving across and up and down the field, a great deal of physical development also takes place.

If the unit is flexible in adjusting the rules to accommodate various sizes of playing fields, the number of players, and the exact dimensions of the goals, these games can serve as the basis for a regular program of competitive sports. Each can be set up quickly and easily. All that is required is a soccer ball or football, a group of soldiers, a piece of terrain of almost any size that is relatively flat, and some goals. In the past, goals have been a major problem because they have tended to be fixed, thus requiring the scheduling of fields and transportation. However, figure 1 presents diagrams that can be used to construct portable goals. These can be carried easily by a couple of men to whatever location that happens to be free when the company decides to play ball. Participation by everyone in the company can be ensured by setting up three or four makeshift fields at the same location. Anyone who can throw, catch, or kick a ball—or guard and prevent someone else from doing so—can play. The basic ingredient to success is organization, determination, and aggressiveness rather than athletic skill. Finally, injuries can be kept to a minimum. That does not mean that physical contact does not occur or that pain is not inflicted. These sports can become rough when played enthusiastically, but each sport tends to be relatively injury free when properly refereed.

While a few commanders would want to base a physical training program predominately on competitive sports, these sports can be used as an effective supplement. One possible program might have the standard 1 hour of conditioning drills and running on Monday, Wednesday, and Friday mornings. On Tuesday and Thursday mornings, grass drills and guerilla exercises could be added to conditioning exercises in a short, half-hour session. The unit could then return to physical training in the afternoon, spending the last hour of the day in competitive sports.

As long as competitive sport is seen by the unit and the commander as physical training rather than some form of recreation, it will be a valuable supplement to running and conditioning drills in developing physical fitness. More important, athletic competition will develop a mental fitness that has traditionally helped soldiers and their units to achieve victory in battle.

CPT STEPHEN D. WESTBROOK was commissioned from the U.S. Military Academy in 1970. He has completed the Infantry and Armor Officers Advanced courses and has commanded Infantry and Armor units. He is currently serving in the Department of History, U.S. Military Academy.

Dissenting Opinion

Many of our articles have engendered debate between authors and readers, and in some cases, among historians. Space limitations preclude printing all of them. Lieutenant Colonel Peter F. Bahnsen's article, "Improving the Army," ARMOR, November-December 1977, has stimulated some of the younger officers. This is good. If you disagree with an author's view, put it on paper and send it to us. We'll forward it to the author. Remember that we are an open forum for decorous discussion. Some of the dialogue we have generated follows. Let us hear from you about this and other matters that stimulate you. MAV

In his article, "Improving the Army," Lieutenant Colonel Peter F. Bahnsen has identified, very graphically, numerous methods of attempting change within the United States Army. I believe some of LTC Bahnsen's methods, if followed dogmatically, may be conducive to the early demise of a young officer's career.

Tenacity, which is stressed in his article, may be misjudged for stubbornness. Similarly, selection and identification of problems may be seen as an attack on the commander's managerial ability. Further, careful choice of staff officers may earn the title of *manipulator.* Above all, writing to the press or to Congress as a last resort will surely toll the death bell on any officer's dreams for a career.

Emphasized by LTC Bahnsen as "a character requirement," tenacity in a young officer is sometimes misunderstood as pure stubbornness or, even worse, an unwillingness to support the commander's programs. The young officer noted for not supporting enthusiastically the commander's programs will be given few challenging assignments to enhance a career. If tenacity is mistaken for an unwillingness to submit to authority, the young officer may be relegated to an inconsequential job and in essence buried.

Selection and identification of problems to attack must be done judiciously. In the highly competitive atmosphere of today's Army, some commanders may see this judicious approach as an attack on their personal leadership ability. As LTC Bahnsen emphasizes, "avoid a direct attack on the sacred cows." The problem exists in defining *what* is *whose* sacred cow. For instance, a division commander's idea becomes a policy and a battalion commander's idea becomes a program. One does not attack the division commander's policies; likewise, if the young officer takes on the battalion commander's program, he risks alienating not only the battalion commander but also his staff. These individuals are the staff officers who should first examine any change in a program. The Staff Officer's immediate loyalty will be to the commander who writes or endorses his Officer Efficiency Report.

LTC Bahnsen suggests that if a young leader wishes to initiate a change, he first gains the ear of a staff officer and his acceptance of the program. He states that the young officer should seek out the "good staff officer" since they "are always looking for good ideas in the problem areas directly related to them." Enlisting the aid of only certain staff officers will possibly gain some help, but it will also gain the reputation of being a politician. As LTC Bahnsen later states concerning personal ego gratification, "People will eventually know the real mover. . . .The word gets out." Unfortunately, the word will be a negative one in this case. Your contemporaries will become suspicious of your every proposal.

Finally, LTC Bahnsen suggests that if all else within the service has failed, then consider a letter to the press or to a Congressman. Consideration is about as far as any young officer should get with that idea if he intends to make the service his career. Senior commanders do not look favorably on *any* officer who writes to the press or to a Congressman concerning a matter within his command. The Army, as with any institution, protects those within the institution as long as they stay within that institution in attempting change. In that light, many commanders consider a letter to the press or Congress as a disloyal act not to be tolerated. The officer who does might as well volunteer for the first *kamikaze* mission available because that is exactly what will happen to any career hopes.

In summary, LTC Bahnsen's article is interesting and well intended. However, I do not believe that tenacity should be stressed as a required attribute. Perhaps "diplomatically persistent" would be a better definition of this required character trait. Selection and identification of problems *must* be done judiciously to insure that the young officer does not antagonize an immediate commander. Selection of staff officers should be based simply on the area of responsibility. The young officer who plays at politics is shunned by contemporaries. Last, but most important, no young officer should ever write to the press or a Congressman concerning a matter of command jurisdiction. The immediate gains, if any, will be extremely costly and the tenure of that young officer will be brief and lackluster.

DAVID E. ALDRIDGE
Chief Warrant Officer

CWO-3 Aldridge was a student at the Warrant Officer Career College, Fort Rucker, Ala., when he wrote this article as a course requirement. He is now enrolled in St. Martin's College, Olympia, Wash., where he is completing requirements for an associate degree in Aviation Operations Management. Upon completion of his civilian schooling, he will be assigned within U.S. Army, Europe.

ARMOR provided LTC Bahnsen with a copy of the foregoing article by CWO Aldridge. His comments follow.

Lest any of your readers missed the point to my article, I was not writing about a "career" or "dreams of a career" but rather how we, all of us, can go about correcting "*obvious* errors and inequities in the Army" (emphasis added). I agree with Mr. Aldridge's conclusion that "selection and identification of problems to attack must be done judiciously;" but I disagree with many of the underlying assumptions made throughout his letter supporting the conclusion:

"Tenacity. . .may be misjudged for stubbornness."

"Enlisting the aid of only certain staff officers. . .will also gain the reputation of being a politician."

"Your contemporaries will become suspicious of your every proposal."

"Senior commanders do not look favorably on *any* officer who writes to the press or a Congressman. . . ."

It is not the purpose to debate the issue here. I will leave that as an excercise for the student, but I think it is important to clarify the basic concepts, "career" and "principles." The two are not necessarily incompatible, it is only when "career" becomes paramount that principles suffer and, of course, without principles the pejorative term of "manipulatory" fits any technique.

The Army is "full" of bright young officers trying to do what they think is right. Romantics maybe—believing in what never was and never will be—but asking only for the opportunity to serve with and for soldiers with principles. "Career" is a term rarely heard in conversations with the true combat soldiers with whom I have served; it carries a connotation of "security" and "20-year retirement." I think it demeaning to weigh decisions of "what is good for the Army" in terms of "what is good for my career."

I do not advocate a wholesale attack by all junior officers on any "problem" that might not be to their particular whim or fancy. I reemphasize attack "obvious errors and inequities" for the good of the Army in concept with your principles, knowledge, and common sense. I sincerely believe that an officer's *raison detre* is morality or action based on some agreement to a set of principles. Those principles must override concepts and "dreams of a career," otherwise one will drift through a "career" like a rudderless ship. The narrow focus on "career" by many of the midlevel and senior leaders of today is the primary reason for my article. When your principles tell you that the "commander's program" is in conflict with common sense then "careerism" must fold or your principles become meaningless.

Acts of omission are committed daily by many weakhearted souls under the guise of "career;" more literally translated as "security." Fear for your security? Hogwash! There is not an officer in the service today who couldn't make an honest living in a civilian "career" should his commander misjudge his "tenacity" for "stubbornness." No officer worth his salt should so embrace a military "career" that he has or can conceive of no place else to go. Such an approach will only make him a less honest person. Too long this Army has marched to the refrain of unquestioned loyalty and obedience to a superior, whatever his failings. We have forgotten the higher loyalty we owe to the Constitution, and the Army as an organization.

I cannot perceive of anyone offering advice to a young officer to select problem areas judiciously so as not to "antagonize an immediate commander." Problems are selected that need solving and "let the chips fall where they may." The things that are truly wrong will probably antagonize him the most.

Mr. Aldridge, my personal thanks for taking the time to respond, despite my fundamental disagreement with your concepts.

PETER F. BAHNSEN
Lieutenant Colonel, Armor
ODCSOPS

Target Servicing

Several years ago, the U.S. Army began to emphasize the Threat. Subsequently, we learned that we would have to fight outnumbered against enemy weapons systems technologically on par with our own. How do you fight and win against an enemy who outnumbers you? At the battalion level and lower, this question has become known as the target servicing problem. The Active Defense concept combined with good use of terrain became the solution at division and higher levels. The Command and General Staff College, Fort Leavenworth, Kan. developed a mathematical formula which, if applied correctly to forces and terrain by corps and divisions insures that our covering forces will not be outnumbered more than 6 to 1, and our forces in the main battle area (MBA) will not be outnumbered greater than 3 to 1. Thus, it would seem that the problem of fighting outnumbered has been solved at the higher echelons; however, we have not solved the target servicing problem at the lower echelons. Therefore, many are skeptical of the Active Defense.

There has been much criticism of the Active Defense and the target servicing problem; however, there have been no viable alternatives offered. Some critics argue that the role of the infantry is not defined. Others argue that avenues of approach will be left uncovered (*Infantry Magazine,* May-June 1978). In addition there are those who believe we will not have enough ammunition to service the numerous targets. The criticism goes on and on at the platoon, company, and battalion levels. What is really needed are some *positive solutions* for the Active Defense and target servicing problem at these echelons.

Essentially, we are at the point where division and brigade commanders and staffs understand their roles in combating the target servicing problem by stressing proper force ratios. However, at the battalion level and lower, the problems of target servicing have not been resolved, and it is at this level the problem is most acute, because if you don't service the targets, the targets will service you.

The following are some recommendations in achieving target servicing solutions. These recommendations are not all-encompassing, nor are they complete, but they do reflect a positive approach, and they are designed to stimulate interest in achieving target and servicing solutions.

The first step in resolving the target servicing problem is to determine how the enemy will be arrayed (deployed) on the avenues of approach into your battle positions. Essentially, you must determine the number of weapon systems by type that the opposing force can deploy against you within the limits of Threat doctrine and the terrain. Having determined how the enemy will be arrayed, and the effects of terrain (intervisibility) you should task organize and emplace weapons systems.

Given a specific number of weapon systems and amounts of ammunition, we will not have all the guns or bullets we desire, and that is normally the case on any battlefield. Therefore, we must be selective in the type and the amount of ammunition we employ on any given target. In essence, we must use weapon systems when and where they will do the most good without wasting resources. In this regard, our tanks and TOW's should be limited to firing at enemy tanks initially. Simultaneously, artillery should be employed against the more vulnerable *BMP's* or *BTR-60's*. Mortars firing HE or smoke should be employed on *BRDM's* mounting antitank guided missiles which would probably be in overwatch positions. There are many variations of selective fire, but the thrust is to use a specific weapon system for a specific target based on target vulnerability, thereby conserving ammunition. To mass fires of all assets, without considering target vulnerability is useless. In this regard, the weapon systems of the entire Combined Arms Team should be employed simultaneously against *selective targets*.

The factors noted above could and should be refined even further. For example, in a situation where a Combined Arms Team tank platoon is covering a minefield, each TOW section and tank should have a sector of fire. Within each unit, however, emphasis should be placed on selective targets. In this instance, priority targets should be Threat tanks equipped with mine roller equipment.

If *A-10* aircraft are available to support the Combined Arms Team, they could probably be most effectively employed against *BMP's* and *BTR-60's*. Again, due to the vulnerability of these vehicles, the *A-10* is capable of destroying many more lightly armored vehicles as opposed to tanks on any given airstrike. However, in this instance, the *ZSU* antiaircraft weapons must be a priority target for the ground commander as he employs his direct and indirect fire weapons, prior to employing the *A-10*. If a ground commander elects to fight in this selective manner, he will be able to concentrate the majority of his direct fire weapons systems on enemy tanks.

By maximizing our use of terrain, and optimizing weapons systems emplacement, and subsequently, using selective fires on targets, we will solve a great portion of our target servicing problem. We will also simultaneously force the Threat off the high-speed avenues of approach.

If the bulk of our long-range, direct fire weapons are covering the high-speed avenues of approach (and they must), then the secondary approaches and logging trails are vulnerable. At the battalion level and lower there should not be a *risk analysis* when addressing avenues of approach. All avenues of approach must be covered. This is where the infantry squads and platoons should be employed with their short-range weapons systems.

In summary the Active Defense is a sound concept, but at the small unit level we must fully employ our Combined Arms capability against selected targets based on vulnerability, and we must understand target priorities if we are going to reduce our target servicing problem to a target servicing solution.

HARRY B. BEAM
Major, Armor
Command & Staff Dept.
USAARMS, Ft. Knox, Ky. 40121

Making Do With Less

In these times when seemingly more and more is expected while less and less is given to work with, I have to wonder how badly we are hurting ourselves in the name of economy and consciousness. I am referring to the steadily decreasing authorization and availability of training ammunition. It would be less than accurate to discount the benefit of the various subcaliber devices, and the positive savings they allow. But making another long point short, we are talking about ultimate readiness in a combat situation. Subcaliber training, up to a point, is fine. After that point, tank crews need to fire the main gun much more often than most battalions are able to do due to financial and other constraints. I'll bet that most company commanders, S-3's, and battalion commanders would agree.

As an example of what my battalion, including a cavalry troop, is up against, the following is a breakdown of major types number of rounds of ammunition that have been approved for FY-79, including annual training.

HEAT-T	49	4.2 Mortar HE	140
HEP-TPT	121	4.2 Mortar ILLUM	50
HEAT-TPT	1,195	4.2 Mortar WP	100
HEP-T	75	Caliber .50	17,500
TPDS-T	30	7.62-mm (COAX)	25,000

It doesn't take long to see that these quantities are hardly sufficient, even to satisfy the existing requirements outlined in FORSCOM Regulation 350-2. Again, I am talking about three tank companies, a 4.2-in mortar platoon, and a cavalry troop, not to mention scouts and the rest of the battalion.

I wonder at what point the returns on saving money will start to diminish, and hurt both training and readiness.

I have a feeling that many commanders feel the same way. It seems to me that other cuts and other waste could be eliminated first, before we start sacrificing ammunition and other vital training assets.

Few, if any, of our troops have ever fired service ammunition. From the start, we in the Reserve Components are playing catch up. For these and many other reasons, I feel the hardware necessary to train realistically toward C-1/C-2 should be available. When it isn't we are only fooling ourselves into assuming a "readiness" we do not, in fact, enjoy.

I don't purport to represent anyone but myself, and I don't say we need a blank check as far as ammunition is concerned. We do need enough to train with. The European situation and Threat capabilities speak for themselves.

SAMUEL T. CONN
Captain, Armor

KanARNG

Target Identification

Although we spend millions of dollars to provide our soldiers with sophisticated antitank systems, they can't readily tell one target from another. We have failed to admit that the problem exists, and we have failed to establish a realistic Target Identification Program. We have relied on the unit trainer's perceptiveness, innovativeness, and initiative to develop meaningful training programs. This is not acceptable.

The time for change is NOW! It's time to decide exactly what we expect of our soldiers and provide training which will match or surpass the effectiveness of their weapons systems. Today's soldier is expected to be able to identify a variety of combat vehicles and aircraft. In some instances, no consideration is given to the problem. Our current SQT's exemplify this statement. A cursory review shows that we expect the soldier to identify numerous aircraft and combat vehicles not normally found in the first echelon of an attacking force.

Although the situation is far from bleak, if most commanders sat back and evaluated their unit's ability to identify targets with the same speed and precision required to engage them, most would agree that there is in fact a problem. Several agencies are involved with improving troop-level training aids to support this training. In addition, I would like to suggest several means through which the unit can improve their target identification training:

- Establish realistic goals and standards. Our soldiers must be able to instantly recognize those combat vehicles associated with the first echelon of an attacking formation.
- Major combat vehicles of allied armies occupying flank positions should be reviewed. Once the initial goals are satisfied, move on to the nice-to-know items.
- Provide the unit trainer with a means of effectively presenting and reinforcing target identification training. Trends towards the newer training aids such as how-to-fight series of television tapes (TVT's) and motion pictures are fantastic.

These efforts can be supplemented with:

- Vehicle models to provide graphic reinforcement during concurrent range training, in the classroom, or wherever they can be easily viewed.
- Newer, more accurate, and more attractive Graphic Training Aids (GTA's) to gain the soldiers attention. The GTA, "Soviet Big 7," produced by the U.S. Army Intelligence and Threat Analysis Center is a fine example, but we need more. GTA's produced in the late sixties and early seventies must be replaced because they are outdated. Well-thought-out displays placed in headquarters, company, and work areas tend to reinforce training and generate interest about the combat vehicles.
- An increase in the types and numbers of visual aids available within the Training Aid Support System. Our soldiers have been reared on motion pictures and television. This fact can be used to the trainer's advantage. The newer versions of TVT and motion pictures presenting *T-62* and *BMP* capabilities and countermeasures are great. The aids are interesting, action packed, and present the subject matter very well. Caution, however, must be exercised when using TVT. Subject matter must be limited to those facts that the average soldier needs to know.
- The 35-mm slide can be inexpensively mass produced and issued down to company level. The slides should depict the combat vehicle in a field setting, rather than on the parade ground.
- Rethinking our training philosophy to insure that target identification training is responsive to the needs of the unit and soldier. It must be brought to the soldier and integrated into whatever he is doing. My section established an intelligence station on a gunnery range. The station consisted of a GP medium tent filled with posters, models, TVT's, and movies. During breaks in training or lulls the soldiers were encouraged, not told, to come in, look around, and get warm. Naturally, while warming themselves, we kept their attention by showing the various TVT's and movies, and answering questions. The majority of the tankers expressed a keen interest in their combat counterparts. It was gratifying to arrive on site and find that word-of-mouth advertising had spread the word to newly arrived companies.

When considering the first round hit probabilities of antitank systems available to NATO and the Warsaw Pact, we can ill afford to continue paying lip service to target identification training. The ability to rapidly acquire, identify, and engage targets must go hand-in-hand and must receive the same emphasis we give to maintenance and gunnery training exercises.

CARL F. DASCHKE
Captain, Military Intelligence

APO New York 09031

NOTES

FIRST AID FOR GLUE

A leading producer of several of the new cyanoacrylate adhesives has issued *first aid procedures* for skin bonded by these new "superglues."

Skin Bonds. Do not try to pull the surfaces apart with a direct opposing action. Immerse the skin surfaces in warm, soapy water. Peel or roll the surfaces apart by using a blunt edge such as a spoon handle. Finally, wash the adhesive off the skin with soap and water.

Eyelid to Eyelid/Eyeball Bonds. Do not try to open the eyes by manipulation. If eyelids are stuck together or bonded to the eyeball, wash thoroughly with warm water and apply a guaze patch. The eye will open without further action, usually in 1 to 4 days.

Adhesive on the Eyeball. Cyanoacrylate introduced into the eyes will attach itself to the eye protein and will dissociate from it within a matter of hours, even if gross contamination has occurred. During the period of contamination before clearance takes place, weeping will occur and double vision may be experienced.

Mouth. If lips are accidently stuck together, apply a stream of warm water to the lips and encourage maximum wetting and pressure from saliva inside the mouth. Peel or roll the lips apart gently; do not try to pull with a direct opposing action.

It is almost impossible to swallow cyanoacrylate. The adhesive solidifies and adheres to the mouth. Saliva will lift the adhesive in ½ to 2 days.

Burns. Cyanoacrylates give off heat solidification. In rare cases a large drop may cause a burn. Burns should be treated normally after the glob of cyanoacrylate is released from the tissue.

It is highly recommended that individuals experiencing the above symptons follow up the first aid procedures with a visit to the medical authorities. This will ensure proper treatment.

ASSOCIATION GIVES TO FUND

The 6th Armored Division Association recently made an additional donation to the Patton Museum Building Fund, raising their total contribution to $5,500. The association also reported that when those who gave financial support for THE SUPER SIXTH are repaid, all future profits from the sale of the book will be donated to the museum.

ARMORED DIVISION ASSOCIATION REUNIONS

1st AD	Denver, Colo.	Aug.	16-19,	1979
3d AD	San Antonio, Tex.	Aug.	22-25,	1979
6th AD	Raleigh, N.C.	July	25-28,	1979
7th AD	Kansas City, Mo.	Aug.	15-19,	1979
11thAD	Cherry Hill, N.J.	Aug.	16-19,	1979
12thAD	Louisville, Ky.	July	19-22,	1979
14thAD	Anaheim, Calif.	July	25-29,	1979
16thAD	Louisville, Ky.	Aug.	9-12,	1979

TANK SIGHT

Shown is the receiver-transmitter unit of a laser fire control system for the *M-60A3* tank. The system's computer processes the range, along with other necessary data such as wind, temperature, and ammunition ballistics, to provide the correct azimuth and elevation firing commands to the tank turret and main gun.

OPMD - EPMD ARMOR

The following lists include all Armor officers in Brigade and Battalion level commands as of March 1979. Even as this goes to press we recognize that some of these names may have already been changed. Please bear with us! We plan to provide periodic updates of this listing.

ARMOR BRIGADE/REGIMENTAL COMMANDERS as of March 79

COL John M. Kirk
1st Bde, 1st Armored Division

COL John Petracca
2d Bde, 1st Armored Division

COL Lee D. Brown
1st Bde, 3d Armored Division

COL Donald S. Pihl
3d Bde, 3d Armored Division

COL Ronald W. Zeltman
1st Bde. 3d Infantry Division

COL Robert E. Wagner
2d Armored Cavalry Regiment

COL Richard D. Cardillo
3d Armored Cavalry Regiment

COL Robert J. Sunell
11th Armored Cavalry Regiment

COL Billy J. Wright
1st Bde, 2d Armored Division

COL James T. Bramlett
1st Bde, 1st Cavalry Division

COL Robert F. Molinelli
6th Air Cavalry Cbt Bde

COL Joseph A. Langer
3d Bde, 4th Infantry Division (M)

COL Richard L. Coffman
1st Training Bde

COL John J. Yeosock
194th Armored Bde

COL John D. Borgman
Lightning Bde

COL John M. Toolson
11th Aviation Group

COL Frederick B. Hull
DISCOM 1st Armored Division

COL John C. Bahnsen
1st Aviation Bde

ARMORED BATTALION/SQUADRON COMMANDERS as of MARCH 79

LTC Robert B. Franklin
1st Battalion, Lightning Bde

LTC Donald W. Williams
2d Battalion, 4th Bde

LTC John F. Jeszenszky
1st Squadron, 1st Cavalry

LTC Raoul H. Alcala
2d Squadron, 1st Cavalry

LTC Alvin W. Kremer
1st Battalion, 1st Brigade

LTC William Rittenhouse
2d Battalion, 1st Brigade

LTC Richard F. Pell
3d Battalion, 1st Brigade

LTC James H. Sangster
4th Battalion, 1st Brigade

LTC James G. Garvey
5th Recon Squadron, 1st Bde

LTC Richard C. Edwards
1st Squadron, 2d ACR

LTC James M. Lyle
2d Squadron, 2d ACR

LTC John R. Landry
3d Squadron, 2d ACR

LTC Richard Quinn
1st Squadron, 3d ACR

LTC John N. Sloan
2d Squadron, 3d ACR

LTC Jerry R. Rutherford
3d Squadron, 3d ACR

LTC Ralph Wolfe
15th Battalion, 4th Brigade

LTC Walter Dillard
1st Squadron, 4th Cavalry

LTC Michael A. Molino
Trp Cmd, Monterey

LTC Donald Kenney
2d Battalion, 5th Cavalry

LTC Leighton O. Hasselgrove
3d Squadron, 5th Cavalry

LTC John H. Tilelli
2d Squadron, 6th Cavalry

LTC Richard A. Jones
1st Battalion, 7th Cavalry

LTC Kent E. Harrison
3d Squadron, 7th Cavalry

LTC James T. Pratt
4th Squadron, 7th Air Cavalry

LTC William S. Chandler
1st Battalion, 8th Cavalry

LTC Edward R. Szeman
2d Battalion, 8th Cavalry

LTC Norman E. Beatty
3d Squadron, 8th Cavalry

LTC William Kimes
4th Squadron, 9th Air Cavalry

LTC Terrence Wallace
1st Squadron, 9th Cavalry

LTC Joseph Gross
2d Squadron, 9th Cavalry

LTC James T. McWain
1st Squadron, 10th Cavalry

LTC Stanley Bacon
3d Battalion, 10th Cavalry

LTC John D. Robinson
2d Squadron, 10th Air Cavalry

LTC James B. Taylor
1st Squadron, 11th ACR

LTC Joseph C. Conrad
2d Squadron, 11th ACR

LTC Thomas J. Haycraft
3d Squadron, 11th ACR

LTC Phillip Medenbach
C&C Sqdn, 11th ACR,

LTC William B. Blake
3d Squadron, 12th Cavalry

LTC Robert L. Sloane
4th Squadron, 12th Cavalry

LTC William A. Izzard
1st Battalion, 13th Armor

LTC Clyde A. Hennies
1st Squadron, 17th Air Cavalry

LTC Jack L. Turecek
2d Squadron, 17th Air Cavalry

LTC Arthur S. Dervaes
7th Squadron, 17th Air Cavalry

LTC Thomas L. Beale
1st Battalion, 32d Armor

LTC Sanderson A. Woods
2d Battalion, 32d Armor

LTC Edward D. Line
3d Battalion, 32d Armor

LTC Michael D. Keating
5th Battalion, 32d Armor

LTC Jack H. Smith
6th Battalion, 32d Armor

LTC David Harbach
1st Battalion, 33d Armor

LTC Dennis V. Crumley
2d Battalion, 33d Armor

LTC Charles B. Fegan
3d Battalion, 33d Armor

LTC Paul E. Funk
5th Battalion, 33d Armor

LTC Donald Lockey
2d Battalion, 34th Armor

LTC Kenneth A. Evans
1st Battalion, 35th Armor

LTC James R. Harding
3d Battalion, 35th Armor

LTC David A. Armstrong
1st Battalion, 37th Armor

LTC John C. Heldstab
2d Battalion, 37th Armor

LTC Charles McManamay
4th Battalion, 37th Armor

LTC David McMillion
1st Battalion, 40th Armor

LTC Barry J. Roller
4th Battalion, 40th Armor

LTC Corless W. Mitchell
1st Battalion, 63d Armor

LTC Preston Johnson
2d Battalion, 63d Armor

LTC John L. Kennedy
3d Battalion, 63d Armor

LTC Arthur T. Fintel
4th Battalion, 63th Armor

LTC Peter F. Scott
1st Battalion, 64th Armor

LTC Robert W. Garrott
2d Battalion, 64th Armor

LTC Timothy H. Donovan
3d Battalion, 64th Armor

LTC George P. Miller
4th Battalion, 64th Armor

LTC Albert Folcher
1st Battalion, 66th Armor

LTC Richard V. Doty
2d Battalion, 66th Armor

LTC David H. Parrish
1st Battalion, 67th Armor

LTC Jon D. Collins
2d Battalion, 67th Armor

LTC William A. West
3d Battalion, 67th Armor

LTC Gordon T. Bratz
1st Battalion, 68th Armor

LTC Jerome L. Haupt
2d Battalion, 68th Armor

LTC William A. Scherr
3d Battalion, 68th Armor

LTC Wayne P. Halstead
4th Battalion, 68th Armor

LTC William Lozano
5th Battalion, 68th Armor

LTC Roy Kimerling
2d Battalion, 69th Armor

LTC Benjamin Covington
4th Battalion, 69th Armor

LTC Richard Goldsmith
1st Battalion, 70th Armor

LTC Douglas H. Rogers
2d Battalion, 70th Armor

LTC John F. Jorgenson
3d Battalion, 70th Armor

LTC Dennis E. Firestone
1st Battalion, 72d Armor

LTC James Smock
2d Battalion, 72d Armor

LTC Vaden K. Watson
4th Battalion, 73d Armor

LTC David K. Riggs
1st Battalion, 77th Armor

LTC Timothy Grogan
2d Battalion, 77th Armor

LTC Garrett Duncan
3d Battalion, 77th Armor

LTC Anthony DiCaprio
2d Battalion, 81st Armor

LTC Phillip G. Sheaffer
11th Aviation Battalion

LTC William C. Page
52d Aviation Battalion

LTC James E. Brayboy
101st Aslt Hel Bn

OPMD

OVER/UNDERALIGNED SPECIALTIES

Proper alignment by officer grade and OPMS specialty to meet Army requirements and provide appropriate opportunity for professional development through training and utilization is a goal of OPMS.

A specialty is listed as over or underaligned when the ratio of designated officers to Army requirements could affect utilization at the indicated grade levels. Specialties not listed are considered properly aligned. The initial designation of alternate specialties for officers during their eighth year of service is a planned management action designed to provide sufficient officers to satisfy future field grade requirements. Because of this, over or underalignment status of specialties at the grade of captain is not provided. Captains who desire specialty changes should submit their requests by letter to their respective career divisions at MILPERCEN. Requests will be considered on a case by case basis.

The current alignment of officers against requirements follows:

COLONEL
Overaligned Specialties

SC 28......... Instructional Technology
SC 41......... Personnel Management
SC 52......... Atomic Energy
SC 54......... Operations and Force Development

Underaligned Specialties

SC 21......... Engineer
SC 27......... Communciations-Electronics Engineering
SC 31......... Law Enforcement
SC 37......... Electronic Warfare/Cryptology
SC 43......... Club Management
SC 46......... Public Affairs

LIEUTENANT COLONEL
Overaligned Specialties

SC 15......... Aviation
SC 28......... Instructional Technology
SC 86......... Traffic Management
SC 88......... Highway and Rail Operations

Underaligned Specialties

SC 21......... Engineer
SC 31......... Law Enforcement
SC 37......... Electronic Warfare/Cryptology
SC 43......... Club Management
SC 44......... Finance
SC 46......... Public Affairs

MAJOR
Overaligned Specialties

SC 15......... Aviation
SC 28......... Instructional Technology

Underaligned Specialties

SC 21......... Engineer
SC 27......... Communications-Electronics Engineering
SC 43......... Club Management
SC 44......... Finance

SC 28 Instructional Technology and Management positions have increased significantly at the grade of major as a result of recent recoding efforts. However, this effort did not produce as many field grade positions as originally intended. Hence, the specialty is now considered overaligned at the field grades. This status, however, does not preclude the designation of officers into the specialty. It is anticipated that SC 28 will have a title and function change effective 1 September 79. The new title will be Training Development. The revised function will focus attention on training development, particularly in TRADOC.

SC 47 (Education) will be eliminated effective 1 Sep 79.

Officers who are designated in an overaligned specialty and who presently possess the necessary skills, experience, or potential associated with an underaligned or balanced specialty, should consider submitting a request for redesignation. Officers are discouraged from seeking redesignation into an overaligned specialty. MILPERCEN will consider all requests for specialty changes on a case-by-case basis with due consideration for Army requirements, and the training and experience of the individual officer. Officers are encouraged to review DA Pamphlet 600-3, 1 September 1977, before submitting requests for designation.

Requests for changes of specialty should be forwarded direct to the Professional Development Branch within the appropriate career division in the following brief format: Paragraph 1: "Request Specialty Change From ( ) to ( )." Paragraph 2 should contain supporting rationale for requested change (i.e., amount and level of training; and experience in requested specialty).

EPMD

OVERSEAS EDUCATION

Soldiers overseas are now able to enjoy a major educational benefit previously limited to soldiers stationed in the U.S. The Servicemen's Opportunity College Associate Degree (SOCAD) program expanded to overseas locations in December 1978. Six colleges and universities have agreed to extend the SOCAD program overseas.

The Servicemen's Opportunity College (SOC) standardizes procedures for academic evaluation of military schooling, experience, and training for over 70 participating educational institutions. The program provides flexible credit transfer options leading to an associate degree.

The program was originally designed for Combat Arms personnel but is being expanded to meet the needs of other service personnel. In addition to the associate degree program in management for combat arms servicemembers, SOC has developed associate degree programs for soldiers in Air Defense Missile Maintenance, Field and Area Communications Maintenance, Fixed Plant Communication Maintenance, Food Service, and Mechanical Maintenance.

SOC plans to add 15 more associate degree programs during fiscal year 1979 in other career fields, including Civil Engineering, Data Processing, Technology, Construction, and Mechanical Engineering.

The six SOC colleges participating in the program expansion overseas are: City College of Chicago, Central Texas College, Big Bend Community College, Los Angeles City Colleges, Florida State College, and the University of Maryland.

The advantages to soldiers are that special arrangements are made to enroll qualified servicemembers, there is a more liberal policy for transferring academic credits from other institutions, and residence requirements can be adjusted. SOC schools sign an agreement with the student for a degree, provide counseling services, and award degrees to eligible students who have completed 60-65 semester hours, depending on the program. Participating schools have agreed to accept the recommendations of the American Council on Education for granting credit for nontraditional learning, such as military training, and credit-by-examination.

The SOC organization overseas monitors compliance with membership requirements. Commanders and education services counselors at Army installations monitor the program to ensure that schools conduct the program in accordance with written agreements.

Commanders are encouraged to advertise the potential of SOCAD, especially to senior noncommissioned officers. SOCAD can assist enlisted personnel in meeting educational goals relating to professional development.

Soldiers interested in the SOCAD program can obtain further information from their local installation education services office.

CHANGE TO CSM APPOINTMENTS

Since the creation of the Command Sergeant Major Program, acceptance/declination has been an individual prerogative that could be exercised either before or after selection by the board. The majority of declinations have been submitted after selection, resulting in wasted effort by selection boards and an increased workload for the CSM/SGM Office at MILPERCEN.

In an effort to put more displine in the selection procedures, changes have been made to Chapter 14, AR 614-200. Significant departures from the current policy are:

- The deletion of the declination after selection option.
- The requirement that individuals who do not decline consideration prior to convening of the selection board, and are selected for appointment to CSM, either accept entry into the CSM program; or if otherwise eligible, apply for non-disability retirement within 30 days after the selection list is announced.

The above changes will be included in change 40 to AR 614-200, which should be in the field during March 1979.

"R" FICHE ALTERS OMPF DESIGN

The conversion of the Official Military Personnel File (OMPF) to microfiche brought not only a new look to the file but also a new design. When the OMPF was maintained in paper form, it contained only two sections—the efficiency section and the historical section. All authorized documents were filed in one of these two sections. When a file was requested for review or evaluation the entire file was routinely provided.

The microfiche OMPF is made up of three sections, called fiche. These are:

•The Performance (P) Fiche. This is the primary file for performance documents which are used for evaluation and selection by DA boards and career managers.

•The Service (S) Fiche. This file contains those documents which must be permanently retained to facilitate personnel administration and to protect the interest of the government and the soldier. It is routinely furnished to the career managers but only upon request to selection boards.

•The Restricted (R) Fiche. This is a protected file containing those documents which must be permanently retained to facilitate personnel administration and protect the interest of the government and the individual. However, because of legal, regulatory, or policy requirements, this file is not released to selection boards, career managers, or other agencies without special authority.

The type of documents filed on the "R" fiche include:

•Application for correction of military records.

•Report of investigation—line of duty and misconduct status.

•Investigating officer's report.

•Court-martial promulgating orders set aside.

•Denied evaluation report appeal correspondence.

•Proceedings of the Army Discharge Review Board with exhibits.

•Army Board for the Correction of Military Records proceedings with exhibits.

•Record of determination for correction of errors in the OMPF.

Because of the addition of the "R" fiche substantially alters the design of the OMPF, policies and procedures have been developed concerning the release of that fiche to individuals and agencies.

There are five broad categories of requests for access to or loan of documents contained on the "R" fiche:

•Requests for access and review of the OMPF by soldiers or their fully identified, authorized representative.

•Requests for access to or loan of documents on the "R" fiche by DA selection boards.

•Requests from career managers.

•Requests from other Department of Defense agencies.

•Requests from agencies outside of the Department of Defense.

These policies and procedures will be incorporated into a forthcoming revision of AR 640-10, currently being drafted by MILPERCEN.

From *FOCUS,* #1-79, 19 Jan. 79.

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 60)

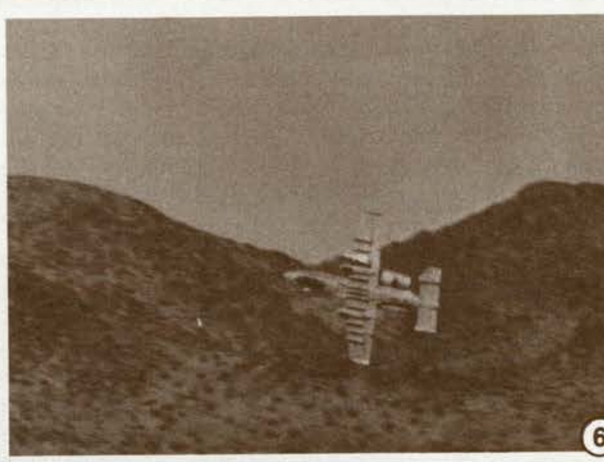
1

2

3

4

5



6

BOOKS

THE ALL-VOLUNTEER FORCE-A STUDY OF IDEOLOGY IN THE MILITARY by Jerald G. Bachman, John B. Blair & David R. Segal. The University of Michigan Press, 1977. 210 Pages.

Like the weather, the all-volunteer force is something that everyone is talking about but doing nothing about. This study endeavors to do something about this highly emotional issue. The authors' involvement in this research developed from different paths. Jerald Bachman's early research was centered on a longitudinal study of youth. From that project extensive analyses were made of young men's views and personal decisions about the military. Using funds provided by the Office of Naval Research and then the Army Research Institute, a 3-year effort of data collection was made possible. This publication is based on three samples of the population: a representative national cross section of the civilian population surveyed in early 1973, a sample of Navy personnel in late 1972 and early 1973, and a sample of Army personnel in late 1974 and early 1975. All addressed the same questions about the U.S. Military and its mission.

The book is concerned with two interrelated questions: "Who should serve in the all-volunteer military force in the United States?" and "What should be the relationship between the military and the civilian society?" First, the authors provide a theoretical and historical context within which to examine these questions. Next, they report in detail on the three surveys already mentioned. Then they summarize their findings and make conclusions from the survey data. Finally, they spell out what they consider to be the most important policy implications.

Since the authors admit in their preface that they are against a separate military ethos and for a military responsive to civilian control integrated in the larger civilian society and broadly representative of that society, it is not surprising when they identify a leaning towards a military ethos that they recommend measures which will bring the military back into the civilian fold. Most military will have trouble with the conclusions the authors draw with respect to civilian control. The universality of these findings may be suspect due to the smallness of the samples. For the "head-in-sanders" who wish to go back to the draft, the comparison of the military population at the end of the Vietnam era with that of today, and the ensuing similarities, will be most enlightening.

As the cost of the military goes up, coupled with an increased need for a viable military and greater difficulty in staffing that force with the quantity of people required, the authors offer policy changes which they feel will help in correcting the direction we are now going. Must reading for all of us concerned with the military.

Colonel C. A. Mitchell
USAARMS

THE LEAVENWORTH SCHOOLS AND THE OLD ARMY: EDUCATION, PROFESSIONALISM AND THE OFFICER CORPS OF THE UNITED STATES ARMY, 1881-1918 by Timothy K. Nenninger. Greenwood Press. 173 pages. 1978. $15.95

General William T. Sherman's exploits during the Civil War are well known to every school boy. History would remember him for his tactical contributions in shortening that terrible war. His "experimental" founding of a school of application in 1881 when he was Commanding General of the Army, though little known, has had a far greater effect on the Army and, in particular, its success in war. Timothy K. Nenninger, an archivist in the Military Archives Division of the National Archives, describes the formation and evolution of the schools at Leavenworth from 1881 to 1918. He relates the early years when the school did little more than give rudimentary education and respite to bored officers tired from the doldrums of Indian warfare, then the evolution into two 1-year schools, and finally the staff college which earned its reputation in World War I.

Of particular interest to the educator is the history of teaching methodology. Initially all courses were taught using the Thayer method of daily recitation and rote memory. Then, based on study of foreign instruction, the application method was introduced. Wagner and Swift were the innovators and the current student body can blame them for the Leavenworth model which put more practical work into the curriculum, including additional tactical problem solving. Swift was also responsible for tracing numerous battlefield failures to the misunderstanding of orders. He attributed this failure to the absence of a systematic means of issuing orders; thus the five-paragraph order came into being. Use of this system changed the instruction from academic attainment to a test of decision making and judgment. The addition of Kriegspiel into the curriculum insured that the fledgling commanders and staff officers were prepared for the 2-million-man force fielded in France. General Marshall and his contemporaries attribute their success in battle to the preparation they received at Leavenworth. The common methodology and thoroughness applied to problems created a competent core of officers who could communicate and get things done.

Today's officer corps will find this history interesting and be amazed at how we are still trying to improve the applicatory method by new definitions such as performance training and experiential learning.

Colonel C. A. Mitchell
USAARMS

PRISONER AT WAR: THE SURVIVAL OF COMMANDER RICHARD A. STRATTON by Scott Blakey. Anchor Press/Doubleday, Garden City, New York, 1978. 397 pages. $10.00

Every now and then a book comes along that can stand on its own in more than one area. *Prisoner At War* is such a book and as a history (both personal and social) it has few peers. Its psychology and philosphy are very clearly woven in, yet the book remains totally engrossing reading and cannot be put down midway through.

On 5 January 1967, Lieutenant Commander Stratton took off from the *USS Ticonderoga* in an *A-4E,* bound for targets in North Vietnam. Precisely 2,551 days later he boarded another aircraft for his repatriation flight to the United States. The things which were done to him during that period, and his struggle to survive them, form the meat of this book.

Prisoner At War also contains the contemporary events that bore on the outcome of the war and on the physical and mental well-being of Stratton's family. All of these are handled in a professional, accurate, and objective manner. Though the author's political views may differ from Stratton's or the reader's, they are suppressed and his compassion for the suffering of the prisoners comes through without syrupy sympathy. Further, he avoids the almost irresistible urge to indulge in polemics when covering the actions of the antiwar groups.

Blakey's book is absolutely first rate. It can be unreservedly recommended and should be on the "must read" list for any military man.

Captain Arthur B. Alphin
Rice University
Houston, Tex.

WAR AND SOCIETY IN EUROPE 1618-1648 by J. V. Polisensky. Cambridge University Press. 1978. 261 pages. $22.50

Since the end of the second World War, historians and members of other disciplines have been trying to place the various European Wars into context with each other. That is, the wars were not independent events in history but were and are interrelated. One of the most important earlier wars was the 17th century Thirty Years War. Although the conflict was fought over the face of Europe, some have called it the German Civil War since the fighting centered on the German countryside. The treaty of Westphalia concluded the conflict recognizing the sovereign states of Holland and Switzerland. In terms of importance to the military profession, the conflict gave rise to the concept of the standing professional army. At the same time, looting became a legitimate and recognized method of paying the standing armies.

Since the Thirty Years War involved many small kingdoms, many of the records, memories, etc. of the conflict have been stored in the estates of the dukes, etc. and are inaccessible to the historians of the modern era. As a result of the Soviet domination of Central Europe in the latter days of World War II, these estates have been turned over to the state. It is these sources, the author, a professor of history at Charles University in Prague, uses as the focus of his work.

The book centers on the historian's attempt to examine the social, political, and economic dimensions of the conflict in light of material in the Czech archives. The author begins with the problem of examining the sources of the war. He then moves on to the various models of the causes of the conflict and of interpreting the conflict. This is followed by a review of the various phases of the conflict from the view of the historian confronting the problem, particularly in terms of sources.

The book is tersely written primarily for the research oriented historian. This rather narrow audience and the high cost puts it on the list of books to read at the library. The book is of rather limited value to the general military reader unless, of course, the individual has an interest in the Thirty Years War, however, the book was interesting in that it gives one some insight into the historian's work or what might lie behind a single paragraph in a history text.

Captain Albert F. Leister Jr.
Department of Behavioral Sciences & Leadership
USMA

THE FREEMAN JOURNAL: THE INFANTRY IN THE SIOUX CAMPAIGN OF 1876 edited by George A. Schneider. Presidio Press, San Rafael, California, 1977. 104 pages, $15.00.

Captain Henry B. Freeman, as an officer in the 7th Infantry, participated in the Little Big Horn Campaign. His diary, kept during this campaign, is currently in the William Robertson Coe Collection at Yale University. Mr. Schneider dusted it off, edited portions not directly related to the Little Big Horn, and had it published in limited edition.

Needless to say, its scope is quite limited, and though portions of it are interesting reading, it will appeal to the dedicated historian doing detailed research into the Little Big Horn. Further, the introduction by John M. Carroll contains notes on the journal from another rabid Custerphile. In the introduction's own words, these notes "... are not revealing and are nothing much more than bits of common knowledge tinged with a bit of bias. . ."

Unlike other works from Custerphiles, however, this book is at least intellectually honest. It will be worth the time of those dedicated souls who are doing in-depth research on the Little Big Horn. Purchase of it can hardly be recommended to others.

Captain Arthur B. Alphin
Rice University
Houston, Tex.

RECOGNITION QUIZ ANSWERS

1) **BRITISH AFV 434** light repair and recovery vehicle. (Photo courtesy of British 1st Division PAO)

2) **BRITISH CHIEFTAIN** main battle tank. (U.K. Ministry of Defense photo.)

3) **U.S. M-48A5.** (Note modified commander's cupola. Photo courtesy CPT George E. Raymond.)

4) **U.S. M-48A5.** Note neight of turret and cupola. Photo courtesy of CPT George E. Raymond.)

5) **U.S. *Hawk.*** antiaircraft missiles on transporter.

6) **U.S. A-10.** (Note engines aft of wing on each side of fuselage.)

ARMOR *Magazine*

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Views Through the Visor

Would you believe that there is still some question about who may write for ARMOR. Once again, anyone of any rank and any nationality may be one of our authors. Last year General Kerwin and SP-4 Pingston had articles in the same magazine. The next issue has articles by MG Patton and PFC Dupuy. We also had two females write for us in 1978, an author and a book reviewer.

There are reports of censorship for ARMOR coming from the field. Some articles are submitted after authors depart particular units because the prospective authors feel the articles couldn't pass the unit censor. Some of the articles were never accepted at ARMOR either, but the thought is disturbing. Once again, these pages are yours. They provide an open forum for professional discussion. We do not allow verbal attacks on individuals or units. There are rules for screening certain articles, and there is common sense. If articles are in fact being stopped somewhere along the line, please discontinue that practice. There are enough potholes in the path of progress without adding additional barriers.

Other authors have stated that they are waiting for an influential friend to submit their articles for them because they think the article would be more favorably considered. NOT SO! No one has had an article printed due to another's influence. Yes, some have tried to use others, but I assure you that no general officer has attempted to influence the pages of ARMOR.

For an article to be considered for publication it should be typed double-spaced on paper as close to 8½ x 11 inches as possible, and it should have one-inch margins all around, and you don't have to submit photographs and drawings. Feature articles should be no more than 3,000 to 3,500 words. For the Departments, word length varies. Use past issues as guides for Professional Thoughts, Book Reviews, etc.

Journals funded by the government do not pay authors. We are in that category. For the last time, the Armor Association neither funds, pays authors, nor influences ARMOR. It does send each author five copies of the issue his article appears in and provides a one-year free subscription. Book reviewers get one additional copy of the issue their review appears in. There is NO other payment.

What about payment to ARMOR for publication? You pay the cost of postage from your location to ours. That is all. To infer anything else is libelous.

What does all this mean? It means that we want to receive articles from all of you. You all have something worthwhile to say and the Armor Community should be privy to your thoughts. Not all will be published, but Private Jones stands as much chance of being published as General Jones, so come on now, write for ARMOR, your professional journal.

MAV

Coming in ARMOR

"FIGHTING VEHICLE SYSTEMS"

The XM-2 Infantry Fighting Vehicle and the XM-3 Cavalry Fighting Vehicle will provide the mobile armor-protected fighting capability for a fully effective Combined Arms Team. One article will highlight the features of these vehicles. A companion article will cover the turret and armament in detail.

"COMBINED ARMS"

Major Michael Andrews explores the Combined Arms concept. He suggests establishing organic Combined Arms teams at the company level to make the concept work better.

"DEADLINE AND THE BOTTOM LINE"

The problem of controlling repair parts funds without reducing the operational readiness of a unit becomes more difficult as budgets become tighter. First Lieutenant John Midgley suggests establishing and maintaining a funds control system that will insure the availability of high-priority items.

"PRELUDE TO DISASTER"

Eric Grove examines the Soviet Union's pre-World War II armored force.

"RESERVE COMPONENT ARMOR TRAINING"

Captain Samuel T. Conn talks about reserve component Armor training and discusses some special problems.

"SOME THOUGHTS ON CAVALRY"

Major General George S. Patton looks at the role of Cavalry in the Combined Arms Team.

ARMOR

may-june 1979

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COVER

The infantry and cavalry fighting vehicles now undergoing operational testing in prototype configuration, have the agility, speed, and the elusiveness of lightweights, but can mix it up with the heavyweights when they have to. Articles and pictures appear on pages 30 through 38.

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the Magazine of Mobile Warfare

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Managing Editor
ROYCE R. TAYLOR, JR.

Assistant Editor
W. RICHARD MORRIS

Art Director
KAREN W. RANDALL

Administrative Assistant
JEANNIE BRIGHT

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LETTERS

Thoughts on Armor

Dear Sir.

I came across some things that I think would be interesting to your readers.

The West Germans felt the *Leopard 1* needed more armor, so the engineers made a shield going around the turret and the gun mantle. The shield is mounted on rubber shock absorbers. The idea is to cause HE projectiles to detonate before penetrating. The hull also has a heavy screen of like material for the same purpose.

The Soviets have also been adding a new ranging system on the older *T-54/T-55*. The new container with its laser rangefinder has been mounted above the barrel of the main gun. It looks like the type we had on the *XM-803*

The Canadians are buying the six-wheeled *Piranha* ICV from the Swiss company, Mowag. They are putting the British *Scorpion* 76-mm gun turret on these vehicles for greater firepower. Speaking of standardization of NATO ammunition, I would like to see MICVs mount a standard 76-mm gun because the new 25-mm cannon will lack firepower, just as the cal. 50 did in its time, against any new Russian MICV since the Russians now have a sample of the Chobham Armor, which I feel they will mount on their new MICVs and tanks.

The idea of using the 25-mm gun for air defense is highly questionable, for without some type of radar the chances of hitting any airplane are not too high. The only thing the 25-mm would do is make the crew feel better about being able to fire at the plane whether it was hit or not. The only answer is to add more air defense to each division.

One idea I had to decrease the Army personnel shortage in wartime would be to let personnel with prior service train with a Regular Army unit 2 weeks each year overseas. These persons could keep their equipment at home and be ready for mobilization. The idea of getting to train overseas would bring a lot of men with 3 years service back into the Army. The Swiss have something like this in their Army for men up to age 50.

One wonders why the Army's new experimental tank doesn't use a 76-mm gun like the British light tank for ammunition standardization or at least be able to fire this round.

I also still worry about the shot trap in the design of the *XM-1* tank—the flat surface leading to the driver's periscope and the area below the main gun when it is raised. And, since the turret does not meet the hull as in other tanks, a smaller caliber round hitting in this area could cause the turret to be locked in position.

GLENN BROWN
Attica, Michigan, 48412

New Fighting Vehicle

Dear Sir:

Mr. Ogorkiewicz's article on the future of armored vehicles, in the November-December 1978 issue, offers a logical and persuasive argument for the development of a hybrid armor-infantry fighting vehicle.

Despite the overwhelming evidence favoring such development, however, Mr. Ogorkiewicz rather illogically refutes his arguments and hastily concludes that this multipurpose vehicle would be an unsatisfactory compromise. I heartily disagree.

- The mechanized infantryman fights mounted and dismounted. In fighting mounted, he requires the same protection afforded to his carrier as afforded to a tank.
- The modern tank and the mechanized infantry squad have a need for and employ similar weapons systems.

The logical progression of this argument leads us to propose a new fighting vehicle that has the following characteristics:

- Protection equal to that afforded a main battle tank.
- A variety of weapons systems including, as a minimum, a turret mounted 90-120-mm main gun, a coaxial MG, a cupola mounted heavy MG, a turret mounted ATGM, and side and rear firing ports for infantrymen.
- High degree of cross country and highway mobility.
- Space for the 4-5 man tank crew/gun team, and space for the integral 5-7 man rifle squad.
- NBC considerations, communications considerations, maintenance/logistic considerations.

The development of such a hybrid vehicle is the most dynamic opportunity afforded to the combined arms concept on the modern battlefield. All sorts of other logical conclusions branch out. Among them:

- Combining the traditionally separate mechanized infantry and armor into a single proponency; branch, schooling, MOS to come under armor.
- Refined tactical concepts of the armor-infantry in mechanized combat.
- Retaining light infantry in its traditional non-mechanized role as airborne, ranger, or air assault forces.
- A need for experimentation to determine the optimal mix of infantrymen per combat vehicle.

I believe it is possible to design an armored fighting vehicle that serves multiple purposes. This vehicle will not be too heavy nor too large—yet it could afford protection, firepower, and mobility. The trend has already begun with the Soviet *BMP*, the Israeli *Chariot*, and to some extent with the German *Marder*. We must begin from the treads up, not attempt to modify present designs which could be disastrous.

WILLIAM G. CHADICK
Captain, Infantry
Burlington, Vermont 05401

T-80

Dear Sirs:

I would like to know if *Armor* magazine will soon publish information and drawings of the Soviet *T-80* tank? This tank was mentioned recently in *Army Reserve* magazine and the *International Defense Review*. The *T-80* was said to be more streamlined than the *T-72*, had a "squatting" suspension system to obtain an even lower silhouette, and had triple layer armor. It was said to be equipped with what could be a laser designator or an optical countermeasures device. The armament was said to be the same 125-mm gun as used in the *T-72*, and appears to use the same automatic loader. Will this tank be deployed? Is the horsepower-to-tonnage ratio the same as the *T-72* or has it been increased to follow our trend? Could an even further increase in barrel length and caliber be expected in the future?

JAMES TRELA
Amherst, Mass.

We all would like to know. *MAV*

Master Gunner's Corner

During the past year, there have been an excessive number of administrative, academic, and unit-related problems that have adversely affected the Master Gunner Program.

Although these problems fall into broad categories, they are interrelated and have, in some instances, generated complaints from unit commanders about ineffective master gunners.

The administrative problems, including financial matters, are encountered at the student company and include the following items.

Leave. Students fail to obtain authority for post-course leave before departing their unit. Leave authority in the form of a DA Form 31 is especially important during the Christmas holiday period.

Hold baggage. Orders assigning the service member to the Master Gunner Course must authorize the student to ship manuals issued during the course to his home station at government expense or must provide an additional weight allowance for personal baggage.

Bachelor Enlisted Quarters (BEQ). Upon reporting to the Student Detachment, U.S. Army NCO Academy (Building 1479, Eisenhower Avenue), the student is allowed to choose to be billeted at the student detachment or in a BEQ. If the BEQ is selected, the student must pay for his room in advance for the remainder of the month in which he reports and at the end of each succeeding month. This creates a financial burden because reimbursement for the $4-per-day room fee cannot be made until the student returns to his parent unit. On the other hand, there is no fee for student detachment billets.

Separate rations. Students who select BEQ billets are placed on separate rations and must pay for all meals. Again, this becomes a financial burden because reimbursement for rations cannot be made until the student returns to his unit. Students billeted at the student detachment remain on rations and use the detachment's dining facility.

Check-to-unit pay option. Students who have chosen to have their pay checks sent to their unit must realize that their pay may be seriously delayed while they are attending the Master Gunner Course. This is caused by the fact that the parent unit must redirect the service member's pay check to him through the finance center at his home station.

Transportation to and from classes. Government transportation is not available between classes and the student detachment or BEQ. Therefore, students may want to use their privately-owned vehicles while at Fort Knox. If they choose to do so, the POV must be registered on post through the student detachment TAC NCO during inprocessing. It is recommended that the student have documents showing proof of ownership, state registration, and liability insurance in his possession when he reports for inprocessing.

Academic problems relating to assigned class projects that arise during the course involve documents and data concerning the student's parent unit that he must have with him.

Before leaving his parent unit, the student should have the following information and documents in his possession:

- The most recent after-action report for his unit's level I and II tank gunnery.
- The operational status of vehicles within his unit and the date of arrival of each *M-60* series tank.
- Information concerning the unit's level of proficiency and the skill level of each NCO and crewman.
- The student should know the strength of his unit and the number of tank crew positions that are filled. Other unit strength data that is mandatory for the student to have includes crew stabilization information, DEROS, ETS, and incoming arrival dates of all CMF 19 and 45 personnel.

Other academic problems that are being encountered in the Master Gunner Course appear to be directly related to the intellectual ability and job experience of the personnel being selected for the course. This has become remarkably apparent when a sharp decline in individual and class academic averages occurred with the advent of self-paced instruction for the turret maintenance segment of the course and with the revamping of the gunnery instruction. In the academic area, most problems seem to evolve from the failure of unit commanders to strictly apply the prerequisites for attendance at the Master Gunner's Course when selecting master gunner candidates. Both the student and the parent unit suffer when a candidate who fails to meet the prerequisites is selected. The student may feel that the unit is unconcerned about his career development by placing him in a situation where he may fail to meet specific standards, and the unit suffers by not having their very best tankers become master gunners.

Since there may be some misunderstanding of the prerequisites, they are listed below with brief explanatory remarks where appropriate. The master gunner candidate must:

- Have a minimum of 2 years service as a tank commander. This means service on the type of vehicle for which the student is to receive master gunner training. For example, if the student is to attend the *M-60A1/M-60A3 course he should have had experience on the M-48, M-60, M-60A1, or M-60A3 series tanks.*
- Have passed the Tank Crew Qualification Course (TCQC) within the preceding 24 months. Again, the vehicle requirement for this item is the same as above.
- Be a "true" volunteer.
- Be hand-picked by the battalion commander. This responsibility should rest with the commander alone. The advice and recommendations of his staff and company commanders should be solicited, but the final selection is the battalion commander's absolute prerogative and responsibility.
- Possess a SECRET security clearance. This must be verified by a statement in the student's travel orders.
- Have a retention period of at least 2 years in the unit after completing the course. Although this is self-explanatory, it should be noted that some commanders are failing to enforce this prerequisite.

By encouraging the strict application of the course prerequisites and by informing the master gunner candidate of how to avoid administrative pitfalls, we hope to minimize the problems and hardships the student may encounter while attending the Master Gunner's Course. By doing so, we provide his parent unit with a graduate who is a *Master* Gunner in every sense if the word.

ROBERT C. SILVA, JR.
Sergeant First Class
Senior Instructor
Master Gunner Branch

THE COMMANDER'S HATCH

MG Thomas P. Lynch
Commandant
U.S. Army Armor School

Eight months ago we began a conscious effort to improve communications between active Army and Reserve Component units, and the Armor Center. Our purpose was twofold; to keep you in touch with what is new, and to get from you the feedback essential in optimizing the development of armor doctrine, training materials, weapon systems, and trained armor personnel. In the course of those eight months we have hosted update conferences and gunnery workshops here at Fort Knox, visited 44 Armor/Cavalry/Air Cavalry battalion size units in USAREUR, FORSCOM and Eighth Army, 31 National Guard and Reserve battalions in 18 states, and furnished range certification and planning assistance to 13 training facilities. That is over one-half of the armor force worldwide! Your support and cooperation in this effort has been terrific, and I appreciate the time and effort each individual and unit has given.

The problems that have surfaced, questions asked, and issues which have been better defined have already caused major revisions and changes. Some of the other actions are completed and are being evaluated, some are being worked on, and others are being investigated in more detail. It is my plan to update you on the details of the major projects in subsequent issues of ARMOR. For the remainder of this article I will summarize the results of our efforts in Active and Reserve Component units.

First, on the positive side:

• The overall attention and effort being given to training and improving combat readiness is at the highest point it has been in the last 15-20 years.

• There is excellent thought and planning going into gunnery programs. Good use is being made of the Master Gunner.

• As a result of the SQT program, the state of individual soldier knowledge is being taken seriously and is improving.

• The new equipment and doctrinal conversion programs have gone fairly well: *M-240* machine gun, *M-60A1* Rise Passive, *M-88A1,* and cavalry conversions.

• There is great awareness by most in looking ahead to determine range and training requirements associated with new equipment and doctrine.

• Graduates of the redesigned, system-specific Armor Officer Basic Course for new lieutenants and Basic Armor Training program for new enlisted men are demonstrating their increased ability to perform effectively upon assignment.

• The enthusiasm, resourcefulness, and professionalism demonstrated by Reserve Component units is widely acclaimed by each team as they report back with their observations and feedback.

Now for some problem areas:

• We are beginning to talk more about standardization of gunnery and tactical training; but, in fact, each unit is still training pretty much the way the commander on the ground wants to train.

• There is a surprising lack of written training regulations and SOP's. Those in existence are outdated in most cases and are not in tune with either the available resources or training time. Battalion and company size units are spending far too much time floundering to even begin to develop programs, especially with inadequate guidance from higher headquarters.

• Collective (unit) training is weak. Although battalion level ARTEPs are being conducted, platoon and company ARTEPs are very sporadic and the preparation time being spent for any of the above is minimal. Seldom is combat support, combat service support and the live fire portion of the ARTEP played properly. In many cases Training and Evaluation Outlines are being altered until they have no resemblance to the ARTEP. This includes simulating elements of the Combined Arms Team.

• Local and major training area facilities are decreasing. Money, ammunition, and repair parts are being reduced. There is probably no way to change this, but to compensate, small unit leaders must be much more innovative in their use of available training devices and alternate training methods. Few units have even approached their capability in these areas. Most small unit leaders do not know what devices are available, how to obtain them, or how to use them if on hand.

• There is a real knowledge deficiency in our middle level NCO's. The NCOES is at fault as well as unit command programs designed to increase their knowledge.

• Track and turret mechanics are perceived as unable to troubleshoot and use test equipment as required. Unit OJT programs are inadequate to convert the apprentice into a creditable mechanic. Maintenance supervisors are in short supply and poorly trained.

• Low density MOS's within the battalion are in short supply and often arrive unable to do the job for which assigned.

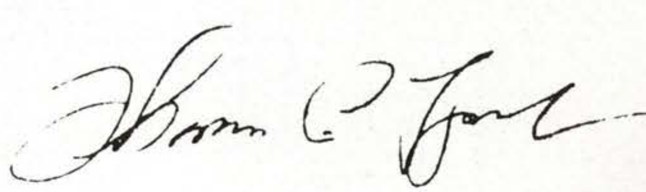
• Less than 50 percent of the new 19E's (Gunner/Loaders) and the 19F's (drivers) are being properly assigned. The result is that the increased training provided in Basic Armor Training is being forgotten instead of being reinforced. Flexibility in assignment was officially permitted for the first year; however, that period has ended.

• Resource planning is weak. Ammunition forecasting, requisitioning PLL support packages for new equipment, identification of the myriad product improvements with their accompanying Technical Manuals, and the budgeting/distribution of funds has not been researched, learned, and properly accomplished. All levels in the chain-of-command can improve this situation.

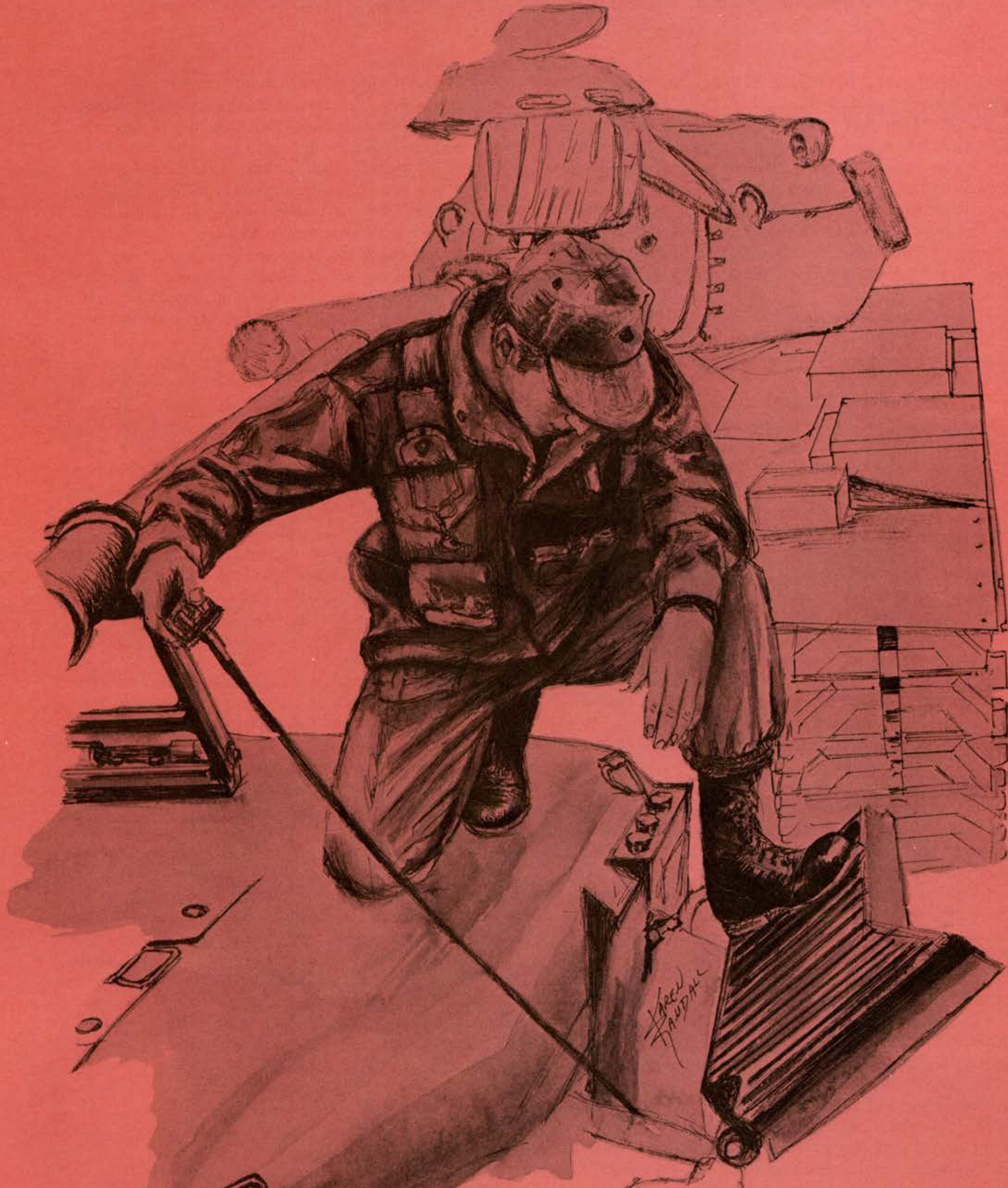
All of the above result in an inadequate amount of time being available to train and maintain the force. This is not new, but we can do better. It is a joint effort. From your comments and our tests I have my staff working hard on establishing the correct standards, writing the proper overall doctrine, judiciously testing new equipment, and turning out as combat ready a graduate as time and money will permit. As stated earlier, we will go into specifics on what is being done in later articles.

At this time I solicit your help—in whatever job you may have—to think on your situation, take a fresh look, drink in a swig of Armor *esprit* and do what you can to make the Combined Arms Team better.

Again, thank you for your help. To paraphrase a familiar passage, we at the Home of Armor are determined to "change those things which can be changed, accept those which cannot, and through your assistance be able to know the difference." *Forge the Thunderbolt!*



Deadline and Bottom Line



by First Lieutenant John J. Midgley, Jr.

Every unit commander and motor officer understands the importance of high standards of material readiness—it's a problem that's given daily command emphasis. Maybe that's why most put priority for controlling repair parts funds just behind training troops to use short swords. Unfortunately, the days of casually ignoring unit-level expenses for repair parts seem to be over. As resource limitations tighten, company level leaders will become increasingly responsible for reconciling the conflict between immediate operational readiness and tight Class IX budgets. This tradeoff need not be difficult, but it requires more supervision and control than current policies provide.

PLL Problems

The Prescribed Load List (PLL) system established in AR 710-2 is—and must be—designed to work in a wartime environment, where funds are not a unit-level consideration. Several features of the PLL system that would be vital in wartime make controlling expenses during peacetime very difficult.

First among these is the implicit assumption that all requisitions will be passed as soon as a requirement is identified. The only unit-level priority setting formally established by regulation is the system of issue priority designators (IPD)—and a part requested on IPD 03 costs no more than the same part on IPD 13. As a unit-level fund control measure, the IPD system is not too useful, because it does not provide guidance on what to order when funds are limited.

A second shortcoming is the lack of some standard document for logging expenses. Ledgers are certainly essential in controlling expenses, but since the PLL system is designed to support deployed units to which cost information is superfluous, AR 710-2 provides no guidance on establishing a ledger.

If these obstacles are not enough to deter a unit from programming Class IX outlays, most units develop PLL "indicators" which encourage uncontrolled spending. Two of the most counterproductive "indicators" are the percentage of zero-balance lines and the percentage of high-priority requisitions. Zero balance is not a good indicator of PLL control, since the unit cannot influence the time required to fill zero-balance requisitions. Emphasis on the zero-balance statistic encourages units to bloat the PLL with low-demand lines which represent a needless committment of funds. Retention of these items as seasonal is easy to justify, and a large PLL is less affected by a few more zero-balance lines. Perhaps even more damaging is the high-priority percentage statistic, which purports to restrain the number of high priority requisitons entering the system. In reality, emphasis on this statistic encourages the unit to pass large numbers of requisitions (which may or may not improve operational readiness) since most high priority requirements such as NORS (not operational ready-supply) requests and PLL zero balance occur unpredictably. The problem with these indicators, then, is that they are set against an illusory backdrop of unlimited funds.

Control Measures

A variety of control techniques are available to the unit motor officer attempting to program his maintenance outlays. One technique is tallying up expenses at the end of each month and simply requesting additional funds whenever the budget is exceeded. This is non-control—simple dependence on the largesse of higher headquarters. No matter how exact the record of expenses, without some plan to control the outlays, the ledger will become the log of a financial disaster. Although reserve funds from higher headquarters may be available, use of these resources should signal a real emergency, not normal operations.

Another technique is to assign one platoon or one type vehicle a fund priority during each month. This technique is hazardous for several reasons. First, if the system is actually enforced, vehicle availability will drop, since all vehicles do not have similar access to available repair parts funds. Second, the system is very hard to operate, particularly during quarterly services, gunnery, and other periods requiring extensive maintenance. Finally operator maintenance drops off (and morale with it) since platoon sergeants and vehicle commanders know they are not "the priority" during some periods.

Many other techniques have probably been devised; however, any "open-ended" technique is probably bound to fail, since the binding constraint of a budget ceiling is not recognized.

Another Approach

What is needed is a technique for controlling repair parts funds while maintaining the operational readiness of the unit. The technique outlined here was developed in an armored cavalry troop, equipped with *M-114, M-113* and *M-551* tracked vehicles and assorted wheeled vehicles. This unit used non-DLOGS manual procedures—with adaptations to local SOP's it should be usable by other units.

Some groundwork is essential before real fund control is attempted. If the unit is not already using it, quarterly rather than monthly Class IX budgeting should be performed. With a quarterly budget, the unit motor officer can plan services, make allowances for expensive gunneries, and be more responsive to the maintainence needs of his unit. Small monthly budgets with large reserves held by higher headquarters discourage planning and virtually force the units to rely on outside help rather than in-house discipline.

A second prerequisite is the ledger or log of expenses discussed earlier. The 3d Squadron, 3d Armored Cavalry Regiment was able to use a log developed by the S-4 section for this purpose. As a minimum, the log must provide the following information: document number; AMDF price of each request; total amounts requisitioned, received and due-in; amount of any cancellations or turn-in credit; and the balance of uncommited funds. This log must be maintained by the PLL clerk for every requisition placed. Although the ledger sounds tedious to establish and operate, once it is set up and the PLL clerk is properly trained (and equipped with a battery-powered calculator) the ledger adds very little to the clerk's workload.

The final key prerequisite is thoroughly briefed leaders. If the motor sergeant, platoon leaders, platoon sergeants, and vehicle commanders do not understand the program, it will never get started. The leaders must understand that fund limitations place heavier burdens on all elements of the maintenance team, and that operator preventive maintainence remains the key ingredient. No fund control system can work when crews are requisitioning headlight assemblies rather than light bulbs!

Setting Up

With the prerequisites met, operation of a fund control system is simple and efficient. Although the system can be implemented at any time, it's simple to start at the beginning of a fiscal year. That is the system discussed here. The first step is to review the document register and price all open requisitions. This total must be subtracted from whatever quarterly allowance the unit operates with, since the items will be received against the current quarter funds. Whatever balance remains after this procedure is the quarterly planning figure the unit must use. This system is designed for an environment where billing occurs on receipt, rather than on requisition.

The motor officer next divides this balance into monthly planning figures which, if met, would provide a surplus at the end of the quarter. For example, if the quarterly budget was $25,000, the monthly figure might be $7,000, allowing a quarterly surplus of $4,000.

Armed with these figures, the motor officer next assembles platoon leaders and sergeants, the motor sergeant, and other key personnel, and explains that some new rules will govern repair parts requests. Specifically, three categories of parts requests will be used:

- *NORS/ANORS Requests.* These requests immediately affect the operational readiness of the unit. They will be passed immediately, and use of the unit's *highest* IPD is authorized.
- *PLL Requests*. Zero balance items can seriously affect the operational readiness of the unit. These requests will be passed immediately, and use of the unit's second highest IPD is authorized. PLL stock replenishment will also be passed immediately, using the unit's *routine* IPD.
- *All Other Requests.* The key to successful fund control rests with these requisitions. Very simply, routine requests will not be passed unless funds are available. To insure that available funds are distributed equitably, the motor officer establishes a lack-of-funds file. As requests for parts are made, the PLL clerk prepares a request for issue. He places these requests in the lack-of-funds file in Julian date order as each request is received,and annotates the DA Form 2408-14 with the pencil entry "Lack of Funds" and the date the requisition was filed.

As the system begins to operate, the unit will spend allocated funds immediately on all NORS/ANORS items and PLL requests. All other requests will remain on file until the end of the month. Then, the motor officer must evaluate his spending. If the unit has spent less than his monthly planning figure, he instructs the PLL clerk to begin requisitioning parts from the lack-of-funds file in chronological order until the monthly figure is met. If the dollar value of NORS/ANORS and PLL requests exceeds his monthly planning figure, no requisitions are passed from the file and the motor officer faces two choices. He can either absorb his excess spending from the quarterly surplus he allowed or, if the excess spending is very great, he may need to request additional funds. At the end of the quarter, the motor officer simply passes requisitions from the file until the quarterly balance is reached.

This system is fairly simple to establish and operate, but units establishing this sort of fund control should be aware of potential problem areas.

- The PLL clerk must operate the ledger with the same dedication he uses on the document register. Careless, forgotten, or irregular entries can cause unpleasant surprises.
- The method outlined here will send the percentage of high-priority requisitions sky high (at least early in each month). To reconcile this problem, show your inspector the lack-of-funds file for the period he is concerned with, and recompute the percentage using the requests for binocular brackets, seat cushions, etc., that the unit would have passed were funds available.
- This procedure may distort demand history somewhat, since no Form 3318 can be kept on items in the lack-of-funds file.

Results

No one wants to buy an untested system. Without some form of results, its unlikely that anyone would try a system that only balances a budget. However, in an armored cavalry troop using the system outlined here, the maintenance section was able to complete the first quarter of fiscal year 1979 substantially below the quarterly allocation provided, with operational readiness on a level with other units spending well in excess of their allocations. During the test period (October-December 1978), the unit participated in gunnery and two troop-level FTX's.

There will never be a substitute for a top-flight motor sergeant, expert mechanics, and PLL clerks, or supervised operator maintainence; but, with some special attention, the conflict *between deadline* and *bottom line* need not be too painful.

1LT JOHN J. MIDGLEY, JR was commissioned in Armor upon graduation from the U.S.M.A. in 1976. He attended the Armor Officer Basic Course and the Infantry Officer Advanced Course. Lt. Midgley is presently assigned as Adjutant, 3d Sqdn, 3d ACR, Ft. Bliss, Tex.

An Organization for

COMBINED ARMS

BY Major Michael A. Andrews

The well-wrought Combined Arms Team concept remains an ineffectual vision. The lessons of history, undisputed theoretical rationale, and the consensus of progressive military thinkers continue to go unheeded. The U.S. Army does not organize and train as a Combined Arms Team. As though in juxtaposition to that condition, the sophistication of future war and an unprecedented Soviet threat loom as ominous spectres.

Throughout history, the necessity of Combined Arms integration has been repeatedly proven and it is now universally accepted. But progressive contemporary military thinkers have not adequately influenced the combat developments community concerning the need for U.S. Forces to organize and train as Combined Arms Teams prior to the onset of hostilities. Theoretical rationale has focused on *why* a Combined Arms Team is necessary, but very few practical accomplishments are evident regarding *how* to implement an effective Combined Arms task organization.

Progress has been further impeded by branch parochialism and vested interests. General Starry discussed this problem in his article, "Combined Arms," in the September-October 1978 issue of *ARMOR*.

> Instead of listening intelligently to one another, we are divided into two or three strident camps . . . All draw . . . examples . . . from the Yom Kippur War. Listening carefully, one wonders if . . . . there were several wars or just one . . . . Every one of us who has successfully commanded a unit of tanks, mechanized infantry, cavalry, or attack helicopters is an expert at how those units should be organized, equipped, and employed. Unable to put aside . . . personal experience and embrace a broader Combined Arms Team perspective, we debate endlessly.

Accordingly, the system by which U.S. Forces attain Combined Arms organizations in order to capitalize upon the synergistic effect of combining various weapons systems continues to be excruciatingly slow and cumbersome. Cross-attachments are directed with preparation of operation plans. Resulting organizations are *ad hoc,* tremendously handicapped by lack of familiarity with personnel, equipment, and operating procedures. Consider, for example, a recent USACGSC scenario:

A heavy division consisting of tank and mechanized infantry battalions is directed to participate in combat operations. Brigade commanders allocate assets to battalion task force commanders after analysis of the METT factors—mission, enemy, terrain/weather, and troops available. A task force is a *temporary* combination of tank companies, mechanized infantry companies, and support units. The process invariably begins by establishing whether the task force headquarters will be that of a tank or a mechanized infantry battalion. The hypothetical brigade consists of three pure mechanized infantry battalions and one pure tank battalion. Organization for combat theoretically follows a detailed staff analysis that includes thorough evaluation of terrain and enemy, perhaps utilizing a quantitative appropriation of combat power allocations. The organization of two battalions is changed as follows:

ORGANIC ORGANIZATION

1-178 Mech (3 mech co)	1-4 Armor (3 tank co)

TASK ORGANIZATION

TF 1-78 Mech	TF 1-4 Armor
1-78 Mech (-) (2 mech co)	1-4 Armor (-) (2 tank co)
A/1-4 Armor (1 tank co)	A/1-78 Mech (1 mech co)

But captains fight the battle, and at task force level, a similar analysis of METT factors results in further task organizing into company-sized teams. The reorganization continues, as indicated below:

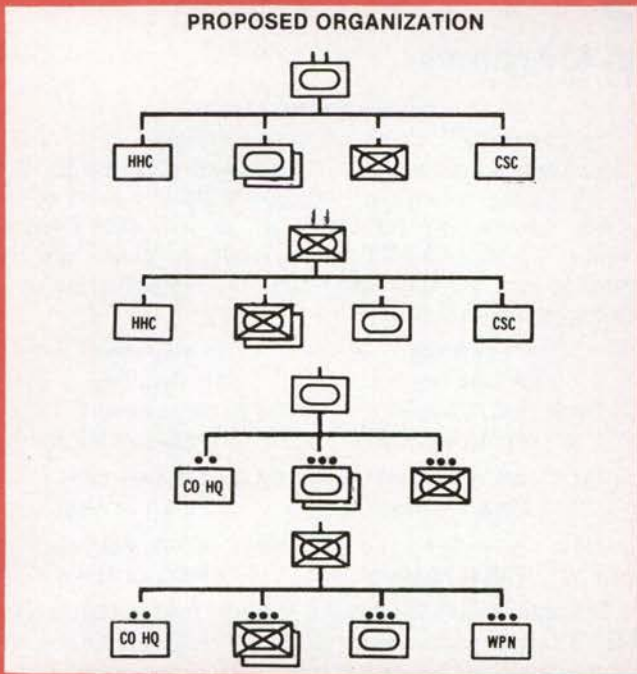
TF-1-78 Mech TM Task Org		TF 1-4 Armor TM Task Org	
TM B	B/1-78 Mech	TM B	B/1-4 Armor
	Plt/A/1-4 Armor		Plt/A/1-78 Mech
TM C	C/1-78 Mech (-)	TM C	C/1-4 Armor (-)
	Plt/A/1-4 Armor		Plt/A/1-78 Mech
TM A	A/1-4 Armor (-)	TM A	A/1-78 Mech (-)
	Plt/C/1-78 Mech		Plt/C/1-4 Armor

The commander, TM B, TF 1-78 Mech, further analyzes the METT factors relative to his sector and continues the process by cross attaching his platoon level assets, perhaps dividing the attached tank platoon into a heavy and a light section to support two mechanized infantry platoons. Likewise, the commander, TM B, TF 1-4 Armor, conducts his analysis and continues the process, perhaps by integrating attached mechanized infantry squads and TOW sections, or attaching *Dragon* teams to units weighted for key missions.

This hypothetical scenario is obviously an oversimplification. Numerous combinations are possible, depending upon the proverbial situation and the personality of each commander. Support units were not addressed. The point is that only after such exhaustive and time consuming paperwork are the two team captains organized to fight—and then only theoretically. In a subsequent C&GSC elective course, as if an afterthought, students are asked to identify coordination and support considerations when one unit is attached to another. The following considerations were included:

- Exchange of SOPs.
- Exchange of CEOIs.
- Terrain orientation.
- Personnel introductions.
- Redistribution of equipment.
- Procurement/allocation of unique CSS requirements—POL, ammo.
- Reconnaissance, and the selection and preparation of fighting positions to accommodate integration of assigned weapons.
- Explanation of new commander's expectations, methodology, techniques, and philosophy.

But even those considerations are superficial when one considers what actually happens on the ground. Possibly before cross attachments assume their positions; probably before they understand their organization, mission, and operating procedures; and almost certainly before they are capable of effectively functioning as a team, the fight in their sector will be over. Our present system for organizing for combat is like asking a football coach to play one all-or-nothing game that has already started, *before* the first day of practice.



The team commanders haven't had the opportunity to train their personnel as a team. They don't know the players and the players don't know each other. The Infantrymen don't understand the capabilities and limitations of tanks. Tankers have not trained while supported by *Dragons* and TOWs, or integrated into a mechanized infantry platoon. Both have undoubtedly been trained and schooled amid a curiously self-defeating, unprofessional environment fostering branch parochialism to the point of sophomoric condemnation and ridicule. There is no Combined Arms Team—to suggest otherwise is rhetoric.

Accentuating that condition are astronomical technological advancements impacting upon the state of military art. Future wars may be resolved in hours, in a science-fiction type environment. Time may not be available for a staff study analysis of how to organize. An awesome Soviet threat is already apparent. The Soviets' buildup in Western Europe and their accumulation of weapons systems is well known. Our overall defense may eventually absorb an offensive, but frontline soldiers should expect a massive onslaught, the intensity of which has never been experienced by the American Armed Forces.

The U.S. has adopted an Active Defense concept in order to fight outnumbered and win. It incorporates a strong covering force defending well forward, and highly mobile main battle area units that maneuver laterally to achieve depth by concentrating at the decisive time and place. Sophisticated weapons systems will be employed. Ongoing studies involving support and control of this future battle include division restructuring and Tactical Operations Support System automation efforts.

But *captains fight the battle,* and frontline soldiers should regard support from rear-based systems as undependable luxuries. The fight will be highly mobile. Unprecedented command, control, and communications will be required. Success depends most upon application of the principle of *decentralization.*

The long overdue solution is to establish an organic Combined Arms Team at company level. Companies in all heavy divisions should be Combined Arms Teams. Mechanized infantry companies should contain one organic tank platoon. Armor companies should have one organic mechanized infantry platoon. Company commanders must be capable of integrating both systems. Technology is obscuring any differentiation between mechanized infantry and armor. Branch parochialism is a self-defeating anachronism for a maneuver unit in modern war. The rapidity and intensity of the next war will require unprecedented combat officer technical expertise in a variety of sophisticated weapons systems for which Armor or Infantry labels are irrelevant. Pure organizations accommodate administrative and basic training requirements, but do not facilitate tactical operations. Combined Arms Team organizations are essential. Further cross attachments could, of course, still be incorporated in operation plans to obtain heavier ratios of infantry or armor, if needed. Artillery, air defense, engineer, and supporting arms would also be integrated as needed. But the basis should be an organic, permanent, mechanized infantry-armor combination. The proposed organizations depicted at left.

The nature of the covering force battle envisioned after World War II is similar to that anticipated throughout the Active Defense area today. Flexible maneuverability by Combined Arms Teams is required. Almost thirty years ago, the progressive solution was the organic Combined Arms Team that became Armored Cavalry. The rationale for its Combined Arms organization after the advent of mechanization should be applied to today's Active Defense concept. Firepower and sustainability should be decentralized to the frontline captain. For years Armored Cavalry lieutenants and captains have led Combined Arms Teams and successfully negotiated the administrative, training, and support requirements that are the inevitable counterarguments to this proposal. Infantrymen and tankers can be gathered at company or battalion level to accomplish their idiosyncratic requirements. Combat service support modifications are negligible when one considers the ratios of tank and mechanized infantry are really unchanged at brigade level. But the unit is now organized and trained as a team to fight—its *raison d'etat*—and not to accommodate administrative and organizational considerations.

The Combined Arms Team concept remains a vision. Many of the decisions regarding optimum overall combinations are difficult, and situation-dependent. But the core required of heavy division units is clear. Let's close ranks and think not as mechanized infantrymen or as tankers, but as Combined Arms officers. Let's reorganize the heavy division with emphasis not only on rear-based support systems, but at the frontline, with the captain—where the fighting's done!

MAJOR MICHAEL A. ANDREWS was commissioned in Infantry from the USMA in 1967. He has commanded Infantry and Armor units and served as an operations officer at battalion through division level. He received a branch transfer to Armor in 1972. He received a Masters in Education degree from Duke University and is a graduate of the C&GSC.

Communication Aids

By Major Robert E. Harry

The ability to transmit geographical locations quickly, accurately, and securely to the correct addressee is essential to the command and control of any unit—whether it be during combat, an ARTEP, or an FTX.

For many years, we have shackled a six-digit coordinate, transmitted it, and waited while the addressee deciphered our shackle and checked his work and our work by posting the position on his map. And too often, we have been asked to confirm our location because the coordinates we sent would not plot correctly in relation to other units.

The point I make is that it takes too long for a commander to tell his units where to position themselves or the units to inform the commander of their location.

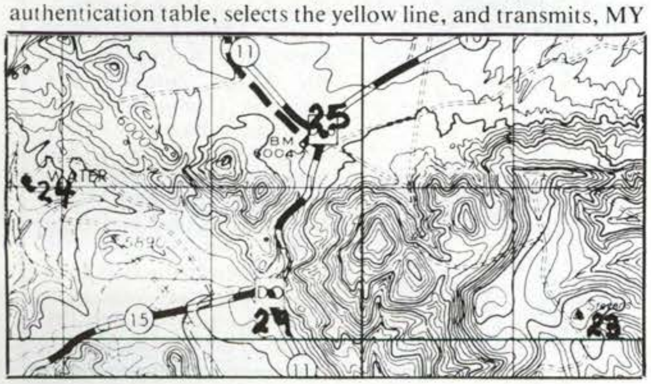
In 1963, ARMOR published an article describing a check point, or terrain indexing, system in which all maps being used by a unit at a given time were marked with common numbers indicating easily recognizable terrain features (figure 1). The system was quick and accurate, but it was not secure and eventually its use was prohibited for transmitting friendly locations and activities.

Now the system has been tied into the authentication tables with a color code, making it not only quick and accurate but also very secure—as was demonstrated last year during an ARTEP of 1-77 Armor at Fort Carson. Army Security Agency personnel monitoring the battalion's communications were unable to obtain a single element's location or break the system.

Basically, the system involves marking four lines of each day's authentication table with different colors. For example, today's table would be marked with an orange stripe over line PAPA, green over line GOLF, brown over line WHISKEY, and BLUE over line DELTA. Tomorrow, the same colors might be used but drawn over lines QUEBEC, ROMEO, LIMA, and X-RAY. Or the colors as well as the lines may be changed daily, (figure 1).

Battalion communication personnel are responsible for marking all authentication tables before they are issued—a task that required only about 1½ hours. This insures that a unit leader or anyone else who draws authentication tables, gets a finished product covering the period his unit is expected to be on an operation.

This is how the system works. When a unit commander's CO calls and asks for his location, he simply notes his location on the indexed map (for example he is at point 23), looks at his authentication table, selects the yellow line, and transmits, MY POSITION IS YELLOW YANKEE ROMEO. His commander looks at his authentication table, checks the yellow line, and quickly sees that YANKEE ROMEO is 23, and immediatly knows his subordinate's location is at or near a particular terrain feature. The platoon leader could also transmit, YELLOW YANKEE ROMEO EAST ONE POINT FIVE NORTH TWO, if that is his actual position.



SAMPLE TABLE

		0	1	2	3	4	5	6	7	8	9
	A	VDFJ	AUF	IHC	EL	XW	YNO	GT	QK	PS	RB
RED	B	CIFN	WKV	BDQ	ES	RH	YOJ	XL	AT	UG	PM
	C	QSXJ	OFY	OGD	RT	UA	VIN	KH	EM	WP	LB
	J	PCWX	RQF	JVM	OY	HS	EGD	BN	KT	UA	IL
GREEN	K	CQPK	ABN	TDJ	MX	IH	NUR	GB	OL	YE	VF
	L	BWRF	JPC	QON	AV	HG	IML	DU	SK	YX	ET
	P	PAFT	NSD	DGR	QM	WX	HKI	OE	YJ	UB	LV
YELLOW	Q	SNGD	JTP	WYI	CR	BE	UOV	MX	FH	QK	LA
	R	AMRH	NJD	QUY	SE	IO	KDL	PV	XC	WB	FT
	W	ASLW	VED	IRO	GE	CT	MXA	HS	MN	JQ	KU
ORANGE	X	DLTV	NEQ	PAS	XB	OC	MHJ	KW	RF	IG	YU
	Y	XSIC	YEP	NPW	HE	KL	JAR	VO	QD	TM	BU

SAMPLE TABLE

Figure 1

Two things are required to use this system. Both parties must have:

- The terrain indexed map.
- A current, color-coded authentication table.

This method is extremely quick compared to the standard shackle code, and it should be obvious why ASA was not able to glean any intelligence information from the transmissions.

Additionally, we found that the system also aided terrain navigation. During administrative periods in the field—such as tank gunnery—saying only, "I am at checkpoint 59," told everyone on the net your location and progress. It is amazing how fast everyone learns to associate the numbering system with the terrain. Very quickly you know that hill is 92, or that road intersection is 19.

If your headquarters takes a dim view of marking authentication tables with colored ink, then merely designate the color code in the operations order by stating that the orange line is the TANGO line, etc. It is not so quick, but just as effective.

Another problem facing all who use radio communication is that of contacting an individual or station whose call sign and frequency is not familiar.

Most of us, after fighting through a pocket-sized CEOI to find a call sign while bouncing around in a tank, APC, or jeep have devised some sort of "cheat sheet" by writing down fre-

DATE ____________

BATTALION	
FREQ	
CDR	
S-3	
S-2	
XO	
S-4	
S-1	
BMO	
ARTY	
ENGR	
ADA	
ALO	
NCS	
COMMO	
S-3 AIR	
SPT PLT	
HHC CDR	

TM A	A5P	TM B		TM I		TM C	
FREQ	48.25	FREQ		FREQ		FREQ	
CDR	P52	CDR		CDR		CDR	
XO	P73	XO		XO		XO	
1ST PLT	M2R56	1ST PLT		1ST PLT		1ST PLT	
2D PLT	K1F56	2D PLT		2D PLT		2D PLT	
3D PLT	F7Z56	3D PLT		3D PLT		3D PLT	
1SG		1SG		1SG		1SG	

CSC		BDE		SPARES		OTHER	
CDR		FREQ		BLACK		DRIVER	
FREQ		CDR		YELLOW		RTO	
SCOUTS		S-3		GOLD			
FREQ		XO		SILVER			
MORTAR		S-4		S-4			
FREQ		S-1					
GSR							
FREQ							
REDEYE PLT							
FREQ							
HQ TANK SEC							
AVLB							

NOTES:

(1) Colors under the heading SPARES stand for:
BLACK: Battalion spare frequency
YELLOW: Battalion Admin-Log Net
GOLD: Battalion GSR Frequency (per CEOI)—also used as Bn Intel Net when necessary.
SILVER: Battalion Redeye Platoon Net (per CEOI)

(2) The driver/RTP call sign is entered per CEOI under OTHER, i.e. today's driver is TANGO. Tomorrow he may be KILO.

(3) Entries for Team A are an example of how the form is used.

"Go Black" or "Go Silver" usually is out before jammers can cut in and allows two parties to rapidly switch nets, pass traffic and then return to command frequency.

quently called units' frequencies on a card. Or we have indexed a CEOI, only to have it issued to someone else for the next operation.

One solution is a template similar to that shown above. Although it is configured for use in an armored battalion, it could be used by any type of unit with only limited modification.

During the year I served as S-3, 1-77 Armor, I participated in numerous field exercises and used the template. I never once had to refer to the CEOI for call signs and frequencies.

The advantages of using this type of template follow.

- It can be locally produced by your Division Training Aids Department.
- It is available to radio operators at a much lower level than those to which CEOI's are normally issued.
- Information is presented in a more concise and organized manner.
- It is faster to use than a CEOI.
- Being quickly erasable, it is more secure than a CEOI in the event of capture.
- Because it is easier to handle, it allows quicker responses on all nets.
- It is reusable time after time.
- It is waterproof, provided it isn't filled out with a water-soluble marker.
- It can be mounted on the dash of a jeep, hatch of a tank or APC, or the plexiglass of a helicopter.
- Day or night use is facilitated.
- Training in its use is simpler than for a CEOI.
- It can be produced in the required numbers before deployment to the field.
- Change can be made quickly at the daily hour of frequency change by simply replacing one sheet with another.
- It can be tailored for your organization.
- It is easy to read.
- Task organization down to platoon level can be posted.
- The template assists in working through EW.

The template is not designed to replace the CEOI but to condense voluminous information into a presentable and workable format and make it available to those who need it. If you decide to try one your next time in the field, I guarantee you will never go back to the "gyp sheet" you are using.

MAJ ROBERT E. HARRY was commissioned in 1967 as a Distinguished Military graduate from Murray State University. A graduate of the Armor, Infantry and Military Intelligence Advanced Courses and Rotary Wing Flight School, he has served with cavalry units, a Special Forces group, and has staff experience from brigade to division level. He is assigned as the Deputy of the Exercise and Evaluation Division, G-3, 4th Inf Div (Mech), Fort Carson, Colo.

Reserve Component Armor Training

by Captain Samuel T. Conn III, USAR

For those readers who have worked so diligently to assist the Reserve Component (RC) tank battalions, this will come as nothing new. For those who haven't, these are some of the problem areas I find as a RC tank company commander.

Clearly, the first major impact on training is the available training time. Without the flexibility of a full-time schedule, we are limited to 1 weekend each month and 2 weeks in the summer to obtain relatively the same end product as our Active Component counterparts. However, the time *actually* spent in training is usually much less. For example, a given training weekend might consist of firing a "roll-up" Table V. Beginning at 0800 on Saturday, and with final formation on Sunday at 1700, my time would be broken down as follows:

0730-0800:	**Officer/NCO briefing.**
0800-0900:	**Formation, issue of required equipment, and preparations for the 1-hour trip to Fort Riley.**
0900-1000:	**Enroute to the training area.**
1000-1030:	**Drawing tanks from the unit training equipment site (UTES), maintenance, communication checks, etc; *if* I have had the luxury of a limited advance detachment.**
1030-1130:	**Movement to the range.**
1130-1230:	**Ammunition breakdown, uploading, safety briefing, final instructions. (Lunch is considered concurrent training.) *Note:* Half of Saturday is already shot.**
1230-1900:	**Table VA roll-up, assuming no "Check Fires" are imposed.**
1900-2000:	**Preparation of range cards, searchlight zero, preparation for night phase (supper is concurrent training).**
2000-0100:	**Table VB roll-up.**
0100-0130:	**Minimum essential post-firing maintenance.**
0130-0600:	**Administrative break.**
0600-0800:	**Armament after operations maintenance.**
0800-0900:	**Movement of tanks back to UTES.**
0900-1400:	**Maintenance, washing tanks, and all other items necessary to complete turn-in of equipment.**

Add 2 hours for target detail, 1 hour for range police, time spent for ammunition residue turn-in, downtime for broken odds and ends, travel back to home station, turn-in and accountability of unit equipment, and all of the sundry extra time consumers, and the weekend has dwindled to only about 12 hours of hard tank gunnery training.

I don't mean to imply that some of the related missions are not required, or are not meant to teach my crews, but it's amazing how fast *real* time passes into *other* time. In discussing the above, I've neglected to mention many items that were accomplished before my troops arrived. Some of these included drawing ammunition from the ammunition supply point; hauling it to the range, where it had remained under guard the previous night; drawing the range; emplacing the first order of targets; and doing as much as possible in advance, to allow maximum time for training, *not* in getting ready for training.

The burden of predrill preparation usually falls upon the limited number of full-time Guard technicians and the handful of volunteers who might be there to help. This help is often without pay, with the men working only for retirement points due to funding constraints.

The second critical impact is that imposed by our strength. My company is authorized 5 officers and 82 enlisted men. The roster shows 3 officers and 46 enlisted. By the skin of our teeth, we can crew seven of the 14 tanks we are authorized. My own crew includes an E-7, who is also a full-time technician, as the loader; the company supply sergeant as the driver; and our gunner generally covers for the rest of us when we must be other places.

Since the end of the Vietnam era and the draft, *strength* has been the most detrimental factor to the *training mission* in the Reserve Components. All of the normal jobs must still be accomplished, but with roughly half of the authorized strength available to do the work. Most of my NCO's have had experience in other branches, and have had to learn about tanks since a battalion reorganization from Engineer to Armor in 1976. My junior E-5's, SP-4's and PFC's, who have been to the Armor School, have had to orient the TC's and PSG's concerning the basic skills of a tanker. In short, we are somewhat behind the eight ball in numbers and in some of the hard skills. Our battalion does not presently have a master gunner or a school trained turret mechanic, although three are now at school.

This has caused an additional support requirement from our "host" unit, the 2-63 Armor at Fort Riley, Kans. They provided the expertise during our initial training phases after reorganization, and continue to work closely with us in an affiliated status. Had they not been geographically "handy," we would not be as far along as we are. We do enjoy the advantage of high officer qualification and prior service experience.

Other factors that adversely affect training include:

- Lack of sufficient training ammunition due to National Guard funding constraints.
- Insufficient or limited overall funding imposed in part by low strength.
- Civilian job conflicts which preclude having 100 percent of assigned strength on hand during a given drill.
- Lack of sufficient subcaliber devices or ranges at home station, or within a short travel time.
- Rapid turnover in key officer assignments and a limited number of doers, who are E-5 and below.

With these and other challenges to consider, the RC commander must now establish his goals for the many activities scheduled throughout the year. Some of these include:

- Annual Maintenance and Evaluation Team inspection.
- Annual property and fiscal accountability inspection.
- Inactive duty tank gunnery.
- Training toward and achieving 100-percent qualification on Table VIII.
- Individual weapons qualification.
- Synchronization, borescope, and pullover.
- Annual General Inspection.
- Periodic inspections by battalion, brigade, and state headquarters.

With the many limiting factors in our circle, the commander must become an uninhibited innovator, long-range planner, short-range motivator, and a user of *every* source of information and assets he can find. With a reliable chain of command, responsible NCO leadership, and a flow of information from the highest to the last man, we can get around these problems, or shortstop most of the impact before it reaches the troops. In my opinion, the RC commander must do the following to maintain a healthy unit:

- Keep the troops totally informed, not just what they need to know.
- Keep the training vigorous, innovative, and challenging. This builds a reputation for the unit that makes recruiting easier, and retention almost certain.
- Give the men a source of pride through outdoing whatever the competition does.
- Know each man by name (first and last) and what he does for a living. Relate with his personal circumstances, while giving him the tools he needs to do his job with the Guard.
- With ample preliminary training, crosscut the *status quo* and try things new, (REALTRAIN), and adventurous. The troops *will* "fire up."

My unit is composed of three segments of the local population. The first group is mid-American farmers, another third work for a local manufacturing firm, and the other third are local businessmen or other members of the civilian community. At some time or another, most of these men will have legitimate job conflicts or personal crises that will prevent them from attending a regular drill. Equivalent training must then be scheduled for them at some other time. Unfortunately, *equivalent* is often synonymous with *inadequate*. It's impossible to train one or two men in equivalence to what they missed on the range in the tank. This is another challenge for the RC commander as a training manager.

So, to retain the soldier when his enlistment is up, how to train him to be able to perform, pass his SQT, qualify for his tank, get promoted, and still satisfy all the other requirements of time and effort, is a special challenge for the Reserve Components.

The Guard is topheavy and I think rightfully so. Most of our men are prior service NCO's, Vietnam veterans, and men with prior Air Force, Navy, Coast Guard, or Marine service. I have more senior E-5's and E-6's than anything else. This puts the burden on the lower ranks to some extent, but it also tends to promote *esprit de corps* and camaraderie, maybe from a common adversary, or maybe it's the nature of a tank crew, platoon, or company, to work together more than other branches.

Although plans are in the mill to establish 1/35th and 1/60th scaled subcaliber ranges at our armories, it takes more time than we can afford to wait for them. The same applies for the various subcaliber devices. Fort Riley now has the *Brewster* device, using the .22 caliber inbore device with the M-16 rifle, and we are looking forward to using it. *Telfare* devices are on the way, but in very limited quantities, one per tank company. The *Riley* 20-mm inbore device is not available due to modifications or inoperability at this time.

Our battalion was cut back roughly 50 percent in all types and quantities of ammunition we had forecast for this fiscal year, including annual training. We will be able to draw 121 rounds of HEP-TPT and 1,200 rounds of HEAT-TPT for the battalion for the year. I need not even mention the paltry 30 rounds of TPDS-T we get. That will make it tough to satisfy the FORSCOM requirement for annual crew qualification with any preliminary main gun gunnery training. I should add that Troop E, 114th Cavalry's tanks will be drawing from this same ammunition. It is another situation that will require innovation and planning to the smallest detail to get by. We'll make it, because we have to. It *is* another problem, however.

Although our 69th Infantry Brigade (Mech) will receive additional funds through affiliation with the 1st Infantry Division, we have lost other funding because of low strength. It sometimes seems like a juggling act. However, I think the nature of the National Guard has been to get the job done with little, if any, real wealth or assets others would normally expect.

Turnover of key personnel will probably always be with us, as well as the Active Component. It makes it more difficult, but it places the burden back on the lieutenants and sergeants to take up the slack. RC battalions now have to train their potential company commanders from within, because the influx of experienced officers since Vietnam has tapered off. State operated OCS, Reserve Component OCS, and input from ROTC are helping us field quality lieutenants. The Armor School and the NCOES program are giving us NCO leadership and expertise. What we need now are recruits.

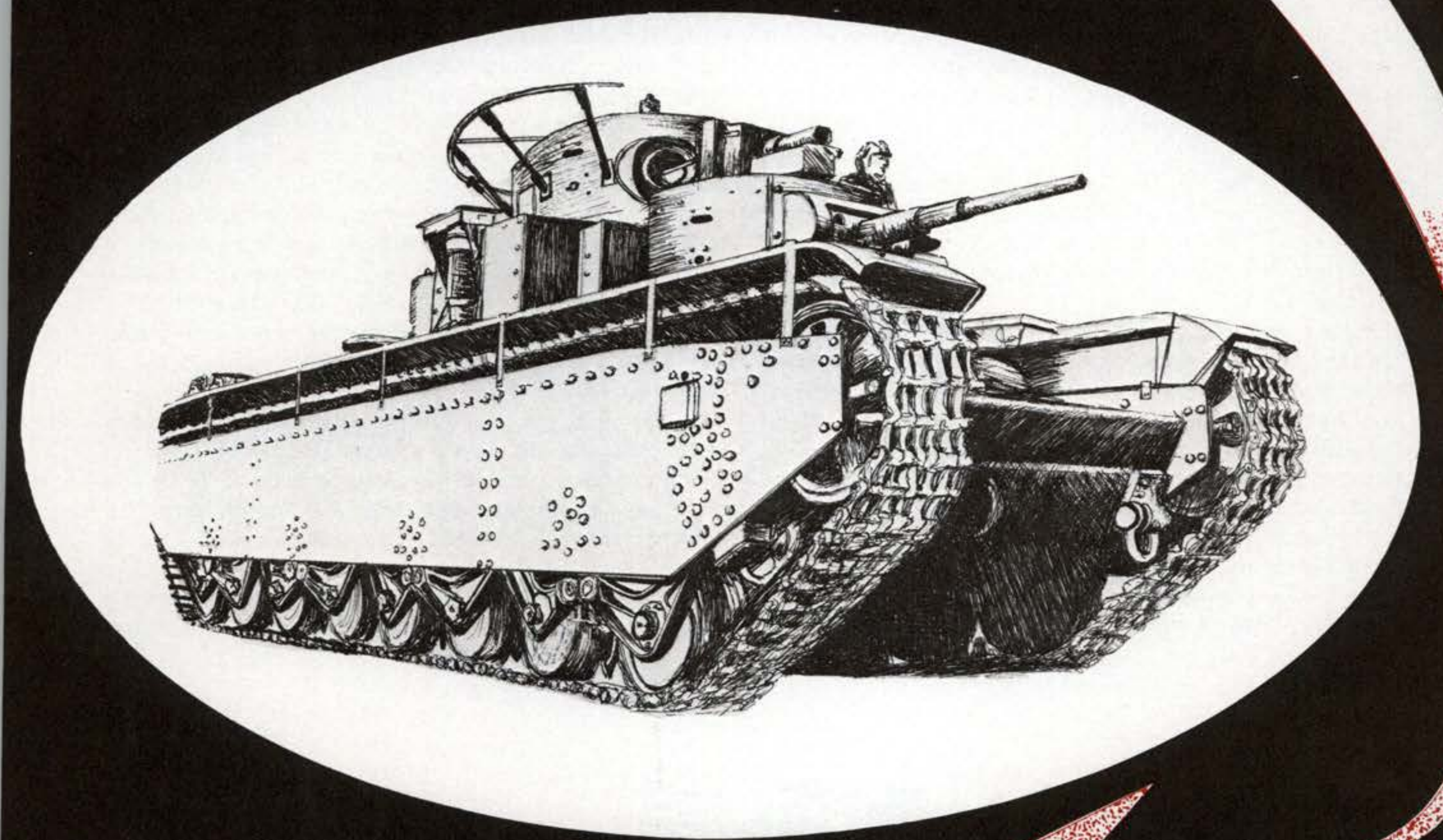
Although I've mentioned our problem areas almost exclusively, I would add that there are many advantages in our approach to the training mission and combat readiness, as well. These are what I enjoy the most, and include:

- Smaller, more closely-knit units. Most members grew up together.
- *Esprit de corps* and an unspoken comradeship.
- Having to do more with less and making it.
- Hearing somebody say "It's OK, they're National Guard," and then proceed to give a lesson in how it's supposed to be done, to the amazement of all.

I have a habit of trying to trade training circulars, letters of instruction, gunnery scenarios, etc., with other tank battalions that I come across. I would welcome the opportunity to do so with the rest of the Armor community.

CPT. SAMUEL T. CONN III was commissioned from Officer Candidate School at Fort Benning, Ga. He attended the Airborne Course, and served in several positions at Hohenfels Training Area, 7th Army Training Center, USAREUR. He is currently employed as an operations and training specialist with the 1-635 Armor, KanARNG and is the commander of Co. A, 1-635 Armor.

Prelude to Disaster



by Eric J. Grove

In the years before World War II no country appeared more committed to armored warfare than the Soviet Union. In tank production her factories outstripped those of the rest of the world. Between 1931 and 1941 the Soviet tank fleet increased from about 1,000 to perhaps as many as 24,000 vehicles. Under the progressive influence of Marshal M. N. Tukhachevsky, Deputy Defense Commissar and Chief of Ordnance, who was convinced of the danger of a resurgent Germany, new formations and doctrines were worked out for the employment of this proliferating armored force.

Lighter vehicles were supplied to the traditional arms in direct infantry support (neposredstvennoj podderzhki pekhoty (NPP)) battalions and in mechanized regiments attached to cavalry divisions. A typical NPP battalion might deploy 20 *T-26* light tanks and 16 *T-37* amphibious reconnaissance vehicles. Medium and heavy tanks tended to be used in distant infantry support (dal'shei podderzhki pekhoty (DPP)) formations of up to brigade size (128 *T-28* mediums) intended for use under centralized Supreme Command control to assist in breaking through enemy defenses on the major axes of advance. Most important of all, long-range (dal'nego dejstviya (DD)) mechanized brigades were formed to exploit breakthrough deep into the enemy rear. As they developed these brigades deployed 159 fast tanks (bystrokhodnye tanki *(BT)*) in three battalions, a recce battalion of 19 amphibious tanks and 24 armored cars, an artillery battalion, and a motor machine gun battalion. 1932 saw the formation of the first two mechanized corps, each with a *BT* brigade with a *T-26* tank brigade, a motor rifle brigade, an antiaircraft battalion, a flame thrower battalion, and a reconnaissance battalion. Such a corps was a more powerful version of the early German Panzer Division and seven were eventually formed by 1936-37. The corps of that period might deploy three *BT* brigades, a total of almost 500 tanks, together with supporting echelons.

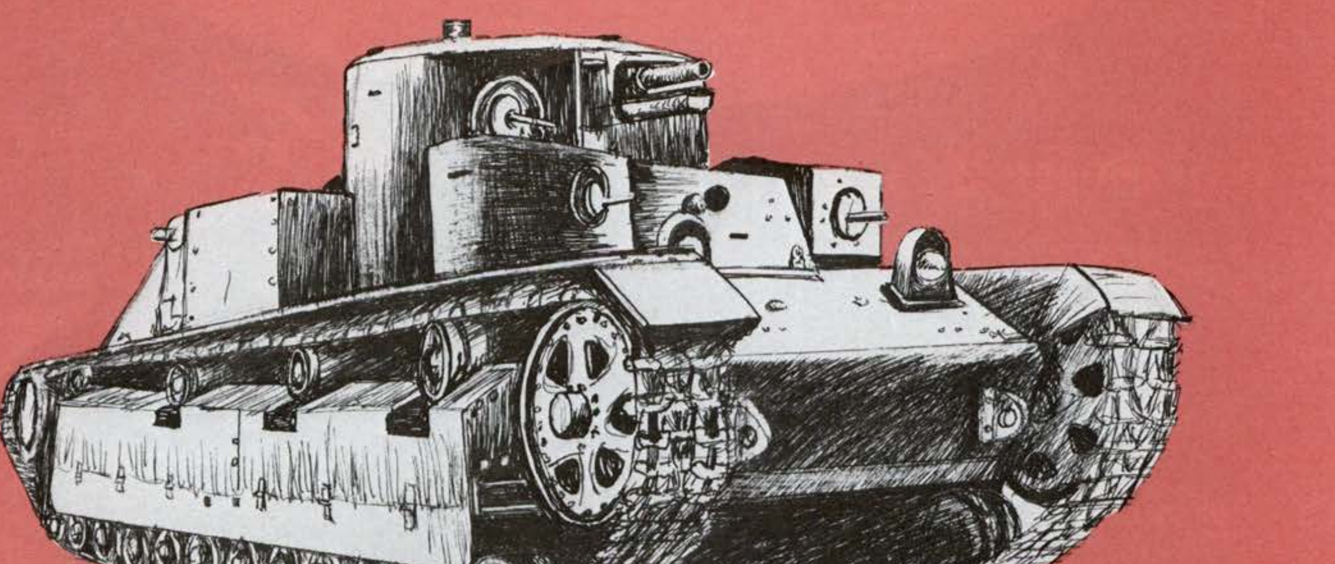
The 10 to 14-ton *BTs*, of various models, were based on the design of the American, J. Walter Christie, two of whose prototypes were purchased in 1931. Given their lack of a technological base, the Russians had to exploit foreign expertise if good tanks were to be produced quickly. Except for the *BT*, British prototypes were usually used for a wide selection of models. These ranged from 2.7-ton *T-27* tankettes through 3.2 to 3.9-ton amphibious *T-37/38* recce tanks, 8.6 to 10.3-ton *T-28* mediums to the huge five-turreted 45-ton *T-35* heavies.

Most Soviet tanks were very heavily armed for their time, often with 45-mm or 76.2-mm main armaments. Indeed, the function of self-propelled artillery was an important part of their role. Production of self-propelled guns or specialized artillery tanks seems to have been kept to a small scale. This emphasis on heavy armament, coupled with a rigid standardization program to increase production and Stalin's policy of "Socialism in One Country," giving almost unlimited national resources to the buildup of Soviet military strength, meant that by the late 1930's the U.S.S.R. had grown to possess an armored force matchless not only in size but in the comprehensive potential of its equipment.

Foreign ideas also played a part in the development of Soviet tank doctrine. Attention was paid to British mechanized theory and practice and benefit gained from the cross-fertilization and developing German concepts at the joint testing establishment at Kazan, from which the increasingly hostile Germans were only ejected in 1934. The PU-36 Provisional Field Service Regulations issued at the end of 1936 spoke of the importance of concentrating mobile forces to achieve a decisive offensive, "followed by a relentless pursuit which can lead to the complete destruction of enemy forces and resources." The cooperation of all arms was exhorted—accompanying infantry were encouraged to ride on tanks—and a Soviet version of Blitzkrieg sketched out in lines such as the following: "Modern technical means of reducing the defensive (above all tanks, artillery, aircraft and mechanized units when used on a mass scale) make it possible to organize a simultaneous attack on the enemy throughout the entire depth of his position, to isolate him, to encircle him completely and finally to destroy him." The issue of this manual followed the 1936 autumn maneuvers when Martel, the British armored expert and protagonist was impressed by the "brilliant leadership" of the Soviet armored troops as well as the quality and reliability of their vehicles used *en masse* over long distances.

Five years later, Soviet armor was being shattered by the German *Barbarossa* offensive. This was spearheaded by a *panzer* force whose deployed strength in tanks was a mere 3,350. The total stockpile of German tanks and assault guns was less than 25 percent that of their opponents. The traditional Soviet passion for secrecy had in one sense, backfired. German planning was based on a Soviet numerical preponderance but not on such a massive scale. Hitler was to say that if he had known of the numbers of Soviet tanks he would never have set *Barbarossa* in motion. Nevertheless the gamble almost came off and the Red Army came within a hair's breadth of defeat. Only the Soviets' apparently inexhaustible supply of men and equipment saved them. Why, after so many years of preparation for modern war and the pouring out of such massive resources on mechanized land forces, had the near collapse occurred?

Despite their apparent quality, all had never been completely well with the Soviet armored forces. The task of pulling a backward nontechnological nation into the forefront of military development was bound to lead to problems. Despite their success, Tukhachevsky was not satisfied with the armored troops' performance in the 1936 maneuvers. The massed formations of tanks had paraded around effectively enough but coordination with artillery and air power had been



poor. The performance of the Mechanized Corps had proved "jerky" and their commanders had not distinguished themselves. Communications had proved inadequate and staff work poor. With time these problems might have been overcome but the political tide now turned terribly and decisively against the Red Army's progressiveness. They had always had their opponents amongst influential conservatives such as the Defense Commissar Marshal Voroshilov, who slowed down the rate of mechanization. Now Stalin himself began to get suspicious of the new military technocrats who were so opposed by his trusted cavalry associates of Civil War days.

In 1937, the blow fell. Tukhachevsky and his followers were liquidated in a purge that decapitated the Red Army. Doctrines of armored warfare became "reactionary and bourgeois." The real operational difficulties which had afflicted the mechanized corps, caused largely by poor communications and inadequately trained personnel, were used as reasons for the gradual abolition of these larger formations.

During 1938, in a restructuring that emphasized the individual tank brigade and battalion, the number of "tank corps," as they were now redesignated, was reduced to four. An even higher corps tank establishment, 560 tanks, only reinforced the old problems as there was no resolve to be branded an ideological traitor by trying to make the formations work. Finally in November 1939 with General D.G. Pavlov as Chief of Armored Troops, the tank corps finally disappeared. Pavlov, the "Russian Guderian," as he was less than aptly styled, had commanded the first Soviet tank unit sent to Spain in 1936. He had returned with the welcome news that modern means of defense had made independent armored operations impossible. Now Pavlov was to preside over the formation of 15 new motorized divisions, each of one tank regiment, two motor rifle regiments, and an artillery regiment. These were intended for the limited cavalry role of exploiting breakthroughs.

Although the new divisions were at first sight flexible formations with over 250 tanks and supporting echelons, given the prevailing doctrinal climate their chances of being used in other than a dispersed NPP role were slim.

Operational experience proved that there was indeed room for considerable improvement in the Red Army's utilization of armor. Although Zhukov's victories in the Far East showed how far a good commander could exploit his restricted armored tools, the occupation of Eastern Poland in September 1939 led to chaos. The mobile forces which included two of the surviving tanks corps, were split up and, as in Czechoslavakia in 1968, logistics broke down. Emergency airlift had to be organized to get fuel to the advanced troops. Such failures were almost welcomed by a high command still seeking arguments against large armored formations. Yet, against the opposition of even smaller groupings, Soviet armor could face difficulties, as the Finns demonstrated only a few months later. In the winter conditions, isolated Soviet formations, including tank brigades, were encircled and annihilated and the thinly armored Russian tanks proved all too vulnerable to the Finns' 37-mm antitank guns. Perhaps as many as 1,600 Soviet tanks were destroyed or captured. Only sheer weight of numbers and firepower told in the end.

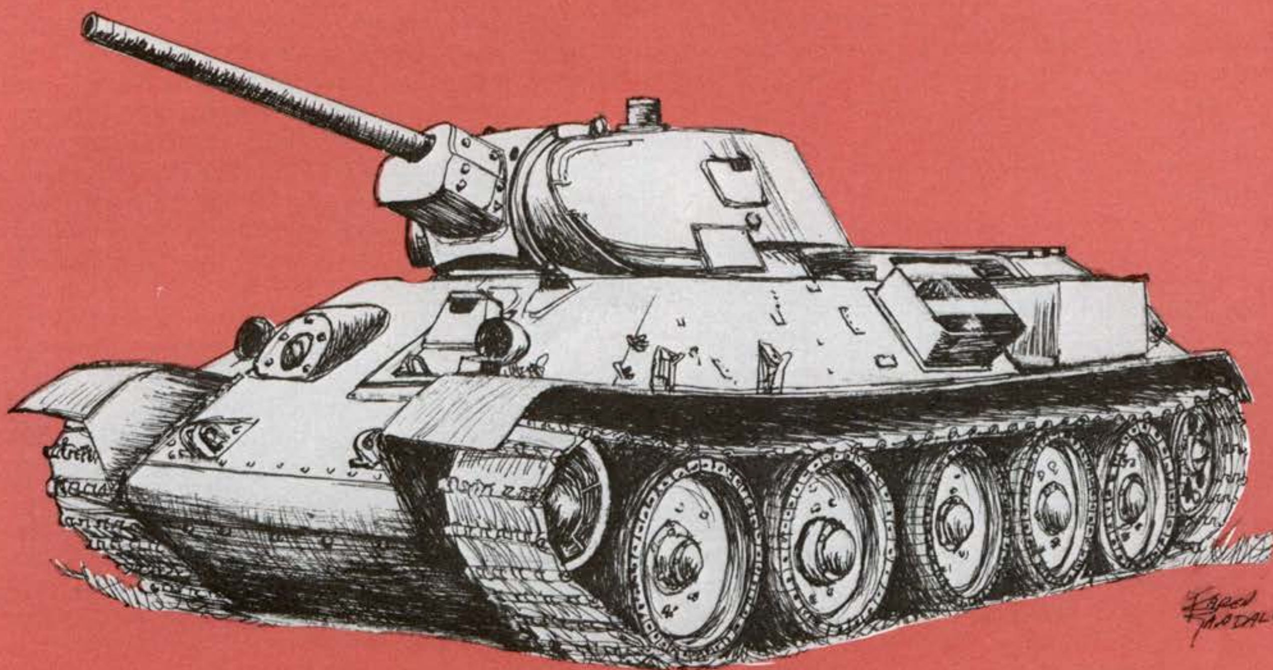
This was too much; something had to be done and from spring 1940 a far reaching policy of reform and reorganization was begun, further stimulated by the German armored victories of the summer. Voroshilov was "kicked upstairs" and replaced by Timoshenko, another old friend of Stalin from the First Cavalry Army, but one who was convinced of the need for change. A new generation of officers was promoted, including those surviving with backgrounds in the armored forces. It became less dangerous to support armored warfare once again, and in the June 1940 issue of the Army newspaper *Red Star* Colonel Rotmistrov was able to publish the radical thought that it was unnecessary for the infantry to have their own NPP tanks. Rather, these vehicles should be reserved for use *en masse* on major strategic tasks. The tide was indeed turning.

It was now decided to restructure Soviet armored forces along German lines. First priority was the creation of mechanized corps in a new massive form. Each formation would contain two entire tank divisions and one of Pavlov's motorized divisions. Each tank division was the size of the old mechanized corps, deploying two tank regiments, a motor rifle regiment, and an artillery regiment—over 400 tanks in all. The motorized division still had a tank regiment of its own and the whole corps would have a total of over 1,000 tanks. Eight corps were ordered to form up in the summer of 1940.

At the special meetings of the Main Military Soviet in December 1940 and January 1941, it was clear that the pendulum had swung back to concepts of decisive victory using mobile forces. Nevertheless, ideas were not specific enough for such as the Commander of 1st Mechanized Corps, Romanenko, who spoke out in favor of two or three mechanized corps with aviation, parachute, and artillery formations being combined into a "Shock Army," such as would be able to emulate the successes of the German Panzergruppen in France. Yeremenko, of 3rd Mechanized Corps, more realistically stressed the need for improvements in coordination and supply.

Yet such matters were the least of the corps commanders' worries. First the corps units had to be assembled and this was not easy. Suitable equipment and manpower was in short supply thanks to the rundown of the armored forces in the time of their disfavor and the incompetence of the Special Commission set up to supervise the acquisition of new equipment. Its members, Marshal Kulik, an ultraconservative artilleryman, and two senior Political Commissars, Schadenkio and Mekhlis, were held in the greatest political favor by Stalin but their military competence was correspondingly low. Production of the old obsolescent tank types was finally halted but that of new models only began at a snail's pace.

The only bright spot in the whole tragic history of Russia's armored forces after 1937 was the activities of her tank designers, who, in great secrecy, carried out a considerable effort over a broad development front. A new generation of light tanks was developed—the 5.5-ton amphibious *T-40* and a 14-ton successor to the *T-26*, the *T-50*. Most important, however, were the new mediums and heavies. Here, reportedly at Stalin's insistence, stress was placed on maximum firepower and protection, coupled with the greatest mobility in all types of terrain. In Leningrad during 1938, Z.Y. Kotin had begun work at the Kirov plant on a new heavy tank to replace the *T-28* and the *T-35*. At first the older vehicles' multiturreted layout was kept in the SMK and *T-100* designs, huge vehicles of almost 60 tons. These were first tested in Finland but eventually, by the end of 1939, a more economical single turreted layout had been selected for mass production in two versions, the 43.5-ton, 76.2-mm armed *KV-1* and the 52-ton,



152-mm armed "artillery tank," *KV-2*. *KV*, rather ironically, stood for Klementi Voroshilov, a long time opponent of armor.

At the Komintern Plant in Kharkov, home of the *BT* series, M. I. Koshkin's bureau had already begun work in 1936 on a better protected, fast medium to replace the Bystrokhodnye tank series. Sloped armor was used to increase protection at minimum weight and the design evolved from the 15.6-ton *BT-IS* through the more thickly armored 20-ton *A-20* and the upgunned *A-30* into the *T-32* and eventually the definitive 26.3-ton 76.2-mm armed *T-34* which was under test by the early spring of 1940. By that time, some of the development tanks had already proved in action in the Far East, although the Germans discounted rumors of new Soviet tanks of high quality.

Neither the *T-34* nor the *KV* were perfect. The former, for example, had a weak transmission, and both required more mechanical attention than contemporary western vehicles, but in general they were undoubtedly the best tanks of their period. Their heavy armament and more than adequate protection (45 mm in *T-34* and 75-110 mm in *KV*) made them superior to any available German tank. Their wide tracks designed for use in snow and mud gave them unrivalled mobility. This was reinforced by the powerful 500-600 h.p. V-2 diesel engine, common to both, which gave a good power to weight ratio and long range. The use of diesel fuel also overcame Soviet shortcomings in both quality and quantity of petrol caused by deficiencies in her refining industry. Ease of production was also a designed-in feature, but due to the chaos of Soviet weapons procurement the new tanks were not rushed into production for the new mechanized corps. Only 114 *T-34s* and 234 *KVs* had been built by the end of 1940—with eight mechanized corps already requiring over 8,000 vehicles, another corps just coming into being, and even more planned!

The corps in the field had to do with older tanks of all shapes and sizes redeployed from the old NPP and DPP units. Despite massive stocks of *T-26s, T-28s,* and *BTs* even these vehicles seem not to have been available in usual form due to the neglect of the recent past. Tanks of any type only began to appear in a vital White Russian sector in April, 1941! Not only tanks, but almost every other item of equipment was absent: ammunition, motor transport, and artillery. Radios, vital for coordinated mobile operations, were still in chronically short supply and usually restricted to commander's vehicles; the aim in 1941 was one for every three tanks. Perhaps most crucial of all was the shortage of trained manpower. The purges had taken their toll of the best tank officers. Training of new tank crews had been neglected. A new armored force was being constructed from scratch with inadequate materials.

At a conference at the highest level in January 1941, the problems of the remechanization of the Red Army led to conflict. Kulik came out strongly in favor of the old-fashioned infantry division. Major General Federenko, the new Chief of Armored Forces Administration, countered with a plan for more new tanks, even at the expense of the artillery which Kulik now claimed would shoot all of Federenko's tanks to pieces! Stalin reproved the officers for lack of a "unity of views," much to the chagrin of Timoshenko, who was being bombarded with requests for more mechanized corps from the Military District Commanders along the Soviet Union's western borders. Although production of the new models now improved, with over 1,000 *T-34s* and almost 400 *KVs* coming off the assembly lines in the first half of 1941, it was still barely enough for one and a half new corps, although it did not stop new ones from being created. By the time the Germans struck in June, there were perhaps as many as 29 mechanized corps in official existence, a grotesquely unrealistic figure which only compounded Soviet problems.

Much had yet to be done to make operational reality match over-ambitious intention. Lack of spares and repair facilities meant that only 27 percent of the Soviet Army's massive tank fleet was fully serviceable. Twenty-nine percent were in need of major repair and 44 percent required medium overhaul. This meant that there were perhaps less than 5,500 operational tanks to be shared among the Soviet formations. There was nothing in the German arsenal to match the latest Soviet tanks whose quality came as a considerable surprise to the attackers. But luckily for the invaders, there were only 967 *T-34s* and 508 *KVs* in service. The vast majority of first line battle tanks were of the older types, but this need not have been a vital Soviet weakness. The new *T-35* heavies were indeed spectacular but useless monsters yet the more numerous 76.2-mm armed *T-28* mediums were good tanks for their time, particularly in later versions up-armored with 80-mm of protection. Even the *T-26s* and *BTs*, which still made up 75 percent of Soviet strength, had more than held their own against the German *PzKpfw I* and *II* during the Spanish Civil War. Captured vehicles had been much in demand by the German tank crews fighting for France.

Unfortunately for the U.S.S.R., as products of an immature technological base, the older Soviet tank models had serious deficiencies in terms of machinery, efficiency, ease of control, and roughness of ride. Increasing age had led to a chronic unreliability and low availability. Poor metallurgy meant that their armor tended to be soft and easily penetrated. Attempts to strengthen it led to brittleness that made matters worse as penetration now caused lethal chunks of hot armor to fly into the tank's interior—the older vehicles were at least "safe" in this respect.

The crucial point was that the Soviet tank models of the 1930s did not have a sufficient margin of technical superiority over the attacking German tank force (especially the 35 and 38-ton *PzKpfw IIIs* and *IVs* that comprised two thirds of its strength) to make up for the lack of skill of their untrained crews. Even in the best circumstances it would have been difficult to match the expertise and experience of the *panzer* crews. But these were not the best circumstances. Tank drivers only had a few hours driving practice, and officers a few months to learn the skills of armored combat. Moreover most senior officers were still imbued with the concepts of dispersed armored support for the traditional arms. It was only after many months of costly fighting that the vital requirement for concentration of armor into really effective tactical units would be learned.

Perhaps for this reason there seems to have been no attempt to group the new Soviet tanks in especially strong units and they were mixed in as stiffeners with the older vehicles. Very few mechanized corps were up to strength in tanks. The more usual complement was around half; some had no tanks at all. Shortages in all fields, from staff officers to radios, remained endemic. What ammunition there was was often of the wrong kind. The past emphasis in infantry support meant that tank gun ammunition stocks remained largely high explosive and not armor piercing, hardly the best situation for fighting *panzer* divisions.

Blitzkrieg was designed to create confusion as a vital factor in its effectiveness. As Red Army tank and motorized divisions left scattered over wide areas attempted to join up in new formations, and were forced to train new personnel on old, worn-out tanks with inadequate supplies of fuel and ammunition, the battle had already been half won for the Germans.

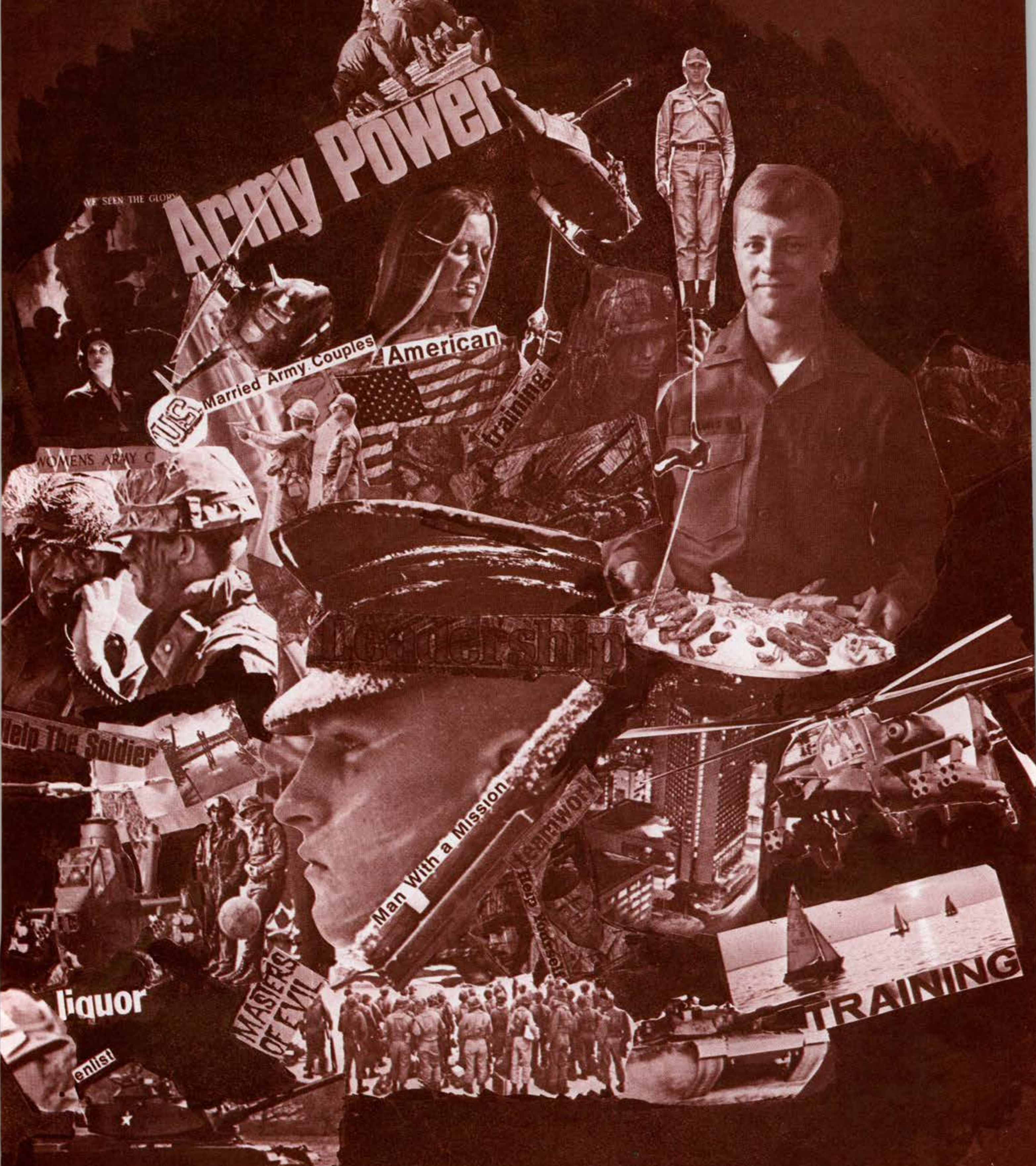
A number of points emerge from this extraordinary tale, two of them which are of particular concern in our age of deterrence when military capabilities are perceived rather than used. The most important is the danger of judging real military strength from a mere analysis of weapon stockpiles. Hardware is only one dimension of military power. The way it is used and organized is equally central, although more difficult to measure without the acid test of actual combat. The second point is the danger of too much secrecy about one's military posture. The Germans were unaware of the size of the Soviet tank park and the quality of its latest equipment. Thus they were led to underestimate their opponent and mount an attack that fuller intelligence might have destroyed. In any event, they had begun a war they could not win, a conflict that cost 20 million dead on one side and the destruction of the nation state on the other.

Another important lesson of the rise and fall of the Soviet tank arm is the fragility of military power in a doctrinaire totalitarian environment where military strategy and posture are subject to the strait jacket of ideology and, perhaps, the dictates of personal paranoia. Such political systems need not necessarily be the stongest in military terms, despite their tendency to spend vast resources on their armed forces.

There is perhaps also a final thought. In the second half of 1941, an apparently strong Soviet Union was humbled by armored forces inferior both in numbers and, to some extent, in technological quality. Better strategy, tactics, oraganization, training and general skill got the *Wehrmacht* to the gates of Moscow and Leningrad and inflicted enormous casualties on the Russians—some reports claim 17,000 Soviet tanks were lost in 1941 alone. The effect on Soviet threat perception for the future must have been enormous. As the Russians look west today, they see a ratio of armored strength not too different in terms of numbers from June 1941, and rather less strong from the Soviet angle in terms of quality. Now the Soviet armored force seems to have the organization and training to match the strength of their impressive tank fleet. This, combined with an aggressive strategic doctrine, creates a potent threat to Europe which must be countered. Yet, when it is asserted that the Soviet Union has more tanks and other forces than required for purely defensive purposes, we ought to bear in mind past Soviet experience. What margin of superiority does a Russian military planner require to feel secure? It might be a very considerable one indeed.

ERIC J. GROVE holds a degree in history from the University of Aberdeen and a master's degree in War Studies from Kings College, London. He is a member of the civilian academic staff, Britannia Royal Navy College, Dartmouth, where he is a senior lecturer in the Department of History. A member of the international Institute for Strategic Studies and Royal United Services Institute for Defense Studies, he has written a number of books notably on the subject of armor.

TRAINEES AND THEIR SOCIAL BACKGROUND



BY CAPTAIN JAMES M. GEORGOULAKIS

Military behavioral scientists, as well as the Army Research Institute for the Behavioral and Social Sciences, are continually attempting to distinguish those individuals who are capable of successfully completing basic training and who will become productive soldiers from those who cannot adapt to military service. The reasons for this continued search are obvious in terms of manpower, finances, and training resources. The literature of this endeavor is replete with research attempting to utilize psychiatrists, psychologists, various types of inventories, and social backgrounds as predictors. This investigation addresses itself to the latter.

The relationship between social factors and military success was examined by Egbert, who administered a 40-hour battery of tests in 1953 to 310 combat infantrymen whom members of the Human Research Unit No. 2 had selected as good or bad combat performers.[1] This selection was based on interviews with soldiers who were chosen from a variety of combat situations, and who described specific instances of their own and others recent combat behavior. The battery included personality questionnaires, interest tests, background and life history inventories, intelligence and aptitude tests, military information tests, attitude tests, projective tests, and other instruments.[2] After reviewing all data, the author concluded that:

- Men who are low in intelligence tend to make poor fighters.
- Fighters were more socially mature and were generally perceived as having greater emotional stability than non-fighters.
- Fighters tended to describe their homelife as harmonious more often than did non-fighters.[3]

In 1958, Ryan[4] explored the relation of performance to social background factors among Army inductees and concluded among other findings that "education alone was the best predictor for most subjects, but in the few cases where a civil criminal record was determined, the chances of Army failure were relatively high."[4] Additional research in this area was conducted by Timmerman in 1974, in an attempt to create a behavioral profile for predicting "problem" soldiers.[5] Variables reflecting background, personality, and intelligence were collected and analyzed on both a *problem soldier* and *non-problem soldier* sample. The author concluded that there were 12 variables of adjustment, background, and intelligence that had a relatively high degree of predictive ability.[6]

In 1977, Worthington[7] studied a number of social factors including age, educational level, employment status, and other family backgrounds of 1,489 successful basic trainees and 75 unsuccessful trainees. In his findings he concluded that:

- Although the unsuccessful group was not appreciably older, it had less education, a higher drop-out rate, fewer single males, and a higher percentage of divorces and multiple marriages.
- There is a significant amount of disruption in family events which, while not tested, would probably exceed normal occurrences in either the total Army enlistee population or that of 19-year-old American males as a whole.[8]

Additional studies examining social backgrounds were conducted by the Navy,[9] [10] [11] and the Air Force.[12] [13] However, with few exceptions, these studies were conducted during conscription. The following study was conducted totally with members of the all-volunteer force.

Fort Knox, Ky. served as the setting for this investigation. At the present time, Fort Knox is the U.S. Army's Armor Center and one of several basic training posts in the U.S. Army.

Sample Studied

The sample studied consisted of 2,500 basic trainees who underwent basic combat training cycles at Fort Knox from 1 June 1976 to 1 June 1978.

Group 1, the *control group,* consisted of 1,000 basic trainees who completed their training without being referred to the staff at the Community Mental Health Activity (CMHA) at Fort Knox for evaluation.

Group 2, the *counseling-adjust-group,* consisted of 500 basic trainees who were referred to the CMHA for evaluation by members of their cadre. These individuals received counseling and were able to complete their training.

Group 3, the *fail-to-adjust-group,* consisted of 500 basic trainees who were referred to the CMHA for evaluation by members of their cadre. These individuals were evaluated by CMHA staff members as experiencing difficulties that were either not amenable to treatment, or beyond the responsibility of CMHA. During the course of their training, these individuals were separated by their commanders for substandard performance.

Group 4, the *recommend-for-discharge-group,* consisted of 500 basic combat trainees who were experiencing difficulties and were referred to CMHA for evaluation by members of their cadre. These individuals were evaluated as manifesting signs of social and emotional maladjustment to the extent that they were recommended for separation from the military by the staff at CMHA. Subsequently, these trainees were separated from the service.

Methodology

The data for group one, the control group, was obtained from 1,200 basic combat trainees who cycled through the Reception Station during February and March 1977.

Data for groups 2, 3, and 4 were obtained by reviewing the closed clinical charts of all basic combat trainees who

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[1]Egbert, Robert L., "Fighter I: An Analysis of Combat Fighters and Non-Combat Fighters," Technical Report 44, (Human Resources Office, Washington, D.C.: The George Washington University Press), Dec. 1957, pp. 3-5.

[2]*Ibid,* p. 4.

[3]*Ibid,* p. 5.

[4]Ryan, Francis J., "The Relation of Performance to Social Background Factors Among Army Inductees," (Washington, D.C.: The Catholic University of America Press), 1958.

[5]Timmerman, F.W.Jr., "Prediction of Enlisted Soldier Discipline Problems in Line Combat Units of the United States Army." *Proceedings,* 1974 Psychology in the Air Force Symposium, USAF Academy, pp. 117-121.

[6]*Ibid,* p. 1201.

[7]Worthington, E.R., "The American Soldier: Those who Make It And Those Who Do Not," Eric Document Reproduction Service, 1977.

[8]*Ibid,* p. 8.

[9]Gunderson, E.K.E., and Arthur, R.O., "Demographic Factors in The Incidence of Mental Illness," *Military Medicine,* 1966, *131,* pp. 429-433.

[10]Plag, J.A. and Goffman, L.M., "The Prediction of Four Year Military Effectiveness from Characteristics of Naval Recruits," *Military Medicine, 1966, 131,* pp. 729-735.

[11]Arthur, R.J., "Success is Predictable," *Military Medicine,* 1971, *136,* pp. 539-545.

[12]Bloom, Wallace, "The Air Force Medical Evaluation Testing Program," Paper presented at the USAF Behavioral Sciences Symposium, USAF Aerospace Medical Center 1966.

[13]Short, L.O., and Stankus, J.C., "The Sympton Checklist: A Brief Questionnaire for Psychological Screening," *Proceedings,* 1974 Psychology in the Air Force Symposium, USAF Academy, pp. 133-136.

were evaluated by staff members from 1 June 1976 to 1 June 1978. During this review, the trainee records were placed in either *counseling-adjust, fail-to-adjust,* or, *recommend-for-discharge* groups. Those trainee records that did not meet the criterion for investigation were disregarded. To have equal group size, the investigator decided to use the group with the smallest number of trainee records as the size for all three groups. The *recommend-for-discharge-group,* consisting of 500 trainee records, was the smallest. Therefore, groups 2 and 3 were randomly reduced to groups of 500 trainee records.

Biographical Data Studied

The data studied consisted of the following variables.

Age	**Social Relations**
	a. Presently has a girlfriend
	b. Plans marriage
Education Level	c. Single
	d. Married
	e. Divorced
Medical History	f. Separated
	g. Unanswered
a. Have used alcohol	h. Remarried
b. Have used drugs	
1. Pot	**Parental Status**
2. Speed	a. Married and together
3. Hallucinogens	b. Separated
4. Prescribed Medication	c. Deceased
	d. Divorced
	e. Unknown
	Number of Siblings in Family
Employment History	a. Under two
	b. Under four
a. Did not have a job	c. Under six
b. Had one job	d. Under eight
c. Had two or more jobs	e. Nine or more
d. Had four or more jobs	f. Unanswered

Description of Statistical Technique

The data supplied by the four groups was tabulated by frequencies. A discriminate analysis technique was employed in the analysis of data for the variables, age and educational level. The other variables were analyzed through the use of the Chi-Square at the .05 level of significance.

Findings

The findings of this investigation are summarized as follows:

- The variable age resulted in an ETA of 0.099 with an explained variance of 0.01, indicating little meaningful relationship existing between the *control group, counseling-adjust-group, recommend-for-discharge-group,* or *fail-to-adjust-group.*
- The variable educational level resulted in an ETA of 0.14 with an explained variance of 0.02, indicating little meaningful relationship existing between the *control group, counseling-adjust-group, recommend-for-discharge-group,* or *fail-to-adjust-group.*
- The *control group* showed a higher rate of alcohol usage than the *counseling-adjust-group, fail-to-adjust-group,* and *recommend-for-discharge-group* combined.
- The *control group* showed a lower rate of drug usage than the *counseling-adjust, fail-to-adjust,* and *recommend discharge-groups* combined.
- The *counseling-adjust-group* showed a lower rate of drug usage than the *fail-to-adjust* and *recommend-for-discharge-groups* combined.
- Among drug users, the *control group* showed a lower rate of speed or hallucinogen use than the *counseling-adjust, fail-to-adjust,* and *recommend-discharge-groups* combined.
- Among drug users, the *counseling-adjust-group* showed a lower rate of speed or hallucinogen use than the *fail-to-adjust* and *recommend-discharge-groups* combined.
- The *control group* showed a higher incidence of previously having had at least one job than the *counseling-adjust, fail-to-adjust-group,* and the *recommend-for-discharge-groups* combined.
- Among those who had held at least one job, the *control group* less often held two or more jobs, or had more job stability than the *counseling-adjust, fail-to-adjust,* or *recommend-for-discharge-groups* combined.
- Of those who held at least two jobs, the *control group* less often held four or more jobs than the *counseling-adjust, fail-to-adjust,* and *recommend-for-discharge-groups* combined.
- Within the *control group,* single soldiers more often had a girl friend than the *counseling-adjust, fail-to-adjust,* and *recommend-for-discharge-groups* combined.
- Among single soldiers, the *fail-to-adjust-group* more often had a girl friend than the *recommend-for-discharge-group.*
- Among single soldiers the *control group* more often had marriage plans than the *counseling-adjust, fail-to-adjust,* and *recommend-for-discharge-groups.*
- Among soldiers having unmarried parents, the parents of the *control group* were less often deceased or divorced than the *counseling-adjust, fail-to-adjust,* and *recommend-for-discharge-groups* combined; and,
- The *control group* came from larger families.

Summary

The results contained in this investigation indicate that there may be some relationship between preservice social backgrounds and the completion of basic combat training at Fort Knox. The commonly held beliefs that the higher the educational level, the lower the incidence of drug usage (alcohol excluded), and an employment history showing having had a job but not many, may have some basis in fact, and are substantiated to a degree by this investigation. However, extreme caution most be utilized in reviewing these findings. While the above mentioned social variables have some validity, it is of an extremely fragile nature, and most certainly does not have the significance whereby one can predict who will or will not complete basic combat training at Fort Knox based on these variables.

CPT JAMES M. GEORGOULAKIS was commissioned in the Medical Services Branch from the Univ. of Alabama in 1971 with a BS. He has since received masters and educational specialists degrees from several universities. He is assigned as the Assistant Chief of Community Mental Health Activity, Fort Knox, Ky.

Morgan's Raid

by Janette J. Raker

Virtually every scenario for the first battle of the next war envisions NATO forces fighting outnumbered in an active defense. Few if any of them address the possibility of employing guerrilla tactics.

Yet history is replete with accounts of the value of successful guerrilla operations—among them General John Hunt Morgan's slashing raid behind Union lines in Kentucky, Ohio, and Indiana during the American Civil War.

As a point of reference, one must understand that a guerrilla force seeks to immobilize and isolate the superior forces of an occupying enemy tactically by means of sudden acts of harassment executed by small bands of men from a main able-bodied force.[1] This is accomplished by, "...surrounding the enemy, and with sudden, unexpected jabs, destroying or taking over his stores, munitions and supplies, cutting his communications, trapping his messengers and ambushing his convoys or lorries, and generally creating a considerable amount of confusion and terror."[2]

A master of guerrilla tactics, General Morgan demonstrated the value of this type of warfare in a three-week campaign during which he disrupted the enemy's lines of communication and forced the mobilization of 120,000 Union militiamen for rear area security.

Morgan's force of 2,460 men was actually too small for undertaking his raid, but in spite of instructions from General Bragg to withdraw after creating a diversion in Kentucky, Morgan continued his march and expanded his operation to the north of the Ohio River.[3]

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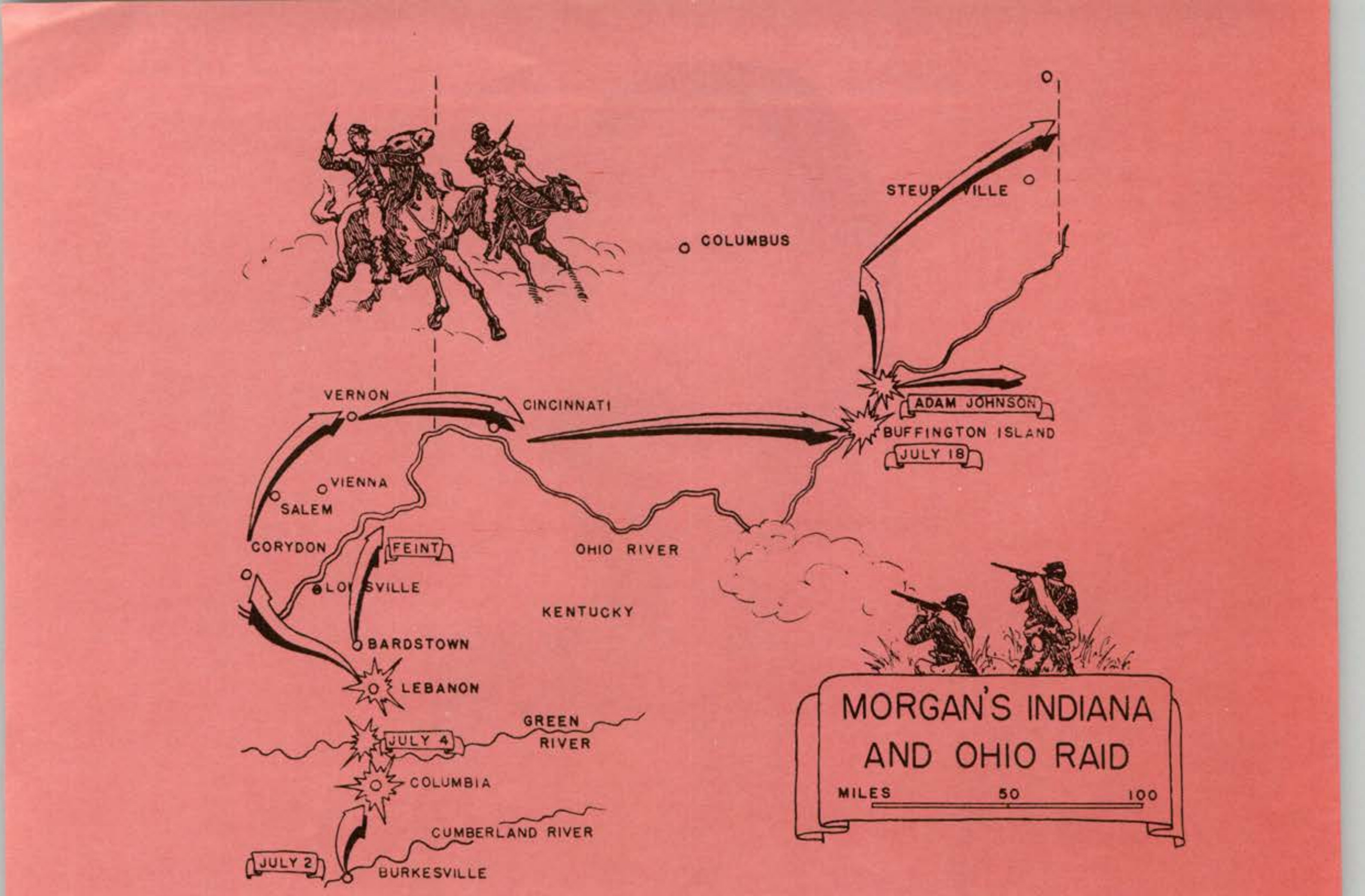
[1]William Morris, ed., *The American Heritage Dictionary of the English Language* (Boston: Houghton Mifflin Company, 1976), p. 585.

[2]Bert "Yank" Levy, *Guerrilla Warfare* (Boulder, CO: Panther Publications, 1964), p. 17.

[3]N.I. Klonis, *Guerrilla Warfare: Analysis and Projections* (New York: Robert Speller and Sons, Publishers, Inc., 1972), p. 23.



Morgan's division consisted of two brigades. The First Brigade, commanded by Colonel Basil Duke, consisted of five regiments with a total of nearly 1,500 men. The remainder of the division, five regiments, was in the Second Brigade under the command of Colonel Adam R. Johnson.[4]

The division was also accompanied by a small artillery unit of four 3-in Parrott guns[5] and a 12-pound, bronzed Napoleon howitzer.[6]

Although his force was small, Morgan successfully utilized the guerrilla technique of ambushing and counterambushing throughout his raid. The first notable occurrence of Morgan's counterambush was on the Kentucky shores of the Cumberland River. As the division was crossing the flooded river on July 2, 1863, they were fired upon by Union troops hidden along the shore. The Rebels, who were riding on captured flatboats with the wagons and artillery pieces, ran off the boats, shooting as soon as the craft touched the shore. The men who had swum naked across the river with the horses dashed out of the water onto the shore without bothering to put their clothes on. Although the Rebels' superiority in numbers was a vital factor, the diarists claim that the Rebels countered this ambush with the psychological shock of an attack by naked men.[7]

Morgan's men frequently used the art of ambush in their raid toward the north; however, three specific instances that demand attention stand out from the rest.

As Morgan's division approached the Ohio River at Brandenburg, Morgan ordered his scouts, a group of 40 men, to find a ford.[8] Instead of making a determined effort to find a ford, the scouts went to the river and waited for an unsuspecting boat to dock. The first boat to appear, the *John B. McCombs*, was swarmed upon by the 40 Rebels as she tied to the pier. Not a single shot was fired. The Rebels ordered the captain to steer the *McCombs* back out onto the river, where they maneuvered alongside the *Alice Dean*, that was heading upstream, and tied the two boats together. When the division arrived, the boats were docked and waiting to ferry the unit across the river.[9]

In another ambush at Salem, the 1st Brigade's 2nd Kentucky Regiment led the column through the Hoosier town where they came upon a loaded, 18-in swivel cannon in the town square. Because the raiders had entered the town so swiftly and without warning, the man designated to fire the antiquated weapon had fled in fear.[10]

As the column neared Cincinnati, Ohio, the scouts checked

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[4]Dee Alexander Brown, *The Bold Cavaliers: Morgan's 2nd Kentucky Cavalry Raiders* (New York: J.B. Lippincott Company, 1959), p. 179.

[5]Parrott guns were rifled cannons with cast iron barrels and wrought iron breeches. Developed by Robert P. Parrott, the cannons were made in seven different sizes from 10 to 300 pounds. Morgan's Parrott guns were 10 pounders, which along with the 20 and 30 pounders, were considered the best of the heavier rifled pieces used during the Civil War. (Mr. Phillip Cavanaugh and Mr. John Purdy, curators of the Patton Museum.)

[6]Brown, p. 179.

[7]Allan Keller, *Morgan's Raid* (New York: The Bobbs-Merrill Company, Inc., 1961), p. 26.

[8]Basil W. Duke, *A History of Morgan's Cavalry* (Bloomington, IN: Indiana University Press, 1960), p. 428.

[9]Keller, pp. 61-62, 65.

[10]Duke, p. 436.

the surrounding vicinity, barricaded the railroad by setting crossties into a cattle gap,[11] and cut telegraph wires. From concealed positions, they watched as a train crashed into the obstacle and derailed, delivering over 300 raw Federal troops into their hands.[12]

A historical account by Allan Keller in his book, *Morgan's Raid,* summarized Morgan's success in ambushing thusly:

> . . . Morgan held the trump card of surprise. His was the choice where to strike. Like a wolf at the edge of a flock of fat sheep, he possessed mobility, superior power at any given point, and best of all, an awareness of the terror inherent in his very presence.[13]

Another important asset to Morgan's success was his effective use of communications. Throughout his raid, Morgan had his men cut telegraph wires to keep the Northern forces incessantly wondering where he was and where he would strike next.[14]

However, Morgan's most profitable resource in applying what is known today as electronic warfare was his able telegrapher, George A. Ellsworth. Ellsworth skillfully connected his portable equipment to severed lines and listened to the dispatches concerning Union troop strengths and dispositions of Federal Regiments. He also sent false reports and orders using intercepted identification codes, causing confusion within the Union forces.[15] Morgan used Ellsworth's talent from the time they were south of Louisville, Ky., until Ellsworth and part of Morgan's force escaped from Union forces on Buffington Island, Ohio, into West Virginia.[16]

Since his division had no logistics force supporting it, Morgan applied another principle of guerrilla warfare, that of living off the land. His men were encouraged to steal for their food, forage for their horses, and find ammunition, clothes, saddles and guns as they needed them.[17] There was an almost constant exchange of tired animals for fresh onces because of the swift pace of the division. However, this practice of taking privately-owned animals angered the local farmers, who may have otherwise turned their sympathies to Morgan to create an even greater diversion.[18]

The guerrilla tactic of disrupting the enemy's supply lines by barricading roads, burning bridges, and destroying railroads and equipment was thoroughly understood and applied by Morgan. Thus, he ordered every bridge, depot, and water tank they passed, burned. Only once during the entire raid, however, was a private dwelling harmed. This occurred because someone in the dwelling fired on the Rebels, killing a few of them.[19]

Morgan's Raid ended July 26, 1863, at Lisbon, Ohio. There the total accomplishments of the raid were recorded by Morgan's adjutant, S.P. Cunningham. The division wounded 600 Federal troops, paroled 6,000 Union soldiers, destroyed 34 vital bridges and 60 different stretches of railroad tracks, burned warehouses and army depots, and caused the enforced spending of large sums of money to put better than 120,000 militiamen in the field.[20] (The number of Federal troops killed in action was not recorded.) The destruction to the bridges, railroad equipment, telegraph wires, and military stores was estimated at 10 million dollars.[21]

Militarily, Morgan's Raid delayed General Burnside's Union forces' movement into Eastern Tennessee to join General Rosecrans against Confederate General Bragg's forces, thereby also delaying the eventual defeat of the Confederacy.[22]

General John Morgan, successfully used guerrilla tactics in his raid through Kentucky, Indiana, and Ohio and his knowledge, thorough understanding, and application of this form of warfare helped him accomplish his mission. Years after his daring raid, people in the North still whispered his name with a shudder. Unfortunately, neither Bragg nor the Confederate high command considered Morgan's Raid a fair exchange for the loss of 2,000 of the Confederacy's best cavalrymen, and Morgan was unable to raise an effective cavalry force again.[23]

What relevance does this historical event hold for us today? Why should we study warfare that happened over one hundred years ago, especially guerrilla warfare?

Although modern technology has changed our weapons and given us increased mobility, the lessons from the past are still pertinent. We are being trained today to fight outnumbered and win. Yet, we consistently think of the next battle as one of conventional warfare. If we maintain this though-pattern, we will virtually force ourselves to fight on the *defensive,* instead of *offensive.* No battle can be won if we fight defensively only.

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[11]Cattle gap or cattle guard: An opening in a fence through which a road or railroad track passes. A pit is dug in the road or track to the depth of at least 18 to 24 inches. It extends from one side of the road or track to the other and abuts to the fence posts. Steel rails, pipes or logs are placed lengthwise of the pit leaving spaces large enough to prevent livestock from crossing (evidently the animals fear their hooves will pass through the rails and get caught). The spacing of the rails or logs does not impede vehicular traffic.

[12]Brown, p. 209.

[13]Keller, p. 67.

[14]Brown, pp. 183, 186, 195, 197, 201, 205.

[15]Duke, p. 428.

[16]Keller, pp. 47, 56, 76, 77, 79, 80.

[17]Richard Wormser, *The Yellowlegs—The Story of the United States Cavalry* (New York: Doubleday and Company, Inc., 1966), p. 276.

[18]Klonis, p. 24.

[19]Duke, p. 439.

[20]Keller, p. 230.

[21]Brown, p. 228.

[22]Brown, p. 228.

[23]Brown, p. 229.

SP4 JANETTE J. RAKER enlisted in 1974, serving as assistant editor of ARMOR from 1975 to 1977. Upon separation, she joined the Army Reserve, and is currently assigned with the 83d ARCOM, Toledo, Ohio. She is a junior at Bowling Green University, majoring in Education.

"An armored commander has got to be quick—a quick thinker. He must be bold and prepared to take a chance. He must know the difference between a gamble and a risk. He is expected to teach boldness, and imagination must be his byword. He must develop a sense of time and space and an instinct for the critical point. He must be a direct, personal leader. He must learn how to improvise. He cannot be a conservative, especially in the field. He must clearly understand combat power, speed, mobility, and the difference between these elements. He must know how to use his air together with army aviation. He must be both operationally and administratively ready to change or respond to a task force shuffle on the fly. He must understand supply and maintenance and their relationship with each other. He must clearly understand the difference between the cavalry and tank leaders, two different arts but both wearing essentially the same insignia—a condition unique to the Armor Branch. All of those things an armored commander must be. If he is not, but seeks success in his profession, he must work on those traits in which he knows he is short. Lastly, notwithstanding the oceans of ink and mountains of volumes written on leadership traits throughout history, the one guiding precept that he must have is simply this: "He must be reliable."

Some Thoughts On Cavalry

by Major General George S. Patton

In mid-December 1978, Colonel Bob Wagner, who commands the 2d Cavalry in Nurnberg, asked me to speak at his annual "dining-in." His suggested topic, "Some Thoughts on the Cavalry," was most appropriate and certainly broad enough to provide this speaker with sufficient challenge. Following the dining-in, I decided to transcribe the substance of my remarks into an article for ARMOR Magazine, hoping that it might be of some interest and use to our branch and to the fine people who "make it happen" every day all over the world.

Before beginning any discussion of "Cavalry," it may be well to review just what its mission is. To this end, I would quote from FM 17-95 in order to cast these thoughts within Department of the Army language. The manual states:

> "Cavalry is a combat maneuver force of Combined Arms mounted in ground and/or aerial vehicles. It is uniquely organized, equipped, and trained to find the enemy in order to prevent the friendly main body from being engaged under adverse circumstances and to provide, within its capability, security for the main body.
>
> "Cavalry organization and use exemplify two essential criteria of battle. The first is the need to find the enemy and develop the situation with the least force possible. The second is the need to provide reaction time and maneuver space with a force tailored to leave the largest possible residual of combat power in the main body available for use at the time and place of decision. These criteria are based on a principal of war—*economy of force.* Cavalry is an economy force.
>
> "In order to see the battlefield and the enemy, cavalry must move continually and rapidly. Cavalry moves to see and moves to fight. One of cavalry's prime tasks is to find the enemy and fight him."

This partial quote from the basic cavalry manual is a good one. As a matter of fact, in that passage there are some very important points. Let's take a look at them.

Combined Arms

Combined Arms speaks for itself and needs little emphasis. As opposed to the armor and mechanized battalions within the armored or mechanized division, the cavalry is Combined Arms by TOE. It does not have to cross-reinforce because it already has! As a matter of fact, it may someday have to "unorganize" and scramble portions of a unit into, for example, a provisional tank and artillery battalion. The 11th Cavalry did that at least once in Vietnam, and with some success, by forming a provisional tank battalion under a squadron commander. This concept can work, but as with everything else we do in the Army, we must *train* for this from time to time.

The next point has to do with "aerial vehicles." There are two types of combat aviation units: attack companies and air cavalry troops. I deeply believe that attack companies are the aerial counterpart of tank companies. By the same logic, the air cavalry troop is the aerial counterpart of the ground cavalry troop. Restated even more basically, the mission of the *Cobra* with the air cavalry is to get the aerial scouts in a position where they can perform the cavalry reconnaissance and security mission. Conversely, the mission of the aerial scout within an attack company is to assist and support the *Cobra* in performing its mission, which is essentially the same as that of the tank.

All of these units—ground cavalry troops, tank companies, attack companies, and air cavalry—are Armor proponent units. It is the total responsibility of the Armor Branch to man and staff them. Doctrinal responsibilties also apply here.Thus the branch has become the "Good Shepherd" for those four types of units representing a very important segment of the combat slice of the Army. In addition, we also must ready ourselves for yet another system to join us in the mid eighties—the advanced attack helicopter (AAH). We will need

". . . we should emphasize that the 19 Delta is not interchangeable with the 11 Bravo MOS."

to do extensive homework in order to prepare ourselves and our branch for this weapons system, whose progress has been monitored so carefully for many years. We will be adding to our team resources an armored—albeit aerial—vehicle of the highest order.

Armor Aviation

The Armor membership, especially those individuals who have been placed in positions of authority, must prepare ourselves now to receive the AAH mentally, doctrinally, operationally, logistically, and administratively. This helicopter is bound to bring a new dimension of combat power to the armored battle. What is it? What can it do? It is the first attack ship developed specifically for day, night, and adverse weather missions, with emphasis on the "fight, live, survive" capability. It is armed with *Hellfire,* and is approximately one-half quieter than the *AH-1S* model.

Thus, we see that *Armor owns the combat aviation side of the Army.* This ownership was earned by a group of dedicated, professional soldiers toward the end of the Vietnam War. I was present at the Armor School at the time and remember well the sweat and emotion that surrounded this particular action. The real pioneers in that doctrinal exchange deserve a great deal of credit from us all. They provided skill and combat experience to a vitally important action. Here we must remember many names, but especially I would cite Bill Desobry, Charlie Canedy, Kit Sinclair, Jim Bradin, and Gordon Stone as officers who worked hard to place these sensitive and expensive units in their rightful places within our fighting structure. The branch owes much to these distinguished professionals.

Economy of Force

The next important point contained in the FM 17-95 mission statement is simply— "Cavalry is economy of force." From the earliest days of recorded military history—at Ulm, the great cavalry operation of 1805, in the many battles of the Civil War, The Boer War, Allenby's 1916 campaign in Mesopotamia, and certain Afrika Korps operations in the Western Desert in 1941—we see it time and again. An economy-of-force type unit, properly employed, allows the commander to concentrate combat power at the decisive point. Thus cavalry provides a corollary to the principal of mass. This concentration is normally done laterally and on the battlefield, and we call it "lateral concentration while in contact." *From personal experience,* I can testify that it is one of the most difficult, if not *the* most difficult, operations in war. Therefore, because of its many challenges, the unit selected for the economy role must be especially competent and, in the author's view, almost independent logistically. Here, then, you see the genesis within the cavalry regiment of what we now would like to identify as your support squadron—a unit whose effective presence on your regimental TOE will assist this unit in performing the economy-of-force role for which cavalry has been designed throughout the history of warfare.

Recon and Security

The most important point in the definition of cavalry's mission is a companion to the circumstances which involve economy of force. The sentence reads, "Cavalry's basic tasks are reconnaissance and security." Again, these roles should not be belabored except to ask our cavalry soldiers at all levels to mark them well. Such mission type orders as "Move east and gain and maintain contact with Warsaw Pact Forces moving west of ____ in zone" involve reconaissance. An order which directs a cavalry regiment to "Secure the corps south flank between ____ and ____" involves security. Both orders involve economy of force, some reconnaissance, and some security. Both orders involve the absolute optimum in professional combat skill. Both orders are feasible, attainable, and completely within the realm of reality for cavalry regiments. Both orders require a marked degree of independent logistical capability and, of course, certain unit reinforcements in artillery, engineers, and air defense.

"One of cavalry's prime tasks is to find the enemy and fight him." Reports, both negative and positive, must reach the commander soonest. In this regard, cavalry must *see* and cavalry must *fight.* In order to do that, cavalry must be able to *move.* And move fast—with all of its equipment tucked up close behind it.

Cavalry must be able to move at night in multiple columns in an electronic warfare and nuclear-bacterialogical-chemical environment with plenty of Class III and V available. Cavalry

". . . cavalry must be able to deploy and attack the unexpected from the march column, promptly, and with total violence."

must be able to know how and where to move, and of vital importance, it must know from the platoon level up how long it will take it to make that move.

Finally, during that move, cavalry must be able to deploy and attack the unexpected from a march column, promptly and with total violence, to accomplish its mission. In other words, cavalry must move, shoot, and (one which we all know but seldom remember until it is too late) communicate.

Cavalry, again from the platoon level up, must be able to interpret what its mission should be if the commander is unable to receive detailed instructions. This is known as acting "within the framework of a general plan" and is unique to the Armor Branch. As Robert E. Lee said of Stonewall Jackson, "I have but to show him my design, and his execution is flawless."

In my experience, this above all continues as the hallmark of the truly great combat commander: the correct interpretation of what to do in the absence of instructions or orders. I have known only seven officers in my service who could do this faultlessly, time after time.

Watchwords

Finally as both a cavalry soldier and a tanker, it might be helpful to touch on a few subjects which have been my personal watchwords with reference to cavalry and armored operations for some time. These are not in priority, but I believe them all to be important. Some involve organization, some fighting, and some a kind of moral code. They are these:

The 19 Delta MOS. The cavalry regiment in Europe today is authorized 589 of these highly skilled personnel, and it must retain this scout reconnaissance capability. A comparable capability must also be retained within divisional squadrons and maneuver battalions, while not forgetting sister aviation cavalry and attack units. In those latter units, the scout cannot double in today's Army as a crew chief. He must be trained to fly with the pilot as an aeroscout and allowed to perform his many scout functions effectively. Now if we accept this premise, we should also "bite the bullet" and admit that this aerial scout must be trained in in-flight emergency procedures and given the opportunity to accrue sufficient "stick time" so that he may successfully land the aircraft in the event the assigned pilot is unable to do so. This was practiced during the Vietnam War—albeit without authority—and the policy should be formalized and executed today with the necessary allocated funds. Failure to do this will simply result in the needless loss of fine men and expensive equipment when and if the next war comes. With reference to our scouts, be they airborne or ground, we must be careful not to overarm them, always remembering that they are principally scouts, not killers. Finally, we should emphasize that the 19 Delta is not interchangeable with the 11 Bravo MOS.

Independent Logistical Capability (Cavalry Regiment). We must equip these units now with an independent, albeit austere, logistical capability to include but not necessarily be limited to medical, automotive, maintenance, aviation maintenance, signal, and some additional S&T. To my personal knowledge, the Armor School has been working on this arrangement for at least 8 years. It is time now to move into an authorization document which will place this unit within our force structure.

Keep Cavalry as Light as Possible. We must retain the mobility differential over our potential enemies. We, the Army, do not do very well here and the challenge is a difficult one. In this connection, we must retain the elements of the integrated Combined Arms Team in this force. As General Donn Starry, the distinguished Commanding General of TRADOC, has repeatedly stated, all of us who are privileged to serve within this branch must learn to speak publicly with one voice. If stabilization is present in our vehicles, we must use it constantly, train with it, become accustomed to it, and eventually, if the need arises, fight and kill more effectively with this important combat multiplier. Why? Because it is well known that if we don't use it, it will not work and eventually the capability will disappear from our units. Thus the generations which follow will not even be given the opportunity to employ it. I have used stabilization as but one example. There are others which are equally important.

Administration. "Before an armored unit can be tactically successful, it must be administratively straight." This is a direct quote from the late General Creighton W. Abrams. And he is so right! Poor ammo distribution, sloppy personnel actions, faulty maintenance, high deadline and inadequate supply discipline will get you whipped and may even get you dead. This writer learned this the hard way 28 years ago and has never forgotten it. There are literally dozens of incidents where good administration made units do well in both battle and peacetime exercises and there are, unfortunately, an equal number of opposite cases. We are simply too complex in force structure to do otherwise, and it is high time we all understood this. The slash and dash of armor which can and must exist must be preceded by meticulous administrative preparation. That *Goer* must get there with the proper load. That casualty must be reported with the correct name. The coffee has got to be hot, and the general mechanic set must have the proper tools within it. The surgeon must have blood type *A Positive* when he needs it, and the generator which supports his light set in the surgical tent must operate efficiently.

"It may be that I shall lose a battle, but I shall never lose a minute!"—Napoleon Bonaparte

The Importance of Time. As Bonaparte said once, "It may be that I shall lose a battle, but I shall never lose a minute!" Time is everything in war and in the preparation for war. Arriving and departing, crossing the line of departure, planning supporting artillery and air, crossing to the rear of a unit, marching, blowing bridges, erecting mine fields and obstacles, rendering reports, feeding, sleeping—all are literally dominated by the "unforgiving minute."

Final Thoughts. The good cavalry or armored soldier must make up his mind that he will never be relieved if defeated in battle. He must simply relax to that point and it will serve him well when times are hard. He always has another way out and that is the easy way. A dead commander is never criticized. If our leaders retain that attitude genuinely, they will invariably be successful in combat should combat enter their lives. For representatives of the Army's truly mobile arm, it is our sacred duty to develop and retain that philosophy. That I truly believe.

In August 1975, shortly after assuming command of the 2d Armored Division at Fort Hood, I put together a personal description of the armored commander that appears at the beginning of this article. It was written for those who would be working with me with the hope it would be read and studied with some care. I believe that it was. Since that time, I have reviewed it frequently and found it to retain a degree of soundness for the Arm of Decision as we all know it today.

These, then, are the points of view specifically offered to today's cavalryman. Although used in conjunction with a group of officers from a distinguished cavalry regiment, they do apply to all cavalrymen and tankers. They have served this soldier well in both peace and war, and they are offered to our fine magazine with humility and pride.

XM-2 and 3

This article was prepared by the staff of ARMOR and is based on information and drawings released by the Office of the Program Manager, Fighting Vehicle Systems. ED.

The *XM-2* Infantry Fighting Vehicle (IFV) and the *XM-3* Cavalry Fighting Vehicle (CFV) give the U.S. soldier the mobile armor-protected fighting capability needed for a fully effective Combined Arms Team.

The *XM-2* will enable the infantry to work closely with armor units equipped with the *XM-1* tank and the *XM-3* will provide the cavalry with the mobility and firepower needed to accomplish its various missions.

Features common to both vehicles include:

• A two-man turret, mounting an externally powered 25-mm automatic cannon, a two-missile TOW launcher, and an *M-240* (Mag 58) 7.62-mm coaxial machinegun.

• Stabilized all-electric turret drive.

• Stabilized day and night sight.

• Periscopes and sights for 360-degree vision for the vehicle commander.

• Spaced laminate armor.

• A turbocharged, 500-hp diesel engine.

• An automatic hydro-mechanical transmission.

• An improved suspension that permits 14-in vertical travel of the road wheels.

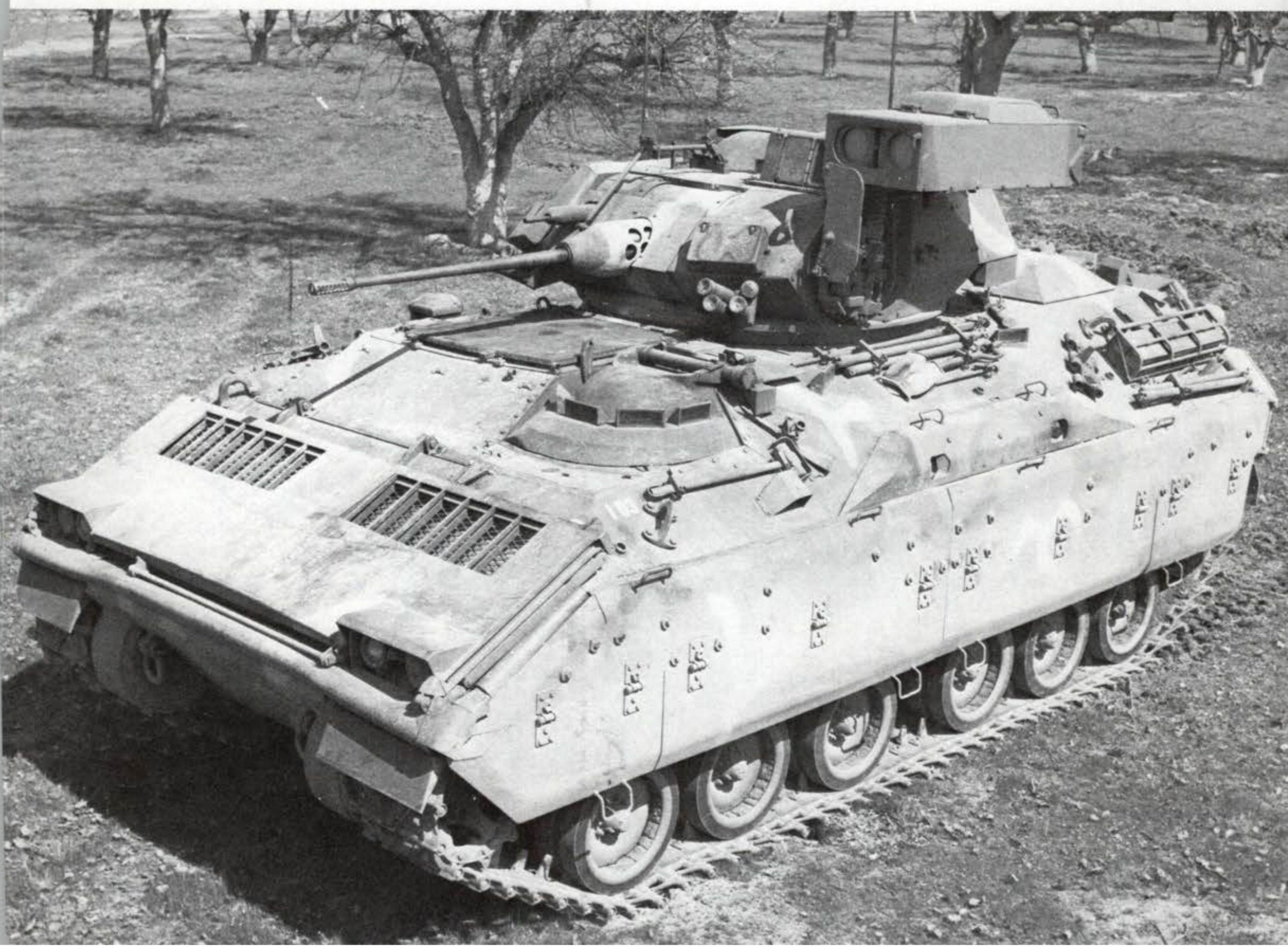
The *XM-3* CFV is identical to the IFV in external appearance, but the interior is configured for a five-man scout crew and stowage of 10 TOWs and more 25-mm and 7.62-mm ammunition than is carried in the *XM-2*.

Detailed characteristics are given on page 32 and a separate article on the turret and armament begins on page 35. ED.

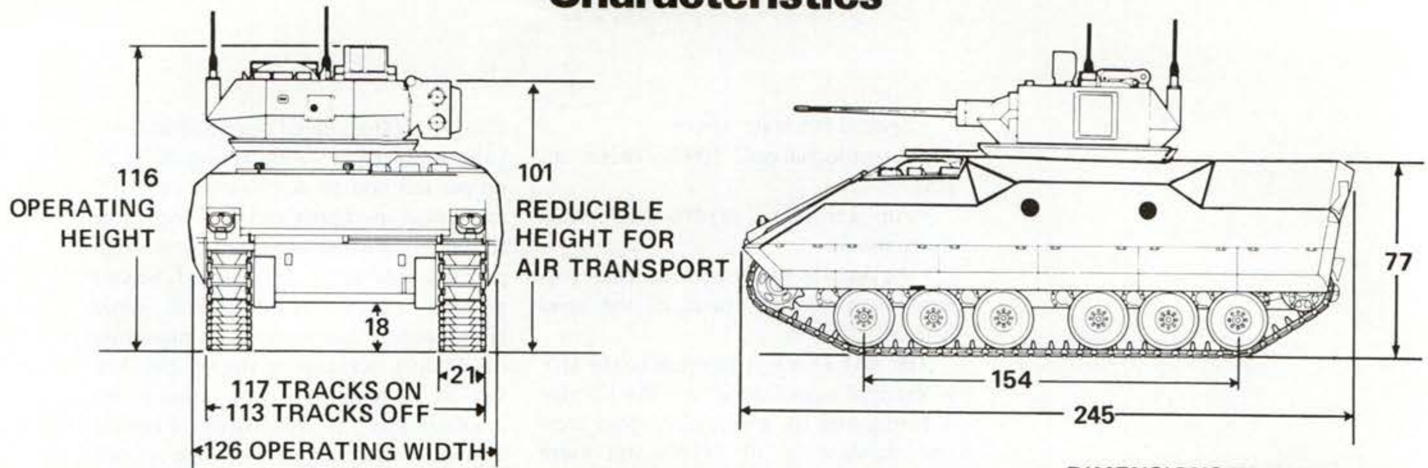
The *XM-2* and *3* are truly fighting vehicles and afford greatly increased mobility, survivability, and firepower in comparison with earlier personnel carriers.

Mobility is assured by the turbocharged, 500-hp diesel engine which provides a power-to-weight ration of 21.28 hp per ton and an acceleration rate of 0 to 30 mph in approximately 19 seconds. Mobility is further enhanced by the high performance shock absorbers of the suspension system which permit rapid cross-country movement with minimum discomfort to troops in the vehicle. The vehicle's mobility was illustrated dramatically at Aberdeen Proving Grounds where it traversed test courses in times equal to or better than the *XM-1* tank.

Increased survivability for this family of fighting vehicles is achieved with spaced laminate armor that gives maximum protection for minimum weight. Although the *XM-2* and *3* are relatively light compared to tanks, their armor can defeat 91 percent of the types of anti-armor attacks that may be encountered on the battlefield. Survivability can be increased further by using the vehicles'



Characteristics



DIMENSIONS IN INCHES

General

Weight, combat loaded	47,000 lb	21,319 kg
Weight, less fuel, crew and OVE	40,650 lb	18,439 kg
Weight, air transportable	41,000 lb	18,598 kg
Ground pressure, combat loaded	7.4 psi	0.52 kg/cm²
Personnel capacity, IFV	9	
CFV	5	
Fuel tank capacity	175 gallons	662 liters

Performance

Speed on land	41 mi/h	66 km/h
Speed in water, with track	4.5 mi/h	7.2 km/h
Cruising range	300 mi	483 km
Turning radius	Pivot to infinite	
Slope	60%	
Side slope	40%	
Trench crossing	100 in.	254 cm
Vertical wall climbing	36 in.	91 cm
Gross horsepower-to-weight ratio	21.28 hp/ton	

Engine

Make and model	Cummins VTA-903	
Displacement	903 in.³	14.8 liter
Type	4 cycle	
Fuel	Diesel	
Gross horsepower	500	506 metric

Transmission, Automatic

Make and model	GE HMPT-500
Type	Hydromechanical
Steering	Hydrostatic
Brake type	Multidisc, oil cooled

Running Gear

Suspension type	Return roller	
Springing media	Torsion bar	
Number of wheels	6 pr. per side	
Wheel size	24 in. diam	61.0 cm
	4 in. wide	10.2 cm
Track type	Steel single pin with detachable rubber pad	
Shock absorbers	4 per side	
Number of shoes	83, left; 82, right	
Track pitch	6 in.	15.2 cm
Track width	21 in.	53.3 cm

Night Vision Equipment

Sight, gunner	Thermal imagery
Sight, commander	Optical relay from gunner's sight
Sight, driver	AN/VVS-2

Electrical System

Generator	
Amperes	220
Volts, dc	28
Batteries	4, type 6TN, 100 amp-hr, 12-volt each

Turret (Two-Man)

Armament	25-mm automatic cannon TOW missile launcher 7.62-mm, M240 machine gun
Traverse	360 deg continuous
Elevation	
25-mm cannon and 7.62-mm machine gun	+60 deg to −10 deg
TOW missile launcher	+30 deg to −20 deg
Slew rate, maximum	
Elevation and traverse	60 deg/sec
Tracking rate, minimum	0.05 mil/sec
Stabilization system	Electric
Ring gear, pitch diameter	60 in.

Squad Weapons

Firing port weapon, XM231, 5.56mm, IFV only	6, ball-mounted
Machine gun, M60, 7.62mm	1
Rifles, M16A1, 5.56mm	9, IFV 5, CFV

Ammunition

	IFV ready/stowed	CFV ready/stowed
25mm	300/600	300/1200
7.62mm (XM240)	800/1400	800/3600
7.62mm (M60)	2200 stowed	3200 stowed
5.56mm (firing port)	1800/2200	NA
5.56mm (M16A1)	2160 stowed	1460 stowed
TOW missiles	2 in launcher	2 in launcher
TOW/Dragon missiles	5 stowed, any combination	10 TOW stowed
LAW (M72A2)	3 stowed	NA

Communications (Commander Vehicle)

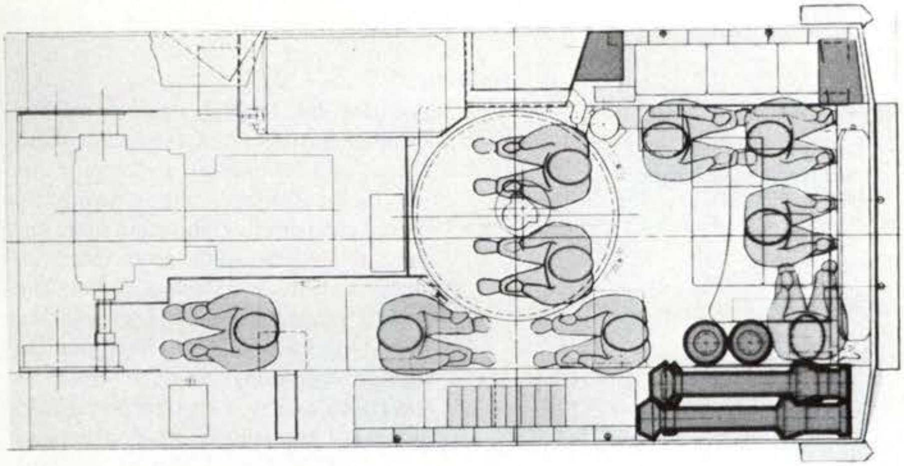
Radio, IFV	AN/VRC-46, 1 set AN/GRC-160, 1 set
Radio, CFV	AN/VRC-12, 1 set AN/PRC-77, 1 set

Armor

Top and front slopes	5083 aluminum
Vertical sides and rear	Spaced laminate armor
Bottom	5083 aluminum with antimine applique (IFV only)
Side slopes	7039 aluminum

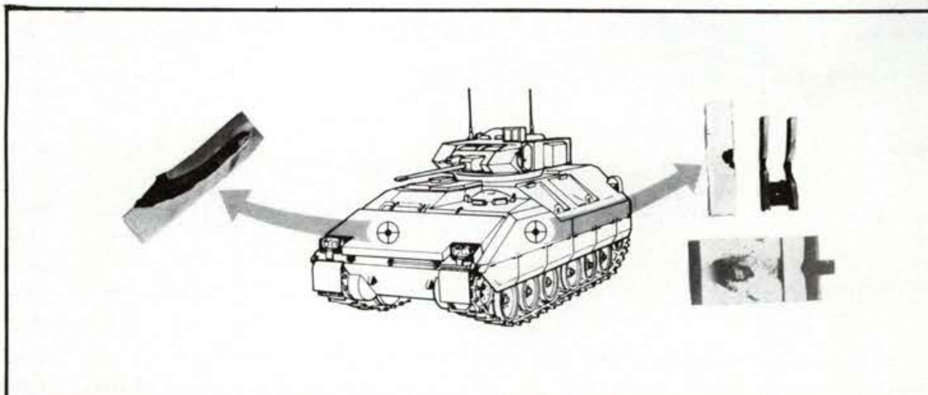
Fire Extinguisher

Fixed	7 lb (3.2 kg) Halon in engine compartment 2, 5 lb (2.3 kg) Halon in personnel compartment
Portable	2.75 lb (1.2 kg) Halon

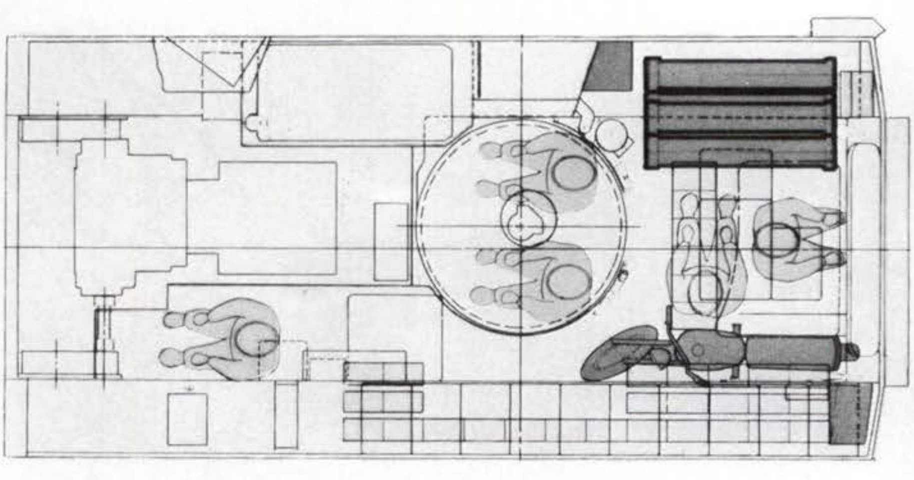


XM2 Infantry Fighting Vehicle arrangement

The XM2 carries a driver, commander, gunner and 6 additional squad members, plus 7 TOW or Dragon antitank missiles, 900 rounds of 25mm, 4400 rounds of 7.62mm and 6160 rounds of 5.56mm ammunition.



RADIOGRAPH—PROJECTILE BREAKING UP IN SPACED LAMINATE ARMOR



XM3 Cavalry Fighting Vehicle arrangement

The XM3 is identical to the XM2 external appearance. The interior of the vehicle was originally designed for a 5-man scout crew, a scout motorcycle, 12 TOW missiles, 1,500 rounds of 25mm, 7,600 rounds of 7.62mm, and 1,460 rounds of 5.56mm ammunition. Subsequent to preparation of the art for this article, a decision was made to eliminate the motorcycle.

agility, terrain masks, and defilade positions.

In addition to the firepower of the turret weapons systems, six periscopes and firing ports in the sides and rear of the vehicle permit the mounted infantrymen to lay down close-in suppressive fires, using their 5.56-mm automatic weapons.

But no matter how well engineered and technologically advanced a system may be, it will be ineffective unless it is built to satisfy the needs of the user—the soldier. With this in mind, the *XM-2* is designed to permit the soldier to fight with maximum effectiveness.

• The IFV has the mobility and agility to move the infantryman to the objective protected from shell fragments and small arms fire, with minimum vibration and discomfort over even the most adverse terrain.

• Squad members can see from the vehicle, remain oriented with the terrain, and participate in the battle with their

GSRS Carrier Characteristics

General

Weight: vehicle	30,000 lb	13,608 kg
Rocket module	20,000 lb	9072 kg
Personnel capacity	3 men	
Fuel tank capacity	163 gal.	617 l.
Air transport	C141 or larger	
Cargo Bed Dimensions	156 in x 70 in 396 cm x 178 cm	

Performance

Speed (level land)	40 mi/h	64 km/h
Speed (10% slope)	18 mi/h	29 km/h
Acceleration (0 to 30 mi/h)	19 sec.	
Stopping (20 to 0 mi/h)	28 feet	8.5 m
Range (@ 25 mi/h)	300 miles	483 km
Turning radius	Pivot to infinite	
Slope	60%	
Side slope	40%	
Vertical wall	36 inches	91 cm
Trench	90 inches	229 cm
Water Fording	40 inches	102 cm

Engine

Make and model	Cummins VTA-903	
Displacement	903 cu. in	14.8 l
Type	4 cycle	
Fuel	Diesel	
Rated horsepower	500	

Transmission, Automatic

Make and model	G.E. HMPT-500	
Type	Hydromechanical	
Steering	Hydrostatic	
Brake type	Multidisc, oil cooled	

Final Drive

Type	Geared	

Running Gear

Suspension type	Return roller	
Springing media	Steel torsion bar	
Number of wheels	6 pair each side	
Wheel size	24-inch diameter x 4 inches 61 cm dia x 10 cm	
Track type	Steel single pin with detachable rubber pads	
Shock absorbers	4 per side	
Number shoes	92 left side 91 right side	
Track pitch	6 inches	15 cm
Track width	21 inches	53 cm
Suspension lockout	1, 5, and 6 road arms	

Electrical System

Generator		
Amperes	220	
Voltage (dc)	28	
Batteries	4, type 6TN, 100 amp-hr, 12-volt each	

individual weapons without leaving the vehicle.

• Controls in the gunner's and driver's compartments are designed for simplicity and ease of operation—an important consideration during a firefight.

• Maintenance is simplified by using modern diagnostic equipment and replacement of defective modules.

These soldier-oriented features of the *XM-2* are also found in the CFV and another member of the Fighting Vehicle System—The General Support Rocket System (GSRS) carrier.

The GSRS was developed to provide mobile long-range artillery rocket support for the leading elements of the Combined Arms Team. It uses the *XM-2* chassis and components as a mount for the rocket launcher and a lightly-armored cab permits completion of an entire fire mission while protected from shell fragments and small arms fire. The vehicle's suspension system can be locked out for stability during firing and loading operations. Another feature of the GSRS carrier is its transportability. When not operating under its own power, it can be loaded aboard standard Army heavy equipment transporters, U.S. and foreign railroad cars, ocean-going ships, and *C-141* and larger aircraft.

By using IFV components, development and production costs of the GSRS carrier will be greatly reduced. Additionally, training for the operation and maintenance of all the fighting vehicles will be identical and repair parts for the three versions will be interchangeable.

Like the *XM-2* and *3*, the GSRS carrier is scheduled for production in 1981.

Fielding of the prototypes of the XM-2, XM-3, and the GSRS carrier is a significant milestone in the acquisition of much-needed and long-sought mobility and armor protection for key elements of the Combined Arms Team. ARMOR will welcome future articles about these fighting vehicles from readers involved in their development, testing, and operation. ED.

Light Heavyweight

by David G. Holmes

Parts of this article pertaining to the XM-242 Chain Gun were written by ARMOR's staff based on information provided by Hughes Helicopter Company and the Office of the Program Manager, Fighting Vehicle Systems. Mr. Holmes is an independent military research analyst and writer, specializing in modern battlefield environments and weapons platforms. ED.

The *XM-2* infantry fighting vehicle and *XM-3* cavalry fighting vehicle (above) now undergoing operational testing in prototype configuration, have the agility, speed, and elusiveness of lightweights, but can mix it up with the heavyweights when they have to.

The hull, suspension, and power plant that give the vehicles their speed and mobility are described in the preceding article beginning on page 30; therefore, this article is devoted entirely to the turret that provides the antiarmor punch and suppressive fires.

Principal antiarmor weapons are the *XM-242*, 25-mm automatic gun, and a twin-tube TOW launcher (above). In development for more than a decade, the 25-mm gun (figure 2) will defeat 75 mm of armor at pointblank range at 0-degree obliquity and 66 mm of armor at 1,000 meters at 0-degree obliquity. Simply stated, the 25-mm cold-worked, staballoy penetrator will defeat the 14-mm armor of the Soviet BMP turret at an obliquity of 45 degrees, and from beyond the 800-meter effective range of the *BMP's* 73-mm smoothbore gun.

When employed for fire suppression missions, the *XM-242* will fire high-explosive rounds. The *XM-242* weapon system is also known as the *Chain Gun*, a registered trademark of the Hughes Helicopter Company which designed and developed it. The gun is so named because it is externally powered and driven by a length of conventional industrial double-row roller chain which cycles in a racetrack pattern on four sprockets—one driven and three idlers. A bolt-drive slider fixed to the master link of the chain converts rotational chain motion to reciprocating bolt motion (figure 2). The chain drive principle has been tested through three-quarters of a million cycles in three different calibers and has proven reliable. The predicted reliability of the gun and other characteristics are shown in table 1.

Features of the *XM-242* gun which differ considerably from conventional self-powered automatic weapons include the bolt assembly, bolt-locking system, gun safing mechanism, bolt-to-receiver interface, motor assembly, and timing system.

The bolt assembly consists of a bolt carried in a bolt carrier with an integral cam that causes the bolt head to rotate 30 degrees to lock in the breech. Unlike the bolt of

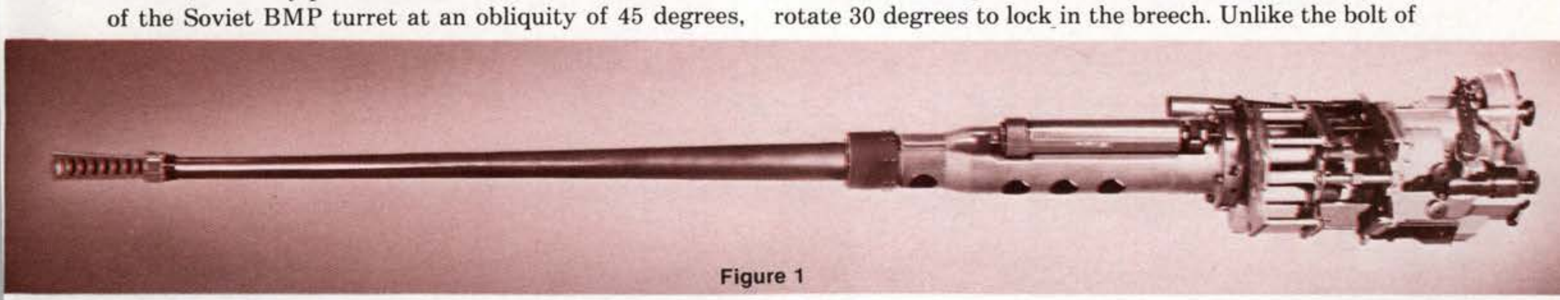


Figure 1

gas or recoil-operated automatic weapons, the bolt of the *XM-242* gun is not blown to the rear to impact with a buffer. The system of sprockets and chain in conjunction with the link guides acts to smoothly accelerate the bolt, move it at a constant velocity, and decelerate it. The bolt is totally controlled at all times, is subject to low acceleration forces, and is positively timed to the rest of the weapon components regardless of firing rate.

Reliability for handling cartridges of either steel, brass, or aluminum is assured by a bolt-locking system that has the following features:

- Breech-locking loads are limited to the barrel, bolt head, and breech, permitting lightweight receiver construction.
- Minimum stress paths and tolerance buildups ensure accurate headspace and minimum case stretch.
- Low unlocking loads minimize bolt-face to cartridge-head movement.
- Positive T-slot extractors provide 30 degrees of engagement on top of the case and 75 degrees on the bottom.

The gun's safety mechanism permits the gun to be cycled normally without having the firing pin fall, and the safety can be engaged at any point in the cycle—even if there has been a stoppage with the bolt partially forward.

A lighter receiver for the *XM-2* automatic gun is possible because the bolt-to-receiver interface is such that the bolt head is locked directly to the barrel and breech. This eliminates the need to stress the receiver to withstand loads created by chamber pressure because the rearward

Table 1. 25-mm XM-242 Fighting Vehicle System Characteristics*

Caliber	**25 mm Dual Feed**	
Ammunition	**Oerlikon KBA/U.S. XM-790 Series**	
Weight		
Receiver Assembly	**92 lb**	**42 kg**
Barrel Assembly	**89 lb**	**40 kg**
Feeder Assembly	**49 lb**	**22 kg**
Total Gun System	**230 lb**	**104 kg**
Dimensions		
Length Overall	**108 in**	**2743 mm**
Width	**12.7**	**323 mm**
Height	**14.7 in**	**373 mm**
Length Behind Front of Feed	**21 in**	**533 mm**
Barrel Length	**80 in**	**2032 mm**
Barrel Life	**13,000 rnds**	
Rate of Fire	**Single Shot; 100 200 spm****	
Time to Rate	**0.15 sec**	
Time to Stop	**0.12 sec**	
Power Required	**1.5 hp**	
Clearing Method (Cookoff Safe)	**Open Bolt**	
Safety	**Absolute Hangfire Protection**	
Case Ejection	**Forward**	
Peak Recoil Force	**7000 lb/3175 kg**	
Dispersion	**0.5 mil (1σ)**	
Reliability Predicted	**25,000 MRBF**	

***Includes gun, barrel, drive motor, integral feeder, and internal recoil mechanism.**

****475 spm available with motor interchange.**

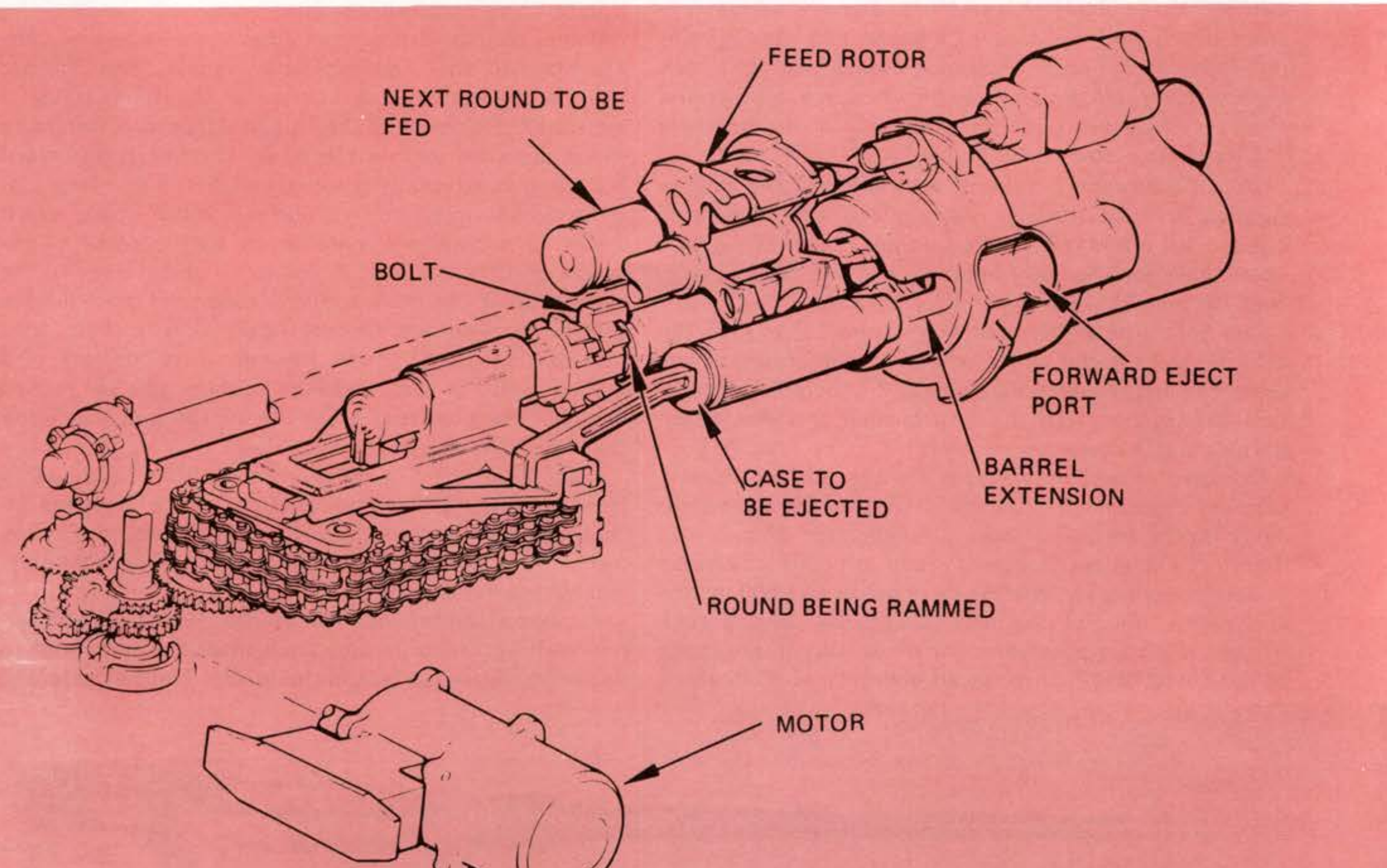


Figure 2

acceleration of the chain-controlled bolt is so low that there is no requirement for a bolt buffer or wearing surfaces.

Power for the *XM-242* is provided by a simple 1.5-hp, 22-volt dc motor mounted on the rear of the receiver. (figure 2). The motor operates at 7,700 rpm and is linked to the chain driver and the feed system by a set of bevel gears and a vertical shaft. The motor controls the basic rate-of-fire functions, and incorporates circuitry to permit dynamic electric braking to stop the gun in the open-bolt position upon cessation of firing.

Since the proper functioning of the *XM-242* is governed by positive synchronization of the motion of all its parts, the timing of those parts must be correct. This is accomplished by aligning timing marks on the gears of the feeder drive housing and by timing the feeder to the chain drive in the receiver. Timing of the gears in the feeder housing is done only when the housing is disassembled at about 25,000-round intervals. Feeder-to-chain timing is done any time the feeder is removed, but the operation is so simple as to be nearly automatic.

When the automatic cannon is to be fired, the gun control system provides the functions of triggering, semiautomatic fire mode, rate-of-fire control, feed selection, and backup power supply and battery recharge.

The TOW

Although the *XM-2/3* fighting vehicles are relatively light, their TOW missile system gives them the capability for defeating the heaviest armor threat they may face.

The TOW system's armored launcher boxes are mounted externally on the left side of the turret. For tactical travel, the launcher boxes are locked in a vertical stowage position. During a missile engagement, the launcher is coupled to the primary sight when the launcher is

Figure 3

elevated through a vertical 90-degree arc by an electric actuator arm (figure 3). The launcher boxes are then elevated on the actuator axis with the TOW elevation drive, having an elevation angle of +30 to −20 degrees. The missile flight is automatically controlled by the integrated sight. The sight aligns the turret in azimuth by slewing it onto the target.

The TOW missile cannot be fired while the vehicle is in motion. For that matter, no current vehicle-mounted ATGM can be fired on the move. When fired, the TOW missile takes 15 seconds to reach 3,000 meters.[1] In contrast, the *Sagger* missile of the BMP takes 25 seconds to reach 3,000 meters[2] and has a lower hit probability than the TOW.[3] Additionally, the IFV/CFV launcher contains two missiles and is much easier to reload. The TOW launcher is reloaded by traversing the turret so that the elevated launcher receiver is in front of the roof cargo hatch. The loader partially opens the hatch and pushes the missile containers into the launcher receivers. The IFV has stowage for five missiles plus two in the launcher, and the CFV has stowage for 12 missiles with two in the launcher.

The fact that the TOW cannot be fired on the move, should not be thought of as an operational handicap.

The result of the first live-fire test of the IFV/CFV TOW missile system at Fort Irwin, Cal. proved that it will be one of the most lethal TOW platform yet deployed. All of the eleven missiles launched were hits. Eight of the targets were stationery and three were moving. The targets were engaged from 500 meters to 3,000 meters in 500-meter increments.

This accuracy and the density of the TOW missiles that can be fired, combined with the stabilized fires of the *XM-242* automatic gun, free the *XM-1* to accomplish its primary mission of destroying tanks.

Fire Control

The fundamental element of fire superiority is gunnery that places accurate, effective fires on enemy armored vehicles and personnel. To do this the main armament of any fighting vehicle must have a fire control system that allows the gunner and turret commander, working as a team, to acquire, identify, and kill moving armored vehicles while they themselves employ fire and maneuver.

The fire control and stabilization of the *XM-2/3* enable their crews to do just that. The fire control system features an integrated day and passive night hard-optical sight that is linked to a stablized, all-electric gun elevation and turret slew drive. The day/night sight has 4- and 12-power magnification with each slaved to a specific target tracking made. Twelve-power magnification is used for the TOW missile in the slow-speed tracking mode, and 4-power is used for the 25-mm gun's fast-tracking mode when the vehicle is in motion. The entire fire control system is redundant and modular, having a manual backup in the case of an electrical failure. Both the vehicle commander and gunner can arm, aim, and fire all three weapon systems in the Turret (Figure 4).

[1]Pg. 4 #14 1 TRADOC Bulletin No. 2, *Soviet ATGMS: Capabilities and Countermeasures* April 75, 27.

[2]Ibid, op cit, p. 5.

[3]R. Meller, "The TOW Cobra Antitank Helicopter-More Mobile Firepower for the U.S. Army in Europe," *International Defense Review*, No. 6/75, p. 883.

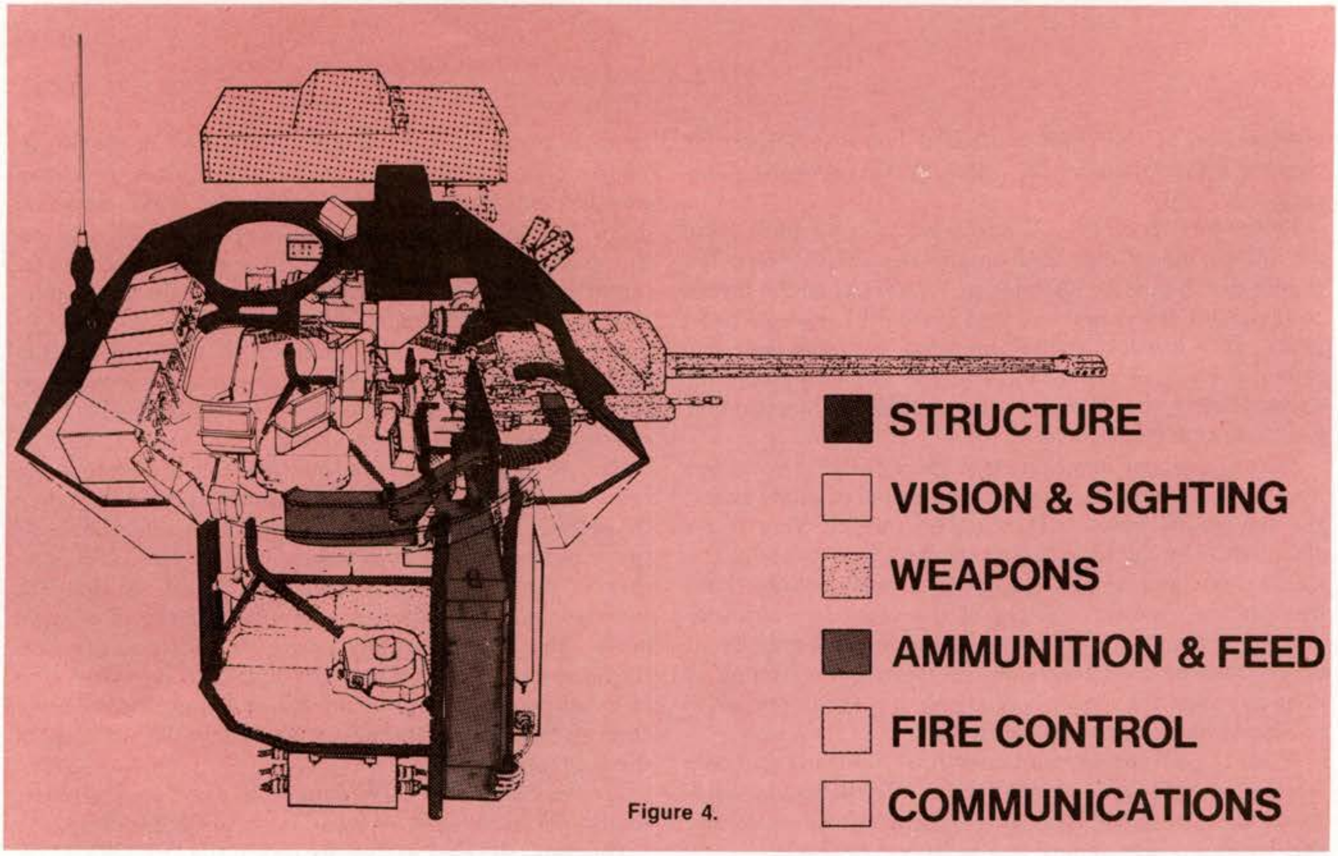


Figure 4.

Stabilization

The turret uses a triple-moment gun stabilization system. The *XM-242* automatic gun and coaxial weapon are stabilized by three closed-loop rate-gyros to compensate for vehicular oscillation. The axial planes of movement, yaw, trunnion cant, and pitch are stabilized by translational commands from the turret's rate-gyros in reaction times of less than 1 second. By stabilizing the guns and slaving them to what the gunner has as a sight picture, the turret provides remarkable accuracy in moving gunnery.

The precision of the stabilization system was demonstrated during live firing in Operational Testing Phase I at Fort Irwin. In this test the MICV, using the single-man 20-mm turret with a previous electro-hydraulic stabilization system, was traveling at maximum speed on an unimproved tank trail. The gunner spotted a 3x2-meter target at 10 o'clock. With stabilization mode on, he slewed the turret onto the target. Opening fire in short bursts of automatic fire, he hit the target several times at a 800 meter range. The vehicle was then put through a violent 90-degree turn to face the target head on. The turret remained aligned on target while firing continued and over 50 rounds hit the target, totally destroying it.

TOW Missile and Fire Control

The TOW missile controls are located to the left of the gunner's station, with the sight and guidance electronics forward of the gunner, alongside the turret's main gun. The display console integrates the TOW missile guidance controls, 25-mm gun and coax fire selectors, and stabilization tracking mode switches on one panel between the commander's and the gunner's station. The gunner's station has power and trigger controls similar to the *M-60A1* tank's, while the turret commander has a command override. The turret also has a nickel-cadmium battery to power the gun's electric stabilization power supply. The gunner's sight combines the TOW missile's optical guidance system with the sight of the 25-mm gun and coax. The turret commander has a hard-linked optical view of the gunner's sight picture.

Summary

The fighting vehicle system will provide the mechanized infantry and cavalry scouts with the following capabilities.

- Stabilized and antiarmor direct fires from the 25-mm automatic gun that will defeat many known armored fighting vehicles beyond the maximum effective range of their main armament.
- Stabilized fire from the *XM-242* gun and *M-240* coaxial machine gun against dismounted assaulting enemy infantry, ATGM gunners out to extended ranges, and suppressive supporting fires for IFV's infantry team during dismounted assault. The vehicles automatic weapons will also provide anti-aircraft fires against enemy low-level close-support aircraft and armed helicopters.
- A two-tube armor protected TOW missile launcher that is fired while the gunner is under armor cover. The total of seven TOW missiles for *IFV* and 12 TOW missiles in the *CFV* will provide an extremely accurate kill capability against all known tanks at extended ranges.
- Armor protection that will enable the *XM-2/3* to survive 155-mm artillery fires and 14.5-mm direct fires or roughly 91 percent of the ballistics projectiles on the modern battlefield.[4]

It all adds up to a versatile, mobile, armor-protected system of precision-guided missiles, stabilized dual-purpose 25-mm fire, and small arms suppressive fires. It is a system that will enable the mechanized infantry and cavalry to fight in the same environment with the *XM-1* as full partners in the Combined Arms Team.

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[4] "Fighting Vehicle Systems Infantry Fighting Vehicle *XM-2* and Cavalry Fighting Vehicle *XM-3*," pamphlet from FMC's Marketing Division, Mar. 78.

Night Training Simulations

by Paul R. Bleda and Robert W. Bauer

Training armor crewmen under strict blackout conditions can be costly.

When the 1st Training Brigade, U.S. Army Armor Training Center, began training drivers and gunners at night to evaluate the feasibility of new requirements established by the Tank Forces Management Program, several difficulties arose.

In one task, driver trainees negotiated a tank driving course without instrument lights, infrared or blackout drive headlights, or flash lights. Of eight tanks used in the exercise, five were disabled temporarily during the 20-minute session. Since maintenance costs for recovery and repairs were high, and scheduling of night training was tight, the commander sought an alternative to actual night exercises.

One alternative considered was light attenuating devices (LADs) which simulate night illumination levels during daylight. These devices were being developed and evaluated by the U.S. Army Research Institute (ARI) for the Social and Behavioral Sciences, and prototypes had been tested at Forts Rucker, Lewis, and Jackson. These prototypes had been fabricated by attaching filters of varying densities as a sandwich on standard Army goggles, outsert lenses on the *M-17* protective mask, and insert lenses in conventional welder's goggles. These tests indicated that simulating night illumination levels with LADs provide advantages over actual night training in terms of safety, training effectiveness, and scheduling flexibility. Safety also increased because individual and group performances could be monitored more closely during daylight by someone having unrestricted vision.

However, when the LADs were considered for tank crew night training, the restricted 50-degrees of the modified welder's goggles raised an important question as to the extent to which peripheral vision might be necessary for driving a tank or disassembling and assembling weapons. In view of this a preliminary assessment of the feasibility of using LADs was conducted.

Included among the selected armor tasks were driver training with the *M-34* trainer, the *M-60A1* tank, disassembly and assembly of the *M-219* machinegun, and tank gunnery. With regard to the two driving tasks, it was determined that the lateral fields of view permitted by the LADs from the driver's seat were somewhat less than that afforded by unimpaired night vision. However, it was the consensus of two scientists and two armor instructors that there was a high probability that the LADs could be applied successfully to the driver training tasks.

The potential applicability of LADs to training in the disassembly and assembly of weapons also was examined. A trainee was timed as he performed this task with an *M-219* machinegun; it required about the same amount of time as it would during actual night. Again, the consensus was that the LADs could be used for this type of training. The LADs were then tried with a tank gunnery task, but neither the targets nor the reticle could be acquired through the LAD when used with tank sights. Consequently, it was decided that the LADs would not be useful in night gunnery training.

After the preliminary assessment of the LADs, ARI and the 1st Brigade jointly planned more extensive field testing of these devices as applied to tank driving and weapons disassembly and assembly. Formal field evaluation of the LADs was considered necessary for several reasons. Foremost was the fact that LADs cannot replicate night conditions precisely. It is unlikely that any device could do so. Rather, LADs serve to approximate some essential features of night illumination. Because of this limitation, inherent in all simulations, there may be certain training areas in which LADs cannot be applied directly.

For example, since LAD filters attenuate light by several orders of magnitude, small areas of focused light (such as that emitted from the instruments of a vehicle) or diffused ambient illumination, e.g., from a nearby town, may not be seen with them. Since the extent to which success in tank driver training is dependent on such factors is unknown, it was necessary to collect some empirical information. Field research also was necessary because there was some concern that the restricted peripheral vision of the welder's goggle would limit depth and cue perception. If such were the case, the acquisition of appropriate perceptual motor skills would be inhibited in training for these tasks.

Improvement of performance effectiveness was the criterion used for evaluating the LADs in this research. The standard was defined operationally as the degree to which prior practice reduced the amount of time and number of errors involved in performing a given task. The research plan included three different groups of trainees, only one of which received the LADs training during the practice exercises.

The other two groups were used as control conditions in order to compare the LADs trained group with those who received no comparable night training or actual night practice. The first control condition was included to provide a baseline level of performance for determining whether any type of night training makes a difference. An actual night condition was needed to determine whether the LADs afforded the same degree of training transfer as practice during normal night darkness.

Two concurrent field tests involving driver training with the *M-60A1* tank and the disassembly and assembly of the *M-219* machinegun were conducted. A total of 24 companies participated in the tank driver field test, while only 12 of these same companies were represented in the disassembly and assembly test. This occurred because each company was composed of twice as many platoons of turret crew (gunner/loader) as compared to tank driver trainees, i.e., four vs. two. The performance data for each test was collected during practice exercises before an examination. The performance measures for both the tank driver and disassembly and assembly tasks included error counts and subjective ratings by observers. In addition, the time required to complete the latter task was recorded to provide an objective index of performance.

Forty-eight platoons of driver trainees were assigned randomly to the three types of driver training conditions. The field test progressed in a series of three phases which included

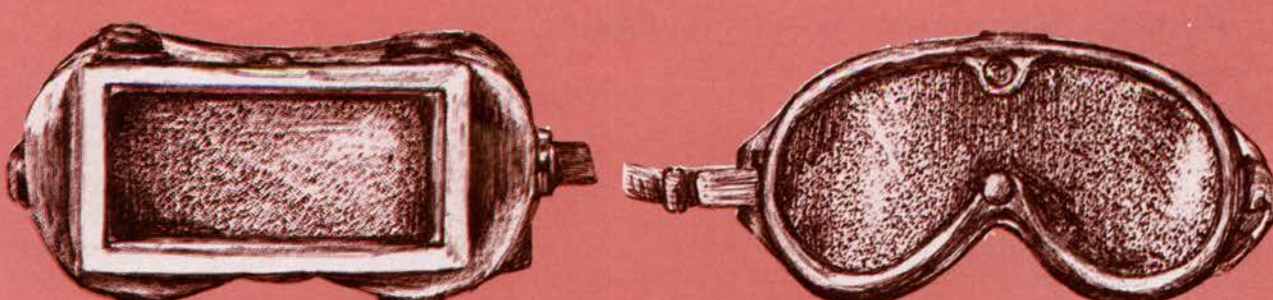


Table 1. Mean Number of Errors Made in Driving *M-60A1* Tank

Training Conditions[a]	Training Phases			
	I (Day Practice)	II (Night Practice)	III (Night Test)	Change[b]
LADs n = 160	3.0	2.4	2.0	+ 1.0
Control I (No Practice) n = 169	1.1	-	1.1	0.0
Control II (Night Practice) n = 133	1.5	1.1	0.8	+ 0.7

[a]462 trainees participated in this field test.
[b]Obtained by subtracting phase III errors from those made in phase I.

- Day training for all soldiers.
- Exposure to one of three practice conditions.
- A posttest for assessing the effects of training.

The practice trial for trainees involved their completion of seven subtasks, such as a vertical wall climb, and ditch crossing on the tank obstacle course. The tank commander/instructor used an inventory that included a checklist to rate trainee performance on each critical step involved in the subtasks. In addition, the TC also reported in detail on near misses of accidents, personal injuries, or damage to the tanks.

The mean number of errors in each of the experimental conditions across the three training phases are shown in table 1. The results indicate that both the LADs (simulated night) and actual night training groups started with relatively high error rates that were reduced before the final phase. On the other hand, the group not receiving night practice started at the lowest mean error level and showed no change. It could be argued that this group was so low to begin with that any improvement would be difficult to demonstrate. However, the actual night practice group also started low but nonetheless, it continued to improve across training phases.

Critical incidents during either day or night training were relatively rare and scattered so that no group incurred more than its own share of tank disabilities. The most common incidents were thrown tracks, getting bogged down in mud, and occasional locked brakes. No near misses or personnel injuries were reported during the field test. In view of routine training experience, this zero report probably reflected the general aversion of organizational personnel to report such incidents.

An ARI observer/data coordinator also made regular, hourly checks on sky and visibility conditions during the practice and test sessions. This was to determine whether driving with the LADs was practical under all types of weather conditions. During the period of data collection, April 10 - July 11, 1978, trainees experienced days that were overcast, hazy, and rainy in varying degrees. Even in the worst of these visibility conditions, the LADs were used effectively.

In the disassembly and assembly field test, 48 platoons of gunner/loader trainees participated. This test was conducted with two platoons at a time in a half-day classroom exercise. Platoons were assigned randomly to the same three comparison groups and training sequence that was used in the tank driver test (see table 1). The LADs practice and night training and testing trials were preceded by 25 minutes of darkness adaptation. In accordance with the usual procedure followed at Fort Knox, the night trials did not occur during actual night but with lights turned off performing the task indoors. Since the performance standard called for disassembly and assembly and a function check within 4 minutes, the time required to complete the task was recorded for each trainee. If all of the trainees had not finished after 10 minutes, the exercise was terminated to allow the remainder of the class to continue the session.

Ratings of each trainee's performance also were obtained in addition to the time measures. Since there were not enough instructors for each individual, trainees were instructed to score one another on the correct performance of five critical steps involved in the task. Trainees also provided an overall performance evaluation on a nine-point scale that ranged in value from 1 (extremely poor) to 9 (outstanding). To prevent collusion, 50 percent of the trainees were rotated to a different classroom position after each trial so that no two trainees were permitted to score each other.

The mean time required to perform the disassembly and assembly task in each training condition across the various phases of the field test are given in table 2. The results indicate that, on the average, from 143 to 199 seconds were required to perform the task during daylight and more than twice that during the night trials.

Table 2. Mean Time (Seconds) for Disassembly and Assembly of *M-219* Machine Gun

Training Conditions[a]	Training Phases			
	I (Day Practice)	II (Night Practice)	III (Night Test)	Change[b]
LADs n = 129	167	310	284	-117
Control I (No Practice) n = 181	199	-	420	-221
Control II (Night Practice) n = 120	143	379	367	-223

[a]430 trainees participated in this field test.
[b]Obtained by subtracting phase III time from the corresponding seconds in phase I.

Since the acceptable standard of 240 seconds is the same for both day and night performances, a large number of the trainees apparently did not reach this level by the end of the practice sessions. More importantly, the results indicate that the LADs-trained group performed the best overall. In fact, trainees in this group outperformed their counterparts in the night and no-night practice conditions by 83 and 136 seconds respectively.

The differential performance evidenced by the LADs-trained group to the other two groups also was evidenced in the relative number of trainees who failed to complete the task within the 10-minute limit. The number of trainees in each training condition who exceeded the 10-minute limit is given in table 3. These results further corroborate the finding that the LADs-trained group performed the best, and those in the no-practice condition did the worst.

Table 3. Number of Trainees Who Failed to Complete Disassembly/Assembly Task

Training Conditions[a]	Training Phases			
	I (Day Practice)	II (Night Practice)	III (Night Test)	Change[b]
LADs	0	1	2	-2
Control I (No Practice)	2	-	41	-39
Control II (Night Practice)	0	11	9	-9

[a]430 trainees participated in this field test.
[b]Obtained by subtracting the phase III number from that of phase I.

With regard to the errors in performance, the difference between the number committed on the day and night trials was regarded as the critical measure rather than the absolute proficiency level shown on the night trial. The reason for this was that the groups assigned to the various training conditions may have had different amounts of practice prior to the day trial. Analyses of the change scores indicated that the three training groups did not differ statistically. However, the results for the error scores paralleled those obtained for the time measures. That is, the mean increase in errors made during darkness as compared to day was least pronounced for the LADs group (.02), most evident for the no-practice group (.17), and intermediate for the night training treatment (.08). This same pattern of results also was obtained for overall performance ratings as well.

Results of the Fort Knox field tests validate the application of LADs to tank driver and weapons disassembly and assembly training. With regard to the former task, the LADs-trained group evidenced the greatest reduction in the number of errors committed relative to the other training procedures.

These results imply that using the LADs during daylight can provide benefits similar to actual night training in terms of enhancing tank driver proficiency. Moreover, there are several potential advantages of training with LADs instead of during actual darkness for this type of armor task. In particular, using LADs as a simulator or supplement might reduce the amount of time, equipment, and effort required to repair and recover disabled vehicles on the obstacle course. This is because such maintenance procedures could be conducted more routinely during daylight as compared to darkness.

The field test results indicated that the application of LADs to the weapons disassembly and assembly task was extremely successful. In this regard, prior practices with the LADs as compared to the other training procedures substantially reduced the amount of time required to perform each task. Moreover, subjective evaluations in the form of error counts and performance ratings by observers were more favorable for LADs than for the other training groups. The relatively greater performance enhancement derived from the LADs training could have resulted from several factors.

For example, during the practice trial the evaluative feedback provided by observers may have been better for the LADs as compared to the night (lights-out) condition. This is because the observer in the former group would have full vision and, therefore, be better able to observe, evaluate, and correct trainee performance. Also, it is possible that the restricted field of view afforded by the welder's goggle LAD aided performers in focusing their attention on the task at hand and not being distracted by things occuring around them. This behavioral tendency then may have carried over to the lights-out testing phase.

The relative success of the LADs night simulation in both classroom and open field training offers much promise for armor instruction. The results of the present field tests indicate that the LADs have applicability for tank-driver training and weapons disassembly and assembly training as well as selected infantry and aviation tasks. It appears that the LADs could be used effectively as:

- An adjunct or supplement to normal night training.
- A transition to night operations under controlled conditions.
- A substitute for normal night practice (where scheduling conflicts or safety concerns make an alternative necessary).

It also appears that LADs could be used readily to train military units and to help maintain a high degree of combat readiness. The potential benefits of incorporating LADs into existing or modified programs is further underscored by the Army's growing awareness of the need for developing a continuous operations capability. This doctrine states that in modern warfare combat and support functions will be conducted at all times of the day or night under all illumination levels. In view of this tenet, combat and support personnel must be trained to rely on reduced visual cues to perform their military functions successfully. The LADs provide a safe, convenient, and cost effective means of accomplishing that goal.

PAUL R. BLEDA, Ph.D., is a research psychologist at the U.S. Army Research Institute for the Behavioral and Social Sciences in Alexandria, Va. He currently works in the Engagement Simulation Technical Area at ARI and is responsible for the continuous operations program. His research interests also include leadership, job-related motivation and satisfaction, and group cohesiveness.

ROBERT W. BAUER, Ph.D., is a research psychologist at the U.S. Army Research Institute for the Behavioral and Social Sciences, Field Unit, Fort Knox, Ky. He is currently involved in research on methods for determination of crew performance requirements and training requirements in high performance tracked vehicle systems.

Vehicle Repowering

The Norwegian M-24

by John W. Kessler

In this day of increasing prices and limited defense budgets, the repowering and modernization of existing armored vehicles becomes an increasingly attractive option for defense planners in many countries. In fact, since the earliest days of mechanized warfare, more powerful new engines or power plants of advanced design have been fitted to original hulls. Recent efforts in this direction have included the addition of a more powerful main gun, the upgrading of turret control systems, and often the addition of infrared or laser range-finding and aiming capabilities. Retrofits have occured within the U.S. Army with the upgrading of the *M-48* and *M-48A1* to *M-48A3* and ultimately *M-48A5* status. The ubiquitous *M-113* armored personnel carrier, originally designed with a gasoline engine, is now diesel powered. One of the most active in vehicle retrofit has been the Israeli Army which, among others, converted the *M-4 Sherman* tank to a more powerful battle tank and is now converting it to self-propelled artillery and mortar platforms.

The repowering of armored vehicles represents an economically feasible alternative for nations unable to commit the large investment necessary for recently produced armored vehicles. In fact, there may be sound tactical reasons for extending the useful lives of older vehicles when comparable new replacements are three and four times more costly than the refurbished vehicles. Thus, for a given investment, new vehicles can significantly reduce the amount of armor a country is able to field.

A recent example of the trend toward retrofit programs is offered by Thune-Eureka A/S of Norway. Thune performed an extensive retrofit for the Norwegian Army for *M-24 Chaffee* tanks. The vehicle in its current role is used as a tank destroyer, in which role the Norwegians have found it useful because its size and weight allow it to use secondary roads where potential adversaries cannot follow. The retrofit accomplished several functions that upgrade the vehicle, fit it for its new combat assignment, and alter it for almost exclusive use in extremely cold weather.

The original twin Cadillac gasoline engines are replaced by a single *6V53T* Detroit Diesel engine driving an Allison automatic transmission. Engine to final drive speed and direction of rotation matching are accomplished by a new gear box. A cooling system is fitted which uses hydraulically operated, thermostatically controlled fans. To better suit the Norwegian environment and accommodate the new fuel, a new heavy duty heating system is installed. The batteries are moved to the floor of the fighting compartment, and have hot air piped to them to increase their capacity during winter conditions.

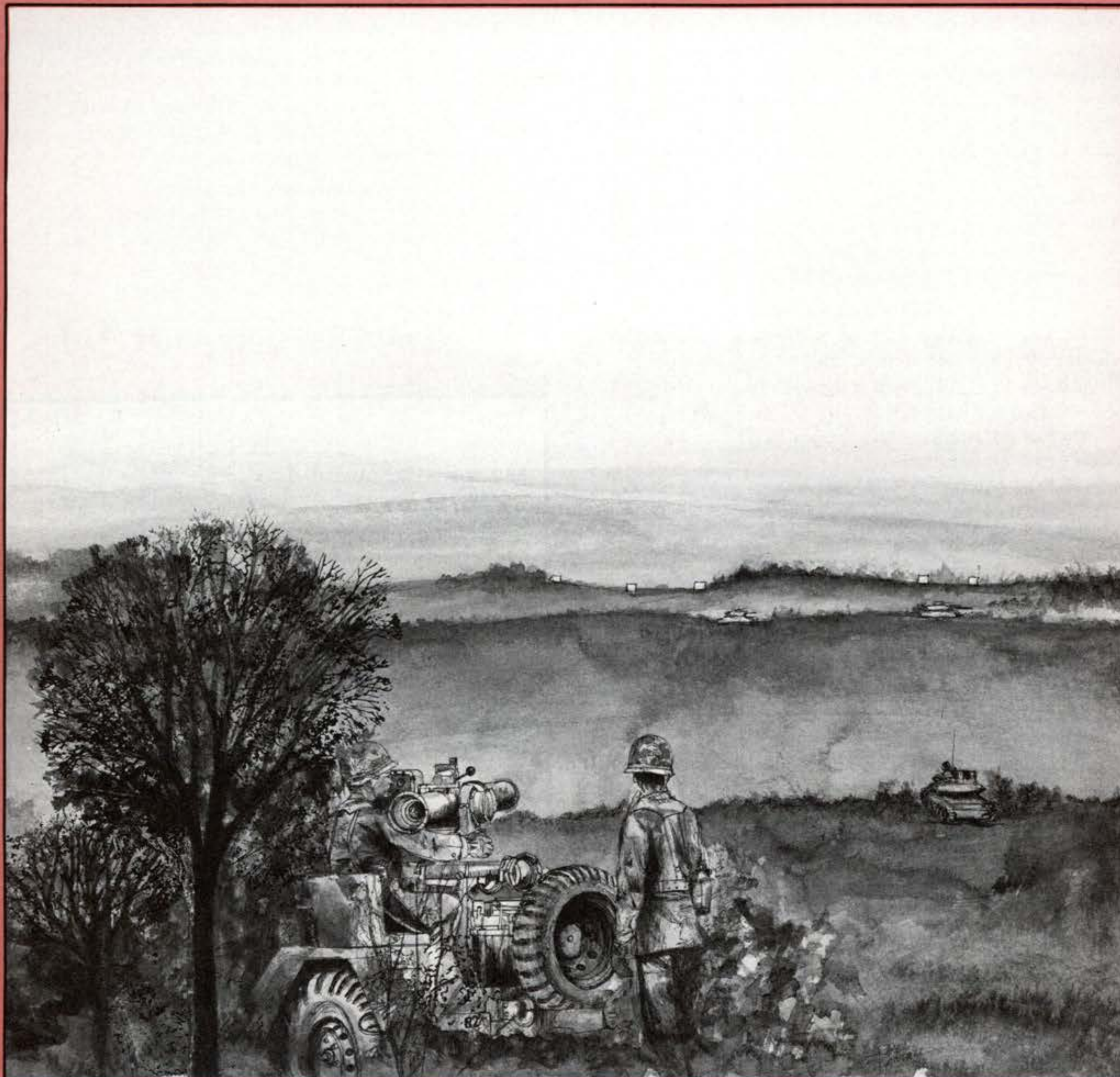
The vehicle is fitted with a new 90-mm low-pressure main gun. This improvement includes replacement of the barrel, minor modifications to the breech assembly, and replacement of the telescope reticle. The recoil mechanism and the gyro-stabilizer are not modified. A 12.7-mm coaxial machinegun is fitted. Four smoke grenade launchers are mounted on each side of the turret.

In order to store a sufficient amount of the new ammunition and to conform to more modern practice, the assistant driver's position is eliminated and the associated machinegun ball turret is welded shut. This space is used for 90-mm ammunition storage. To increase the comfort of the crew and enhance their ability to service the main weapon, the modified turret is fitted with a basket which eliminates the need for the loader to work from a kneeling position. A number of ready rounds are carried in the basket.

In any retrofit there are, or can be, a number of positive

byproducts, both for the tactical commander and the officer charged with supporting the vehicle within certain time and budget constraints. First and foremost, for a given level of investment a country can have a significantly larger armored force. Second, the range and reliability of the vehicles are increased, meaning a wider operational radius and a higher probability that the mission will not be affected by mechanical breakdown. Third, the engine and associated systems are replaced with ones of modern design that can be supported without unreasonable effort or cost. Fourth, fuel costs and consumption drop drastically, offering significant savings. All of these advantages have been obtained by the performance and the retrofit of vehicles which, instead of sinking into obsolescence, provide combat-ready service to modern standards for many years to come.

JOHN W. KESSLER is the marketing specialist for the Repowering Projects of the International Marketing Group of Napco Industries. In that capacity, he is responsible for developing proposals and promotional material for Napco. Mr. Kessler, a veteran of the Navy's Submarine Service, holds BSB and MBA degrees from the College of Business Administration of the University of Minnesota.



Antiarmor Complex

by Private First Class Mark M. Dupuy

The 82d Airborne Division has spent years and approximately $320,000 constructing an antiarmor complex. This new development offers improved training, not only for armor crewmen, but also for the infantry soldier. The complex consists of three courses, each designed to increase efficiency in antiarmor defense.

Advanced Gunnery Range

Built by members of the 548th and 307th Engineer Battalions, the Advanced Gunnery Range can be used to train armor and infantry troops. It is the largest of the three ranges, and consists of a 60-foot control tower, two tank firing pads, multiple firing lanes, and a large target area.

One feature of the Advanced Gunnery Range will be the use of remote controlled tanks as targets. The concept was developed by the Kaman Sciences Corporation in 1973. The tank is fitted with a micro-computer which converts navigational information into guidance data for the vehicle steering servomechanism. The tank is then driven over a specified route, and the computer memorizes the tank's path. Later, the vehicle can steer itself through the course while being fired at by ground troops using practice *Dragons,* light antitank weapons (LAW), and TOW missiles.

Plans are being developed to use the new remote control tanks for the helicopter ranges. There are no plans at this time to use them as targets for the *Sheridans,* which will use stationary and rail-mounted targets instead. A circular track enables the *Sheridans* to fire from three positions with all of its weapons.

The course will allow the *Sheridans* to fire Tables VII and VIII. Elements of the 4-68 Armor (Abn), have already trained on the course, and plans call for full operation of the remote control capabilities by February 1979.

Close Combat Course

The Close Combat Course is centered around training ground troops in antiarmor defense and demolition. The circular course is divided into the following stations at which the subjects listed are taught.

Station 1—Introduction to the course and a short explanation of each station.

Station 2—Antiarmor mine fields, their characteristics, and how to set them up using training mines.

Station 3—Characteristics of armored vehicles.

Station 4—*Dragon* antitank weapon. Troopers learn how to set up the *Dragon* and how to find ideal positions and tracking space. *Sheridans* participating on station 7 provide lifelike targets for the training.

Station 5—Soldiers learn the construction of antiarmor obstacles such as log hurdles, cribs, rectangular and triangular ditches, and log post obstacles.

Station 6—When regular antitank weapons are not available and time limits constructing obstacles, expedient demolition is used to defeat armor attacks. The use of pole charges is taught, along with track demolitions.

Station 7—A confidence course, where the soldier lets the tank go over him while he lies in an 18-inch cement culvert, then pops up to disable it.

Station 8—Chemical warfare against an armored attack. Personnel carriers are used for targets as the soldiers make and use dummy Molotov cocktails as weapons.

Armor Recognition Course

The Armor Recognition Course uses silhouettes of all types to teach troopers to identify armored vehicles by their shape alone.

Training with the antiarmor complex began in January, 1978. The use of remote control targets has added realism to the 82d Airborne Division's training program.

PFC MARK M. DUPUY attended the Defense Information School and Airborne School after completing Basic Combat Training at Fort Knox, Ky. in December 1977. After serving as a recruiter for a month in his hometown of Albuquerque, N. Mex., he received his present assignment as a journalist in the Public Affairs Office, 82d Airborne Division, Ft. Bragg, N.C.

DRAPER AWARD

The Draper Armor Leadership Award was presented recently to Captain Robert Mixon, commander, Troop L, 11th Armored Cavalry Regiment, and Captain George A. Derbin, commander, Company A, 1-246 Armor, Michigan National Guard, St. Joseph, Mich.

The award recognizes the outstanding leadership of small unit commanders as shown by the proper training of their men and performance of the unit in garrison and during field exercises.

Trophies to accompany the award have been produced for Army-wide distribution to the commander of each armored and infantry division, armored cavalry regiment, separate armor brigade (including mechanized brigades), and armored group of the Active Army and Reserve Components. Commanders may request the trophy by writing to:

Commander
U.S. Army Armor Center and Fort Knox
ATTN: ATZK-DPT-P&M
Fort Knox, Ky. 40121

The trophy will be forwarded at no cost to the requesting unit. The commander is then responsible for conducting an annual Draper Competition and awarding the trophy on a rotational basis to the winning company-sized unit.

Winners of the award are announced as they are reported to the custodian of the Draper Leadership Fund at the address above.

The Patton Museum of Cavalry and Armor Presents

A LIVING HISTORY Of World War II

Keyes Park--Behind Patton Museum
4 July, 1979 at 2 p.m.

Pages from the Past

Tank guns roar, machineguns chatter in short staccato bursts, infantrymen leap from their half-track and dive for cover. The battle is joined.

That will be the scene when the Patton Museum presents its seventh annual 4th of July reenactment of a World War II battle.

The event is staged by the museum staff, assisted by 50 volunteers from Fort Knox and the surrounding civilian communities.

The fighting vehicles used in the mock battle are part of a fleet of 24 restored tanks, self-propelled artillery pieces, and wheeled vehicles that are maintained in operational condition.

The historical equipment used in the living history display provides a spectacular show, but the primary purpose of the vehicle restoration program is that of preservation of military rolling stock that may some day be irreplaceable.

Most of the museum's operational historical vehicles, including those shown here, will be on display from 2 to 4 p.m. in Keyes Park during the 4th of July celebration.

NOTES

New Cees

The traditional "C" ration will be replaced with new ready-to-eat meals in flexible packages in mid-1980, according to *Army Logistician* magazine.

Developed by the U.S. Army's Natick Research and Development Command, the ready-to-eat ration is said to be easier to prepare, tastier, and more nutritious than the individual combat meal. The new ration will be easier to carry, 50 percent lighter than canned foods, and will fit comfortably into a combat uniform pocket. The ration packet can be easily opened by tearing off the sealed edge of the pouch. The contents of some ration items may be heated by dropping the sealed pouch in hot water, or the contents may be eaten unheated.

Twelve different meals will be available with each containing an individually packaged meat portion; crackers and peanut butter, jelly, or cheese spread; a high calorie dessert and instant coffee powder. Three of the menus contain beans with tomato sauce, two contain a freeze-dried potato patty, seven contain cocoa beverage powder, and five contain one of three freeze-dried fruits.

High Sensitivity Infrared System

The U.S. Army's Night Vision and Electro-Optics Laboratory has awarded a $1.7 million contract to the Honeywell Electro-Optics Center for the design and production of a high-sensitivity tank forward looking infrared system.

The system will be used on tanks to give greater range and fire control capability in all weather conditions. It features a multi-element focal plane, which combines mercury cadmium telluride photodiodes with charged coupled devices.

Earthquake Bomb

A new multipurpose weapon *(MW-1)*, especially effective against tanks and airfields, has been under development by Messerschmitt, Boelkow, and Blohm (MBB) for the West German Army. The new weapon weighs about 4.6 tons and contains approximately 4,000 small runaway bombs that detonate and cause fires over an area of some 325 yards, making the earth rumble. Hence the name, earthquake bomb.

The bomb is a result of a study begun in 1966 by MBB to find an effective means to counter mass tank attacks in contrast to attacking individual tanks with conventional multpurpose weapons having a high-nuclear threshold. The *MW-1* system can be delivered by low-level flights using *Tornado* aircraft. Submunitions of different types are ejected sideways from four individual containers. To engage armored vehicles, the containers will carry hollow-charge miniature bombs or mines that detonate on impact and provide direct (active) antitank destruction. The mines are also detonated when run over by a tank and considerable area coverage is achieved by the method used to eject the mines.

When attacking airfields, different types of bomblets are used that will cause destruction of runways, prevent movement of aircraft on the ground, and destroy aircraft parked in shelters. The *MW-1* can be carried by several different types of aircraft other than the *Tornado*.

General Support Rocket System Tested

The redesigned General Support Rocket System rocket streaks through the sky at White Sands, N.M., during its first flight December 1, 1978. The rocket was redesigned at U.S. Army direction to accommondate German mines as well as U.S. antipersonnel and antimaterial munitions.

First TAURUS Armored Recovery Vehicle for Canada

The first TAURUS armored recovery vehicle has been delivered by the German company MaK Maschinenbau Gmbh to Canadian Forces in the Federal Republic. The vehicle was one of 45 units of the *Leopard* family to be delivered.

Recovery Vehicle

The Bundeswehr recently received 100 product improved recovery vehicles which give its armored force a better recovery and repair capacity.

Bracing capacity was increased 25 percent by using a tail support in addition to the front spade. A low-speed winch runout capability has been added to allow armored vehicles to be secured to recovery vehicles during deep fording and submerged operations.

Training Tanks

Sixty driver-training tanks have been delivered to armored training units of the Bundeswehr. The tanks, based on the *Leopard I MBT,* provide modern, realistic and cost-effective student training, both on and off-road.

The training tank consists of a regular *Leopard I* chassis with a cabin replacing the turret, and a dummy gun. The crew is made up of two student drivers and an instructor, who has a second control panel. He can monitor the student's progress, and intervene when necessary. The normal traffic safety devices on the *Leopard I* are augmented by large rear-view mirrors, directional indicators, and warning lights. lights.

Patton Museum

The Patton Museum added another armored vehicle to its collection on September 29, courtesy of the Federal Republic of Germany.

The *Spachpanzer Luchs* reconnaisance vehicle is currently part of the West German military inventory. The gift to the museum is a fully-operational experimental prototype, nearly 21 tons. Its 10-cylinder water cooled 390-horsepower Daimler-Benz diesel engine provides a top speed of 70 kilometers per hour (42 mph). The *Luchs* is 10 feet tall and measures more than 25 feet from end to end.

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 58)

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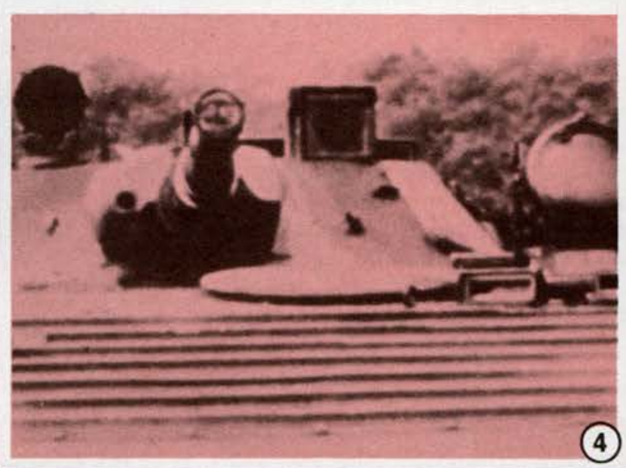

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THE NCO's ROLE

A primary principle of leadership is that of taking care of soldiers. Many look at it as only looking after physical comfort, but that is not the whole picture. You can take care of a soldier by looking after his training, morale and discipline. You give him responsibility and hold him responsible for standards of performance and readiness.

We are a people organization. True, our equipment is made up of tanks, planes, radios, etc., but our most important asset is people.

At one of my previous duty stations the leaders forgot to take care of the soldier. We had a beautiful duty station—but we had a lot of unhappy soldiers, and their work reflected that. A soldier would do exactly what he was told. He would not disobey or become belligerent, but if you didn't tell him exactly what to do he would not do the work.

As we made people understand, there was a gradual change. Being a soldier became a thing of personal pride.

On NCOs

Commanders have many responsibilities and often cannot spend as much time with the privates as they would like. If the NCO is the least bit effective, he knows the soldier better than anyone else. The commanders give orders, but it's the NCO that causes the order to be executed. He is the one who gets down on the ground and gets the young soldier to do the job. The commander may drive the train, but the NCO makes the wheels go around.

You see a lot of NCOs today who really don't know who does what. They don't know where to send a soldier who has an administrative problem. They don't know how to process a DF if the soldier needs a personnel action. It is the senior NCO's responsibility to teach those young sergeants. It's more than instructions in how to give an order or fix a truck; the senior NCO has to teach the junior NCOs and prospective NCOs the little "ins and outs" of being an NCO.

We also have to re-educate the middle grade NCOs who came in during the Vietnam buildup. They were lost in the shuffle. Their educations were sometime pushed aside for experience. Now we have to get back to basics, and teach them the full scope of their responsibilities.

Nothing makes me more upset than to hear a sergeant say he's not a babysitter. Well, I'm not a babysitter either. If I go out to see where the soldier goes to socialize to get an idea of what he faces when he goes downtown, or check the messhall early in the morning, or walk through the barracks at night, I'm not babysitting. A lot of younger sergeants were brought up with that syndrome. It's going to be hard to let those people make mistakes; to sit back and let the NCO make mistakes and not overreact.

On Fraternization

It is an old adage that nothing in itself is bad; it's only bad when it's abused. There used to be a concept in many units in the Army that the E9s associated only with E9s and E7s only with other E7s. This went down to E5. I'm not saying that was wrong, but I think the units that had that policy missed the boat.

Let's talk, too, about the senior NCO who is constantly socializing with the lower grades. That is wrong. The NCO has to be a friend, but not a buddy. A friend is a person who truly cares about someone. We all have buddies we socialize with, but with whom we never get too involved; whereas the friend gets deeply concerned and involved with every facet of your life.

We have the added problem of fraternization with female members. The young single sergeant can't socialize with a female private. Once he has betrayed his confidence as a sergeant, he can't deal effectively with her on the job. He is there to help her do the various things soldiers have to do. He must teach and train her, but he can't cross that line.

So if you're talking about fraternization where the NCO is a friend, the guy who is concerned about your personal and professional problems, then that type of fraternization we need. If you're talking about the buddy syndrome, then it's wrong.

On Money

Although we are able to identify many areas that need improvement, we face fiscal restraints. Upgrading living areas, providing more services, and other projects take money. In many instances we will recognize a problem, and will really want to take action. However, we will have to wait for funds. There are improvements we have programmed, but which won't take effect right away. In fact, in some areas our present soldiers will not receive the benefits of improvements, but those who follow will be better off. We must accept these frustrations and not allow them to deter us from our ultimate goal—improving conditions for our soldiers.

On Readiness and Leadership

Many people look on readiness as the readiness report. They minimize or forget soldiers are a vital part of readiness. I just came from an armor brigade where we used to say about our tanks, "If you don't have a man to operate that tank, all you have is a 52-ton radio." If we emphasize the soldiers, and take care of them, they will develop a sense of pride, a sense of duty, and a sense of mission; and those soldiers will take care of the equipment.

I can cite my own example. My platoon sergeant in 1945 probably never realized the impact he had on my life. It took the battalion sergeant major 18 years to realize the impact he had on me. It was those people who made me decide to stay in the Army. When I was promoted to command sergeant major, the then-retired battalion sergeant major from my first unit was present at the ceremony. It was then he realized what impact he had had.

Years ago my platoon sergeant gave me four pointers that I never forgot. I always try to make them my guidelines when I deal with soldiers.

Be Fair. Reward those who deserve to be rewarded and punish those who deserve to be punished. If you don't punish those who deserve it, you're not being fair to those who care.

Be Firm. Make a decision and stick with it.

Be Friendly. Friendly to the point that soldiers can always approach you without fear.

Be Forceful. You have to exert yourself. Soldiers don't look up to NCOs who are slow to react.

Condensed from an article by CSM Patrick J. Campbell in EurArmy, September 1978, and earlier in 3d SUPCOM Log.

CHINOOK MODERNIZATION

The Army is conducting a major modernization program for the *CH-47 Chinook* helicopter fleet that will provide a rapid, reliable troop and cargo transport system through the year 2000. Existing *CH-47A, B* and *C* models will be modernized into a single *CH-47D* model. The best of the technological improvements resulting from such Army research and development programs as the heavy lift helicopter and utility transport aircraft programs will go into the *Chinook* modernization.

Initial production will begin about October 1980, with the first deliveries of the modernized craft expected to be three per month, with the entire fleet being converted in 11 years.

Changes to be made to existing airframes include:

- Installing fiberglass rotor blades that are more damage and crack resistant than metal blades and eliminate the need for the integral spar inspection system.
- Redesigning and installing an improved drive system. The drive system will be upgraded from a 6,000 to a 7,500 horsepower rating.
- Installing an improved transmission lubrication system. The new system reduces leak points from 116 in older models to 28 in the D model, and reduces system components from 210 to 90.
- Installing an improved auxiliary power unit. The unit provides direct hydraulic power for ground operations, system checkouts, main engine starting, flight control hydraulic system operation, and electrical system checkouts.
- Installing and relocating main wire bundles. Two redundant wire bundles, each capable of complete system support, provide capacity for increased electrical loading to power avionic, survivability, and blade de-icing equipment.
- Installing a multiple cargo hook system. Two additional hooks, one forward and one aft of the existing one, improve external load stability, cargo handling flexibility, and allow increased speed with external loads.

A new engine, not a part of the basic modernization program, will be added to *CH-47C* and *D* models to increase reliability and provide additional contingency power, allowing it to fly 30 minutes at maximum gross weight with only one engine operating.

Maintainability and reliability are major features of the modernization program. *Chinook* mechanics participated in mechanical reviews of new components, and some engineering and design changes resulted from mechanics' suggestions.

According to Major General Story C. Stevens, commander of Army Aviation Research and Development Command, the modernization will save the Army $1 million per *CH-47D* delivered over the cost of a new helicopter.

Condensed from the January-February issue of Army Logistician.

PROFESSIONAL THOUGHTS

. . . not just a test of training devices . . .

TELFARE VS. INBORE

In reference to Major Broderick's "professional thoughts" on the *Telfare or Inbore* expressed in your September-October issue, many of his comments are very unkind and unfair to the professionals involved in the subcaliber training device test. Some are not true and could be misleading to the reader without all of the facts at his disposal. Allow me to set the record straight.

First, Major Broderick's observation that the *Inbore* device has two advantages over the *Telfare*, ease of installation and impact area requirements, is valid and well taken. While it is debatable as to whether these are major advantages, comparative ease of installation was considered in the test and is covered in the test report. Both test personnel and training managers agreed that the greater time required to install the *Telfare* was attributable to a general lack of familiarity with the *M-2* HB .50-caliber machinegun. We also felt that more experience with the device would reduce installation time considerably. But we do not know for sure because we did not test it.

He is also correct in that we do not know how the *Telfare* stacks up against the *Inbore* in terms of target life. We did not note any difference during the test, but we were distracted by the overwhelming superiority of both devices in this respect when compared to the 105-mm gun. However, I find it hard to believe that .50-caliber API-T from the *Telfare* is that much more destructive to common target materials then the *Inbore's* .50-caliber spotter round. If API-T is a problem, I suggest that using units switch to regular .50-caliber tracer ammunition, *M-17*.

Contrary to Major Broderick's finding, we did not feel that an occasional burst of two from the *Telfare* significantly degraded its effectiveness as a training device. Both rounds went the same place, for all practical purposes, and if there was any effect on applying BOT, it was easier.

Another issue where our test findings differ from Major Broderick's concerns the hazard posed by the inbore breech flash. While the seasoned tankers of the 3d Cavalry Regiment did not consider the hazard sufficient to warrant stopping the test, they were quite cautious and uncomfortable with the situation. It is generally recognized that an open flame in a tank turret is not good.

And now to the allegation that TCATA purposely designed a test biased in favor of *Telfare* and against the *Inbore*. That is simply not true....and is unfair to the test community. I believe Major Broderick feels the way he does because we did not establish test control procedures to negate the obviously superior performance characteristics of the *Telfare* such as range, velocity, and cyclic rate. He also appears to be under the impression that the test was a shoot-out between test groups firing their respective subcaliber devices. Wrong again!

It should be understood that this was not just a test of training devices, but a comparison of two training systems which include the subcaliber devices, their training programs, and support requirements. The primary measure of effectiveness used in the comparison was tank crew performance in the most realistic combat environment we could create and control. That was the 3d Cavalry Regiment's version of the Tank Crew Qualification Table VIII with the crews firing all weapons on the *M-60A1*, not the subcaliber training devices.

To use Major Broderick's own analogy, we were not testing two pitchers to determine the velocity of their fast balls (and "forcing one of them to throw a bowling ball"). We were testing methods of training pitchers to prepare them to defeat the batters they will encounter come game time. Except for the support requirements, it does not matter what they throw during practice.

Finally, I am not the only one that thinks the *Inbore* device got a fair test. The test design plan was reviewed and approved by all agencies with a bona fide interest. Moreover, we had representatives from the proponents of both devices on site at all times—free to go anywhere and do anything to insure that the test was fair and that their device was at its best. The Deputy PM TRADE visited the test site for the expressed purpose of satisfying himself that the test was not biased. Everyone concurred that the test was honest and valid.

I appreciate Major Broderick's interest in my article and the subcaliber training device test. However, he should bear in mind that as a TRADOC test, its scope must encompass considerations greater than the New Jersey National Guard training environment. If the Guard feels that the *Inbore* is better suited to their needs, I will bet the 3d Cavalry will give them theirs—in exchange for *Telfares*.

ARMAND E. RACINE
Lieutenant Colonel, Armor
APO San Francisco 96301

OPERATIONAL READINESS

General DePuy in his address to the 1977 Armor Conference, General Kalergis in his Tank Force Management study, and much of the comment that followed in *ARMOR* seems to call for a truly "systems" approach to the overall readiness problem.

After 20 years of listening to and reading discussions such as this, I am amazed at the Army's reluctance to make use of the means by which Gen Curtis E. LeMay converted the post-World War II Air Force into a believable "ready now" force. I refer to the Operational Readiness Inspection (ORI).

After the Berlin blockade and the Soviet takeover of Czechoslovakia in 1948, and, in particular, the explosion of the first Soviet nuclear device in 1949, the United States government became convinced that it no longer could look forward to a long period of warning and mobilization if war came again. The US Air Force Strategic Air Command (SAC) was told to act on the assumption, which from then on would appear in the first sentence of all its operations plans, that "war may begin at any moment" and that it must be prepared to react instantly and decisively.

General LeMay made a reality of that mission statement by basing SAC overall management on a *performance* rather than a judgmental test of readiness.

The Air Force did not think up the ORI. The words and the concept were part of its heritage from the army. But the conversion of the ORI from a predeployment test to the contolling element of routine administration and training was a development peculiar to the immediacy of the nuclear age.

The Air Force ORI is essentially a test of a given unit's ability to respond to the contingency plans it is intended to support. An ORI team arrives without notice and evaluates the unit's reaction to emergency action messages that direct the unit to implement the contingency plans. Sometimes the unit deploys, but more often actions halt short of deployment. The unit is graded on everything from the readiness of its individual members and their records to the completeness of "fly-away kits" (spare parts, etc. needed for sustained operations at an overseas base), and the gunnery and bombing scores of its assigned aircraft and crews. There is very little margin for guesswork and the criteria are the same for Regular, Air National Guard, and Air Force Reserve units. Was the unit ready to deploy and conduct operations at a given time? Did an acceptable proportion of the unit's aircraft have "wheelsup" by a designated time? Did the bombs hit the target?

The Air Force Unit commander arrives at the bottom line of his readiness report as does his Army counterpart, essentially by a judgment as to the unit's level of readiness. The difference lies in the fact that the Air Force unit commander knows that his judgmental estimate will be validated by an ORI. Experience to date is that the ORI might reduce the rating, but it is not likely to raise it. In short, the ORI has proved to be a safeguard against the inflationary pressures found to be the plague of the Army system.

This is all old hat to the Artillery. The battery test is essentially an ORI. That has much to do with the fact that the only Army National Guard and Army Reserve combat arms units certifiable as combat ready have been in the Field and the Air Defense Artillery.

The pressures that forced the Air Force into a believable readiness reporting system now impinge on the Army as a whole. The battlefield is only a matter of hours away from the nearest jet-capable airport. Standing at that runway and arguing that the judgmental estimates that still dominate the Army's system that were hopelessly inflated to meet peacetime career pressures is not going to do anyone any good. Nor is it going to help much to argue with the enemy that our units were tested at a lower ARTEP level than the game the enemy is playing.

There is ready at hand in the Maneuver Area Commands the nucleus of a system by which all components of the Army can be tested under common criteria by professionally trained teams independent of command influence. With planning, any unit of the Active Army, National Guard, or Reserve can be administered an ORI often enough to establish a numerical rating of exactly where it stands on the readiness scale.

ORI's and battery tests have a definite relationship to tenure of command. That helps to explain the Army's long delay in accepting a performance test as the basis for its readiness reporting system, except in these units, such as the former Army Air Defense Command, where proven readiness for combat was a criteria for existence. The exception is instructive—when we truly believe in readiness, we will go to a performance test.

WILLIAM V. KENNEDY
Colonel, Armor, USAR

Carlisle Barracks, PA 17013

DECONTAMINATION VEHICLES

At this time, the U.S. Army does not possess any type of vehicle to be used in chemical decontamination. With the knowledge that the next war may be fought in an NBC environment, the Army needs a way to carry decontamination agent for use by mechanized and other units. Understanding the problems of designing a completely new vehicle, I arrived at these modifications to the Army's standard trucks, the *M-35A2* 6x6 2½-ton and the *M-54A2* 6x6 5-ton, adapting them to the purpose of NBC defense.

The current models of these trucks are used to carry MOGAS and diesel, among other things. By simply filling the pods on the trucks with the decon agent, the Army would have a mobile decon vehicle.

The advantage of using these trucks is simple and obvious. The 5-ton truck already has the necessary equipment for the task, including two 600-gallon pods, a pump, compressor and two 15-foot hoses. With a slight modification to the hoses, two high pressure spray washers (such as used in car/truck washes) could be attached. There are also a number of commercial and farm implement sprayers that could be used. These would be perfect for scrubbing and spraying decontaminated vehicles and equipment. The pump and hose could easily be modified to take two sprayers. The truck could also keep its present 15-foot hoses. The pump would have to be modified to take a high-pressure unit in the only change necessary on the vehicle.

Craig C. Mosher
SP-5, K/3/2 ACR

APO N.Y. 09452

OPMD - EPMD ARMOR

OPMD

NEW OFFICER EVALUATION REPORT

The Army's new Officer Evaluation Report (OER), set for implementation 1 November 1979, promises to have more credibility among officers than the current OER.

In developing the new report, the Army's Military Personnel Center (MILPERCEN) gathered information from more than 100 Active Army, Army National Guard, and Army Reserve organizations; a large cross section of the Active Army officers corps; more than 50 selection boards; and a large number of DA managers. A great deal of assistance, support, and enthusiasm came from field participants.

The effort also included a worldwide survey of the officer corps and a review of information from past Army systems, other services, selected foreign services, civilian industry, government, and academia.

Transition Period

A transition period from 15 September to 31 October will precede the new system, and insure that as many officers as possible will get a final report on the DA Form 67-7 to close out their records under the old system. In addition, MILPERCEN teams will brief worldwide. A pamphlet briefly describing the new system is expected to be distributed in July, and articles and videotapes will cover questions about the system. Army service schools will have classes covering the system and the part officers will play in it. Correspondence courses will be available for members of the Reserve Components.

New Forms

The new system uses three forms:

• DA Form 67-8 replaces DA Form 67-7, the current OER. The new form differs in several ways. It does not use a numerical score. It emphasizes the duty description. It includes a more structured performance narrative. It increases the role of the more senior officer in the rating chain.

• DA Form 67-8-1, the Support Form, accompanies the OER through the rating chain but does not go on to DA. It allows the rater and the rated officer to discuss the duty description and specific objectives at the beginning of the rating period. It also allows the rated officer, at the end of the rating period, to describe his accomplishments in light of his duties and objectives.

• DA Form 67-8-2, the Tracking Form, is for DA's use in maintaining a record of the evaluation history of each senior rater. It indicates whether the rater is ordinarily an "easy" or a "hard" rater.

New Features

The new OER system incorporates several features not included in previous officer evaluation reporting systems:

• Rated officer participation. The rated officer's participation throughout the rating period should improve the professional development of officers and the effectiveness of organizations.

• Senior rater concept. The names of rating officials have been changed from rater, indorser, and reviewer to rater, intermediate rater, and senior rater. Most rating situations will include only two rating officials, the rater and the senior rater (usually the same person as the current system's indorser). The senior rater's role has been increased from a purely administrative one to a more active one that includes a critical evaluation of the rated officer's potential.

• Senior rater profile. The profile provides a comparison of a specific rating with a senior rater's normal rating tendency.

• Professional development. The emphasis on better communication, objective-setting, and development of subordinates helps daily performance and expands the traditional functions of the officer evaluation system.

• Personnel management. Explicit techniques and procedures support the specialty concept, focus attention on the human side of the organization, emphasize the functions of programs, and encourage communication.

• Administrative accuracy. The new system simplifies certain administrative items such as the accountability of rating periods, and it allows the rated officer to review and authenticate administrative data.

In the transition to the new system, each officer will get a final report under the old system. This will ensure " a degree of fairness that was lacking when we changed systems in the past," said General Bernard W. Rogers, Army Chief of Staff, in announcing the target date for implementation.

EPMD

REVISIONS MADE TO ENLISTED EVALUATION REPORTING SYSTEM

Significant revisions to the Enlisted Evaluation Reporting system which become effective 1 April 1979 include:

- A revised schedule for the submission of annual reports.
- Implementation of a "complete the record" SEER.
- Mandatory narrative comments on all EER/SEER.

Annual Reports

Annual reports will now be submitted one year from the ending month of the soldier's last EER/SEER—i.e., change of rater, or special or annual report. Under the old system all E6s received annual reports during the month of June. Now, if an E6 receives his last SEER in August—a change of rater report—his next annual report will be due next August, instead of June.

Occasionally a soldier's annual report becomes due 12 months from the last report, but the minimum 3-month rating period/rater qualification requirement will not have been met because of an extended student or patient status. In these instances, the period of the report will be extended until the 3-month rating period/rater qualification is met. Procedures for the submission of a change of rater or special report remain unchanged.

The revised annual report submission schedule provides the following improvements.

- Produces a leveling effect on the workload over the entire year.
- Decreases the total number of reports processed annually by field MILPOs.
- Decreases the number of reports rating officials would be required to prepare at any one time, thereby improving the overall quality of enlisted evaluation reports.
- Ensures that all eligible service members receive at least one evaluation report per year.

Mandatory Narrative Comments

Narrative comments are now required on all enlisted evaluation reports. Formerly, comments were required only under those circumstances outlined in the instructions contained in Part II of the report forms. Under the present policy, rating officals may evaluate a soldier as needing improvement in a performance trait or quality without being required to address the deficiency cited. The revised policy requires all ratings of *ranks with the very best* (overall performance); *promote immediately* (advancement potential); *needs improvement; demonstrates major shortcomings; not promote;* or *deny continued active duty* to be cross-referenced and specifically addressed by rating officials. Additionally, career development recommendations are required on all EERs/SEERs. This portion of the report provides rating officials the opportunity to make career development recommendations concerning the soldier's potential for future assignments, schooling, and other personnel management programs.

Complete-the-Record Reports

Another significant change is the introduction of complete-the-record reports for soldiers in the announced zones of consideration for DA centralized promotion/selection boards.

Submission of complete-the-record reports are optional with the rater, provided that the individual in the zone of consideration has not received a report for his current duty assignment, and the 3-month minimum reporting requirement, as specified in AR 600-200, is met.

The complete-the-record report provides rating officials the opportunity to update the official record of those soldiers who have changed duty assignments since their last SEER was submitted, provided the minimum 3-month rating period requirement is met. Since the report is rater-optional, absence of a complete-the-record report at the time of the board's review will not be a basis for requesting standby board reconsideration. The initial complete-the-record reports will be submitted for the CSM/SGM Retention Board, scheduled to convene in June. The HQDA message announcing the zones of consideration and the board convening date will provide guidance for submission of these reports.

Administrative procedures to support the policy revisions are contained in recent changes to AR 600-200, DA Pam 623-1, and DA Pam 600-8.

Source: Focus, Number 4-79, dated 2 March 1979

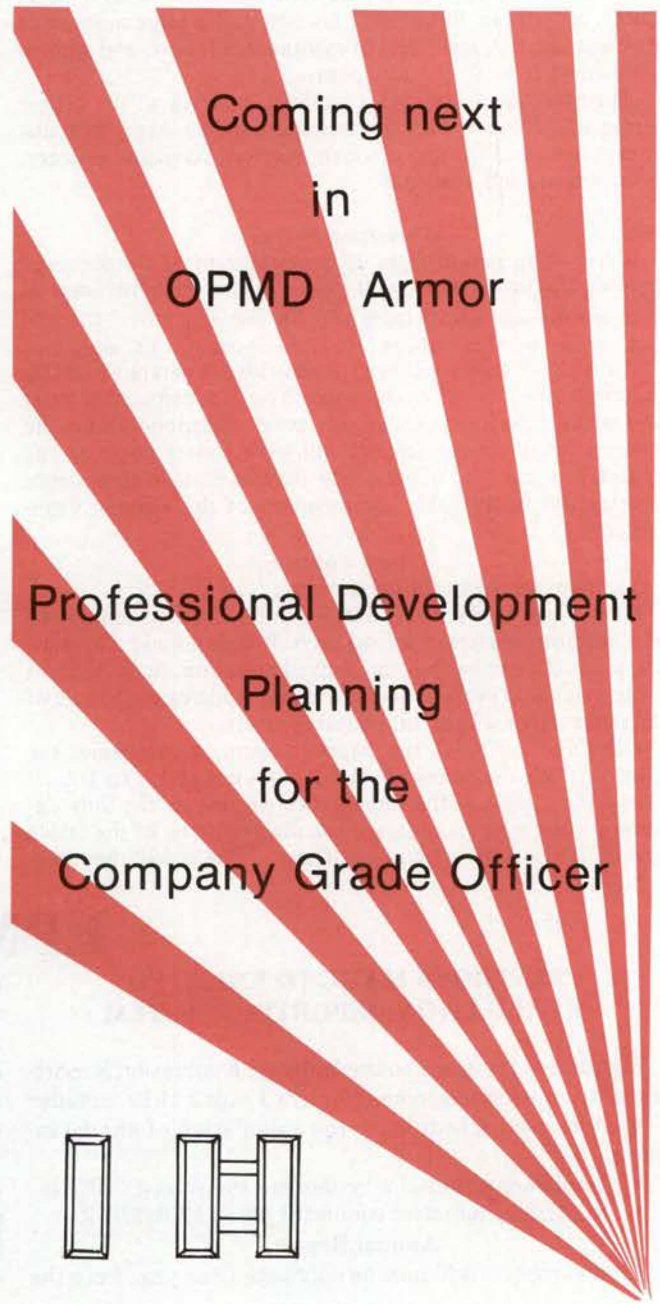
ENLISTMENT BONUS

For the first time the Army is offering an enlistment bonus in excess of $2500. The enlistment bonus for Armor skills (Career Management Field 19) has been increased from $2500 to $3000 which is the maximum amount permitted by law.

To be eligible for this bonus program, which began 22 January 1979, an individual must be a high school diploma graduate; be classified in mental categories I, II or III; be a non-prior service enlistee; and must enlist for a period of at least four years.

The increase was brought about due to a long-term shortfall in recruiting for CMF 19 skills. As an example, in FY the Army recruited 6,988 personnel in CMF 19 against a requirement of 9,157. In the first quarter of FY 79, 990 personnel were recruited against a requirement of 2,829.

The bonus will be paid upon the individual's successful completion of training and award of the MOS.



BOOKS

COMPARATIVE STRAGETY: AN INTERNATIONAL JOURNAL, v. I no. 1 and 2, 1978. Crane Russak & Company, Inc., 347 Madison Avenue, N.Y. 10017. $14—4 quarterly issues. ($28. for institutional subscriptions).

Comparative Strategy is a new journal dedicated to the formation of a comprehensive national strategy which will integrate political, economic and military factors. In the political parlance, it is a defense-oriented journal, which leans rather clearly to the perspective of the political right. Naturally, we judge all journals, as with books, by their contents. However, since a journal exercises some selectivity in choosing its contents, it is appropriate to find out who is doing the choosing before we examine the contents of the present issue.

By all appearances, the Board of Editors of this journal is representative of the best of the senior scholars of international relations, while it also includes several very promising young scholars who might incline toward fresh and insightful points of view. For example, we find Leon Gouré, one of the foremost scholars of Soviet foreign policy joined by Cynthia Cannizzo, a bright, young professor of political science. In addition, the military finds representation through several prominent retired general officers, notably General Richard Stillwell, and faculty members from the war colleges.

The premier issue of *Comparative Strategy* contains nine articles and several fairly extensive book reviews. The articles range from Richard Foster's interesting introduction and separate treatment of the Soviet economy, to Ray Cline's call for a new national strategy, to discussions of South African policies, Brazilian nuclear programs, prospects for nuclear proliferation in Northeast Asia, and allied military questions. Foster sets the tone for the journal in his outline of the concerns that the *Comparative Strategy* will emphasize. These range from Soviet strategy and vulnerabilities, nuclear deterrence and arms control, intelligence, military force relationships, to geopolitical and regional security issues.

Cline's article is by far the most provocative, and has already received national attention in the *New York Times*. Cline sees the Soviet Union—"a multinational empire"—as the primary global threat with Communist Asia comprising the other rival, although the animosity between Vietnam and China can only raise questions about this part of his analysis. To counter this threat to the U.S.-oriented "transoceanic trading and security alliance system," he proposes that the U.S. must lead the way in creating an "Oceans Alliance," a latter-day Athenian League. Such an alliance would subsume the following key nations (and 13 others): Canada, West Germany, France, U.K., Italy, Israel, Japan, Taiwan and Australia. He argues that such a strong, voluntary alliance would "try to work for an orderly economic, social, and political evolution without destructive spasms of violence." Whether Cline's proposal is realistic (in fact, this reviewer finds it naive in several aspects), it still represents an interesting point of view that does more to stimulate the reader than many of the other analyses which flood the field of international relations.

In closing, *Comparative Strategy* is a competent journal which should be of value to the professional and the interested layman alike. It merits considerations for inclusion in any serious military science or international relations library collection.

Major Augustus R. Norton
Defense Language Institute
Monterey, Calif.

THE BATTLE OF MINE CREEK by Lumir F. Buresh. The Lowell Press, Kansas City, Missouri, 1977. 265 pages, $12.95.

It is perhaps axiomatic that the detailed study of a military campaign provides many pointers on things to do and not to do. The better known battles and campaigns have been analyzed many times over but there are many other less well known battles which offer many lessons to the man willing to dig for them. Certainly, the Campaign and Battle of Mine Creek is one of them.

In September, 1964, Major General Sterling Price, CSA, departed Arkansas on an expedition that was to capture St. Louis, and then, move westward into Kansas. Many other objectives, both military and political, had been assigned and were to be accomplished en route before Price withdrew south into Oklahoma. The expedition started inauspiciously, was conducted haphazardly, and ended in utter disaster. This extreme result, coupled with the fact that it happened on U.S. territory which can be walked today, make the campaign appealing to the soldier-historian.

Mr. Buresh, a local resident of the battle area, has obviously spent a great deal of time researching the battle and the campaign. He is an unchallenged master of details on units, names, and personal histories. These details are woven together quite well throughout the book. Unfortunately, other problems crop up which tend to obscure the lessons to be learned. Attempts were made throughout to draw parallels between Balaclava and Mine Creek. Further, the words *reason why* are lifted out of context from Tennyson's "The Charge of the Light Brigade" and used as a thread of continuity with a totally twisted meaning. These allusions only waste space and frustrate the reader who is familiar with Balaclava and the subsequent poem.

Gratuitous critiques of the actions of various participants are liberally sprinkled throughout the book. These are based on Mr. Buresh's obvious intimate knowledge of the ground, to which the participants weren't privy as the readers are not, thanks to the poor maps. The campaign map is of such a scale as to be virtually useless, and the battle maps are all hand-drawn and nonuniform. As an example, the military symbol for a railroad is sometimes used correctly and on other maps in the same chapter represents creeks or bluffs. Lastly, the technically inclined will be confused by the author's constant references to the Spencer carbine as an "automatic rifle."

Despite its deficiencies, this book does have a wealth of information and emphasizes many valuable military lessons. For the man willing to spend the extra effort to get through the confusion to these lessons, *The Battle of Mine Creek* is a worthwhile book.

Captain Arthur B. Alphin
Rice University
Houston, Tex.

WARNING AND RESPONSE by Julian Critchley. Crane, Russak and Company Inc. 1978, 144 pages, $14.00.

"A study of Surprise Attack in the 20th Century and an Analysis of its Lessons for the Future," harks the cover of this well-written and terse little book by a member of British Parliament. As one might surmise from its title and subtitle, the essence of this work is concern for the Central European front of NATO. The author's initial goal is to review the effects of tactical and strategic surprise on modern war and in the process lay the groundwork for a plea for increased readiness and vigilance within NATO. He later examines the ability of NATO to predict and to respond to the Soviet-Warsaw Pact threat.

Information concerning the availability of professional books may be obtained from the U.S. Armor Association, P.O. Box 0, Fort Knox, KY 40121.

In his analysis of surprise attacks, the author focuses on the Japanese and German attacks of World War II, the North Korean and Chinese operations of the Korean War, and the Arab-Israeli conflicts (or as the author calls them, the Thirty Years War). The analyses are terse and surprisingly perceptive. For example, in his consideration of MacArthur's failure to respond to intelligence indicators of Chinese intervention, Critchley shows that the Chinese strategical and tactical surprise was due not only to his failure to heed the warnings, but to Chinese discipline and use of the old adage that man is destined to repeat his mistakes is quite clear after one gets through this section of the work. One has the perception that more time and effort could have been devoted to this area for the general reader. For the uninformed or previously uninterested reader, this portion is, however, an excellent introduction to the topic.

The next section of the book deals with the shifting balance of power in Central Europe. The major hypothesis is that the buildup of Warsaw Bloc power is actually a cause for decreased warning time for NATO. This transition chapter leads to a critique of NATO's ability to react to and absorb a surprise attack. Relying heavily on a U.S. Senate Report (Sen. Nunn's Report), the author examines the political implications of a reduced warning period. His criticism of the NATO structure then focuses on several points: the coalition nature of the alliance, fragmented intelligence gathering and analysis (there is no NATO intelligence arm), and the lack of an announced strategy for the conduct of a preemptive surprise attack similar to the Israeli 1967 attack. The author contends that NATO can take some precautions to reduce the possibility of surprise while realizing that this possibility cannot be reduced to zero. The primary emphasis of his contention lies with effective intelligence analysis and the concept of preemptive surprise attacks. The author readily admits the vulnerability of the NATO alliance to sudden attack lies to some degree in the democratic nature of the alliance and its individual nation-states.

The book is highly recommended to the military professional in that it serves as a brief review of the past and the current crises in terms of intelligence and the surprise attack. For the non-military, military history buff, I recommend that another text be read if the reader wants to examine the issues of surprise attack. Although it is highly recommended, one should determine the cost-benefit ratio for this book.

Captain Albert F. Leister, Jr.
Department of Behavioral Sciences & Leadership, USMA

RECOGNITION QUIZ ANSWERS

1) **U.S. LIGHT RECOVERY VEHICLE,** ***M-578*** (low hull, Christie-type suspension, high square turret for boom and winch controls, single boom).

2) **SOVIET SAM-8** (six-wheeled carrier, boxlike superstructure housing radar and guidance equipment for four surface-to-air missiles).

3) **BRITISH SCORPION ARMORED RECONNAISSANCE VEHICLE** (angular armor on turret, 76-mm gun, three grenade launchers on each side of turret—one set visible here).

4) **SOVIET BMP-1** (flat turret, gun mantlet nearly same height as turret, ribbed front slope).

5) **U.S. CH-54 SKYCRANE** (outrigger-like landing gear, box-like air intakes above cockpit, flat dome-like rotor head).

6) **U.S. TRACKED CARGO VEHICLE** ***M-548*** (glass-enclosed cab and passenger compartment, canvas covered cargo compartment, .50-cal. machinegun mounted in race ring above cab).

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_______Other. Explain ____________________

3. Do you read the following, if so how thoroughly?

Letters to the Editor	_ All	_ Most	_ Scan	_ No
Commander's Hatch	_ All	_ Most	_ Scan	_ No
Forging the T-bolt	_ All	_ Most	_ Scan	_ No
(Gunner's Corner)	_ All	_ Most	_ Scan	_ No
OPMD-EPMD	_ All	_ Most	_ Scan	_ No
Briefs from Other Journals	_ All	_ Most	_ Scan	_ No
Armor Force Management	_ All	_ Most	_ Scan	_ No
Professional Thoughts	_ All	_ Most	_ Scan	_ No
Pages from the Past	_ All	_ Most	_ Scan	_ No
Book Reviews	_ All	_ Most	_ Scan	_ No
Recognition Quiz	_ All	_ Most	_ Scan	_ No

4. How often do you read articles pertaining to the following subjects?

Tactical Doctrine	_ Always	_ Seldom	_ Never
Logistics	_ Always	_ Seldom	_ Never
History	_ Always	_ Seldom	_ Never
Maintenance	_ Always	_ Seldom	_ Never
Personnel	_ Always	_ Seldom	_ Never
Research & Development	_ Always	_ Seldom	_ Never
Equipment	_ Always	_ Seldom	_ Never
Communication	_ Always	_ Seldom	_ Never
Training	_ Always	_ Seldom	_ Never

5. How do you rate ARMOR's mixture or balance of departments and features?

_____Excellent, _____Good, _____Fair, _____Needs more articles on____________ Needs less articles on ____________

6. How do you rate ARMOR's performance in the following areas?

It is interesting and informative:
_____Always, _____Sometimes, _____Never.

Its layout and design is: _____Outstanding, _____Excellent, _____Good, _____Fair, _____Poor.

It has helped increase my professional knowledge:
_____Significantly, _____Somewhat, _____Not at all.

It is a stimulating forum for new and diverse ideas:
_____Always, _____Sometimes, _____Never.

7. What is your reaction to the following statements about ARMOR?

Its appearance (layout and design) is: _____Outstanding, _____Excellent, _____Good, _____Adequate.

Its articles are: _____Always timely, _____Usually timely, _____Sometimes outdated, _____Other (explain) ________

Its authors are: _____Experts in their field, _____adequately knowledgeable, _____uninformed, _____too opinionated, _____Other (explain) ____________

Articles in ARMOR are: _____too difficult to read, _____written in too technical language, _____easy to read, _____below the reading level of most readers, _____Other (Explain) ____________

8. The artwork in ARMOR:

____is outstanding
____contains too many drawings
____doesn't have enough drawings
____is well balanced
____uses too much space
____other (explain)____________

9. The cover of ARMOR is:

____OK as is
____should feature unit crests and insignia
____should be standardized with one design for all issues
____should have photographs of armored vehicles
____other (explain)____________

10. The type faces in ARMOR are:

____hard to read
____easy to read
____sometimes hard to read (explain) ____________

11. The content of ARMOR should be changed to include more or less articles on the following:

Platoon-level tactics	_ more	_ less	_ same
Company-level tactics	_ more	_ less	_ same
Large-unit tactics	_ more	_ less	_ same
Historical analysis	_ more	_ less	_ same
Research & development	_ more	_ less	_ same
Training	_ more	_ less	_ same
Gunnery	_ more	_ less	_ same
Maintenance	_ more	_ less	_ same
Communication	_ more	_ less	_ same
Logistics	_ more	_ less	_ same
Professional development	_ more	_ less	_ same
Leadership	_ more	_ less	_ same
Personnel management	_ more	_ less	_ same
OPMD-EPMD	_ more	_ less	_ same
Book reviews	_ more	_ less	_ same
Briefs from other journals	_ more	_ less	_ same

12. How do you rate ARMOR as a professional journal?

_____Outstanding, _____Excellent, _____Good, _____Fair, _____Poor

COMMENTS (continue on reverse if necessary)____________

* * * * * * * *

NAME____________
ADDRESS____________
BRANCH OR JOB ____________
RANK OR POSITION ____________
DUTY STATUS:

_____Active duty
_____Active Reserve
_____National Guard
_____ Retired
_____Veteran
_____ Civilian

Comments:

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STAPLE

Views Through the Visor

It seems like yesterday that my first Visor was conceived. Although I'll assist with the July-August issue, this will be my last look from behind the Iron Mask.

We have an outstanding journal. Many consider it the best! Why? Glance back through the author lists, the subject matter, and consider the appearance.

ARMOR's *authors have included all the grades from private to general from the Total Army. We have authors from foreign armies. We have had civilian authors, U.S. (females too) and foreign. None of the authors read the same. Each author's style and personality shines forth. There is no editorial murder board outside the Lannon House doing the editors' jobs.*

Check the subject matter. We are truly a Combined Arms journal, and international at that. We not only write about equipment and tactics, we write about soldiers—not just famous generals, but about soldiers.

Now peruse the design. The covers have been varied. We have used color to its maximum within the regulatory two color limitation. Some civilian organizations use us as their model in the two color concept.

Each editor leaves his mark. Each strives for the perfect journal—his personal mark of excellence. No editor can do it alone, for he must work for you, and you for him. Your demand for the best, and for a better journal, has increased circulation by 3,000 in less than two years.

The last Views Through the Visor sees an Armor Force that is coming together, a force that is once again leading the vanguard in the formation of the Combined Arms Clan. This journal must remain in the lead. With your support the new editor will keep it there.

It has been my privilege serving you as editor of your professional journal, ARMOR.

MAV

Coming in ARMOR

"FORT KNOX'S DRYLAND NAVY"

Have you ever wondered why the mockup of a World War II Landing Ship Tank (LST) came to be at Fort Knox? Lieutenant Colonel (RET) John W. Campbell answers that question about Austin Hall.

"UNCHAINED MOBILITY"

Captain John R. Drebus proposes lightening the "ball" of support requirements and shortening the "chain" of the battalion supply route.

"CAVALRY IN THE ACTIVE DEFENSE"

Major Michael A. Andrews examines the concept of Cavalry in the Active Defense.

"TIME SAVERS"

Major V. Paul Baerman suggests several ways to improve training, including avoiding reinvention of the wheel, cramming maximum training into minimum time, and training to your own needs.

"TANK DESTROYERS"

"Stopping enemy tanks and other mechanized vehicles is the biggest task of our Army today." These words were spoken in 1941. Major Charles M. Baily examines the tank destroyer units and doctrine of World War II, and the part they played during the war.

Why A Master Gunner?

Dear Sir:

"If you want it done right, do it yourself!" How often have you heard that old "saw" or thought of it when a task was inadequately performed? This probably applies to our present day Army too.

Our strength levels are inadequate, skill levels inadequate for the machines, and, in the case of Armor, our leaders are apparently inadequate. Consider, if you will, the Master Gunner concept. Recall a *truth* that has apparently fallen by the wayside, "The unit does well what the commander checks!" (He can't check unless he knows what is correct).

No duty in an armor unit ever resulted in clean fingernails, light duty, or short hours. No lasting skill development for armor crewmen will occur without dirty and broken fingernails, anger at the tank commander, the platoon leader, and the "Old Man"—anger at them for their demanding ways, disregard of the clock, and their failure to understand that a missed target was the fault of the weather, the grinch, the ammunition, or even gremlins. The *miss* was certainly not caused by an inadequately calibrated fire control system, an inadequately zeroed gun, or sloppy crew performance in "prepare-to-fire" checks that experience tells us are required before moving out.

Would you risk your life in an aircraft that was not preflight checked? Neither would I!

The "Master Gunner" in the tank unit *must* be the gunner, the tank commander, the platoon sergeant, and platoon commander. If this is the bottom line, first sergeants, sergeants major, unit commanders, and staffs at all levels in armor units will know and understand problems, training needs, time demands and the multitude of "things" large and small that produce "mission accomplishments,"—and they can intelligently plan for them.

Maybe—just maybe—with this knowledge and understanding, "Mickey Mouse," "spit and polish," "hurry up and wait," "bluster," and "dazzling the chain of command" with fancy footwork, will be replaced with honest training, careful and detailed supervision, and disregard for the clock through involvement of the chain of command, and entire units of "Master Tank Gunners." This is the bottom line!

If a unit needs a *Master* something—give it a master paper pusher or report preparer. Get the "Old Man" out of meetings and orderly rooms and out *with* the crews. Don't be overly concerned with the I.G. He wants to see a unit that is well-trained, a functioning chain of command, and a unit that will succeed in combat. This is achievable with *honest* training.

Consider also that if you do these things—"on the way" "target," "win!" there is less time for drugs, booze, pot, and idle hands. There will be fewer D. R.'s, fewer R. B. I., fewer of all the bad things that induce sloth, demand excuses, and waste everyone's time. It means a lot more time for making possible success in combat, which means winning and going home, it means pride and confidence in self *and* unit, and so much more that I don't know how to put into words.

If success in combat is *still* the objective, we have a long way to go, long hard hours of drudgery, but in the end we will be *"right on target!"*

JOHN G. BELT
Colonel (Ret)

Gahanna, Ohio 43230

Liked ACVs

Dear Sir:

Very much enjoyed your "Air Cusion Vehicles" in the latest *ARMOR* and its updating of the military ACV story. I was particularly interested in details on the study of their use in arctic environments, which, as you confirm, has been fully exploited by the Russians. Perhaps you'll favor us with an update on the arctic program, domestic and foreign, at a later time.

With ACV AFV's, I'd direct your attention to at least one design proposal dating back to the late fifties and detailed in British and U.S. patents. This proposed attaching ACV elements to a conventional battle tank, with the view being to reduce ground pressure of tracked combat vehicles. It would seem to me that this combination of ACV and tracked locomotion systems might have a real future; perhaps, too, some sort of ACV platform which could support battle tanks.

M. ROSEN

San Francisco, Calif. 94121

Recognition Quiz Answers

Dear Sir,

I wish to reply to several errors in your Recognition Quiz on pages 40 and 59, January-February 1979 *ARMOR*.

Your correspondent who corrected your data on the *STRV-103B*, S-Tank, is wrong; your original statement was correct, in that the S-tank has the hydropneumatic suspension. This tank does have a Christie-*type* suspension, with individually sprung roadwheels and no return rollers.

In the issues' quiz, you have labeled photo 1 as "German Hotchkiss APC." No APC's, beyond several prototypes, were built. The vehicle in your photo is probably an *SPZ-111* Observation and Command Vehicle.

Your French *AMX-10* in photo 4 is more accurately an *AMX-10P*. There are a large number of variants in the *AMX-10* series, including several wheeled vehicles. All versions have visual differences from their "comrades" and the alphabetic suffix is vital for accurate identification.

The identification of the *Leopard* in photo 6 is greatly misleading. The first 4 lots of *Leopards* are labeled as *Leopard 1 A1.* Distinguishing between individual lots is rather difficult.

Which chassis is holding up the turret in Photo 2? Can you be more definite than "U.S. Fighting Vehicle"?

My secondary reason for writing arises from your identification of the *M-48A5* in photo 5. From photos in my reference materials, I would have identified it as an *M-60A1.*

JOHN M. HEINRICHS
Officer Cadet

Royal Canadian Armoured Corps
Kingston, Ontario

(The chassis holding up the turret in photo 2 is that of the XM-2 infantry Fighting Vehicle (see pages 30-38 of May-June ARMOR for more pictures.).

The M-48A5 in photo 5 can be identified by the rounded bow armor and dome-shaped turret. The 105-mm gun makes it an A5 model. Ed.)

For Better Recognition

Dear Sir:

In the Recognition Quiz in the March-April, the photo of the *Hawk* missiles depicts the missiles on a storage pallet and not a transporter. The loader-transporter is used only for transporting the missiles from the pallet to the launcher, and not for transportation to the field location.

MAURICE R. ALEXANDER
Major, ADA.

Alexandria, VA 22332

THE COMMANDER'S HATCH

MG Thomas P. Lynch
Commandant
U.S. Army Armor School

Over a year ago the Armor community established CMF-19 with the objective of identifying specific skills for specific positions on discrete tanks and other armored vehicles, thus *producing* an initial entry soldier who reports to his first duty assignment qualified to perform at wartime levels of proficiency. This objective was to be attained through system-specific and position-specific training. Although the training program is moving forward successfully, the U.S. Army Recruiting Command (USAREC) has experienced a recruiting problem in CMF-19 which we have taken action to solve. I will address those recruiting problems, corrective actions and results, and point out how you can help.

The recruiting shortfall for the 1st Quarter FY 79 resulted in a predicted shortage of 1,254 basic armor and cavalry scout trainees in the Armor community. To assist in correcting this problem, guest speakers were dispatched from the Armor

Center to the Southeastern, Southwestern, Midwestern, and Northeastern Regional Recruiting Commands with a two-fold mission. The primary task was to identify the factors related to the recruiting shortfall in CMF-19 and to evaluate possible solutions. The second mission was to better inform USAREC personnel on CMF-19. This two-fold mission was accomplished by presenting a briefing on the workings of CMF-19 to guidance counselors and operations sergeants and officers from each District Recruiting Command (DRC), followed by a discussion of related recruiting problems which identified specific causes and possible solutions.

A General Officer Conference convened at the Armor Center on 11 January 1979 to discuss the identified problems and formulate solutions to alleviate the recruiting pinch. A major issue was the 20/20 visual acuity entry standard for enlisted personnel. Prospective Armor selectees were lost when individuals, many of whom had never had an eye refraction before, were required to take one. The resultant optometry appointment and subsequent loss of time for the prospect caused many individuals to enter other career management fields. The conferees agreed to a temporary adjustment of enlisted entry level visual acuity standards to bring them in line with those for commissioning in the combat arms (corrected to 20/20 in the best eye and to 20/100 in the worst eye). A caveat to the agreement was the requirement to conduct a test, under field conditions, to determine the appropriate visual acuity standard for entry and retention in Armor for both officer and enlisted personnel. Responsibility for developing the test plan has been assigned to the Armor Center, and action is ongoing at this time.

Another factor that inhibited CMF-19 recruiting was the requirement that the prospective enlistee have a civilian driver's license or score no less than 85 on the Army Motor Vehicle Driver Selection Battery I test. Because there was no correlation between this requirement and enlistee trainability, it was eliminated by the General Officer Conference.

Another identified problem was a definite lack of visual aids and information about CMF-19 at Recruiting, and Armed Forces Entrance and Examination Stations. Recruiting Command felt that visual aids were important because many prospective enlistees have never seen a tank and know very little about the Armor Force. As a result, the following actions were implemented to rectify this problem:

- Immediate distribution of over 3,000 copies of "Your Future in Armor" booklets to USAREC.
- *ARMOR* Magazine began mailing approximately 1,900 copies of *ARMOR* to addresses provided by USAREC effective with the January-February 1979 issue.
- Preparation of a TV tape explaining CMF-19 for distribution throughout USAREC.
- One hundred copies of "Inside the Turret," the Fort Knox newspaper, are mailed weekly to USAREC addressees.
- Distribution of 8-in x 10-in photographs of Armor vehicles to DRCs. Other actions undertaken by Headquarters, Department of the Army (HQDA) to improve enlistments for CMF-19 were:
- $3,000 enlistment bonus for Armor enlistees.
- Two-year enlistment option to include substantial quotas for Armor.
- A simplified CMF-19 training course, scope, and duty description developed jointly by the Armor Center and USAREC was approved by ODCSPER, HQDA, for use by guidance counselors in lieu of AR 611-201 and DA PAM 315-4.
- The Home Town Recruiter Assistance Program has received greater emphasis. Soldiers who are returning home upon completion of one station unit training (OSUT) now receive additional motivation training to include viewing the CMF-19 tape and the General Patton film from the Patton Museum to enable them to better assist the home based recruiter.

These actions impacted dramatically on CMF-19 recruitment causing an immediate increase in arrivals for Basic Armor Training (BAT) and Basic Reconnaissance Training (BRT). This increased training input load, or *surge,* has presented the Armor Center with the problem of having to expand its training base to accommodate the new trainees without adversely affecting the quality of training.

Since 12 January 1979, all OSUT companies have filled at the maximum capacity of 187 trainees; however, other more extreme measures were necessary to accomodate the substantial quantity of recruits that the Recruiting Command was providing. Thus, a provisional training battalion will be created from the assets of the 194th Armored Brigade and the 4th Training Brigade (BCT) to help meet this demand. This provisional battalion will initially support U.S. Military Academy Third Class Armor Training (TCAT), picking up part of the BAT and BRT *surge* in September.

In addition, back-to-back starts of the companies of the 1st Advanced Individual Training/One Station Unit Training Brigade, Armor, have been planned to further increase the output of Armor qualified soldiers. These actions should reduce or eliminate the FY 79 shortfall in CMF-19.

I am pulling out all the stops to provide you a top quality replacement for your tank and scout crews, but I need your assistance to assure these replacements get assigned in their primary MOS. I am concerned that some of these new 19Es are being utilized as drivers and some 19Fs are being utilized as loaders and gunners even though the appropriate mix exists within the unit.

The driver training and gunner/loader training is much better than the old system, and yet, the great difference between the two tracks dictates that the soldier be assigned against the slot for which he is trained, or we are no better off than we were before. Currently, 19F drivers are receiving 147 hours of driver-related training and 24 hours of gunnery-related training, whereas the 19E gunners/loaders are receiving 198 hours of gunnery training and 15 hours of driver training. Of the battalions visited by my staff, only about 50 percent of the replacements coming from the training base are getting into the right positions. We must capitalize on the specific skills and experience that are acquired here in Basic Armor Training.

As we at the Home of Armor mobilize our resources to support *surge* training, *I ask you to do your part in strengthening the Armor Force and the Combined Arms Team.*

MASTER GUNNER'S CORNER

With the completion of scaled tank ranges quickly approaching for all Active Army and selected Reserve Component armor units, it is time to address their proper use.

The primary purpose of a scaled range is to provide training for tank commanders and gunners, and cross training for loaders and drivers, in the critical basic gunnery skills which must be mastered before they fire the main gun on Table VI. These skills include fire control and fire control instruments, primary and alternate methods of adjustment, and firing from range card data.

To correctly use the scaled ranges, a qualified assistant instructor should be assigned to each firing tank to brief the crew before the engagement, monitor performance during the engagement, and debrief the crew when the exercise is completed. By doing this, the crews are made aware of their strengths and weaknesses early in the gunnery training program.

Admittedly, this technique is more time consuming than the methods employed by some units, but if it is applied properly and scaled range firing is conducted quarterly, the result should be better trained individuals and crews and a more effective unit. Although quarterly firing of scaled stationary ranges is recommended, the requirement could be waived by the unit commander if there have been no crew changes since the last scaled range firing.

I will be the first to say that a scaled range has its limitations, but if it is properly used, it can and should allow our tank crews to depart home station proficient in basic gunnery skills.

Now that we have an idea of what the scaled Tank Tables can do for us, I believe we need to address what each table consists of (Tables I thru IV and VP).

Table I teaches the individual the proper boresighting and zeroing technique, manipulation of the gunner's controls, and firing from range card data. By using a qualified assistant instructor (AI) during the practice firing, we insure that each tested individual is proficient in Table I tasks before being allowed to progress to Table II.

Table II tests the individual on the primary method of adjustment (burst-on-target (BOT)), and the alternate method of adjustment on stationary targets using mils, meters, and formulas. Again, an individual must demonstrate his proficiency in these areas prior to progressing to Table III.

Table III tests the individual on his ability to engage a moving target from a stationary position and his ability to correctly adjust fire using BOT and the alternate method of adjustment. The individual must be proficient in the crew duties and techniques that were taught on Tables I thru III prior to progressing to Table IV.

Table IV is the first table permitting the crew to train as a team. This table tests the crew's ability to engage both single and multiple moving and stationary scaled targets. Here again, those basic skills that were taught and tested on Tables I thru III are emphasized. Once a crew has met the standards of Table IV, they proceed to Table VP.

Table VP trains and tests the crew to engage both stationary and moving targets using BOT, target form, mil and meter adjustments, and tests each crew's ability to deliver fire on a series of multiple tárgets as part of a platoon. This table permits the platoon leader and platoon sergeant to refine their SOPs and techniques as related to control and distribution of the platoon tank fire.

One idea is to set Table VP so it depicts the unit's general defensive position or the terrain that they would be expected to operate in if they had to move into combat tomorrow. Also, a realistic threat force ratio must be used.

If a qualified AI is used on the scaled Tank Tables, I believe a tank unit will find that their proficiency on Tables VI thru IX will increase. So the key to scaled ranges is to have a qualified AI to brief, closely monitor, and debrief each individual and crew on each of the engagements in Tables I thru IV and VP.

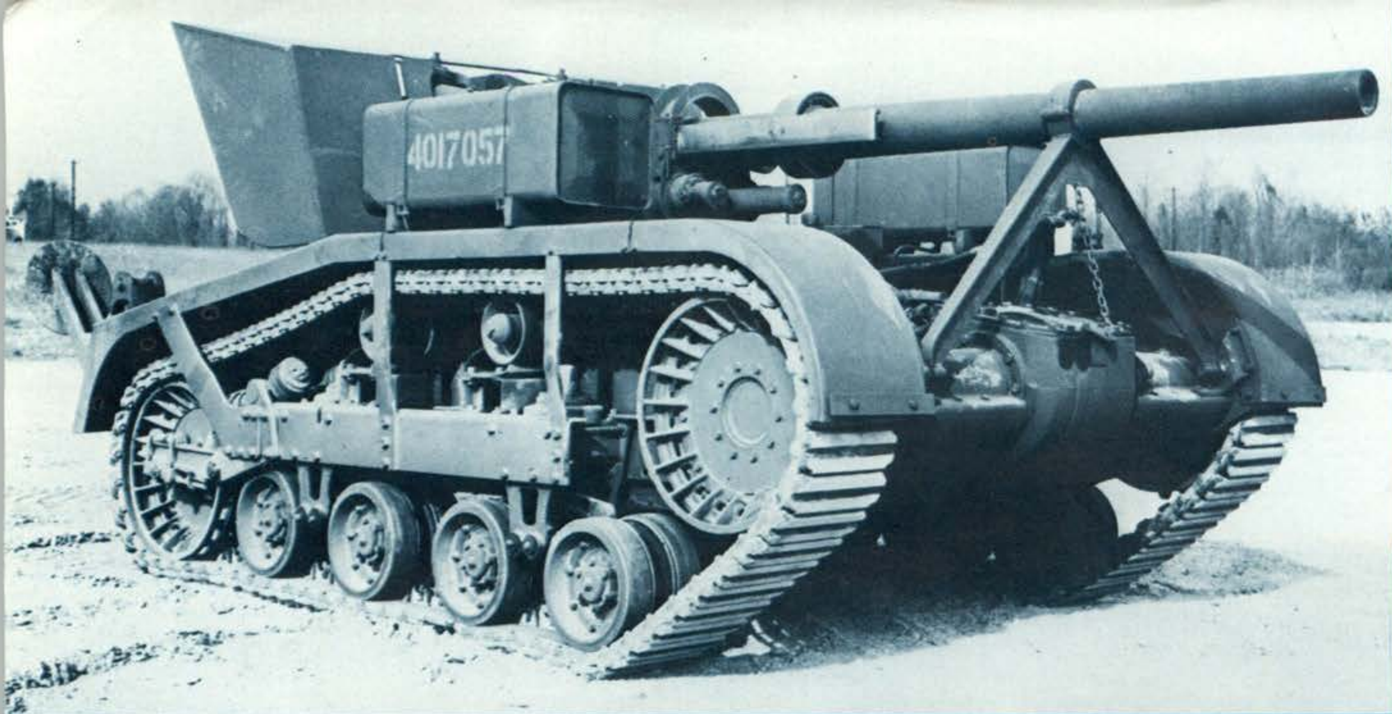
HOWARD D. ROSENBAUM
Sergeant First Class
Senior Instructor
Master Gunner Branch

Tank Destroyers

Major Charles M. Baily

"Stopping enemy tanks and other mechanized vehicles is the biggest task of our Army today."[1] Those words, spoken in 1941 by the Army's G-3, MG Henry L. Twaddle, have a very contemporary ring. As Army planners struggled during the latter days of the long armistice to prepare for the next war, they believed the coming struggle would be very much like the last. The fall of France changed all that. Only one fact was clearly revealed through the fog of fragmentary and often erroneous information that trickled back across the Atlantic—German *Panzers* had crushed Europe's most respected army in barely six weeks. The Army's counter for this awesome threat was to develop a unique antitank doctrine. By the end of the war, the Army's leaders agreed that the solution had not worked. Their answer to antiarmor warfare, furbished with the prestige of combat experience in America's greatest land war, remained the basis of our doctrine to the present day. Essentially, they decided that the best antitank weapon was a tank.

Not surprisingly, antitank doctrine was a matter of dispute in the prewar Army. MG George A. Lynch, Chief of Infantry, reflected a significant body of opinion with his conclusion that "the best antitank defense lies in the defeat of hostile armored forces by our own armored units."[2] He was opposed by MG Lesley J. McNair, Chief of Staff of the General Headquarters (the Army's re-creation of the American Expeditionary Force's headquarters) and later the commander of Army Ground Forces (AGF), responsible for Army doctrine. McNair, conditioned by 20 years of experience in the postwar army, knew what austerity was all about. He argued that it made little sense "to use a $35,000 medium tank to destroy another tank when the job [could] be done by a gun costing a fraction as much."[3] But he realized that making each infantry division rich enough in antitank guns to stop a major tank attack would be uneconomical and overload the divisions with weapons that had little to do with their primary mission, offensive operations. As he summed up his idea:



The U.S. Army's development of antitank weapons before and during the early part of World War II included the Cletrac, mounting a 3-in gun (above); the M-3, a halftrack mounting a 75-mm gun, (right); and the M-6, a 3/4-ton truck mounting a 37-mm gun. The Cletrac was sometimes called the "cleak track" because it was slow, thin-skinned, prone to break down, and had a propensity to set itself on fire.

> Antitank guns must be organized and "multiplied" so as to permit their timely concentration in numbers commensurate with the strength of the hostile tank attack. Their organic assignment to divisions . . . tends to prevent their concentration when and where needed, and subjects us to the inevitable consequences of dispersion. An antitank gun is cheaper than a tank. Providing antitank guns in fully adequate numbers is a waste of resources only in case such guns are dispersed so widely as to be effective nowhere . . . . [Antitank] guns should be organized in tactically selfsufficient battalions, each complete with warning communications . . . . This number of guns should constitute a mobile GHQ reserve, available for meeting major masses of tanks.[4]

The Army's Chief of Staff, General George C. Marshall, agreed. In May 1941, he stated that he was certain that units such as McNair described should be developed, and he directed the G-3 to establish a planning branch to work on the problem.[5] In July, the Army's hierarchy met at the War College and agreed on the outlines of the new antitank units—subsequently renamed tank destroyers. On 27 November, the War Department established a Tank Destroyer Center under the command of Col. Andrew D. Bruce, an Infantry officer who had headed the G-3's planning branch. The Tank Destroyer Center, like the rest of the Army, soon entered a period of extremely rapid expansion.

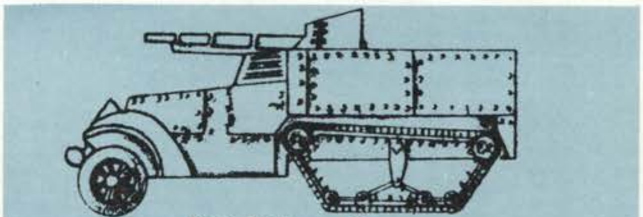
In February 1942, the Center moved from Fort Meade to Temple, Tex. until its ultimate home, Camp Hood, had facilities and was free of unevicted farmers. By June the Center, retitled the Tank Destroyer Command, had defined its doctrine in FM 18-5. With frenetic effort during 1942 the Command built a post from scratch, developed its doctrine, completed a training program, and, by April 1943, trained and released 42 battalions—a respectable achievement. However, this busy schedule left no time for the Command to spread its gospel to the whole army.

America's antiarmor doctrine was different from her allies' or foes'; their's being primarily to put more guns into infantry divisions and, as guns became larger, to make them self-propelled and armored. The tank destroyer concept envisioned independent battalions in reserve under corps or army command. When an enemy armor attack broke through friendly lines, the battalions located the enemy tanks with their organic reconnaissance company and then deployed to stop and destroy the enemy tanks with aggressive fire and movement tactics—all summed up in the tank destroyer motto, "Seek, Strike, Destroy." If the size of the attack warranted the use of more than one or two battalions, several battalions could be concentrated and controlled by one or more Tank Destroyer Group Headquarters just as artillery battalions could be concentrated into groups.[6]

This doctrine did not leave frontline units unprotected. The U.S. Army enjoyed the best of both worlds. In 1942, the Army planned to have over 100 antitank guns in each infantry division, more than their German or British counterparts. The number was reduced to 63 the next year but supplemented with over 500 bazookas.

Armored divisions were expected only to fight those enemy tanks encountered during exploitation, the primary mission of armored divisions. Therefore, tanks had to have an antitank capability even though this was definitely not their primary function. In summation, infantry divisions could protect themselves from small attacks, but major armored breakthroughs would be defeated by tank destroyers behind the lines. Armored divisions would look after themselves as they exploited unless they expected to encounter large enemy tank formations, in which case tank destroyers would be attached. The backbone of all this was, of course, the tank destroyer battalions which would prevent a major catastrophe such as France's in 1940. The Army had created both doctrine and units before it had to fight the Germans in late 1942. Properly equipping the tank destroyer units would be a more difficult problem.

As the doctrinal requirements for tank destroyers were formulated during 1941-1942, so were the material needs. Despite McNair's preference for towed guns, the Tank Destroyer Command quickly decided that self-propelled weapons were needed. The basic requirement formulated in 1941 was for a vehicle more mobile than tanks with enough firepower to destroy any tank, and armored sufficiently to avoid being destroyed by machineguns. There was no such vehicle in sight in 1941, and one would have to be developed from scratch. Meanwhile, the Command adopted the *M-3,* a 75-mm gun mounted on a half-track which lacked the cross-country mobility of tanks, hoping that it would have to be used only for training. The *M-3* was supplemented by the *M-6,* a 37-mm gun mounted on a ¾ ton truck, which was a failure in combat. The Ordnance Department tried to satisfy the Tank Destroyer Command's needs although it seemed to prefer its own counsel over the Command's. First, the Ordnance Department tried to force the *Cletrac,* a 3-in gun mounted on a high-speed tractor (manufactured by Cleveland Tractor Co.), on the Tank De



Tank Destroyer Forces

stroyer Command. Newly promoted BG Bruce referred to it as the "cleak track" because it was too slow, insufficiently armored, continually broke down, and had a propensity to set itself afire.[7] All parties involved finally lost interest in the *Cletrac* after a crew from Camp Hood took one on a cross-country test and brought it back with "sides . . . dished in, the gun supports buckled, the suspensions out of line, the travel lock folded, and the gun mount loosened."[8] The Ordnance Department was more effective in forcing another vehicle, the *M-10,* on the Command. This was a *Sherman* tank reworked to carry a 3-in gun in an open turret. Bruce considered the *M-10* to be too heavy and too slow, but AGF, agreeing with the Ordnance Department's arguments, overruled and requested mass production of it.[9] Bruce's ideal tank destroyer was the *M-18,* a fast little vehicle (50 mph) which carried the 76-mm gun, but it was not in action until after D-Day. Tank destroyer units had entered combat nearly two years earlier.

During the months before D-Day the tank destroyer concepts presented by FM 18-5 had not been proven in combat, but this was due only partially to the limitations of tank destroyer equipment. The main problem of tank destroyers was that they were never employed according to the doctrine that governed their training and organization. Instead of employing tank destroyer battalions as units, senior commanders quickly fragmented and dispersed them. One of the first two battalions in North Africa, the 601st, left its reconnaissance company in England to guard the II Corps headquarters. By early 1943, a visitor from AGF was able to locate two companies serving under different units but was unable to find the rest of the battalion. Another AGF visitor commented on the only battalions in North Africa until February 1943:

> . . . .they [the 601st and 701st] were generally used in

These tank killers of World War II were the M-10 (above), M-36 (right), and M-18 (below).

roles for which they were not designed, such as infantry accompanying guns, assault guns, assault artillery operating with tanks, and in cordon defense of areas instead of in depth.[10]

In an isolated example of proper employment, the 601st proved able to accomplish its intended mission. The battalion was attached to the 1st Infantry Division in March 1943, when the 10th Panzer Division attacked the division. The reconnaissance company of the 601st detected the attack, and the battalion hastily adjusted positions that had been intended to oppose infantry. The 601st stopped over 100 tanks, killing 30, including 2 *Tigers.*[11] The battalion's own heavy losses, 21 of 31 halftracks, were probably due as much to its mission, which tied it to the static role of protecting the division's artillery, as to the faults of the *M-3.*

There is no single, conclusive reason for the misemployment of tank destroyer units in North Africa. One observer thought that it was due to "the necessity of holding a wide front with little means."[12] In addition, Americans did not face German tank attacks frequently. Generals were rightfully loath to leave an important asset sitting in reserve when it could have been firing on the enemy. Further, most senior commanders were probably unaware of tank destroyer doctrine. The sudden establishment of the tank destroyers, which lacked a field manual until June 1942, did not allow time to disseminate a radical, new doctrine throughout a rapidly expanding army. Finally, many important commanders simply did not agree with the doctrine. By 1943, Bruce was "distressed over the attitude of Generals Patton, Devers, Bradley, and . . . Lucas."[13]

Lack of a fair test for tank destroyer concepts in North Africa did not stop senior commanders from condemning them. After a short inspection trip to North Afrida, LTG Jacob Devers, chief of the Armored Force, concluded, "The separate tank destroyer arm is not a practical concept on the battlefield."[14] He and MG George S. Patton preferred tanks. MG Omar Bradley preferred towed guns, as did MG John P. Lucas, later to be the commander of the Anzio landing, who asserted after observing operations in Sicily that the tank destroyer "had failed to prove its usefulness."[15]

Despite all this criticism from important generals there was no reappraisal of antiarmor doctrine. The debacle at Kasserine was charged to inexperience. There were no major tactical setbacks that could be attributed to faulty antitank methods. Significantly, the *Tiger* tank, a bugaboo after D-Day, caused no great alarm in North Africa. The British had killed them easily and Americans, for example Patton, were likewise unimpressed.[16] The only lesson learned from North Africa was the value of towed guns based on German and British success with such weapons, and McNair directed Bruce to create towed tank destroyer units which satisfied the criticism of Bradley and Lucas. A thorough revision of FM 18-5 addressed other issues of this doctrinal non-crisis.

Developers of doctrine and equipment labored on in 1943 with no fundamental decisions that might have altered the course of events. Although disagreeing with the adoption of towed guns, Bruce was consoled by rapid progress with the *M-18.* In any case, the Tank Destroyer Command would be only a spectator during the next major dispute.

MG Alvan C. Gillem, who had replaced Devers at Fort Knox, unintentionally started a complicated, three-way fight among himself, McNair and MG Gladeon M. Barnes, in charge of research and development for the Ordnance Department. The immediate issue was tank armament, but antiarmor doctrine was at the bottom of the dispute.

In the autumn of 1943, Gillem requested that *Sherman* tanks with 76-mm guns replace 75-mm versions on the production lines in order to cope with thickening German armor. He soon retreated from this position because the 76-mm gun, due to its muzzle blast and smaller explosive charge, was not as good as general purpose weapon as the 75-mm. In September, he modified his request to the effect that only one-third of the available *Shermans* would have the 76-mm gun. The Ordnance Department used this last request to attach their own proposal for production of the *T-25* and *T-26* tanks and the *T-71 (M-36)* tank destroyer—all with 90-mm guns.[17] General McNair turned down this proposal, and the others that soon followed form the Ordnance Department to build *T-25s'* and *T-26s'*, which were still on the drawing board. However, he changed his mind and agreed to produce the *T-71* after support increased for 90-mm guns and a prototype was successful.

Even before McNair and Barnes began battling over the *T-25* and *T-26,* Gillem had asked for production of *Shermans* with the 90-mm gun. Studies at Fort Knox had convinced Gillem that a tank with the 90-mm gun would be necessary to combat heavy tanks and that putting the gun into the *Sherman* was the only way to build such a tank by the summer of 1944. McNair and Barnes disagreed. General Barnes claimed that the tank would be "unbalanced."[18] General McNair's arguments were more fundamental and the same ones that he continued to use in his arguments against the *T-25* and *T-26.*

To McNair, the problem was one of antiarmor doctrine. "The answer to heavy tanks," he maintained, "is the tank destroyer, a 90-mm version of which he was producing."[19] When General Devers, then commander of the European Theater of Operations, sent a British-inspired request for production of 250 *T-26s'* to the War Department he clearly explained his opposition:

> There can be no basis for the *T-26* tank other than the conception of a tank versus tank duel— which is believed to be unsound. Both British and American battle experience has demonstrated that the antitank gun . . . is the master of the tank. . . . Tank destroyers can support an armored division or other unit in whatever degree is necessary to protect them against hostile tanks, leaving friendly tanks themselves free for their proper mission.[20]

While not disagreeing with his doctrine, Marshall overruled McNair, apparently seeing no reason to disapprove an overseas commander's desire for a small number of tanks. Marshall warned Devers, accurately, that production of the tanks would require at least nine months. As Gillem feared, the *T-26* would be too late to be of much use in Europe although nearly 3,000 were on order by May 1944.

To postwar commentators, the muddled dispute between McNair and Barnes would become the main reason that the American Army would have so much trouble fighting German tanks during the last year of the war. But Gillem's letter requesting *Shermans* with 90-mm guns revealed a far more important problem than the acid flow of paperwork concerning the *T-26,* which was still on the drawing board in 1943 and could never have been available in quantity before 1945.

In 1943, the U.S. Army greatly overestimated the ability of its guns to deal with German *Panther* and *Tiger* tanks, and this error was not discovered until after D-Day. General Gillem wanted the 90-mm gun because his data showed that it could penetrate the *Tiger's* frontal armor at 3,000 yards while the 76-mm could only do so at 2,000 yards. In addition, according to his figures, the 90-mm could penetrate the front of the cumbersome and unsuccessful *Ferdinand* at short ranges while the 76-mm could not. These figures could not have been very convincing to McNair. Given the gunsights of the day, hitting a *Tiger* at ranges over 2,000 yards was as great a problem as penetrating it. And McNair provided enough heavily gunned tank destroyers to deal with the limited number of *Ferdinands* which had appeared at that time only on the Russian front.

Gillem's information, from which the *Panther* was conspicuously absent, although the Army was well aware of its armor thickness and slope, clearly indicated that the 76-mm gun had plenty of power to kill any German tank except for a few behemoths that the 90-mm gun could handle. Of course this data, the responsibility of the Ordnance Department, was totally false. Troops in the field found that the 3-in. gun, which had exactly the same performance as the 76-mm, had a chance of penetrating the *Tiger's* front at 50 yards. Worse, ballistic tables from the Ordnance Department confidently predicted that the 3-in and 76-mm guns could penetrate the *Panther* at 1,000 yards, which would be much more numerous than *Tigers* in Northwest Europe.[21] The American Army's developers labored under this delusion until July 1944, and the troops overseas did nothing to correct it.

There was no great demand for heavily armed or armored tanks when the War Department queried the overseas theaters in the fall of 1943. Indeed, the commanders from the only theater that had fought the Germans, North African Theater of Operations, specifically rejected the *T-26* for use in armored divisions. The commander of the 13th Armored Regiment,

Tank-killing was again on the back burner and remained there until the Germans assembled nearly 1,500 tanks in the Ardennes.

Col. Hamilton H. Howze, thought that the *T-26* [was] not worth the trouble to build.[22] Those officers planning for D-Day were so unworried about German tanks that they placed them fifth on their list of target priorities for tank guns and rejected issuing available 76-mm-armed *Shermans* prior to D-Day because of training problems and the deficiencies of the 76-mm gun which were "an excessive price for the additional inch of armor penetration obtained."[23]

This complacency quickly ended after D-Day. By July, the soldiers had discovered that German tanks were considerably tougher than they had been led to believe. The First U.S. Army, determined to find out just how tough, dragged a *Panther* to a suitable range, fired at it with everything in their inventory that could penetrate armor, and found that only the 76-mm and 90-mm guns stood any chance of penetrating the tank's frontal armor at ranges of about 200 and 600 yards, respectively. General Bradley invited the Supreme Commander, Dwight D. Eisenhower, to witness the results. Eisenhower howled.

> Ordance told me this 76 would take care of anything the German had. Now I find you can't knock out a damn thing with it.[24]

General Eisenhower quickly dispatched a Brigadier General to carry a letter to Marshall demanding more 90-mm guns. The Chief of Staff expedited the shipment of *M-36s'* and his staff increased production of the new tank destroyer. None reached the front until October. The troops in Europe had since departed the slugging match in the bocage and enjoyed the heady exploitation through France where the superior mobility of American tanks and tank destroyers had made them a match for the few German tanks they encountered. Tank-killing was again on the back burner and remained there until the Germans assembled nearly 1,500 armored vehicles in the Ardennes. During the Battle of the Bulge the troops com-

plained loudly about their equipment, and news correspondents spread the tale in American news media.

Clearly, the ability of the American Army to kill tanks was in question. This made both equipment and doctrine subject to re-examination. The ability of tank destroyers to deal with heavy German tanks was only better than tanks inasmuch as all tank destroyers had 3-in, 76-mm, or 90-mm guns while most *Sherman* tanks still carried the 75-mm. Indeed, Bruce's "ideal" tank destroyer, the *M-18,* was seriously undergunned by the time it reached the front. Lack of firepower was clearly the main reason for the Army's inability to deal with German tanks effectively. The Battle of the Bulge neither validated nor invalidated tank destroyer doctrine. In the Ardennes, as in North Africa, the doctrine was not used. But to survive the new concept needed a positive demonstration of its effectiveness, and the Army's largest battle against German tanks failed to provide one. In addition, events before and after the Ardennes brought the doctrine into doubt.

Planning prior to D-Day for the employment of tank destroyers clearly reflected the doctrine expressed by FM 18-5. Towed battalions would accompany the assaulting infantry divisions while self-propelled guns would be available in reserve as would be tank destroyer brigade (rechristened groups) headquarters. Good doctrinal intentions were abandoned speedily in the face of realities. Invasion rehearsals revealed that towed guns were very difficult to land, and the First Army replaced them with self-propelled units in the assaulting divisions. After landing, the troops did not face massed German armor. Small groups of attacking tanks and dissatisfaction with infantry antitank weapons compelled commanders to disperse tank destroyers among forward units. These bad doctrinal habits were not overcome even when the situation demanded it. Although apparently warned about the German counterattack near Mortain by ULTRA (code name for the British intelligence operation which intercepted and decoded German radio signals), the 30th Infantry Division left its attached tank destroyer battalion, the 823d, dispersed among its regiments. During the ensuing fight the battalion commander of the 823d, having been ordered to move a company, had to tell the division commander that he had no companies under his control. The division commander gave him control of one platoon, but the 119th Infantry Regiment would not release the unit for 6 hours. The 823d helped stop the German attack by knocking out 15 tanks but paid for its efforts[25] with 11 towed guns and 104 soldiers. Fortunately, such large attacks by German tanks were an infrequent occurence.

Repelling German tanks did not prove to be the main task of tank destroyers. In fact, there were remarkably few German tank attacks against the American Army before the Battle of the Bulge. From August 1944 to February 1945, the First Army's 3-in guns found only in tank destroyers, expended 337,367 rounds of high explosive ammunition versus only 29,210 of armor piercing rounds. A fight against only 25 German tanks near Puffendorf, Germany in November was viewed as the "biggest tank battle in 2d Armored Division experience."[26]

The fundamental doctrinal problem for tank destroyer units throughout the war was that they were defensive units in an army almost continually on the offensive from 1942 to 1945. In these circumstances, tank destroyers were measured more by their ability to support offensive operations than to stop tanks. Tanks were at the forefront of offensive warfare and of necessity became an important antitank weapon. Tank destroyers were used as artillery and as tanks. Flat trajectory weapons made them less useful than field artillery, and the lack of overhead protection on the turret and bow and coaxial machineguns made them poor substitutes for tanks. And the "lesson" for tank destroyers from North Africa was less than efficacious.

The towed guns which had been so effective for the Germans and British in North Africa were a failure in Northwest Europe. Units with towed guns could not lead or adequately support advancing infantry. Even in the defense they were less effective than tanks or self-propelled tank destroyers since they could not maneuver for the flank shots necessary to kill *Panthers* or *Tigers* at practical ranges. In addition, they were exceedingly vulnerable to advancing infantry since they lacked mobility and armor protection. The First Army lost 119 tank destroyers during the Battle of the Bulge; 89 were towed guns. When McNair argued for towed guns in 1940 he was thinking of the 37-mm gun which was fully capable at the time. The 900-pound 37-mm gun could be towed by a jeep, easily concealed, and moved by hand. By 1944, the 3-in towed gun had minimal effectiveness, and its 6,000 pounds were as hard to move as to conceal. An experimental 90-mm gun to replace it weighed 8,000 pounds. The only way to move such heavy weapons in forward battle areas was to mount them on tracks and protect them with armor. By the end of 1944, no one in the European Theater of Operations was interested in towed guns for tank destroyer units.

Soon after V-E Day the European Theater of Operations established a General Board to study its operations and make recommendations for future training, organization, and equipment. One of those boards studied tank destroyers. The Board rapidly dismissed towed guns. The belated arrival of *T-26s'* and the availability of large numbers of *Shermans* with 76-mm guns meant that tanks now had weapons as effective as any tank destroyer and could do anything tank destroyers could do. The Board concluded that the tank destroyer's function should be assumed by tanks and "that tank destroyers as a separate arm be discontinued."[27] The Army agreed, and tank destroyers became history.

It is possible to conclude that the tank destroyer concept did not work but impossible to conclude that it was wrong since it was never tried. The concept of massed, highly mobile antitank weapons may still have merit. The technology of the 1940's could neither provide light, effective antitank weapons, nor vehicles that could move increasingly heavy guns with any significant mobility advantage over tanks. Modern technology has provided the weapons and the mobility—ATGMs' and helicopters. In this context, McNair's concept may not be an idea whose time came and went but one that could not be supported by the technology of the time. If so, do the concepts of the tank destroyers deserve contemporary study? Should corps commanders keep attack helicopters under their control to combat breakthroughs rather than expending them to support brigades in the main battle area? The experience of tank destroyers casts doubt on the wisdom of creating any formation intended strictly for defense. Does this indicate that the proliferation of TOWs' organic to infantry formations will reduce the Queen of Battle to the role of moving missile launchers about the battlefield and rob the Army of the offensive capabilities of its most versatile ground-gaining arm? Of course the problem of stopping tanks that so worried General Twaddle in 1941 is not exactly the same as the current problem. But it would seem that today's army could make more use of the ideas and experience that were so expensively purchased in World War II.

NOTES

[1] "Notes on G-3 Antitank Conference, July 14-20, 1941, War College, Washington, D.C.," *Bruce* (Andrew D. Bruce Papers, Archives, U.S. Army Military History Institute).

[2] Memo from Maj. Gen. George A. Lynch to Assistant Chief of Staff, G-3, War Department, 3 July 1940, file no. 470.8 to 680.3, *AGF* (Records of Army Ground Forces, Record Group 337, National Archives).

[3] "Notes on G-3 Antitank Conference," *Bruce.*

[4] Letter from McNair to The Adjutant General, 29 July 1940, 2nd Ind. to memo from Lynch to G-3, file no. 470.8 to 680.3, *AGF.*

[5] Memo from Chief of Staff to Asst. Chief of Staff, G-3, 14 May 1941, quoted in its entirety in "History of the Tank Destroyer Center", Record Group 337, National Archives.

[6] This discussion is based on FM 18-5, *Organization and Tactics of Tank Destroyer Units,* 16 June 1942. This manual was greatly revised in 1943 and reissued as *Tactical Employment: Tank Destroyer Unit,* 18 July 1944, but the 1942 edition is a better representation of the original tank destroyer concepts.

[7] Letter from Bruce to Col. Wendell Westover, Asst. Chief of Staff, G-2, Tank Destroyer Center, 24 November 1943, *Bruce.*

[8] Mrs. Anne B. Jones, *3-Inch Gun Motor Carriages,* unpublished manuscript in *OHF* [Research and Development, Records of the Ordnance Department (Ordnance Historical File), Record Group 156, National Archives].

[9] "Notes Taken at Conference at Aberdeen Proving Ground, Md. on May 2, 1942," *Bruce.*

[10] Final Report of Maj. Allerton Cushman, 15 April 1943, Intelligence Reports, Foreign Observer Reports, Folder 48, p. 19, *AGF.*

[11] *TD Combat in Tunisia,* January 1944, Training Circular, *Bruce.*

[12] Letter from Col. H.J. McChrystal to Bruce, 30 October 1943, *Bruce.*

[13] Letter from Bruce to "Pinky" (Maj. Gen. Orlando Ward), 1 October 1943, *Bruce.*

[14] "Report of the mission headed by Lieutenant General Jacob L. Devers to examine the problems of Armored Force units in the European Theater of Operations," pp. 1-2, file no. 320.2/26, *AGF.*

[15] Memo from Maj. Gen. J.P. Lucas to the Commander-in-Chief, 26 August 1943, file no. AG 370.2, Record Group 407, National Archives.

[16] Lida Mayo, *The Ordnance Department: On Beachhead and Battlefront* (Washington, D.C.: OCMH, 1968), p. 149 and Martin Blumenson, *The Patton Papers,* Vol II (Boston: Houghton Mifflin Co., 1974), p. 295.

[17] See Charles M. Baily, "Pershings for Normandy", *Armor* (September-October 1975) for a more complete explanation of this dispute.

[18] "Chronology", 13 September 1943, *History of the M4 (76-mm. gun),* unpublished collection in *OHF.*

[19] Memo from CG to RQTS, 19 November 1943, file no. 470.8, *AGF.*

[20] Memo from CG, *AGF* to Chief of Staff, U.S. Army, "Subject: Heavier Armament for Tanks and Self-Propelled Vehicles," 30 November 1943, file no. 470.8, *AGF.*

[21] (1) Letter from Gillem to McNair, 4 September 1943, file no. 470.81, *AGF;* (2) Memo from RQTS (signed William F. Dean) to CG, 18 November 1943, file no. 470.8, AGF; (3) Letter from Brig. Gen. John W. Coffey, Ordnance Officer of Services of Supply, North African Theater of Operations, to Col. James L. Guion, Office of the Chief of Ordnance, 21 August 1944, *OHF,* and (4) Diagram entitled "Penetration of U.S. Projectiles against German Pz. Kw. V *'Panther'* Tank and self-propelled mount *'Ferdinand'*—0° obliquity homogenous plate" in *AF&W* (Records of The Armored Fighting Vehicles & Weapons Section, European Theater of Operations, Record Group 338, National Archives). The last item is a technical diagram prepared by The Ballistic Section, Technical Division, Service Branch, and approved by The Chief of Ordnance.

[22] Letter from CG, 1st Armored Division to CG, NATOUSA, United States Army, 17 October 1943, with nine attachments, file no. 470.8, Records of the Army Staff, G-4 Decimal file, Record Group 165, National Archives.

[23] Memo from Brig. Gen. Joseph A. Holly (head of the AFV&W Section) to G-3, ETO, 2 May 1944 and Capt. I.D. Brent, III, "Conference Notes: Distribution of Medium Tank, M4 Series (76-mm. gun), 20 April 1944, both in *AFV&W.*

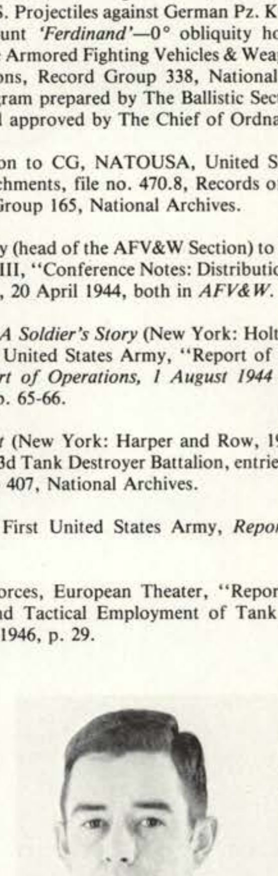
[24] Eisenhower quoted by Omar Bardley, *A Soldier's Story* (New York: Holt and Co., 1951), p. 323 and data from First United States Army, "Report of Proceedings of Board of Officers," *Report of Operations, 1 August 1944 - 22* February 1945, Annex 5 Appendix 2, pp. 65-66.

[25] F.W. Winterbotham, *The Ultra Secret* (New York: Harper and Row, 1974), pp. 148-154 and After Action Report, 823d Tank Destroyer Battalion, entries for 5, 6, and 7 August 1944, Record Group 407, National Archives.

[26] Mayo, *Battlefront,* pp. 325-326 and First United States Army, *Report of Operations,* Annex 9, p. 28.

[27] The General Board, United States Forces, European Theater, "Report on Study of Organization, Equipment, and Tactical Employment of Tank Destroyer Units," Study No. 60, 22 April 1946, p. 29.

MAJ CHARLES M. BAILY was commissioned in Armor upon graduating from USMA in 1966. He has served as platoon leader in cavalry and air cavalry units and commanded a cavalry troop. He has a Ph. D. in history from Duke University and is a graduate of the C&GSC. He is currently assigned to the Department of History, USMA.



Reserve Component Gunnery

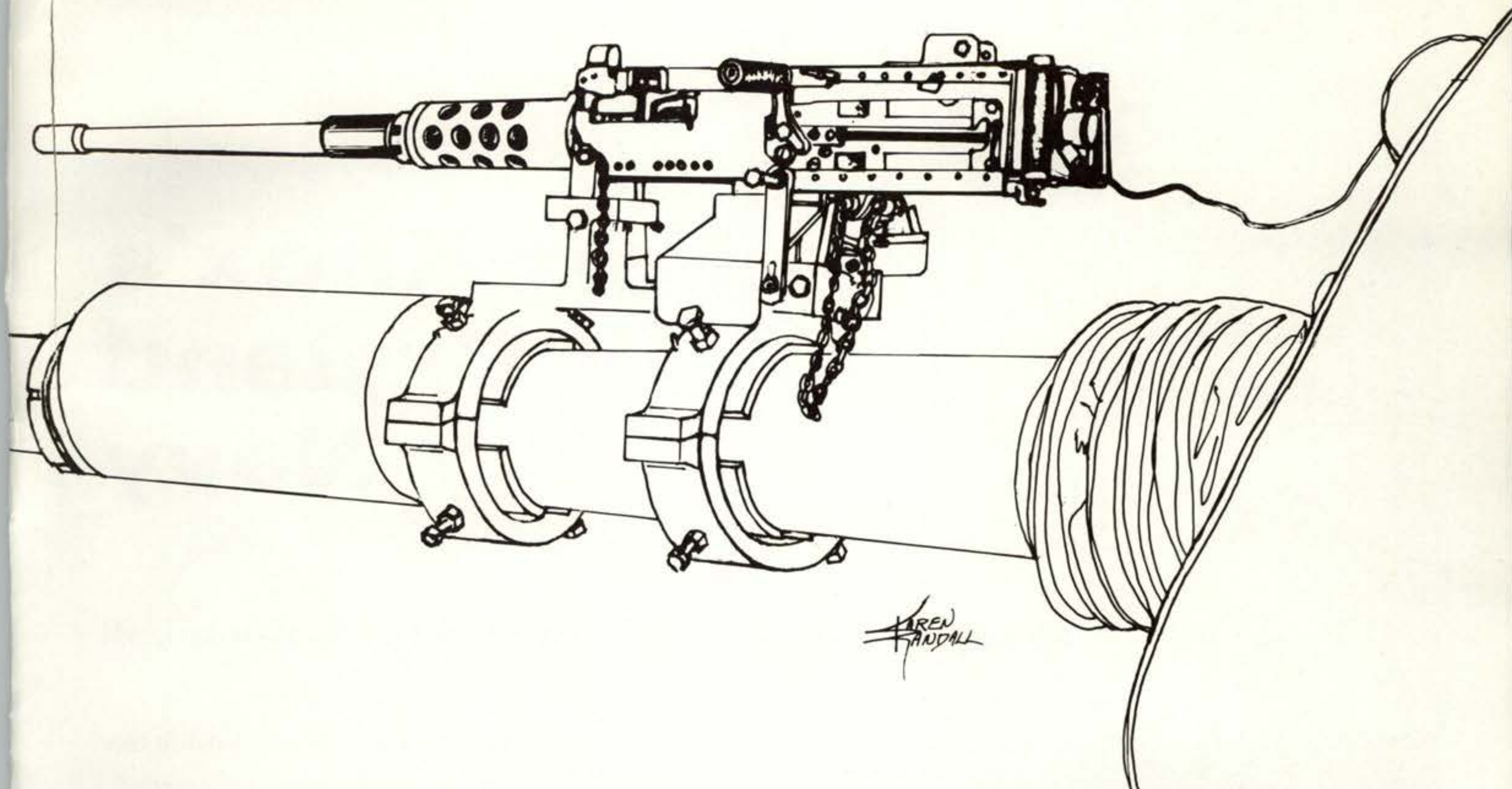
by Major Donald H. Davoli

New tasks and standards for zeroing, crew qualification, and sustainment gunnery for all Active Army and Reserve Component armor units are established in FM 17-12 and FM 17-12-2. But the question arises as to whether these standards are suitable for the Reserve Components.

The availability of range facilities, ammunition, subcaliber devices, and time affects all gunnery training, but the impact on Reserve Component gunnery programs is more pronounced.

Training time is the most critical resource of Reserve Component units and many factors influence the number of days required to take a tank crew from refresher gunnery training, through the tank gunnery skills test, to firing the tank tables. These factors are: facilities, availability of equipment, travel distance, travel time, unit strength, and number of crews. The past experience of Reserve Component tank company commanders has shown that a unit which has approximately 90 percent of its assigned crews will require 12 days to complete Tables I thru VI. This firing, which is conducted during Inactive Duty Training (IDT), takes up one-half of the training time available to a Reserve Component unit. Crew qualification, Table VII, is then conducted during Annual Training (AT) and takes a minimum of 2 days. When the time needed to conduct refresher gunnery, tank crew gunnery skills test, and corrective training is considered, the minimum time needed to complete a tank gunnery training program is 16 IDT days and 4 days during AT.

Zeroing has surfaced as a major item of concern in light of the new Army zero policy which is basically to zero only once during the life of the gun tube or after changing a major component, and then record the established zero in the logbook. The Reserve Component position is that zeroing techniques are the key to accurate tank gunnery, and remain a valuable training objective. Future ammunition allocations should consider the need for Reserve Component units in view of the fact that all tanks are pooled at unit training sites and are used interchangeably throughout the year by all armor elements within the various states. This negates the unit's ability to maintain an accurate zero for any given tank.



Tank gunnery qualification standards and requirements, as established in FM 17-12 and FM-12-2, set the premobilization objective of crew qualification through Tables VIIIA and B. The qualification standard for all tank crews of armor units to qualify annually on Tables VIIIA and B, has been recognized as being impractical for Reserve Component units, but a clear-cut policy has not been established.

Table VIIA and B should be the minimum annual requirement for Reserve Components. Armor units unable to fire Tables VIIA and B due to ammunition constraints and/or lack of range facilities should fire and be credited with Table VIIC as their qualification course. However, it should be stressed that the transition from Tables VIA and B (main gun) to tank Table VIIC (subcaliber) is not smooth and is viewed as being anticlimatic by the tank crew. The established sequence should be to fire Tables I through V, using subcaliber devices; Table VI, using main gun ammunition, and then Table VII, as the crew qualification table. Again, it is recognized that some units, because of inadequate range facilities, will be unable to fire Tables VIIA and B. For those units, Table VIIC would continue as the minimum annual requirement until such time as proper facilities are made available.

Continued training on Tables I through V using subcaliber devices, is accepted for sustainment tank gunnery. The current results indicate that this program has been satisfactory. The continued success of this program is dependent on providing a sufficient number of subcaliber devices to the field. The commanders will then be able to evaluate their gunnery program with the flexibility of determining the frequency and in which sequence the firing of these tables will best suit their needs. For example, a commander of a unit with crew stability and high qualification results in the preceding training year may eliminate all or a portion of Table I through V to gain time to concentrate on the advanced tables.

It appears that a solution to the problem of Reserve Component gunnery training would be to revise or develop a new chapter or chapters for FM 17-12 and FM 17-12-2 relating specifically to Reserve Components. The revision should take into consideration current range restrictions, availability of training facilities, availability of Reserve Component training time, and the level of training within Reserve units. Until such time that tank gunnery training guidance comes to grips with the Reserve Components' problems, the results will continue to be unfavorable. Guidance should spell out in detail a different set of tasks (not standards) that would produce tank crews that can shoot, and hit what they aim at.

MAJOR DONALD H. DAVOLI, NYARNG, was commissioned in armor from OCS in 1959. He has attended the Armor officer Basic and Advanced courses, and the Command and General Staff College. He has served with the New York Army National Guard as company commander, Battalion S-4, S-3, and Executive Officer. He is currently the Battalion Commander, 1st Bn, 127th Armor, New York Army National Guard.

Fort Knox's Dryland Navy

by Lieutenant Colonel (Ret.) John A. Campbell

Why would anyone build a Landing Ship Tank (LST) mockup in 1942 in the middle of Fort Knox, Kentucky, the home of the Armored Force?

I hope this article will answer the question for you as it did for me. My curiosity dates back over 30 some years and it wasn't satisfied until several months ago when General Jacob L. Devers, (Retired) former commander of the Armored Force (1941-42) and Admiral S. N. Pyne (Retired) provided the facts surrounding the Fort Knox LST.

Upon the fall of France and the Low Countries and England's evacuation from the European Continent, the British immediately began planning to invade the German stronghold. Although this may have seemed like a wild dream in those dark days for the British, their planners were certain a massed armored force attack, screened by an air armada, followed by infantry onto the European coast was necessary if the German Army was to be destroyed.

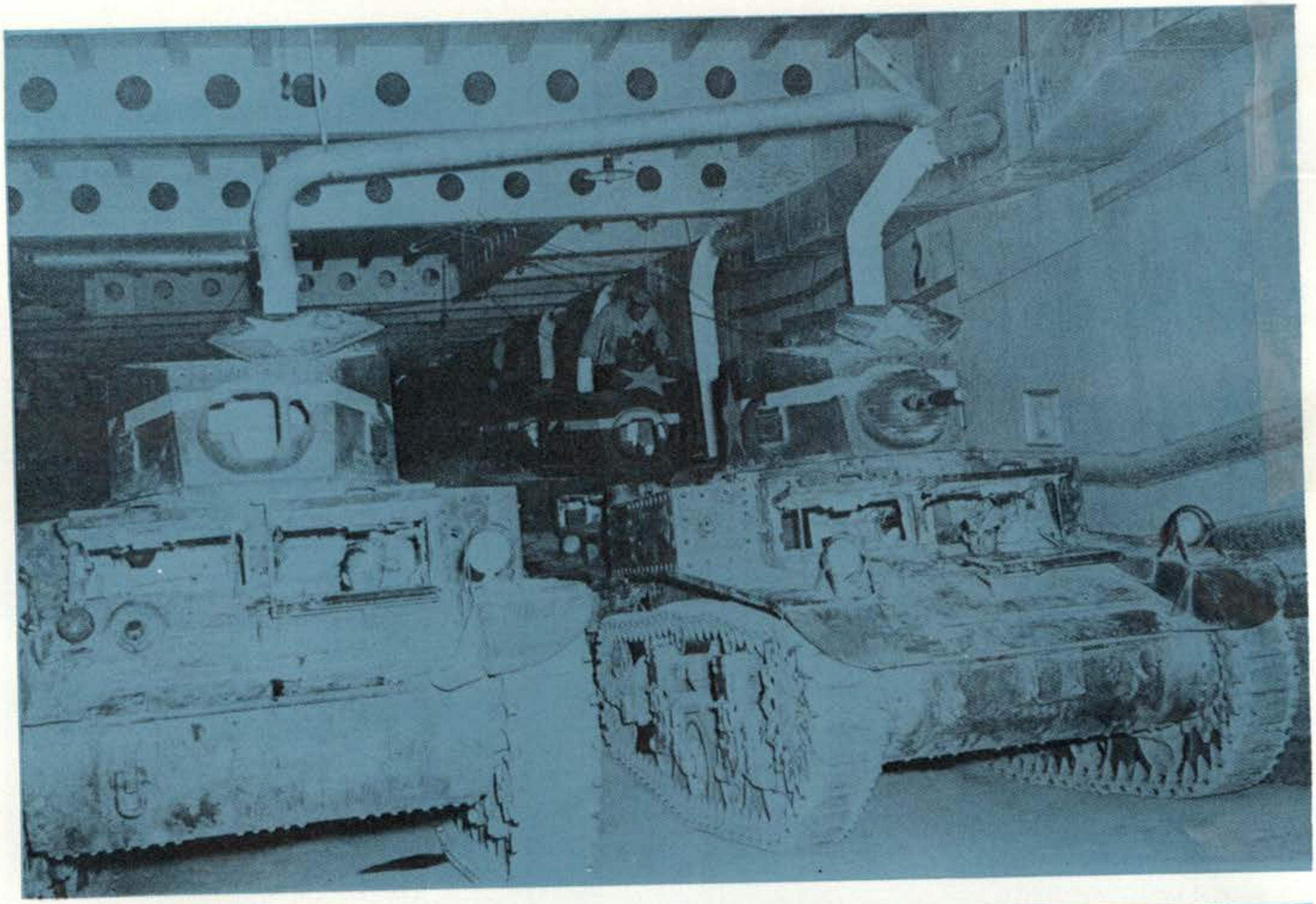
The British Admiralty, working within the framework of the Roosevelt-Churchill Lend-Lease Agreement, submitted rough specifications to the U.S. Navy Department for the types

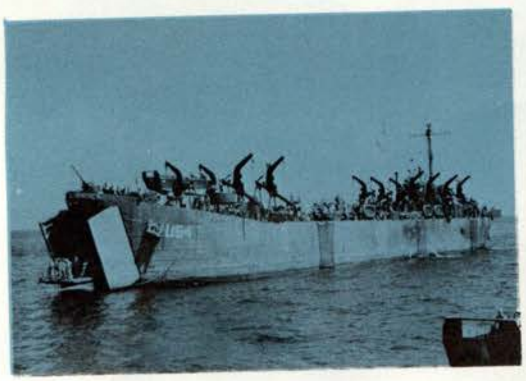
and sizes of ships necessary to carry out the invasion. Among these requirements were several for cross-channel and ocean-going vessels. One proposed design capable of handling tanks in a combat configuration, which was to be some 300-feet long, lead to the design and development of the 327-foot U.S. Landing Ship Tank (LST). The British estimated that 500 LSTs would be required.

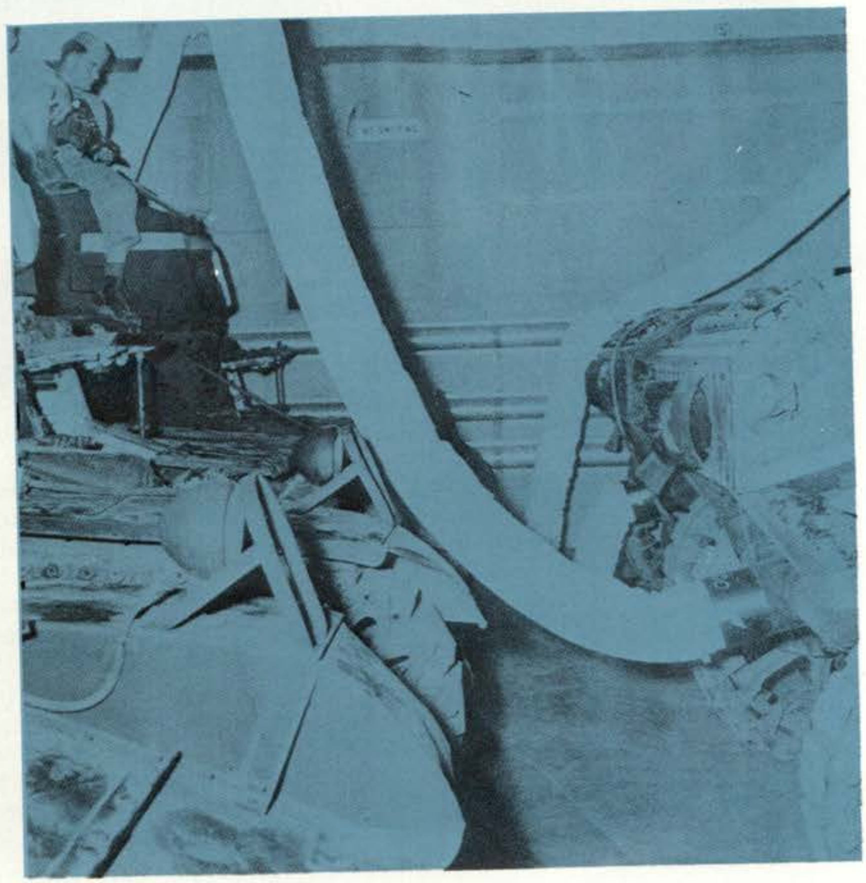
In late 1941 the Bureau of Ships of the U.S. Navy Department and the British Admiralty developed several designs for the ships. These were followed by contracts to the architectual firm of Gibbs and Cox, Inc., of New York for detailed specifications and the Pittsburg firm of DRAVO for the lead yard and mass material procurement actions.

Ocean-going vessels for landing tanks in a combat-ready configuration on a hostile shore were an entirely new concept in ship design and construction. One major problem with the revolutionary design was quickly recognized by the Naval architects—that of ventilation for the enclosed tank deck where tanks would operate under their own power.

Since solving such problems did not lend itself to scale model testing, the Navy sought assistance from the War Department. A large instrumented box representing the space one tank could occupy in the ship was constructed at Aberdeen Proving Ground, Md, and a medium tank, no doubt an *M-3,* was placed in the container with the engine operating at high speed. Instruments then recorded the amount of toxic gas produced and volume of air required to ventilate the tank-deck spaces. The results were staggering. Based on a straight-line projection, the volume of air to be moved and the power required to do it were beyond the LST's capabilities. Further tests using a full-scale mockup loaded with a full complement of vehicles was directed, and Fort Knox was designated by the War Department to support the Navy operation.







ARMOR

july-august 1979

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"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."

COVER

Beginning on page 16, Lieutenant Colonel (Ret) John A. Campbell looks at the history of Fort Knox's Austin Hall, and explains how a mockup of an LST came to be built 500 miles from the nearest ocean.

JULY-AUGUST
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ARMOR

the Magazine of Mobile Warfare

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KAREN W. RANDALL

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LETTERS

"Prized Possession"

Dear Sir:

First, allow me to congratulate you on your excellent magazine. It provides one of the best international forums on mechanized combat and it is a prized possession of officers here at the Canadian Forces Combat Training Centre.

I have just managed to get a copy of your November-December 1978 issue and I read with interest "Future Infantry Armored Vehicles" by Richard M. Ogorkiewicz. Being aware of Mr. Ogorkiewicz' reputation in this field, I believe that two major points raised in his article, how best to protect mechanized infantry and the requirement for a direct fire support vehicle (DFSV), deserve further discussion.

* * * * *

M. G. BIRT
Captain
Royal Canadian Armor Corps
Canadian Forces Base, Gagetown

(Captain Birt's letter discussing "Future Infantry Armored Vehicles" is continued in the PROFESSIONAL THOUGHTS department. Ed.)

"Everything But the Kitchen Sink"

Dear Sir:

I feel obligated to reply to the "Tank-Delivered Scatterable Mine" article in the January—February issue of *ARMOR*. As with other "experts" who desire to attach everything available or fire every type device (except tank ammo), these authors always fail to recognize the resultant deficiencies. Some of the systems that personnel (other than Armor) have desired to use or have tank-mounted are mine plows, mine rollers, surface-launched fuel-air explosives, and flame rounds.

Now, the latest proposal is for reducing our basic load to provide a capability to fire 105/120-mm FASCAM (antitank mine) projectiles. Major Andrews, in his article, has inferred Armor needs a FASCAM round having the ballistic characteristics of the present *M-393A2* HEP-T round at ranges of more than 7,000 meters. It would seem Major Andrews failed to address various critical aspects during his background research (if any was accomplished). He first failed to consider the requirements for an airburst to disperse the very few mines in this type projectile and secondly, he failed to address the aim-off required—which would be considerable—to even get the round near the area of desired impact. We have a Combined Arms Team, and let's continue to use it as that—a team. There is one other area whereby Major Andrews failed to do his homework, and this is in reference to his comments on the *XM-1* ammunition types. Agreed, we won't have separate APERS, canister, and HEP rounds; however, we will have a new round with a multipurpose capability. Need I say more?

RICHARD P. CULP
Fort Knox, Ky. 40121

Pleased

Dear Sir:

I must say that I'm very pleased with my subscription to your magazine. The most interesting articles I think, are Master Gunner's Corner and the Armor Recognition Quiz, which I hope you go on with.

SERGEANT ULF LINDEN
Swedish Army
Vaxjo, Sweden

Diesel Smoke

Dear Sir:

The press reports that the Chemical Systems Laboratory at Aberdeen Proving Ground (APG) has discovered that injecting diesel fuel into a hot exhaust pipe can result in creating a dense white smoke. Kits are being produced for installation in our *M-60A1* tanks in Europe. The device also will be incorporated in production tanks and later may be added to other armored vehicles. It was not pointed out that Soviet tanks in World War II and since have had this capability.

Smoke and the tank in the 1920's were considered to be the two most important tactical developments of World War I. The British had combined the two in their Medium B tank, but this never reached combat. At that time sulfonic acid was dripped into the exhaust pipe to produce smoke. APG developed a similar device for our old 6-ton tank. In 1928 the British tried it again but decided that "the smoke disclosed the general location of the tank, thereby tending to make it a greater target."

But, by the time of World War II, British thinking had changed and their combat vehicles were fitted with smoke grenade dischargers, now in fairly general use around the world.

Developments in electronic warfare increase the value of smoke because of its inhibiting effect on IR and laser accuracy. The new-old use of diesel fuel to create smoke should prove of value in concealing our own armor, but the ability to place smoke on an enemy indicates a need to keep the smoke mortar as well.

ROBERT J. ICKS
Colonel AUS (Ret.)
Elmhurst, Ill. 60126

Wanted—Information for Reserves

Dear Sir:

As a longtime member of the Armor Association and avid reader of your fine magazine, I have a small bone to pick.

In each issue I read thrugh OPMD-EPMD Armor in vain for information of use to me as a USAR officer. You obviously have a substantial USAR and National Guard readership. U.S. Army Reserve Component Personnel Administration Center has a very active Officer and Enlisted Personnel Management Directorate. A great deal of effort and money is being spent to orient the USAR community on current Army policy.

I catch an occasional sneer or snort from my professional soldier comrades about the Reserve "Good ole boy" network. Those of us who soldier by avocation really need one, it appears, for all the career information my favorite professional magazine delivers, Falls Church, Virginia, 6 miles from the Pentagon could be in Mongolia!

Enough said. How about it?

JIM HORN
Major, Armor, USAR
Falls Church, Va. 22042

Excellent idea. We'll work on it.—MAV.

horse obsolete. To the chagrin of traditionalists, the demise of "cavalry" and a consensus that it also was obsolete was highly publicized. Tank forces rapidly expanded during World War II. Cavalry was frequently used for reconnaissance by stealth, sometimes using wheeled vehicles. With the Armor branch firmly established, increased dependence on mechanization and an ever increasing scale of warfare suggested that the concept of cavalry, as well as of horsemen, was dead.

After the war, however, it was decided that mechanized cavalry should continue to perform ancient horse cavalry missions such as security, economy-of-force, and reconnaissance operations. The covering force for area and mobile defenses seemed to be the primary requirement. The covering force required highly mobile organizations capable of independent operations over extended distances. Covering force units would also be the first to encounter the same enemy that MBA units would fight. Accordingly, considerable firepower and sustainability were required. The solution was the Combined Arms Team organization within Armor branch characterizing today's armored cavalry. Placement within the Armor branch was logical because only that combat arm then possessed the requisite mobility for such extended operations. Cavalry was born again.

But the nature of war has significantly changed in the past 25 years. Geometric change implies that technological advancements and sophisticated weaponry will render the complexity of future war almost incomprehensible. Its science fiction aura will not only include satellites and highly maneuverable command modules, but probable utilization of such resources as biocybernetics and parapsychology. Unprecendented technical expertise will be required. Very little reaction time may be available. Conflicts may be resolved in hours.

The United States has therefore developed the Active Defense as the military art for the immediate future. While numerous advancements in equipment have been incorporated into existing doctrine through the years with relative ease, doctrinal changes are understandably assimilated more slowly and usually with excruciating resistance to change. Changing personal beliefs, previous learning, and years of training is involved. Doctrine is like water flowing through a pipeline. The process of incorporating a change throughout the system of all ranks, year groups, and organizations while at the same time maintaining a viable fighting posture, is complex. Accordingly, considerable concern exists today regarding acceptance of Active Defense concepts, and the ability of U.S. forces to train for and implement such a sophisticated, coordinated effort.

Active Defense tactics and new equipment are appropriately evolving. But organizational progress is lagging. For example, what *is* the role of cavalry in the Active Defense? Armored cavalry no longer has a mobility differential over main battle area units. The Soviet blitzkrieg-type threat, political considerations, and ominous technological advancements preclude extensive delaying actions from an international border. The covering force now consists of several combined arms task forces, and a lone armored cavalry covering force is obsolete. Is cavalry dead again?

Traditionalists and lineage enthusiasts will undoubtedly insist on maintaining cavalry designations, regardless of unit function. But a fate worse than death, although a predictable development, would be for cavalry to assume a hodgepodge organizational structure for "special missions," without a definitive, contributory role within the Active Defense. A less blasphemous alternative would be to adapt traditional cavalry economy-of-force missions to specific Active Defense requirements.

Since the beginnng of warfare, cavalry was best used to supplement the main body. Although flank operations and reserve missions remain appropriate, cavalry could make significant contributions to the Active Defense if given economy-of-force missions *within* the main body's area of operation—between major combat units and their areas of responsibility. Screening between battle positions or in contested areas vacated by friendly units moving laterally to concentration points will be needed. Reconnaissance within subsequent battle areas or sectors of responsibility will be required, including traffic-control-type operations. In addition to guiding units to major subsequent positions, cavalry could maintain contact between major subordinate units, just as it has traditionally coordinated between units of different organizations during flank operations.

Such internal coordination is of increased importance in the Active Defense because of the semi-independent nature of the major combatants and the fluid nature of the battlefield. Communications for command and control of coordinated withdrawals to subsequent positions, or for concentration of forces from lateral positions, may not be available in view of the massive jamming and deception anticipated in future combat operations. Cavalry, traditionally the eyes and ears of the commander, may be called upon to direct and orchestrate the battle.

Soviet doctrine emphasizes bypassing pockets of resistance and slipping off the shoulders of concentration

points that blunt penetrations. Accordingly, active defense cavalrymen may be gainfully employed by conducting classic covering force operations *between* battle positions of friendly units—delaying, buying time, or canalizing the enemy into more advantageous routes. Cavalry should therefore continue to possess considerable sustainability and antiarmor capability in addition to a mobility differential. It will be required to fight the same enemy as the Main Battle Area elements, but from impromtu positions responding to evolving tactical dispositions as opposed to the initially orderly covering force alignments.

Flank protection assumes a unique dimension. Consider the danger an Active Defense doctrine imposes on adjacent Allies in NATO sectors. The Allies may successfully employ a position defense well forward, while U.S. forces, intending to fight a fluid battle throughout their sector, may accept a FEBA well to the rear of the Allies' front line trace. The result is a vulnerable Allied flank detrimental to overall NATO dispositions. This hypothetical situation appears to be the most significant danger in the NATO defensive posture. Doctrinal interoperability seems unattainable in the foreseeable future. Cavalry's greatest contribution to the Active Defense, therefore, could be provided in the area of flank operations. But flank operations in an Active Defense also may seem curiously inverted. For the reasons described above, the major objective might not be to keep the enemy *out*, but to keep him *in* the U.S. sector!

The structure, equipment, and tactics to accomplish such missions requires as thorough an analysis as did the genesis of the armored cavalry concept. Perhaps the foremost question is, "Should active defense cavalry possess a mobility differential over covering force and MBA units?" Others have discounted and ignored this obvious dilemma with the rhetoric that cavalry is "a state of mind." But supplementary missions required around and between major combatants suggest the question can only be answered with a resounding "Yes!" Perhaps Armored Cavalry is then indeed "dead." Air cavalry alone possesses the degree of mobility needed to permeate the Active Defense battlefield in response to unanticipated tactical developments throughout the area of operations. Air cavalry could be augmented with the most highly mobile, although not necessarily fastest, ground vehicles—perhaps wheeled vehicles equipped with TOWS and *Dragons*.

While it's true that cavalry would oppose the same enemy that has slipped off the shoulders or overwhelmed a friendly position, attempts to fabricate *ad hoc* substantial ground defenses amid mutually supporting friendly positions are ill-advised. Perhaps the primary function of cavalry intervention would be to direct countermobility operations in order to delay and redirect the enemy advance. Air strikes, perhaps small antiarmor ground positions, and obstacles would be appropriate. Dynamic obstacle systems in the family of scatterable mines (FASCAM) would be especially productive. Such obstacles could be delivered during a battle, thereby responding to a specific tactical situation. They may also be designed to self-destruct after a specified time, to be remotely activated, or to be detonated by remote control. Short-life, self-destruct models would preclude meticulous identification and reporting requirements. This system would give active defense cavalrymen tremendous flexibility and would allow friendly troops to negotiate mined areas unharmed.

The Active Defense concept necessitates a reevaluation of the role, structure, equipment, and tactics of Cavalry. Economy-of-force requirements are evident, but definitive missions and procedures must be designated.

MAJ MICHAEL A. ANDREWS was commissioned in Infantry from the U.S.M.A. in 1967. He has commanded Infantry and Armor units, and served as an operations officer at battalion through division level. He received a branch transfer to Armor in 1972. He received a M. Ed. from Duke University and is a graduate of the C&GSC.

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 77)


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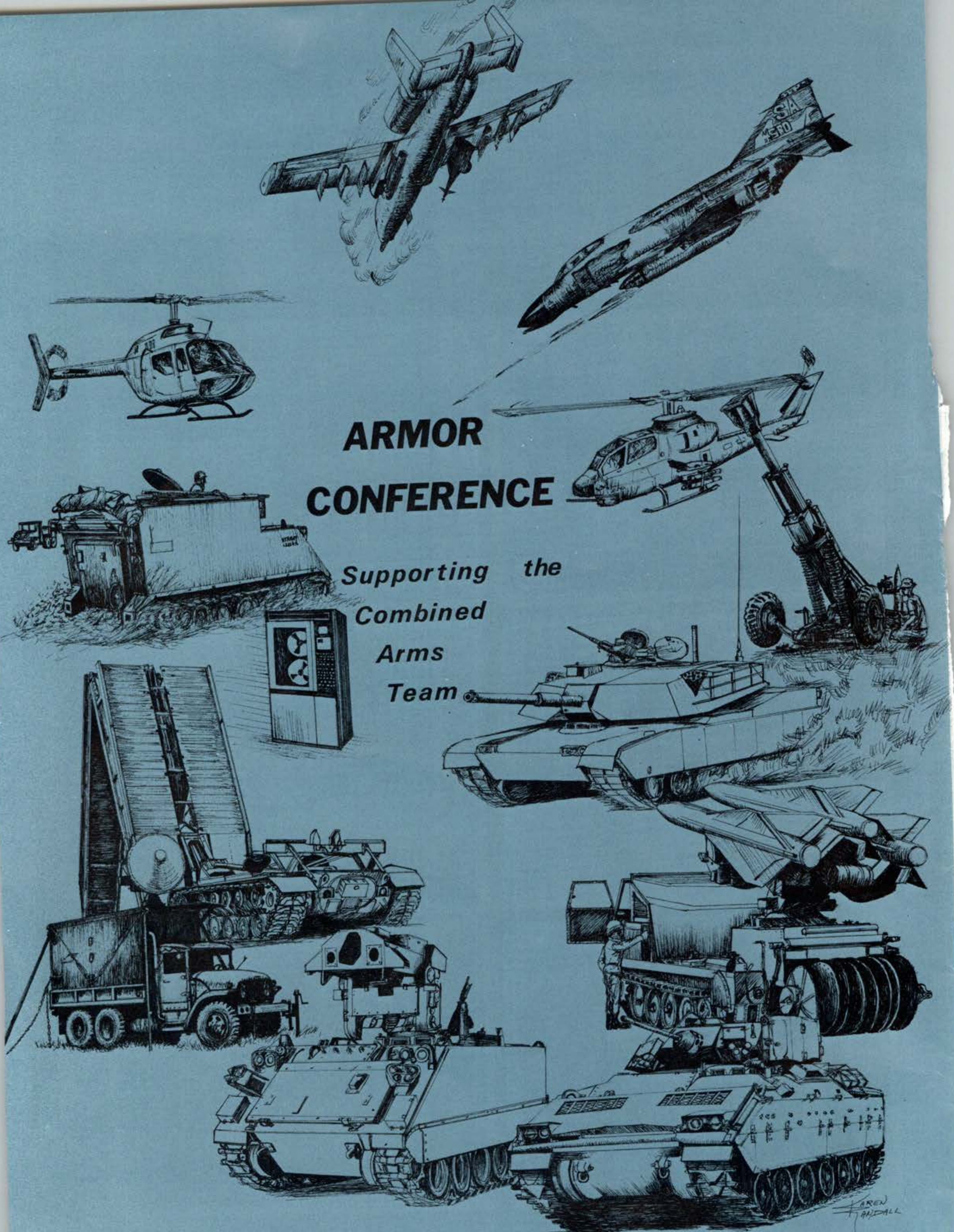
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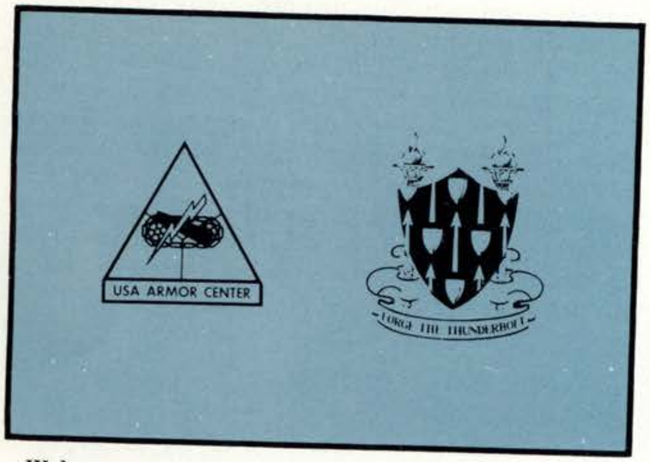


Opening Remarks

MG Thomas P. Lynch
CG, USAARMC

Welcome to Fort Knox for the 89th Armor Conference. During previous conferences, our discussions have centered around the first battle of the next war. We've discussed how to defeat a numerically superior force through mobility and the massing of our Armor and Infantry forces at a critical point. Much of our discussion has centered around how to train and fight in both the covering force (CFA) and the main battle area (MBA).

Equally important to our success on the battlefield, though, is the total integration of combat and combat service support into the maneuver plan. The force ratios of the central battle will be about the same as those facing the 7th Cavalry at the Little Big Horn. Custer went into that one without his Gatling battery and pack train, and we all know the result. If we are to do better in the destruction of first and follow-on echelons of Threat forces, we cannot afford the disaster of inadequate support.

Our concept of the future battle revolves around the success of our covering force causing the enemy to disclose his major thrust and slowing him down by forcing him to deploy early. It is vital that this fight in the CFA not only allow sufficient time for our major forces to prepare their positions, but also that it force the commitment of the enemy's breakthrough attack so we can make adjustments in order to defeat the enemy when he closes into the MBA. In order to succeed, total integration of engineer, artillery, tac air, and air defense is essential. But the best plan, executed by the best trained soldiers, is worthless unless we can provide them with sufficient ammunition to kill the enemy, fuel to maneuver against him, and the maintenance and resupply to keep our systems working.

This then is the theme of this year's Armor Conference: Support of the Combined Arms Team.

We have spent a tremendous amount of time and money to develop and test the tactics and equipment necessary to fight the next battle. Working in conjunction with the Infantry, Artillery, Aviation, and Air Defense Centers, we have fielded developmental programs such as UTTAS, DIVAD, GSRS, AAH, IFV, and *XM-1*. New, more powerful and more accurate munitions and subsystems are also in development. How-to-fight manuals for brigades and divisions which are compatible with the team and task force manuals already in the field, are on the presses. New thoughts on the organization of divisions in the next decade are under discussion. Staff working groups among our NATO allies have made significant contributions toward interoperability of tactics and equipment.

The result of our effort is that we are in the process of fielding the best equipped army in our history. We in the Armor Center are encouraged by these developments and feel that we have gone a long way toward solving the total problem.

At this point, it is appropriate that our discussions focus on the methods by which we support the team. Quite often when we talk "Combined Arms Team" we really mean maneuver forces, but the future battle is not going to be won by tanks, infantry, and attack helicopters alone. It is going to be won by a combination of the obstacles we throw up in front of the enemy to slow him down: indirect fires to button him up, separate the elements of his team, and suppress his supporting artillery attack; the confusion we create through electronic warfare and the destruction of Threat air defenses to allow our attack helicopters, and tactical aircraft to kill him. It is up to us, the maneuver leaders, to integrate the support capabilities of the Combined Arms Team. The commander who can envision the battle and manipulate the enemy by use of this support is the one who is going to win, and if we're going to be successful, we're going to have to teach that commander to be able to utilize his combat support just that way.

Now, when we talk battlefield support, we've got to think also in terms of rearm, repair, and refuel—*forward*. The number of enemy targets to be serviced in first and follow-on echelons is such that our forces are not going to have the luxury of moving off battle positions to rearm and refuel. They're going to have to stay and fight over long, continuous periods of time. Too often the limits of our mobility are dictated by the limits of our support echelons. To counter that, our logistical support must be responsive to the demands of the maneuver force. Supplies and services critical to our mobility must be delivered to the user well forward. Fuel, for example, must arrive *on* the battle position in a timely manner.

And, what happens to our mobility when we encounter the *other* guy's scatterable mines. We've really neglected countermine equipment for at least 30 years.

The next battlefield is going to be an extremely cluttered place. To be effective, our logistical support elements must anticipate requirements, move through the clutter of battle, and locate their supported units in a fluid, ever-changing action. Additionally, they will need the training and the weapon systems for self defense.

Finally, we must educate our maneuver arms officers in the methods of battlefield support. The lieutenants and captains in that maneuver force who are assigned as support platoon leaders, XOs, staff officers, and even commanders are going to need to know *how to support* as well as *how to fight*. The instruction in our service schools must emphasize team and task force combat and combat service support. *Realistic* logistics play must be integrated into ARTEP evaluations. By realistic, I mean resupply and repair well forward, in the field, from field supply points under real stress and in real time. Such training and evaluation cannot be limited to the tanks and infantry alone but must also include the aviation members of the ground maneuver team.

In all aspects of the future battle we stress mobility. Mobility is certainly the function of many variables, but two thoughts stand out. First and in simple text, the ability to counter the mobility of the enemy revolves around the successful use of our combat support. Secondly, our own mobility depends on effective command, control, communications and the successful use of our combat service support. We will win the future battle only by paying increased attention to these important parts of the total Combined Arms Force. The key to our success on future battlefields will be *total force effectiveness*.

Keynote Address

LTG Robert J. Baer
DCG, DARCOM

As a tanker, I have had first-hand experience with the intricacies of the Combined Arms Team—the need to mass combat resources—men, materiel, firepower—at the precise time and at the precise place to achieve a favorable combat ratio and defeat the enemy.

Today, I am a logistician—a developer, producer, and sustainer. In short, I, and the Materiel Development and Readiness Command (DARCOM), are in business for only one purpose—to provide support to the Total Army, to our sister services, and to our allies. It is around this three-fold division of support—developing, producing, and sustaining for the Combined Arms Team of today and tomorrow—that I wish to structure my remarks. And I hope you will keep in mind one major point—the equipment that you see on the battlefield is the result of a community effort, not just DARCOM working in its project offices and research and development commands, but with full partnership of TRADOC, Forces Command, and the major overseas commands. It's the only way to go and we know it—it's *our* Army that has the need.

The first phase, as I have said, is that of combat materiel development and acquisition. Here the community effort begins with the user representative—TRADOC—developing clear and reasonable requirements for effective, nongoldplated combat, combat support, and combat service support equipment. DARCOM, as the developer, *must work with TRADOC* to insure that the technology to meet system requirements is within the realm of the possible. Together, we must also settle on the parameters of the proposed system, not only capabilities in combat but how we match up with the expected threat, the costs to us in resources, and the time frame for ultimate fielding.

Unfortunately, no matter how hard we work to determine these parameters and nail them down so that development can be started, it seems more and more that the Army as a service *cannot get and keep its acquisition act together*.

Let me give you some examples of what I'm talking about when I say it takes us too long to get systems into the hands of our troops.

Back in the 1950's, we in the Army had a good track record—we had our act together. The Honest John and Corporal missiles took only 4 and 4½ years, respectively, from initial research to deployment. In January 1958, feasibility studies on the *M-60* were finished; 27 months later the tank was fielded. The *M-60A1* took 37 months. But during Vietnam things started to become unglued, and in the past 10 or so years we have been taking longer and longer to get reliable and maintainable systems out to the troops before their capabilities are overcome—or nearly so—by improvements in enemy capabilities.

Let me put it this way—returning from Vietnam on 1 May 69, I became Chief, Combat Vehicle Developments in ACSFOR, DA. At that time, the first *MBT 70* was scheduled to roll off the production line in the early seventies. When I became Deputy Commanding General, DARCOM in September 1977, the first *XM-1*—due off the line early in 1980—was only a little less than 3 years from production. So although those two points in my career are chronologically 8 years apart, the Army was in 1977 essentially where it was back in the late 1960's. Even the *M-60A3*, despite its major improvements, is still an *M-60* in terms of mobility, silhouette, armor protection and main armament, and it is being fielded 17 years after the *M-60A1*.

Why does it now take us so long? I think General Lynch, in a March message on the *XM-1*, hit the nail on the head. He said,

"We invite debate, active exchange, discussion and challenge within professional arenas; but to get this we must have your unqualified support up front. In short, you can draw sabers and join the charge, dismount and defend the wagons, or quietly hold the horses. Whatever you choose to do, *do not cheer for the hostiles*."

I want to re-emphasize the point he makes—if the Army, as a service cannot agree on what is needed, cannot close ranks once a decision is made to develop and produce; and then maintain a united front as the development and acquisition process unfolds, we will never successfully meet and overcome the technical, funding, political, and economic problems that face every program. We do need discussion to determine what we want and whether present or near-term technology can translate concepts into hardware and software. But once the decision is made to go with development and production, we all must close ranks behind our projects and support them. Those who can't do this would be well advised to consider silence as the preferred alternative in the interest of the Army.

I am not suggesting however, nor did General Lynch, that one cannot express personal reservations when asked. The point is, don't go out and unintentionally sabotage a program by questioning decisions by proper authority just because you may not agree with them. For one thing, you may be wrong or you may not have the whole story.

Believe me, if the program is bad, if collective common sense has been subverted by what I call "enthusiasm," the user-developer community will inevitably face up to that fact and will act. If this point is reached, that is the time to speak out and to provide reasonable alternatives for consideration.

I admit that it's not always easy to change people's minds, especially when a personal investment is involved. I've been trying industriously, within the Army structure, to terminate just one program—any program—which from my viewpoint was costing too much and taking too long for what it was supposed to give us in terms of capabilities. So far, I have been singularly unsuccessful.

I know that it is past time for us to get some teeth marks on the bullet and perhaps weed out some projects which are going nowhere, or are of lesser priority. Why? Because in the next 5 years, the Army intends to field close to 50 *new major systems* in armor, infantry, air defense, aviation, command, control, communication, engineer, intelligence, and field artillery.

This is going to be a very sporty course. We must really discipline ourselves and our processes or we can create major difficulties for our training establishment, support system, and field forces. It will require careful, thorough planning and Total Army understanding and commitment. If we don't get on that wagon, and I mean all of us, the inevitable result will be that we leave our fighting forces out on a limb with the other side wielding—no longer a crude hatchet—but a modern chain saw and looking for an opportunity to use it!

How was this so-called bow wave created? At least in part by unrestrained new development starts or, as I have already said, "enthusiasms."

For the past 11 years in AMC/DARCOM, when putting together a research and development program, our first policy priority has been that there would be no new starts. I know that this has been the case in the past 3 years. But for fiscal years 78-80, we have had or are projecting 64 new starts in both major and nonmajor systems—an average of 21 per year. When I look at these numbers and look at the program and resources, I feel like the soldier in the musical "1776" who, when arriving at the Continental Congress with a message from George Washington, could only think to ask, "Is anybody here? Does anybody care? Does anybody hear what I hear?" And what I hear, what I see, is trouble and grief for the Army and for our nation if we don't get together and logically, consistently, and realistically get on with the business of defending our country.

Let me again quote from General Lynch's March message:

"We need this tank *(XM-1)* now for its proven performance and its potential for growth in survivability, performance, RAM-D, and overall capability. Our cost to move the *XM-1* into low rate initial production, at least through initial fielding, will be reduced availability and increased maintenance effort. As a practical matter, the *XM-1's* growth potential can only be realized through tank production and subsequent product improvements. We can afford neither the operational risk nor the cost inflating delays that would result from an attempt to seek perfection with prototypes."

I would add only one loud word to General Lynch's statement—so loud that everyone can hear it—*Amen!*

Fielding *(the second phase)* is a multifaceted transition period during which we infuse new or improved systems into the field. Planning for fielding obviously must begin early in the development cycle and again must be an Army-wide effort. New or revised training programs and manuals must be developed so that the combat power of the Combined Arms Team is not degraded during the initial fielding period. Production schedules must be adequately funded so that schedules are met. This requires Army-wide support during the budget process. It is as bad to have equipment and no training as to be trained but not have the equipment.

"We must meet the threat of the 1980s before chasing the will-o'-the-wisp of the 1987 threat."

Needed product improvements often come to light during the initial fielding period as our systems come into more widespread and real world use by combat troops. This is, in my opinion, and as General Lynch indicated, the only realistic approach to developing the full potential of any piece of equipment.

No materiel system is ever going to fully mature when it is fielded. No testing program, no matter how extensive and how costly, will ever expose all the problems. *Systems grow to maturity only through experience in the hands of troops in the field.* We have to say, at some reasonable juncture of proven performance, time, and money, that "we've gone about as far as we can go," get on with fielding, and then not perpetually revisit that decision.

I am not, however, advocating that systems be fielded simply because the "schedule" says "it's time to field." General Abrams, some 10 years ago, succinctly made the point that, "The United States Army doesn't have a requirement for a system that doesn't work." What we do have requirements for in the Army are working systems; we have requirements for *good* systems that exist and not so-called *"better systems"* that exist only on paper. We must first meet the dangerous threat of the early 1980's—one which will be shortly described to you—before chasing the will-o'-the-wisp of the 1987 threat. A programmed system, as General Abrams also said, is merely a *scheme* reduced to paper with tabs and columns of figures. And you and I know how little good these are when the Combined Arms Team is eyeball to eyeball with its adversaries.

This seems to me to be a good place to reemphasize a salient feature of DARCOM. We, as an organization, have absolutely no requirements of our own for the products we produce, field, and sustain. Our workload is in response to the requirements of other commands for the materiel and services they need to fulfill their missions. Our job, therefore, centers on providing the support needed where needed—doing what the Army wants done.

"The Total Army must rebuild an appreciation for, and act on an old principle of war—unity of effort."

We will take, I might add, any suggestions from *anyone* about how we can better provide this support. An example is a request from CINCUSAEUR for developing a single initial ASL/PLL support package to accompany new items. This would alter the present system of requiring numerous requisitions from the field to get the full complement of parts. Only one specially coded requisition would be submitted. The wholesale system—DARCOM—would then break out the list of needed individual items to the various depots and pull them together at one central location for shipment as a complete support package.

If you asked me if DARCOM should provide a centralized initial ASL/PLL package, I would say "Yes," for this is a matter, on the surface, of improving support. If you asked me if DARCOM could provide such a package, I would say "No," at least not with the present resources and missions we have. To provide centralized packages for each and every new system would require additional people to do the picking, consolidating, and packaging, people that we don't have available. The only way DARCOM would implement this procedure on a recurring basis would be through increased resources or through diverting men and women from other functions which are, in my judgment, equally or more beneficial to the Combined Arms Team.

"We must stop assuming the proverbial negotiating position every time someone with a different shoulder patch walks into the room."

The sheer impact on our present procedures of the 50 major new systems I mentioned earlier is staggering. For only one DARCOM command—the Armaments Materiel Readiness Command—and for only 27 of these 50 systems for fiscal years 79-81, *more than 14,000 new secondary items and repair parts will have to* be procured and managed. This workload, in itself, is indicative of what confronts the wholesale base in its third, and its most direct phase of continuing support to the Combined Arms Team—sustainability.

I say this has the most direct impact because today there is no "communications zone" (COMMZ) backing up the corps. DARCOM has become the COMMZ. While the Combined Arms Team has its basic load of ammunition, a given number of days of rations, POL, and repair parts, and has additional stores at DISCOM and COSCOM, the continued fighting capability of the Combined Arms Team rests on DARCOM's ability to bridge tremendous gaps—3,000+ miles of sea and land to Europe and about double that to Korea.

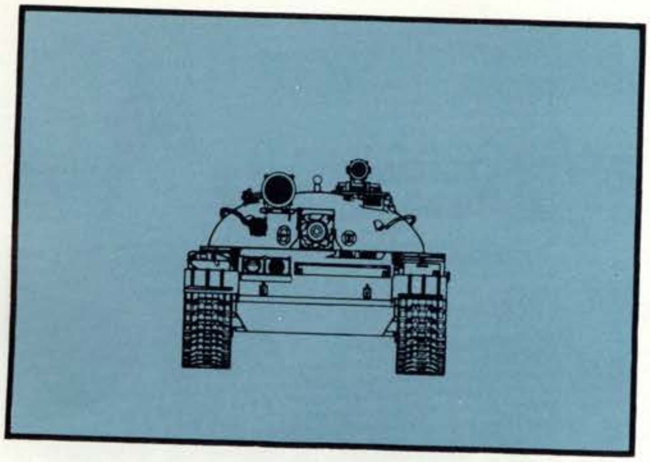
And we must be able to bridge these gaps effectively not only in peace but in wartime. No Combined Arms Team would even consider training in a mode that would not be used during actual combat. Neither can the support structure attempt to sustain the force in a way that would not work during war. We must, through the Direct Support System (DSS), be able to operate in peacetime as we will in war. By not having to change our system, we can more gracefully and without interruption transition and expand support of increased wartime requirements. We are not at that point today but we are looking forward to getting there soon.

If I were to sum up my comments today, and presuming to include some of the views of General Lynch and others of the Army's top leadership from whom we have received messages, I would say that the Total Army, from the Combined Arms Team right back through the concept and materiel developers, Active Force, Reserve, and National Guard, must rebuild an appreciation for, and act on an old principle of war—*unity of effort*. We must stop assuming the proverbial negotiating position every time a new idea is suggested or somebody with a different shoulder patch walks into a room. We need, in short, a change in attitude. We are in name and theory a Total Force, and from my perspective, it's past time that we responded to our challenges and our duties as a Total Force.

It is also past time for us to break out of what I call the "Route 13" syndrome. You Vietnam veterans know what I mean. For the benefit of those who don't, it means inflexibily doing the same thing year after year, and predictabily, getting zapped every time. It is of little consequence to have the most advanced technological potential if we can't get our act together well enough to transform that potential into actuality within a reasonable time frame and at a reasonable cost.

You have undoubtedly noticed that I did not discuss the specifics of our newest weapons system for the Combined Arms Team. That was intentional because you will receive in-depth presentations on these programs—AAH, XM-1, XM-2, and the Improved TOW. As these systems are discussed, I hope you will remember not only what I have said about how DARCOM supports the Combined Arms Team in developing, fielding, and sustaining systems, but also think about what each of us, as part of the Total Force, must do to weld the Army into a flexible, dynamic, responsive, and modern organization.

In the end, whether we draw sabers, defend the wagons, pull the caissons or hold the horses, each of us must contribute his or her imagination, initiative, and integrity. These remain the strength, the bond, and the armor of our calling as professional soldiers and members of the Total Army.



Threat Update

CPT Dennis Wance
USAFSTC

In 1976, in observance of the 31st anniversary of VE day, Marshal of the Soviet Union, Kiril Moskalenko, said:

> "We have done a great deal in the past 5 years by improving the equipment of our armed forces with the most modern arms and materiel....today our Army and Navy are, from the point of view of equipment, virtually new forces possessing great possibilities and capable of carrying out the most complex military tasks."

The Marshal is not boasting idly. The Soviets have invested heavily in *new, quality* equipment and have increased the quantity of fielded systems as well.

Traditionally, Russia has been an importer of foreign technology. No significant foreign technological development is likely to occur without counterpart Soviet investigation and exploitation.

Five invasions of Russian and Soviet territory in this century have left an indelible mark on their military thinking.

Immense armored battles such as Kursk and Orel were especially significant in developing and cementing Soviet ideas on how to fight. The conviction of the primacy of armor and mobile warfare as well as subordination of all forms of combat power, including tactical aviation, under the ground commander, emanated from these experiences.

The Soviet Union has traditionally maintained large standing ground forces requiring immense amounts of materiel and necessitating incremental equipment updating. New systems evolve from older models while retaining a great deal of commonality. The deployment cycle is frequently overtaken by the development cycle. Multiple generations of materiel—such as tanks—are common in a single combat unit. The total effect is a constant, but gradual increase in capability over time—a sort of incremental gradualism.

Economic constraints and requirements for large ground forces mutually reinforce the Soviet view of the relationships between man, technology, and warfare. The primal belief is that technology is important, but the outcome of battle is ultimately dependent on the *character* and *training* of the combatants.

Soviet philosophy insists on initially meeting new requirements by obtaining the maximum performance from existing systems. Changes in employment doctrine or increased training (as was done with the aging *Sagger* missile system) are used to allow unmodified equipment to be upgraded.

When training or doctrinal change cannot provide the required capability, the Soviets product-improve a fielded system. Such improvements are likely to capitalize on foreign advances in technology which have appeared since the original Soviet item was developed. Other improvements may result from ongoing domestic R&D programs which have been proven in prototype.

When possible, proven off-the-shelf components are used, permitting shortened development time, and simplified logistics through interchangeability of components and major assemblies.

Soviet weapon systems tend to be simple and rugged. *Simple should not be confused with inexpensive or crude.* Materiel which is relatively complex is carefully engineered to perform effectively with a well-trained crew and to survive the hazards of the contemporary battlefield, while still being easy to manufacture in great quantities.

When necessary to achieve a capability perceived as vital, departure from the philosophy of incremental improvement and the introduction of a totally new system may occur.

Normally, however, such systems, although they represent a departure from Soviet design trends, *are still within and take advantage of,* the current worldwide proven state-of-the-art.

Soviet philosophy permits the fielding of systems which are based on proven technology, while ensuring a conservative minimum risk development program.

Armor

The classic requirements of an armored ground force are firepower, mobility, armor protection, and the ability to communicate. The Soviets reflect their concepts and design philosophies in their equipment while achieving these classic requirements.

Regardless of the direction of doctrinal shift to or away from nuclear weapons, the backbone of the Soviet ground forces has been the medium tank. The *T-62* continues as the basic medium tank design the Soviets have been improving incrementally for about 25 years. Over 20,000 *T-62's* have been built and an additional 20,000 older-model tanks are still in the inventory.

The major distinguishing feature of the *T-62* over earlier-model tanks is the 115-mm smoothbore gun—first in the Soviet smoothbore family. The 115, with its kinetic energy (KE) round and long-rod penetrator, allowed the Soviets to meet the Free World tank threat of the 60's with a minimum of modification to their basic medium tank design. The extreme high velocity and flat trajectory of the 115 gives a grazing range of over 2,000 meters, partially compensating for the lack of a rangefinder and ballistic computer.

The Soviets have made low silhouette a key component of ballistic defense. To maintain the resultant compactness, Soviet tankers have accepted a *reduced basic load, a smaller depression angle, slower rate of fire, lessened crew comfort, and have imposed height restrictions on armored crewmen.* Such tradeoffs are not expected to diminish effectiveness.

The *T-64* deployed in Groups of Soviet Forces Germany represents a break from recent tank design trends. The vehicle weighs 38 metric tons, mounts a smoothbore 125-mm gun, and employs an automatic loader which allows a crew reduction from four to three. A new fire control system with a rangefinder and ballistic computer provides increased accuracy. Ammunition is separate-loading and includes HVAPDSFS, HEAT, and FRAG-HE. The *T-64* also sports a 12.7-mm dual-purpose turret roof machinegun capable of being fired from the closed-hatch configuration.

The *T-72,* displayed at the November 1977 Moscow parade, weighs 41 metric tons and uses the same main armament, fire control and automatic loader as the *T-64.* It, *like the T-64,* features 70-degree angle-of-protection at the front slope, low silhouette, and side armor shields. Both tanks employ a blade which is billed as a self-entrenching device.

Indications exist of a new Soviet tank development—the *T-80.* It is expected to follow the established method of incremental improvement over existing models.

The *BMP* is an amphibious, armored, infantry fighting vehicle (IFV) and successor to a large family of wheeled and tracked personnel carriers, many of which are still in service. The *BMP* is an impressive, well-engineered, fully-developed fighting vehicle, utilizing such features as an automatic loader for the main armament and gunner's passive day/night sight. For increased survivability in a nuclear-chemical environment, a sophisticated collective filtration system is provided, allowing vehicle personnel to operate unmasked. The *BMP* is the world's *first infantry fighting vehicle* to go into service and by many assessments is still the most formidable such vehicle either fielded or projected for the near future.

Small Arms

An impressive array of small arms and light AT weapons are provided to the Soviet motorized rifle squad. The *AKM* clamped into firing ports provides suppressive fire while the squad is mounted in the *BMP,* and forward-facing firing ports will accept the *PKM* machinegun. These weapons are simple in design, easily manufactured, and sufficiently accurate by Soviet standards.

The Soviets are quite serious about an armor threat and dedicate one man in each motorized rifle squad to an antitank weapon, the *RPG-7.* They are not, however, remaining complacent with current squad weapon designs. Already identified are successors to the *RPG-7* and the *AKM.*

Artillery

The overall trend has been to strengthen the conventional warfare capability of Soviet ground commanders by increasing the quantity and quality of artillery systems.

The *D-30* 122-mm howitzer has been fielded for over 15 years. It is currently a direct support piece in regimental and divisional artillery units. From an engineering standpoint, this is perhaps the finest artillery piece in its class in the world. With low silhouette, 360-degree on-carriage traverse, fire control instruments, and a precise fin-stabilized HEAT round, the gun is also an effective

antiarmor weapon. It is an excellent example of the Soviet insistence that field artillery be used not only for indirect fire support, but also for the direct fire role, including antitank.

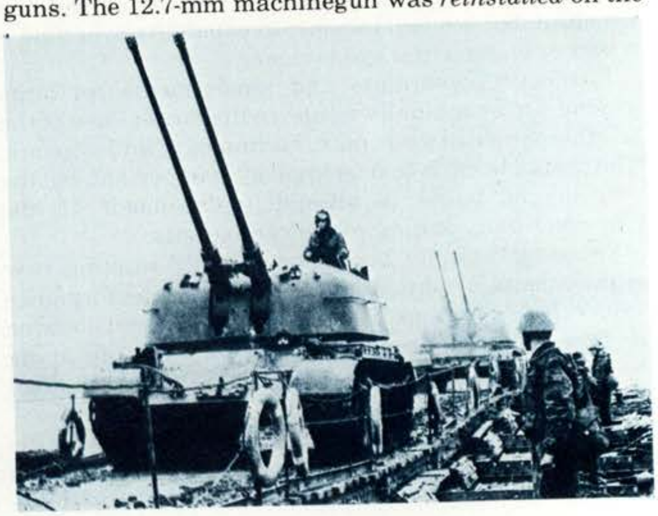
Recently fielded self-propelled (SP) artillery, a major break with prior design practice, reflects a Soviet desire to obtain operational capabilities, particularly mobility, which they consider more important than increased maintenance levels. The 122-mm SP is amphibious and fully compatible in mobility with *BMP* equipped motorized rifle troops, while its sister, the 152-mm SP, lacks the amphibious capability. *CBR* protection is included on the 122 and might be on the 152. The overriding requirements are to provide close and continuous, direct and indirect fire support to the fast moving, Soviet Combined Arms Team.

Each Soviet division includes a battalion of multiple rocket launchers (MRL). The 18 launchers of a unit equipped with the 40-round *BM-21* can deliver over 15 tons of improved fragmentation warheads to a range of 20 km in 20 seconds. The *MRL* employed as general support artillery, must be recognized as being effective for counterbattery fire, chemical delivery, surprise saturation fire, and engagement of approximately located targets.

Air Defense

The Soviets have long realized the aviation threat to their forces—both high-performance aircraft and helicopters. For air defense, they have followed four paths.

The first is to provide self-protection to individual vehicles. Both the *T-55* and the *T-62* were originally fielded *without* the dual purpose turret roof machineguns. The 12.7-mm machinegun was *reinstalled* on the



T-55 and the newer *T-62* has a recast turret to accept a 12.7-mm mount, while both tanks mount a coaxial machinegun. Infantry carriers also have had gun turrets installed.

The second path is the use of electronics and electronic countermeasures. New developments in fire control and ECM equipment have kept air defense systems current and increased their effectiveness.

The third path is to continue to develop and deploy mobile antiaircraft (AA) systems. The *ZSU-23-4* is the latest, appearing in 1965. Its all weather capability is derived from an on-board fire control radar and director, featuring components designed for effective employment in EW environments. It is also capable of direct fire against personnel and light armor. A moving target indicator to eliminate ground clutter, extensive backup options, and redundant subsystems make the *ZSU-23-4* a formidable and versatile threat to close air support and Army Aviation.

The fourth path to air defense, the tactical surface-to-air missile family now ranges from the hand-held *SA-7* at company level to the high-altitude *SA-4* at army and front level. *Regiments* now appear to have four *SA-9's* and associated command and control vehicles to complement the organic battery of *ZSU-23-4s*. The *SA-9* employs a modified wheeled reconnaissance vehicle as the transporter erector launcher sporting four missiles in pods on launcher arms. The *SA-9* is probably heat seeking, possibly with a cooled detector and proximity fuzing.

The *SA-6* gained a great deal of publicity as a result of its employment in the 1973 Middle East War. With outstanding tactical mobility, it appears to be fielded as a divisional weapon. The *Straight Flush* acquisition and guidance radar together with one or more transporter erector launchers form a fire unit. Intercommunication between the radar and launch vehicles is *thought* to be data link requiring no cabling and resulting in extremely rapid site occupation.

Antiarmor

Just as the Soviets consider their primary weapon to be armor, they consider enemy tanks the prime threat to their own highly mechanized forces. The response to this threat has been the assignment of antiarmor roles to all formations, and provision for a broad spectrum of weapons and components to fulfill this mission. Frontal aviation would engage enemy armor at the longest ranges, and Soviet helicopters *have been observed* mounting and firing ATGM's.

All *field* and *antiaircraft* artillery have armor-defeating ammunition and may be employed as direct fire weapons. Soviet armor formations, *of course,* are a potent antiarmor weapon. Motorized rifle formations also possess organic antiarmor systems. The motorized rifle division has an organic antitank battalion with both ATGM and towed antitank guns firing HEAT and KE rounds. Motorized rifle *regiments* and *battalions* will employ ATGM units. Squads equipped with the *BMP* also have an organic ATGM and 73-mm smoothbore gun firing a HEAT projectile. Individual riflemen can use armor-piercing small arms ammunition and the *RPG-3M* antitank hand grenade.

The Soviets have a complete family of antitank mines, emplaced by engineer units using armored mine planters and high-speed ditchers. All Soviet troops are trained to *hand-lay* minefields. The depth of the antiarmor capability *is impressive.*

Sagger is the most deployed Soviet ATGM. Although it is a product improvement over earlier systems, it is still at least a generation behind missiles with semiautomatic guidance, such as the TOW. However, rigorous operator training, plus routine employment of antitank grenade launchers to cover the minimum range dead space, have kept *Sagger* a viable threat to armor.

While new ATGMs with improved guidance, longer range, and increased lethality are appearing in the Soviet inventory, the towed antitank gun continues to be a cheap, efficient weapon capable of engaging armor with chemical and KE projectiles.

The *RPG-7* is the second generation of Soviet squad antitank grenade launchers. Some U.S. personnel initially were critical of the RPG because of the sensitivity of its rocket-assisted round to crosswinds. However, when U.S. firers were trained to Soviet methods and standards, the weapon was demonstrated to be excellent in range and accuracy, illustrating the Soviet reliance on a well-trained operator as well as technology to deliver maximum performance.

Mobility

In the area of rotary wing aircraft systems, Soviet materiel concepts have differed considerably from those of the U.S. In both countries, helicopter development was nearly parallel until 1956. In the early 1950s, Soviet stress was on heavy-lift helicopters, while the U.S. emphasized the air cavalry and gunship potential, exemplified by the *AH-1 Cobra* which entered service about the same time as the Soviet *MI-10*. The *MI-10 (Harke)* is somewhat comparable to the Free World *CH-54,* but in addition to having a larger payload, *Harke* has other features not present with the *Skycrane*. The

MI-10 has an all weather capability with an ice-detection and deicing system. It features an automatic fire extinguishing system for forced or crash landings. An on-board fuel transfer unit permits *Harke* to self-refuel while hovering over a ground fuel tank. Finally, maintenance-to-flight hour ratios are approximately one-half those of *CH-54* and are achieved through the use of integral maintenance platforms at key locations, an essentially leak-free hydraulic system, and a tendency toward simplicity and ruggedness in design of major components.

Beginning in the early sixties, Soviet tactical exercises began featuring heliborne troop landings, using motorized rifle troops moved by medium-lift ships from the front's tactical air army. Some strap-on armament kits were also seen, while light observation duties were performed by obsolete aircraft. Soviets *seemed* uninterested in gunships or in true airmobile operations or organizations.

Then in 1971, the *MI-24 Hind* was first seen. It was a major departure from Soviet trends. Retractable landing gear, integral ordnance stations, camouflage, and lack of a civilian counterpart made it unique. Performance, stability, and survivability were driving constraints in its design. Rather than just having the ability to merely move cargo about the battle area, the Soviets now have an aerial weapons platform plus an assault carrier for the Soviet squad. *Hind* appeared in service opposite central Europe and two models now exist in East Germany which have ATGM launcher rails, rocket pods, and some sort of rapid fire cannon in the nose. It is unknown how far the Soviet Union will go with airmobility, but *Hind* is evidence that they have paid close attention to U.S. combat and R&D experience with assault helicopters and gunships.

Wheeled Vehicles

In contrast to well-publicized Soviet advances in *aircraft, combat vehicles* and other *high-visibility systems,* improvements of transport vehicles have taken place with a minimum of publicity and have featured continued upgrading of the fleet. The mobility of the Soviet wheeled vehicle fleet of today must be assessed as challenging or surpassing that of our own full-production counterparts, particularly in soft soils.

All incorporate Soviet mobility features such as low-profile tires, central tire inflation systems, locking differentials, and power brakes and steering. Features such as electronic ignition are also standard. Each is a member of a vehicle family which includes a commercial counterpart with lesser off-road mobility but greater payload capacity. Commercial counterparts can be impressed in time of war for service in the rear areas.

While some Soviet truck designs show the influence of advanced U.S. prototypes of the late forties and early fifties, the Soviet 8-wheel series is an indigenous family. The *MAZ-537* is the primary tank transporter of the Warsaw Pact. It is used *more* to reduce reliance on railroads for long-distance movement of combat-ready armored vehicles, *than* as an evacuator of disabled equipment. The Soviets are capable of moving the tanks of several divisions in one lift with *MAZ-537* vehicles.

Bridging

The Soviets recognize that natural and manmade obstacles will challenge their ability to carry out massive, high-speed attacks. They feel any bridge is going to be located and targeted by their opponents within 2 hours of emplacement. Therefore, they have stressed *speed of emplacement* and *recovery* in designing their bridging. In contrast to the conventional scissors design seen in the U.S. armored vehicle launched bridge (AVLB), the Soviet AVLB is launched by cantilevering and maintains a low silhouette during emplacement.

For rapid bridging, the Soviets developed the PMP ribbon bridge. Introduced in 1961, it is the world's first bridge assembled from individual ponton deck units while forming a continuous ribbon. When western attaches first saw this bridge, they were astonished by the speed with which Soviet engineers could span major river obstacles.

Soviet medium tanks have a deep fording capability through the use of snorkeling equipment, while most APC's and IFV's are amphibious. Additionally, simple but efficient ferries have been seen.

Soviet interest in force mobility stands out in air-cushioned vehicles (ACV) such as *Gus,* a 200-ton ACV that can carry any piece of divisional equipment. ACV's have been observed operating with conventional troops as well as with the more specialized naval infantry.

To assure resupply and thus continuity of force mobility, the Soviets have invested heavily in a total logistic system. Massive pipe-laying capabilities to ensure an uninterrupted fuel supply, and modern feeding techniques and equipment are but a few examples of the Soviet commitment to the logistical support of a massive mechanized force.

Soviet communication philosophy differs from that of the United States. Soviet equipment is issued in more

The Armor Force Board, forerunner of the U.S. Army Armor and Engineer Board was selected as the Army component for the operation and the Armor School area was chosen as the site. This was done so that the building to be constructed for the test could be used later for training in amphibious operations. However, it is not known whether such training was ever conducted in the facility.

Construction was begun in April 1942 and completed in less than 2 months by Fort Knox personnel assisted by the Navy Bureau of Ships and its design contractor.

The instrumented building duplicated every beam, rivet, support, stiffener, light, vent, and hatch of the tank deck of the new-type ship that was to become the LST. According to Admiral Pyne, who participated in the project while serving with the Bureau of Ships as a lieutenant commander, a person standing in the building was, for all intents and purposes, aboard an LST on the tank deck.

Based on the test at Aberdeen Proving Ground with the single tank box, the initial design for ventilation in the Fort Knox mockup was made using a series of hoses connected to the exhaust of individual tanks. These were in turn joined to a master exhaust duct to carry gases to the outside.

On signal from the monitoring crew located in the building control room, each tank would start its engines in turn and dart out the bow and down the ramp as though landing on a hostile shore. This operating technique left a forest of exhaust lines hanging from the ceiling, creating a built-in obstacle to the tanks further aft in the ship. Although this was a reasonable solution for removing gases, too many problems were apparent. These were not pointed out, but it appears obvious that repeated use of the exhaust lines would not have been possible, and they would have to have been refitted after each invasion. Not only this but, as proved by their test, many leaks occurred in the system. Personnel were required to wear protective masks and their movements were hindered during operations. Furthermore, commanders were opposed to any restrictions which would prevent periodic checks of vehicle and equipment readiness during a voyage of days and weeks. All this was recognized by the Navy design groups and they abandoned the individual exhaust hook-up system.

The test group then began a series of experiments with vents, deflectors, baffles, interior design changes, and installation of several large exhaust fans. These experiments produced a system capable of moving a sufficient volume of air to permit the loading and offloading of a full complement of tanks under their own power. Additionally, there was no need for crewmen to wear masks or other protective devices and the tanks could be checked for operational readiness while the ship was under way.

"Temporary" building T-1538 served out its role in the development of one of World War II's most famous ships in the fall of 1942 and became the property of the U.S. Army Armor School. It eventually was named Austin Hall and remained in the school's care for three decades. During that time, thousands of students passed through it when it was an instructional facility and many of them must have wondered about the structure's strange shape. I hope that this article answers their questions.

Austin Hall is now a storage area for the antique armor vehicles of the Patton Museum and although the old building did not serve a more dramatic role in the development of the LST, as was once thought, it is unique. So much so that it deserves recognition as another important contribution to the art of mobile warfare—along with the many other accomplishments of the Armor School, the Armored Force, and its soldiers.

Information for this article was provided by General Jacob L. Devers, U.S. Army (Retired) and Rear Admiral S. N. Pyne, U.S. Navy (Retired) in letters to the author. ED.

LTC JOHN A. CAMPBELL, USA-Retired, was commissioned in Armor upon graduation from OCS at Fort Riley in 1949. He served with the 3d and 14th Armored Cavalry Regiments, the Armored School and in numerous staff assignments. Colonel Campbell retired in 1971. He was Director of the Patton Museum of Cavalry and Armor at Fort Knox from 1972 until 1975, and presently serves on the Board of Directors.

A New Breed

Active Defense Cavalrymen

by Major Michael A. Andrews

Neither promulgation of the Active Defense concept nor the resulting healthy consternation and conjecture regarding that evolutionary new doctrine has adequately addressed future employment of cavalry. The new FM 17-95, *Cavalry*, provides little insight concerning optimum cavalry utilization and integration relative to the Active Defense.

Unlike other historical doctrine adjustments to specific technological advancements, a myriad of economic and political considerations necessitate an Active Defense concept for the United States to fight outnumbered and win. The fundamental doctrine-equipment relationship evidenced in previous changes is maintained in that the Active Defense will be characterized by utilization of recently developed equipment in sophisticated weapons systems—computers, radios, lasers, missiles, air-delivered mines, and smart bombs.

Doctrinally, the Active Defense concept incorporates a strong covering force with the mission of conducting a major defense well forward. Main battle area (MBA) elements achieve depth through lateral maneuver and concentrating at the decisive time and place while accepting risks elsewhere. Ironically, traditional covering force and MBA unit characteristics and tactics seem reversed. Covering forces retain the cavalry economy-of-force missions of buying time, obscuring the location of the forward edge of the battle area (FEBA), and of identifying the enemy main attack. But a major battle well forward is envisioned to absorb the enemy's massive, overpowering thrusts until decisive concentration points are identified. The enemy's first echelon and air defense umbrella must be depleted. It will be a major fight, not a sparring, jabbing delay. The concept further envisions considerable lateral movement to concentration points, and coordinated withdrawals to subsequent fighting positions by MBA forces—classic cavalry economy-of-force measures requiring unprecedented flexibility, mobility, and task organizing for independent operations.

Since it may therefore seem that everyone is a cavalryman in the Active Defense, the role of cavalry within that doctrine is curiously obscure. Active Defense genesis was response to the U.S. posture in West Germany. The situation precludes extensive covering force delaying actions for which current armored cavalry Combined Arms Team organizations were structured. Furthermore, the massive Soviet buildup and the advent of increasingly sophisticated weapons systems suggested that previous MBA dispositions were an eggshell that, once cracked, provided little defense in depth. Current scenarios integrate available cavalry squadrons among several task forces when the covering force is task organized. The issue of how to best utilize cavalry in modern warfare requires a renewed operational definition of cavalry. What is cavalry? An answer to that recurring question necessitates a historical perspective.

One of the earliest developments in warfare was the emergence of horsemen. Initially, cavalry supplemented massed infantrymen. The horse's mobility differential provided a means of maneuver from an infantry base. Cavalry was used in front or on the flanks to screen, or as a mobile reserve or enveloping force. But eventually horsemen became formidable adversaries in their own right. Until World War I, the horse virtually dominated major trends in tactics. But mechanization rendered the austere numbers and more time is devoted to training, especially in communication discipline. Their doctrine is designed to severely hamper enemy communications, using a combination of artillery fires and their capability to exploit or disrupt the use of the electromagnetic spectrum. There is also some evidence that the Soviets consider electronic intelligence to be their *primary* all weather target acquisition means.

Chemical, Biological, and Radiological Warfare

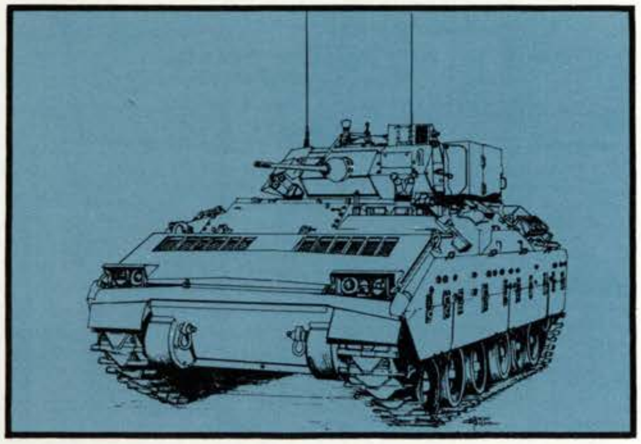
The Soviets are the most CBR prepared force in the world. Protection levels that include full, collective protection in the *BMP* and possibly other new armored vehicles are indicative of a broadly funded research and procurement program to support the CBR program. Decontamination is stressed and a full inventory of equipment from the simple individual decontamination kit to sophisticated devices are provided to accomplish the mission. The Soviets argue that they are merely reacting to what they see as the "capitalist CBR threat." However, it is obvious that they are engaged in a concentrated effort to achieve the capability to operate effectively in a chemical environment *of their own creation.*

We have seen that Soviet materiel differs from that of the Free World due to technological strengths and weaknesses in various fields. Technology and concepts are conditioned by *foreign orientation, lessons of combat experience, competition for resources, the size and shape of standing ground forces, and a tendency to emphasize the role of the operator in system performance.*

The chief technological differences between Soviet and U.S. materiel have been based in large part on Soviet utilization of existing state-of-the-art rather than achievement of some breakthrough. However, we must accord the Soviet's technological leadership in some areas. We have acknowledged Soviet leadership in gap-crossing capability by copying their ribbon bridge, but we have not seriously pursued the excellent multispan technique they developed. In other areas, the Soviets have used technology which is certainly available to us, but which we have not applied extensively. Thus they have gained an *experience advantage* in such areas as smoothbore tank cannons, antiaircraft artillery, multiple rocket launchers, and rocket-assist antitank weapons.

The Soviets have fielded an impressive military challenge and we must assess that threat as one of both quantity and quality.

The Soviets feel that *with* a lot of equipment of moderate quality/state-of-the-art they can win a war.



Mounted Ground Combat Operations

MAJ John Sterrett
USAARMC

LTC William L. Shackelford
USAIC

ARMOR

To defeat a Soviet attack in Europe today, using current equipment, our defense concept is to destroy the enemy with strong Combined Arms Teams and task forces fighting from mutually supporting battle positions, in depth, throughout the battle area. Defending platoons, company-teams, and task forces employ their weapons with maximum effect by skillfully using terrain and the concentration of supporting fires on massed enemy formations. Company-teams and task forces are moved to and from battle positions, as necessary, by battalion or brigade commanders in reaction to movement of Threat forces to take advantage of the terrain and weapons, and to execute their defensive battle plans, including counterattacks.

Careful placement of weapon systems with skilled integration of the rest of the Combined Arms Team, insures battlefield resistance that can withstand a heavy blow and permit the defender to strike back. The defender loses the initiative to the attacker. To win, we must regain the initiative. Even if for short periods, it will be necessary to attack—while defending. Aggressive attacks by fire and maneuver at critical times and places are the rule.

INFANTRY

The battle discussed here will be described not only in terms of firepower, terrain, and the enemy, but in terms of command and control at each level from platoon to task force. This control is necessary to mass superior forces at the proper time and place.

This is how the defense is executed. The 25th Armored Division defends in sector with three brigades abreast (figure 1):

"1st Bde in the north, 2d Bde in the center, and 3d Bde in the south. The division will assume control of the covering force in sector vic line TOM; each bde will be prepared to assume control of covering forces operating forward of the bde sectors. Initially there will be no reserve at div or below. 1-20 armor becomes reserve once returned from CFA."

In this example we have Task Force 2-12 Armor, part of the 2d Brigade in the main battle area (MBA), defending against a tank regiment that is a part of a breakthrough attack (figure 2). The task force commander determines that the primary avenue of approach (AA) into his sector is on the right. He expects the enemy to deploy about two battalions of about 60 tanks

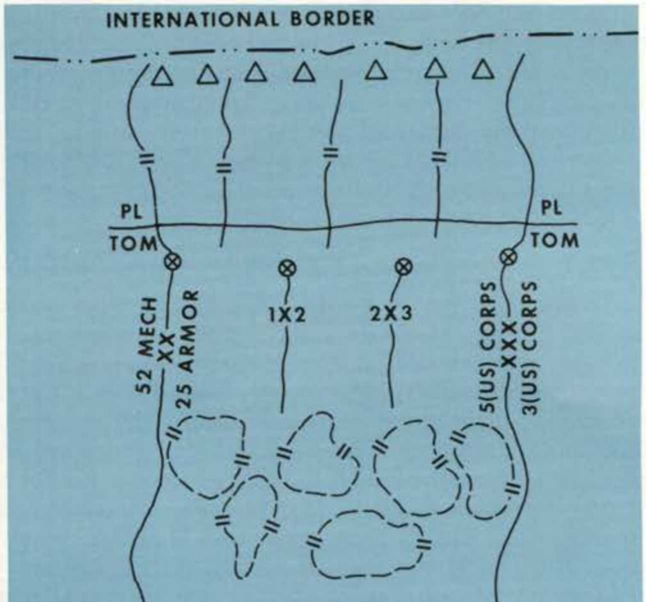


Figure 1

and 20 *BMPs* moving about 1 km every 5-6 minutes along this approach. He intends to engage enemy forces on the right at long range with TOW and tank fire. He will use minefields and other obstacles forward of his positions to canalize the enemy, reduce his mobility, and hold him in areas where fires can be concentrated (figure 3). Specifically, two 500-meter minefields have been emplaced on the key terrain north of the FEBA. These obstacles will deny the enemy use of overwatch support for his drive toward the initial battle positions. To canalize the enemy into the primary engagement area, two antitank ditches were emplaced east and west of the primary engagement area. These will prevent any attempts by the enemy to exit the engagement area laterally once the firing begins. To round out the obstacle plan, a 500-meter minefield is emplaced astride the main approach between the initial battle positions. This obstacle should slow any Threat attempts to push through the initial battle positions (BP).

Artillery fires are planned to slow the enemy and destroy him if he dismounts. The task force commander is in his tank, well forward, directing and controlling the movement of his teams. He also considers alternate ways to continue the fight should a team be detached by the brigade commander for concentration in another TF area.

ARMOR

He places Team B (mech-heavy) on BP 11, and Team C (tank-heavy) on BP 12. Company A (pure tank) is given BP 10 that includes some secondary avenues of approach. The scout platoon screens to the front. If the extent of enemy fire and maneuver makes it necessary, he intends to move his units to subsequent BP's such as 21 and 22 to continue the defense. Company A's positioning enables the task force commander to attack the enemy flank if the enemy situation permits a counterattack. The engineers are busy with their obstacle plans and the artillery supporting the brigade is positioned to provide fires to the TF. *Redeye* is providing protection to the forward teams and the trains area, while the *Vulcan* platoon is positioned with Team B. The Air Force forward air controller is ready to request immediate tac air when requested by commanders. The division commander placed an attack helicopter company OPCON to the brigade and the commander is preparing contingency plans based on brigade's guidance, BPs, and target reference points (TRPs). Early in the planning the scouts from the attack helicopter company reconnoiter possible positions for the attack helicopters to use after the battle starts. They are also prepared to direct or request tac air and indirect fires to support the attack. The task force commander multiplies the combat power of the company/team with these attack helicopters, obstacles, and artillery and mortar fires to assist in target servicing.

INFANTRY

It is essential for the task force commander to explain how he plans to fight, how he wants the battle to come out, and how he plans to force the enemy to do what he wants. He can no longer just say, "Defend in sector, Team A on the left, Team B on the right and Team C in reserve." The concept of the operation must flow from the head of the battalion commander to the company/team commanders. Each team commander then considers enemy avenues of approach, terrain intervisibility, areas of fire for his weapons systems, and where he can see and shoot. He selects platoon BPs and TRPs and then uses a template of various threat arrays to determine choke points where he will use smoke and obstacles. This detailed planning reduces lengthy transmissions once the battle is joined.

Team movement and control of fires without boundaries makes target identification and use of artillery difficult. This adds complexities to the battle, requires practicing with all systems, and positive communications.

ARMOR

We now join the battle with the scout platoon in contact and making this report.

"I see 22 *T-62s* and 33 *BMPs* deployed in assault formation at ES965276 moving south on Highway 91."

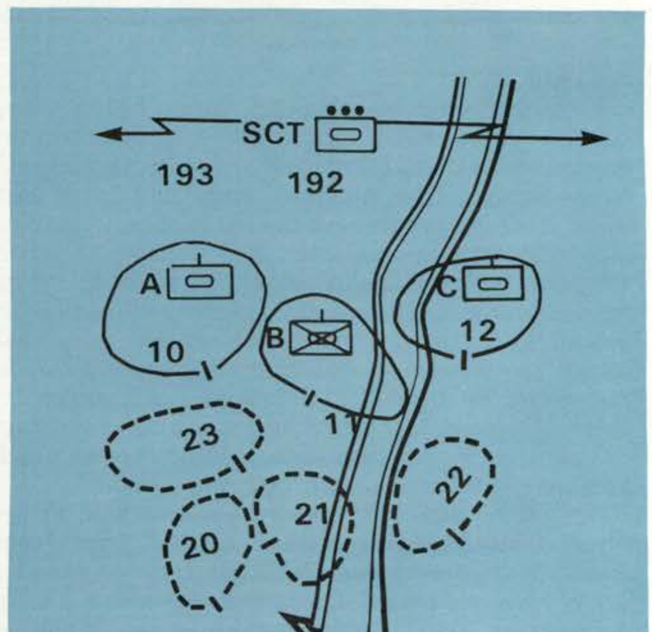


Figure 2

Now the decision process begins for the task force commander. It's what he expected. His teams are in good positions so there is no need to readjust them and he considers use of tac air and attack helicopters. He tells the S3 to notify brigade of the contact and to request additional resources. The scouts call for replacement artillery fire and move to their next positions. Next the Team C commander on BP 12, makes the following report to the task force commander.

"I've got 25 *T-62s* and 30 or more *BMPs* moving down AA 1. They just crossed the north edge of area FOX. Beginning long-range fires now. I'm receiving some artillery fire."

The Team B commander confirms this report, begins his long-range fires, and he too reports receiving artillery fire. The Company A commander can see about 10 *T-62s* and 3 *BMPs* entering his engagement area.

Let's pause here a moment and consider the decisions that have been made within the first 5 minutes of the battle by the team and task force commanders. To be successful and win on the modern battlefield the task force commander must see, suppress, and move better and faster than the enemy so the TF can destroy that numerically superior enemy. Within the TF, numerous decisions affecting all facets of the battle must be made under pressure, in a short time, by commanders of all elements. These decisions must then be transmitted rapidly and accurately and the inability to communicate could prevent the TF from seeking, suppressing, moving, and destroying.

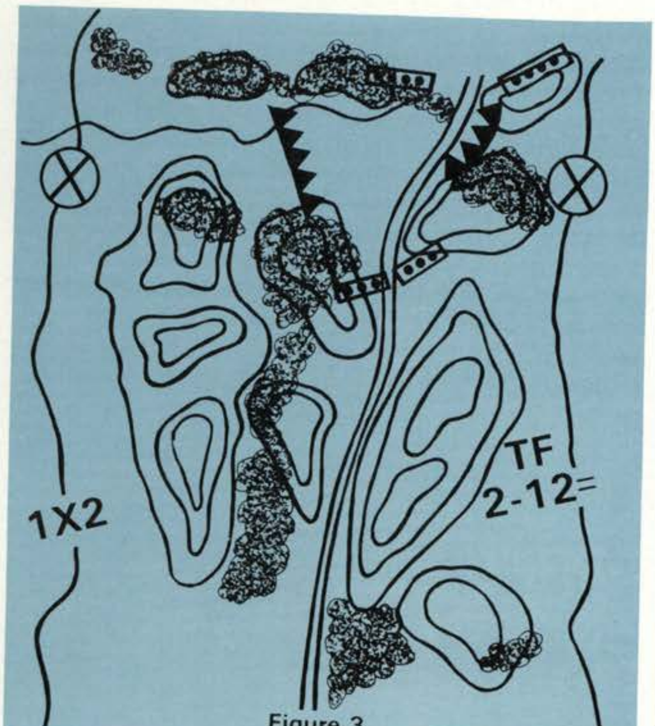


Figure 3

Let's see how the Team C commander controls the fires of his forces.

"At my command! 1st TOW section engage tanks right of TRP A8... 1st tank platoon engage *BMPs* right of TRP A8... 2d tank platoon engage all targets left of TRP A8. Acknowledge.

"FIST! When those *BMPs* north of A8 come on line with that TRP I want HE and smoke behind them to keep those tanks following them from seeing our fire..."

As the tanks fire, they move back into defilade, then return to the same firing position or move to another. After firing 3-6 rounds, however, they must change firing positions to avoid the enemy's direct antiarmor fires and indirect suppressive fire.

The team commander is able to place immediate indirect fires on the enemy because he had preplanned targets and positioned OPs to adjust fire.

The task force commander is updated on the situation by his unit commanders. Company A looks good. Team B is receiving artillery and some smoke but is able to continue the engagement. Team C is under heavy suppression, has lost three tanks and two APCs and requests to move to BP 22. The task force commander is at Team B's position, can see the battle developing, and needs to make some quick decisions. Should he move forces? If so, who and where? When should he start moving resupply vehicles forward? Can the teams stay and deal with the targets?

We may not lose ground in the first engagements. It may be better to stand and fight. If we've guessed wrong, we may have to give up a little ground. Standing and fighting may not be the intelligent thing to do if we lose our capability to continue the fight the rest of the day. So, using our mobility and the terrain, we give a little. Again the commander must ask himself some questions with respect to:

Timing—If I move, when do I start that movement? How long will it take the enemy to close on my positions?

Resources—What do I have? What can brigade give me and where should I use it?

Reports—Am I getting all the information? How accurate?

A good percentage of the reports may be erroneous, and he may end up making decisions based on just a few reports. These are reflex decisions. Time won't allow the commander anything else. These types of decisions occur simultaneously throughout the battle, at all levels—platoon through TF.

INFANTRY

The task force commander orders the attack helicopter commander to provide overwatch fires from a target reference point in the valley forward of Team B. He then orders Team C to BP 22, while Team B covers the move. Mortars and artillery are used to place smoke on the enemy during the displacement. Team B's TOWs are now vulnerable to the indirect fires of the advancing enemy, so they are moved to BP 21. When Team C is set, Team B will move to BP 21 still under the overwatch of the attack helicopters. Company B will stay in BP 10 as long as possible, then move to BP 23.

If enemy artillery or electronic warfare measures effectively neutralize the task force commander's ability to control the battle at a critical moment in the battle, he relies on his prior planning, which called for specific emergency signals to be used, or moves to that team position to personally issue the instructions.

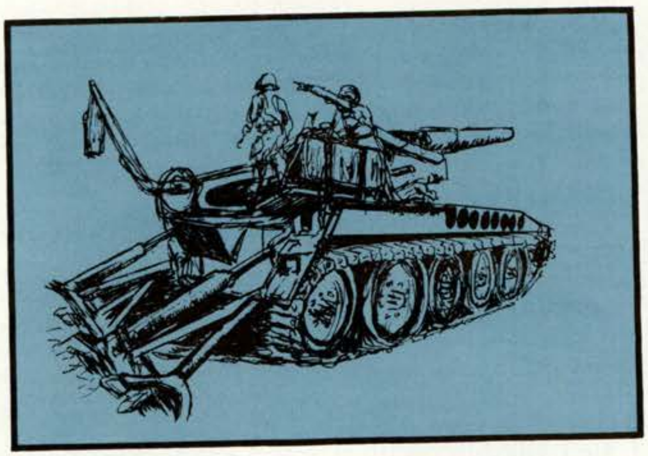
Company A reports that the enemy has been slowed by the minefield, and 10 more *T-62s* have crossed the ridge. It looks like the next battalion, so he continues his engagement. The attack helicopters continue to engage from the lower ground in front of Team A. Tac air is on station, so the task force commander directs the FAC to hit specific targets. The TF fire support officer continues to call for artillery to suppress the enemy air defense systems and hamper their movement.

Situation reports from subordinate units indicate that the tac air was effective and that Team C has destroyed five *T-62s* and 10 *BMPs*. Team B has destroyed 10 *BMPs*, but lost two more APCs and 10 KIA. Team C has destroyed four more tanks and reports that the enemy is on the north edge of area WOLF, with a few BMPs and two tanks left. From the reports, the task force commander feels that this regiment is just about gone. The attack has been stopped, and the time is ripe for a counterattack. The task force commander must constantly keep the brigade commander apprised of the situation. He reports the situation to the brigade commander, who tells the attack helicopter company commander to continue operations with the TF. The brigade commander then allocates a tank company to the TF to finish destruction of the enemy in areas FOX and WOLF. A lot of counterattacking will be necessary. We talk of attacking by fire, and by fire and maneuver, always bearing in mind that when the defender moves out of his prepared positions, he gives up the terrain advantages that are his as the defender. Counterattacks are important, but they are done in small increments more quickly than before.

ARMOR

The task force commander directs his S3 to link up with the company, lead the team on the attack position, and issue necessary orders regarding direction, attack objective, and fire support. The counterattack will go through BPs 20 and 21 to destroy the remaining enemy in area WOLF then continue the attack through area FOX, while Teams B and C prepare to reoccupy the forward BPs. While the counterattack is taking place, Teams on BPs continue to destroy the enemy. The task force commander gave the attack helicopters a BP from which they service targets on the enemy's flanks or rear as he attempts to withdraw from the counterattack area. Artillery fires are planned in front of the BPs to provide suppression while the counterattack force moves. Close air support is also continued. The task force commander issues instructions to teams for shifting friendly fires as the counterattack continues. He directs the teams to employ their infantry forward to clean up the area behind the counterattack and check enemy vehicles and equipment to insure enemy resistance is eliminated. The task force commander feels this offensive action is necessary to clear the decks and get ready for the next echelon. Once this action has been taken, and the information is relayed to the brigade commander, there has to be a decision as to whether or not this is the point of the enemy's main effort. The counterattack is successful and the task force prepares for the next battle.

At this point there may be or may not be a short lull, giving the task force and team commanders some time to resupply, evacuate casualties, recover vehicles, and reposition forces. If there is no lull, tanks and other weapons systems will have to be resupplied by backing off the position one at a time to a point where an ammunition truck or armored personnel carrier can bring up ammunition or fuel without being subjected to intense artillery and direct fire. In any case there will not be much time for large scale resupply within the task force. It is going to be piecemeal and must be kept mobile to avoid loss. Here the scouts have just reported another contact, and the next battle begins!



Field Artillery Fire Support

COL John E. Donahue
USAFAC

The past few years have marked a period of tremendous change of the Field Artillery. There are a number of significant current and planned innovations in our doctrine and tactics, in our organizations and structure, in our materiel, and even in the way we face our traditional mission of fire support. The driving force is our perception of what the next war will be like. There is no doubt that the Central European battlefield and the Soviet threat dominate our tactical thinking and the evolution of doctrine and equipment. Whether or not this is our next battlefield, *it* does represent the most dangerous threat. The important thing is, that if our forces can meet the demands of the European battlefield, we have a reasonable assurance of meeting the demands of other battlefields.

The Field Artillery's job on the Combined Arms Team is best summarized in our mission statement: "To destroy, neutralize, and suppress the enemy by cannon, rocket, and missile fires; and to integrate all fire support into Combined Arms operations."

Supporting Fires

Delivering accurate and responsive field artillery fires is not a simple job. It requires a total system which provides for the acquisition of targets, the computation of a complex gunnery solution, a variety of weapons and ammunition, and the necessary command and control to tie the system together. It is this total system which enables the Field Artillery to support the Combined Arms Team with fire.

Close support fires assist the frontline combat forces either by directly participating in the attrition of the enemy, or through the use of suppressive fires, smoke, and illumination, to make the enemy a more lucrative target for our direct fire weapons.

The basic close support weapon for our armor and mechanized forces is the 155-mm self-propelled howitzer. This weapon can deliver a wide range of munitions, including high explosive, dual-purpose improved conventional munitions, smoke, illumination, scatterable mines, and chemical and nuclear rounds. It can deliver this support out to ranges beyond 18,000 meters, and with the rocket-assisted projectile out to ranges of 24,000 meters. A product improved version of this weapon will be fielded this year. The modifications will make the weapon safer, more reliable, and will speed up ammunition handling. In addition to these improvements, a feasibility study is currently being conducted in an effort to increase the range to 30,000 meters.

"Precision guidance, coupled with a shaped charge warhead, gives the Copperhead a high probability of killing any known enemy armor."

Future 155-mm close support battalions will be configured with three batteries of eight howitzers each, versus the current six howitzer battery. In addition to the obvious increase in firepower, this will permit employment as two 4-gun platoons. This employment provides a higher degree of survivability by allowing more frequent moves, while still maintaining our ability to deliver fires.

With the fielding of the battery computer system in the autumn of 1981, each 4-gun platoon will have its own automatic data processing capability. The battery computer system is designed to operate with TACFIRE. However, it is also capable of autonomous operations. The battery computer system has many features which provide for precise and responsive close support fires.

Close support fires can also be provided by the 8-in howitzer which delivers a 200-pound projectile to ranges in excess of 20,000 meters. In addition to conventional high explosive, the 8-in howitzer can deliver dual-purpose improved conventional munitions, as well as chemical and nuclear rounds. Product improvements are continuing on this howitzer in an effort to achieve ranges approaching 30,000 meters.

Area Targets

Historically, the field artillery has been employed in the attack of area targets, but we have not been very successful at the destruction of hard, point targets. With the advent of the *Copperhead* round, this situation is changing. The *Copperhead* round is fired by the 155-mm howitzer, and is guided to the target by homing on reflected laser energy. Precision guidance coupled with a shaped charge warhead gives the *Copperhead* a high probability of killing any known enemy armor.

Laser designating for the *Copperhead* round can be accomplished by the ground laser designator (GLLD). With this designator, the observer has a high hit probability on moving and stationary targets to ranges meeting and exceeding those of the TOW. It has a day and night capability, and can be employed from either a ground tripod, or can be mounted on the pintle of an armored personnel carrier. Future plans call for mounting the GLLD on a retractable hammerhead on the forward observer vehicle.

In addition to providing designation for the *Copperhead* round, the GLLD can designate targets for other precision munitions, such as HELLFIRE, or can illuminate targets for hand-off to acquisition systems, such as the Air Force's *Pave Penny*. Linking the GLLD with the TACFIRE system enables the operator to transmit information which provides for fire for effect accuracy with conventional munitions.

Another device which assists in the locating of targets is the hand-held laser rangefinder. The *GVS-5* has the same optical characteristics as the current binocular, and also provides an accurate range-finding capability.

Laser devices will also be airborne, such as in the Advanced Scout Helicopter, and in the Field Artillery's Remotely Piloted Vehicle (RPV). The RPV can provide optical or infrared surveillance of the battlefield at ranges beyond the capability of ground observers. Once targets are acquired, the RPV can be used in the adjustment of conventional munitions, or can lase for the employment of precision munitions. The RPV is controlled from a ground station and extends the brigade and division commander's eyes 20 kilometers and more beyond the line of contact.

Counterfire

A Central European battle would find one U.S. division facing some four Warsaw Pact Divisions. We might find that our company commander is facing not only a ratio of one to four in maneuver systems, but also an enemy capable of pounding his position with massive amounts of high explosive indirect fires. Freeing our maneuver forces from such attacks is a job the Field Artillery accomplishes through counterfire.

Counterfire encompasses all aspects of finding and attacking the enemy's indirect fire systems. Counterfire is truly a combat multiplier since it not only causes damage and casualties to the enemy, but also frees our direct fire weapons. The more effectively we accomplish the counterfire job, the more effective will be our fighting capability. The importance of the counterfire role has lead to many doctrinal and organizational changes in the field artillery system. A target acquisition battery has been added to each division artillery and the division artillery tactical operations center has been structured to accommodate management of the counterfire effort.

"These radars can track multiple firings and can locate 15 to 20 targets per minute with an accuracy that allows first round fire for effect."

In the area of acquisition equipment, we have developed the *Firefinder* system. *Firefinder* consists of two radars—the *AN/TPQ-36* countermortar radar and the *AN/TPQ-37* counterbattery radar. These radars provide a quantum jump over the current capability, with greatly increased area coverage, and a range capability sufficient to locate any Threat cannon or mortar system. Both of these radars can track multiple firings, and provide direct digital communications input into the TACFIRE computer.

These radars can locate 15 to 20 targets per minute with an accuracy that allows first round fire for effect. Direct digital communications from the radars to the TACFIRE computer gives us a degree of responsiveness such that, in some instances, we can have rounds on the way against an enemy target before his initial rounds land. The *AN/TPQ-36* has been fielded in USAREUR on a selective basis.

General Support Rockets

All of the acquisition systems are of little benefit if we do not have the means of attacking the acquired targets. As a step toward increasing our firepower and countering the advantage of the Warsaw Pact, the Field Artillery is developing a General Support Rocket System (GSRS) under an accelerated program. This system will provide our forces with a 35-kilometer range weapon, capable of delivering large volumes of fire. Each launcher is manned by a crew of three, and is loaded with twelve 9-in rockets. The initial warheads will contain dual-purpose antiarmor antipersonnel bomblets, with follow-on warheads for antitank mines and terminally-guided antitank submunitions. Comparing the munitions delivery capability of the GSRS with that of the current cannon artillery improved conventional munition, we find that one launcher load from a GSRS launcher equates to one volley from some three battalions of 8-in howitzers. With nine launchers per battery, this equates to a massive indirect firepower capability. The GSRS is scheduled for fielding the latter part of 1982.

Suppressive Fires and Interdiction

Air assets, including close air support provided by the Air Force and Army aerial maneuver systems, provide us with a significant measure of combat power. However, if our aircraft are to succeed against a modern enemy force, the enemy air defenses must be suppressed. The Warsaw Pact can be expected to field an intensive air defense umbrella with their attacking forces. Field Artillery weapons provide the commander with an effective means of suppressing the enemy's air defenses without risking limited close air support and attack helicopter assets.

> **"The Field Artillery will never lose sight of its primary role of providing the ground gaining arms with timely and accurate fire support."**

Throughout history, Field Artillery has been able to reach out and attack the enemy at long ranges, but as we enter the 1980's we find interdiction as a distinct new mission for the Army. Even with the development of our sophisticated antitank weaponry, the sheer numerical superiority of the Warsaw Pact enables him to continue the commitment of forces, even in the face of massive losses. The goal of interdiction is to prevent the second echelon forces from becoming first echelon problems. This can be accomplished by either slowing the enemy's forward momentum to reduce his rate of arrival or by degrading or destroying those forces so that our combat forces face a less capable enemy. Interdiction has broad implications on the Field Artillery, including development of longer range weapons, improved target acquisition, terminally-guided munitions, and the development of doctrine for the management of the interdiction role. Our ability to deal with second echelon forces will have a major impact on our ability to win not only the first battle, but also the succeeding battles of the next war.

Of significance to our interdiction efforts is the Field Artillery's *Lance* missile, which can deliver a nonnuclear warhead with some 1,000 pounds of antipersonnel and light materiel-defeating bomblets to ranges in excess of 70 kilometers. The range of the *Lance* makes this system ideal for early attack of enemy forces, and for attack of his second echelon formations. In addition to the nonnuclear capability, *Lance* can deliver a nuclear warhead to ranges in excess of 100 kilometers.

The Field Artillery's longest range weapon is the *Pershing* missile, which can deliver nuclear warheads to ranges in excess of 700 kilometers. The *Pershing II* is currently being developed as a follow-on for the present system, and features an improved guidance system, improved warhead technology, and greater ranges.

Fire Direction

The Tactical Fire Direction System, or TACFIRE, provides the Field Artillery with an automatic data processing system which vastly increases our capability to plan fires, acquire targets, and attack them expeditiously with proper amounts and types of ordnance. TACFIRE automates, in varying degrees, virtually every function of the Field Artillery system.

TACFIRE consists of a system of computers and remote terminals located at every echelon of fire support from the FIST at company level to the field artillery section at corps headquarters. These computers and terminals are tied together with digital communications which provide for the transmission of large volumes of information quickly and efficiently over standard communications equipment. The TACFIRE computer provides a degree of refinement in both technical and tactical fire control beyond the realm of possibility using manual techniques. In addition to providing information by hard copy printers and cathode ray displays, the system provides for a fully automated situation map display.

Fire support personnel with the maneuver forces gain access to TACFIRE's capability through one of two message devices. At company and platoon level, observers can imput to, and receive messages from, the TACFIRE computer using the Digital Message Device, or DMD. This device couples to either wire or radio communication equipment and provides the operator with a variety of message formats, including free text. The fire support elements at maneuver battalion and higher are equipped with the Variable Format Message Entry Device, or VFMED. This device provides for input to the TACFIRE computer via a keyboard and can receive messages on a cathode ray tube display or line printer. TACFIRE has been issued to the 1st Cavalry Division at Fort Hood and the 1st Battalion, 17th Field Artillery at Fort Sill. The 212th Field Artillery Group at Fort Sill will receive TACFIRE in June of 1980. TACFIRE units will go to USAREUR in October of 1980, with the first USAREUR division being equipped in 1981. TACFIRE will be fielded in CONUS beginning in 1981.

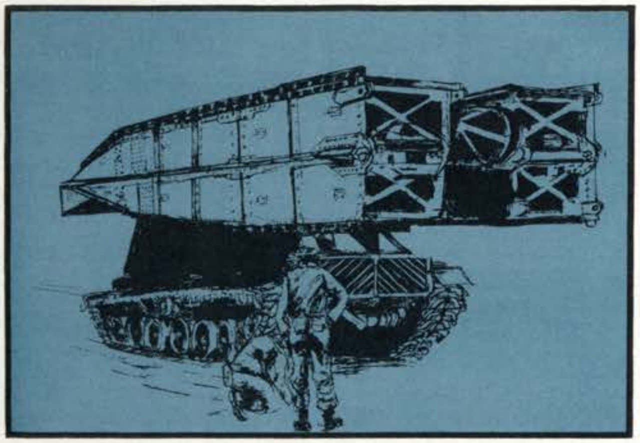
Fire Support Coordination

The Field Artillery has been charged with the management of the total fire support system including not only field artillery, but also mortars, naval gunfire, and close air support. This is accomplished by providing each maneuver commander from company through corps with a Fire Support Coordinator (FSC) and a team of fire support specialists which form the base of the maneuver commander's fire support coordination facility. These fire support personnel provide an effective solution to the complex planning and coordination required for optimum employment of the total fire support system.

The key individual in this planning and coordination process is the FSC. It is the job of the FSC to advise the maneuver commander on how fire support can best influence the battle, and to accomplish the planning and coordination necessary to effect that support. While these fire support personnel are quite capable of providing the coordination of fire support, their real potential comes in assisting the commander in the integration of fire support into the total Combined Arms operation. The maneuver commander, his operations officer, *and* his fire support coordinator, establish the battle plan and implement the plan to accomplish the integration of fire support with maneuver. The integration of fire support and maneuver is especially critical when attack helicopters are available. Target arrays generating requests for fire support may be ideally suited for engagement by attack helicopters and targets generating requests for reinforcement with attack helicopters may be more effectively engaged by mortars, field artillery, or close air support. The ever-increasing sophistication of weapons systems makes ever increasing demands on the commander. Fire support is likewise growing more complex, requiring increased emphasis on the role of the commander's fire support coordinator.

This emphasis is reflected at company level in the fire support team (FIST). The purpose of the FIST is to provide each company and troop with a team of fire support experts. Each member of the team is a fire support specialist, trained to request and adjust all types of indirect fires. The fire support team chief is extensively trained in all aspects of fire support planning and coordination, including the direction of close air support in the absence of an Air Force forward air controller.

The field artillery system is undergoing dramatic changes, but regardless of the changes, the Field Artillery will never lose sight of its primary role—that of providing the ground-gaining arms with timely and accurate fire support.



Engineer Support

COL Robert E. Conroy
USAEC

The Army's new tactics are based on the age-old partnership of fire and maneuver. For the engineer, his part of the puzzle must be fitted in terms of the new dimensions given the battlefield by an entirely new generation of weapons systems.

The engineer's job, in General Gorman's terms is to "structure the terrain" to give the maneuver commander his fullest advantage from the increased combat power inherent in our weapons systems.

Defense

We can describe the Engineer contribution by analyzing the defensive scenario presented by the Infantry-Armor team in terms of the classic engineer missions of *countermobility, mobility,* and *survivability*.

Recall that Task Force 2-12 was preparing to defend from Battle Positions 10, 11, and 12 (page 35). The supporting engineer analyzes the engineer effort required, and establishes priorities in concert with the task force commander. The engineer must enter the planning early to fully integrate the sapper into the tactical and fire plans. If additional engineer help is required, he must request this help as early as possible. The task force commander's priorities in this scenario are initially for countermobility along the main avenue of approach.

He also wants TOW, tank, and *Dragon* positions improved, other avenues of approach blocked, and routes between battle positions improved.

TF 2-12 is habitually supported by a combat engineer platoon from the 25th Armored Division's organic engineer battalion.

The divisional engineer battalion is employed with a company in support of each brigade, and that company normally supports each task force with a platoon, supplemented with additional company equipment as priorities dictate. Here we have a typical mechanized engineer platoon, three squads mounted in APCs and beefed up with a combat engineer vehicle (CEV), a frontloader, a backhoe, and an *M-57* mine dispenser.

The 25th Armd Div's organic engineer battalion can also expect extra help in the form of one or more direct support (DS) combat engineer battalions from corps. Those assets may be utilized in the division or brigade areas or to provide extra support directly to a forward task force. The corps Combat Engineer Battalion in DS of the 25th Armd Div will place one company in DS to each brigade, and one DS platoon will join TF 2-12. Note that the corps platoon lacks combat engineer vehicles and rides in dump trucks. Action is underway to mechanize the corps engineer battalions in Europe with APCs for the mobility and protection necessary to best serve mechanized forces in the covering force and main battle areas.

Typically, the supporting corps platoon will be working on a task basis, such as the antitank ditches requested by the task force commander.

Recognizing the amount of effort required to emplace these ditches, the task force engineer requests an antitank ditch team from the third type of engineer battalion—the combat heavy engineer battalion—

equipped with added dozers and wheeled scrapers.

In the meantime, the task force engineer (the engineer platoon leader) and the maneuver commanders work together to consider the terrain and the effective ranges of available weapons in order to site obstacles to optimize weapon capabilities. The fields of fire cover minefields, roadblocks, craters, or antitank ditches. So sited, obstacles can double the probability of a kill.

The engineer platoon leader recommends that one squad be utilized to prepare road craters along the main avenue of approach. With the *M-180* cratering device, the squad can blow and mine each crater in one-half hour. More than 2 hours are required for the same task, using the shaped and cratering-charge system. The squad will execute all targets forward of the battle position. The rear of the position will also be prepared for execution, and will be turned over, along with the required demolitions, to the maneuver team. Upon completion of this task, the squad will prepare craters and abatis on other possible avenues of approach, and in depth throughout the battle area.

"The GEMSS works like a skeet thrower, mixing AT and AP mines and throwing them left to right and sustaining a placement rate of 1,600 per hour."

The second engineer squad has been tasked to emplace the minefields desired by TF 2-12. Recognizing the excessive labor to hand place mines, he has attached the *M-57* mine planter to the second squad. Two infantry squads will be required to uncrate mines to keep the mine layer at the full output of approximately 200 meters per hour. Hand-laying the same 200 meters would take four times as long. The *M-57* will be replaced in 1982 by the Ground Emplaced Mine Scattering System (GEMSS). The GEMSS works like a skeet thrower, mixing AT and AP mines and throwing them left and right. The drum carries 800 4-pound mines and the equipment can sustain a placement rate of 1,600 mines per hour—at least 5 times faster than the *M-57*.

While waiting for the GEMSS and other members of the family of scatterable mines to come on line, the *M-56* mine has been deployed to Europe. The *UH-1* helicopter can carry two *M-56* dispensers and create a minefield 300 by 30 meters in one sortie. The forces in USAREUR have requested a follow-on system be developed for delivery by the UTTAS.

"Combat Engineers have fought at the Marne, in the Bulge, at Pusan, and Dak To, and today's sapper is ready to take his place in line with the Combined Arms Team."

In our scenario, the *M-56* would be ideal for minefields forward of the scout platoon's initial positions and to emplace flank minefields as an economy-of-force measure. Rapid response and the self-destruct feature make the *M-56* scatterable mines ideal when the enemy's intentions are developed.

For close-in protective minefields, the Modular Packaged Mine System (MOPM) shows real promise. The box is placed and the mines inside (AT and AP) will be scattered on command. If a new position is occupied before the mines are needed, the maneuver unit picks up the box and takes it with them—a truly portable protective minefield. The MOPM can also be used to close gaps and lanes or to mine craters and bridge approaches.

Scatterable mines are also planned for artillery delivery, adding an even more dynamic dimension to mine warfare. Their self-destruct capability will allow us to counterattack or resume the offensive with even greater flexibility.

Back to our battle positions. The third engineer squad, augmented with equipment, is constructing firing and protective positions for tanks, TOWs, and APCs. These prepared positions not only provide protection against enemy indirect fires, but give the tanks in hull defilade a 50 percent better chance than in the open.

The CEV will also be used to improve combat trails to facilitate movement between battle positions.

The corps engineer platoon, having completed the AT ditching task, will use its own dozer, frontloader, and backhoe to prepare battle positions 20, 21 and 22 (page 35). The Infantry-Armor study team identified a requirement for some 300 improved positions within a task force main battle area to ensure the survivability of our combat power. The Bundeswehr has recognized this need by adding four Unimog H mobile backhoes to each German mechanized battalion. Infantry weapons and command and control systems, in particular, must be hardened to survive under the Threat's ever increasing artillery and rocket capability.

During the battle, all engineer squads will continue to accomplish tasks for the maneuver elements. They will be used to execute obstacles or close minefield lanes, construct added positions in depth, and continue to clear routes between battle positions, or for resupply and evacuation, especially where battle damage may hinder movement.

Mobility tasks, long associated with offensive operations, will continue to be a major requirement of the Active Defense. OPFOR forces habitually employ minefields, as an example, for offensive flank protection. Our counterattacks can expect to find enemy mines. The Threat's *GMZ* is a tracked, armored mine laying vehicle, designed to lay mines under fire with his assault echelon. To counterattack in strength, we will also have to move large forces laterally on a very dirty battlefield.

Offense

As we move to the offense, the same mobility tasks now receive prime consideration from the task force commander and his supporting engineer.

The Armored Vehicle Launched Bridge (AVLB) has been proven again. In REFORGER 79, the 1st Brigade, 1st Armored Division emplaced 15 AVLBs in one day of offensive action. The Division 86 study places all 24 AVLBs in the divisional engineer battalion. The CEV, on the same chassis, has the mobility and protection to assist in the assault, and the 165-mm demolition gun to breach enemy strong points. The CEV would be attached to each maneuver team in the attack.

We haven't made that much progress in countermine warfare, however. Vietnam found us doing it the same way we did in World War II. Our studies of Threat doctrine indicate that we can expect heavy minefields in depth throughout his defensive belts.

Two systems now in being can help. The *M-157* line charge can clear a lane 4 by 90 meters, but takes 4 to 6 hours to assemble. The *M-173* sled is better— it can do the same thing in about one-half hour. The *Giant Viper* line charge is also under test.

What we hope to have soon is the Surface Launched Fuel Air Explosive (SLUFAE), whose 30 rockets can clear a vehicle lane 250 meters long in less than 10 minutes. It will require the same mobility and protection as the maneuver elements of the breaching team. The first versions are mounted on the *M-548* tracked cargo carrier chassis. For the immediate future, the mine roller offers the best available system for detection and limited offensive breaching capability. Countermine warfare is our major concern.

Although assault elements can swim their fighting vehicles, rivers remain the most difficult natural obstacles to offensive operations. We'll use the AVLB if we can to get the tanks across, but if the gap is too wide, the mobile assault bridge in the divisional engineer battalion bridge company can enter the water from the march and create its own raft or bridge in minutes.

The recently fielded ribbon bridge, copied from the Russians, opens itself when unloaded in the water, and can be linked up so quickly that rafting is often unnecessary. With the advent of the ribbon, the older class 60 bridge will be held in theater stocks.

We have had recent successes in airlifting the ribbon with the *CH-47,* as well as airlifting the medium girder bridge (MGB)—the fixed span to replace the Bailey in forward areas. The MGB can be erected in a fraction of the time with fewer engineers, freeing the combat companies for engineer work on the far shore.

An added benefit is the freeing of bridge trucks, such as the ribbon transporter, for the critical hauling of mines and demolitions. Using the same mechanism that launches the bridge, it loads its own pallets and drives off.

While the APC can swim, the best we can do to help it exit and fight on the far shore is to ford the CEV. We need the *M-9* Universal Engineer Tractor. It has the cross-country speed to get your battle positions dug, and can swim to the far shore.

Combat Engineers have fought as infantry at the Marne, in the Bulge, at Pusan, and Dak To. We are proud of our heritage as fighting members of the Combined Arms Team. Today's sapper is ready to take his place in the line. "Let us try."

Tac Air Fire Support

COL Solomon Harp, III
USAF

The Threat is very real, and, as it continues to increase, we need to work even more closely to insure that firepower is there in the right amount and at the right time and place. To defeat the massive armored assault we need to work the total air-land battle problem together. That requires mutual understanding of our capabilities and Joint requirements.

First we'll turn to munitions. Today, in the family of general purpose bombs we have the *MK-82,* 500-lb and *MK-84,* 2,000-lb bombs. They are available in both unguided and laser-guided versions and are effective against armor and hardened targets. There are several cluster munitions in the inventory. The *CBU-58* and *71* contain 650 bomblets and the *CBU-52* contains 217 bomblets. The *CBU-71* is unique in that the bomblets are set to detonate at different time intervals, allowing sterilization of an area for extended periods. Each of these cluster munitions will cover an area approximately 200 meters in diameter, and are effective against softer targets such as defensive systems and vehicles.

Rockeye is a cluster-type munition specifically designed for use against massed armor. The 500-lb dispenser, containing 247 bomblets, is designed for multiple armor kills on a single delivery pass. Each *Rockeye* dispenser covers an area approximately 100 meters in diameter.

The *GBU-2* is a laser guided, 2,000-lb cluster munition for use against SAM sites, artillery batteries, and radars. The weapon's 1,800 bomblets cover an area approximately 170 meters in diameter, depending on delivery techniques.

The *GBU-15* guide bomb, now in active testing, uses TV guidance or a command data link. Later versions will also have laser and imaging infrared guidance. Wings on the weapon provide standoff ranges out to 80 km. It can use either the *MK-84* or *GBU-2* warheads discussed earlier.

The *AM-65 Maverick* was especially designed to be effective against hard targets, such as armored vehicles. With TV guidance, it can be launched from slant ranges of over 7,000 meters down to a minimum range of 900 meters. For a properly launched missile, the probability of kill is 87 percent. A near miss will still produce a mobility kill on an armored vehicle. Multiple launches can be made against different targets during a single delivery pass. Advanced imaging infrared guidance programmed for the 1980-85 time frame will give the *Maverick* a night and degraded weather capability. It will also be effective in conditions such as European haze and battlefield smoke.

The *AGM-45* and *AGM-78* are our current air-to-ground antiradiation missiles. The missiles, primarily employed by our *F-4* and *F-105 Wild Weasel* aircraft, will be used against SAM and air defense artillery sites.

The *AGM-88* high-speed antiradiation missile (HARM), in development and programmed for 1980, will provide an upgraded weapon to counter the projected enemy radar defensive systems. These defense suppression munitions improve our ability to penetrate defenses and to attack armor.

Our current mine is the *MK-36 Destructor*, which is delivered in a *MK-82*, 500-lb bomb, with advance sensors. Armored vehicles must pass over the mine for it to be effective. When this mine was used in Southeast Asia, it was found to be easily disarmed. Since then, efforts have been underway to make the mine more resistant to counter-measures. These include an improved sensor, a self-destruct mechanism, and improved antisweep characteristic.

An antiarmor cluster munition will use fragments that are self-forging when released by an explosive force that simultaneously heats them so that each fragment is both streamlined and forged as it travels through the air at high speed.

Wasp will probably be a small missile that can be launched in salvos from an aircraft or possibly from an air-dropped cannister. It will have the ability to acquire and lock onto an armored vehicle after launch, using an infrared or millimeter-wave sensor. This missile, as presently envisioned, might be approximately the size of the Army's *Hellfire*.

The extended-range antitank mine may initially use an existing mine combined with a sensor or signal processor capable of detecting an approaching armored vehicle rather than requiring the vehicle to pass over the mine to detonate it.

Aircraft

One of the Air Force's most recent additions, the *A-10*, was designed for the close air support task. It will play heavily in the antiarmor role, both day and night, and in reduced visibility conditions. We are programmed to have 733 *A-10s* by 1982

For the first time in Air Force history, we have an aircraft that is essentially designed for close air support. While there are other roles the aircraft can play, no one envisions the *A-10* fleet being pulled off the close air support mission. The specialization of the aircraft limits it to battle—and training for battle—in the vicinity of the FEBA.

The *A-10* has the characteristics and capabilities of lethality, survivability, simplicity, and responsiveness designed into it.

Lethality was achieved through the *A-10's* capability to carry as much as 16,000 pounds of conventional weapons. The *A-10* can carry a mixture of munitions tailored for the antiarmor role, such as 12 *Rockeyes* and six *Mavericks,* plus appropriate electronic countermeasures pods on its wing stations.

Most importantly, the *A-10* is equipped with the *GAU-8*, 30-mm gun for use as the primary weapon in the antiarmor role. During tests, the gun has demonstrated its tank-killing ability against the Soviet *T-62*. A maximum load of 1,350 rounds provides enough ammunition for 10 to 15 effective firing passes per sortie. The GAU-8's killing power was demonstrated in one test in which 50 rounds were expended on each firing pass with an average of 20 hits per pass.

While the *A-10* can be absolutely lethal, its survivability is obviously a relative quality. Survivability of the *A-10* was attained through its maneuverability at appropriate airspeeds and altitudes and through its design and construction as a hardened aircraft. The *A-10* has been proven through tests to be capable of defeating the Soviet 23-mm gun and is more survivable than any other aircraft.

Operational control of the *A-10* resources in Central Europe is related to the basing concepts of a two-rank forward deployment. The rear rank, or main operating bases (MOBs), will be in Great Britain, and the forward rank, or forward operating locations (FOLs), will be in West Germany. The FOLs will be the primary bases from where the *A-10s* will operate when the battle begins.

The *A-7*, another ground attack aircraft, is equipped with an automatic weapons delivery system and other equipment that aids in target acquisition. Its ground map radar provides an accurate navigation and offset bombing capability in all-weather conditions. The *A-10* and *A-7* are not air superiority aircraft, nor are they committed to tactical nuclear operations. Rather, they are air-to-ground attack aircraft for close air support and battlefield interdiction. If we assume over 500 *A-10s*

flying at least two sorties per day in a hypothetical scenario and using our experience of 10 firing passes per sortie, that means up to 10,000 *A-10* firing passes per day with guns alone. Additionally 350 A-7s, configured with six *Mavericks* each could provide 4,200 more antiarmor attacks per day.

The *F-4* has long been a mainstay of the tactical air forces. It performs in both the air-to-air and the air-to-ground roles. The *F-4* carries a variety of guided and unguided munitions and is equipped for accurate target acquisition and weapons delivery.

The *F-111* is designed for around the clock operations in all weather conditions. It is primarily a deep interdiction system. The *F-111* is configured with the terrain-following and attack radar and an automatic weapons delivery system.

The newest aircraft that will perform in the antiarmor role is the *F-16* which is programmed to be operational in 1980 with one wing arriving in Europe by 1981. The aircraft will be used for air-to-air and air-to-ground missions.

The *F-16,* when equipped with a high resolution ground map radar, an offset beacon bombing capability, and a laser acquisition system, can provide close air support and battlefield interdiction, day or night, in all weather conditions.

Supporting Systems

Supporting systems are necessary for the application of tactical air firepower and, although they do not directly attack armor, they enhance the effectiveness of Joint air-ground operations.

The *EF-111,* available in 1980, will be capable of jamming enemy radars either while escorting attack flights to targets or from standoff ranges. Other operations, such as attack helicopters, would benefit from the jamming.

The Precision Location Strike System (PLSS), scheduled to be available in 1984, will employ precision triangulation to locate and identify radar emitters. With this target information, attack aircraft will be able to employ glide weapons in all weather conditions against fixed emitters. Nonemitting targets generated by both Army and Air Force sources could also be inserted into the PLSS grid for attack.

The Tactical Electronic Reconnaissance System (TEREC) is designed to identify radar emitter locations. It will identify radar frequencies which enable attack forces, both air and ground, to update ECM pods and keep our ECM capability competitive with the dynamic threat.

The *F-4G Wild Weasel,* presently in the inventory, is configured to operate against a wide spectrum of Threat radars and jammers. It will counter all radar-guided enemy air defense systems including the *SA-8* and *ZSU-23-4*. The *F-4G* can locate and attack these systems by using conventional munitions or antiradiation missiles in all weather conditions.

Reconnaissance and Surveillance

Other supporting systems provide reconnaissance and surveillance. These two functions are key elements for initiating the attack. We must know the critical enemy locations so that necessary firepower can be brought to bear on these locations. If the enemy can be located, then we can kill him together.

We are currently working out the procedures and interfaces that will enable us to insure information is made available, in as near real time as possible, to appropriate Army elements for dissemination or use when and where needed. This is being accomplished through the TAC/TRADOC Reconnaissance and Surveillance Joint Working Group.

Reconnaissance and surveillance include area search systems such as the Side-Looking Airborne Radar (SLAR) which provides a standoff capability to identify probable tank or other vehicle-size target buildups and their movement. An advanced SLAR which will provide increased range and real-time data transmission will be available in early 1980.

The down-looking imagery infrared (IIR) sensing system has the capability not only to locate tank and other vehicle buildups, but to identify the type and number of SAM missiles in their revetments. An improved IIR system which will data link imagery to ground stations is under development. It will be an element of the Quick Strike Reconnaissance System (QSR), which will provide targeting information on time-sensitive targets and will be available in 1980. The QSR system will consist of *RF-4* aircraft equipped with an IR camera, a Forward Looking Infrared (FLIR) target-acquisition sensor, and a laser designator.

Target information from these sensors is data linked in near real-time through the reconnaissance reporting facility to the Combat Information Center (CIC) for correlation with other intelligence data and transmission to the appropriate decision makers for action. These systems will also aid in reconnaissance and surveillance. Precision navigation and location systems will include small portable electronic transponder beacons which provide an accurate reference point for determining target locations and attack. These beacons will be deployed with tactical air control parties attached to ground units. Attack aircraft will use the beacon as an aid in navigating to target areas or as a reference point for offset bombing. The *F-111,* in weather, has demonstrated offset beacon bombing accuracies of less than 100 meters.

Target Acquisition

Target acquisition and designation systems include the Target Identification System Electro Optical (TISEO), which is mounted in over 300 *F-4* aircraft. It is a TV system that magnifies targets 4 to 12 times, depending on the field of view and can be used for either air-to-air or air-to-ground weapons launches.

There are two laser guidance systems in the tactical air force inventory and a third about to enter production. The three systems are *Pave Penny, Pave Spike,* and *Pave Tack*.

Pave Penny is a passive receiver only. It is designed to detect and track reflected energy off a target illuminated by a separated ground-based or airborne designator. Weapons delivery can be accomplished without the crew visually acquiring the target. This system is being used on the *A-10* and *A-7* aircraft and will be used on the *F-16*.

Pave Spike contains a laser designator that is aimed at the target as seen through a television camera mounted in the pod, whose imagery is displayed in the cockpit. This system is limited to visual conditions and is being used on some *F-4D* and *F-4E* aircraft.

Pave Tack, which is entering production for use on some F-4E, F-111F, and *RF-4C* aircraft is functionally similar to *Pave Spike,* except that it uses a forward-looking FLIR sensor that can designate targets at night and under light foliage or camouflage, and in reduced visibility conditions, such as battlefield smoke and haze.

Command and Control

The ground elements of the Tactical Air Control System (TACS) provide interface with ground units, tactical air operations, mission resources, and battle commanders. This interface extends down to battalion level, providing coordination and application of firepower on the battlefield.

The Airborne Warning and Control System (AWACS) is an extension of the TACS. AWACS provides low-level coverage of up to 200 nautical miles and big-picture flow of information to military and civilian authorities with vision and comprehension not available from the ground-based facilities.

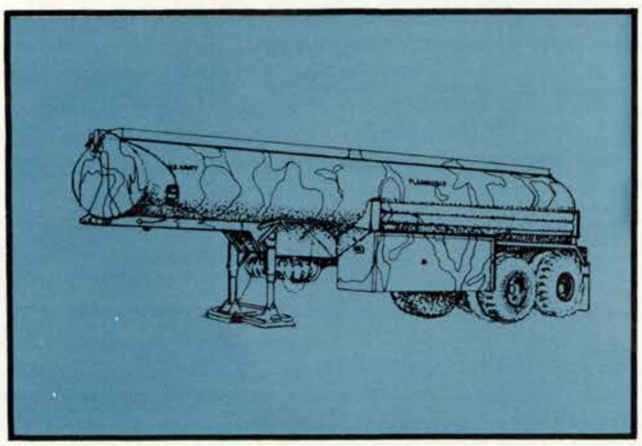
We have 12 AWACS aircraft of the scheduled 34 in the Air Force inventory. NATO has formally approved the NATO AWACS program which will encompass acquisition of 18 *E-3A* AWACS aircraft.

Systems Employment

The Tactical Air Force must apply combat power when and where needed to achieve the joint objectives in the air-land battle.

In the face of heavy and sophisticated arrays of air defenses, a defense suppression effort is required for successful Joint air-ground operations. Suppression operations must be planned jointly so artillery, ECM platforms, ground units, attack helicopters, and Air Force assets can all be brought to bear on enemy defenses. Along with defense suppression, we must conduct reconnaissance and surveillance operations. Our primary concern is to identify the main thrust so firepower can be massed against it. Priority may be on either close air support or battlefield interdiction against the second echelon forces, but the objective is to put the weight of effort where it can be most effective with the focus on attacking enemy armor. Tactical air must have the capability to provide massed air attacks against the depth of the Soviet armored thrusts in the area extending from troops in contact to those enemy forces in follow-on echelons.

The key to the air-land battle is the combination of our capabilities integrated in Joint employment. It is the application of a spectrum of capabilities, ranging from missiles and bombs to air-to-ground cannon, which characterizes tactical air power in the antiarmor role. Our responsibility is to provide tactical air support to you, our partners on the air-land team. The application of weapons and systems discussed here represent the Tactical Air Forces' commitment to that responsibility.



Logistical Support

BG Kenneth A. Jolemore
DCG, USALC

The military equipment that we support today and will support in the future is both complex and sophisticated. The trend is toward increased complexity. Needless to say, the more complex the equipment, the more demanding the mission of the support element of the Army.

Future wars will be characterized by an intense lethality on both sides, causing high personnel casualties as well as high consumption of materiel.

The Army's contribution to lethality in a conventional war will require extraordinary tonnages of expendables such as ammunition. It will also lead to high attrition of major end items such as tanks, artillery pieces, and associated equipment.

Such projected high battle losses reemphasize the importance of mobility on the battlefield—recovering personnel and equipment as well as providing replacements for both.

Mobility will be required to shift combat power, to maintain momentum, and to capitalize on success.

To support the application of combat power, the logistics system must be flexible and responsive to the needs of the combat commander.

In this environment, dependable communications will be mandatory. The fluidity of the combat environment requires us to manage our limited assets as efficiently as possible.

That, briefly, is the environment in which we will be operating. I will discuss the logistics support structure we presently use to provide the required support and some of the things we're planning for the future. These are the critical functions which we must perform:

- Supplying fuel
- Supplying major items and repair parts
- Fixing
- Transporting
- Controlling.

Ammunition

First, a look at how we provide our most critical commodity—ammunition.

Ammunition is palletized and/or containerized at the CONUS manufacturing plant, depot, or outloading port, then shipped by container ship or as breakbulk cargo.

"The trick with ammunition is to be able to handle a relatively few items and rather staggering tonnages on a daily basis."

On arrival in the theater, ammunition is moved through fixed ports or over the shore using materials handling equipment (MHE) designed specifically for the type of packaging and terrain. Once through the port or over the shore, it is transported to theater-level storage sites and corps-level ammunition supply points (ASP) which are established as far forward as practicable. The corps receives, stores, controls, and issues all ammunition. Combat elements draw ammunition from ASPs to replenish their basic loads and to meet operational requirements. They send their own wheeled vehicles back to the ASPs to pick up the ammunition and return it to the forward areas. We believe that the dynamic nature of tomorrow's battlefield together with greatly increased consumption rates will require us to arm the combat forces as far forward as possible. Rapid rearming operations will be critical. The trick with ammunition is to be able to handle and manage a relatively few items and some rather staggering tonnages on a daily basis.

To solve the tonnage problem, we are adopting the concept of adding an ammunition transfer team with MHE to supply and service companies in divisions to permit the throughput of high-usage, high-tonnage ammunition to the brigade area.

Ammunition transfer points (ATP) in the brigade should help us cope with the greatly increased expenditure rates of ammunition, as discussed earlier.

The ATP offers several advantages. It is mobile, presents a relatively small signature, and is capable of handling a large volume of projectiles or similar munitions. Additionally, by positioning it forward, the ATP should reduce by a significant percent the turnaround time of combat battalion ammunition vehicles.

Containerized Ammunition

We visualize that ammunition containers will enter a theater of operations through established ports or by-lots operations. Priority for shipments of containers will be to ASPs located just to the rear of supported divisions or within the division rear area. Containers not required for immediate throughput shipment to ASPs will be delivered to corps storage areas (CSA) located in the corps rear area.

In fast-moving mounted warfare, it will be necessary to use high-mobility, armored combat logistical support vehicles (ACLSV) to reach the fighting elements of maneuver battalions.

The requirement has been firmly established for a family of hardened vehicles consisting of four configurations on the same chassis. They are the armored forward area rearm vehicle (AFARV), field artillery ammunition support vehicle (FAASV), maintenance assistance vehicle (MAV), and medical evacuation vehicle (MEV).

Chassis being considered for this family of vehicles include a stretched version of the *M-113* armored personnel carrier, the *M-548* tracked cargo carrier, the *M-109* motor carriage, and the general support rocket system.

Automated Ammunition Management

Because of the great tonnages of ammo, there exists a need for automated management. One of the things we're working on is a computerized standard army ammunition system (SAAS).

SAAS level 1, the theater ammunition management system, provides visibility of total theater assets, computes requirements, and provides information on ammunition which is on order or in transit.

There is no SAAS level 2 system. It was planned for the field army; however, this system was deferred because of doctrinal changes.

SAAS level 3 is the ammunition stock control system being designed for the corps-level control activities. It will provide the corps commanders with visibility of ammunition assets by location within the corps, compute requirements, provide stock status information by lot number, and display quantities on order and in transit.

SAAS level 4 is the storage site system which will be designed for the ammunition supply points and the corps storage area.

Fueling

Bulk fuel moves from off-shore supplies to the theater of operations, then into corps field storage—either bladders or tank farms—via pipelines, trucks, railcars, waterways, or in an emergency, aircraft.

Corps moves fuel to the division where it is stored in bladders or on tank trucks. Division then delivers to its brigades and other major units.

"The importance of Army Aviation to the Central Battle requires almost instant rearming and refueling in the vicinity of the FEBA."

Bulk fuel supply, like ammunition, is a continuous supply system which is accelerated or decelerated as the combat situation dictates and involves moving hundreds of thousands of gallons every day.

The importance of army aviation as a member of the Combined Arms Team engaged in the central battle requires almost instant rearm and refuel of rotary wing aircraft in the vicinity of the FEBA. The concept for this is the forward area refueling and rearming point (FARRP) which provides for the arming and refueling of air cavalry and attack helicopter maneuver units in combat as far forward as possible.

Repair Parts

Let's turn now to the supply of repair parts. Requisitions for parts flow from the user to the division materiel management center (DMMC), to the corps materiel management center (MMC), to the theater MMC, and from there to CONUS. This system is the normal one followed for most supplies.

To reduce order and ship time, DA implemented a more responsive system for delivering selected repair parts in Europe through air delivery of certain items in November 1977.

Except in an emergency, the air line-of-communications (ALOC) system *excludes* heavy tonnage items, such as engines, which normally are shipped by surface transportation. Where repair parts requests from using units cannot be satisfied from their direct support unit (DSU) or general support (GS) repair parts companies, the COSCOM and TAACOM MMCs forward these requisitions directly to CONUS to the NICP through the defense automatic addressing system that automatically identifies the correct item manager, which might be any one of the services to include the Defense Logistics Agency (DLA). NICPs direct shipment from the appropriate CONUS depot.

"A major concern of the commander is the ability of supporting units to move as the tide of battle shifts."

We have always had the problem of having a mobile ASL at the DSU. A major concern of the combat commander is the ability of supporting units to move, or be moved, in increments, as the tide of the battle shifts. We spent a great deal of time in determining how to tackle this task and, as a result, DA has now approved the placement of 37 MILVANs on the MTO&Es of armor, infantry, and mechanized divisions in order to get our stocks mobile.

It should be obvious that with an expected high attrition rate for weapons systems on the next war's battlefield, coupled with the extraordinary problems of recovering these systems from that battlefield, that we will have to depend upon resupply of large numbers of systems in the initial stages of the battle. Initial sources of such systems will be prepositioned war reserves within the theater of operations. But these systems must be deprocessed, mated with the right communications equipment, given a basic load of ammunition, and then married up with a crew before they are of any use to the combat commander.

We have been working with the Admin Center in an effort to develop a Weapon System Relacement Operations (WSRO) concept to determine how best to replace inoperable critical weapon systems in order to keep the maximum number of those systems in the battle at all times.

Future Supply Support

We believe that the supply system in the established overseas theater must also be designed to survive the initial stress of war when the surface lines of communication are interrupted. Combat ASLs must be built into the stockage levels at each echelon to meet partial requirements, and we are working on a methodology here. Prepositioned war reserve materiel stocks (PWRMS) must be positioned in the theater as far forward as the corps to serve as the primary source of supply for heavy tonnage items should the surface LOC from CONUS be interrupted at the onset of general war. The composition of PWRMS must be wide enough in terms of numbers of line items and deep enough in terms of quantities of each line to accommodate the needs of the theater force until resupply from CONUS can be reestablished.

What we are trying to do is allow the corps to fight with its own battle-oriented resources for at least 10 days, until outside support can be brought into the area. The PWRMS includes tanks, APCs, gun tubes, and self-propelled artillery. A combat oriented ASL is also part of the overall concept.

Of course, we are also utilizing ADP systems to insure our capability to provide responsive supply support and is now operating within all Active Army divisions.

We believe that standardization and an improved information processing capability will greatly increase our capability to make the correct management decisions in a timely manner and assist us in better supporting the combat commander.

Supply Personnel

In addition to our efforts to develop responsive replenishment systems, we are also attempting to improve the ability of our personnel to operate within the system.

One problem we have had for years is at the unit level and concerns the PLL and TAMMS clerks.

We are now moving toward redesigning the enlisted career management field for supply MOSs in order to create a separate MOS 76C for the PLL/TAMMS clerk who will perform only PLL or TAMMS duties in the unit. We believe that a more technically qualified specialist in this important job will significantly improve overall unit readiness.

As with ammunition and fueling support, maintenance support is based on the concept of forward support of combat units and weapons systems. People, parts, and tools are pushed into forward support areas as needed and then pulled back when no longer needed.

Analyses indicate that our current recovery and evacuation doctrine and overall capabilities may be inadequate for tomorrow's battlefield. We are attempting to improve these capabilities by looking at two major areas—the recovery environment and its affect on what actually can be recovered and evacuated, and the equipment and personnel required to effect such actions.

"We must orient our support toward providing the combat commander with the maximum available firepower."

This whole area is an extremely critical part of our responsibility toward supporting the combat commander and we will do our best to come up with a responsive and workable system.

We must orient our support toward providing the combat commander with the maximum in available firepower. One method of doing this is to develop a pool of systems-oriented expertise that is extremely responsive toward weapon systems availability. A restructured general support (RGS) concept will provide us with this expertise.

RGS concept visualizes formation of a commodity-oriented GS battalion which would be able to provide necessary parts and assistance to the forward area.

The goal is to return the maximum amount of equipment possible to the user and also develop a corps backup maintenance capability in the COMMZ.

Automatic Test Support System

Fault isolation has always been a serious shortcoming in the Army, contributing to excessive maintenance man-hours and turmoil, and excesses in the repair parts supply system.

To help solve this problem, particularly with the great complexity of modern day equipment, we are developing a family of automatic test support systems (ATSS).

"It seems that we have arrived at the point where systems-specific mechanics at organizational level are needed."

Simplified test equipment for internal combustion engines (STE/ICE) has been developed for use by the automotive mechanic at the organizational and direct support levels. The heart of the set is the digital vehicle test meter (VTM).

With the STE/ICE set, a mechanic can measure pressure, voltage, current resistance, engine speed and temperature—functions that now require six separate items of equipment.

To make the system even simpler, a single connector called a diagnostic connector assembly (DCA) has been developed. When installed on the vehicle, it will enable the mechanic to make all tests through the one connector.

Master Mechanic

It seems we have arrived at that point where systems-specific oriented mechanics at the organizational level are needed if viable support is to be available in the FEBA. Our approach to this is the training and assignment of master mechanics.

Initially, the soldier is trained either on the automotive or the turret portion of the combat vehicle. As a senior E5, the soldier is cross-trained so that he then is capable of maintaining both the turret and automotive portion of a specific combat vehicle. This is what we call the systems mechanic. Upon promotion to E7, he has had the training and experience to be called a master mechanic

A detailed discussion of the master mechanic appears in the July-August 1978 issue of ARMOR. ED.

Standard Army Maintenance System

In maintenance, the major data shortfalls are accuracy and timeliness required for the management of day-to-day operations and equipment status reporting.

To overcome this, we are developing the Standard Army Maintenance System (SAMS), which we feel will virtually eliminate the accuracy and timeliness shortfalls of current systems.

SAMS will replace the many different systems in the field today and will relieve the user from training problems associated with a multiplicity of nonstandard system. It will also provide information required by field commanders and maintenance managers to fulfill their responsibility for maintaining equipment in an operationally ready condition.

Transport

A generally unsung but absolutely vital part of our logistics support is that of transportation. One generally thinks of transportation as moving items of war forward, and, of course, more support forward in all areas reduces the requirement to go to the rear. But transportation plays an equally important role in the retrograde movement of the casualties of war.

I have mentioned our efforts to obtain a family of armored combat logistical support vehicles. We're also looking at what type of family of tactical wheeled vehicles are required to provide responsive logistical support.

In combat units, tactical wheeled vehicles have included two high mobility trucks—the *Gamma Goat* and *Goer*.

These vehicles represented an advance from the standpoint of providing improved off-road mobility; however, many combat units found that they had problems, particularly in the area of maintenance. As a result of an analysis we conducted of the requirements in the forward area and the problem of providing vehicles which have an improved readiness rate, we recommended that no more *Gamma Goats* and *Goers* be procured.

DA accepted that recommendation but directed that action be taken to fill these voids. Right now TRADOC has underway a study effort which will determine the requirements for trucks in the 5-, 8-, or 10-ton range in artillery, armor, and mechanized infantry units.

Control

Command and control of logistics operations must begin at the using unit if the system is to provide the right support, in the right place, at the right time.

Support of using units in the forward area is coordinated by a Forward Area Support Coordinating Officer (FASCO) representing the Division Support Command (DISCOM) commander. This field grade officer insures that combat elements are provided support by coordinating the operations of the DISCOM forward support elements located with the brigade they support.

The DISCOM commander utilizes the Division Materiel Management Center (DMCC) as his primary coordinating and control element. This element continually examines weapon system status and takes action to keep them operational. It controls maintenance priorities to insure that the operations of the maintenance battalion optimize weapon system readiness and takes immediate action to obtain critical repair parts when necessary to return a weapon to combat. When division requirements cannot be met by division resources, requests for supplies or assistance are forwarded to the

"The ability of our support elements to communicate is critical to our effort to support the combat commander."

Corps Support Command (COSCOM).

The COSCOM provides integrated general support supply and maintenance to all elements of the corps and direct support to nondivisional corps units. The COSCOM commander utilizes a materiel management center (MMC) and a movements control center (MCC) to manage logistics operations throughout the corps.

The ability of our logistical support elements to communicate is critical in our effort to support the combat commander. One of the things we're looking at in new communications technology is the Position Location Reporting System/Joint Tactical Information Distribution System. This computer-based system will provide real-time, secure-data communications, location, and navigation information for command and control of combat, combat support, and combat service support (CSS) elements throughout the division.

Problems

The structure for support and the systems we utilize are not without problems. Some are technological in nature, some come about by virtue of the environment in which we must provide support, others are caused by the necessity of defining and articulating what we really want, and some are associated with personnel—training, turbulence, and shortfalls. A few of these problems involve information inundation, maintenance of automatic data processing equipment, maintenance of software, automatic data processing outage procedures, and personnel.

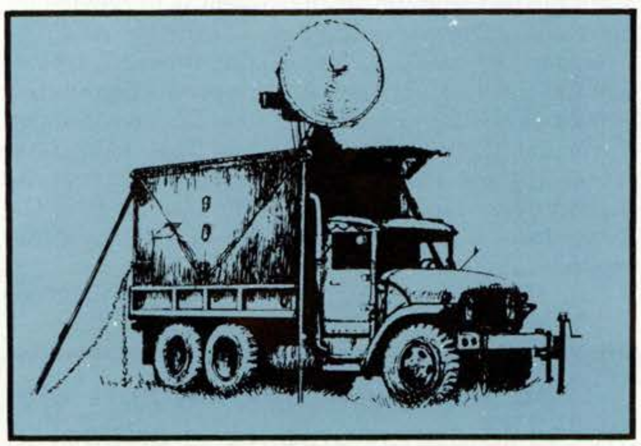
Information inundation can be a serious problem at any time, but particularly during wartime operations and, of course, it can also affect the efficiency of our peacetime managerial actions. We are taking steps to identify and stratify those essential elements of information that we must have during wartime.

Maintenance support of ADP equipment is another problem. Our current means vary from contractor support to military technicians, or numerous combinations thereof. In order to nail down what has to be done, the Army is currently addressing maintenance support of the theater army ADPE systems and their peripheral systems. Included are "imbedded" systems such as the ballistics computer in a fire control system and "free standing" systems such as the tactical operations system computer used for command and control in the tactical environment. During the fielding of many such systems, there has been a lack of coordination in the selection and training of maintenance personnel. This, coupled with the proliferation of such systems in the tactical arena, has generated an urgent need to come up with a standardized maintenance concept. What we really need are hardened, mobile, highly reliable systems that can withstand the rigors envisioned on the modern battlefield.

As we have moved towards automating various support functions, we have, by default, lost some of our capability to operate manually should an ADP system go out, and although we can operate manually for short periods of time, we must have redundancy in our support structure.

Whether or not we can survive in the face of ADP outages will also depend, largely, on our ability to train personnel to do the job from the moment of the outage until we can get the system operating.

I realize that I have oversimplified a complex logistical system and have only addressed certain selected areas for presentation, but I hope that I have given you some appreciation for our concept of operation and our efforts towards insuring that our combat forces will be able to accomplish their mission.



Command and Control

LTC William S. Jones
USASC

Today's and tomorrow's weapons system technology and their tactical employment are driving us to an almost absolute dependence on communications.

The integration of these systems, through command and control, demand effective communications. The control battle will be a highly complex thing. To be successful and win, the task force commanders must see, suppress, and move better and faster than the numerically superior enemy. A great number of key decisions must be made in a compressed time frame, and positive communications play a vital part in transmitting those decisions into commands and actions. The inability to communicate fast and effectively interrupts the command and control process and the demand to see, suppress, move and destroy.

Today, the Combined Arms Team uses radio primarily to support its missions. It also has HF radio, wire, and messenger when the situation allows their use. The division and corps communications systems exist to back up the task force.

The Integrated Tactical Communications System (INTACS) is the result of a multiyear study that was completed in 1976. It described the communications system of the future and the Army is moving to field this system during the late eighties and early nineties. Understanding that requirements tend to change over time, the Signal Center is in the process of updating the INTACS study to account for that growing need for data communications on the battlefield. We are also working on keeping the operation and maintenance of communications equipment as simple and effective as possible, particularly where the equipment is user-operated.

When developing our communications systems and equipments, the ultimate driver is the dollar. How many of our relatively scarce dollars are we willing to commit to insure we can communicate when the time comes? Today's FM radio, the VRC-12 series, has some problems. The new FM radio, the SINCGARS series, will be built to overcome those problems.

But, SINCGARS is not around the corner, so how do we help ourselves now? An engineering program is underway within DARCOM and TRADOC to identify tactical communications deficiencies that exist now and to develop and field relatively immediate fixes. Organizational maintenance of FM radios is a problem. The quick fix is the fielding of a simplified test set in conjunction with better maintenance procedures and improved maintenance training at the Signal Center.

Another problem has been the siting of many FM antennas at command posts. A modular multicoupler has been designed to help alleviate the problem. The coupler allows more than one FM radio to effectively use one antenna. Another component of this fix is a broadband antenna. The program is charging ahead to get this equipment to the field.

A third problem is the need for extending the range of our FM radios. Increased range and more directional radiation characteristics are provided by a one-half rhombic antenna.

The Signal Center is taking a hard look into two other areas of interest to the Combined Arms Team. The Army has been guilty of neglecting to some degree, the development of improved HF radios. We have all cussed the GRC-106, and the RATT sets at one time or another. In fact, the original INTACS study did away with HF radio within the division. Now, we are having second thoughts, and encouraged by many of you here today, we are taking a look at what we refer to as *improved HF*. Some improved, militarized, off-the-shelf HF equipment is available today if we decide to go for it.

At Fort Hood, there is a rig affectionately known as *Super Track*. It is an *M-577* configured with multichannel and RATT communications equipment and is designed to give highly mobile communications support to a brigade tactical CP. The concept of a highly-mobile communications carrier that has mobility equal to that of the forward tactical units is close to our hearts at Fort Gordon. We are working on a concept that may be based on an IFV-type chassis.

The Signal Center is very concerned about the significant training problems inherent in this turbulent period of communications developments and is enhancing training in specific areas.

Turning to the future of tactical communications, I will review INTACS and report on the progress of the INTACS update. The initial INTACS study, which was approved in 1976, utilized a systems approach to identify the requirements and design a communications architecture for tactical communications at all echelons through the mid-1990s. A key input to the study was user participation in the development of the Communications Service Requirements (COMSR). The user was also key in weighting of the measures of effectiveness. Panels of senior combat arms officers assisted the Signal Center and the contractor in those tasks.

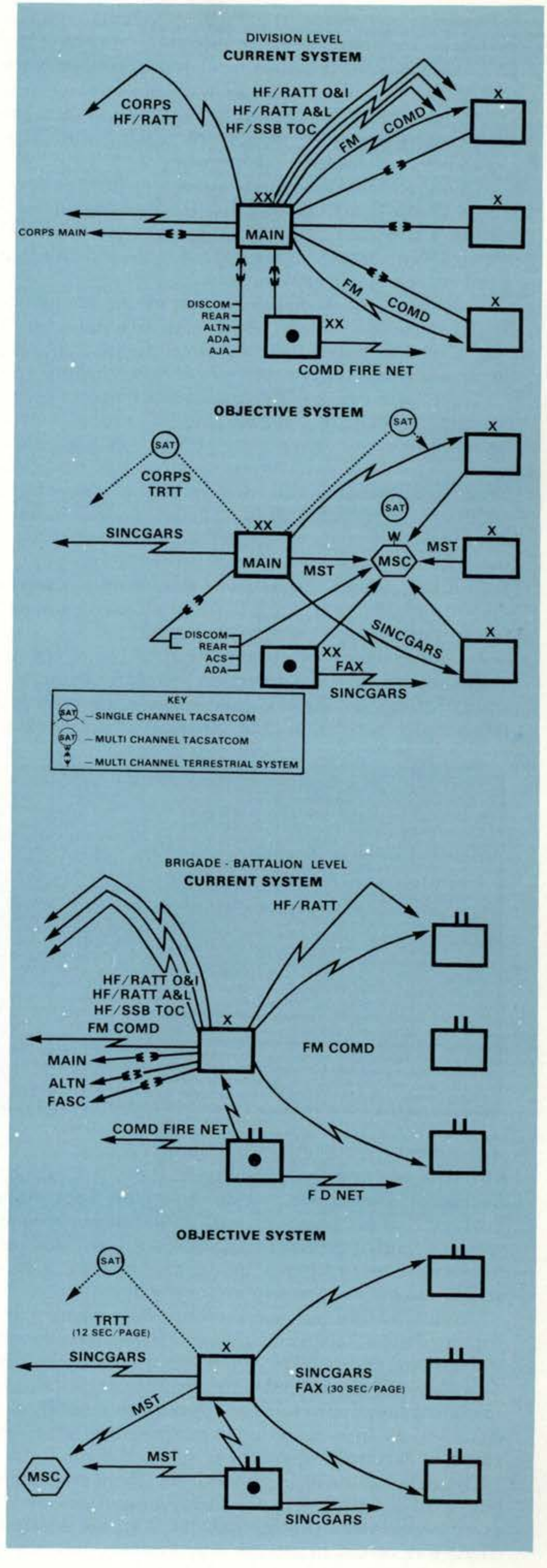


Figure 1 compares the current communications system to the objective communications system of the INTACS study. At battalion level, radio is our primary means now and will remain so in the objective system. Note that the RATT is not in the objective system but that tactical facsimile equipment will provide page capability from battalion to brigade.

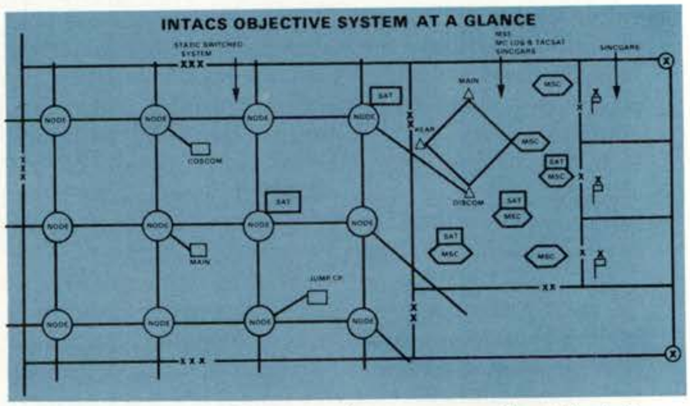
A more significant change is seen at brigade level where tactical satellite replaces HF and Mobile Subscriber Equipment (MSE) replaces the multichannel system. As at battalion, the FM net radio will still be a primary means of communication.

At division level, multichannel would almost be totally replaced by MSE. Limited multichannel would remain in the division support area. Tactical satellite communications plays a key role at this echelon.

Figure 2 summarizes the tactical nets and also shows the grid-like switching system that will support corps.

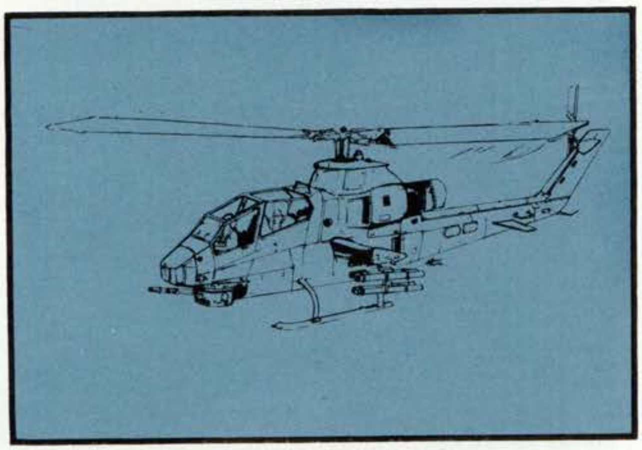
Continuing our discussion of the communication needs of the Combined Arms Team we find that field automated systems will require signal support in addition to that of command and control. Although the initial INTACS study considered some of those systems, the last few years have seen a veritable explosion of realization about the impact the communications system could have on the efficiency, effectiveness, and integration of these automated systems.

An analysis of all communication requirements shows that the voice requirement has increased significantly at brigade, division, and corps while there is a tremendous increase in data communication. Looking



at the source of this great increase we identified the areas of highest data transfer need. ADA leads the pack, so for sensitivity sake we looked at the data requirements comparison but this time without ADA included. We still have a very significant data transfer need.

The INTACS update is not yet complete. The next task is the detailed candidate description. It is important to maintain constant TRADOC interaction in that work to insure valid portrayal of user needs and desires. The candidates will then be assessed with communications effectiveness modeling cost estimating and first cut electromagnetic compatibility-electromagnetic vulnerability, and combat effectiveness analysis. The objective solution with the data architecture will in the final phase be a fully coordinated TRADOC position.



TASVAL

MAJ Joseph Laeho
6th ACCB

The Joint Test and Evaluation of Tactical Aircraft Effectiveness and Survivability in Close Air Support Antiarmor Operations, which has been short-titled TASVAL, was designed and undertaken because previous combat experience, studies, analyses, and test results have led to different assessments of the effectiveness of close air support in antiarmor operations.

Meaningful aircraft survivability data against the Warsaw Pact's force structure and air defense arrays is still largely unavailable. Therefore, the Office of the Secretary of Defense (OSD) directed that a Joint test be conducted to examine tactical aircraft survivability and effectiveness in a high-threat environment while engaged in antiarmor operations.

The Army, Air Force, and Marine Corps are participating in the test, with the Army designated as the executive service. The Institute for Defense Analysis (IDA) was tasked to prepare a preliminary test design and evaluate the test results. A Joint Test Directorate (JTD) was formed under the auspices of the U.S. Army Operational Test and Evaluation Agency (OTEA) and compiled the draft test plan.

The Army's Combat Developments Experimentation Command (CDEC) was tasked as the executive agency to review and provide recommendations concerning the JTD plan, and in conjunction with the Air Force and Marine Corps, to prepare a detailed plan for execution and to be responsible for the execution of the Joint test under the direction of the JTD.

The purpose of the test was to reduce the uncertainties associated with decisions on weapons systems acquisition, force structure, and force mix. A Joint test and evaluation will be conducted to examine tactical aircraft survivability and effectiveness in close air support.

The specific test objectives, as determined by the JTD are to:

• Determine loss rates of friendly ground attack aircraft during antiarmor attack missions in moderately to heavily defended areas. Determine which enemy weapons or combination of weapons are most effective in destroying friendly aircraft.

• Determine enemy armored target destroyed/damaged rates. Determine which attack aircraft/weapons and tactics or combinations result in maximum target kill rates.

• Determine friendly aircraft losses vs. armored targets killed, considering effect of tactics and combinations of friendly aircraft (i.e., type and mix of aircraft in attack force: size of force, etc.).

• Evaluate effects of the *AH-1S* and *A-10* aircraft operating in concert on kill and survivability rates.

• Evaluate effects of weather (assumed ceiling and visibility restrictions) and EW countermeasures on friendly aircraft losses vs armored targets kill exchange rates.

The IDA test design requires that a Red Force comprised of a tank battalion from a Warsaw Pact tank division reinforced by a motorized rifle company, attack a Blue Force comprised of a tank company minus, with available attack helicopter and close air support by Army, Marine Corps, and Air Force attack aircraft.

The Blue ground forces will be supported by tactical fixed-wing aircraft or helicopters in single-service strike packages or joint Army/Air Force attack teams. The strike packages are composed of various tactical aircraft and ordnance appropriate to antiarmor operations and will be flown using current tactics.

As each strike mission is conducted, information from instrumentation installed on the range and player vehicles, supplemented by that from data collectors and controllers, will be automatically and manually collected, combined, stored, and reduced by analysis relative to answering the test objectives. The reduced data will be provided to IDA and other authorized service agencies. The JTF will also publish a hard copy formal report containing the summary statistics and computer simulation models of the test results.

The test is being conducted at Fort Hunter Liggett, California, which provides the necessary realistic maneuver area for both forces' air and ground vehicles. The test dates are May 1979 through August 1979.

The data to be collected during TASVAL falls into five basic categories: position/location, events, laser pairings, supplemental, and near-real-time casualty indication.

The position location (PL) data are those classes of data which describe the physical location of a test player in relation to the test coordinate system. PL data will be obtained using the Department of Defense Research and Engineering Range Measuring System (RMS) for ground vehicles, and aircraft data will be obtained by using the RMS Simulated Combat Operations Range Equipment (SCORE) subsystem which will allow positive placement and identification of all player vehicles' locations.

Event data are designated discrete events involving the various players as either inputs to models or elements for independent observation. Examples of selected events include weapon's trigger pull, simulated missile launches, and target detection.

Laser pairing data are those data which establish an optical communications link between a laser transmitter and a laser energy detector. This pairing establishes the existence of line of sight and uniquely identifies the laser *firer* and his *target*.

Data not characterized as PL, event, or laser pairings are considered as supplemental data. These first four categories provide the necessary means to compile and validate the last category, that of near-real-time casualty indications (NRTCI). The NRTCI is a system which allows the players a maximum amount of realism during the tactical play. The instrumentation requirement is basically composed of coded, eye-safe laser transmitters and sensors incorporated into a system for identifying opposing vehicles, ground-to-ground, or air-to-ground, via laser pairings, computing the range, and applying that information to the computer-stored probability of kill (PK) hit tables which informs the *fired at* vehicle that it has been hit. The total time required for the computer to analyze and inform the player vehicle is approximately 3 to 6 seconds. If a vehicle has been killed the vehicle will stop and a smoke grenade will be discharged. Aircraft hits or kills are denoted via a control panel installed in the aircraft which lights up to notify the pilots that they have been hit or killed and are no longer in play and must depart the area.

The laser system is a communication device and not a weapon simulator. It is a means to an end, in that the laser target pairing indicates a simulated engagement is in process by communicating an "I shot" transmission and an "I'm being shot at" reception between a firer and his target. The formulation of estimates or loss exchange ratios can be computed from the engagement histories by post trial analysis since many other factors represented by the other data collection categories will be correlated and compiled with the engagement histories to present a true depiction of the sequence events.

The completed instrumentation now allows completely automated pairings for engagements occurring between Blue and Red ground forces, Red air defense weapons and Blue helicopters, and between Blue attack helicopters and Red ground force targets.

The two controlled independent variables in the test are the strike package and the ground scenario. Electronic countermeasures (ECM) and communications jamming is a constant variable to be played during all iterations. The two uncontrolled variables are weather and trafficability. The instrumentation is clearly a complex and technical conglomerate of automated and manual data collection systems and simulation which will provide the necessary foundation for analyzing the true status of expected tactical aircraft survivability and effectiveness in antiarmor operations. Having defined the collection means and processes, it is now appropriate to address the players involved in the test design.

As mentioned earlier, the opposing force is a Warsaw Pact tank battalion reinforced by a motorized rifle company. It consists of 71 vehicles, and artillery in the indirect and direct fire role. The one major artillery limitation is the use of smoke. Smoke reduces the range of laser pairings, therefore only selective use of smoke will be played. The primary area for the use of smoke will be the artillery targets. The 4-40 Armor, a full TO&E *M-60* tank battalion from Fort Carson combined with its DS maintenance company and the 5-57 Air Defense Battalion from Fort Bliss are the FORSCOM designated units playing the Threat Forces.

The Blue forces consist of a tank company minus one plt, plus one TOW section from Fort Hunter Liggett, and attack helicopter troop from the 7-17 Attack Helicopter

Squadron and a FIST team from the 7th Infantry Division. The USAF is providing six *A-10* aircraft from the Tactical Fighter Center, Nellis AFB, and the USMC is providing four *A-4M's* and five *AH-1T* attack helicopters from the Marine Attack Squadron, El Toro, California.

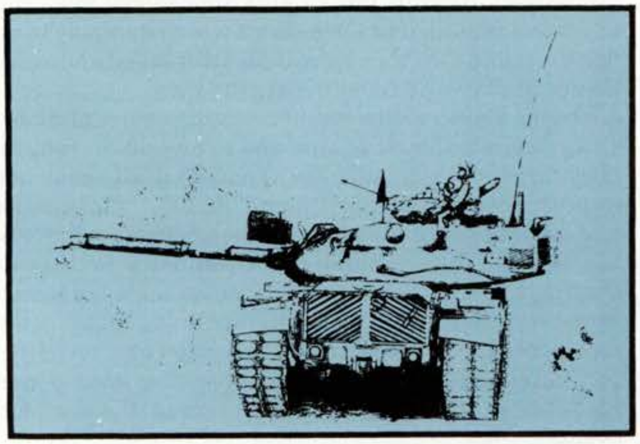
The attack troops are organized with five platoons, and a headquarters and operations section. A scout platoon which consists of 12 *OH-58's*, three attack or gun platoons each having seven *AH-1S* (TOW) *Cobras*, and a headquarters and service platoon which has three *UH-1* helicopters, and two *UH-1s* in the operations section. With these assets the troop commander organizes for combat with three 3 x 5 mixes. This mix or team is made up of three *OH* scouts and five *AH-1S Cobras*. With three attack teams in the troop, the troop commander has the capability of employing his unit in continuous combat by use of the one-third option.

By this, we mean that the troop, when employed separately, will have one platoon engaged in battle, a second platoon en route to the battle area or in a holding area, and the third platoon in the forward rearm-refuel point (FARRP).

By applying this option, the commander can maintain a continuous attack on the enemy force by rotating teams into a battle area for a period of 10-12 hours.

Although this is a test, the design and relatively free play allows the unit to plan and operate as a troop normally would in a typical combat maneuver mission.

Space constraints preclude the remainder of this briefing which outlined the air and ground battle scenario of the TASVAL test. ED.



M-60A3 Update

LTC Terry L. Alexander
M-60A3 Project Manager

The *M-60A3* tank, the newest in the *M-60* series, is the result of several years of coordinated user-developer efforts to provide the best weapon system with the funds available. It is a good tank which will enable us to meet the Threat in the interim years until the *XM-1* is fielded in quantity.

The external configuration of the *A3* is not very different from the *A1*. Only the thermal shroud on the gun tube, the wind sensor on top of the turret bustle, and the laser safety shield on the right side rangefinder blister distinguish it as an *A3*.

Unique features of the *A3* are the new fire controls which include the laser rangefinder, wind sensor, solid state electronic computer, and the gunner's *M-35E1* periscope. Later the *M-35E1* will be replaced by the tank thermal sight (TTS).

We arrived at the *M-60A3* through the application of a series of product improvements which began in 1971. Of the four product improvements which were incorporated during 1978, only the laser rangefinder and the solid state computer are unique to the *M-60A3*. When the *M-239* grenade launcher and the *M-240* coaxial machinegun went into the *M-60A3* it was also added to the *M-60A1*, which had already been equipped with the reliability improved engine and the passive sight. The final configuration of the *M-60A3* equipped with the tank thermal sight will be designated *M-60A3 (TTS)*.

Low-rate initial production of the *M-60A3* was approved in December 1975 and approval for full-scale production and type classification standard was received in May 1979. The first *A3* rolled off the production line in February 1978, and 209 had been produced by April 1979.

To support the deployment of the *M-60A3*, a DARCOM/TRADOC new equipment training team has been training instructors and key personnel at the 7th Army Combined Arms Training Center since February of this year. The new equipment training is completed, and the CATC cadre are awaiting the first unit to be equipped with the *A3*. Additionally the Armor and Ordnance Schools have started training crews and mechanics in the new skills which will be required to operate and maintain the *M-60A3*. Tanks for the first battalion to get the *A3* are on site in Europe, as are the unique special tools, test equipment, and manuals. A materiel fielding team and a deprocessing team provided by the project manager's office are also on site to assist units receiving the *A3s* in transitioning to the vehicle.

The deprocessing team is comprised of quality assurance personnel from the DARCOM commodity commands which have responsibility for each of the systems of the tank. This team is augmented by direct support personnel from USAREUR. Contractor technical representatives are also available.

Although lengthy and costly test programs are conducted during the development process, every problem cannot be uncovered before hardware is issued to the user. But there is a system to solve these problems. The DARCOM Logistics Assistance Office will provide maintenance technicians from each DARCOM commodity command to each unit as it completes its transition to the *M-60A3*. Additionally, a 2-year program will be conducted to collect performance data from the two battalions equipped with the *A3*. This data will be used to support funding required for correcting any problems that may be identified from equipment improvement reports.

Looking to the future, there are four new product improvements scheduled. The tank thermal sight and vehicle engine exhaust smoke system are in production and will be fielded soon. The muzzle position sensor and the heading reference system are in development.

The tank thermal sight provides a marked improvement over image intensification sights. It employs thermal technology so that its detection range is not dependent on moon or starlight. It "sees" as well in total darkness as it does in daylight and can detect targets through smoke, fog, and dust. It can also penetrate camouflage because it senses the heat of objects hidden by natural or manmade materials. It is equipped to provide the tank commander with the same thermal image display as that seen by the gunner. In a force-on-force operation against image intensification devices, the thermal sight demonstrated an average 7 to 1 loss-exchange rate during attack and defense scenarios.

The vehicle engine exhaust smoke system is based upon similar foreign equipment. It complements the *M-239* smoke grenade launcher by providing a screen capability on the move and for long periods of time. The system injects fuel into the exhaust manifold where it is vaporized. When it leaves the exhaust, the vapor condenses and provides a dense cloud of smoke.

The system consumes 1 gallon of fuel per minute and can be run intermittently or continuously. The smoke is not hazardous to personnel. The system will begin to be applied at the tank plant and in the field in FY 80. Other vehicles using the *AVDS-1790* engine are also adopting this system.

The combat vehicle heading reference unit is a self-contained magnetic on-board unit that provides general vehicle heading information to assist the driver in maintaining a desired course and will allow navigation during closed-hatch operations. A gyroscopic auxiliary sensor unit will be procured on a limited basis for the tanks of unit commanders. The gyroscopic equipment will complement the basic unit. Test models are scheduled for delivery in FY 80.

The muzzle reference system is being developed in an attempt to correct for firing errors induced by gun tube thermal variations. It may improve accuracy by 10 to 20 percent, reduce zeroing requirements, and eliminate the need for a thermal shield. The equipment may be operated manually or automatically. Two models are under investigation. If the concept has demonstrated that it is a viable, cost-effective approach, a single competitive engineering development contract will be awarded.

In summary, the main thrust for the *M-60* fleet is to concentrate on reliability, availability, and maintainability. New performance goals for our tank fleet will be realized with the fielding of the General Abrams tank—the *XM-1*.

Logistical Support for the Air Cavalry Squadron

LTC Leighton O. Haselgrove
CMDR 3-5 Cav

Space constraints preclude the publication of Colonel Haselgrove's entire briefing, the first part of which consisted of a description of the operation of a divisional cavalry squadron in the Active Defense. Included was a detailed oral order of one of the troop commanders involved in the operation. ED.

Logistical support is a prime consideration in the continuous operations of an air cavalry squadron.

As the battlefield becomes more and more modernized with low-density, sophisticated weapons, it becomes imperative that we become increasingly better managers of each system, which includes its peculiar maintenance requirements, its specialized ammunition requirements, and its skilled operator requirements.

The air cavalry squadron could be classified as a complex unit in itself, since it employs tanks, *Dragons,* 2.75-in rocket launchers, mortars, TOW missiles, 20-mm cannon, miniguns, and 40-mm grenade launchers—all of which are carried on rather complex weapons platforms. Maintenance packages must be tailored to meet the squadron's needs of three types of aircraft and to maintain a low-density of tanks, armored personnel carriers, and mortar carriers in the ground troop.

Not only is the cavalry squadron a modernized unit, equipped with technologically based weapons systems, but when employed at critical points in the battle, it is usually operating well forward with extended lateral frontages. This causes logisticians to support over extended supply lines that run through and pass over the major commands positioned in the main battle area (MBA); thus requiring coordination with DISCOM, DIVARTY, and brigade commander.

The division main support area is some 50-60 kilometers from the forward edge of the MBA. Add 15 kilometers to that for deployment of the reconnaissance elements of the squadron, and one can see why our logistical requirements are unique and worthy of special attention for the "limited" time we are forward of the MBA. With the extended distance involved and the dispersion required to withstand massed artillery fire, the squadron must locate elements in each of the three brigade sectors.

The organic support elements of the squadron are echeloned with readily-mobile assets up front and less-mobile elements located all the way back to the division main support area. This concept permits scheduled movements and reduces the signatures provided to enemy intelligence by our radio traffic and repeated aircraft landings. It also provides support sites in depth, allowing for greater flexibility in compensating for battle losses and the fluidity of the battle.

Logistics expediters are also dispersed. The troop executive officer is located close to the brigade trains and the support platoon leader with the squadron forward area support team (FAST) in the center of the division sector. Stationed well to the rear in a less mobile configuration is the squadron S-4 and the troop aviation maintenance officer. This echeloning of support sites and key support expediters helps pull and push supplies. It also provides checkpoints for monitoring progress of resupply operations and holding points for flexibility and mission changes as dictated by the flow of battle.

Because of the extended supply lines, it is imperative that we plug into brigade trains to capitalize on the dedicated support packages provided to the brigade by DISCOM FAST's. Basically, we will require the more common supplies such as food, water, fuel, emergency medical supplies, repair parts for tracked and wheeled vehicles, recovery support, medical support, POW collection, and sundry other items. Locating near brigade trains has another important advantage, that of providing the ability to tie into the secure VHF net for communication with the division rear area support headquarters.

For specialized requirements such as JP-4, rockets, missiles and aviation repair parts, the squadron will employ its own FAST commanded by the support platoon leader. This very mobile and compact element serves as a focal point to collect, distribute, reallocate and expedite the peculiar logistical requirements of the squadron. It is through this point that the divisional supply and transportation battalion can provide unit supply distribution or rapidly expended consumables such as JP-4 and ammunition. These are the high volume/weight items that trouble us most when allocating limited organic line-haul capabilities of the squadron. This element moves every 2 hours to previously briefed locations to cut down on its vulnerability to enemy artillery. It monitors the squadron admin/log net with a *PRC-77* radio and an *A-292* antenna which gives it the necessary range.

It should be pointed out that regardless of the mission given the squadron, the brigade FAST will be required to support the aligned cavalry troops whether they are forward of the MBA in a recon role, on a flank screen for the division, or in a rear area security role. It is recognized that once the battle reaches the forces in the MBA, the priority of support reverses and in fact our support elements stationed in sector could assist the brigade S-4 with his problems. We certainly have greater mobility with our aircraft in the support structure than he has.

The logistical support of an air cavalry squadron may not be the most pressing professional challenge confronting us today, but all of us need to keep the logistical support in the forefront and no more than one step to the left and rear of tactics, training, and weapons procurement.

The basic organization of the cavalry squadron for which we have just discussed logistical support has been in the Army well over 15 years. However, recent changes in doctrine, with the attendant defense in depth and relatively narrow frontages associated with infantry divisions, have caused the 9th Infantry Division to consider a reorganization of its squadron.

The reconnaissance troop would have a larger aeroscout platoon than does an air cavalry troop by adding two *OH-58* aircraft. It would also have a much larger aerorecon platoon with approximately 60 men and an airlift section equipped with 10 instead of six *UH-1s*. On the other hand the aeroweapons platoon of the conceptual troop would be decreased in size from nine to six *AH-1* aircraft, but would retain sufficient firepower to provide overwatch and suppressive fires for the aeroscout and aerorecon platoons. The troop headquarters and service platoons would have to draw their *UH-1* support from the lift section of the aerorecon platoon.

The reconnaissance troops of the conceptual squadron would have a greater capability to provide sustained aerial reconnaissance than those of the current air cavalry troop and the increase in size of the aerorecon platoon gives it 50 percent more capability for manning ground OPs.

The air cavalry attack troop of the conceptual squadron would be tailored much like a small attack helicopter company. It would or could be used in a similar role and provide the division commander with a highly flexible, responsive antitank force. The attack troop would still have the capability to conduct aerial reconnaissance with its six *OH-58* aircraft and would be ideally suited to operate in conjunction with the armored cavalry troop and its ground assets.

The attack helicopter platoon of the attack troop would consist of two sections of seven *AH-1s* each. The platoon commander would serve as one of the section leaders. The service platoon would be responsible for maintenance of the two *UH-1s* used for command and control, liaison, and supply.

The reorganization is possible within the assets of the squadron and provides for a substantial increase in responsive firepower in the attack troop while retaining a flexible reconnaissance force.

There are disadvantages to the reorganization, the most obvious being the inability to align one air cavalry troop with each brigade. However, this disadvantage can be reduced if the armored cavalry troop is used to its maximum capability.

The advantage of having an air cavalry attack troop capable of reacting rapidly anywhere in sector, particularly for an infantry division, is a capability we can hardly afford to overlook.

The 1979 Armor Conference also included presentations on ground and air cavalry operations within the Combined Arms Team (CAT), personnel considerations in support of the CAT, air defense for the CAT, and deployment of combat aviation as the eyes of the commander. Updates on the advanced attack helicopter, the XM-1 and XM-2/3 fighting vehicles, and an air Cavalry Attack Helicopter symposium were the closing items on the agenda. These topics may appear in future issues of ARMOR. Copies of the manuscripts used for the presentations may be obtained from the Directorate of Plans and Training, U.S. Army Armor Center, Fort Knox, Ky. 40121.

PROFESSIONAL THOUGHTS

Armor Protection for Infantrymen

(This discussion is continued from the LETTERS Department, page 2. Captain Birt is referring to the article, "Future Infantry Armored Vehicles," by Richard M. Ogorkiewicz, which appeared in the November-December 1978 issue of ARMOR.)

I am not certain that the best method of protecting infantry on the next battlefield will be found in developing infantry combat vehicles (ICV) as suggested by the author. For every technical action there is a technical reaction; this simple rule of development and counterdevelopment means that the efficiency of a technical solution to the infantry protection problem is based on the hope that our latest move comes along before their next counter.

The best way to protect any body of troops, given relatively equal opposing military technologies, and the method most likely to stand the test of time, is superior combined arms tactics.

Mechanized infantry, operating in close cooperation with tanks would be best protected from antitank weapons with the accurate application of artillery fire (including a high volume of smoke), fighter ground attack, direct tank fire, and suppressive fire from their own high-rate-of-fire weapons. In addition, mechanized infantry commanders should be as well versed as tank commanders in the effective use of ground and in the techniques of fire and movement (in your terms, overwatch). Finally, the most certain method of neutralizing enemy antiarmor weapons is to close with and kill the crew. The surest way to accomplish this is through an aggressive dismounted attack.

No one would deny that the mechanized infantry should reap the benefits of advances in AFV technology, but since we are all bound by the limits of cost effectiveness I would suggest the following, technical/tactical trade-off. A realistic ICV should protect the crew against small to mid-caliber cannons (perhaps up to 35-mm) and against artillery fragmentation rounds. It should be a high-rate-of-fire cannon with a defined antiaircraft capability. The ICV should also be fast over all types of terrain and have a low profile. (Such carriers would be relatively cheap and, therefore, could achieve additional protection in numbers.) Perhaps most importantly, the vehicles should be commanded by men who can use the terrain to mask their position and movements.

Simplicity in all aspects of combat is a virtue which should be practiced. I think that Mr. Ogorkiewicz' suggestion of DFSVs, heavy and light ICVs and tanks would make for a confusing and ponderous force, both in terms of command and control and logistic support.

The three roles which the author suggests for DFSVs can, I believe, be met by existing weapons types. For example, infantry antiarmor weapon teams and light armored vehicles could be neutralized by high volume fire from ICV weapons and with effective artillery fire (salvoes from multiple rocket launcher systems would be particularly suited for this task). It should be noted that the very characteristics which make a tank vulnerable to close range infantry antiarmor weapons would apply to a DFSV. Finally, hostile attack aircraft, including helicopters, could be best engaged by dedicated antiaircraft weapons like the German *Gepard.* I believe that the ideal mix of cheap, numerous weapons for this task already exists in the Soviet Army where every motorized rifle company has three shoulder-launched SAMs and the battalions have detachments of *ZSU-23-4* self-propelled antiaircraft guns in direct support.

As modern soldiers we should be quick to take advantage of every advance in weapon technology, but we should always keep two points in mind. First, our combat systems should be kept as simple as possible. Second, we must accept solutions which are feasible politically and economically. In other words, "the best must not be allowed to become the enemy of the good."

Again, let me take a last opportunity to express my appreciation for this fine journal and for giving me a chance to use your platform.

M. G. BIRT
Captain
Combat Training Centre
Canadian Forces Base, Gagetown

Professional Ethics and Behavior

We in the military are under the constant, critical scrutiny of the Congress, the news media, and the general public. We are sometimes praised, sometimes ignored, and occasionally damned. This we must accept. But in accepting the verdicts of those who judge us, we must also subject ourselves to self-evaluation to insure that we present the best possible individual and organizational public image—an image that is founded in our professional ethics and behavior.

Recognizing this, an examination of our current ethical standards and professional behavior is in order. What follows is a series of questions and observations that address these critical areas. The questions are not listed in any order of significance nor are the thoughts on behavior. They are but one soldier's musings and are presented here to stimulate thought and discussion about two facets of our professional lives that may sometimes be dwarfed by the pressures of daily activities.

Let's begin with the questions.

Key Questions on Professional Ethics

- How do we translate general guidelines for professional ethics into specific criteria which influence every hard decision which a busy officer must make?
- How do we best create a common understanding of professional ethics throughout the officer corps?
- How do we counter the perception (or the reality) that solid integrity often goes unrewarded while selfish expediency often results in personal gain?
- How do we avoid placing an officer in an "ethical crunch" where he perceives that either his career or his integrity must be sacrificed?
- How should a commander communicate his actions and intentions so that sound but unpopular decisions are not perceived as unethical?
- How do we sensitize the commander to the probable impact of his decisions on the ethical climate of his unit?
- How do we place loyalty to the boss in proper perspective so that it does not unbalance the greater need for loyalty to the highest professional ideals?
- How can we maintain an officer corps that is vigorous and aggressive but not ambitious to the point of individual selfishness?
- How do we define "success" within the officer corps? (Surely it is *not* synonymous with "rapid promotion.")

Notes on Contemporary Elements of Professional Behavior

The Army is busy with multiple missions and its resources are relatively austere. An organization under stress normally moves to solve first the most immediate and identifiable problems. Specific measurement of progress toward problem resolution is particularly desirable when an organization or unit feels a need to reinforce its stature or effectiveness.

Matters of principle, ethos, or personal value sytems are difficult to quantify, although the perceived ethical (or unethical) behavior of leaders has immediate impact on the organization. Specific results of ethical conduct are not usually susceptible to short-term measurement, and shortcomings in matters ethical often are addressed directly only after a massive flaw becomes apparent.

As a commander under pressure moves to achieve the visible productivity which will relieve the stress on him and his orgaization, his actions often will raise issues or generate concerns, regarding the professional ethic.

Ethical principles of the commander are transmitted to subordinates through a combination of policy guidelines, announced and operable priorities, and leadership style. The clear transmission of simple policy guidelines is often difficult. The clear transmission of an ethical code is considerably more difficult, particularly if the subordinates are skeptical generally regarding the corporate professional ethics of senior officers and the seniors are under pressure to produce results.

As busy subordinates scrutinize their commander's *modus operandi,* his tough, unpopular but sound and honest decisions may be perceived as self-serving or otherwise unethical.

Many of the minor tasks or intermediate objectives which organizations are burdened with assume in their totality an importance greater than the primary organizational mission. Frustrations stemming from the need to cope simultaneously with a multitude of tasks, many not seen as relevant to combat readiness, can generate a managerial atmosphere within which the professional ethic may seem cumbersome or inapplicable.

An Army lives to win. Second place in war means the soldier has failed the nation. Mission accomplishment regardless of cost is sometimes the clear and only goal of the soldier. It is, therefore, easy to downplay methods and emphasize short-term results and to lose sight of long-range goals.

Evidence of material success—such as promotion or command selection—is tightly knit to the contemporary American value system. Many Americans—and apparently some field grade officers—appear almost totally dependent on visible evidence of achievement for feelings of adequacy as human beings. With such dependence on formal reward systems, there is great potential for frustration if the systems appear to be imperfect. Further, dependence on these formal systems for a feeling of accomplishment includes the hazard of a feeling of career hopelessness at an early time should the desired promotion or selection not be forthcoming.

Expectations for a fair chance at promotion are strong, and deviations from the normal career pattern are resisted and resented when such deviations are seen as unfairly or capriciously compromising the individual's chance for promotion. The resistance and resentment are particularly strong when a proposed assignment is not based on a valid need as perceived by the officer involved.

If an officer considers himself valuable professionally to the Army, and inherently deserving of promotion and selection, he can be tempted to cut ethical corners under the rationalization that his promotion—regardless of the methods by which it was attained—is ultimately in the best interest of the Army. This is particularly true if the promotion or evaluation system appears unfair or capricious. The temptation is to postpone taking a stand on principle until the ultimately worthwhile issue is at hand—particularly if the ratio of ambition to ethical standards is high.

If an evaluation system is suspect in concept, or its output is skewed from the normal distribution so that it does not discriminate reliably, or if the competitors within the system are relatively equal in terms of the resolution capability of the system, then there is temptation for an individual to take actions which will highlight his accomplishments at the expense of his peers.

If an officer does not gain requisite stature, comfort, and respect from serving honorably but without distinction, then he may feel compelled to achieve institutional rewards for the sake of maintaining a positive self-concept and "dignity."

In fact, many officers are often vague and hesitant about exploring or understanding their own value system, are not fully aware of their impact on subordinates, and are unsure or inconsistent regarding the translation of the traditional military ethic to the solution of specific problems. This pertains in spite of the fact that these officers do care about the Army and their role in preserving its traditional values.

The deeper meaning of "success" in the minds of most officers needs to be probed.

There have been sufficient ethical transgressions among Army officers during the last decade to generate some degree of skepticism regarding the value systems of senior Army officers and the fairness of the systems they regulate.

There exists today within the officer corps a healthy concern for the subject of professional ethics. There is widespread interest in exploring the subject within the context of contemporary realities of missions, standards, priorities, resources, and individual and societal expectations.

W. F. ULMER, JR.
Major General

ODCSPER, HQDA

The Guy Up Front

Since the beginning of World War II, military intelligence has made tremendous progress in the art of order-of-battle collection. One has only to look around and reflect on its progress over the past 34 years.

The Army intelligence field, vividly portrayed in *History of MI* by Majors Marc Powe and Scotty Wilson, suffered deleterious effects after World War II. It shrunk to almost pre-WW II size and took a back seat to the other branches, even during the Korean conflict. With the advent of the Vietnam war, it began to regain momentum. A branch was created, and the era of putting people who could not "hack it" into battalion and regimental S-2 jobs neared an end. The post-Vietnam era was unique for military intelligence. The branch was not dissolved or put on the back burner as after World War II. Instead, it was given impetus in the tactical and strategic modes.

High-level staff planners gave practical priority to Sun Tzu's dictum that we must not only know ourselves, but our enemy as well, in order to fight outnumbered and win. Consequently, military intelligence has become an art of military science. Military Intelligence companies have evolved to provide the G-2 with a greater in-depth capability to provide the commander timely information upon which sound tactical decisions can be made. Imagery interpretation, interrogation support, counterintelligence activities, and order-of-battle analysis can now all be conducted at division level.

It has not stopped there. An Army Security Agency unit is organic at division level, offering its spectrum of support; all a vital function to survivability on the battlefield. There is signal intelligence (SIGINT). The standoff target acquisition system (SOTASS) is with us at the tactical level. The combat electronic warfare intelligence (CEWI) battalion has come of age at division to provide centralized control of these expanded assets available to the G-2. Finally, the all-source intelligence center now allows the complete and total integration of these assets so we can know as well as possible what the enemy is going to do next and when, where, and how.

The whole process has been quite revolutionary. Examine the inventory available to the G-2: radars, night observation devices, electronic intelligence capability, photo reconnaissance and interpretative support, active and passive operational security measures, complex computerized systems to quickly process information, and dedicated, secure radio communications. Compare the post-Vietnam era to the post WW II era and the difference is mind boggling.

All the aircraft, all the computers, and all the electronic wizardry make the G-2 look like a genius with a crystal ball. But in reality, where are we? What is our strength? What is the one item of exotic equipment that can never be replaced, never forgotten, and makes or breaks the G-2? Winterbotham alludes to it in his fascinating book, *The Ultra Secret.* Stevenson brings it home time and time again without ever saying it in *A Man Called Intrepid.* His tacit message is that even with all the electronic gadgetry, the guy up front is the one to whom we go for our information. We can count on him because he is in the living hell of where it all is. His eyes, his ears, and his courage get that vital information back to us. The trained rifleman, cavalry trooper, or scout is that exotic item of equipment that can never be replaced—never forgotten. In the final analysis he is the one we, in the military intelligence system, rely upon so much.

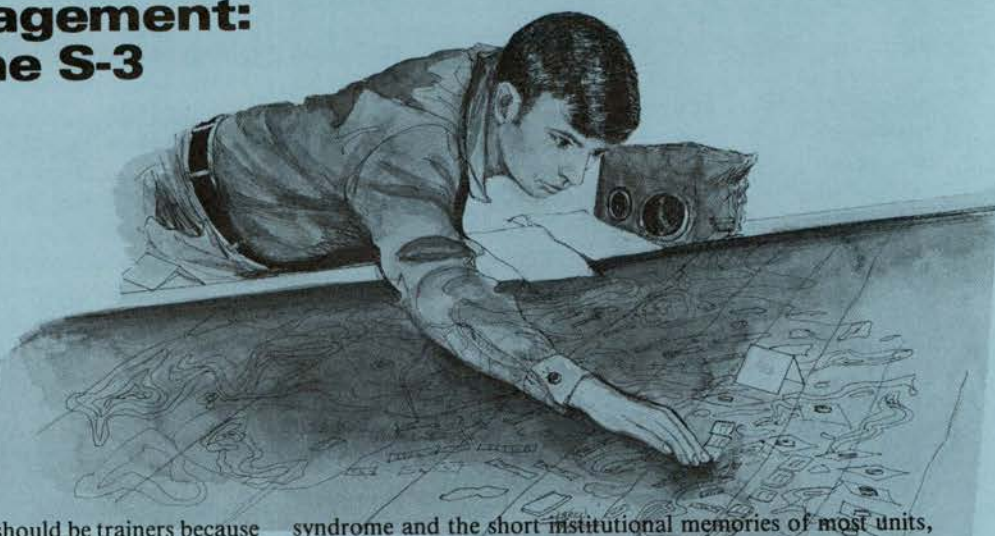
Be it behind the lines on long range reconnaissance patrols, or on the forward edge of the battlefield, when our radios are jammed, agents detained, planes destroyed, and generators for computers down, there he is: a cold and wet private lying on his stomach providing us with that one bit of information which just might be the final link to the big puzzle.

To those of us who wear the intelligence insignia, vigilance is part of our heraldry. It is most important that we never forget that the greatest part of our vigilance is found in the privates of our Army.

EDWARD J. GESICK, JR.
Major, MI

APO New York 09355

Training Management: As Seen by the S-3



by Major V. Paul Baerman

All leaders and supervisors are or should be trainers because everything we do in the Army is training. Likewise, if we are to be good trainers, we must be good students in order to obtain, study, and improve upon the information and techniques available. It is important that we have some "methods" immediately available to do so. Some of the methods trainers can perhaps use to improve their training and save precious time follow.

As trainers and students we probably find our most persistent constraint is time. This problem is twofold. While there never seems to be enough time at the leader levels to get everything accomplished, our men find that time often seems to drag or be wasted. Here are some guidelines and techniques that can help units spend valuable time most wisely.

Avoid Reinvention of the Wheel

This subject area can prove burdensome to the trainer if he doesn't completely understand the purpose behind certain paperwork. Here, I am specifically referring to after-action reports and training SOP's which can immensely aid trainers if used properly. After-action reports should be written after every major and many minor training efforts. For example, one unit simply made notes on a TOW training LOI prepared at battalion-level in preparation for quarterly qualification. These notes indicated shortcomings and strengths that affected the training and the training support. After two or three iterations of this training, the LOI became a very complete document on which to base quarterly qualifications. The original LOI was saved along with succeeding editions so that a new trainer could see unit progress. The LOI's or like documents, annotated as necessary based on experience, were also used as an indexed reference on which to base new training directives.

The ultimate solution for saving time for the trainer would have been the publication of a simple order directing the TOW training and referencing a previously published detailed training letter. However, the LOI reference book gives a newcomer on the scene a leg up on training by establishing an institutional memory.

The philosophy underpinning training SOPs' is similar to that pertaining to LOIs' and an essential part of any training program. Most units suffer from personnel turbulence problems, but its effects can be limited if the newcomer is given a "running start" on his job. One of the best means for doing that is a proper SOP that lists the training procedures in the unit and is written as if the author, with all his knowledge and experience, were to die tomorrow.

Since we constantly decry the "reinvention of the wheel" syndrome and the short institutional memories of most units, it is essential that trainers emphasize retention of lessons learned. Files that detail strengths and weaknesses of unit training experiences must be established so that succeeding trainers have an information base upon which to build.

The thought strikes me at this point that this article itself probably reinvents the wheel. If one researched *ARMOR* one could probably find similar articles. If you agree with this particular article, cut it out and save it, and you may save "reinvention time."

Reports must not be written and SOPs' established just to fulfill a paperwork drill. The emphasis must be on their use and availability. One of the first questions any trainer should ask in a new situation is, "What information is already available on this subject?" As a corollary to this question, the trainer must use all the resources available to him. In addition to the usual field manuals and training circulars, the trainer should not overlook other resources such as the Training Support Center at Fort Eustis, the Army Research Institute and their field units, and the telephone. The latter is for calling other units and posts for an exchange of ideas. Imaginative and experienced people of all ranks within your own unit are also available, and their ideas should be solicited.

The following management technique helped eliminate the time lost due to personnel turbulence in a battalion that had 27 different officers in the S-3 section during a 14-month period, with the S-3 being the only officer present during the entire period. To avoid spending all his time orienting new officers in their areas of responsibility, the S-3 developed a book that listed all the tasks, conditions, and standards for each position in the section. Then for each task, the staff section member was required to keep a personal file with all the information dealing with that task. As a result, the task book and the personal files minimized time lost through personnel turbulence and its deleterious effects on unit training.

Cram Maximum Training Into Minimum Time

There invariably seems to be slack time in training. Realize this and plan for it. I'm not talking about concurrent training but other ideas that can streamline training for the maximum benefit.

Pocket Lesson Plans. Also called "ammo pouch" lesson plans, these aids get everyone involved in the training. For instance, squad leaders assign each squad member a 10-minute class such as armored vehicle recognition, use of atropine, or map symbols. Each man then prepares a 3x5-inch card with the necessary information on it plus a training aid or two that can be kept in his pocket or ammo pouch, e.g., flash cards. If each squad member has two or three subject areas prepared, an hour of slack time can be quickly filled while waiting in the motor pool or in the field.

Training Kits. The next step from "ammo pouch" lessons is to training kits ranging in size from an ammunition box to a footlocker. These kits could be subject-matter oriented and contain all the necessary training aids required for a specific subject. A mine warfare training kit would contain mockups of all mines in the unit's basic load or covered in the applicable SQT, the GTA mine warfare card, and instructions for using the kit. The instruction could be organized around a "county-fair" concept with individual stations. Station 1 could be for employment of the Claymore mine and include an inert mine plus instructions on a laminated card for the assistant instructor and the standards from the SQT. A scoreboard would be issued to each man to keep track of his progress.

The objective of the kits is to sustain training of the individual based on SQT skills. A trainer can prepare for presentation of good training in a short time and, since the kits are hands-on, they are ideal for regular training classes, concurrent training, or during inclement weather or slack time.

Most soldiers generally have an idea of what is required of them upon finishing basic and advanced individual training, and they retain that learning at different levels of knowledge. Therefore, a key to saving time, maintaining interest, and getting the most out of the training is to use a test-retrain-retest process. Begin the process by testing the individual using one of the training kits, or a pretest similar to those issued with training extension course (TEC) lessons. If he fails, retrain him as necessary, then retest him. A class is necessary only if the individual fails the second test. This way you teach only those soldiers who failed the specific points of the test. You don't bore all the rest and you also have the soldiers who passed the tests initially, available to serve as instructors.

The same process could be used for mandatory subjects by administering prestests for classes on drug abuse, Geneva-Hague Conventions, and Code of Conduct. Those members that pass move to more advanced subjects while the remainder are retrained. The completed tests can also serve as training records.

Economy of Effort. There are classes that must be given because they are directed by higher headquarters or Department of the Army. There is also pressure to have 100 percent at these mandatory classes. Two methods are suggested. First, hold the classes at the highest feasible level (say battalion) and have these classes coordinated by the battalion staff. Hold them every two or three months for all subunits and require attendance for only those personnel who are newly arrived in the unit or who need updating. Then, company-level trainers need not be plagued by scheduling a variety of specialized classes. Second, have as many of these classes on video-tape as possible and update the tapes as necessary. Then, those personnel who missed the classes, but who must attend, can watch them on a dayroom TV using a video recorder/playback machine.

The video recording idea can also be used to tape any specialized classes, such as air-and-rail loading, that may be taught at higher level and require cadre refresher training.

Train to Your Own Needs

This area may be one of the most difficult to discuss. Think about your unit. Are individual tasks the key or does most everything happen at company or troop level? Many would argue that most units rarely need to train above platoon level, especially if the next battlefield is going to be as fluid and isolated as predicted. There are a wealth of training methods available to commanders at company level and above. These range from terrain walks, to TEWTS, to a variety of war games and CPXs'. Therefore, concentration on the platoon and emphasizing its training may be a very big timesaver. Self sufficient and confident individual soldiers, crews, squads, and platoons are the basis of good battalions. Moreover, with the varied requirements placed on most units, training at platoon level and below is easier in terms of support, training space, and supervision.

Units traditionally do certain things well, while other items continually go wrong. Any trainer could probably write a reasonably valid evaluation of a unit's weaknesses without seeing it operate. He would probably list such areas as COMSEC, OPSEC, and night operations with comments along these lines:

"Communications procedure is widely violated."

"Men commit frequent violations of communications security."

"Men have insufficient experience in driving."

"Range estimation, sensing, use of binoculars, and the mil formula are deficient."

"Firing from a moving tank and firing at a moving target constitute critical training problems."

"Tankers fail to follow themselves on a map."

"Men have difficulty in utilizing terrain."

"Tankers tend to be lax in security of all kinds."

The foregoing remarks could be written about many of our units today yet they were taken from an Army study made by Human Research Unit Number 1 at Fort Knox, Ky., in 1954 and '55. The point is that there are certain fundamentals on which we always need to concentrate our efforts. These problems vary from unit to unit, but it's up to the trainer to tackle them with as many useful ideas as possible.

Nothing covered in this article is by any means new and many of the ideas are being practiced in units now. Get out any book on training and you'll find many similar ideas discussed. But our execution could be better and hopefully some of these methods will spawn better ideas. If the organizational and training techniques discussed here free the commander and his fellow trainers to concentrate on tactical training, this article will have been a success. If not, let's use *ARMOR* to develop other ideas.

MAJOR V. PAUL BAERMAN was commissioned in Armor upon graduation from the United States Military Academy in 1968. He has commanded armor and cavalry units in Vietnam and the United States and has been a battalion and brigade S-3 and division G-3 training officer. An AOAC graduate, Major Baerman served as S3, 1-10 Cavalry, Fort Carson, Colo. He is currently attending the Command and General Staff College.

Training Management: As Seen by the Commander

by Captain Edward Maher

With all of the different MOSs in a typical company/troop, and the many various requirements that we already have, i.e., ARTEP, Gunnery, REFORGER or similar type field problems, Reserve Component and partnership training, unit details, maintenance, IGs, etc., how do we successfully tackle the challenge of SQT? How do we go about accomplishing the mission?

In my opinion there is only one way. The tank commander, platoon sergeant, and platoon leader must be made responsible for insuring that training is accomplished. SQT training must be decentralized down to the lowest level possible, phased, and goal oriented.

But before getting started into a training program there is one prerequisite for success, and that comes from above. The battalion commander and S-3 must give the company commander a long-range training schedule that lists all of the various requirements the company will be required to meet. Once this is done they must stick to it and not allow that schedule to be changed. If the battalion commander and S-3 cannot do this, there is very little chance for a successful program.

Once the company commander has the long-range training schedule, he can sit down and organize his plan to bring his soldiers up to the necessary skill level in their MOSs.

I recommend that the company commander set training goals based on the SQT tasks for the platoon to meet on a weekly basis. He should then allow the platoon leaders and platoon sergeants maximum freedom in developing their own plans to meet those goals. These small unit leaders can get the job done. Make them responsible and hold them accountable for the results on the test.

Here is one recommendation to assist the platoon in staying on track. The platoon leader should submit a written weekly report as to how his platoon is meeting its training goals. This has a number of benefits:

- The platoon leader has a heightened awareness of his responsibility to his platoon to insure that they are well trained.
- It identifies problem areas in training.
- It assists the young officer in learning how to put his

thoughts on paper in a clear, concise manner, a skill that is lacking in many new lieutenants, and which they will have to learn to be an effective staff officer or company commander.

For this training to be successful there are a few rules to follow.

- Do not allow company classes! Classes should be at tank commander level and only at platoon level when absolutely necessary.
- Insist that junior NCOs give classes. This is an excellent way of developing junior leaders.
- Have tank commanders and platoon leaders keep a simple progress chart for each of their men using a GO/NO GO system.
- Encourage the use of Training Extension Course lessons and TV tapes. They should be mandatory viewing for all subjects for which they are available.
- The training schedule must allow time for some classes to be given many times. Some tasks are difficult and though a soldier may be able to pass a quiz right after viewing a TEC tape, he will many times not be able to pass the same quiz if it is given a couple of days or weeks later. Many tasks will have to be repeatedly drilled.

Innovation and Integration

There is no Army unit that has enough training time to adequately cover all subjects. This is a luxury we do not have in the real world.

The only solution is to be innovative in your approach and integrate training at every opportunity. It may be necessary to extend the training day.

One prime area for integration is maintenance time in the motor pool. Is there a maintenance program that doesn't have "dead" time or poor utilization of time? Why not require that two or three subjects be integrated daily into your maintenance program. There are a number of benefits:

- Soldiers increase their knowledge.
- Soldiers are kept busy and perform meaningful tasks.
- Maximum use of available maintenance time is realized.

Another suggestion is to have your training NCO take the TEC tape machine to the motor pool with a selection of TEC lessons. At formation, the time of showing and titles of the tapes can be announced. Therefore, if a tank commander has a soldier who is weak on one of the announced subjects, he can insure that he is available for the instruction.

You may discover that an NCO may fall behind on subjects o*r* his own skill level due to his concentration on the training of his men. Our solution to this problem was to turn the company over to corporals and below on Tuesday and Thursday mornings from 0630 to 0800. During that time the senior NCOs attended classes in their skills. This program was organized and controlled by the first sergeant in coordination with the unit's master gunner.

Low Density MOSs

Of course a company cannot concentrate all of its resources on a high density MOS such as 19E. What about the track vehicle mechanic, the commo people, and other low density MOSs?

It is possible to have a tank platoon concentrate all of its efforts on training, but this is not possible for supporting personnel. Maintenance must still be performed and requisitions must be processed. Therefore, a section leader probably cannot handle his job and still train his soldiers effectively in the many areas in which he and his people are required to be knowledgeable. By blocking out a period of time during the duty day, these section sergeants can accomplish a number of the training tasks, but certainly not all of them. There are going to be many tasks that require a higher level of expertise and resources.

Here is where the battalion commander and S-3 must become involved. There has to be a single point of contact and coordination for training in these low-density MOSs to insure that everyone in the unit receives the required instruction. This should normally be the staff officer who has the particular expertise and resources for a particular MOS, i.e., the battalion motor officer would be responsible for overall supervision of 63C training.

The coordination and control of this training is more difficult due to the number of units and personnel involved. It requires maximum effort and support from the companies to the man who is responsible for the training. It also takes a strong and firm stand from the battalion commander to make this training successful. He must insure that the company commanders have their soldiers at the proper place at the appointed time. There are always a "hundred and one" high priority items for our mechanics to accomplish, but we can't shortchange them. The payoff is a better trained mechanic, truck driver, or radio operator. It is worth the sacrifice.

Benefits

A well-run training program will produce the following benefits. It will:

- Increase NCO professionalism by making them responsible for the training of their soldiers. Many NCOs will be instructing their men for the first time and their sense of pride and self-worth will be heightened. This training presented by the NCOs will also increase knowledge and expertise at all levels.
- Increase officer professionalism. Lieutenants will be learning many tasks that could not be learned in Armor Officer Basic Courses because there was not enough time to teach them. They too will acquire a heightened awareness of their responsiblity for the platoon and they will learn to become goal oriented.
- Increase individual performance during tank gunnery and ARTEPs.
- Produce a well trained unit whose members are more confident of their skills and their ability to defeat the enemy.
- Field a better Army.

CPT EDWARD R. MAHER was commissioned in Armor from St. Bonaventure University in 1972. He has served as a cavalry platoon leader, support platoon leader and troop executive officer in the 3rd ACR. He has served in Europe in the 4-73 Armor, 1st Inf Div (FWD) as a company commander, S-2 and S-4. He is currently attending AOAC at Fort Knox, Ky.

Living History

Lieutenant Colonel (Ret) R. R. Taylor, Jr.

Out of the past they came—foes of wars gone by. The "Easy Eight" was there; so was the "General Grant," the "Walker Bulldog," and the "Priest," "Centurion" and the *T-34,* the "Hetzer" and "Kettenkrad."

But this time, instead of squaring off for combat, they performed for photographers and TV cameramen. And, although the vehicles represented several countries and the crewmen wore authentic uniforms, interpreters were not needed. The crews were all American armor buffs who volunteer their time and skills to assist the Patton Museum in presenting a bit of living history several times each year, using equipment that has been restored by the museum's staff.

The "General Grant" was commanded by an Armor colonel, driven by a Department of Army civilian employee, and "gunned" by a retired Infantry lieutenant colonel. The Marines were there too, with a major as tank commander of an *M-103,* assisted by a master sergeant and a couple of "gunnies." Other vehicles of the museum's "task force" had crews with equally varied backgrounds—all devoted to armor and the history of mobile warfare.

On this particular day the vintage vehicles were being used to train the crews and provide film footage for a television show. At other times the tanks, self-propelled artillery, and wheeled equipment are used during a mock battle on the 4th of July each year and for static display on Armed Forces Day and at the Armor Conference.

The primary purpose of the museum's restoration program, however, is to preserve historical military equipment that some day may be irreplaceable.

Some of the World War II German vehicles that are once again operational were part of the captured materiel known as the "Patton Collection" which was shipped to Fort Knox by General George S. Patton during and shortly after World War II. This collection later provided the primary exhibits for the Patton Museum of Cavalry and Armor when it opened in 1949 in a World War II building.

For years, the vehicles of the Patton Collection were slowly deteriorating while on display in or near the museum or at other sites around Fort Knox. But no serious efforts were made to put any of them in operating condition until 1972 when Sergeant First Class Rolf D. Bahl, an instructor in the U.S. Army Armor School and a former NCO in the German Army, volunteered to recondition a World War II *Panther* tank.

Shortly afterward, the need to preserve the old vehicles was recognized by the Armor Center Staff and SFC Bahl was officially detailed to the museum staff as the first restoration mechanic. In addition to providing a fulltime mechanic, the staff also allocated funds for the project and was authorized the use of the general support maintenance facilities.

Once the *Panther* became operational, work began on a U.S. tank that had been provided to the French Army through the Lend-Lease Agreement and had, at one time, been used in Algiers. It was almost

in running condition when it was received by the museum and was quickly restored to "fighting trim."

Three U.S. armored fighting vehicles were the next to roll out of the restoration shop under their own power. They were an *M-4A3E8* tank, an *M-7* self-propelled 105-mm howitzer, and an *M-5* halftrack. The *M-4A3E8* tank was better known to World War II tankers as the "Easy Eight" and each one usually carried a name selected by the crew, as does the museum's—"Ole Henry."

Not all of the tracked and wheeled vehicles in the museum's operational fleet had to be rebuilt to get them rolling. Some were received in operating or near operating condition and were easily repaired by applying the equivalent of direct support maintenance services. A British *Centurion* tank was one of the first tanks received in this condition. Later a German World War II assault gun, the *Hetzer,* and a French *AMX-13* tank were acquired in operating condition and only require routine services.

On the other hand, some of the tanks that are now seen as part of living history would once have been considered in medical terms as "basket cases" or as "junkers" in the eyes of a used car dealer. Such was the condition of the U.S. *M-3* medium tank, "Kentucky."

Like many U.S. built tanks of World War II, "Kentucky" saw service with an allied army. The old *M-3* was used for years by the Brazilian armored force, but was eventually placed in storage. It remained there until the early seventies when a group of Brazilian officers visited Fort Knox and offered the tank as an addition to the Patton Museum collection. But not until 3 years after the offer was made did the hulk of what had once been a fighting tank reach Rio de Janeiro for shipment to the U.S.

"Kentucky" had been operational when placed in storage at a jungle site in the Brazilian interior, but the tropical climate soon took its toll. Track pads and other rubber components such as wiring deteriorated, communication equipment corroded, and optics clouded with fungus growth. As a result, the old war machine was hardly suitable for display when it arrived at Fort Knox.

But the scrap yard was not to claim another victim. In late 1975, an *M-31* tank retriever built on an *M-3* chassis was donated to the museum by the 3d Armored Division—and "Kentucky" had a new lease on life. Parts cannibalized from the *M-31* were used to rebuild the ex-Brazilian tank and it now takes its place in living history displays. It also displays identification code markings of F Company, 2d Battalion, 13th Armored Regiment of the 1st Armored Division which used hundreds of the *M-3* medium "Grants" like "Kentucky" in North Africa.

Unlike the other equipment of the museum's operational fleet which has been rehabilitated by the museum staff, "Kentucky" was rebuilt by the Boatright Maintenance Facility of the U.S. Army Armor Center.

Another tank that was rebuilt from the hull up is a Russian *T-34* that was captured from the North Korean Army in the fifties. When it was received by the museum, it was in bad mechanical shape but had a good hull and suspension system. For years the *T-34* was just one of the many foreign tanks on static display. In 1975 its status changed when another *T-34* that had been used for making training films was acquired in operational condition but with sections cut out of the hull. Again, cannibalization and the ingenuity of the museum's mechanics produced another authentic tank for the living history of mobile warfare.

Other operational foreign fighting vehicles, owned by the Patton Museum include a Russian *T-62* tank, a German *Leopard* tank, a German *Luchs* wheeled reconnaissance vehicle, a German Kettenkrad "halftrack motorcycle" and a German amphibious wheeled vehicle built by Volkswagen and named appropriately "Schwimmwagen." The *T-62,* which was acquired from the U.S. Army Opposing Forces (OPFOR) program, was in operating condition when it was received and its ancillary equipment indicates that it had once seen service with both the Israeli and Syrian armies.

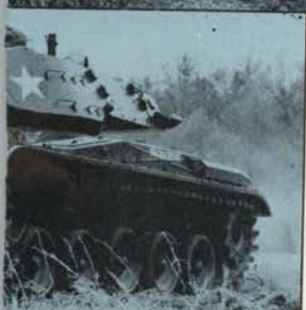
The *Leopard I* and the *Luchs* are gifts of the Federal Republic of Germany and were presented to the museum by the German Liaison officer to the U.S. Army Armor School.

Most of the operational military antiques are acquired from U.S. Army assets or donations by individuals or foreign governments. The Kettenkrad, however, is an exception. This unique vehicle, which was used as a prime mover for light antitank guns, was located through a West German military antique dealer and purchased with profits from the museum's gift shop.

Gift shop profits are also used to support the vehicle restoration and preservation program and living history display through such purchases as the operational radios in the *M-3* medium tank and some of the authentic uniforms worn by tank crewmen and infantrymen who fight the mock battles.

Operational U.S. equipment is now being acquired as it becomes obsolete and is preserved in that condition by a preventive maintenance program. These acquisitions include such vehicles as the *M-103* heavy tank that was last used by the U.S. Marine Corps and the Army's *M-551* armored reconnaissance airborne assault vehicle that is being phased out of use.

Other sources of historical military items include the personal donations mentioned earlier and institutional donations. Examples of personal donations are the Schimmwagen which was given to the museum by John Hislop of



Louisville, Ky. and the 1938 Dodge command and reconnaisance car which was presented by Joseph J. Schott of Bal Harbour, Fla.

A World War II Jeep in mint condition became a part of the Patton Museum collection when the Smithsonian Institute's military vehicle program was discontinued.

When vehicles are received by the museum, their condition is evaluated and a decision made as to whether they will be used for static display or made a part of the operational collection. If selected for the latter use, nonoperational vehicles are completely rebuilt. Tanks, for example, are disassembled down to the hull and each major component and part is restored, rebuilt or, in some instances, replaced—tasks that are much easier stated than done.

Although the museum library contains many technical manuals that provide adequate information for repairing and rebuilding obsolete U.S. and German equipment, such information for foreign equipment is sketchy, at best, or nonexistent. In such instances, Master Mechanic Ed Koester, who is directly responsible for the museum's vehicle restoration and preservation program, must rely on experience, imagination, and intuition—qualities with which he and his assistant, Steve Maxham, possess in abundance.

At any one time, these mechanical wizards may have as many as three tanks or combination of tanks and wheeled vehicles dismantled and under restoration. This multiple-vehicle approach is used because it is impractical to work on only one vehicle due to the length of time required for obtaining parts and conducting research for any one project.

For example, screens for carburetors, gaskets, and springs that would normally be available as replacement parts must often be fabricated. Even tools which were in common use and readily available when a particular tank was in service must sometimes be machined. Such was the case with a wrench needed for working on the main bearing of the engine of the Russian *T-34*. At other times, badly worn parts, for which there are no replacements, are built up and then machined down to the proper tolerances.

The same requirement for imagination and innovation exists in the maintenance program for the old U.S. tanks, trucks, jeeps, and halftracks. And, when manuals or schedules for periodic services are missing, Koester drives, listens and feels, and senses the maintenance needs of each vehicle. He is nearly always right.

All of which adds up to a program that restores and preserves military vehicles that represent those moments of combat that have punctuated man's eternal quest for peace.

Unchained Mobility

by Captain John R. Drebus

"The supply problem is the ball and chain of the tank commander."[1]—Guderian

Pity the poor maneuver battalion! The ball of support requirements is becoming heavier and the chain of the battalion supply route is becoming longer. Yet, current doctrine demands unfettered mobility. Do our battalions possess the ability to reinforce laterally, as required by the active defense? Or are they hindered by the dragging ball and chain?

Forward Support

Corps delivers support to division. Division delivers support to brigade. Then the philosophy of "supporting to supported" is abruptly abandoned. The battalion, while attempting to fight outnumbered and win, must travel back to the brigade support area to sustain itself. Until a recent doctrinal change establishing ammunition transfer points, the battalion was required to transport all its ammunition from the *corps* supply points, sometimes 60 kilometers behind the line of contact!

In addition, the brigade trains (in a wise attempt at passive protection) are retreating from the ever increasing range of Threat artillery. They are now located approximately 20 kilometers behind the line of contact.

Further complicating the issue is the fact that approximately 47 percent of a tank battalion's vehicles are wheeled. Consider the implications:

> "As a result of rain the conditions of the road had still further deteriorated and it was dotted with vehicles hopelessly stuck in the mud."[2] "The next few weeks were dominated by the mud. Wheeled vehicles could only advance with the help of tracked vehicles."[3]

These are General Heinz Guderian's observations during the German's 1941 Russian campaign, but they could just as accurately describe current field exercises in Europe using our "modern" equipment.

Service support will always be a requirement, but it need not be a restraint. A variation of a medieval weapon, the mace, also consisted of a ball and chain. However, unlike the shackles of a prisoner, the ball was smaller and the chain shorter, the resulting weapon being an extension of combat power. Properly configured combat service support can likewise contribute as a combat multiplier.

In order to restore battalion mobility and lend credibility to the doctrinal cliche "support forward," the following changes should be implemented:

- Lighten the ball.
- Shorten the chain.
- Strengthen the links.

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[1]Major General Heinz Guderian, "Armored Forces", *Infantry Journal*, Sep through Dec 1937, copyright 1937 by the Association of the United States Army.

[2]General Heinz Guderian, *Panzer Leader*, E.P. Dutton & Co., Inc., New York, 1952, p. 214.

[3]Ibid., p. 237.

Lighten the Ball

No word short of incredible is adequate for describing the paraphernalia which a modern combat unit hauls around the countryside: tents, heaters, camouflage nets, briefing charts, typewriters, desks, chairs, files, and enough personal equipment to outfit each soldier for every climate from desert to arctic. Most vehicles, both wheeled and tracked, resemble gypsy wagons rather than tactical conveyances.

Is a cumbersome maintenance tent better shelter than a barn or garage? Would medics really need a 2½-ton supply truck if empty ambulances carried critical medical items forward? Are 23 cooks and 5 trucks with water trailers really required to sustain a battalion that is supposedly destined to fight a relatively short and violent war? (Modern crew and individual rations are more than palatable and will certainly prevent malnutrition.) Would not water supplied in properly designed 5 gallon cans enhance crew delivery in a contaminated environment?

We must help lighten the load by removing the elements found at the battalion field trains (primarily clerks and cooks) and assign them to brigade. They are normally collocated there anyway. Keep the maneuver battalions lean and organized for combat, augmenting as required for peacetime. The current trend is just the reverse.

Shorten the Chain

The primary service support responsibility of the combat battalion should be to rearm, refuel, evacuate, and repair *only in the zone where it fights.* This is basically the area from the combat trains forward.

Placing the battalion's service support role in proper perspective will require higher echelons to expand their responsibilities and capabilities. Organizing the forward area support team into a forward support battalion, based perhaps upon the model proposed by LTC Mooradian in *Military Review,* June 1978, would increase support responsiveness. Creating a brigade service support company (figure 1) to perform what are now battalion functions (wheeled transport, evacuation, rations, and administration) would free the combat units to fight.

Strengthen the Links

Because the forward combat zone is normally subjected to all of the direct fires and the most intense of the indirect fires, it poses a unique support challenge. Modern weapons systems, whether conventional, chemical, or nuclear, have created a forward environment in which thin-skinned wheeled vehicles cannot long endure. The challenge should be met with unique equipment.

The Army is already examining a family of armored support vehicles based upon the developmental general support rocket system chassis. This, in turn, is derived from the infantry fighting vehicle chassis and provides comparable mobility and common components. The conceptual design of these vehicles and their predicted capabilities are shown on page 64. This equipment should be the means by which the battalion supports forward to the fighting elements.

Brigade should provide support forward to the battalion combat trains utilizing high mobility vehicles, to include the 8-ton GOER and whichever 10-ton truck the Army ultimately selects. Those direct support elements venturing forward for extended periods, such as maintenance contact teams, must be mounted in armored vehicles.

Conclusion

While the Navy has mastered the art of ship-to-ship resupply on the high seas and our Air Force routinely performs the delicate ballet of aerial refueling, the Army still spins its wheels in the mud. We must be better or share the fate of the master of blitzkrieg:

> "...we were informed of Hitler's instructions that 'fast moving units should seize the Oka bridges to the east of Serpuchov.' We could only advance as fast as our supply situation would allow. Traveling along the now completely disintegrated Orel-Tula road our vehicles could occasionally achieve a maximum speed of 12 miles per hour. There were no 'fast-moving units' any more. Hitler was living in a world of fantasy."[4]

Will our fast-moving battalions of the active defense also be a fantasy? Or will our "ball and chain" enhance combat power rather than hinder it?

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[4]Ibid., p. 244.

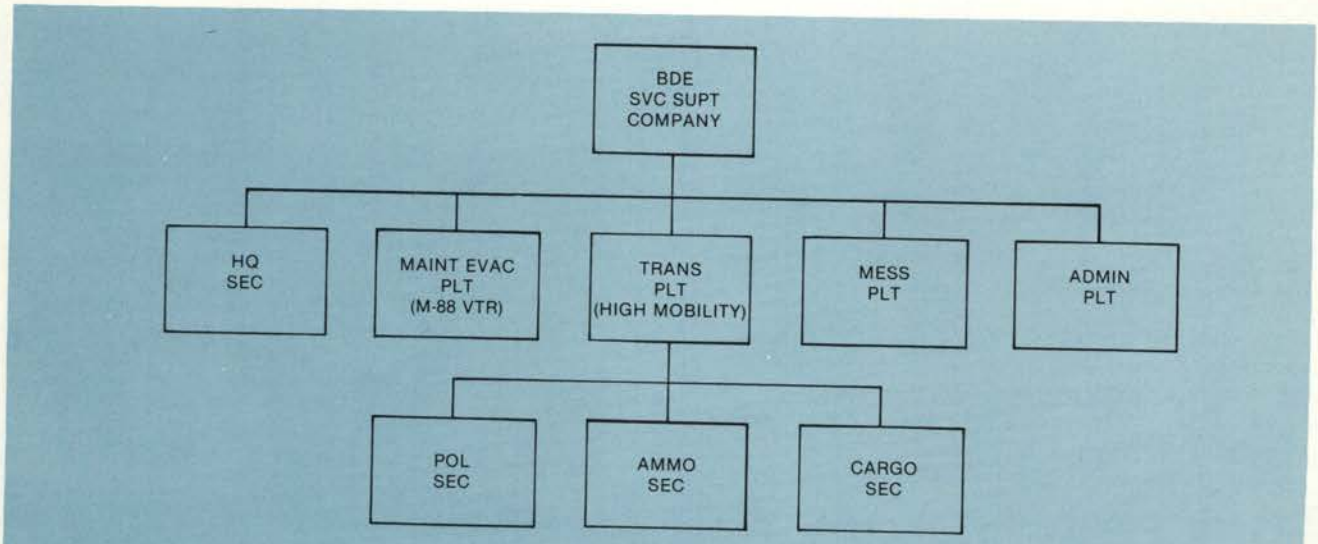
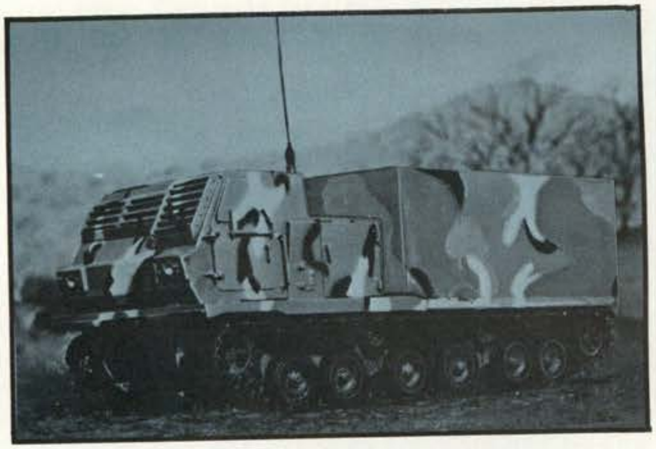
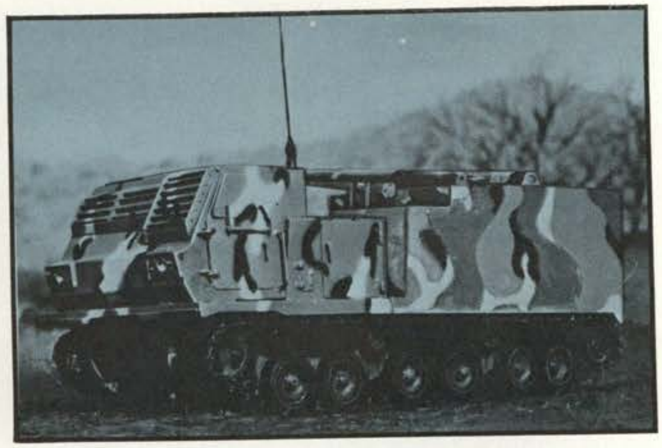


Figure 1.



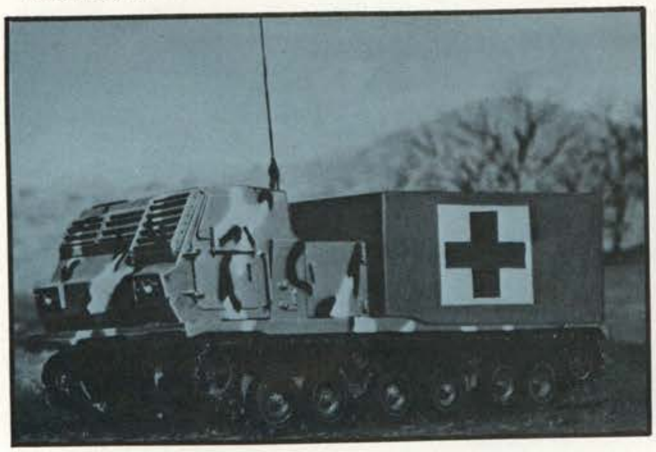
FORWARD AREA REARM VEHICLE

- Armor protection for crew and ammunition
- Improved mobility increases survivability
- 20,000-lb., 9072-kg payload maximizes ammunition resupply per mission



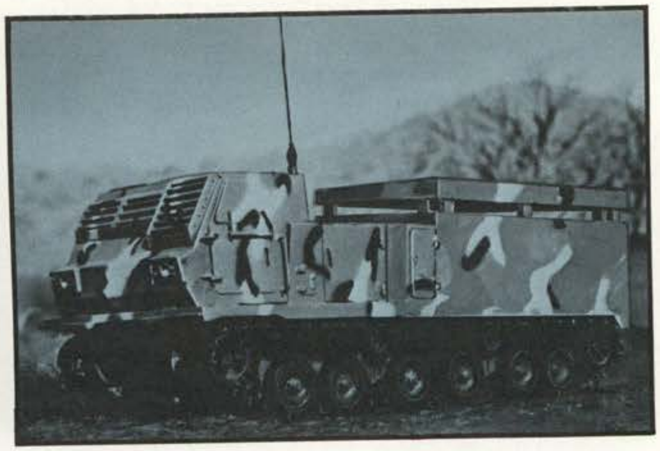
MAINTENANCE ASSIST VEHICLE

- 10,000-lb., 4536-kg lift capability
- MIG and TIG welding
- Small field repairs reduce organization support



MEDICAL EVACUATION VEHICLE

- GSRS suspension provides ride quality needed for patient comfort in rough terrain
- Greater litter capacity
- Provide application of life saving techniques during evacuation



FUEL RESUPPLY VEHICLE

- Can deliver 2400 gal, 9054 l, of fuel in one mission—enough to resupply a minimum of 6 *M-60A1* tanks or 5 *XM-1* tanks
- Armored man-rated cab provides greater protection for crew

CPT JOHN R. DREBUS was commissioned in Armor after graduation from Indiana University in 1973. He has served as a tank platoon leader, support platoon leader, and battalion S-1 while assigned to the 1st Battalion, 68th Armor. A graduate of the Armor Officer Advanced Course, CPT Drebus is currently assigned to the Office of Armor Force Management, Fort Knox, Ky.

NOTES

LEOPARD 2 IN PRODUCTION

After extensive tests of the prototype *Leopard* 2, series production has begun on 1,800 main battle tanks for the Bundeswehr. Delivery of the first production vehicle is scheduled for October 1979, with all tanks to be delivered by 1986.

The government of the Netherlands is also negotiating with the manufacturer for the *Leopard 2* for the Dutch Armed Forces.

A *Leopard 1* (left) and a series configuration *Leopard 2* (right) illustrate the differences between the two MBTs.

MINE DETECTOR

The US Army Mobility Equipment Research and Development Command (MERADCOM) has awarded a contract for engineering development of the Vehicle Mounted Road Mine Detector System (VMRMDS).

VMRMDS represents a major technological breakthrough because it is the only system that can reliably detect both metallic and plastic mines with a very low false alarm rate. Using sophisticated microwave and microprocessor techniques, the system locates buried mines through a special search head that can be mounted on any standard Army vehicle. When the system detects a buried mine, an alarm is sounded and a visual display pinpoints its exact location. The VMRMDS can clear a path up to 11-feet wide at 8 miles per hour over unpaved roads or flat, sparsely vegetated terrain.

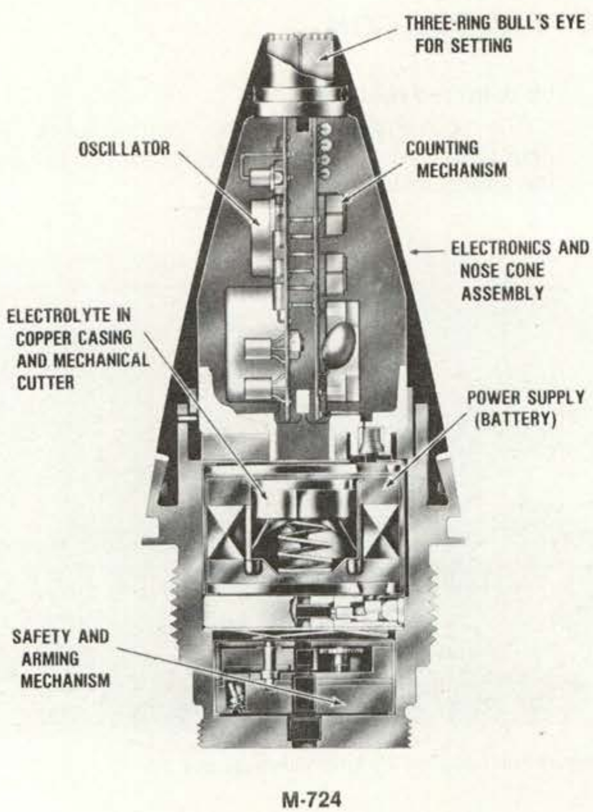
Eight units will be produced for testing under the initial contract, with the first system set to arrive in January 1980.

ELECTRONIC TIME FUZE

The first all-electronic time fuze system to be accepted into the Army inventory will eliminate the fuze-setting wrench. The *M-587,* for HE rounds, and the *M-724,* for submunitions and canister rounds, are set by placing the *M-36* electronic fuze setter on the nose of the fuze for a few seconds.

The fuzes use a precise electronic oscillater and a counting mechanism to replace the mechanical clockworks found in older systems.

The system, which has been under development for 8 years, is expected to be fielded by the early 1980's.



M-724

89th Meeting

The U.S. Armor Association in conjunction with the Armor Conference, conducted its 89th meeting since its formation in 1885. Business this year included the election of the Association's officers and executive council for 1979-1980.

OFFICERS

President	GEN Michael S. Davison, USA, Ret
1st Vice Pres.	LTG Donald H. Cowles, USA, Ret
2d Vice Pres.	LTG Julius W. Becton, Jr. (USAREUR)
3d Vice Pres.	MG Thomas P. Lynch (Ft. Knox)

EXECUTIVE COUNCIL

Gen. Officer	BG John P. Prillaman (Ft. Knox)
1Fld. Grade	COL John C. Bahnsen, Jr. (Ft. Rucker)
2Fld. Grade	COL James G. Hattersley (USAREUR)
3Fld. Grade	COL James Z. Dozier (2d AD, Ft. Hood)
4Fld. Grade	LTC Robert B. Franklin (Ltg Bde, Ft. Knox)
5Fld. Grade	LTC Peter E. Genovese (50th AD, NJARNG)
6Fld. Grade	LTC Michael A. Molino (Ch. Armor Br)
7Fld. Grade	MAJ James E. Lawson (USMA)
1 Co. Grade	CPT Gary A. Murphy (6th ACCB, Ft. Hood)
2 Co. Grade	CPT Phillip A. Howard (1st Cav Div, Ft. Hood)
3 Co. Grade	CPT Ronald L. Rold (194th Bde, Ft. Knox)
4 Co. Grade	CPT Stephen C. Main (3d ACR, Ft. Bliss)
1 Sr. NCO	CSM William R. Price (Ft. Knox)
2 Sr. NCO	SGM Sherrod W. Gibson (107th ACR, Ohio ARNG)
Member-at-large	LTC Clarence W. Pratt, USA, Ret

TITLE CHANGE

The title of Secretary-Treasurer of the U.S. Armor Association will change to Executive-Director effective 1 July 1979. The first to serve with the new title will be LTC Frederick W. Shirley, who was elected by the Executive Council.

DRAWING WINNERS

Armor Association members who were winners at the drawing held as part of the Armor Conference banquet were:

1st Prize (Hawkins Rifle)	COL William F. Coad (Ft. Knox)
2nd Prize (44 Cal. 1885 Revolver)	LTC Jack L. Turecek (Ft. Campbell)

In tne absence of additional prizes, each Association member received a handsome key chain, money clip, or tie pin with the Association crest in pewter.

ARMORED UNIT ASSOCIATION REUNIONS

2d ACR	Orlando, Fla.	Oct. 5-7, 1979
1st AD	Denver, Colo.	Aug. 16-19, 1979
3d AD	San Antonio, Tex.	Aug. 22-25, 1979
6th AD	Raleigh, N.C.	July 25-28, 1979
7th AD	Kansas City, Mo.	Aug. 15-19, 1979
10th AD	Louisville, Ky.	Aug. 31-Sep.3, 1979
11th AD	Cherry Hill, N.J.	Aug. 16-19, 1979
12th AD	Louisville, Ky.	July 19-22, 1979
14th AD	Anaheim, Calif.	July 25-29, 1979
16th AD	Louisville, Ky.	Aug. 9-12, 1979

OPMD - EPMD ARMOR

Professional Development Planning for the Company Grade Officer

These are the personal views of the Chief of Armor Branch and the company grade officer management and assignment team of the Combat Arms Division, MILPERCEN.

The Officer Personnel Management System (OPMS), implemented as Department of the Army personnel management policy for the 1970's and beyond, is proving to be a viable, dynamic management philosophy in meeting the Army's needs for a highly-qualified, professionally-motivated Officer Corps.

CAREER PATTERN DEVELOPMENT

No two officers have identical career patterns, nor should a senior officer counsel a junior officer to "Do what I did—it got me there." At the very least, timing will always vary in assignments, schooling, or length of duty in a specific job. A major OPMS innovation in the career development of officers is the dual specialty development of officers which recognizes the heavy company grade requirements in traditional branch duties and the transition to specialized needs in the senior grades. This management concept is designed to concentrate professional development and utilization through training, education, and assignment in two specialty areas commonly referred to as primary and alternate specialties. The interaction of primary and alternate specialty development is the most influencing factor on an officer's career pattern.

Primary Specialty Development

The primary specialty qualification period is intended to hone an officer's leadership skills and develop his proficiency in the tactical and technical skills associated with this specialty. For the Armor company grade officer, three events-goals must be attained to be primary specialty qualified.

- A tour of duty in an armor unit.
- Command a company-size unit for a minimum of 12 months.
- Completion of the Armor Officer Basic Course and an Officer Advanced Course.

No definite order for achieving these goals is established, except, of course, that the basic course is attended immediately after reporting for active duty and an officer is not eligible for an advanced course until his third year of service.

Alternate Specialty Development

One of the most important career management events armor captains will experience is the selection and designation of their alternate specialty.

If not designated previously, an officer will be designated for an alternate specialty by the completion of his eighth year of Active Federal Commissioned Service (AFCS).

DA Pamphlet 600-3 describes the dual specialty aspects of OPMS as well as generally describing the duties associated with each specialty. It is the best reference for officers contemplating their alternate specialty desires.

In addition to Army requirements, designations made by the Company Grade Career Managers are based on consideration of the officer's desires, training, experience, manner of performance, and demonstrated potential.

ALTERNATE SPECIALTY TRAINING

As stated previously, dual specialty development is fundamental to OPMS, and Army training and education programs should support this concept. For some specialties, existing courses provide adequate alternate specialty training. However, for other specialties, particularly in the logistics areas, alternate specialty training opportunities are limited. Efforts are underway to accurately identify the position requirements and develop appropriate courses of training.

Schooling

Army training and education is designed to develop the professional attributes and capabilities of officers to meet the Army's needs through planned assignments and schooling. The goal is to ensure that officers are trained to perform effectively in time of war. The officer training and education program is not limited to formal military schools, but also includes attendance at civilian schools and, in some cases, periods of training with industry. Additionally, significant training and education occurs daily in units as officers apply new concepts and techniques to solve problems. Experience gained in this manner is equally as valuable as lessons learned through formal training and education programs.

Civilian Schooling

The Army's civilian schooling program is conducted in conjunction with Army civilian education objectives contained in AR 621-1.

All commissioned officers should hold a baccalaureate degree and are encouraged to obtain an advanced degree supportive of their specialties through participation in off-duty education programs.

Selected officers will be educated by the Army to satisfy requirements validated by the Army Educational Requirements Board (AERB). This Department of the Army board validates all Army requirements for officer positions which require advanced civilian schooling credentials. These officers pursue full time studies toward baccalaureate, masters, or doctoral degrees under programs either fully or partially funded by the Army.

Under fully funded programs, the Army pays all tuition costs and reimburses the officer up to $100 per fiscal year for textbooks and supplies. In addition, the Army provides the officer with full pay and allowances, and moves the officer and his family to the college or university where he will study.

An officer participating in a partially funded program receives full pay and allowances. In addition, the Army will move the officer and his family to the college where he will study, unless he is in a permissive temporary duty (TDY) status. The officer is responsible for paying for all tuition costs, fees, and books. Many officers use the financial benefits provided by the Veteran's Administration (GI Bill) to help defray the cost of tuition and fees.

Officers who came on active duty on or after 1 January 1977, are entitled to participate in a contributory program for educational benefits, The Veterans Educational Assistance Program (VEAP). For additional information on VEAP, see DA Circular 621-14 or contact your education officer.

Fully funded programs include:

Advanced Degree Schooling. This is schooling provided to meet specific DA requirements established annually by the AERB. Disciplines of study should support OPMS specialties and be in AERB shortage disciplines. Officers must agree to serve in an AERB utilization position for 3 years immediately following graduation.

Top Five Percent USMA and ROTC Graduate Schooling Program. This program offers up to 18 months of advanced civil schooling to the top five percent of all USMA and ROTC DMG RA officers. Selected officers will attend graduate school during their fourth through tenth years of commissioned service provided their duty performance and demonstrated potential are at least equal to that of other officers considered for graduate school. Disciplines of study must be in an AERB shortage discipline.

Short Course Training. This program provides training of less than 20-weeks duration in subjects for which the Army has no in-house training capability. Examples include the Advanced Management Program, academic enrichment courses for USMA faculty, and education required for performance in current assignments.

Training with Industry (TWI). This program provides training in industrial procedures and practices that is not available through military service schools or the civilian college system. TWI provides officers with vital knowledge, experience and perspective in management and operational techniques to fill positions of significant responsibility in commands and activities that normally interface with civilian industry. Academic degrees are not awarded as part of this program. Officers serve a 3-year utilization tour immediately after completing training.

"... Key to selection for a funded program is the officer's overall manner of performance in his primary specialty and his expected potential for future service. . . ."

Selection for other than short course training is based upon a comparative evaluation of academic and military records. To be selected for entry into an Army funded Advance Civil Schooling program, an Armor officer must first be primary specialty qualified and otherwise available for assignment to the appropriate educational institution for the required length of study. Key to selection for a funded program is the officer's overall manner of performance in his primary specialty and his expected potential for future service, both in his primary and alternate specialties. His absence from a primary specialty position must be balanced by a valid Army requirement of the future. Army advanced schooling programs require that a 36-month utilization tour in the appropriate alternate specialty be accomplished immediately following completion of advanced schooling. Thus, an officer participating in ACS should block out a 3-year period, following ACS, in his career planning as being not available for a primary specialty assignment.

". . .officers pursuing an advanced degree must agree to study in a discipline for which the Army has AERB validated positions and a shortage of training assets. . . ."

Partially funded programs include:

Degree Completion Program (DCP). The Army authorizes officers up to 18 months to complete undergraduate or graduate degree requirements. Commissioned officers pursuing an advanced degree must agree to study in a discipline for which the Army has AERB validated positions and a shortage of training assets. Further, schooled officers must agree to serve in an AERB utilization position for the 3 years following graduation.

Advanced Degree Program for ROTC Instructor Duty (ADPRID). This program is designed to upgrade the academic qualifications and provide greater assignment stability for officers assigned to ROTC instructor duty. Officers already possessing a masters degree are assigned directly to a 3-year ROTC assignment. Applicants not possessing an advanced degree are sent to school, normally the institution of ultimate assignment, for 15 months to complete degree requirements at the masters level. Schooling will be followed by a 3-year ROTC assignment. The study program must be in an AERB validated shortage discipline and align with one of the officer's two OPMS specialties. Selection criteria are the same for fully funded programs.

Cooperative Degree Program. Students attending the Command and General Staff College (C&GSC), Senior Service College (SSC) and several service schools are offered the opportunity to enroll in various courses conducted by cooperating colleges and universities. Attendance at some of these courses is concurrent with the normal military schooling. Subsequent to graduation from the military school or college, officers are authorized up to 6 months to complete degree requirements as a full-time resident student. Those attending SSC pursue studies during summer school preceding and subsequent to the military course. Officers are required to pay all educational costs. Study at C&GSG and SSC must be in a discipline which supports the officer's primary or alternate specialty. Immediate utilization is normally required for all officers participating in the program other than the programs at the SSC and C&GSC.

Military Schooling

All Armor officers in a career status (Regular Army or

USAR Voluntary Indefinite) will be scheduled for an Officer Advance Course normaly after 3½ years of service and prior to completing 8 years of active service. Exactly when is determined by:

- Availability, as determined by appropriate length of tour completion.
- Other competing Army requirements.
- The officer's professional development needs.

Chart 1 places the military and civil schooling eligibility periods in perspective with projected promotion points to the company grades and to major. To insure continuity of professional development, entry into civil schooling after approximately 9½ years of duty is coordinated with Major's Division, Officer Personnel Management Directorate, MILPERCEN.

NORMAL ASSIGNMENT PATTERN

What is the normal assignment pattern for Armor officers? Like each officer's career pattern, assignment patterns will vary with the length of tours. It is universally accepted that Army requirements for officers have primacy and must be responded to efficiently and purposively. Within the framework of responsiveness to worldwide requirements, Army tour length objectives have been developed to conserve permanent change of station management funds while also satisfying the objectives of reduced personnel turbulence and professional development. These additional objectives are the key. It is hoped that the personal hardships endured by the officer corps and their families will be minimized while simultaneously meeting Army requirements and retaining sufficient flexibility to professionally develop the officer corps through follow-on assignments of increasing scope and responsibility. Officer tour length and stability policy were discussed in the January-February, 1979 issue of *ARMOR*.

Chart 2 depicts several typical assignment patterns for Specialty 12 (Armor) officers. The Officer Advance Course (OAC) is shown at various entry points of eligibility as appropriate.

CONUS tour lengths of less than 36 months are a result of a reallocation of officers to meet Army assignment priorities, which you remember *always* have *primacy*. The Army's assignment priorities are reviewed semiannually by the Vice Chief of Staff and serve as the basis for allocating officers worldwide. The current priorities are:

- 1—USMA, Army Readiness Region, US Army Recruiting Command, and ROTC duty.
- 2—Joint and special activities.
- 3—The remainder of the Army according to the DA Master Priority List.

Within priority 3, the forces deployed overseas have the highest priority. Assignment pattern and stability are thus driven by overseas, priority 1, and priority 2 requirements.

BALANCING COMPETING DEMANDS ON AN OFFICER'S CAREER

The personnel manager in Armor branch balances the competing demands on an officer's career by considering the:

- Needs of the Army.
- Officer's qualifications.
- Officer's professional development needs.
- Officer's assignment preferences.

Not every officer will receive an initial assignment to a primary specialty position in an Armor unit, nor will an officer who achieves primary specialty development early in the company grade years be automatically considered or selected for a priority 1 assignment in a subsequent tour. In a few instances, Army requirements may well dictate that the most available, best qualified officer be assigned to a duty that neither supports his personal preferences nor his professional development needs. In such cases, the MILPERCEN career manager makes every effort to ensure that subsequent assignments consider these two factors.

Each officer should have confidence in the knowledge that no assignment is made in a "vacuum" by any single career manager. Each assignment is made after careful consideration by the assignment officer and the Branch Chief at a minimum.

Chart 1. Promotion and Education Eligibility

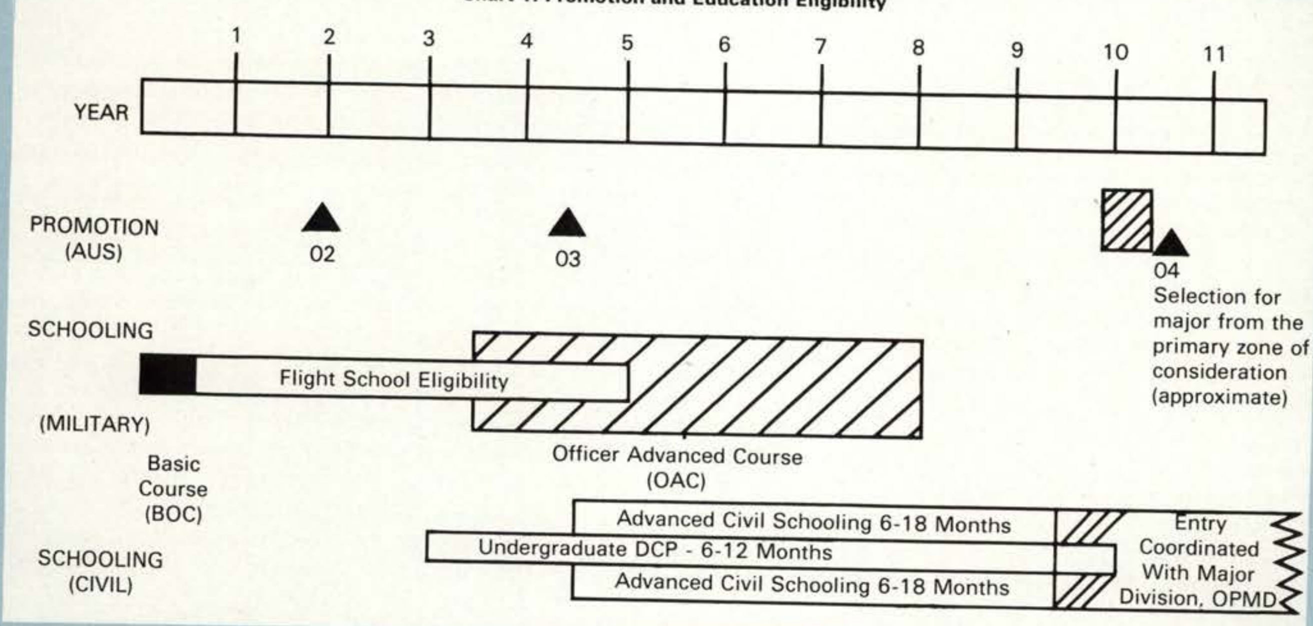
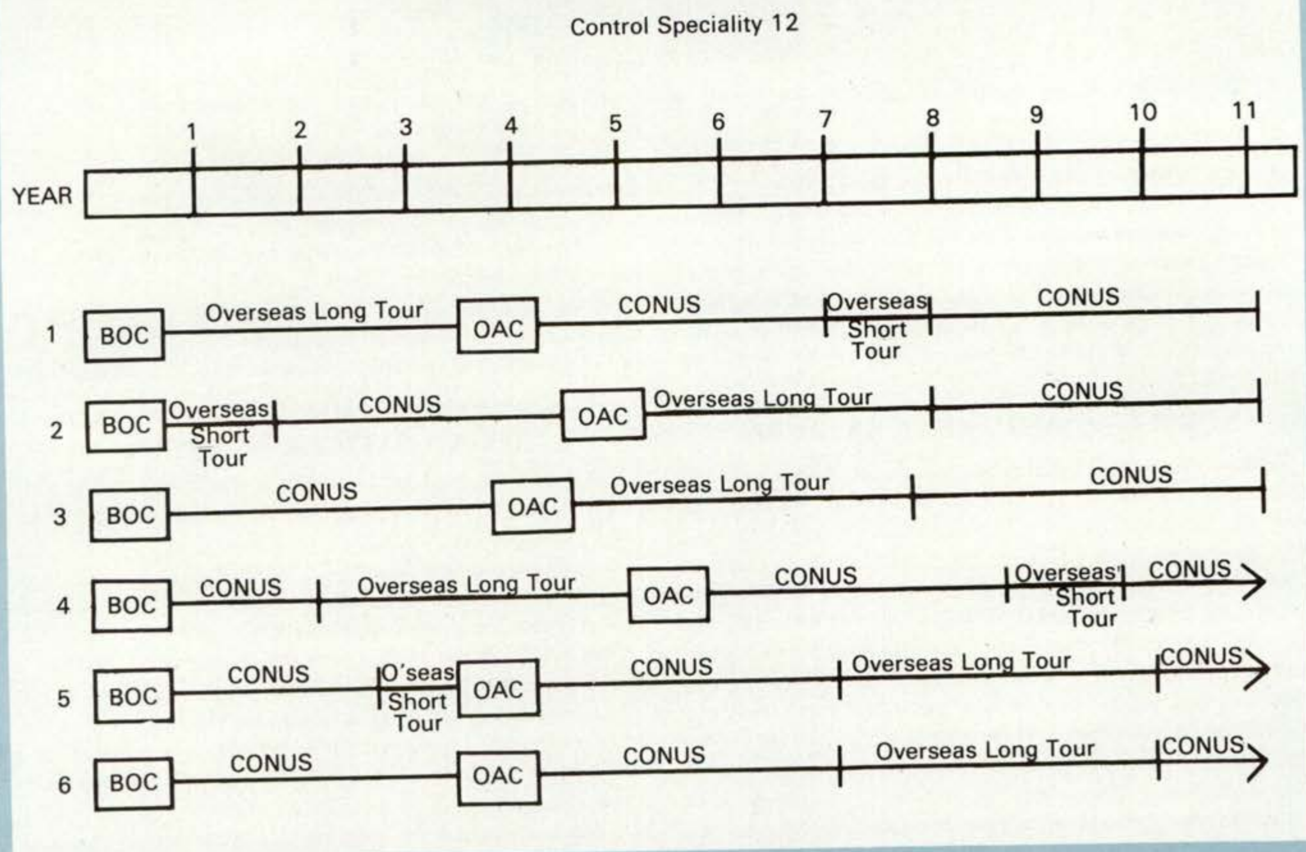


Chart 2. Assignment Patterns for Company Grade Officers



Frequently an assignment is made only after an informal boarding action, during which professional development officers and the Combat Arms Division Chief considers the best interests of the officer as well as the needs of the Army.

As a matter of policy in Armor Branch, the rationale behind the assignment is discussed with each officer, either through personal interview, correspondence, or a telephone conversation when possible. While the information or counsel the assignment officer provides may not always be what the officer wants or expected to hear, it is always candid. The MILPERCEN career manager acts as the officer's advocate as well as the Army's assignment officer.

The Officer Professional Development Plan

DA Pamphlet 600-3 (Chapter 4) discusses professional development planning and outlines the responsibility and interaction of the professional development triad—the officer, his rater, and the MILPERCEN career manager—in developing a career plan for the individual officer.

Individual Participation. To foster professional development and growth, officers must stay abreast of the current state-of-the-art in their designated specialties and develop and maintain a thorough understanding of Army goals. The individual officer is responsible for performing each assigned task or duty to the best of his ability. The officer corps will only be as strong as each individual officer's endeavor to "make it" through self-development. Additionally, the officer is responsible for:

- Informing his rater and the assignment officer of his aspirations.
- Asking for assignments within his specialties that require greater responsibility commensurate with his leadership or management ability and technical skills.
- Auditing his Officer Record Brief (ORB) and reporting any error at least annually or more often if required.
- Developing his Officer Professional Development Plan (DA Form 4190-R) and providing it to his career manager at Armor Branch.

Rater's Role. Raters are an integral link in the professional development process. They are responsible for:

- Advising their officers of the impact that education and assignments have on their professional development goals.
- Assigning their officers realistic problems and missions and critiquing their manner of performance.
- Preparing the Officer Evaluation Report (OER) and periodic counseling and guidance during the rating period is mandatory.

MILPERCEN Career Manager's Participation Specialty managers (Armor Branch assignment officers) and professional development officers at the Combat Arms Division, Officer Personnel Management Dictorate, MILPERCEN, provide valuable and realistic counseling and guidance on their professional development planning. Officers can inquire and receive a subjective evaluation of their overall manner of performance. Additionally, officers can obtain needed guidance on the best course of action to take to better qualify themselves for their projected assignments. All officers should feel free to communicate with their specialty managers. The Armor officer personnel Manager's Directory was published in the November-December 1978 issue of *ARMOR*.

BOOKS

GLITTERING MISERY, by Patricia Y. Stallard, Presidio Press/The Old Army Press, 159 pages, $10.95.

Glittering Misery gives us a look at a neglected part of American Frontier history—the dependents of the Indian-fighting Army.

This fascinating book presents pictures and anecdotes of life on the hostile plains during the period, 1865-1898. It gives us insight into the problems that Army wives had to cope with while trying to make a home on the frontier.

The hardships of living with possible Indian attacks and death, dealing with a variety of insects and reptiles, and exposure to the elements were all problems that had to be dealt with.

Housing ranged from dugouts to tents to lovely frame homes, depending on the post. Quarters were arranged by rank and seniority, and those of senior rank were entitled to the quarters occupied by their juniors. Occupants had to move immediately if their home was chosen.

Inferior medical care and lack of formal education were also harsh realities. But with all this, as one wife mentioned while sitting in beautiful surroundings and luxury in Presidio, she missed the closeness, friendship, and camaraderie of life on the plains.

The Army wife of today can identify with this book and be proud of the heritage that has been given to her by her sisters of long ago.

MRS. MARION S. STREETER
Army Wife
Fort Hood, Tex.

THE TRAIL OF THE FOX by David Irving. E.P. Dutton. 1977. 496 pages. $15.00.

This is a fast-moving biography of Erwin Rommel, the legendary and controversial World War II field marshall and favorite general of Hitler.

The reader initially sees Rommel as a frail cadet, in the military at the urging of his father, and as a young lover. Then he advances to the battlefields of World War I as an infantry officer decorated with the *Pour le Merite,* Prussia's highest honor. Between wars Rommel rises to colonel, but without general staff experience prospects are dim for his future.

However, his outstanding success in the easy conquest of France in 1940 moves him to the forefront of the German field commanders. He then captures the world spotlight with his tactical genius displayed during his desert conquests of 1941 and 1942. Now Rommel has the image of a military hero, a man of the people, not the Prussian aristocrat.

But Rommel's African victories became secondary as Germany became entangled in the Russian campaign. A new Rommel emerged. His readiness to disobey orders and to gamble on the battlefield raised the ire of the general staff traditionalists, but Hitler was indulgent of him. However, his constant disregard for supply problems as he plunged headlong into Egypt led to his overwhelming defeat at El Alamein. Rommel now sank into heavy depression and is brought home for a "forced cure."

As Allied power improved from 1943, Rommel's strength, the blitz, was stifled. Rommel was becoming obsolete. He was then relegated to the defensive in France, but he performed ineffectually and was personally unsatisfied. By the fall of 1944 he was dead, a suicide at the command of Hitler because of the suspicion surrounding him and the attempted assassination of Hitler on July 20. Rommel had been offered a quiet exit.

David Irving bases the novel heavily on the much touted lost Rommel diaries, but in the text he fails to use footnotes to allow the reader to identify sources. Irving relates an interesting story that moves rapidly from one high point to another but does not delve into the many controversial issues raised. He especially fails to fully substantiate his effort to absolve Hilter in ordering Rommel's death. Just the same, it is an interesting look at a man whose battlefield reputation may have made him larger than life, a reputation that eventually destroyed him.

Rober H. Nagle
Salem, Mass.

THE EISENHOWERS: RELUCTANT DYNASTY. Steve Neal. New York. Doubleday, 1978. 493 pp. Bib. Ind. $10.95.

Mr. Neal attempts to trace the Eisenhower family history from their arrival in Pennsylvania through the present generation. This approach to the study of a family is of considerable interest, but the book fails to deliver on its promise. As is so often the case in any prominent family, the majority of the family members are almost totally overshadowed by the achievements of one or two family members; such is the case of the Eisenhower family, with its two illustrious members, Dwight and Milton.

This book treats both Dwight and Milton well, being neither critical nor admiring, but fails in one of the purposes of biography, namely to provide background for the actions of its subject or the long-range effects of their actions. Because of the amount of material available on these two men, any biographer runs the risk of being snowed under by the mass of material, and that appears to be the case with this book. Often the coverage of material is superficial, a major problem in attempting to depict the lives of two outstanding men, to say nothing of their entire family, in a book of less than 500 pages. All of World War II for Dwight is covered in a mere 70 pages of text. Although this can be explained by the current availability of Ambrose's superb *Supreme Commander*, which exhaustively covers Dwight D. Eisenhower's war years, this total lack of in-depth coverage of a period in which the future president was molded is unforgivable. The same comments also apply to Milton's wartime services, which included short-term leadership of the resettlement program for Japanese-Americans on the Pacific Coast. The largest amount of material on Dwight D. Eisenhower concentrates, with some justification, on his political career, while the material on Milton concentrates on his governmental and scholastic record, and his later role as presidential representative. Because so much material is collected into so small a volume, vital details and backgrounds become blurred or nonexistant. The author would have been better advised to select one facet of the life of one of the Eisenhower brothers, and done a complete study, rather than produce a rather nebulous history of a family.

Perhaps the most disconcerting problem with the whole book is the lack of citation of source for information or for what appear as direct quotes from various sources. In any book which attempts to record history, such an absence is both inexplicable and unforgivable. If one reads a book for information and personal edification, the reader has the right to know the source of the information presented completely and accurately.

I cannot recommend this book for the interested military reader, for military history is almost absent in this volume which should provide coverage of the military, as well as the political, Eisenhower. The book does provide a relatively short and innocuous coverage of two of the more important Americans of modern time, but which, for lack of depth and lack of source citation, must be read with care.

Robert C. Smith
Pennsauken, NJ

JOURNAL OF POLITICAL AND MILITARY SOCIOLOGY, published semiannually, $7.50 a year, c/o Department of Sociology, Northern Illinois University, Dekalb, Illinois 60115.

ARMED FORCES AND SOCIETY, published four times a year, $12.00 a year, c/o Social Sciences Building, University of Chicago, Chicago, Illinois 60637.

Two periodicals debuted in recent years which, if their names are at all indicative, augur interest for members of the military community: the *Journal of Political and Military Sociology (JPMS)* which first appeared in the spring of 1973, and *Armed Forces and Society (AFS)* which appeared in the Fall of 1974. The foreword to the first issue of *JPMS* describes it as "....international and interdisciplinary in scope. It is also for the academic and nonacademic leaders and professional specialists."

Armed Forces and Society was created by sponsors who: "....believe there is a need for a scholarly medium which focuses on an interdisciplinary and an international approach to the topics of armed forces and society, war, revolution, arms control, and peacekeeping. The journal will seek to reflect the emerging focus on military institutions as objects of research and in their relation with other socio-political phenomena."

The *JPMS* and *AFS* are both most welcomed additions to an area that has seen far too few serious students. Each of these volumes has presented articles that are consistently diversified, topical, and interesting. From *JPMS,* we have been able to read about ROTC, revolution, the military industrial complex, the McNamara Years, an Arab Military Coup, AWOL's, military officers and arms control, military intervention in Africa, and scores of others. From *AFS* have come articles on Clausewitz, civil-military origins of the Cuban revolution, UN peacekeepers, the impact of basic combat training, a study of the drill sergeant, and many more. Both journals provide a varied fare of book reviews bearing on the military.

A warning to the casual reader is in order. These journals were created to serve as conduits of serious academic intercourse and as such will not appeal to everyone. But, for the serious student of the profession of arms and its foibles, these periodicals represent valuable new sources.

Major Terry A Girdon
Princeton University

GRAND STRATEGY FOR THE 1980'S. BRUCE K. HOLLOWAY, THEODORE R. MILTON, BRUCE PALMER, JR., MAXWELL D. TAYLOR, ELMO R. ZUMWALT, JR. Edited by Bruce Palmer, Jr.; American Enterprise Institute Studies in Defense Policy. 113 pages. 1978. $3.25

EVOLUTION OF THE AMERICAN MILITARY ESTABLISHMENT SINCE WORLD WAR II. Edited by Paul R. Schratz, George C. Marshall Research Foundation. 125 pages. 1978.

Both of these books have much in common. They are the product of the key actors on the national defense stage for the last 30 years. These dedicated professionals continue to have a grave concern for the country and its continued defense. They are both of immediate interest to serving professionals.

General Goodpaster, in his role as Chairman of the George C. Marshall Research Foundation Conference on the Evolution of the National Military Establishment since World War II, brought together views on the services and elements of defense departments to discuss the inner workings of the defense establishment since its unification. The review of where we have been gives a better understanding of where we are today. The review clearly highlights the issues which have plagued the defense establishment since unification. Then, as now, the bottom line is how to cut the resource pie to the satisfaction of all.

General Palmer and his distinguished contributors have endeavored to chart where the United States should be heading militarily in the 1980's. The experience and qualifications of the contributors is well known by all readers. The result of their efforts is a timely thought provoking product which anyone interested in the country's future must read.

Colonel Corwin A. Mitchell
Command & Staff Department, USAARMS

THE BATTLE OF NORMANDY: THE FALAISE GAP, by James Lucas and James Barker. New York, N.Y. Africana Publishing Company, 1978. $14.95.

"Whether the enemy can be stopped at this point is questionable. Enemy air superiority is overwhelming and smothers our movement. . . . there is nothing immediately available. There are no mobile reserves . . . Our own air force offers little support. Under such circumstances we must expect that within the near future, the enemy will break through our thinly held front . . ."

Such was von Kluge's report to Hitler on the German situation in Normandy, 31 July 1944.

Written by two English historians, *The Battle of Normandy: The Falaise Gap,* is a compelling, fast-moving, and often depressing account of the fierce, desperate, but futile attempts of the German soldier to stem the tide of Allied advance in Normandy in August, 1944. Drawing heavily on German source material, the authors lead the reader through each phase of the action. The daily situation reports from the German command tell a horrifying story, a narrative not unlike that which might occur should the Warsaw Pact attack Western Europe.

". . . losses in men and equipment are extraordinary.

"The battle . . . was a completely new and shattering experience . . .

". . . all day long flew the Allied aircraft. We had no experience of fighter-bomber attacks on this scale.

". . . the whole front was alive . . . obliterated under a storm of shellfire.

". . . infantry supported by an armored wedge of 60 tanks advanced behind a thundering barrage, covered by an air umbrella."

Although Lucas and Barker write of a battle fought nearly 35 years ago, all the ingredients of a contemporary war in Western Europe are vividly described. German reaction to the prodigal expenditure of shells, tanks, and aircraft the Allies utilized in 1944 to accomplish their missions was one of sheer astonishment and disbelief. The realization that one was facing a seemingly irresistible power soon overcame the German soldier. Tactics of fire and maneuver, based on superior training and leadership, and proven time and again, were useless against the enormous Allied superiority. German letters, war diaries, and personal accounts provide the reader with a penetrating chronicle of what it's like to fight outnumbered and lose, a reality presently foreign to Americans.

To an army accustomed to enjoying

must "luxuries" in combat, *The Battle of Normandy* offers a valuable lesson to the American soldier. Problems of command and control, logistical resupply, and physical endurance under continuous combat conditions (controversial subjects which seem to bow before more pressing issues) are constantly surfacing as the German Army in the West fights for survival.

"... the battle line had been cracked wide open.

"... units were fighting without central direction from divisional or corps headquarters.

"Every kind of splinter group or fragment of a military formation which could be scraped together was assembled to hold the front.

"I had never known such tiredness. It causes halucinations and a complete sense of non-being.

"The workshop companies repaired the damaged *Tigers* within firing distance of the battlefield ...

"Logistical resupply was a nightmare. Difficulties with the lorries bringing forward spares and petrol ... constantly changing battle positions meant that many lorries could not find their parent units ..."

Fighting outnumbered and winning was a common trait of the German soldier since the beginning of the war, and a concept which is today repeatedly engrained in the mind of the American soldier. But against the massive Allied superiority in Normandy, the German soldier paid an exorbitant price employing an art revered by the greatest captains. For the American reader, this realization is critical. In Normandy, the German soldier was *not* defeated by superior tactics, fighting skill, or bravery. He was simply crushed by an overwhelming Allied material and manpower superiority.

CHARLES E. WHITE
Captain

Fort Polk, La.

Recognition Quiz Answers

1) JAPANESE **TYPE 74** TANK (low silhouette, dome-shaped turret located middle of hull, Christie suspension, sharply sloped frontal armor)

2) GERMAN **LEOPARD 2** (box-like turret with vertical walls, bulbous bore evacuator, flat after deck of hull, seven road wheels)

3) U.S. **F-4E** FIGHTERS (pronounced negative dihedral of horizontal stabilizers, blunt-topped vertical stabilizer)

4) U.S. **XM-1** TANK (angular flat surfaced turret, grenade launchers well forward on turret walls, blunt bow, sharply angled glacis, wind sensor at center rear of turret)

5) SOUTH KOREAN **M-47** TANK (elongated turret bustle, high cupola, bore evacuator near muzzle, muffler and exhaust stacks mounted on fenders)

6) ADVANCED INFANTRY FIGHTING VEHICLE (AFIV) MOUNTING AN IMPROVED TOW (rounded corners of hull, sides slope sharply inward at rear, U.S. **M-113** suspension and power pack components, AFIV being manufactured with armament options for sale abroad)

Photos 1 and 5 submitted by 1LT M. C. O'Neal, USMC

ARMOR's 33d Editor-in-Chief is **Lieutenant Colonel Frederick W. Shirley.** His most recent assignments were at Fort Hood, Tex., where he served as Deputy for Operations and Intelligence in the 3-10 Cavalry from October 1977 to April 1978 and as Chief of the Leadership and Management Development Course from April 1978 to May 1979.

LTC Shirley was commissioned in Armor upon graduation from the Virginia Military Institute in 1962. Following completion of the Armor Officer Basic Course, he served in Germany from February 1963 through August 1964 as a platoon leader, communications officer, and troop executive officer with the 2-3d Cavalry.

Returning to the U.S., he was assigned to the 1-11 Cavalry at Fort Meade, serving as troop executive officer, platoon leader, and liaison officer until June 1965.

After graduation from the Armor Officer Associate Career Course in 1965, LTC Shirley attended the MATA course at Fort Bragg, N.C. and the Language School at Monterey, Cal., where he completed study in Vietnamese in May 1966.

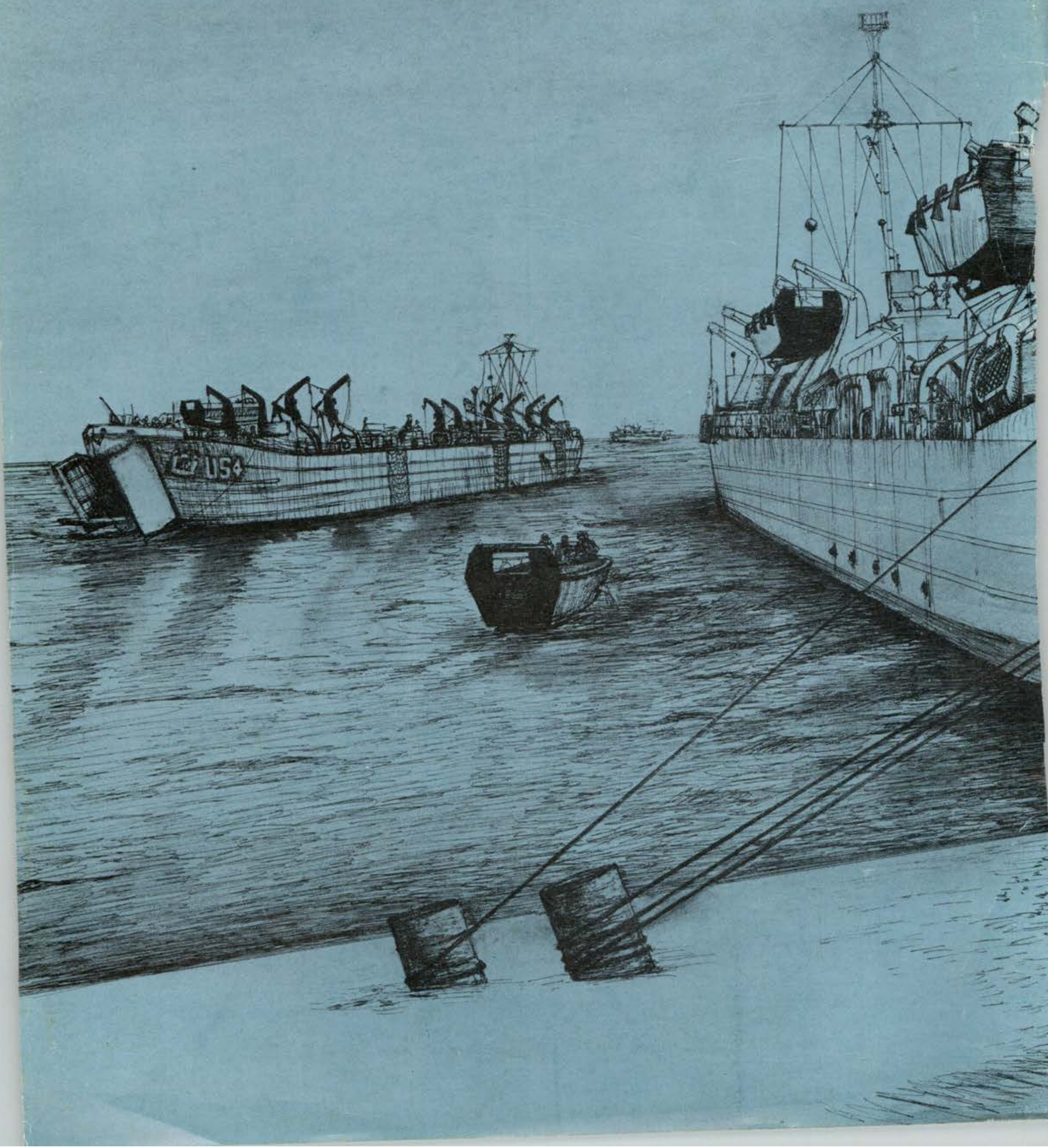
His service in the Republic of South Vietnam included an assignment for 1 year as tank troop advisor in the ARVN 1st Cavalry and duty as S-2 and troop commander with the 1-4 Cavalry, 1st Infantry Division from July 1967 to April 1968.

LTC Shirley's service in Vietnam was followed by 2 years of duty as an instructor in the U.S. Army Armor School where he was Chief of Cavalry Branch of the Company/Team Division, Command and Staff Department.

After completing work for a Master's Degree in Business Administration at Arizona State University in 1972, he attended the Armed Forces Staff College and was graduated in January 1973.

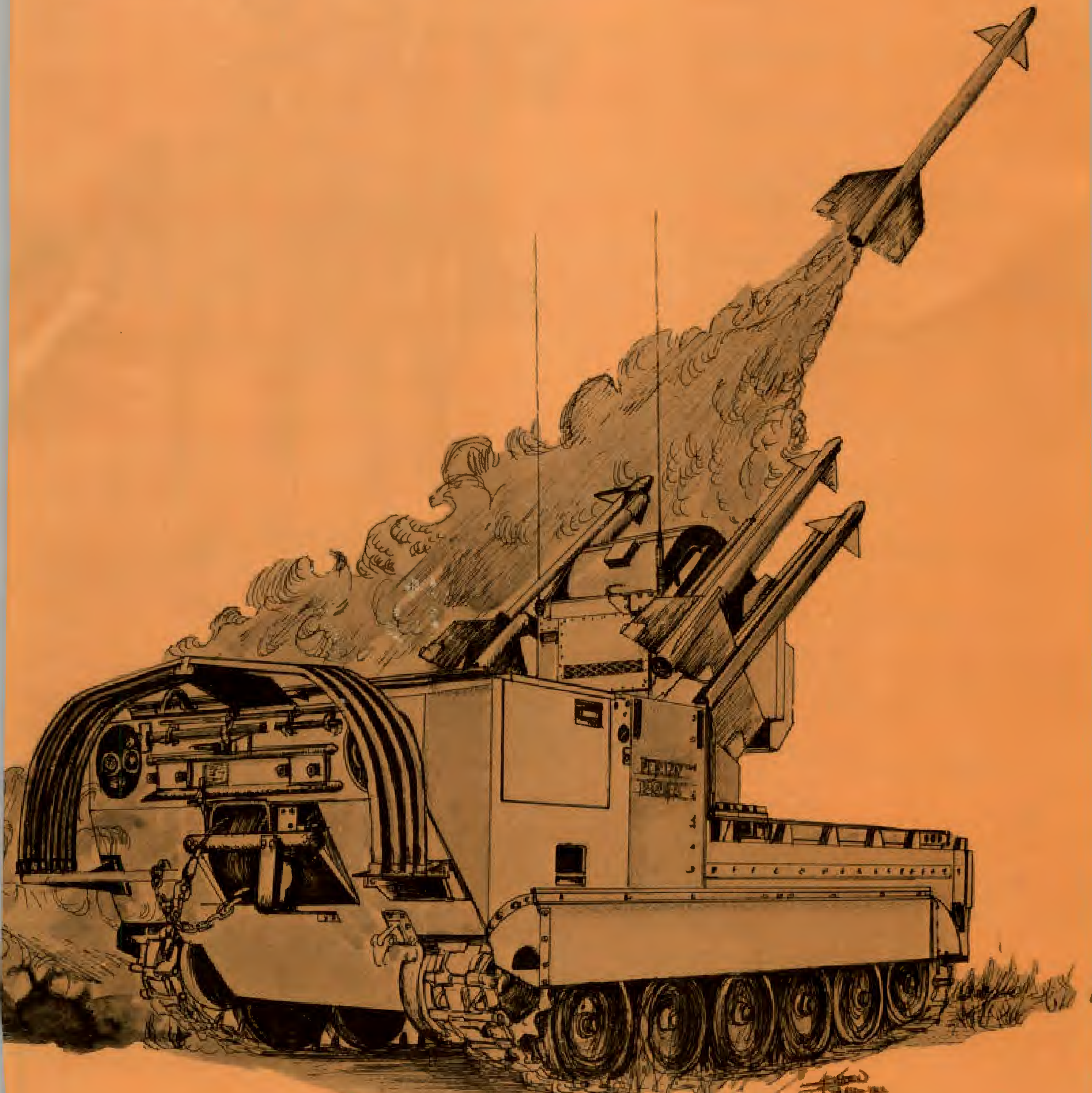
From February 1973 to October 1977, LTC Shirley served in the Washington, D.C. area as a Staff Writer and Chief of Management Branch of the Command Information Unit and as a staff member of the News Branch, Public Information Division, Office of the Chief of Public Affairs.

LTC Shirley's awards and decorations include the Silver Star with two oak leaf clusters, Bronze Star with three oak leaf clusters, the Meritorious Service Medal, the Army Commendation Medal with two oak leaf clusters, the Combat Infantryman's Badge, and the Vietnamese Armor Badge.



ARMOR

september-october 1979



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"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."

COVER

To ground gainers, Air Defense Artillery can be something of a puzzle. Why is it here? What does it do? Why should we bother with it? For answers to these and other questions about ADA, see "Air Defense Artillery" beginning on page 30.

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Editor-in-Chief
LTC FREDERICK W. SHIRLEY

Managing Editor
ROYCE R. TAYLOR, JR.

Assistant Editor
W. RICHARD MORRIS

Art Director
KAREN W. RANDALL

Administrative Assistant
JEANNIE BRIGHT

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LETTERS

Crew Endurance

Dear Sir:

The January-February issue of *ARMOR* reached me here on the 16th May. I am delighted to see that no less an authority than the Commandant of the U.S. Army Armor School is directing our attention to the problems of crew endurance. To my mind crew endurance must rank equally with volume reduction in the design of smaller, three-man, 120-mm turreted, heavily-armored, front-engined vehicles to succeed the large, conventional, four-man, hand-loaded main battle tanks *Chieftain, Leopard 2* and *XM-1*.

I hope that you can find space to publish the attached contribution "Crew Endurance" either as a letter or in **PROFESSIONAL THOUGHTS.**

Robin H. Fletcher
Wayside Cottage, Over Wallop,
Stockbridge, Hants, U.K.

Mr. Fletcher's professional though begins on page 46. ED.

Refueling

Dear Sir:

I have been a subscriber many years to this finest of military publications from which I have learned much. I appreciate the opportunity to comment on CPT Pratuch's article, "A Plan for Refueling," that appeared in the Jan-Feb issue of ARMOR.

EDWARD J. HERTERICH
Gunnery Sergeant, USMC (Ret)
San Marcos, Calif. 92069

See page 47 for GySgt Hertrich's professional thought on refueling. Ed.

Help Wanted

Dear Sir:

A group of officers who are members of the 4th Battalion, 69th Armor, are attempting to fill in some gaps in our unit's history and to add some color to the brief sketch provided by Department of the Army. We would appreciate anyone acquainted with our battalion or its ancestral forebearers sharing with us any information, memories, anecdotes, or tales regarding any of the following units:

4th Bn, 69th Armor
Co D, 69th Armored Regt.
69th Tank Bn
69th Amphibian Tractor Bn

We would also like to borrow any available photos or memorabilia pertaining to this unit. Material sent to us will be returned if desired. If a former member of the battalion feels that he has no "unusual" information, we would still like to hear from him at the following address:

1LT RICHARD A. WILLIAMS
HHC, 4th Bn, 69th Armor
APO New York 09185

Second Round Hits

Dear Sir:

In the **LETTERS** section of the March-April 1979 *ARMOR* magazine, Major McClellan's "Aim—Fire—Fire Again" brings out a most important yet overlooked point of tank crew drill. That is the need for a second round to kill a tank, unless of course, there is a secondary explosion. During a recent trip as a guest of an Israeli brigade commander, I had ample opportunity to hear just how important that second round can be to the survivability of a tank in combat. We should learn from the Israelis and MAJ McClellan.

JAMES R. ROWLAND
Captain, Armor
1-1 Cavalry
APO NY 09142

Telfare-Inbore Debate: May It Rest in Peace

Dear Sir:

In reviewing the March-April issue of *ARMOR*, I read Major Delbert M. Staub's interesting letter concerning my article "Telfare and Inbore" in September-October 1978 edition.

Although I appreciate Major Staub's comments, and am pleased that the subject caught his interest, I'm afraid that he missed the entire point of the article. He seems to interpret my position as an advocacy of disposal of the *Telfare* in favor of the *Inbore* device. Nothing could be farther from the truth.

On the contrary, our position in the New Jersey Army National Guard urges the adoption of an entire family of tank subcaliber devices rather than the designation of one device as the standard one for Army-wide use.

We agree that the *Telfare* probably fills the bill for the wide-open spaces of Montana, but it certainly does not meet requirements in congested, populated areas like New Jersey.

As evidence that we do not propose shooting down the *Telfare,* we were one of the first states to use the device and manufactured 47 of them in one of our Combined Support Maintenance Shops.

Last year, at the request of the ARRADCOM Project Officer, we tested the *XM-179* Subcaliber Universal Mount assembly being developed by that agency, which is a vastly improved version of the *Telfare.* Partly as a result of our input, that device has been accepted and will go into production shortly.

In our report, we noted that the simplified strap-mount and the self-contained traversing and elevating mechanism in the *XM-179* overcomes our objections to the *Telfare* which were based on the difficulty in mounting the device. We also indicated that the lower mounting axis of the *XM-179* vastly simplifies boresighting and zeroing.

Our reservations concerning the *Telfare* for inactive duty training use in New Jersey deal mainly with the ammunition.

The caliber .50 AP round requires too much impact area, and causes excessive target damage for our purposes.

At Fort Dix, our main training site, we employ a track-mounted moving target propelled by a Poly-Drive and a remotely controlled *M-114* command and reconnaissance vehicle for Tables IV, VP, VI, and VIIC.

As these target assemblies are maintained chiefly at ARNG expense, we naturally are interested in maximum target serviceability. The caliber .50 ball and AP rounds, when used extensively, cause buckling of the 3/4-inch steel target facing of the track-mounted target and excessive damage to the steel beam uprights. This necessitates frequent repair and replacement of the assembly. These rounds obviously cannot be employed against the *M-114,* as we have found they often achieve complete penetration.

The comparative low velocity of the caliber .50 spotter-tracer round employed in the *Inbore,* suits our requirements admirably. The round causes negligible target damage and its reduced impact area requirement provides great latitude in range area selection.

In the article, I thought I made my doubts as to the validity of the TCATA test perfectly clear. A comparison of the performance characteristics of the caliber .50 AP round against caliber .50 spotter-tracer ammunition is just not a valid subject for testing. If I wanted to assure myself that the AP round shoots farther, faster, and more accurately than the SP-T, I'd simply look in the field manual. Both rounds have been in the inventory for a long time and have been employed extensively.

To echo Major Staub's observation, I'm not an research and development type either, but I feel this portion of the test was a waste of time, effort and money.

In summary, I feel that the *Telfare* has a place in the tank subcaliber family, but no more so than does the *Inbore, Brewster* and the laser devices.

Each has it's own advantages and disadvantages, but all should be available to the armor trainer to meet his specific needs, within the limitations imposed by available time, equipment and training areas.

We also urge continued development of new and better subcaliber devices of all types. Let's not adopt a single assembly and retard future progress in this important area. As Major Staub points out, the Montana ARNG has made its own improvements to the *Telfare.* Good! These efforts will continue to improve the entire system.

As a further example of this progress, we note that ARRADCOM is working on a new version of the *Inbore* device which will employ, interchangably, the barrel assemblies of the *M-8C* spotting rifle, the caliber .50 HB *M-2*, the *M-139* 20-mm gun and the .22-caliber rimfire rifle. Another plus!

JAMES A. BRODERICK
Lieutenant Colonel, NJARNG
Trenton, NJ 08625

Recruiting Aid

Dear Sir:

After reading and studying the last two issues of *ARMOR* Magazine, I feel confident in my decision of volunteering for the armor branch in the new two-year combat arms enlistment program. I found Captain Georgoulakis' article, "Why the Armor Trainee Joined," has given me an appreciation of recruits I will be training with this summer.

I would like to suggest, that with the high cost of recruiting armor personnel, a few issues of *ARMOR* might be placed in high school and junior college libraries during the Spring semester, since *ARMOR* would most likely be an inexpensive and effective recruitment aide. As a prospective enlistee last winter, I found that my limited knowledge of the Armor profession, beyond the information my recruiter provided about training was a delaying action in my commitment to join the Army.

I would suggest also that new armor recruits in the Delayed Entry Program be given a copy of *ARMOR* and be encouraged to join the Armor Association. The dividends of a professionally-oriented new trainee would greatly exceed the initial cost of a free issue or two.

A sense of enthusiasm and professionalism with knowledge are the rewards to the reader of *ARMOR.* And if the magazine is used not only as a source of information and discussion but as an outlet of armor pride, *ARMOR* can aid in making the All-Volunteer Force a success.

Respectively,
Richard A. Dashiell,
USAR(Inactive)D.E.P.
Santa Ana, Calif. 92909

The Road to Hell

Dear Sir:

Major Robert E. Harry's article "Communication Aids" appearing in the May-June issue presents a well-intentioned but fatal piece of advice concerning the transmission of locations in a tactical environment. Major Harry proposes altering the operating instructions for the DRYAD Numeral Cipher/Authentication System (inaccurately referred to as the "authentication tables").

Two points invalidate Major Harry's proposal. First, it violates AR 380-40 which sets forth DA policy for safeguarding communications security information. That AR prohibits any modification to a cryptosytems's operating instructions without prior approval of the CG, U.S. Army Intelligence & Security Command (formerly "ASA"). Major Harry implied INSCOM approval by stating that "ASA" couldn't break his system. The fact is, the signal security unit monitoring 1-77th's ARTEP never attempted breaking the system but noted it as a "parochical & extremely dangerous" practice and strongly recommended its elimination.

The second weakness in Major Harry's proposal is that it doesn't make very good sense. It *can* be broken and will *not* afford any commander the degree of security he needs on the modern battlefield.

MAJ Harry is to be commended for his good intentions. Unfortunately, the road to hell is too often paved with good intentions. Altering the DRYAD will most likely hasten your unit's rendezvous with the devil himself.

CHARLES F. SARDO
First Lieutenant WILLIAM T. RIEBEL
902d MI Group
Vint Hill Farms Station
Warrenton, Va. 22186

Encryption

Dear Sir:

I am writing in response to an article in the May-June 1979 edition of *ARMOR* Magazine concerning the use of the *KAL 61* encryption device. In this article, Major Robert Harry advocated color-coding four lines of the *KAL 61* and using these lines as the basis of encryption of location data.

The use of the *KAL 61* in this fashion is an open invitation to compromise of the system. For one thing, the use of only four lines as opposed to the use of the full twenty-five available reduces considerably the number of permutations and combinations an enemy analyst must solve to break the code. Elimination of the set line encryption also makes cryptoanalysis easier.

The temptation is also great to use only one line of this four-line system, making analysis even simpler. The *KAL 61* is the only device authorized by National Security Agency (NSA) for use in low-level encryption. It is a simple system that requires a minimum of training to utilize properly. Misuse of this system by home-make variants invites compromise and disastrous results in wartime. The fact that ASA personnel at Ft. Carson were on one occasion unable to break this variant is not a guarantee if its security in general use.

HUGH V. BLANCHARD
Second Lieutenant
Military Intelligence
APO NY 09173

(Lieutenant Blanchard is currently in charge of the Signal Security detachment at Hohenfels Training Area. Editor)

A message originated by the Intelligence Security Command retransmitted worldwide by major command's states in part that "Use of the unauthorized DRYAD modification proposal in ***ARMOR*** *Magazine is prohibited." Editor.*

THE COMMANDER'S HATCH

MG Thomas P. Lynch
Commandant
U.S. Army Armor School

The high cost of main gun ammunition and limited access to adequate main gun ranges do not permit the Armor Force to rely solely on main gun firing to achieve required gunnery training standards. The need to maximize training resources is not new. It is, however, more complex today than ever before and will become even more so in the future. Armor units will have to rely increasingly on supplementary training techniques as an alternative to main gun firing to achieve required training standards.

Logical alternative training techniques include the use of simulators, dry fire exercises, and subcaliber gunnery. Sophisticated computer simulators are in the development stage, but neither their fielding dates nor their training effectiveness can be accurately predicted at this time. The dry fire exercise has been and remains a viable tool for the development of individual skills and crew interaction. This method however, lacks the terminal effect of a target hit which is vital for evaluating performance and maintaining crew interest. Subcaliber tables to test the gunner's ability to manipulate the controls, adjust fire, and track moving targets have been in existence since the end of WW II. More recently, in response to ever greater training challenges coupled with diminishing training assets, gunnery training doctrine has expanded the role of subcaliber gunnery to include the training of tank crews and platoons.

The increased reliance on subcaliber gunnery implied in published training doctrine called into question the method's capability to fulfill the role.

Recognizing the critical need for developing the most efficient and effective training methods and the imminent introduction of the *M-60A3* and the *XM-1* tanks into the inventory, the Armor Center has reexamined subcaliber gunnery to determine its proper role in the overall gunnery training program. Investigations were conducted over a period of months to reexamine subcaliber gunnery in three areas; the subcaliber concept, subcaliber devices, and scaled-range target systems. This article will discuss the findings of those investigations, the conclusions that have been drawn from them, and the direction being taken in subcaliber gunnery.

First, the subcaliber concept: subcaliber gunnery is a viable means of teaching rudimentary gunnery skills on all tank systems, but the method has shortcomings which must be understood by both the trainer and the trainee. The following shortcommings are inherent to subcaliber gunnery.

- Subcaliber firing cannot fully duplicate all crew tasks required for firing the main gun.
- No device yet developed provides the blast, recoil, or sight obscuration effects of main gun firing.
- Subcaliber devices do not ballistically match the main gun round. While the probability of hit, P(H), of the devices can be improved by placing targets within appropriate range bands, they will not match the P(H) of the main gun. As a result, the gunner's ability to hit targets on a subcaliber range does not necessarily reflect his ability to hit on main gun ranges to the same degree.
- There is no evidence that increasing subcaliber iterations improves main gun firing performance in any direct proportion.
- The exclusive use of scaled ranges in the train-up process leaves a void in the areas of target acquisition, sensing, battlesight gunnery, and ranging exercises.

In spite of its shortcommings, subcaliber gunnery provides the trainer with the capability to provide training experiences which cannot now be duplicated any other way prior to main gun firing. The principal training value is gained inside the turret in the development and evaluation of individual procedures and crew interaction. Subcaliber gunnery offers important advantages over dry-fire exercises in the following areas.

- The concept of boresight and zero, the most critical function in tank gunnery, can be taught, demonstrated, and practiced.
- The concept and function of lead application can be effectively taught, demonstrated, and practiced.
- Subcaliber firing develops crew interaction and timing. Crew drills can be evaluated through subcaliber exercises.
- Subcaliber gunnery developes the crew's ability to do simultaneous and multiple engagements.
- Subcaliber firing teaches the crew the difficulty of engaging targets while wearing the protective mask, since crews must use the tank optics under those conditions to sense main gun engagements.
- Subcaliber firing is essential preliminary training in platoon fire control and distribution prior to main gun battleruns.
- Subcaliber firing challenges the crew during train-up. The TC is able to evaluate the crew's performance in areas essential to main gun engagements.
- Subcaliber firing interjects chance into crew engagements.
- Subcaliber firing more fully exercises the driver as a member of the crew, in such areas as observing rounds during engagements, target acquisition, and maintaining a stable gun platform.
- Subcaliber firing saves time. There is less requirement for an evaluator to climb down into the turret to insure that procedures have been properly performed.
- Subcaliber gunnery provides secondary training benefits not directly related to the development of tank gunnery skills. The unit practices range operation procedures; including all logistical aspects of range operation, range safety, the

organization of firing orders, and range maintenance.

- Periodic subcaliber firing increases crew and unit interest in maintaining turret operational readiness.
- Perhaps most important, properly conducted subcaliber gunnery exercises develop and sustain crew interest, an essential ingredient of successful training. Unlike dry firing, which tends to be dull because it focuses on form and fire commands, subcaliber firing causes target reaction. Further training

Figure 1. The *M-179* subcaliber training device is shown here mounted to the rear of the bore evacuator. Experiments to determine the optimum mounting method for this device are continuing.

benefits are derived because the crew spends more time together in the turret.

Briefly then, subcaliber gunnery supplements but does not substitute for main gun firing. The principal training value is gained inside the turret in the reinforcement of individual skills through repetition of procedures and crew interaction. However, subcaliber firing leaves a void in gunnery train-up which must be addressed further by the Armor Center in the future development of a total training program for our new tank weapons systems.

In line with these findings, gunnery doctrine will no longer require all unit crews to fire Tables I through V. They may be conducted as the commander deems necessary to train-up to entry into main gun exercises. Gunnery tables will be changed.

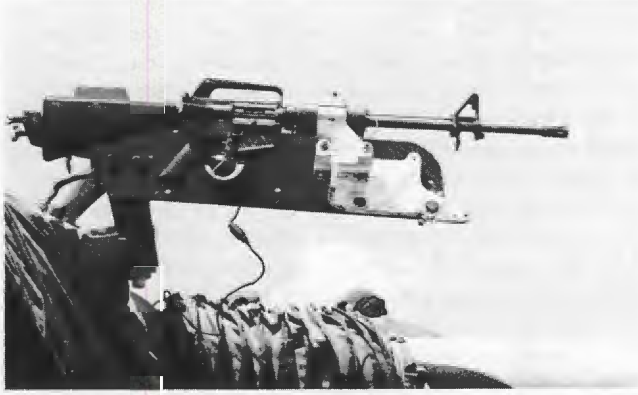


Figure 2. The *Brewster* device is shown here with the *M-16* rifle attached. The *M-55* laser trainer can be used in place of the rifle.

They will have standards which must be achieved by those crews designated by the commander to undergo subcaliber training. Exercises and qualification criteria will be altered to reflect a new evaluation philosophy.

- Crew procedures, interaction, and timing are the principal training benefits. Qualification criteria will focus on these areas.
- Speed of engagement is a secondary benefit.
- Scoring of hits as a criteria for qualification will be deemphasized.

Investigation of the capabilities of subcaliber devices focused on the *Brewster* and the *M-179 Telfare* devices. Although it was recognized that these devices could not meet the total needs of all units across the spectrum of the Armor Force and might not be the final solution for subcaliber gunnery, they were selected as best available to meet the requirements Army-wide in terms of cost and training effectiveness.

The *Telfare* device has been improved to permit easier and faster mounting and zeroing and has been type classified as the *M-179* Universal Caliber .50 Subcaliber Training Device (figure 1). The *Brewster* device is scheduled for type classification in September 1979 and for production and fielding between March and September 1980 (figure 2). The Armor Center investigations of these devices determined the following:

- The *M-179 (Telfare)* device is sufficiently accurate for subcaliber training purposes when employed against full-scale targets not in excess of 1,400 meters. It is the preferred device for subcaliber gunnery on full scale ranges.
- The *Brewster* device provides the best solution to decrease parallax during subcaliber scaled-range firing. The *Brewster*-mounted *M-55 HE-NEON* laser trainer is focused to 60 meters and is effective to 100 meters. The *Brewster*-mounted *M-16* rifle with a .22 caliber rimfire adapter has an acceptable probability of hit within a range band of 25 to 40 meters from the firing tank. The *Brewster*-mounted *M-16* rifle firing 5.56-mm ammunition is sufficiently accurate for subcaliber training purposes within an engagement range of 200 to 350 meters.

There is still work to be done on the development of devices for the *M-60A3* and the *XM-1.* Investigations on modification of the *M-179* for adaptation to those tanks are in progress.

Mounting, boresighting, and zeroing of the *Brewster* device on the *M-60A3* is similar to that on the M-60A1. Experiments to determine the feasibility of developing and evaluating a *Brewster* type device for the *XM-1* are continuing.

The goal in the investigation of ranges for subcaliber gunnery was to determine which ranges were required to support the subcaliber program for present and future tanks, keeping in mind the training requirements and assets available across the Armor Force and the capabilities of the subcaliber devices. Four ranges were selected, all of which can be supported by target systems already in existence or planned for the inventory. They include the full-scale range, a new 1/10- and 1/5-scale range, the combination of the present 1/60- and 1/35-scale ranges into a single 1/60- and 1/35-scale range, and the present 60-meter range used for Tables I-III.

The requirement for the construction of one or more of these scaled ranges to support a unit tank gunnery program should be determined by the training mission of the unit, the weapons systems to be employed on the ranges, the current availability of ranges or range space, and operational cost considerations.

- The full-scale subcaliber range provides the best target acquisition training, permits the full employment of the fire control system on all tanks, and provides full crew interaction during training. All moving-tank exercises should be conducted on full-scale ranges using full-scale targets supported by a full-scale target system. If the unit does not have access to a full-scale range for moving tank exercises, an available 1/10- and 1/5-scale range may be used. The full-scale range can be used for the conduct of subcaliber Tables IV and V, the subcaliber

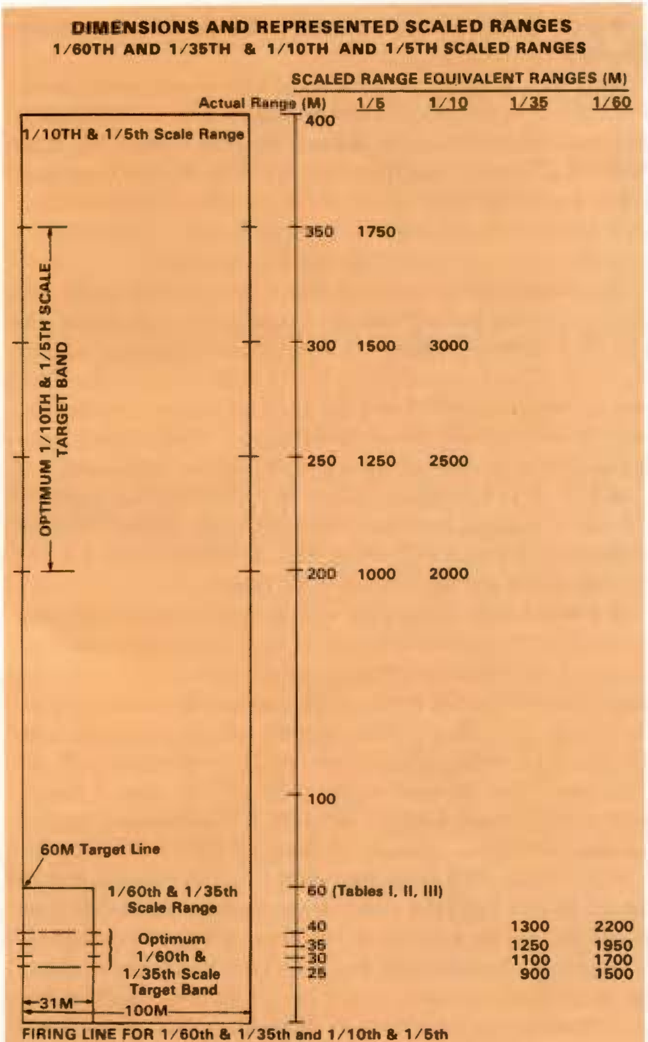


Figure 3

runs on Tables VI through IX, and all unit subcaliber training for the *M-60A3* and *XM-1*.

● The 1/10- and 1/5-scale range system provides the capability to employ the laser rangefinder in stationary tank crew training for the *M-60A3* and *XM-1* tanks since the laser rangefinders of both tanks are fully operational at 200 meters and beyond. On this range, target pop-up mechanisms are installed within an actual range band of 200 to 350 meters from the firing tank. Simulated engagement ranges of 2,000 to 3,000 meters are achieved when 1/10-scale targets are emplaced in the mechanisms from 200 to 300 meters. Simulated engagement ranges of 1,000 to 1,750 meters can be achieved by emplacing 1/5-scale targets in the same mechanisms (figure 3). The *M-48A5, M-60, M-60A1,* and *M-60A2* can also train on the range, however, the 1/10- and 1/5- scales provide limited training advantage over the 1/60- and 1/35- scales for these tanks since rangefinders are not fully operational. The 1/10-and 1/5-scale range can be supported by the *M-31A1* target pop-up mechanism which is type classified and in the field. This range can provide sustainment and train-up for *M-60A3* and *XM-1* units which do not have access to full-scale ranges at home station. Further experimentation is required at the Armor Center to develop the most effective moving target exercises to be conducted on this scale range.

● The chief advantage of the 1/60- and 1/35-scale range is that it can be built in limited facilities (figure 3). The .22 caliber long rifle round requires an impact area of only 1,400 meters or can be contained by a backstop. The *M-55* laser trainer requires no impact area and permits Reserve Component units to construct the range indoors. On this range, target pop-up mechanisms are installed within an actual range band of 25 to 40 meters from the firing tank. Simulated engagement ranges of 1,500 to 2,200 meters are achieved when 1/60-scale targets are used and simulated engagement ranges of 900 to 1,300 meters are achieved when 1/35-scale targets are used. The range can be supported by the Scaled Range Target System (SRTS) 35/60 which is being fielded in limited quantities by Training Aids Support Center. Type classification and full issue of the system is anticipated within two years. The 1/60- and 1/35-scale range provides gunnery training, without integration of the rangefinder, for the present main battle tanks and degraded mode training for the more complex systems of the *M-60A3* and *XM-1*.

● The 1/20-scale range was found to offer no training advantage over the 1/60- and 1/35-scale range. Parallax is not eliminated by the 1/20-scale. During moving-tank exercises at this scale, the tank must be driven at an unrealistically slow speed both to remain consistent with the scale and to prevent overrunning of the targets. The slow speed produces negative training for both the driver and the crew within the turret. Although the 1/20-scale range is no longer a preferred scale, the Armor Center has recommended that targets continue to be produced for use on existing ranges.

● The present 60-meter range will continue to be used for gunnery Tables I-III for the *M-48A5, M-60, M-60A1,* and the *M-60A2* tanks.

Dimensions of the recommended scaled ranges are shown in figure 3. It should be understood that these dimensions are exclusive of the surface danger area associated with the caliber of the ammunition used or the Nominal Occular Hazard Distance (NOHD) of the laser rangefinder, which for the *M-60A3* tank is 10,000 meters or until the beam is contained by a back stop. The NOHD for the *XM-1* is expected to be similar. The surface danger area or the NOHD must be the final determinant for the use of the ranges.

The revised role of subcaliber exercises within the tank gunner training program is consistent with training requirements and the capabilities of the systems. It takes its place along with dry fire exercises as a tool which can be used by the commander in the train-up of his crews and platoons prior to main gun firing. The devices described above will perform adequately to support the training mission within the limitations discussed and have been type classified or will be in the near future. The ranges will support a high percentage of the wide spectrum of training requirements and facilities available to the Armor Force today, and all can be supported by target systems already in the field.

The door has not been closed on subcaliber gunnery development. The Armor Center is continuing to seek ways to improve subcaliber gunnery in areas which range from the previously mentioned requirement for devices for the *M-60A3* and *XM-1* tanks to the quantification of the training transfer from subcaliber to main gun firing. Each solved problem and each question answered is expected to raise its own new set of questions, the solutions to which will require another look at the role of subcaliber gunnery and the devices which can best support that role. Cooperation and feedback from the field is needed and welcomed to ensure that subcaliber gunnery continues to play a viable role in tank gunnery training.

Selecting the Master Gunner

The selection of an individual to attend the Master Gunner Course, in many cases, is done by the stroke of a pen, drop of a name, or wave of a hand. Yes, these methods may seem a bit extreme and far-fetched, but in some units it actually happens that way. The selection process may determine whether or not the end justifies the means.

Selection of an individual to attend the Master Gunner Course, at Fort Knox, should be undertaken with great deliberation and thought. So often, we at the Armor School receive students who are mismatched, trained on the job, reclassified, or in some other way not basically qualified in CMF 19 or the Armor field. Needless to say, these individuals do not meet the prerequisites established for the course. Because of this, they must endure many hardships simply because they do not have the proper knowledge of basic gunnery or armor-related skills.

Therefore, commanders should be looking for the NCOs in their battalion who meet the following criteria. The master gunner candidate must:

- Be a highly motivated individual who wants the job and all the responsibilities of a master gunner.
- Be a highly proficient Armor NCO in the grade of E6 or E7.
- Possess the ability to instruct other NCOs and officers on how to teach their soldiers and crews.
- Be able to interact and relate with his fellow NCOs and officers.
- Be dedicated to improving training so as to benefit the individual as well as the unit.
- Have an eye for improving training, training aids, and methods of training.
- Be able to relate to and advise his commander.

Perhaps the most important question that must be answered after the individual has met the prerequisites is, "Is this individual the best man the unit has to offer?" The Master Gunner Branch strongly recommends that a Battalion Level Board be convened, utilizing the master gunners already present in the unit, or senior NCOs, with the battalion commander as the President, with the understanding that the final decision rests solely with the commander as to the selection of the master gunnery candidate.

The Master Gunner Program was implemented as a tool for getting the knowledge out of the school and into field units. The course is designed to take a NCO with a good basic knowledge of Armor and the vehicle he is to receive training on, and make him a *Master of Gunnery*.

Keep in mind also, that the individual sent to Fort Knox for the Master Gunner Course represents the battalion or division, and that the finished product represents the master gunners throughout the Army.

Also, remember that thousands have been spent to make this man a master gunner. So the individual should be used to the utmost. He has the knowledge but must be supported to be able to impart this knowledge to the unit.

MILFORD DEAVER
Staff Sergeant, Senior Instructor
Master Gunner Branch

REFORGER INTEROPERABILITY

By Lieutenant Colonel R. L. Sloane

The continued credibility of NATO is to a great extent dependent upon the ability of alliance military forces to operate together. The greater the extent of interoperability the greater the deterrent effect. If for this purpose alone, REFORGER '78 was a resounding success in its harmonious blending of the efforts from various nations. One of these elements is of particular note. British Task Force (TF) DELTA provided the Blue Forces of the 5th Infantry Division from Fort Polk, La., with a brigade-size maneuver force. This was the first such maneuver for the recently reorganized forces of the British Army of the Rhine (BAOR). As if to make the already interesting and challenging exercise even more so, the task force was given operational control of the 5th Division's 4th Squadron, 12th Cavalry. This was in addition to the task force's own organic tank battalion and mechanized infantry battalion as well as the 3-60 Infantry, 9th Infantry Division.

It is significant to note that the 4-12 Cavalry is a "roundout" unit, and thus one of its ground troops is in fact a unit of the Louisiana National Guard. Because the squadron was unable to deploy neither this troop nor its organic air cavalry troop, the remaining two ground troops made up the primary maneuver force. As a result, the force was further task organized for the initial phases of the exercise to provide a squadron of the 5th Royal Inniskilling Dragoon Guards, a British tank company, under operational control (OPCON) of the 4-12 Cavalry. The basis for a real test of interoperability was thus laid even before the exercise commenced.

Throughout the exercise, the task force employed the U.S. cavalry as it would one of its own medium reconnaisance units. The squadron was consistently given reconnaisance and security missions ranging from advance guard to flank security. It was also employed as an economy of force unit to help blunt the enemy main attack during the defense and conduct a diversionary attack during the offense. In fact, the unit remained committed and actively engaged in operations for the entire 10-day exercise with only two brief periods in reserve totaling approximately 7 hours. Such intense commitment required fast and effective interaction not only within the chain of command but laterally within and between units as well. Some of the more important lessons learned as a result of this interaction are the basis for this article.

As the exercise commenced, it quickly became evident that the real key to promoting interoperability lay within the area of communications. It had been agreed well in advance that liaison parties with appropriate communications would be exchanged for control and reporting within command channels. Even though such an exchange would provide dual communications, it was agreed that this should be done to minimize interruptions should one system go down. As it turned out, these dual command channels were essential in providing continuous communications during "jumps" of the CPs as well as the inevitable breakdowns and other difficulties that occurred. With two entirely different systems available during the exercise, one was almost always operational.

Before the exercise began, no one was able to determine whether the new *Clansman* series of British radios would net with U.S. radios. As we were all on the inevitable radio silence until contact, we were unable to conduct adequate tests even though task organized and collocated in advance. In anticipation, however, the squadron placed all of its radios in the *old squelch* position and frequency allocations were made to insure that they netted with the maneuver units. As soon as radio silence was lifted, it became evident that concerns were unfounded—in the *old squelch* position, communications were excellent. In fact, we could even talk to British aircraft as long as their unique new series of radios were switched to the

Larkspur or older series mode. As we were unsure of the ground-air interface, the task force had already provided an air-ground liaison team. This team proved vital in providing an interface with British Army air which is deployed using different techniques than the squadron's organic air cavalry.

The one area of communications where frequency allocations did not allow netting of the different radios was in the artillery fire direction net. Again, this difficulty was quickly resolved by the task force's provision for a liaison team from their artillery direction center (ADC). All calls for fire from U.S. troops were directed to the squadron FIST team collocated with the ADC liaison team in the squadron tactical operation center. They were then passed through British channels to the appropriate firing battery.

Calls for fire from British units OPCON to the squadron were simply passed back through the organic communication channels of the British FO accompanying them. The primary lesson learned here is that, even though our radios are interoperable if frequencies are properly allocated, liaison teams are essential. Differences in methods of operation, organization, weapons systems, tactics, and even language alone make the exchange of liaison personnel extremely helpful and greatly enhances the ability of units to maneuver together.

Another area where a vital lesson was learned involved that of oral communications from commander to commander and staff officer to staff officer. Even though I, the squadron commander, had spent 2 years on an exchange tour with the BAOR, and had experience with one of the task force's battalions, it quickly became evident that the task force commander and I had to discuss each operation in detail to ensure that it was executed by U.S.-led forces in the manner that it was planned by British staffs. Because of the different meanings imputed to various teams such as *exploitation, reserve demolitions, active defense,* and *advance guard,* it was determined that, whenever feasible, operations officers should meet to discuss operations before they were planned, and commanders should do the same before they were executed. While it might be said that this has always been a tenet of successful operations, the heat of battle frequently makes such discussions hard to realize. The continued success of such multinational maneuvers, however, predicates that such discussions be attempted.

An additional area where REFORGER '78 provided valuable lessons involved tactics. Even though many common tactical terms exist throughout both national military vocabularies, in some cases these terms signify different maneuvers, in many a different method of executing a similar maneuver, and in still others they do not coincide at all. Oriented to a great extent on the concept of defeating enemy offensive successes with counterattacks and counterpenetrations, the British prefer to retain a larger reserve than their U.S. counterparts. During REFORGER '78, however, this did not prove to be the case. Although the traditional planning for these maneuvers was present throughout the task force, actual execution was very closely attuned to the active defense where nearly all forces were committed forward. Even the 4-12th Cavalry was used in its economy of force role where it was rapidly and fully committed against the main attack.

Upon reverting to the offense, TF DELTA gave the mission of sending scouts ahead of the advance and deep into the enemy to the 4-12th Cavalry. This resulted in 20 scouts moving rapidly over different routes, under the cover of darkness through the front lines and well behind Blue Force's initial objectives. While this produced a great deal of enemy information and caused much havoc, it was not, in fact, the actual mission intended by the task force commander. The intended mission was that of a zone reconnaisance in front of advancing British battle groups. As this was not perceived by the squadron and the U.S. term was not in the British terminology, a slightly different operation was mounted which proved to be as effective as that envisioned by the order.

As the offensive battle progressed, a warning order was given to be prepared to conduct an exploitation following the capture of the initial objectives. While this term conjures up deep penetrations, direction of attack arrows, and pursuit and cutoff forces to U.S. units, that is not what was intended by the task force. On the contrary, on several occasions, the advancing British battle groups exloited by simply attacking over their initial objectives and then rapidly continuing forward to secure a front line trace a short distance beyond. As this final rapid movement from the objective forward was through the retreating enemy, it tended to produce significant rear area security problems as Orange Force battalions were bypassed.

In summarizing these tactical differences, it must be noted that many more exist than are described herein. When operating with the British, we must be aware that, even though eventual execution might well be similar, there are distinct differences in the plans made for both the active defense and conventional offensive operations. In many cases, common military terminology will not exist. It is thus imperative that all operations be discussed in as much detail as feasible.

The final major area of significant lessons learned involves that of administrative and logistical support. Prior to the start of the exercise, arrangements were made for all support of U.S. units OPCON to the task force to be controlled by the British. In order to facilitate this, a forward area support coordinator was provided to the task force from the Division Support Command. While this arrangement proved essential for the staff at task force to keep track of the ever-changing situation, actual execution more closely approximated conventional throughput techniques. In effect, it worked remarkable well and produced an ever-available quantity of supply to the squadron when needed. The only major exceptions involved those items which are unique to one nationality.

All in all, REFORGER '78 can only be classified as a resounding success for the continued enhancement of interoperability between differing national military forces. The tactical successes achieved by the multinational 5th Infantry Division force has once again demonstrated not only the viability of a deterrent posture built upon U.S.-developed reinforcements, but also the credibility of a multinational NATO military force acting in concert.

LTC ROBERT L. SLOANE was commissioned from the US Military Academy in 1963. He has commanded units in the 3d Sqdn, 4th Cav during two tours in Vietnam; the 6th Cav at Fort Meade, MD.; a joint U.S.-British Task Force during REFORGER 78; and 4th Sqdn, 12th Cav at Fort Polk. He holds an MS in PE, an MBA, and is currently attending the Army War College.

Low Light Level Television for Training

by Major Patrick H. Orell

Low light level television (LLLTV) is similar to night observation devices that the Army uses today, except LLLTV allows the user to make a video tape for critique or record copy. LLLTV is not new to the electronics community and has been used for many years in low illumination areas to support industrial, private, educational, and military requirements. There is a wide range of television cameras available that are designed to support a particular type of low light level requirement. Sensitivity, cost, power requirements, portability, and environment housings are a few of the factors considered when selecting the right camera for the job. High sensitivity TV cameras for low light level operation are much more expensive than standard TV cameras.

The first LLLTV camera fielded by the Army as an aid to night training was originally procured for airborne night surveillance and target acquisition in Vietnam. The system was the *AN/ASQ-132 Iroquois* night fighter and night tracker (INFANT) which was mounted on the Army *UH-1C/M Iroquois* helicopter. In 1974, the Commander, U.S. Army Training and Doctrine Command (TRADOC), authorized the use of one INFANT system to evaluate the new Army Training Evaluation Programs (ARTEPs) being validated at Yakima Firing Center, Wash.

The first sytem used for training support consisted of an INFANT system mounted in an electronic trailer van at Fort Lewis, Wash., by a team from the 1st Signal Group which was supporting the TRADOC test.

One of the first utilizations of the system was to observe part of an armored unit's night road march. The night was clear, with starlight measuring 10 to 4 lumens.

During the evening, the crew documented on video tape the various capabilities of the LLLTV system. Each vehicle in the convoy could be identified by type, and blackout marker lights on the vehicles were so bright they looked like normal headlights. Lighted cigarettes being smoked or carried could be seen clearly; one was spotted being thrown from a tank at a range of 1,320 meters. The system allowed the evaluators and the chief controller to know exactly where the vehicles were and when it was the most opportune time to initiate simulated attacks and other scenario actions. This utilization was so impressive that the chief controller used it every night for evaluation of different types of training. The only problems noted during this initial field usage were the size of the system and noise caused by the generators.

LLLTV was so successful at Yakima that TRADOC decided to continue tests at Fort Lewis. The crew continually devised ways to better the system by making it more compact and quieter. They mounted a van on a 2½-ton maintenance truck and installed INFANT components, with the camera head mounted on the forward part of the roof. This configuration allowed the LLLTV crew to be reduced from three to two, and only one trailer-mounted generator set was required to power the system. This new configuration began to solve the size and noise problem encountered at Yakima.

There were many successful training applications of the LLLTV at Fort Lewis, and it was well accepted by all commanders who used it. The division commander used it on numerous occasions to observe night training and for ARTEP control, evaluation, and critique. The division used it during JTX *Gallant Shield* in 1975 for support in observing friendly light discipline and early warning of enemy activity. The system performed well and was seen by the III Corps Commander who expressed interest in acquiring one for Fort Hood, Tex., to aid in night training. This interest caused TRADOC in turn to decide upon a formal test of the system to validate LLLTV as a training aid.

TRADOC Combined Arms Test Activity (TCATA) was tasked to test the INFANT in a small vehicle configuration and sent representatives to Fort Lewis to study the system and discuss improvements. The TCATA representatives worked with the project officer and crew to design a smaller package that could be mounted in a 1¼-ton truck and be powered by a trailer-mounted generator. They took the design back to Fort Hood and built two systems using INFANT components. One camera system used the same type INFANT as the Fort Lewis system, and the second camera system was built using a first generation intensified silicon vidicon tube (ISIT) which gave it greater stability and capability. This tube allowed the operator to view objects that emitted bright light sources without damaging it.

Both TCATA systems were used to support training of the 1st Cavalry Division and the 2d Armored Division through March 1977 with excellent results. The divisions being armored, the noise and size were not a problem; however, lighted objects and illuminated training areas were. The armored units were using white light and infrared illumination extensively in training. They also used a large number of artillery and mortar illuminating rounds to facilitate target detection during night operations and range training. This illumination caused the non-ISIT INFANT system to bloom and caused the automatic shutter to close, hampering continuous observation and video taping. However, the ISIT tube was very stable and performed well when exposed to illumination with only slight blooming when viewing the light source. The commanders at Fort

Hood liked the capability offered by the systems and were especially enthusiastic about the ISIT tube performance. Both divisions used it extensively as an aid in evaluating night training, and in ARTEP evaluation and critique.

During the INFANT systems evaluation, TCATA validated LLLTV as a useable and needed training aid. A recommendation was made that smaller, more portable systems should be evaluated using ISIT tubes and 12 to 24-volt DC power. TRADOC informed TCATA that a camera must be found that was light weight, used the newest ISIT-technology tube available, could be used with the Sony Rover TVT, and was man-portable.

Inasmuch as the Night Vision Laboratories (NVL) had supplied the converted INFANT system and had been working with small LLLTV cameras, they were asked again to assist with the project. NVL was experimenting with a small camera that was equipped with a second generation ISIT tube and would connect to the day trainer video input. Although the camera used 110-volt, 60-cycle AC power, it was a good device for experimentation to determine if the optics available would do the job. The system was returned to Fort Hood for field testing to determine how it would perform on a tank gunnery range against the same illumination problems that had affected the INFANT systems.

The small camera performed well when exposed to bright illumination and stabilized instantly. This allowed the observer to actually score the target. A 500-mm f/2.4-22 lens was used on the camera for target scoring which helped to eliminate illumination glare and gave the camera a tremendous range when observing illuminated targets. This application gave the armored units the capability of accurately scoring night tank gunnery and, by replaying the tape, provided a critique for each tank crew immediately after they finished firing. The tank crews felt they were given a much more realistic score since they could actually see how they fired.

While most targets are plywood silhouettes and give no flash on impact, others are old tank hulls which produce a tremendous flash when the projectile impacts. In spite of this illumination, the camera continued to give a clear picture throughout the impact, much to the pleasure of the tank crews viewing their hit. The camera also showed rounds that skipped into the target giving a false flash. Without the camera, these would have been scored as hits. A 75-mm f/1.4 lens was also used to record the movement of the tanks as they negotiated the course. It was found that the camera performed well in the illumination and streaked only for a second when the tank fired. The camera provided a clear picture of the tank as it moved through the course.

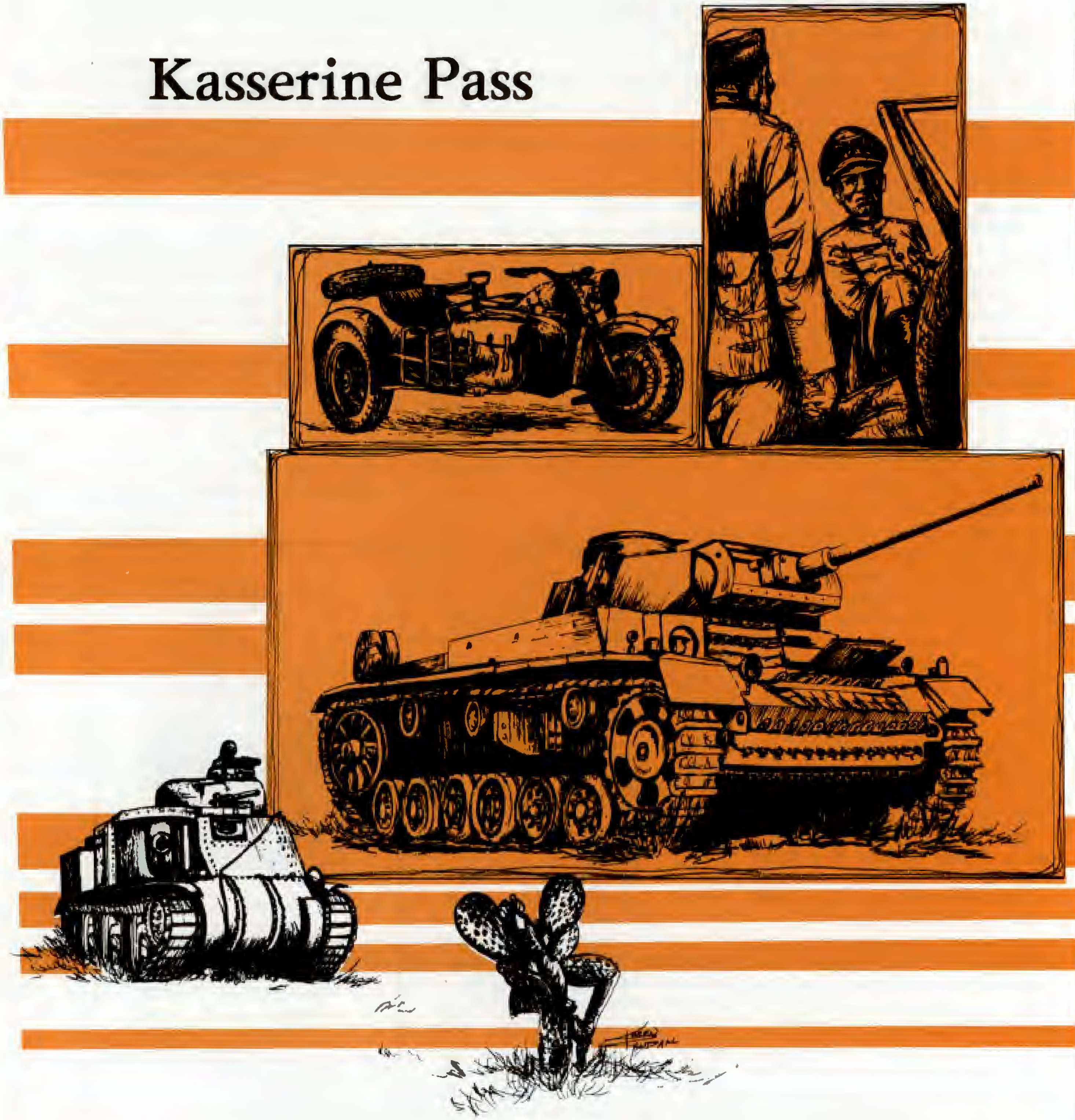
The camera was used during armor ARTEP evaluations and proved to be far superior to the INFANT in resolution, stability, and versatility. The INFANT had only one lens with an electronic zoom while the small camera afforded the operator an opportunity to use the lens of his choice for each application. One of these applications was observation of a night river crossing where a mobile assault bridge (MAB) was being used to move armor. The camera was set up 75 meters from the action, and a 75-mm f/1.4 lens was used to view the operation. There was a quarter moon and starlight, and all video tapes were bright with excellent resolution. Personnel, armored vehicles, and the MAB could be seen and all surrounding terrain was clearly visible. This was a great selling point for the second generation ISIT because the commanders noted that the picture quality was superior to the other systems they had seen. They could clearly see the shore activity, the bridge with its load, and the far bank action. The water was clearly visible, and the camera could have been used to assist in the location of a soldier if one had fallen off the bridge. This added safety factor was yet another application of the system.

Brigade and battalion commanders at Fort Hood became very interested in the small camera and suggested many applications. They were also especially pleased that the camera would pick up infrared illuminated targets or training areas. (The camera picks up infrared as well as visible light.) The interest generated by the exceptional performance of the camera was the basis for a request for three prototype man-portable systems to be purchased. Each system includes a camera, video tape recorder, battery belt for field operation, tripod, an assortment of lens ranging from 50-mm f.95 up to 700-mm f.8, a playback monitor, a 110-volt, 60-cycle power supply for classroom use, a 12-volt vehicle battery connector for access to vehicle battery power, and carrying cases for each system. The system may be used in a man-portable mode weighing less than 35 pounds, a vehicle mode, or at a site where 110-volt, 60-cycle AC power is available. The user has a lens selection that will give him the versatility in range required to best suit his application. The cameras have built-in microphones which enable the user to talk onto the finished video tape to further document the action or provide notes for the critique.

The systems have been placed in the hands of individual soldiers through the Training Aid Support Center (TASC) at Fort Hood, to determine performance as a training aid Exposure to constant field utilization and operator changeover will support an assessment of the reliability of the cameras. Utilization will be documented by TCATA to identify the most productive applications of the system as an aid to night training. Upon conclusion of the performance and reliability tests, a report will be forwarded to TRADOC.

MAJ PATRICK H. ORELL was commissioned in the Signal Corps upon graduation from the Junior College Division of New Mexico Military Institute in 1965, and received his BS degree in radio/television production in 1971. He has served as assistant S-1, corps radio officer in Vietnam, battalion communications officer, and assistant S-3 in various Signal units. Major Orell is presently attending C&GSC. Following his attendance at the staff college, he will pursue a masters degree in mass media techniques at the University of Wisconsin.

Kasserine Pass



by Henry E. Gardner

Thirty-six years have passed since the series of engagements took place in central Tunisia which became known as "The Battle of Kasserine Pass." The war then had long years to go in Europe before the Italian campaign and the invasion of France and Germany finally brought victory to the allied armies.

Despite the numerous major engagements of the United States armies after February of 1943, most adult Americans, if asked to name a battle involving American troops in North Africa, unhesitatingly mention Kasserine. The reason is that initially it was highly publicized as an American defeat, which it was, and subsequently as an American victory, which it was, but only in a very limited sense.

While the events surrounding the fighting that focused on Kasserine were still fresh in mind, I wrote an article which was published in the *Armored Cavalry Journal* in the March-April issue of 1948, entitled "We Fought at Kasserine."

Turning back to the article after more than 30 years, I find this comment in the introduction:

"I have never felt that the credit for the success in halting the German offensive at Kasserine has been properly shared. The main force of that attack, once the Pass was captured, was launched in the direction of Thala, with the apparent plan of heading from there for Le Kef and thereby getting around behind elements of the British First Army. That attack was stopped by the British, assisted by a small American force. The attack in the direction of Tebessa, which an all-American command defeated, was not the enemy's principal effort.

"In my opinion, what really caused the Germans to pull back through the Pass, once they found their way blocked, was not the pressure we put on them but the realization that the Eighth Army was about to resume its drive and the holding of Kasserine was of no particular value to them. They had accomplished their mission by throwing us off balance in our attempt to drive through to the coast and had prolonged the eventual showdown in Tunisia by several months.

"However, the fact that the Germans withdrew and were not driven back through the Pass in no way discredits the fight that we put up. American forces slowed Rommel's advance across the country leading to the Pass and stopped one prong of his offensive after he broke through."

Since the date of my article, a number of stories and several books have been written about this operation or contained references to it. The most authoritative of these from those involved are *The Rommel Papers* and *Armor Command* by Paul McDonald Robinett who commanded Combat Command B (CCB) throughout the Kasserine operation.

From *The Rommel Papers* and my 1948 article one can follow certain engagements around Kasserine as they were seen from the opposing sides. I hasten to add that about the only similarities that I can claim to Rommel is that I was also a member of an armored force and we were in the same general area in Africa at the same time for the space of a few days.

Here, in his own words, is Rommel's description of the opening phase of the Kasserine battle.

"On the 14th February, the 21st Panzer Division moved forward from its bridgehead at the Faid Pass in an enveloping attack against 1st U.S. Armored Division, which was stationed in the Sidi-bou-Zid area. With the enemy formations pinned down frontally, one armored group advanced round the northern sector deep into the American flank, while another went forward to Sidi-bou-Zid and attacked them in the rear, thus forcing the enemy into an extremely difficult tactical situation. A violent tank battle developed in which the inexperienced Americans were steadily battered down by my tankmen—veterans of hundreds of desert battles—and soon large numbers of Grants, Lees, and Shermans were blazing on the battlefield. The bulk of the American force was destroyed and the remainder fled to the west.

"At this success, I urged the Fifth Army, which was in charge of the operation, to push straight on during the night, keep the enemy on the run and take Sbeitla. Tactical successes must be ruthlessly exploited. A routed enemy who, on the day of his flight, can be rounded up without much effort, may reappear on the morrow restored to his full fighting power.

"However, the 21st Panzer Division did not follow up the retreating Americans until the night of the 16th. On the morning of the 17th February, the division was in position in front of Sbeitla. But the delay had enabled the Americans to organise some sort of a defence and they now fought back skillfully and bitterly."

While it is true that most of the American troops involved in the fighting on February 14th and 15th were relatively inexperienced, their reverses were not due so much to that reason as to the inept handling of these elements by II Corps. The 1st Armored Division, as was the case of other organic units, had been parceled out and scattered about and in some cases were directly commanded down to the company level by Corps.

Fortunately, my tank battalion did not become involved in this fighting in the area of Sidi-bou-Zid. We were a part of CCB and had been off with the French in the Ousseltia Valley until we were rushed down to Sbeitla in a night march on February 15-16. This medium tank battalion was the most experienced tank unit in the Division. Its personnel were also very familiar with the Kasserine-Sbeitla section having been bivouacked in that area for 2 weeks in January during which daily reconaissance had been carried out.

Late in the afternoon of February 16th we moved into a position south of Sbeitla. II Corps was withdrawing, the 1st Armored Division was covering the Corps' withdrawal, and CCB was covering the Division. This meant that the 2nd Battalion of the 13th was to be the last unit in direct contact with the enemy.

The action of 17 February, the same date on which Rommel wrote, "The delay had enabled the Americans to organise some sort of a defence and they now fought back skilfully and bitterly," was recounted in my 1948 article in these paragraphs:

"Shortly before dawn, our liaison officer came to take me back to see the Combat Commander. . . . Our mission remained unchanged except that the order now was to hold Sbeitla until 1100 hours. I was told to be ready to counterattack, if such a move were ordered. The battalion was all in position on my return. I had a conference with the Company C.O.s and a scheme of withdrawal was agreed upon. Our reconnaissance had disclosed that there would be no difficulty in pulling out without going back through Sbeitla.

"It then became a case of just waiting and the morning dragged on without anything happening. . . . Just at noon I counted 35 enemy tanks come rolling over a rise in the ground almost to our direct front, a distance of about 3 miles away. There were others but I didn't have time to count them.

"The tank destroyer battalion soon found things too hot for them and they came streaming back. As the enemy fire began to land around us, I ordered the battalion mortar and assault gun platoons which had been immediately behind the tanks to take up a position further to the rear. The field artillery battalion that was also in our general area was ordered to displace and took off for a new position.

"Our boys, with the exception of one platoon of the right company which, of necessity, was sitting out in the open, were in excellent positions to meet the attack without disclosing their positions until they fired. There was a series of small wadis running at right angles to the direction of the enemy's approach and our tanks were so favorably located and their camouflage so effective that they were difficult to detect until you were right on them.

"We held our fire until sure it would be effective and then let the tanks that were in view have it in what amounted to almost a volley. It stopped the attack cold and the enemy was obviously very much surprised to find that they had run into some organized resistance. . . .

"We had the advantage of being on the defensive and well defiladed from the front. However, this advantage began to diminish rapidly as the enemy, which was in great strength, began to locate our tanks and work up to them. Losses started to occur and the center company which was somewhat out in front was forced to pull back slightly in order to keep from being cut off.

"As things became increasingly warmer, I advised CCB that we would soon be in serious trouble if we were not allowed to displace. Word came back that we would have to hold until the infantry battalion on the hill mass to our right was withdrawn. Fortunately, we were informed soon after that a route had been found to take the infantry out which would permit us to commence our withdrawal as we saw fit."

The events of the next few hours are deeply burned in my memory. Before detailing them, let me describe one of the procedures which was adopted automatically when we went into combat. I rode in my own tank with the forward elements of the battalion and joined in the fighting. My link with the combat command was through my executive officer who stayed in the battalion command half track somewhat to the rear. He could communicate with me and monitor the traffic between my tank and the rest of the battalion. This relieved me from having to keep headquarters informed as to our position and left me free to direct and participate in the fighting of the battalion.

Word that we could commence to withdraw came none too soon. Enemy tanks taking advantage of the broken terrain, had worked up close to our tanks. The initial advantage of surprise and concealment which we had enjoyed was gone. We were receiving no support from any other unit. Since we were outnumbered by an aggressive battle-wise force, the fact that we were on the defensive was rapidly becoming of little advantage.

I ordered the other headquarters tank to move to a designated point about a mile to the rear. "E" Company was then directed to displace and form on that tank in a delaying position until the other two companies passed through. Once the last "E" Company tank had pulled out, I followed in mine. This took us over a rough trail which for a short distance ran at right angles to the axis of the enemy attack but behind "D" and "F" Companies which were continuing to fire at the attacking tanks.

As we entered a wadi just beyond the left flank of our front and turned away from the direction in which the enemy was advancing, I spotted a German tank at about 300 yards. My gunner rapidly got off a round at this tank. It fired an instant later, the shell breaking our right track and bringing us to a halt. We were hit immediately a second time and our tank burst into flames. Three of us bailed out through the turret and started to run but came under machinegun fire from the enemy. As we started to crawl over to secure the protection of our tank, I heard a cry from the assistant driver who had gotten out through the escape hatch. He was wounded in a leg and unable to walk. The driver had been killed. Using our burning tank as a shield, I worked back to him and got him on his feet. Using me as a crutch, we made it around a turn in the wadi and were momentarily out of danger. There we joined several men from knocked out tanks and one of our "E" Company tanks. The tank sergeant offered to take my wounded driver on his tank. But before loading him on it, I climbed out of the wadi to look around. As I came up on the level, I found myself looking into the eyes of commander of a German tank which was about 10 yards distant.

I ducked back into the wadi and told the tank sergeant that there was an enemy tank just above him. I directed that he make a run for it but to swing his turret around, elevate his gun, and be prepared to fire the moment the German tank came into view. The enemy tank could of course hear ours and it got off the first round which tore away one of the turret hatches. A second shell hit it in the engine compartment bringing it to a standstill. The crew jumped out and scattered.

Things were happening awfully fast and I knew that if the rest of us were going to escape being killed or captured we could not remain where we were.

This wadi we were in had many small gullies leading into it. We started to move up the main wadi when a German tank came into view behind us and opened up with its machinegun. We scattered and I ran up one of the draws leading into the wadi. It was a shallow one and I had only gone a short distance when I came up on the level of the surrounding countryside. I couldn't go back because German tanks were rumbling up the wadi and I couldn't go any further forward because I would have been completely in the open.

There was a small sagebrush-like plant not more than 18 inches high just beyond the end of the gully. I flopped down behind it facing in the direction of the enemy. I had hardly caught my breath when a German tank waddled out of the wadi and headed straight in my direction. I thought I would have to get up to keep from being crushed and was wondering whether to run for it again when it changed course slightly and passed within 20 yards of me. As it veered away from me, I kept my face buried in the bush and pivoted in such a way so that if the commander had looked in my direction he would not have been able to see any more of me than the lower part of my body. Two other enemy tanks followed. Fortunately, however, their commanders were intent in observing ahead and were staying well down because our artillery was now shelling their advance—and, incidentally, me.

Shortly after the last tank passed by, a desert Volkswagen appeared with a driver and two men in it. The top and windshield were down. One of the men stood up and looked long and intently in the direction of his tanks. I glanced to the rear and saw a line of infantry approaching. They were looking for persons like myself, so I dashed back into the main wadi, raced across it, and took off into the broken country beyond.

In all probability the man whom I saw stand up in the Volkswagen was a battalion or task force commander. However, having since learned that Rommel was in that area at the time, I have been intrigued by the possibility that the man silhouetted against the late afternoon sky might have been he.

In my previous article, I sketched my experience of the next 24 hours. For the purpose of continuity in this article, it is sufficient to say that I later rejoined my battalion which had been placed to defend another pass further to the west and learned that in the course of our withdrawal my battalion had lost 10 tanks.

To return to the account of the battle in *The Rommel Papers*, the German Field Marshal wrote:

"In the belief that the Allies were weaker at Kasserine than at Sbiba, I decided to focus the weight of our attack in the Kasserine sector and bring up the 10th Panzer Division.

"At 07.00 hours on the 20th of February, I drove to Afrika Korps H.Q. in Kasserine, where I met General von Broich, commander of the 10th Panzer Division. Unfortunately, he had brought only half his force, von Arnim having held back part of it in the north for his own purposes. The division's motorcycle battalion was already on the move and I passed it on the way.

"All Menton's attacks had been brought to a halt by extremely well-placed American artillery and mortar fire from the hills. Now 10th Panzer Division's motorcycle battalion was to join in the battle. Unfortunately, we heard and saw nothing of it for almost the whole of the morning. When I inquired from von Broich what all the delay was, he told me that he had detailed a different unit for the assault, as he wanted to reserve the motorcycle battalion for the pursuit. The assault unit was still on its way up to the front. Once again valuable time was being squandered. I was extremely angry and ordered the commanders to take themselves closer to the front where they could get a proper view of the situation. I had the motorcyclists brought forward immediately, for the Americans were growing stronger every hour and our position consequently more difficult.

"From midday onwards the attack was resumed in fierce hand-to-hand fighting. . . . "Finally, at about 17.00 hours, the pass was at last in our hands. The Americans had fought extremely well and Menton's losses had been considerable.

"During the night of the 20th, however, our columns moved on from Kasserine, northwards along the Kasserine-Thala road and westwards toward Tebessa. The enemy had withdrawn."

The Pass was captured, it will be noted, on February 20th. To help counter this advance, CCB was ordered that same day back over the route on which it had come through the Kasserine Pass on the night of February 17th-18th. Its mission was to drive the enemy out of the Pass and restore the situation. My battalion again became the advance element of our force.

Taking up the story as seen from our side of the line, in my previous article I wrote:

"With light of the next morning, February 21, we found we were right out in the flat. The open country extended to our front in the direction of the Pass and for miles to our left. We were close to the lower hills of a range of mountains on our right, which ran down to and formed the west shoulder of the Pass. A series of hills were to our rear. . . .

"Just as we were becoming aware of our extremely exposed position, some friendly tanks appeared, coming from the direction of the Pass. They were the survivors of a company of the Regiment's third battalion, which had been with the force assigned to defend the Pass. . . . They were followed almost immediately by elements of our reconnaissance company which had preceded us on the move the day before. Two platoons during the night had gone to within 3 miles of the Pass where they had gotten involved in some crossfire before pulling back. The tank company commander. . .told us there were no friendly troops that he knew of between us and the Pass and that he had crossed several large wadis running at right angles to the road which came down from the hills on our right.

"No time was lost in moving forward and the tanks took up positions in a wadi which was just about perfect for depth, while our assault guns and mortars set up in a cactus patch to our right on the edge of the hills. We were joined there by our forward observer of a few days before, who, at that time, had been madder than we were that he couldn't get any missions fired. Everything was fine this time and he proceeded

promptly to register in.

"I was just on the point of sending out some battalion reconaissance to locate the position of the next wadi when a column of trucks appeared to our front, halted a few miles distant, and men began to unload, while some other vehicles, presumably tanks, continued in our direction. They were within range of the artillery which opened fire, causing the trucks to withdraw and the personnel to scatter. . . . The battalion took the tanks under fire when they came within range and, while they replied, they didn't press their attack and sought cover in some intervening broken ground.

"Reports came in to us of enemy infiltration along the ridges to our right and that our infantry had been sent forward to stop them. With no other instructions than to continue our mission, we pulled back a couple of miles that night to resupply.

"As it began to grow light enough to see, we started forward to our wadi of the day before but, on approaching it, found that it had another tenant who was in no mood to share it. However, the conditions were not completely reversed from the day before since we soon discovered that the enemy's antitank guns were not knocking out any of our tanks. Furthermore, we seemed to be gradually silencing some of their fire. Our mortar platoon laid down a smoke screen enabling one tank company to edge into a wadi from which a platoon was able to work around to the head of the one from which most of the enemy fire was coming.

"Late in the afternoon a surprising number of enemy wheeled vehicles suddenly broke cover from our right front and started streaking to the rear. We didn't get all of them but our batting average was pretty good.

"As the light began to fail, the tank company commander, whose platoon had worked forward, reported he had a batch of prisoners. I moved over to his position and climbed out of my tank in time to see one of the most exhilarating sights, so far as I was concerned, up to that point in the campaign. A column of prisoners came marching around a bend in the wadi, with their hands held high, led by one of our tankers with a tommy gun in his hands. In the dusk, it looked like there were a thousand of them but the actual count showed just under three hundred. . . ."

Back to Rommel's report of the happenings of February 21st:

"The enemy's plan now appeared to be to fight delaying actions in new positions and to stay on the defensive. On this assumption, I decided to press on immediately into his rear. At about midday the 10th Panzer Division moved off towards Kalaet Jerda, where they were to cut the road junction and railway and render them unusable. The Afrika Korps' group was to throw back the enemy at El Hamra and take the summit of the pass on the road to Tebessa. The 21st Panzer Division sion was to hold its line. By deploying troops at several danger spots I hoped to split the enemy forces far more than our own. Meanwhile, the Fifth Army was to try to pin down the enemy by frontal attacks in their sector and prevent them from throwing further reinforcements into the southern front.

"Driving back from the 10th Panzer Division in the late afternoon of 21st February, I could see a heavy artillery duel going on in the direction of the Afrika Korps' attack. It looked as though their column had made little progress and this impression was confirmed by the reports which awaited me at H.Q. After some initial success, the division's advance had steadily slowed down in the face of continually stiffening resistance. Unfortunately, it too had kept to the valley bottom and had not simultaneously advanced over the hills on either side in order to reduce the positions in the pass by an attack round their flank. This was the third time this mistake had been made. Here again the right course would have been to have put the main weight of the attack on the hills, bearing in mind, however, that the use of tanks would have been impossible in view of the wooded terrain. The American defence had been very skilfully executed. After allowing the attacking column to move peacefully on up the valley, they had suddenly poured fire on it from three sides, quickly bringing the column to a halt. Buelowius's men had been astounded at the flexibility and accuracy of the American artillery, which had put a great number of our tanks out of action. When they were later forced to withdraw, the American infantry followed up closely and turned the withdrawal into a costly retreat.

"Next morning, the 22nd February, I drove up to Thala again, where I was forced to the conclusion that the enemy had grown too strong for our attack to be maintained.

"Later, at about 13.00 hours, I met Field Marshal Kesselring, who arrived at my H.Q. with Westphal and Seidemann. We agreed that a continuation of the attack towards Le Kef held no prospect of success and decided to break off the offensive by stages.

"Accordingly, the 10th Panzer Division and the Afrika Korps' group were drawn back to Kasserine during the night, where they took up positions north-west of the pass. The 21st Panzer Division (the easterly prong) was to remain at Sbiba for the moment, but was to be prepared to receive orders to mine the road and withdraw.

"Kesselring asked me whether I would like to take over command of the Army Group. Apparently, as a result of the Kasserine offensive, I had ceased to be *persona non grata,* and had become acceptable again, in spite of my defeatism."

Sir Winston Churchill in the fourth volume of his work *The Second World War* has a section devoted to the "Course of the North African Campaign." The following quotations are taken from the section dealing with the Kasserine operation:

"Rommel, promoted to command all the Axis troops in Tunisia, concentrated a striking force of two German armored divisions east of Faid in order to throw back the U.S. II Corps and prevent them from coming down on his flank and rear while he was engaged against the Eighth Army. The attack began on February 14. It had been mistakenly expected that the main blow would come through Fondouk and not Faid. Consequently the 1st U.S. Armored Division, under General Anderson's orders, was much dispersed; only half of it was east of Sbeitla to take the shock. It was overborne and there was much confusion. Sbeitla was taken on the 17th and the next day both Kasserine and Feriana were in German hands.

"Rommel now had a choice: he could advance through the Kasserine Pass on Tebessa, a main centre of communications, with the important airfield of Youks-les-Bains behind it, or strike northward. He struck northward and was met and held by the 1st Guards Brigade and a detachment of the U.S. 9th Division, which Anderson had hastened there. On the Thala road the 21st Panzer Division, which led the attack, encountered our 26th Armored Brigade and two British battalions, together with American infantry and artillery. A fierce fight ensued, but by noon on the 22nd Rommel began a general withdrawal. It was carried out in good order. Kasserine, Sbeitla, and Feriana were all reoccupied by our forces on February 28, and later our original line was reestablished."

Churchill in a letter to King George on February 22nd, 1943 wrote:

"I do not feel seriously disturbed by the course of events in North Africa, either political or even military, although naturally there is much about both aspects which I would rather have different. As to the battle, I suspend judgment till we hear from Alexander. The II American Army Corps sustained a heavy defeat, and apparently was deprived of about half of its important weapons without inflicting any serious loss upon the enemy.

"I need scarcely say that no work of mine is intended in disparagement of the Americans. They are brave but not seasoned troops, who will not hesitate to learn from defeat, and who will improve themselves by suffering until all their strongest martial qualities have come to the front."

The foregoing is an attempt to show how two participants in the Battle of Kasserine saw this particular series of actions from opposite sides. Such a comparison naturally suffers from the extreme disparity in our positions, knowledge of the situation, and responsibilities. However, one similarity does exist. Both of us were putting down our observations at approximately the time the scenes unfolded. My article of 1948 was based on diaries that I kept and letters that I wrote within days of the action.

There is no disputing the fact that II Corps took a shellacking at the hands of the Axis forces in the earlier phases of the Kasserine operation and that the 1st Armored Division and attached troops suffered heavily in this reverse. The Division reinforced with infantry was committed in the defense of Faid Pass, Corps making the decisions as to defensive arrangements. The Americans were defeated far in front of and in the pass suffering heavy losses in both areas.

As the Germans attempted to exploit this victory by a two-pronged drive, they were stopped by a combined British and American force on the road to Thala. In their drive toward Tebessa they were slowed and then turned back by an all-American force. Rommel, after failing to take the Djbel El Hamra Pass, realized that he could not press on any further and made an orderly withdrawal through Kasserine Pass pursued only by the United States Air Force and moved back to those positions his forces had occupied before they attacked II Corps on February 14.

His gamble was destined to make the last time the Germans held the initiative in Africa. From then on the end was inevitable, although the fighting became even more severe. A few men, moved in time, had plugged critical holes and prevented him from reaching any of his major objectives. Now it was time for the Allies to regroup and reorganize and turn on their foes.

Tunisia was the testing ground of men and tactics. It was the beginning of the long, costly, agonizing process of the amalgamation of men and weapons into an invincible army. It was there that we began to fashion the key which would eventually unlock Fortress Europe.

HENRY E. GARDNER was commissioned in 1940 in the Illinois National Guard. Called to active duty in December of 1940, he served overseas with the 1st Armored Div, rising to battalion commander and regimental XO, and was discharged as a Colonel in 1945. He was employed by Anaconda Company in Chile and Washington, retiring as a vice-president in 1971. He currently resides in Bozeman, Mont.

Red Thrust

by Captain George E. Raymond Jr.

The active defense has been around for a long time and the concept has been tested in its various forms throughout the history of armed conflict. Primary changes which have occurred are the intensity of the action with respect to modern technology and the mobility of the opposing forces. In the past, movement on the battlefield was relatively slow, proportional to who was there first with the most.

In today's terms, this is still a valid factor. Modern technology and the mobility of the combatants have increased and these factors have become so critical that success or failure in war is largely determined in the first confrontation.

The science and mechanics of this first battle are very popular considerations and drive most all of our training. At the top these considerations are computerized and spoken of in terms not always understood at the bottom. Target servicing time, target windows, maximum direct-fire range, combined arms operations, mobility logistics, mental and physical strength; all of these factors become fuzzy when translated at the bottom.

However, there is a training exercise which clears the air and is probably the best single test of the active defense ever offered. The exercise, known as "Red Thrust," will not only humble and shock you but will drive home every weakness and strength you have in your system.

On a recent trip to Fort Irwin, Cal., Troop D, 10th Cavalry conducted a "Red Thrust" exercise for elements of the 194th Armored Brigade. Nineteen combat platoons of armor and mechanized infantry participated in the exercise. They were given the mission of conducting an active defense against elements of a motorized rifle battalion. An engineer battalion with earth moving equipment assisted them in preparing their battle positions. Troop D, 10th Cavalry, consisting of 22 APCs and nine *M-48A5* tanks, was organized into two reinforced motorized rifle companies.

Each APC was equipped with a plywood turret, plastic 76-mm gun, and a *Sagger* launch rail with missile. All *M-48A5s* were equipped with Hoffman tank gun simulators and specially designed smoke racks. These racks were made of angle iron and had two 55-gallon drums attached to them to simulate a Soviet *T-62* or *T-55.* Half of one end of a 55-gallon drum was cut out and a 30 pound smoke pot was placed inside. The smoke pot was fired electrically by the crew commander during the assault. All crews were equipped with blanks, colored smoke grenades, and hand grenade simulators.

The friendly platoon dug into the desert floor as the artillery FIST team and engineers assisted them in preparation for the Threat attack. At the appointed time the enemy battalion moved to the attack, supported by massed artillery and close air support. Nine kilometers from the friendly position the enemy battalion moved from a double march column to a line formation, *T-62s* in the front followed by *BMPs* and *BRDMs* moving at 15 to 20 kilometers per hour laying a smoke screen.

The friendly platoon leader was knocked to his knees by an explosion caused by prepositioned TNT and demolition cord under the hull and in the track of the tank next to his, and then triggered electrically by a controller. At a range of 2,500 meters the *T-62s* began firing in mass at the U.S. tanks in dug-in position. Individual tanks and APCs who had fired more than three times from the same position started receiving mass direct fire from the *T-62s* and *Saggers* mounted on the *BRDMs*.

As the range continued to close and the artillery fire kept falling in and around the friendly elements, hundreds of pounds of C4 and demolition cord exploded on cue and smoke pots obscured all vision. The Realtrain devices signaled kills on *T-62s*, green smoke indicated destruction. Jamming blocked all frequencies and CS gas stung the eyes of the friendly crews.

Far above, on a hill overlooking the scene, various commanders watched the final part develop. The Red Force, now smaller in number but continuing to move and fire, closed with the friendly platoon. Smoke, CS gas, and dust from the explosions soon hid the point blank fighting.

However, the rather dramatic exercise ended on a happy note. After the forces virtually closed to within meters of each other in what would have become a very messy situation, the exercise was halted. The two forces were aligned opposite each other and critiques began. Observations were made by the leader, controllers, and the commander of the Red Force. All of the teaching points were highlighted and the men with gaunt and dirty faces nodded in agreement with lessons learned. There were no casualities, no dead men, and no destroyed vehicles. They were all winners. The look on the faces of the soldiers gave the indication that they had learned, in the most basic terms, the following lessons which will stay with them for some time:

- Use time to its maximum advantage.
- Dig in and camouflage properly.
- Know the enemy's tactics and capabilities.
- Make every round count, shoot to kill, and at long ranges.
- Know your equipment; operate it in smoke, gas, and under other extreme conditions.
- Never fire more than twice from the same position.
- When moving, move fast, with decision, and stay covered and concealed.
- When the enemy closes to within 1,500 meters of your position you had better begin to move.
- Learn to use and work with your brothers in the infantry, artillery, and engineers.
- Think, develop plans, and organize.

These lessons were repeated 19 times as each platoon went through the exercise. If one or more were violated, the outcome was the same. The defenders were overwhelmed by the mass and momentum of the opposing force. Underestimating the speed of the battle, waiting too long to move, and not using their assets properly were some of the prime weaknesses noticed.

One commander remarked, "I never realized what a fine science this has to be. It has to be right the first time. This is the best exercise of the active defense at platoon level I've ever seen." Then before the controller released the friendly platoon, one young soldier looked out across the desert horizon in disbelief as the third echelon of the attack closed to within striking distance.

Red Thrust training support material is prepackaged and sent to requesting units from Fort Hood, Tex. Not only is the material informative and well prepared, but officers and NCOs from the Red Thrust committee will help prepare the training and give advice when needed. These gentlemen contributed significantly to the development of the 194th Armored Brigade Red Thrust exercise at Fort Irwin, Cal. The program has built-in flexibility and can be as difficult or easy as one wants to make it. Creativity in developing the exercise can play a large part in the amount of realism desired.

Troop D, 10th Cavalry, with the assistance of the 19th Engineer Battalion, used over a ton of explosives and hundreds of canisters of smoke and CS to add realism. Modification kits for APCs and tanks were made by TASO at Fort Knox and shipped to California. Threat tactics were easy to learn, and it took only a small amount of time to drill the Red Force unit. Uniforms with special insignia are available, as are vehicle markings, a special language, and even identification kits for troopers. Finally, the real beauty of the program lies in the fact that it is easy to do anywhere in the world, and the leadership involved can design the basic exercise any way they want to.

During a Red Thrust exercise, both troops and leaders undergo a profound learning experience. Lessons, dramatically highlighted, can become the cornerstone of a small-unit training program. Proper use of available time for example had more impact than anyone had imagined. The engineer support had barely enough time to dig primary positions, causing proper use of available terrain to become a critical factor.

The single most prominent weakness noticed during the exercise was that most platoons remained in position too long—sacrificing the mobility needed to continue the active defense. It is very easy to become decisively engaged with a superior force moving rapidly behind massed direct fires.

The result, vividly illustrated, is a platoon overrun before it can move to alternate or supplementary positions. Everyone concerned with the Red Thrust exercise will tell you that the mechanics of the active defense must be practiced diligently at the lowest level—and that time is a resource not to be wasted.

CAPTAIN GEORGE E. RAYMOND, JR., was commissioned in Armor through the ROTC program at North Carolina State at Raleigh, where he received a BS in Chemistry. After completing Armor Officer Basic and Motor Officer Courses, he served as platoon leader and assistant S3 with 2d Sqdn, 11th Armored Cav. Regt. After graduating from the Armor Officer Advanced Course in 1978, he commanded several companies of the 194th Armored Bde, and is currently the Headquarters Commandant.

ATTACK HELICOPTER OPERATIONS

Presented at the 1979 Armor Conference

by Lieutenant Colonel John R. McQuestion

The attack helicopter is a highly maneuverable, sophisticated, responsive, and extremely lethal member of the Combined Arms Team. Properly employed, the attack helicopter teams can defeat large formations of enemy armor and mechanized vehicles at ranges in excess of 3,000 meters, thereby providing major unit commanders with a destructive antiarmor capability heretofore unknown on the mid-to-high-intensity battlefield.

Attack helicopters organized into teams, companies, and battalions are maneuver units plain and simple. The direct support and general support relationships of lift battalions and *Chinook* battalions do *not* apply to the attack battalion. We fire and maneuver, and we can dominate terrain. It is imperative that units such as ours maintain an operational control (OPCON) relationship to the commanders of the forward committed brigades as a full partner in the Combined Arms Team.

Attack units must be included in the ground tactical plan. It has been my experience, working with some of the most combat-ready armored and mechanized infantry brigades in Europe, that their total planning regarding the employment of attack helicopter is to include in their operation order (OPORD) the simple statement, "Plan for the use of attack helicopters."

When the battle begins, commanders will have a number of problems that must be solved simultaneously. The time to plan for attack helicopter employment is now, while you are drafting operation plans (OPLANS) and OPORDS, not when the first armored columns begin their attack on your positions.

We are attack oriented against an enemy on the move. Simply speaking, we cannot dig tanks out of trees. That is a mission better suited to tac air, artillery, or infantry.

A word about unit integrity. I would rather give you my entire attack battalion than place a single team under your operational control. Doctrine for the employment of attack helicopters is clear on this point. "The smallest element which should be placed OPCON to a brigade is the company." In many cases the battalion (-) may be required, or even the entire battalion. The underlying principal to remember here is that the true strength of the attack helicopter is the ability to rapidly mass firepower which can defeat large armor formations on the move. Guard carefully against piecemealing your attack units, thus reducing their value to you when the "big kill" presents itself.

During REFORGER '78 we found that the best way, perhaps the only way, to get into the battle, is to maintain direct coordination with the ground commander. He is the best able to provide the most up-to-date information concerning location of friendly and enemy units and the current tactical situations. Whenever possible, I require my *battle team captains* (team leaders) to coordinate with forward committed battalion commanders personally. This is not to say that we are never OPCON at any lower than brigade level, but that vital coordination which must take place can best be effected at that level. If the tactical situation is fluid, contact will be made over command nets. Failure to effect direct coordination with the forward elements can, and probably will, result in overflight of enemy positions and unacceptable losses to attack helicopter elements.

We are not gunships! The low intensity battlefield will not be addressed here. The experiences which most of us recall from Vietnam relating to the use of "gunships" must be relegated to the past when discussing the employment of "attack" helicopters. The tactics are different, the enemy is different, the aircraft are different, and the environment will be totally different.

No more driving runs with rockets and machineguns blazing away. These have been replaced with antiarmor aircraft operating in essentially the same combat environment as the tank or APC. We will use nap-of-the-earth (NOE) flight techniques to maneuver into battle positions from which enemy armor formations can be effectively engaged.

Offensive operations involving attack helicopters are very similar to ground operations in that attack assets must tailor their movements to the terrain, use suppressive fire, and must know the enemy. Then by operating in a terrain flight environment and engaging enemy targets at maximum ranges, from concealed positions, the attack helicopter can maximize its capabilities and drastically minimize its own vulnerability.

During movement to contact operations, the attack units can be held as a responsive reserve to reinforce advancing ground units. Attack units will advance in bounds 5 to 10 kilometers behind frontline units once an area has been cleared.

Obviously the attack helicopter unit is least effective when attacking strong defensive positions. We cannot secure and hold terrain. We must attack enemy armor formations on the move to insure the best possible combat results.

During the exploitation and pursuit the attack company orients not on the terrain, but on the enemy, in order to inflict maximum destruction and disrupt efforts to reorganize a defense. Ideally attack helicopter units are used in the encircling force. They attack the main body elements, but *avoid* and do not become engaged with the enemy rear guard.

During covering force operations, keep in mind the principal I mentioned earlier, "Employ attack helicopters as far forward as possible." Ideally the attack helicopter unit will be working in close harmony with the forward air and ground cavalry elements who may already be developing the tactical situation. Once coordination has been effected with the covering force commander, attack teams move from assembly areas to holding areas or laager sites. Team leaders receive target information from cavalry elements and forward battalion commanders. Once this is done, and target situations develop, the team leader deploys his team to attack positions from which enemy formations can be engaged. The role of the *OH-58* scout aircraft is critical at this point since he must visually acquire the target and pass the necessary information to the *Cobras*. Only then should the attack helicopter unmask and launch a missile. During REFORGER '78, we had a definite problem with this technique since the *Cobras* are equipped with 13-power telescopic sight systems and the scouts are not. Couple this limitation with reduced visibility due to weather and the situation arises wherein *Cobras* are creeping forward to look for targets. This of course increases the likelihood of the *Cobras* being acquired as targets by enemy air defense systems. Our training must insist upon the scout being the primary target acquisition aircraft. The *Cobra* must not be employed in this mode if it is to be preserved for its mission as an antiarmor weapon.

". . .the true strength of the attack helicopter is the ability to rapidly mass firepower . . . ."

The covering force operation is perfectly complimentary to the firepower and maneuverability of the attack helicopter. The fluidity of such operations lends itself well to a flexible and responsive weapons system capable of defeating enemy armor columns at maximum stand-off range.

We are not so naive as to believe that conditions on the battlefield will always be such that our aviators will be able to pick off enemy tanks at their leisure from their secret little "hidey-holes" 3,750 meters away. Smoke, rain, fog, and confusion are all conditions that will present themselves on a frequent, if not a continual basis. The "short shot," or any missile firing less than 2,000 meters, is a capability of the system. However, whether or not the attack helicopter should be there in the first place is a trade-off decision which can only be made by the forward brigade or division commander based upon the tactical situation and the recommendation of his attack helicopter commander.

The attack helicopter battalion fights the same in the main battle area (MBA) as in the covering force area (CFA) when they are employed as integral parts of the Combined Arms Team. As an alternative, the attack battalion can be held as a reserve and committed as an independent force against an enemy who has either bypassed or penetrated the MBA. Regarding the penetration—once the limits and flanks of the penetration have been identified and coordination with ground elements has taken place, the attack battalion can then attack the penetrating force.

One experience that we had during REFORGER involved the setting up of an armor killing zone created when the 1st Brigade, 5th Mech Division allowed elements of an enemy *panzer* brigade to pass through. An obstacle lake had been created astride their avenue of approach with attack helicopter teams in position on the flanks. It was well coordinated and except for the fact that the *panzer* units would not acknowledge the artificial lake in spite of what the umpire said, we were still able to engage and got credit for numerous *Leopard* tanks and other mechanized vehicles during the battle.

I mentioned that the attack helicopter was sophisticated and lethal. That is true, but it would be hard to imagine a piece of equipment that requires more logistical backup than the attack helicopter. The huge amounts of fuel and ammunition must be kept moving forward if the *Cobras* are to have a mission on the battlefield. The main areas of concern are class III and V supplies.

". . .it would be hard to imagine a piece of equipment that requires more logistical backup . . . ."

Each attack company can set up two forward arming and refueling points (FAARP) to replenish their *Cobras* and scouts. Usually they are 17-25 kilometers behind the forward edge of the battle area, but could be employed even farther forward if necessary. Obviously this amount of fuel requires a means of getting it forward. A dual supply system to provide some flexibility during combat operations is recommended. The first of these methods is the 5,000-gallon tanker. If each company has three tankers they can move fuel forward to FAARPS or if the tactical situation doesn't permit, establish a forward support base (FSB), somewhere to the rear of the operational area. The other method uses *CH-47 Chinooks*. They can resupply forward fuel sites with 500-gallon fuel bladders when tankers are not able to move forward. The two systems are compatible and, to a great degree, mutually supporting.

Ammunition resupply presents much the same type of logistical problem. The large quantities of various types of ammunition require a continuous flow to keep the *Cobras* firing. The need for at least three 5-ton tractor trucks with trailers is anticipated to provide us with a ground resupply capability along with the *Chinooks* to give us the flexibility and maneuverability so necessary on the modern battlefield. The attack battalion does not have *Chinooks* organic to its structure, therefore, a company of *CH-47s* would be required in direct support to keep the attack battalion's teams and companies resupplied.

At this point it would be useful to discuss some of the limitations of attack helicopters, for which you, as commanders, should have an appreciation.

Weather. Aviators have probably been the brunt of more jokes about the weather than anything else. Using NOE techniques, attack helicopters will be able to fly under most weather conditions. If we stay clear of the clouds and have at least ½ mile of visibility, we can launch the attack teams. Obviously if we only have ½ mile visibility we are not going to be able to engage targets at greater distances. If you commit *Cobras* to fight under marginal weather conditions it stands to reason that you are going to lose more aircraft and crews than would otherwise be the case. One technique used with success during REFORGER was to launch the teams from their assembly areas just as soon as conditions began to improve. They would then fly NOE to a holding area or laager site, in the vicinity of the forward battalions' defensive positions, where they would wait for weather conditions to improve enough to acquire targets at reasonable standoff ranges. If the weather didn't improve, the team could always fly NOE back to their assembly area. Other advantages of laagering forward and shutting down engines, is that eyeball-to-eyeball coordination can be effected with the battle captain, while the aircraft are conserving fuel and waiting for the situation to improve. Additionally, a scout aircraft can be launched to reconnoiter the area for suitable battle positions and armored kill zones.

"...operations requiring helicopters at night must include plans for illumination ...."

Night flight. The *OH-58* scout and *AH-1 Cobra* are proven night flight aircraft, however, neither aircraft is presently capable of acquiring targets at night without artificial illumination of some type. Therefore, operations requiring helicopters at night must include plans for illumination by mortar or artillery fire. In the not-too-distant future we will have our own night illumination capability with the 2.75-inch rocket system. The illumination rocket has been fielded for testing and should be available soon.

Time in the battle. This is probably our biggest limitation in the employment of attack helicopters. The maximum flight time for the *TOW Cobra* is approximately 2 hours and 20 minutes. NOE flight consumes larger amounts of fuel than other flight modes, so planning becomes even more critical. The one-third rule of one team on station, one team enroute, and one team refueling and rearming will solve many of the station-time problems by providing a continuous overlap of attack helicopter firepower. There are other times when the one-third rule may be impractical. Let us assume that a large formation is being engaged and the commander decides to "surge" his attack helicopter company, to get all available attack helicopters into the battle area simultaneously. The problem is obvious—If they are committed too soon they may have to leave the battle station just as they are needed. Once again the need for planning in the timely commitment of your attack helicopter units cannot be overemphasized. Laagering forward and shutting down, if the tactical situation permits, can significantly increase the responsiveness of attack teams.

"A rule of thumb to keep in mind is a 12-hour maximum crew duty/flight hour day."

Crew fatigue. Everyone remembers the tremendous flying record that our helicopters achieved in Vietnam where 15-hour days were not unusual. However, in Vietnam, we did not fly NOE, which is extremely fatiguing. A rule of thumb to keep in mind is a 12-hour maximum crew duty/flight hour day. As the flight day grows longer the vulnerability of the crew to accidents increases. The tactical situation must be the ultimate discriminator, but keep in mind the physical requirements of those aircrews—it will pay the commander dividends on the battlefield. The *OH-58* aeroscout is critical to the successful employment of the attack helicopter. The scouts conduct preoperation reconnaissance of attack routes, holding areas, and battle positions. The battle captain is the attack platoon leader and will normally control the operation of his team from the scout aircraft. The scouts also receive target handoffs from cavalry or ground units, locate targets, and place the attack helicopters in their battle positions. Since the scout helicopter is not armed, it makes effective use of terrain to shield its movements. During the battle, scout aircraft provide local security for the *Cobras* and coordinate any supporting fires such as artillery or Air Force tactical aircraft. Since the *OH-58* has fuel endurance in excess of 3 hours, he can provide continuous coverage and coordination until the replacing attack team is oriented to the battle. The battle captain has a tremendous job to do and must rely heavily upon his section leaders, who are normally located in the other scout aircraft of the attack team. The most serious limitation of the scout aircraft currently in the inventory is considered to be its lack of a telescopic sight system with which to acquire targets. Hopefully, the advanced scout helicopter presently on the drawing boards will alleviate the shortcoming.

The AH-1 TOW Cobra. This discussion of attack helicopter employment centers on the anti-armor capability, and other weaponry of the *AH-1 TOW Cobra.* A brief rundown of its weapon capability may serve to bring everything else into perspective.

Ordnance	**Range**
8 TOW missiles	3,750 meters
750 rounds 20-mm	2,000 meters
28 2.75-in FFAR	Less than 1,600 to 5,000+
4,000 rounds 7.62-mm	1,000+ meters

We have a truly potent weapons system which, if employed properly, can provide the commander with tank kill ratios in excess of 12:1. •

SOVIET ATTACK HELICOPTER

BY CAPTAIN ROBERT M. JOHNSON

(The data and opinions expressed in this article are those of the author and publication in no way implies endorsement by the Department of Defense. Editor)

With the ever-increasing military equipment competition between the Soviets and the NATO forces, professional soldiers are constantly searching for all the available information on every piece of equipment in the Soviet Army's inventory. One Soviet vehicle recently developed and deployed is the Soviet *MI-24-A* attack helicopter, better known as the *Hind-A*.

In this article, I will not only discuss the *Hind-A* itself, but also the current Soviet view of tactical employment of the attack helicopter and future development of the aircraft in various support roles.

With further developments of Soviet tactics, this aircraft will play an important role in any conflict on a modern battlefield.

Armament

The *Hind-A* mounts one 12.7-mm machinegun, which is flexibly mounted in the nose of the gunner's compartment. A basic load of 250 rounds is used during approach and takeoff for supportive fire to the landing areas.

Three weapons systems can be mounted in each of the wing stations or hardpoints. These wings act aerodynamically to aid in unloading the main rotor during high-speed flight. They are swept at an incidence of 20 degrees and the angle of dihedral is 16 degrees. The wingtip stations have double rails for the radio command-guided antitank missiles of the *AT-2 Swatter* type. The associated aerial is mounted in the nose of the aircraft. *Sagger* missiles can also be fired utilizing the same rails.

Two inner stations of each wing may accommodate a variety of weapon systems. The most commonly used, however, is the *UB-32* pods, containing 32 *S-5*-type 57-mm, unguided hollow-charge rockets. Five rockets in the center of the pod are possibly used and equipped with fragmentation or chaff dispensing warheads. In view of the electronic equipment installed, it also seems likely that the *AS-7 Kerry* guided missile can be carried.

A variety of other missiles can be used, including the *S-16*, *S-21*, and *S-24*. Gun pods could also be mounted, such as the *GSch* 23-mm twin-cannon pod. Bombs of up to 551.15 pounds may also be employed on the wing.

The *Hind* poses a great antitank threat with considerable firepower when given armament of 4 guided missiles, 128 unguided hollow-charge rockets, and 250 rounds of 12.7 mm.

Assuming a penetration of four times the caliber, the *S-5* rockets can penetrate almost 220 mm of steel plate armor. Effective range of the *S-5* is approximately 1,200 meters. The *AT-2 Swatter's* range is even more superior; out to 3,500 meters.

Tactical Employment

The Soviets have increased their interest in the employment of attack helicopters in recent years. Their development of tactics can closely parallel those of the United States. The basic difference observed in the helicopter itself appears to be the size of the aircraft. U.S. doctrine has concentrated on limiting the size of the aircraft, thereby presenting a smaller target on the battlefield. Our attack helicopters also have been given an almost singular role, that of being a sophisticated weapons platform.

Soviet views differ somewhat in that their technological development has produced a weapons platform capable of carrying a squad of troops, while able to deliver a considerable amount of ordnance. The use of the troops carried on board could possibly be to provide security for the aircraft in the event that it is shot down by hostile fire. Another theory is that the helicopter would be used to airlift troops into rear areas or onto special targets where exposure is high and losses would be significant if using a larger transport aircraft.

On the modern battlefield, the Soviets view helicopter employment as beginning after the enemy main forces are severely disrupted and Soviet units are conducting the exploitation and pursuit. It is reasonable to assume that either attack helicopters or heliborne forces would be used in the pursuit to seize key area installation or to establish blocking positions obstructing the enemy withdrawal or retrograde operation, while the Soviet main forces continue to advance. Upon completion of their mission, these heliborne forces would either link up with the main body or be extracted. Attack helicopters could also be employed to establish ambush positions against an armor threat utilizing the tank killing capabilities of the *Swatter* and *Sagger* missiles.

Soviet employment of attack helicopters is similar to our doctrine in that they fire from selected positions, exposing the aircraft only long enough to fire and track the missile, then return to a masked position or assume a new firing position. Engagement ranges could be as far away as 3,500 meters with an exposure time of approximately 30 seconds.

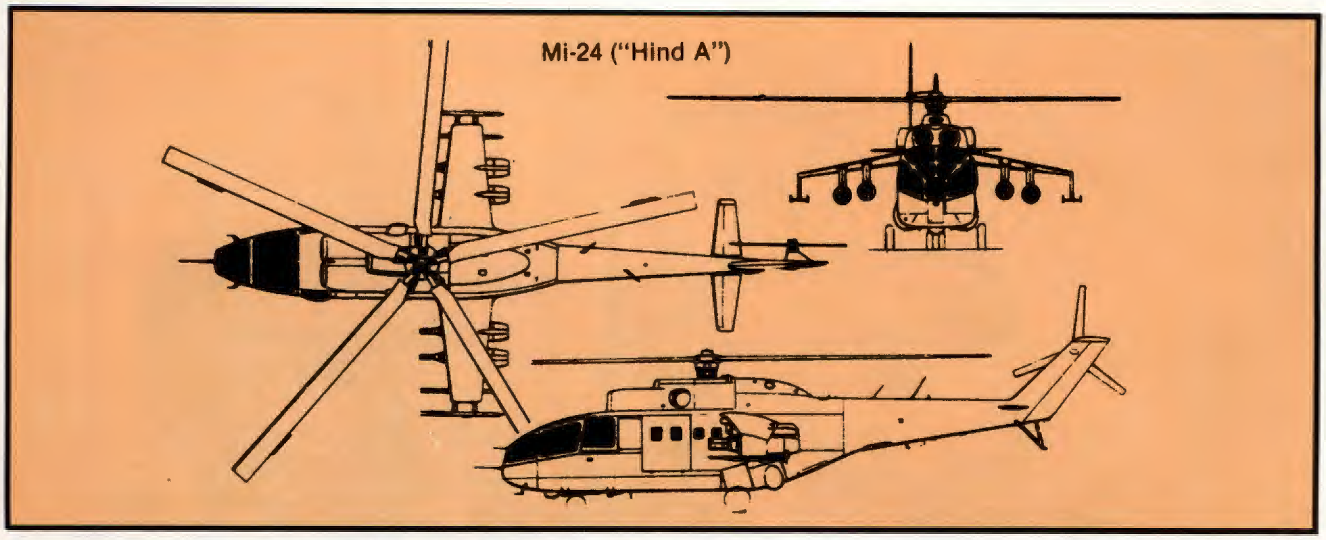
Soviet attack helicopters in the armed escort role would be used when inserting a motorized rifle battalion (MRB) on a bridge site or road junction. The escort would commence with the insertion of the troops and continue through phases of the operation when vehicles, additional ammunition, and supplies are airlifted by heavy-lift helicopters. Prior to initial insertion, the armed helicopter would be used to "clear up the area" for the following forces.

It is interesting to note that the Soviet armed helicopters and helicopters in general are controlled by the front commander. This could severely hamper the responsiveness of the helicopter unit. In an immediate support role, the requests could arrive too late to be of adequate and timely use. Although the Soviets use a modified radio procedure from the one we are used to, (all units of a battalion are on the same net), the responsiveness of the attack helicopter could not help but be affected. On the other hand, U.S. doctrine has been, and should continue to be, that close coordination is required between the ground, frontline unit commander, and the attack helicopter for maximum utilization of firepower.

Soviet heliborne forces are considered to have the capability to land an MRB 80 to 150 km in the enemy's rear area to

GENERAL CHARACTERISTICS

CREW	3—PILOT, CO-PILOT, GUNNER 4—PILOT, CO-PILOT, GUNNER, FO/NAVIGATOR
DIMENSIONS	
FUSELAGE LENGTH	19.3M
ROTOR DIAMETER	17.05M
SPAN OF WING STORES	7.40M
WEIGHTS	
EMPTY WT.	4700 KG
MAX FUEL LOAD	2900 KG
MAX TAKE OFF WT	8400 KG
POWERPLANT	
NUMBER AND DESIGNATION	2 GLUSCHENKO GTD 3F MOD
TYPE	SHAFT TURBINE
TAKE OFF POWER	1500 HP
CRUISE POWER	1000 HP
PERFORMANCE	
MAX RATE OF CLIMB VERT AND OBLIQUE	8.8/12.5M/SEC
SERVICE CEILING IGE/OGF	4500/2200M
MAX SPEED	310 KM PER HR
CRUISE SPEED	295 KM PER HR
COMBAT RADIUS W/MAX FUEL	360 KM
COMBAT RADIUS W/MAX PAYLOAD	90 KM
AVIONICS	
RADAR AND FIRE CONTROL	RADAR FOR FWD MACHINE GUN
IFF	SRD2M
MISSILE OPERATION	CMD GUIDANCE TRANS FOR AT—2 SWATTER
NAVIGATION	
RADIO COMPASS	ARL 15
RADAR ALTIMETER	RV—5
BEACON RECEIVER	MPR 56P
ATC/SIF	SOD 57N
ILS	SP 50
GYRO COMPASS	GIK—1
SHORT RANGE NAV SYSTEM	RSBN—25
COMMUNICATIONS	
VHF	LANDYSK 5
UHF	MIKRON
INTERCOM	SPU—7
TROOP TRANSPORT CAPABILITY	8—12 LIGHTLY LOADED CBT TROOPS (16) LIGHTLY LOADED CBT TROOPS
ROTOR SYSTEM	
MAIN ROTOR	5 BLADE, RIDGED ROTOR
TAIL ROTOR	3 BLADE, FULLY FLAPPING
HYDRAULIC SYSTEM	MAIN AND AUX
CREW PROTECTION AND SEATING	PILOT AND CO-PILOT SIT SIDE BY SIDE, GUNNER SITS IN FRONT OF THE FLIGHT STATION PROTECTED BY A BALLISTIC PERPLEX SHIELD.
FUEL TANK LOCATION	ONE TANK LOCATED IN AFT CABIN HAS ARMOR PROTECTION, POSSIBLE FUEL STORAGE IN BELLY OF MAIN CABIN.
LANDING GEAR	TRICYCLE TYPE, FULLY RETRACTABLE, HYDRAULICALLY CONTROLLED.
ARMOR PROTECTION	FUEL TANK IN REAR CGO COMP, STEEL PLATE ON FORWARD FRAME OF FUSELAGE FOR PROTECTION AGAINST FRONTAL HITS.
WEATHER CAPABILITY	IFR/NO OXYGEN SYSTEM, DEICING SYSTEM AND HEATER—BLEED AIR.



destroy ammunition dumps, neutralize nuclear sites and command posts, or to disrupt lines of communications. Normally, staying time for these forces is not expected to exceed 24 hours, but could possibly be extended to 48 hours.

Another possible role for the Soviet attack helicopter is that of a scout aircraft. With the current organization of the Soviet forces, however, this is not expected to be a major role because both their ground and tested air units are more specifically oriented and equipped for this mission. The air-to-air role has been planned by the Soviets and could be expected on the modern battlefield. In this concept, the primary target for the attack helicopter is another helicopter or slow moving aircraft. However, the engagement of high performance aircraft cannot be ruled out.

Future Developments

As the Soviets further exploit new tactics in helicopter employment, several new developments in the design and capabilities of their rotary wing aircraft have been observed. The *HIND-D,* is an updated version of the *HIND-A.* Wing station armament is basically the same for the *HIND-D* which also fires 57-mm rockets and the *Swatter* missile. Some sources have suggested that the *HIND-D* only fires the new fire-and-forget missile.

Seating in the *Hind-D* has been modified so that the pilot and co-pilot now sit tandem. This is possibly an effort to minimize the target silhouette that the *HIND-A* presented with its wide fuselage. The *HIND-D* also is capable of carrying up to six lightly-loaded combat troops.

All models of the *HIND* can carry another basic load of ammunition in lieu of the troops. This adds to the firepower capability of the aircraft. It is important to note that when considering employment of attack helicopters, the amount of fuel carried can be as limiting a factor in regard to the staying power of the aircraft as is the amount of ammunition that is carried.

The Soviets have experimented with a new fire-and-forget missile with a range of up to 8 km. This missile has three guidance sensors with optical contrast and a TV seeker in the nose. The *HIND* could follow the missile to the target. The fire-and-forget missile may also have an altimeter measuring height above terrain for a low-level approach to the target. This missile can also be picked up by the helicopter sensors and guided terminally to the target.

Nap-of-the-earth flying is stressed in Soviet training for helicopter forces as a means of survival on the battlefield.

Some of the special features of the *HIND* include bulletproof, flat, antiglint cockpit windows, blade and tail rotor deicing systems, and twin turbine engines.

Logistical support for the helicopter seems to be geared around a war environment. The Soviets have studied statistics based on the U.S. involvement in Vietnam and determined that helicopters have an extremely short life in combat. Enemy fire and operational failures are prime considerations in the production of Soviet helicopters. The U.S. lost 4,869 helicopters in Vietnam; 2,281 due to hostile action and 2,588, or 53 percent, to operational failures. Based on these statistics, the Soviets accept a durability life of from 100 to 500 hours per aircraft in combat. They strongly believe that the war will not last much longer than that. Therefore, a highly durable aircraft will not be required. This contrasts sharply with the U.S. practice of fine tuning the helicopter to achieve a highly efficient and cost effective machine.

With the advent of new tactics and a continuing study of airmobile operations, the Soviets can present a major threat through the use of helicopter forces. Camouflaged Soviet *Hinds* have participated in maneuvers with tanks recently. Operations of this nature only emphasize the important role Soviets foresee in the development of an attack helicopter.

CAPTAIN ROBERT M. JOHNSON joined the Army in 1968. He was commissioned through OCS in 1972. A graduate of Flight School and Armor Officer Advance Course, he has a bachelor's degree in Professional Aeronautics from Embry-Riddle University. He has served with the 7th ACR, 4th Armored Div, 3-4 Cav, and 1st Bde AIT/OSUT (Armor), Ft. Knox. He is currently assigned to the Directorate of Training Developments, USAARMS.

CREW QUALIFICATION COURSE

by Major V. Paul Baerman

A recurring complaint heard around cavalry squadrons involves the tooth-to-tail ratio involved in the Tank Crew Qualification Course (TCQC). The complaint is that roughly five-sixths of the unit supports the one-sixth, the tankers who are firing. All leadership and evaluation focuses on how well tank gunnery is progressing. Meanwhile the nontankers in the unit are tasked as range guards and for other range support. A cavalry squadron has four or five major combat MOSs. Each one of these separate MOSs is usually subgrouped into a crew. These crews are expected to be independent, spirited, and to operate over wide distances, many times out of contact with friendly elements. Each crew must be fully confident in its ability to fight, survive, and win its independent battles and skirmishes. Therefore, the gunnery training in the squadron must go deeper than TCQC and emphasize a systematic and periodic program designed to involve all of the unit's combat crews and combat service support (CSS) elements.

The 1-10 Cavalry at Fort Carson decided to reorient its gunnery program and had all its crews negotiate a Table VII-type course once each quarter. The program was called the Crew Qualification Course (CQC), to emphasize the total gunnery picture in the squadron, while not slighting tank gunnery. This article is an explanation of what the unit did to prepare the program, what the course consisted of, the results, and the lessons learned. The article is written from a data base of four highly successful quarterly gunneries from July 1977 to June 1978. For non-cavalrymen this article's philosophy is every bit as applicable to an AG unit, an artillery battery, an armor or mechanized infantry company as to a cavalry organization; the difference being mainly in scope of training.

The cavalry by its very mission and organization has one of the most complex training challenges in the Army. Its platoon leaders and troop commanders are faced with organic combined arms teams at the platoon level. This problem is particularly pronounced as regards live-fire training. Mortarmen go off to mortar points, scouts and infantry to scout courses or ranges, tankers to the tank tables, and the air cavalry somewhere else. It is a rare occasion that one group gets to see the other practicing their profession in a live-fire situation. This separateness does nothing to contribute to the integration of the unit, either in the ground-to-ground or air-to-ground sense. Moreover, numerous other problems are introduced. The unit's leadership is scattered in all directions monitoring and evaluating training. The CSS personnel are spread thin trying to keep up with all the action. Another solution is to simply rotate emphasis on scouts one week, mortars the next, and tankers during TCQC. But are these two solutions to the complex training problem the only way of looking at the situation?

The answer, of course, is no! The 1-10 Cavalry tackled this training problem by first outlining its gunnery objectives. The primary objectives were to:

• Improve readiness through improved gunnery.

• Provide a periodic, systematic approach to gunnery.

• Promote combined arms familiarization at the platoon level.

• Increase crew confidence in their basic load items and weapons.

• Enhance air-ground integration.

Secondary objectives were to:

• Construct a single range that would allow accomplishment of the above objectives while increasing training effectiveness and decreasing range overhead (economies of scaled ranges).

• Improve load planning.

• Promote crew drill effectiveness.

• Enhance NCO leadership.

• Force the use of the Soldiers' Manual.

Once all the objectives were established the research process through past and present Army range regulations began. How many of our objectives could be accomplished concurrently on one range, and could a range be found suitable to our purposes? After much work and coordination with G-3 and Range Division, permission was obtained to "creatively tailor" and amalgamate several ranges to achieve the desired objectives. The work done by the squadron's air cavalry troop was particularly important in preparing for aerial gunnery. Aerial gunnery had not been conducted at Fort Carson in recent memory. The air cavalry troop had to fly to Fort Bliss, Tex. All the coordination and tailoring paid off, especially regarding range overhead, since amalgamation of ranges and careful selection of firing points totally eliminated manned range guard posts and considerably reduced tower, ammunition, and detail personnel requirements.

While the above coordination was going on, equally important contact was maintained with G-3 ammunition forecasters. Since the specific types and amounts of ammunition required were not all stocked or were not stocked in sufficient quantities at the ammunition supply point (ASP), unit ammunition forecasts, combined table of allowances (CTAs), and G-3 approval had to coincide to be ready for firing. Contact was also maintained with Division Artillery and Range Control since the aerial gunnery portion of the range would close down many artillery and other firing points. It was the squadron's desire to keep these conflicts to a minimum.

After 3 months of effort, physical preparation of the course began. Engineer reconnaissance took place a full month prior to live firing, followed by extensive target and range preparation. Bunker targets, defilade firing positions, erection of steel targets, berms, road grading, collection of scrap, and construction of the ASP were all completed.

The target system also was built to:

• Provide a variety of targets so each crew could engage different ones.

• Place the targets out at realistic ranges in realistic forms (CONEX containers partially buried as bunkers).

• Harden targets to prevent time loss due to frequent target replacement and therefore eliminate target details. All targets were either steel or backed by steel (wooden panels backed by a CONEX for truck targets). Even the personnel targets were 55-gal. drums. An added benefit of the steel targets was the crew's ability to realistically sense the effects of their fire.

Over 100 crews, ground, air, and CSS, negotiated the CQC once a quarter. Each quarter the training varied as different items of interest were emphasized. These items became the immediate training objectives in addition to the major continuing objectives. For example, the second CQC emphasized hand grenades and claymore mines, the third emphasized *fougasse,* and the fourth: mine warfare, the Molotov cocktail, and the *M-202* four-shot flame launcher. By the end of the fourth CQC a sample crew would take over 2 hours to complete the course. The drawing accompanying this article is based on photographs made on various CQCs.

Now is probably the time to ask, "Does all this really matter? Is this just another unit's way of blowing its own horn? Haven't other units accomplished basically the same training?" The answer to all these questions is probably yes, but also forcefully NO! The important points here are for the interested trainer to receive input from other sources on how they conduct training and to note the scope and intensity of training that can be achieved once imagination and preparation are put into the program. The principal difference that separates the CQC from other gunnery programs is the degree of seriousness in which the program is undertaken. From this emphasis grows the quality of the training, its scope and intensity, and the conviction to conduct the training on a regular basis to sustain it.

Let's follow a sample crew through a CQC, catalog the benefits, and gain an appreciation for the scope and intensity of training. A month before the live-fire phase of the CQC a letter of instruction (LOI) is published outlining the specifics of the course, in particular any new items of training interest since the last CQC. This document is a statement of the training objectives with references and includes a general range schedule. (After the first CQC, all other coordination was handled by SOP and subsequent LOIs were about two pages long.) Trainers down to crew-level begin the preparation and training process based on information contained in the LOI. Training Extension Course tapes and Training Aids Support Center training devices in particular prove most valuable.

With the basic preparation completed (crew drill/immediate action, weapons/vehicle maintenance, load plans, special classes/hands-on training), the entire squadron moves to the field. Depending on the firing schedule, an individual crew may find itself conducting field training first, then firing, or vice versa. This schedule confirms the need to continue maintenance in order to have working weapons and vehicles. Crews scheduled later in the firing have the opportunity to conduct more field training. To prevent maintenance and safety problems on the course, each crew receives a safety and maintenance technical inspection from squadron before moving to the ASP/rearm pad.

At the rearm pad/ASP each crew loads the authorized amount of munitions. As an interesting training sidelight, the crew receives an appreciation of how the ammunition is supplied, not just the usual types of small arms but also grenades, LAWs, and demolitions. The crews and squadron combat service support (CSS) personnel get a much better feel for the transportation problems involved with class resupply due to the variety of ammunition. The 30 different line items issued to each crew is a reflection of the authorized basic load. The course is oriented on the basic load to:

- Give the crew the approximate amount of ammunition by type and quantity similar to its basic load so it can appreciate how much it would have to include in its load plan.
- Allow the crew to have the same variety of weapons it would normally have to engage various targets.
- Give the crew experience in carrying and employing all these munitions.

The crew loads the ammunition per their load plan and moves to the start point for a final briefing and weapons test. Generally at this point the crew has the opportunity to watch other crews in the platoon negotiate the course. Thus tankers can watch infantry, scouts watch mortarmen, etc., and all gain an appreciation for the others' skills. When the crew's time arrives to begin the course, it has a certain feel for what to expect and what mistakes are being made. The course is designed with this in mind and could be altered to make each run somewhat different. The crew then picks up its assistant instructor (AI), safety officer, and medical corpsman, and the run begins.

During the maneuver phase of the CQC, various situations are presented which require individual or crew immediate action. Certain situations are obvious as the crew is called upon to cover employment of a LAW team or maneuver against a bunker. Other times the crew places suppressive fire on distant targets; still other actions require only reporting. Other situations call upon the driver alone to use his weapon or the loader his submachine gun. A crew member on the TOW may be required to dismount with his *M-16* and fire at a relatively close target to test individual reactions. Figure 1 gives a sample target engagement sequence while figure 2 shows weapons used. Note that mortarmen fired the mortar on hip shoots or direct lay while negotiating the course.

Because of the range design, normally other live-fire training is conducted within ear-, eye-, and nose-shot of the crew on the course. These other activities are manifestations of sounds, sights, and smells that occur on the battlefield and give crews a better feel for what they will encounter in combat. Specifically, *Cobras* and door gunners of the air cavalry troop could be seen and heard firing on a neighboring lane while troop mortarmen fired their missions at targets forward of the vehicle on the course. Infantrymen preparing for their turn could be found practicing with live LAWs and 40-mm grenade launchers next to the course road. Meanwhile, explosions from demolitions, mines, hand grenades, and *fougasse* could be seen in the distance.

When the crews finish the maneuver phase of the CQC, they proceed to a series of stations that test their knowledge on other items in their ammunition basic load. While it's ideal to employ many of these items during the maneuver phase, such an arrangement unnecessarily lengthens course time. Figure 3

Figure 1. Sample Engagement Sequence (Scout/Infantry).

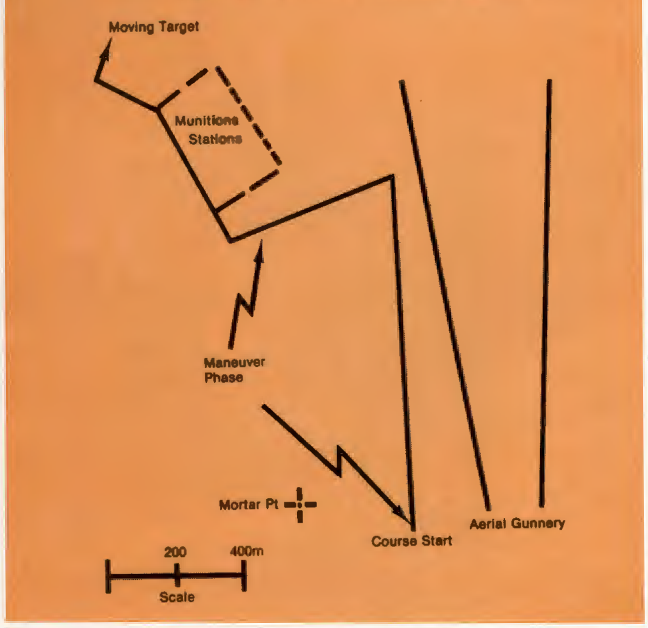
1. Enemy truck at 800 meters.
2. Enemy machinegun/troops (multiple engagement).
3. Enemy troops at 600 meters.
4. Single enemy soldier at 25 meters (driver/rifleman reaction target)
5. Enemy APC/tank at 200 meters.
6. Enemy bunker/truck (multiple engagement).
7. Enemy troops/bunker (multiple engagement).
8. Moving enemy truck at 800 meters.

Figure 2. Weapons/munitions Employed.

Type Crew	Weapons Used	Munitions Employed
Mech Inf	*M-16* rifle, cal. .45 pistol, cal. .50 MG, *M-60* MG, *M-203* GL, *M-202* flame launcher, LAW	Hand grenade, *M-21* AT mine, *M-18* claymore mine, *fougasse*, demolitions, Molotov cocktail, trip flare, bangalore torpedo.
Scout	Same as above, TOW (as authorized)	Same
Mortar	Same as mech inf less *M-60* and *M-202*; 4.2-inmortar (HE, WP, and ILLUM)	Same
Sheridan	*M-219* coax MG, cal. .50 MG, main gun (HEAT and CANNISTER), missile (selected crews), *M-3* subMG, cal. .45 pistol, smoke grenade launchers	Same
Aerial Recon Plt	Same as mech inf less cal. .50 MG	Same
Scout-Wpns Team	40-mm GL, mini-gun, 2.75-in FFAR, cal. .38 pistol	Same
Redeye	*M-16* rifle, cal. .45 pistol, LAW	Same
Grnd Survl. Radar	Same as mech inf less *M-60* MG and *M-202*	Same
Recovery	Same as mech inf less *M-60* MG, *M-202, M-203*; *M-3* subMG	Same
Cbt Svc Spt	*M-16* rifle, cal. .45 pistol, LAW	Same

Abbreviations: AT—antitank; FFAR—free-flight aerial rocket, HE—high explosive; ILLUM—illumination, GL-grenade launcher; LAW—light antitank weapon, MG—machinegun; TOW—tube-launched, optically-tracked, wire-guided; WP—white phosphorus.

Figure 3. Stylized Course Layout



shows a stylized course layout. These stations include demolitions, live antipersonnel and antitank mines, hand grenades, *fougasse*, Molotov cocktails, *M-202* flame launchers, trip flares, and booby traps. Each crew also has the opportunity to test fire the *AK-47* during this phase.

It must be emphasized that all crews in the squadron underwent a maneuver phase that was keyed to the weapons they would normally use. Then all crews went through all other stations.

Another important feature of the CQC was the rank of the monitors at these stations. Note that the word "monitor," not "instructor," is used. These monitors were all junior enlisted personnel expert on the particular area involved. Their function was to monitor the crews' preparation and employment of the munitions. If they had to step in, these monitors provided basic peer instruction. The obvious benefit of this type instruction was the lessening of the mystery involved in the task because the crew was aided by a peer, not a senior sergeant or officer. Classes were not taught on the range, although the monitors were prepared to do so. The crew commanders were expected to have already taught their subordinates the necessary skills to complete the stations.

In evaluating the crew's performance, ARTEP and Soldiers' Manual standards, modified where necessary, were used. More importantly, you could tell from the crews themselves how they had performed. The soldiers know when they did well, and their evaluation was usually correct. Weak crews had the opportunity to tackle the course again and improve their skills. Feedback for the crews came immediately through oral debriefings by the AIs. Unit trainers received feedback by means of marked scoresheets and later with detailed after-action reports including lessons learned and training shortcomings noted. These training shortcomings were continually reinforced and emphasized on future CQCs.

The quarterly CQCs provided the unit with many benefits. Particularly satisfying were the following features:

• Growth in confidence gained by the crews in their own ability and the effects of their weapons. The periodic nature of the CQC reinforced that confidence and retarded training erosion.

• Growth of crew commanders as the first level trainers of their crews.

• Greater appreciation of the requirement for and purpose of crew drill.

• Steady maintenance improvement in weapons and fire control equipment due to quarterly firing.

• Workability of combat zeroing on the tank—applying established or emergency zero and firing one confirmation round.

One of the most satisfying features of the CQC, and perhaps the best indicator of the strengths of the program, was the individual and small unit attitude toward training. The CQC was viewed as a challenge and the variety of situations presented sparked interest in doing the preparatory training. Using live munitions also spurred interest, since the danger factor was always present. Soldiers and their crew commanders were observed researching Field and Soldiers' Manuals in order to answer "how-to" questions. They were also eager to suggest new activities for subsequent CQCs. The interest and pride in training accomplishments finally resulted in the squadron's publication of a booklet that included many of the pictures of the CQC training.

While the CQC was an unqualified success, major problems reoccurred that were difficult to solve; primarily due to new personnel. Specifically these problems included:

• LAW and 40-mm grenade gunnery. Range estimation is a key skill and it can come only through known-distance range estimation on like terrain.

• Reaction to events. Try as we could to emphasize speedy reaction, this particular feature is a function of first level leadership while on dry runs. If the leader isn't enthusiastic and doesn't "play the game," his crew's reaction on live-fire exercises suffers.

• Standard Operating Procedure. A crew has to have its own detailed SOP. Does PFC Smith always fire the LAW since he's the best LAW gunner? If so, who then takes over the *M-203*?

• Physical Training. A small percentage of soldiers on the CQC were observed vomiting after fire and movement, or being so out of breath from physical exertion that they were unable to give coherent spot reports over the radio.

Hopefully this article will provoke thought among other trainers on one means to accomplish crew live-fire training.

MAJOR V. PAUL BAERMAN was commissioned in Armor upon graduation from the United States Military Academy in 1968. He has commanded armor and cavalry units in Vietnam and the United States and has been a battalion and brigade S-3 and division G-3 training officer. An AOAC graduate, Major Baerman served as S3, 1-10 Cavalry, Fort Carson, Colo. He is currently attending the Command and General Staff College.

AIR DEFENSE ARTILLERY

by Lieutenant Colonel Richard B. Wessling
with Major Charles C. Walden
and Wilfred H. Steward

This article is based on a presentation by Lieutenant Colonel Wessling at the Armor Conference, 17 May 1979, Fort Knox, Ky. Major Walden and Mr. Steward are members of the Staff and Faculty of the U.S. Army Air Defense School, Fort Bliss, Tex. Ed.

To the ground gainer—the tanker and the infantryman—Air Defense Artillery must present something of a puzzle. Why is it here? What does it do? Why should we bother with it? These questions arise from the fact that most ground gainers come into contact with ADA only in a training environment when there is no air threat and the training exercise is carried out without interference from the air. This environment, however, is totally unrealistic. The air threat is difficult and expensive to simulate realistically in a training environment and, consequently, it is convenient to sort of ignore it. That attitude does not change the facts of life; the air threat to the ground gaining force is real and serious and that's why ADA is there.

The battle scenario that follows illustrates where ADA fits into the picture and answers the questions of why it is there—what it does and why you should bother with it. To understand the action, you first need to know something about how air defense weapons are employed.

The employment of air defense weapons is derived from the characteristics, limitations, and capabilities of the weapons themselves; the nature of the air threat; the character of the battlefield; and the tactics, composition, and scheme of maneuver of the supported force or defended asset. These considerations evolve into four basic doctrinal principles and five employment guidelines that define how the air defense force is structured, how assets are allocated, and how weapons are employed.

The doctrinal principles are:

MASS—Allocate enough weapons to defend adequately the force or asset. Don't skimp on weapons; half a defense is worse than no defense at all.

MIX—Employ a complementary mixture of weapons. Structure the defense such that the limitations of one weapon are offset by the capabilities of another.

MOBILITY—Employ weapons that have a mobility equal to that of the defended force. If air defense weapons can't keep up, they can't defend.

INTEGRATION—Integrate air defense into the defended force. Air defense does not sit out on the side, and air defense does not defend itself. It becomes a part of the defended force and it responds to the force commander's needs and scheme of maneuver.

The employment guidelines are:

WEIGHTED COVERAGE—Design the defense to concentrate fires toward the enemy's most likely avenue of attack. However, insure that all-around coverage is maintained.

EARLY ENGAGEMENT—Position weapons so that they can engage the enemy before he can release his ordnance. Revenge is sweet but it does not protect the defended force or asset.

DEFENSE IN DEPTH—Position weapons to subject the enemy to increasingly lethal fires as he approaches the defended force or asset.

MUTUAL SUPPORT—Position weapons so that they are mutually protecting; i.e., the engagement zone of one weapon covers the dead zone of an adjacent weapon.

OVERLAPPING FIRES—Position weapons so that their engagement zones overlap to preclude gaps in the defense.

These principles and guidelines have resulted in the fielding of a complementary family of air defense weapons.

The small but highly lethal and very mobile *Redeye* guided missile system is organic to combat maneuver battalions and moves with the maneuver companies to provide an immediate response to air attack.

The *Vulcan* air defense gun and the *Chaparral* air defense missile are organic to the division air defense battalion. Highly mobile *Vulcan* moves with the mechanized force and augments *Redeye* in defending against the low-altitude threat. The less mobile *Chaparral* defends critical division assets behind the FEBA from low-altitude attack.

The fires of these short-range air defense (SHORAD) weapons are complemented by the low- to medium-altitude fires of a *Hawk* missile battalion deployed in direct support of each committed division. *Hawk* platoons are positioned to extend coverage well beyond the FEBA and tend to force threat aircraft to the low-altitude regions where they are vulnerable to the fires of forward SHORAD weapons or to fly at such high altitudes that they are not a threat to the ground force.

Rear area, high-altitude coverage is provided by *Nike Hercules* air defense missile systems assigned to the corps or theater army. These weapons can engage threat aircraft forced to high altitudes by the forward SHORAD and *Hawk* defenses, and they counter the high-altitude strategic bomber threat. Now let's see how all this looks in action. Consider the following situation.

It was 0945. First Lieutenant Cox was in a somber mood as he reflected on the events of the past few days. So much had happened!

It was only last Sunday when the platoon leader, 1st Platoon, A Battery, 6th Battalion (*Chaparral/Vulcan*), 59th ADA, was awakened in his BOQ and received the news that the Soviets had launched a general attack against NATO forces defending West Germany.

It is now Wednesday and, instead of a week's leave in Garmisch, Cox is with his platoon in direct support of Team Alpha. His mission is to provide air defense for that company team as it leads Task Force (TF) 2-76 Mech's attack against the Soviet Forces north of the Raube Ebrach River.

Initially, NATO forces, outmanned and outgunned, had given ground in all sectors. Losses were heavy on both sides. The defensive action near Katlerback on Monday resulted in the loss of a tank battalion as well as an entire mechanized infantry company. On that day, Lieutenant Cox felt the full fury of ground combat for the first time. His platoon had been placed in direct support of Team Bravo, TF 2-12 Armor, which was defending from a battle position in the vicinity of the Soviet breakthrough.

TEAM ALPHA

- ☐ A/2-76 MECH (-)
- ☐ 1/C/2-4 ARMOR
- ☐ REDEYE TM 1 (DS)
- ☐ 1/A/6-59 ADA (VULCAN) (DS)

Figure 1. Team Alpha

Watching from a ridge line on which he had his CP, he could see the smoke screen that covered the valley, the result of an intensive Soviet artillery barrage. He saw the tanks of the Soviet mechanized regiment as they left the cover of smoke and moved directly into our defensive positions. The counter fire was fierce. The Soviet artillery fire lifted and four Soviet fighters attacked the fortified positions. Their direct fire weapons kept our forces pinned down.

It was at this time that Lieutenant Cox saw ADA in action for the first time. One of the fighters exploded in a burst of flame, a direct hit by a *Hawk* missile. Almost at the same time, another of the fighters fell victim to one of his *Vulcans*. The remaining two beat a hasty retreat.

The battle intensified, there was a blur of activity—bullets and rockets filled the air for several intense minutes. Tanks fired from covered positions. Riflemen and mortars laid down round after round on the advancing tanks. And then, the Soviet forces wavered and stopped. It was the high watermark of the Soviet advance. A few tanks turned and retreated but many remained on the battlefield, a mass of burning hulks.

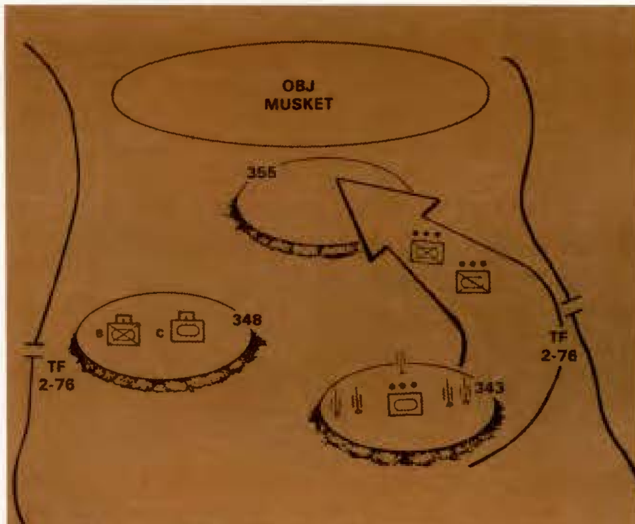


Figure 2. Vulcan/Redeye defense of Team Alpha.

NATO forces were finally holding, but it had been at a terrific cost to the defenders. The 19th ACR, the VII Corps covering force, had suffered 65 percent casualties since Sunday. The 25th Mech, parent division of Lieutenant Cox's ADA battalion, had suffered a 15 percent loss of personnel and equipment. This comparatively low loss was due to superior target servicing techniques and well concealed defensive positions.

Lieutenant Cox's platoon had come through unscratched. However, three of A Battery's other *Vulcans* had been destroyed and the *Redeye* section leader working with the A Battery's 3d Platoon had been killed.

The list of hostile aircraft destroyed in the division area was impressive. Besides the *Su-17 Fitter* that his platoon had destroyed, A Battery's *Vulcans* had destroyed three other fighters. He had seen *Hawk* missiles destroy a Soviet reconnaissance aircraft and four jets. The *Redeye* section from the 2-12 Armor, accounted for three *Hind* helicopter kills and one *MiG-27*. Small arms fire from the ground gainers had knocked down two helicopters and a light reconnaissance aircraft. Sixteen aircraft, all in all, not a bad score. And everybody contributed to it, the supporting *Hawk* unit, the *Redeye* teams, and tankers from 2-12 Armor, as well as the *Vulcans*.

The NATO forces had already started to regroup. Currently, the 25th Mech Division is defending along a line south of the Raube Ebrach River above Nurnberg. The division is opposed by a Soviet Combined Arms Army (CAA). The CG, VII Corps has directed that the 25th Mech attack to secure objectives on the north bank of the river. The 19th ACR, which was reconstituted as a squadron with two howitzer batteries, has been attached to the division and will be held in reserve.

The 2d Brigade has been designated to make the main attack. The brigade will attack in a column of battalions. TF 2-76 Mech will be the lead battalion. Its mission is to secure objective MUSKET and be prepared to maintain the momentum of the advance.

A Battery, 6-59 ADA, has been placed in direct support of the 2d Brigade and the first platoon has further been placed in direct support of TF 2-76th Mech. The Commander, TF 2-76th Mech, informed Lieutenant Cox that his air defense priority was Team Alpha which was to lead the task force. Considering the principle of MASS, Lieutenant Cox assigned all four of his Vulcans to support Team Alpha.

To achieve MASS, at least four Vulcans must be employed in the defense of a single asset. Although Lieutenant Cox would liked to have had Vulcans with each of the task force's company teams, he had only four Vulcans available. As Team Alpha was critical to the success of the operation, providing Vulcan protection to that team satisfied the task force commander's first air defense priority.

Lieutenant Cox reviewed the air defense weapons that would be available to assist Team Alpha.

Besides his four *Vulcans,* Team Alpha had a *Redeye* team from the task force's *Redeye* section and the automatic weapons and small arms of the company team to engage low-flying hostile aircraft.

The *Hawk* battalion in direct support of the division (4-517 ADA) would supply low- to medium-altitude coverage of the operation. The *Hawk* unit was a "triad" battalion; that is, each firing battery had three fire units—a base platoon and two deployable platoons. Battery C would position its fire units to insure that TF 2-76 (including Team Alpha) would have continuous coverage during the attack.

High altitude air defense coverage of the entire division area would be provided by 2-202 ADA *Nike Hercules*, which was in general support of VII Corps. *Nike Hercules* batteries could also provide extremely accurate, long-range, guided missile surface-to-surface fires if required.

Even though only the DS Vulcan platoon and one Redeye team were with Team Alpha, the team was receiving low- to medium-air defense from the Hawk battalion supporting the division and high-altitude air defense from the Nike Hercules battalion supporting the corps. This complementary MIX of weapons, each compensating for the limitations of the others, would not only provide an air defense umbrella over Team Alpha but they would also be INTEGRATED into the theater air defense battle.

The commander, TF 2-76 Mech, included Lieutenant Cox in his operation briefings. He also gave Lieutenant Cox operational control of the *Redeye* team that was placed in direct support of Team Alpha. This allowed Lieutenant Cox to INTEGRATE the air defense into the maneuver plan of Team Alpha. It also provided a gun/missile MIX for the air defense.

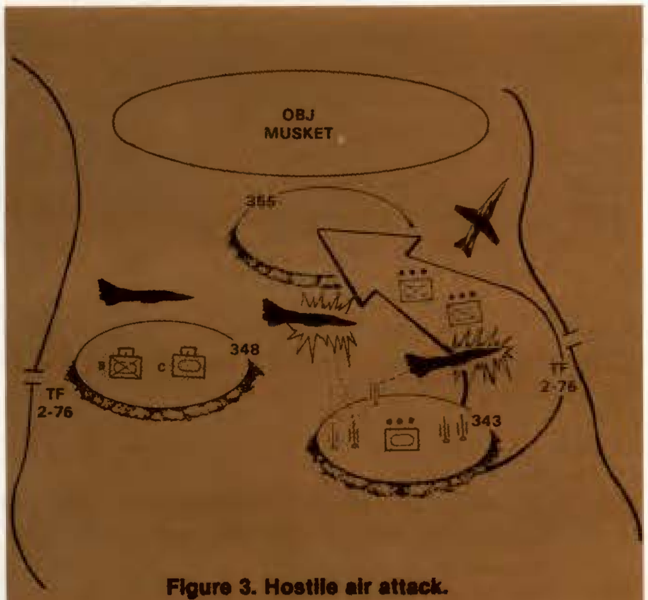


Figure 3. Hostile air attack.

Although the division ADA battalion also has 24 Chaparral missile systems, these weapons are normally used to defend the less mobile division assets (trains, TOC, supply installations). The reason for this is that Chaparral cannot fire while moving. Even though Chaparral, like Vulcan, has the MOBILITY to keep up with an advancing maneuver force, it takes about 2 minutes to prepare Chaparral for firing once it has stopped moving. Vulcan, on the other hand, can be fired while moving and can, like Redeye, react immediately to a hostile air attack. This makes Chaparral the best weapon to defend the less mobile assets.

The squawking radio broke the silence and captured

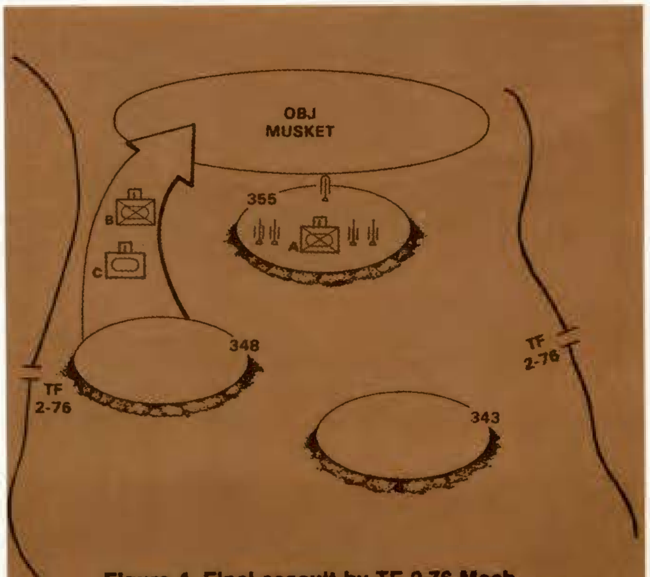


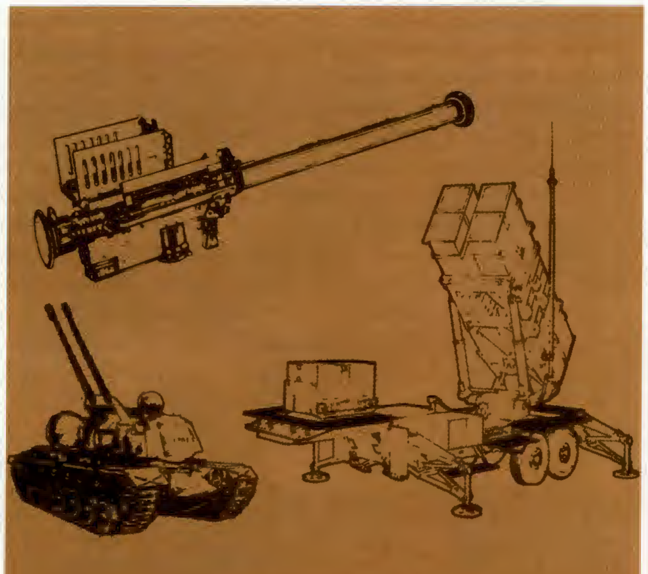
Figure 4. Final assault by TF 2-76 Mech.

Lieutenant Cox's attention. A friendly air strike was inbound and the early warning system was relaying the information. The forward air controller (FAC) directed the *A-10* to attack a Soviet tank column moving south toward Team Alpha. Friendly artillery stopped firing as the *A-10* passed over toward the Soviet tanks. The AD weapons control status WEAPONS HOLD was announced. This restricted AD weapons from firing except in self-defense.

The ADA platoon sergeant, Sergeant Todd, had just received word that all *Vulcans* and the *Redeye* team were in position. Lieutenant Cox checked their locations on his situation map. Team Alpha had just secured Hill 343. The attached armor platoon was providing overwatching fires for the two mechanized infantry platoons while they moved to assault the enemy on Hill 355. The four *Vulcans* were positioned on the flanks of the armor platoon while the *Redeye* team was placed in front of the overwatch platoon to provide early engagement of hostile targets.

If the bound of the mechanized platoons exceeds the range of Vulcan, a section (two Vulcans), commanded by the platoon sergeant, could be moved with the bounding units to provide continuous air defense coverage.

As Lieutenant Cox checked his situation map, he could hear



ADA weapons of the 1980s.

the distant *A-10* deliver its ordnance and the thunder of a Soviet *ZSU-23* quad air defense gun. He held his breath as the *A-10* zoomed back over friendly lines within the recovery corridor. The noise became louder as the artillery resumed firing.

As the mech platoons began their assault on Hill 355, a flight of four *MiG-27, Flogger Ds* attacked. The *Vulcans* and the *Redeye* team engaged the aircraft, destroying two of them. The other two climbed to determine the position locations of the weapons that engaged them and were destroyed by *Hawk* missiles.

It was now 1630. The mechanized platoons had secured Hill 355 and the *Vulcan* platoon had moved with the tank platoon to the hill where Team Alpha reassembled and overwatched Teams Bravo and Charlie of the task force as they made the final assault on objective MUSKET.

When objective MUSKET was secured, Lieutenant Cox would move his platoon with Team Alpha to MUSKET where he would be prepared to support the task force in maintaining the momentum to drive deep into the Soviet rear.

As the platoon prepared to move to objective MUSKET, word came from the A Battery commander that a deployable platoon from the DS *Hawk* battery (C/4-517 ADA) was displacing forward and would occupy a position at Hill 343.

Lieutenant Cox notified the Team Alpha commander of the pending *Hawk* move. The team commander, in turn, notified the task force S3. The task force S3 had already received the same information from the C/V battalion's air defense fire support coordination team at the 2d Brigade tactical CP.

The AIM Division Chaparral/Vulcan battalion TOE provides personnel and equipment to establish an air defense fire support team at each of the three brigade tactical command posts.

As the Hawk platoon was scheduled to arrive at Hill 343 in about 30 minutes, Lieutenant Cox left Sergeant Todd in command of the *Vulcan* platoon and returned to Hill 343 to meet the *Hawk* platoon leader. The *Hawk* unit was already present when Lieutenant Cox arrived. A *Redeye* team from the *Hawk* platoon headquarters was already deployed to provide air defense of the site while the *Hawk* equipment was being emplaced.

Hawk units provide area coverage of the division and add an all-weather defense to assets defended by the division's Chaparral, Vulcan, and Redeye. Hawk complements defense of the division by increasing MIX, thereby compounding the problem hostile aircraft have in countering and avoiding friendly air defense fires. Hawk fires may force hostile aircraft to fly low, thereby increasing the efficiency and effectiveness of the division's short-range air defense systems. As the attacks and the line of contact move forward, the division's direct support Hawk batteries displace forward to support the maneuver elements. Emphasis is placed on providing air defense coverage for the lead elements as they maneuver.

As Lieutenant Cox was briefing the *Hawk* platoon leader on the local ground situation, a change in weapons control status was announced over the division early warning net. WEAPONS FREE was declared. This status allowed air defense weapons to engage all aircraft not positively identified as friendly. Lieutenant Cox hurried to rejoin his platoon.

Lieutenant Cox wondered why the weapon control status had changed. He was soon enlightened by a call from Sergeant Todd who reported that 15 *Hind* helicopters were moving toward the task force at low level. As Cox arrived at objective MUSKET, one of the *Vulcans* opened fire, even though the helicopters were beyond the maximum effective range of the *Vulcan*. However, fire from the task force's *Redeye* teams that were deployed beyond MUSKET accounted for three of the *Hinds.* The remainder turned and flew to the north. Again all was quiet.

TF 2-76 Mech had accomplished its initial mission, the seizure and occupation of objective MUSKET. The Combined Arms concept had worked under the protective cover of the family of air defense weapons. The tankers and infantry, supported by artillery, had reversed the tide of aggression.

If this battle had occurred a few years from now, Air Defense Artillery would still support the operation but a new generation of air defense weapons would be available. These weapons would have provided an even greater capability to protect the ground gainers.

Stinger, with greater range and head-on attack capability, will replace Redeye.

The new division air defense (DIVAD) gun will fire a larger projectile to a greater range than Vulcan. The DIVAD gun battalion provides three gun batteries, one for each maneuver brigade.

The division rear area will be protected by the Improved Chaparrals of the missile battalion.

Improved Hawk will continue to provide direct support to the division; however, the many new features to be added will enhance coverage.

Patriot, which will replace Nike Hercules, is a new, mobile ADA system designed to engage to high-speed, ECM-emitting air threat of the future. Patriot will have the capability of engaging several hostile targets simultaneously.

These are the ADA weapons for the 1980s. As these weapons are fielded, new tactics will evolve to take advantage of their increased capabilities.

To the ground gainer, the new weapons will provide greater all-weather protection with increased range and volume of fire in mobile situations. The third dimension of the battlefield will continue to receive emphasis necessary for the survival of the battle force.

ACTIVE SUSPENSION

by Captain Peter A. Massey

In a "Tank-Design—Theirs and Ours" presentation to AOAC 1-76, the Armor School Commandant, then Major General Donn A. Starry, made the comment that "if attainable cross-country (tank) speeds continue to increase we will have to stablize the crew as well as the gun." The comment was somewhat tongue-in-cheek and produced a mild ripple of laughter, typical for what was then a new Armor Officer Advanced Course. But the General doesn't treat the subject of tank design lightly.

Cross-country speeds have increased and will continue to do so. Programs have been considered whereby stabilization of individual crew positions has been analyzed, such as a stabilized gunner's seat. Remote, rather than direct view optics are finding favor due to increased gunner performance and ease of tracking in a high-speed, fire-on-the-move environment. Sight elevation, gun azimuth stabilization systems are employed on the *XM-1*, and dual axis sight stabilization is employed on the *Leopard II*. The next steps might be multiaxis sight stabilization with automatic on-the-move cant correction, preview control, employment of fluidic stabilization technologies, and multiple algorithm tracking, to name a few approaches.

These latter state-of-the-art developments aren't currently available, and when and if they are adopted, they will significantly increase the total vehicle acquisition costs in which fire control, guns, and drives already account for 44.9 percent of the total. For example, the decision not to procure dual-axis sight stabilization on *XM-1* was primarily a cost/performance tradeoff. Even making the unrealistic contention that all desirable existing and future weapons control and sight stabilization technologies could be afforded, the point of maximum performance saturation of available turret control systems could soon be reached as cross-country speeds continued to increase. As the perturbations of the vehicle increase with off-road speed, the tank crew's ability to function with even the most sophisticated turret control system decreases proportionally. We are then faced with the options of limiting cross-country speeds or providing some relief for the crews by stabilizing them with respect to the hull. The former is not a viable option from a mobility/agility/survivability standpoint; however, the latter is both desirable and achievable at minimum cost.

Since we can quickly reach the outer limits of control and stabilization within the turret, we must better balance our effort and expense between the turret and the hull. Mobility and therefore the hull drive and suspension are of great concern. A stated tank design goal is to provide improved performance characteristics of the power train and suspension systems so that a tank can better perform its mission. Some of these performance characteristics include improved off-road mobility and evasive agility, in order to close rapidly on the objective while outmaneuvering Threat tracking systems.

The suspension should also provide a stable platform for firing the main armament regardless of the vehicle speed or terrain conditions. This is a big order, especially considering that the suspension system currently accounts for only 5.8 percent of the total acquisition cost. The *XM-1* suspension design is a superior optimization of a basic design which can be called an "improved conventional" system. Another type suspension system which has recently been considered is the hydropneumatic suspension system. This type system employs rotary actuators on each road wheel connected through damping valves to gas charge accumulators. The self-contained wheel suspension units are integrated into a high-pressure hydraulic power system with a variable displacement pressure compensated pump. However, the advantages of a hydropneumatic suspension system are optimized more in theory than in practice, and there is not much hope for any system that parallels the Congressional description of the *MBT*

70 as unnecessarily sophisticated, excessively complex, and too expensive! Figure 1 is a comparison between the improved conventional and hydropneumatic suspension systems. Until an as yet unidentified contender system is developed from advanced concept studies, it is certain that the old, reliable spring-mass damped suspension system or some variant thereof will be with us for some time. Therefore, in order to better achieve the stated mobility goals and provide an environment for good crew gunnery performance in the high cross-country speed scenario, the improved conventional suspension system must be further improved by reducing or eliminating its current disadvantages.

An achievable, cost effective means to accomplish this with currently available, low-cost control technology, which upholds all the current system advantages, is to convert the existing, proven system from passive to an active controlled suspension.

The key here is that the existing system provides the base. There is no radical or complex redesign effort and all current system advantages are retained in the performance output. It is with the addition of inertially referenced gyro control technology that the improved conventional suspension system makes the significant transition from "passive" or "reactive" to "active" or "predictably" controlled.

The approach does not represent a revolution as much as an evolution. Consider that variations of the spring-damped wheel have been employed in suspension systems for decades on all types of ground vehicles. These systems have the acceptability of a long history of low cost, high reliability, and ease of maintenance. Such attributes are very impressive and cannot be ignored. However, improvements in performance of this concept have been slow. Further significant or "radical" advances are unlikely. This is primarily because the system's relatively simple concept provides few major design alternatives. In the case of automobiles, the greatest single contribution toward providing a good ride has been providing a better quality road. For combat vehicles, the mission requirements are becoming more comprehensive, yet off-road mobility conditions remain the same. Dynamic, high-intensity warfare mobility requirements are surpassing or, at the very least, straining the state-of-the-art in mechanizing automotive platforms.

Consider also that inertial referencing technologies have raced forward in the aviation field from the first gyro compasses to today's advanced laser gyro inertial components for all weather flight control, navigation, and stabilization. These advanced control technologies have predictably flowed to numerious nonaviation applications, not the least of which are combat vehicles weapon and fire control stabilization systems. It is then logical to assume that control technology applied in the area of "hull stabilization" is both desirable, achievable, and well within the state-of-the-art.

For discussion purposes, the system described here is applied to the *XM-1* tank; however, it could be applied equally well to any off-road, spring-damped suspension system, either tracked or wheeled. Therefore, the approach has universal applicability depending on material need.

The active suspension system concept is an automatic control system which is designed to operate in such a way that the vehicle hull becomes a stabilized space-referenced platform. The objective of this sytem is to significantly reduce armored vehicle hull disturbances such that the entire crew can function effectively at much higher vehicle speeds during off-road (battlefield) terrain conditions. The hull, as a stabilized space referenced platform, stabilizes the entire crew. This approach is considered to be more cost effective in every respect than attempting to stabilize selected crew members inside the vehicle which is merely a Band-Aid® approach since controls, weapons and optics would continue to be in the vehicle shock environment. And anyone who has had the opportunity to function as an armored crewman can testify to the severity of that environment even at relatively slow cross-country speeds.

The system concept is conceived on the basis that the existing suspension forms the closed loop system plant. The

Improved Conventional Torsion Bar/Shock Absorber		Hydropneumatic	
Advantages	Disadvantages	Advantages	Disadvantages
• Simple	• Speed/Terrain limited spring and damping capability	• Improved Speed/Terrain Spring and Damping	• Complex
• Reliable			• Poor RAM-D
• Maintainable	• Passive		• Expensive
• Combat Proven			• Vulnerable
• Inexpensive			• High Technical Risk
• Reduced Vulnerability			• High Weight
• Low Technical Risk			• Sensitive to Extremes of Temperature
• High Performance			• High Thermal Signature
• Low Cost			• Passive
• Low Weight			
• Insensitive to Extremes of Temperature			

Figure 1.

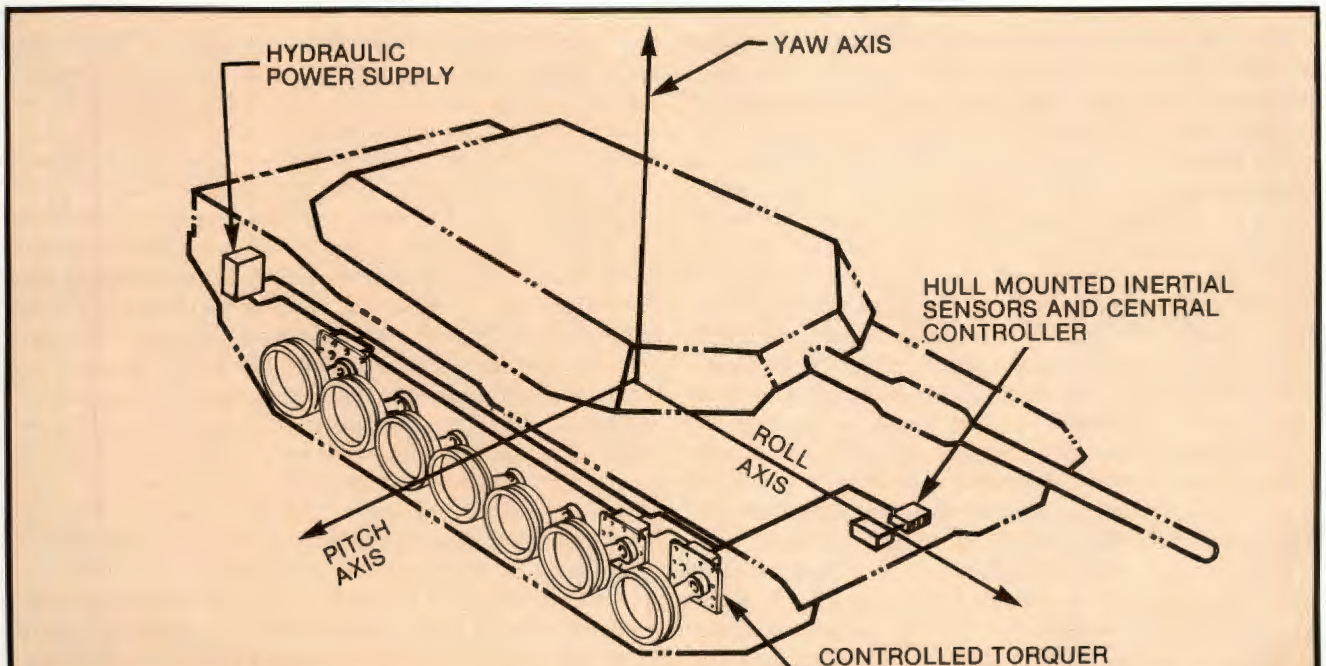


Figure 2.

shock absorbers are converted to servo controlled torquers, which add to or subtract from the suspension system torsion bar torque as requred to minimize vehicle hull disturbances relative to speed and off-road terrain conditions. This controlled torque applied through the shock absorbers (control cylinders) is derived from employing pitch and roll inertial sensors which measure hull perturbations and direct a system electronic controller unit to operate the servo valves at the shocks such that the pitch rate and roll rate of the hull are minimized for all disturbance input conditions. System components and operation as applied to the *XM-1* would consist of the following:

- Hydraulic actuators/shock absorbers.
- Dual-axis rate gyro package sensing pitch and roll.
- Accelerometer package sensing vertical acceleration.
- Electronics controller unit which contains the power supply, controller electronics, and a microprocessor to combine the rate and acceleration signals to command a proper reaction of each of the controlled road wheels.
- Hydraulic servo valves, manifolds, filter, accumulator, and tubing for connection to an engine-driven hydraulic pump.
- Electrical harness.

Dual-axis gyros are utilized as the inertial pitch and roll rate sensors. Predictably, this rate sensor package would be located in the forward part of the hull as indicated by figure 2. When the gyro detects any disturbances of the hull, amplified and filtered signals are sent to the electronic controller which transmits these signals to the appropriate servo valve(s).

The *XM-1* employs a total of six internally mounted rotary shock absorbers located at stations 1, 2, and 7 so that 6 of 14 road wheels are so configured. Thus, these six stations which are already the most critical to system performance, would be equipped with the servo valves which open or close oil flow to the rotary shock absorbers in response to input rate signals from the controller unit. These critical road wheels are then actively retracted or extended in an accelerated fashion in response to terrain conditions and vehicle speed requirements. For example, as the vehicle encounters a rise or bump, the forward portion of the hull begins to elevate. The pitch gyro then senses the pitch rate. The system ports hydraulic fluid to the active shock absorbers to lift the number one road wheels. This reduces the amount of hull motion that the bump imparts to the front of the vehicle. The second road wheels are also lifted by their active shock absorbers, however, the number 2 road wheels are lifted a smaller amount than the number 1 wheels. This is because the amount the active shock absorbers lift the wheels is proportional to the magnitude of the pitch rate sensed by the gyro. The process of lifting the two front road wheels on both sides, the first more than the second, has formed the track into a ramp. This ramping of the track over the bump also reduces the pitch rate imparted to the hull. The fact that the front of the hull has not elevated as far as it would have if the two front wheels on both sides had not been actively and rapidly lifted, causes the third and subsequent wheels on both sides to deflect to a greater extent when reaching the bump than they would have if the hull had been allowed to pitch to an uncontrolled height. The result of this greater deflection is a smaller total upward motion of the vehicle. The seventh road wheels are controlled by a vertical accelerometer. If the hull is experiencing upward acceleration, the seventh wheels will be lifted so that they do not augment that acceleration. As the hull begins to move down, the stabilization system will extend all six active wheels to counteract the downward acceleration.

In a case where a rise or bump is only encountered by one track, a roll motion is imparted to the hull. This roll motion is sensed by the roll rate gyro while the pitching motion is being sensed by the pitch gyro. The sensed roll motion cancels out the pitch motion in the commands to the active shock absorbers on the track opposite the bump. If the roll motion is large enough, the stabilizer will extend the controlled road wheels opposite the bump to counteract the roll. In a case where the vehicle enters a depression or hole, the action is very nearly opposite to that of a rise. This continuous process tends to keep the hull level at all times.

Hydraulic pressure is supplied for the system by an engine-mounted hydraulic pump which provides sufficient operating pressures for the system. Electrical power requirements would be drawn from the normal 24 to 28-V DC of the vehicle.

This demonstrates that the basic system plant of the active suspension system is comprised of the same major components and is of the same configuration as the highly reliable, improved conventional spring-mass systems that have been proven to contain all of the desired operational characteristics except the super-extended performance which is needed now. This extended performance is achieved by the addition of highly reliable, proven control components. It is anticipated that further analysis will show that speed/terrain hull disturbances can be significantly reduced, perhaps as much as one-tenth of what is presently experienced with even superior systems such as *XM-1.* This could lead to cross-country speeds in excess of 20 miles per hour above speeds achievable now, while maintaining the crew's ability to fight the tank.

There are, of course, limitations to an active suspension system which must be considered. The system will only operate within the existing constraints of the basic suspension system to which it is applied. On the *XM-1,* for example, the system will not increase individual limits of road wheel travel beyond the 15 inches of jounce currently available in that system. In other words, constraints within existing plant dynamics form the major, if not all, the limitations of any stabilization system. A good case in point is the current weapon stabilization system on the *M-60* vehicles. The system alone has the capability to provide outstanding tracking and aiming performance. However, limitations within the turret drive severely reduce available performance. The maximum hull pivot rate of the *M-60* series vehicles during a short, high-speed, narrow-vector turn can be as high as 12 revolutions per minute (RPM), while the maximum turret traverse rate is approximately 4-5 RPM due mainly to constraints such as inappropriate gear ratios, insufficient hydraulic pressure, excessive friction, backlash, and other nonlinearities within the traversing gearbox assembly. The result is that the pivoting speed of the hull can very easily outstrip the speed at which the turret can traverse during slight evasive maneuvers. This situation can and does cause the sight be be pulled off the target any time the relative traversing rate between the turret and hull exceeds approximately 427 mils per second.

Of course, it must be kept in mind that the cost of *M-60* weapons stabilization would have increased dramatically if these turret drive problems had been eliminated. (The relative traversing rate between hull and turret on the *XM-1* at approximately 7 RPM for each can cause similar traverse stabilization difficulties during evasive maneuvers due to the ability of the hull to reach RPMs of 12 or higher.)

Active hull or chassis suspension of a tracked vehicle cannot be made to perform as well as a wheeled vehicle for two reasons:

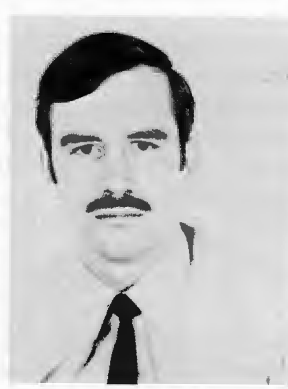
- The wheels on a tracked system are not independent of each other. They are connected with a track and transmit forces from one wheel to the other through the track.
- All the wheels are not controlled. In the *XM-1* example, six of 14 are controlled while the remaining eight are uncontrolled and undamped except for track damping.

On the other hand, there are many other advantages to active suspension on tracked vehicles in addition to significant off-road performance improvement due to increased speed and evasive maneuver capability (survivability). Fire on the move accuracy would improve due to an increase in crew confidence and performance and a concurrent reduction in the load placed on the turret fire control and stabilization components. The system is reliable. Many combat vehicles already employ the same required shock and vibration hardened componentry in turret and weapon control systems with excellent reliability. Vulnerability is very low since the entire system is located within the hull of the vehicle. System costs are also low. There are no high-dollar components rquired and there are viable ways to keep even initial design costs to a minimum. A stable hull can reduce or maintain the level of required fire control sophistication with resultant savings in that area. Also, technical risks are low. No aspect of the system is pushing the state-of-the-art. A system of this design is totally redundant. It is activated or deactivated by the crew on an as-needed basis. When deactivated, the system reverts to a normal improved conventional suspension with no loss of inherent performance characteristics. The system is compatible as a product improvement since it has add-on capability due to its comparatively simple design approach. This is especially significant since it is not vehicle type limited as it can be applied to multiple fighting vehicle systems with a minimum of design effort. Maintenance for an active suspension system should be minimal provided good hydraulic engineering principals relative to the applications and environment are employed. For example, the hydraulic seals would be metal rings to withstand the severe operating conditions.

Any leakage would be retained to sump at low pressure. Perhaps one the the most important characteristics of an active suspension is the system growth protential through sensor aiding and other reconfigurations. A forward looking doppler and required signal processing electronics could be added to "preview" the terrain ahead. This could further enhance the time optimal control principle already applied within the system

Application of an active suspension system is simply a process of making an already good thing better at an affordable price and within a realistic time frame. The benefits derived far outweight the risks. This system has the potential to be a major advance in reaching the stated optimum mobility goals of our armored fighting vehicles.

CAPTAIN PETER A. MASSEY, USAR, was commissioned in Armor as a Distinguished Military Graduate from Providence College in 1968. He served as platoon leader and company commander and in staff positions in Germany and Vietnam. A graduate of Armor Office Advance Course, he served as gunnery instructor at the US Army Armor School. He is employed by Honeywell, Inc., Minneapolis, MN, where he is a service engineer.



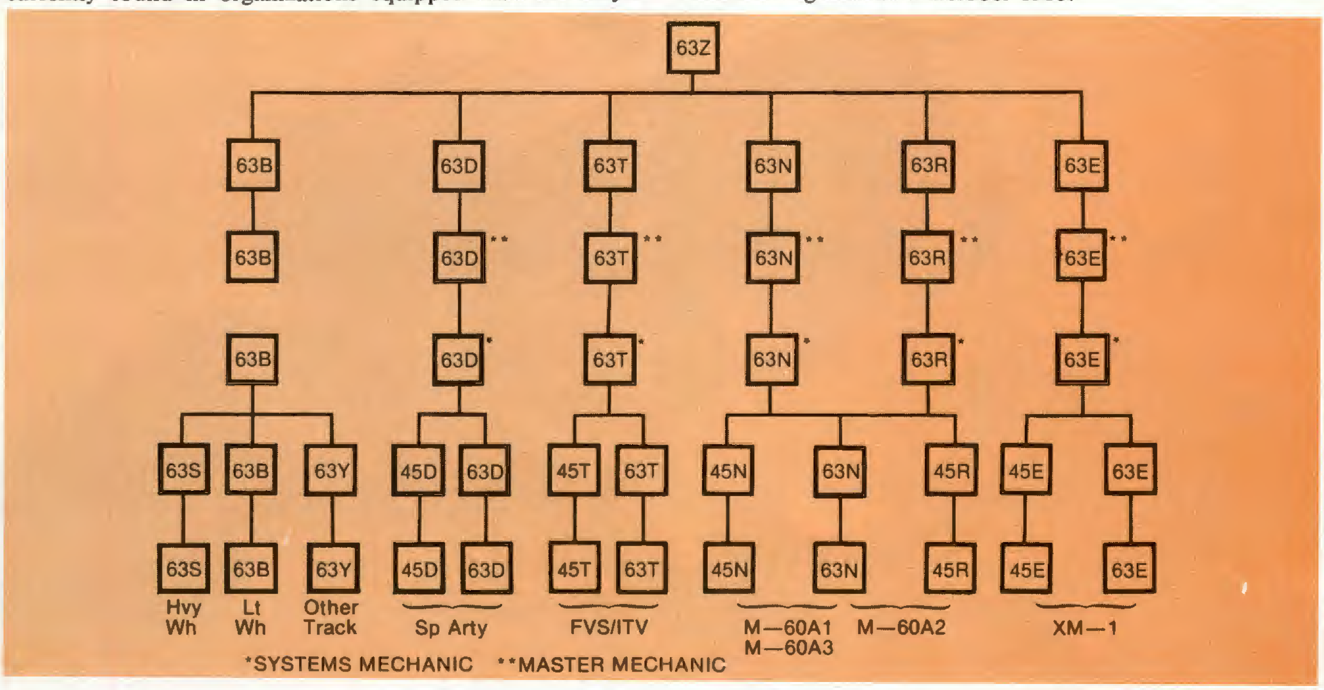
ARMOR FORCE MANAGEMENT

The new master mechanic concept envolved out of the problems defined by the Total Tank System Study and the Tank Force Management Group. Mechanics could not be adequately trained or managed due to the proliferation of new equipment being fielded. This adversely impacted on organizational maintenance and resulted in the degradation of tank availability. The solution to these problems was to train system-specific mechanics, manage them efficiently, and provide them professional development training including formal technical and administrative instruction.

The master mechanic program is now in final proposed form and has been forwarded to DA MILPERCEN for approval and implementation. This concept visualizes a separate organization maintenance MOS for each major weapons system and a separate MOS each for turret mechanics and automotive mechanics through skill level 2. Thus a 63E20 would be an automotive mechanic for the *XM-1* tank and a 45E20 would be the turret mechanic for the same system. Initial entry training would include training on other vehicles currently found in organizations equipped with the major weapons system such as the ¼-ton and 2-½-ton truck, the *M-113* family of vehicles, and all recovery vehicles commonly found in those units. MOS 63F has been deleted and all system specialized mechanics will be trained in recovery operations.

Merger of cross-over training has been incorporated into the master mechanic concept. Formal institutional training course or on the job experience (OJE) coupled with successful completion of the SQT will be required for advancement to skill level 3. This merger training will consist of qualifying the automotive mechanic in turret mechanic skills and *vice versa* as well as teaching management and advanced recovery skills. Individuals thus qualified in the total weapons system will be called system mechanics and will carry the MOS 63 appropriate to the weapons system. Tables of Allowance and equipment will be modified to authorize one system mechanic per line company/battery and two in the battalion maintenance platoon.

Upon approval by DA MILPERCEN, this concept will be incoropated into AR 611-201 with an effective date and a start training date of 1 October 1980.





SOILS AND SLOPES

The tank shown here is a T-54 operated by a Patton Museum staff member. The tank was able to clear this particular hurdle, but it should be noted that the barrier was hastily constructed solely for the purpose of illustrating this article and was located on a lesser percent of slope than specified in the text. ED.

by Captain Daniel O. Graham, Jr.

The defender should use the terrain as much as possible to manipulate and stop enemy armor. He can also manipulate and stop the enemy with man-made obstacles and barriers. The trick is to refine what nature has provided, and that requires a fundamental appreciation of where the terrain has provided an effective obstacle. This article intends to do three things: refine our definition of natural obstacles, discuss the field expedient log-hurdle in light of the refined definition, and examine a field test of the combined effects of a log hurdle on a hillside.

Natural Obstacles - Soils and Slope

Presently, when terrain analysts look for natural obstacles, they consider the absolute performance values of military vehicles. The Soviet *T-62* tank and *BMP* armored fighting vehicle can traverse soil with a bearing pressure not less than 8 pounds per square inch (psi) on *level ground.* The *T-62* and the *BMP* can climb a 57 percent slope on *ideally trafficable soil,* but there is very little *ideally trafficable soil* and *very little level ground* in Western Europe. Rather than define limits of trafficability in absolute terms, one should determine the combined effect of *less-than-perfect* soils and not *not-so-level* ground.

On less than ideal soils, the *T-62* will not be able to climb a 57 percent slope because the soil will not support the tank and will shear out from under the tracks. As the slope increases, soil is less able to support the stress of a vehicle's weight. The soil's ability to support vehicles on a slope can be determined by testing the soil's shearing resistance and remolding properties. The tests are simple and require a two-man team with a man-packable Soils Test Kit. In less than 20 minutes a team can gather the measurements and calculate the strength of the soil in an area. TM 5-330, Chapter 9, describes the mechanics of the soils tests in detail. The soil is then rated with a Rating Cone Index (RCI). The value will change as the moisture content of the soil changes, so the same soil should be tested for various conditions—dry, moist, and wet when they apply.

Every vehicle can be rated for soils trafficability, specifically its propensity to shear soil, with a Vehicle Cone Index, (VCI) which is derived from the vehicle's technical data. The VCI is calcuated as follows:

$$VCI = 25.2 + .454 \times \left[\frac{\text{contact pressure factor} \times \text{weight factor}}{\text{track factor} \times \text{grouser factor}} + \text{roadwheel factor} - \text{clearance factor} \right] \times \text{engine factor} \times \text{transmission factor}$$

The equation is found in TM 5-330, Chapter 9, and each of the factors is defined. The factors' values are derived from the following technical data:

	T-62	*BMP*
Gross weight	82,800 lbs	30,460 lbs
Area of tracks in contact with the ground	7,604 sq in	3,200 sq in
Track width	22.8 in	12.0 in
Grouser length	1.5 in	1.5 in
Number of Roadwheels on track in contact with ground	10	12
Area of one track shoe	122 sq in	44 sq in
Ground clearance	16.9 in.	13.1 in.
Horsepower	572	393
Type transmission	manual	manual

EXAMPLE: The *T-62* Tank

$$\text{Contact pressure factor} = \frac{\text{gross weight}}{\text{area ground contact}} = 10.88$$

Weight factor for 82,800 lbs = 1.4

Track factor = Track width/100 = .228

Grouser factor for 1.5 inch = 1.0

$$\text{Roadwheel factor} = \frac{\text{gross weight}/10}{\text{Roadwheel} \times \text{area track shoe}} = 6.79$$

Clearance factor = clearance/10 = 1.69

Engine factor for 13.8 hp/ton = 1.0

Transmission factor for manual = 1.05

$$VCI = 25.2 + .454 \left[\frac{10.88 \times 1.4}{.228 \times 1.0} + 6.79 - 1.69 \right] \times 1.0 \times 1.05$$

VCI = 59.5

The VCI for the *T-62* is 59.5 and the VCI for the *BMP* is 62.9. By contrast, the US *M-60A1* tank has a VCI of 49.0. The greater the VCI, the less the vehicle has the ability to climb. With the soil's RCI and the VCI in hand one can consult the performance curves found in TM 5-330 to determine the maximum attainable slope on the tested soil. Performance curves can be derived for any vehicle.

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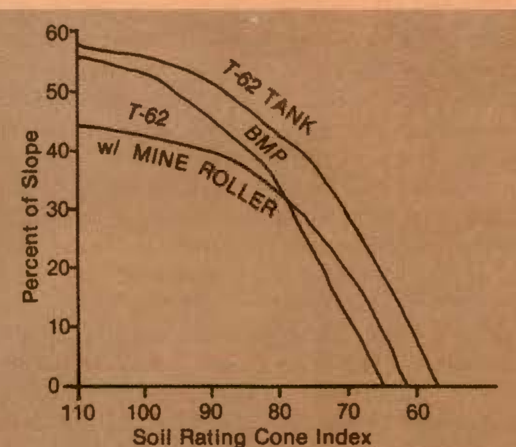
The relationship between the slope and the soil's ability to support a *T-62* and the *BMP* vehicle is shown in figure 1.



Points beneath the curves represent conditions of soil and slope that permit each vehicle to climb. Points above the curve represent conditions that stop the vehicle.

Figure 1

Heretofore, a cautious terrain analyst would not declare that a ridge was an obstacle to enemy armor unless its slopes exceeded 57 percent. Now he can consult the performance curves, test some soil and discover that there are many more natural obstacles than he previously though existed. The refined definition of an obstacle also gives the barrier planner greater flexibility. For example, on an average soil, the *T-62* can climb a 38 percent slope while a *T-62* burdened with an antimine roller or plow can climb less than a 27 percent slope on the same soil. A defender could mine a hillside or put hasty mine patterns on mountain roads and the enemy would have to dismount their armored vehicles to clear the mines, greatly increasing their vulnerability to indirect and small arms fires. The combined properties of soils and slope more accurately describe existing obstacles, and the method of combining the properties of soil and slope suggests that there can be further refinement with respect to other types of obstacles such as vertical step.

Soils, Slope, and Vertical Step

There is an absolute value that says the *T-62* and the *BMP* can climb a 32-inch vertical step, but that is the case on level ground made of ideal soils. However, a lesser combination of soils and slope augmented with a seemingly inadequate vertical step will prove to be an obstacle. Since we may not need to make our vertical steps 32 inches tall, we can make more of them faster. The question is, "given a slope and a soil condition, how high must a vertical step be built to stop the *T-62* and the *BMP*?" Much of the answer lies in understanding what happens when a vehicle is confronted by a vertical step on a hillside.

Increased Slope. As a vehicle mounts the step, its slope of ascent increases. The vehicle must continue forward until its center of mass passes over the lip of the vertical step. The slope of ascent continues to increase as the vehicle moves forward on the step and is greatest just as the center of mass is directly over the step (figure 2).

Radical Increase of Vehicle Cone Index. As the vehicle mounts the step, much of the track loses contact with the ground. The *T-62* normally distributes its weight over 7,604 square inches of track, but when it is propped up on the step it may concentrate its weight over four points of contact totalling approximately 1,220 square inches of track surface. The great reduction of track in contact with the ground radically increases the contact pressure factor which causes the VCI to increase, in this case from 59.5 to 225.8. Even an excellent soil of coarse ground, cohesionless sands, and gravels would shear under the stress of a vehicle with a Cone Index of 225.8 on a moderate slope. As the soil shears away from under the rear of the tank, the slope of ascent will increase until the tank digs its way down to its belly.

This analysis will focus on the increased slope caused by the vertical step. The effects of the radical increase in VCI shall be considered a bonus to the obstacle and thereby add a margin of safety to the calculations.

We can derive a formula to describe the height of a step necessary to stop a vehicle when we know the:

- Angle gradient of the hill.
- RCI of the soil.
- VCI of the vehicle.
- Center of mass of the vehicle.

According to the diagram, h* is the height of the step.

$$h^* = h_1 - h_2$$
$$h_1 = x \sin \beta$$
$$h_2 = g \tan \alpha$$
$$g = \frac{h_1}{\tan \beta} = \frac{x \sin \beta}{\tan \beta}$$
$$h^* = x \sin \beta - \frac{x \sin \beta \tan \alpha}{\tan \beta}$$
$$h^* = x \sin \beta \left[1 - \frac{\tan \alpha}{\tan \beta}\right]$$

The value for α is the gradient of the hill. The value for β is the maximum attainable gradient established by the soil's RCI, the VCI, and the performance curves. The value for x changes as the value for β changes. The center of mass in the *T-62* tank is 50.8 inches above the ground. When the tank is on level ground the center of mass lies over track that is 105 inches from the rearmost ground contact. When the vehicle is on an uphill slope the center of mass lies over track that is further to the rear. How far rearward? If the tank is tilted at a gradient of β degrees, the rearward shift will be $\tan \beta$(50.8 inches). The value for x becomes:

$$x = 105 \text{ inches} - \tan\beta(50.8 \text{ inches})$$

EXAMPLE:

A hill is measured and determined to have a gradient of 10° (17.6% slope). The soil is tested and given a RCI of 85. Since the VCI for the *T-62* is 59.5 we know that the maximum attainable slope on the tested soil is a 43% or 23° gradient. We know that the center of mass of the *T-62* is 50.8 inches above the ground. We can figure out how tall a step we must build to stop the tank.

1. $\alpha = 10°$ $\quad \tan\alpha = .176$
2. $\beta = 23°$ $\quad \tan\beta = .424$ $\quad \sin\beta = .391$
3. $X = 105 - \tan\beta(50.8) = 83.5$

$$h^* = 83.5\,(.391) \left[1 - \frac{.176}{.424}\right] = 19.1 \text{ inches}$$

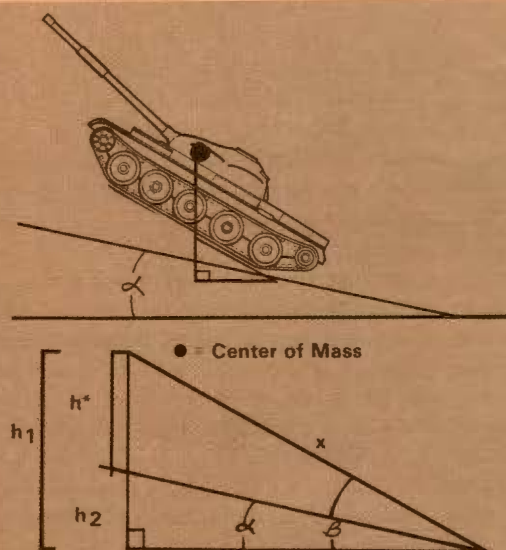
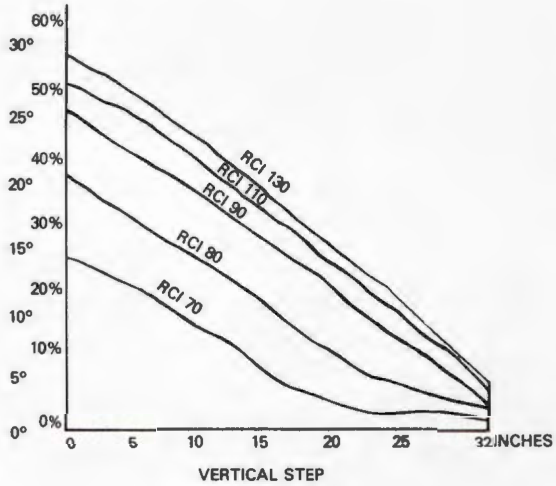


Figure 2.

Table 1.
Data table for the *T-62* Tank

Slope	RCI	130	110	90	80	70
	B[5]	30°	29°	26°	21°	15°
	x[5]	76.0	76.5	81.6	85.6	93.3
5°		31.5	31.2	29.3	23.6	16.3
10°		26.4	25.5	22.8	16.4	8.3
15°		20.4	19.1	16.0	9.0	1.0
20°		14.0	12.7	9.0	1.2	-
25°		7.3	5.9	1.5	-	-
30°		-	-	-	-	-

The soils, slope and vertical step performance curves are another tool for the terrain analyst, since they identify even more obstacles. There are hundreds of kilometers of terracing holding up vineyards along the river valleys in West Germany and now we can be certain of those that are obstacles. Many of the Federal highways and *autobahns* in West Germany have fills which are 15 percent to 66 percent steep and at the top of many of the fills there are guardrails. The performance curves can predict where the combination of the fill's slope and the guardrails' height combine into an obstacle.



T-62 Tank
SLOPE and VERTICAL STEP
FOR DIFFERENT SOILS

The points under the curve represent all the circumstances in which the *T-62* can climb; the line is the limit and the area outside the curve will stop vehicle.

Figure 3.

The terrain analyst can also use the performance curves to suggest areas that could be augmented with small vertical steps. While nature has provided few materials to build 32-inch vertical steps, nature has provided an abundance of hillsides and trees which average 15- to 20-inches-thick. The curves show that a 20 percent slope with an average soil (RCI = 80-90) can be reinforced with 15 to 20 inch thick trees to create an obstacle. A single log wall has all the advantages of the log hurdle. It exposes the soft underbelly of the tank while forcing the main gun and coaxial machinegun to point skyward. The *T-62*'s maximum gun depression angle of -4° would be more than offset by a vertical step greater than 10 inches. The single log wall is vulnerable to a tank with a lot of momentum. It must be anchored to prevent the tank from pushing one end and passing through it like a turnstyle. The momentum problem could also be beaten by emplacing two or three parallel single-log walls.

We could augment a single log wall by digging a cut into the slope approximately 80-inches downhill from the log. The cut would slow down the tank, reducing the momentum problem and it would lower the rear end of the tank increasing the angle of ascent. The cut need not exceed 18 inches when it precedes the single-log wall.

An airborne unit would not have to take tons of mines and demolitions into battle, but a few chain saws to fell trees and some snaking chains to drag the trees into position. An infantry company could improve its own barrier plan without having to rely on trained engineers. A forested hill could be made impassible without using tons of demolition which would free those engineer demolitions for barriers in level areas.

Field Tests

The 10th Combat Engineer Battalion recently tested the slope, soil, and vertical step performance curves at the Hohenfels Training Area in West Germany. They selected a 20 percent slope with a soil measured at RCI = 110. The study predicted that a 23-inch vertical step would stop a *T-62* tank. It predicted that the tank could mount the step, but as the tank would try to pass its third road wheel over the step, the soil would shear out from under the rear of the tank. The 10th Engineers steadied their 23-inch thick oak logs with three U-shape pickets. A *T-62* tank provided by the 7th Army Training Center OPFOR detachment then attempted to breach the obstacle. After five attempts, the tank crew stated that the log was impossible to breach. Indeed, it mounted the step up to the second road wheel and the soil gave way until the tank's rear was bellied in. The *T-62* was unable to turn right or left while mounted on the log, and it could only retreat from the log. While mounted on the log, the tank exposed two to three feet of its soft underbelly. Also while on the log, the *T-62*'s main gun and coaxial machine gun were pointed in the air. Therefore, the *T-62* on a 23-inch log was stopped, exposed, and harmless.

There were several other observations made during the tests. Dead fall will not stop a tank and will usually break under the pressure. Green pine compresses; therefore, one should select pine logs that are a couple inches thicker than what the performance curves indicate. Oak, hornbeam, and beech are solid and make good vertical steps. The untrimmed branches of a felled tree serve to anchor the tree. Also, the tank crew claimed that they were badly shaken during their attempt to climb the single log, and they were dangerously shaken when they descended a slope and crossed a log. The crew claimed they could not have effectively maneuvered or engaged targets while descending a slope strewn with log obstacles. Therefore, a reverse slope defense would be improved if the attacking armor was forced to fall over single log walls.

Unfortunately, there is not a variety of soil types at Hohenfels, but the excellent dry clays probably provided conservative data even though the entire spectrum of soils, slopes, and vertical steps could not be tested. The field tests demonstrated that a *T-62* tank can be stopped by a log on a hillside. The size of the logs that stopped the tank were predicted by the formula and the formula was derived by refining the absolute values associated with obstacles. The formula generates performance curves which are easily applied by the analyst in search of natural obstacles or by the commander augmenting nature's soils and slopes with single-log walls.

CAPTAIN DANIEL O. GRAHAM, JR., accepted a Regular Army commission as a distinguished military graduate from the College of William and Mary, where he earned a BA in English Literature in 1974. He earned an MBA from the Univ. of Alabama in 1976. A graduate of Ranger School and MIOBC, he served in Europe as the S2 of the 10th Cmbt Engr Bn, and is currently assistant operations officer for the G2, 3d Infantry Division.

. . .A significant facet of mobile warfare

MILITARY OPERATIONS IN BUILT- UP AREAS

There has been a remarkable increase in the size and number of urban or built-up areas in the past 30 years. This fact is particularly obvious in West Germany. The area between Frankfurt and Nuremberg, for example, has become as crowded with man-made structures as the Northeastern United States. Towns and cities near the East German and Czechoslovakian borders have also undergone enormous growth in recent years. Bad Hersfeld, Fuda, Coburg, Bamberg, Hof, or Amberg are no longer towns but small cities. This massive urban expansion has significantly altered the topography of West Germany and will significantly affect any future battles fought there.

Fortunately, these facts have not been overlooked. Field Manuals 71-1 and 90-10 conclude that military operations in built-up areas (MOBA) can no longer be avoided. Nonetheless, despite recognition of the relevant facts and the existence of doctrine on the subject, it seems that no cognitive effort is being made to integrate MOBA into the overall tactical plan. This is unfortunate, for MOBA will play a significant, perhaps crucial role in a future European war.

Natural lines of communication have traditionally sponsored urban development. In West Germany, many large cities have grown out of river settlements. Today these natural lines of communication have been reinforced and extended by a sophisticated network of highways and secondary roads. This road network has sponsored new development and continues to do so. In many places these natural and man-made lines of communication are now surrounded by built-up areas. Mobility in other large areas, particularly highland areas, is often reduced by rough terrain or well conserved forests.

Threat tactical doctrine emphasizes offense, mass, shock, speed, and echelons. They hope to achieve, indeed they rely on achieving, advances of up to 50 kilometers a day. Their ultimate victory may in fact hinge on rapid success. Hence, the topography of West Germany in general, but particularly the extent of built-up areas, represents a potentially serious obstacle to Threat forces. A large mobile force moving generally east to west across Germany tends to be channelized, forced in many areas onto traditional lines of communication, and into built-up areas.

When this occurs, the defender, fighting from a built-up area, gains a clear advantage. Concealment and protection from direct or indirect fires become readily available. Every building becomes a time-consuming obstacle to be overcome by an advancing force. When this occurs, an area can be successfully defended by a comparatively small number of well-positioned men. For instance, in October 1978 three to four thousand Phalangist militiamen armed with only rifles, machine guns, and light antitank weapons were able to hold large sections of Beirut, Lebanon for 10 days against a force of over 20,000, employing infantry, armor and artillery. Although aerial bombing played no part in this battle, Phalangist strongholds were subjected to intense, almost continuous bombardment from Soviet-made 220-mm artillery pieces. When the fighting stopped, relatively little damage had been done to most buildings, even those which sustained direct hits, and the Phalangists had lost only about 50 men. While precise figures are not available, the larger more heavily armed force took far more casualties.

The Israelis realized the potential of difficult terrain during the early hours of the 1973 war. By operating from commanding positions along the Golan Heights, a relatively small number of Iseaeli soldiers were able to slow the advancing Syrian Army, while reinforcements deployed.

But West Germany's topography only represents a potential disadvantage to Threat forces. Before this potential can be realized, before disadvantage can be turned to advantage, positive steps must be taken. Moreover, unless these steps are taken, Threat forces can capitalize on certain topographic features to actually facilitate their success. Primary among these steps is the development of a strategy which recognizes the importance of MOBA in mobile warfare. For in developing this strategy, critical issues will be resolved and serious problems anticipated and solved in advance.

Although such a strategy is well beyond the scope of this article, some of the issues that merit further consideration deserve mentioning. Should, for example, built-up areas be used systematically to add depth to the battlefield? Should fighting in built-up areas be emphasized or fighting from them, that is, should efforts generally be made to hold built-up areas or should they be regarded primarily as a means of using space to gain time? Should units permit themselves to be bypassed and surrounded? Do existing weapons and material stockpiles match existing needs? Should a limited number of 90-mm recoilless rifles be returned to the inventory and larger amounts of barrier materials placed in forward storage areas? Force structures also need to be carefully evaluated to determine whether there are enough infantrymen available to mount a defense in which MOBA plays a significant part. None of these are simple questions, but the last one may be the most difficult to answer. For despite all the noise that is made about properly integrating the Combined Arms Team, the infantry is routinely relegated to a secondary role during training exercises. It is not uncommon to see the infantry sweeping woodlines that would actually be cleared by firepower alone. Nor is it uncommon to see the infantry performing so-called security missions which in fact amount to nothing more than guarding tanks.

To fight and win outnumbered, every soldier, every weapon, every inch of the battlefield and every minute must be used to the greatest advantage. Commanders must be able to really put the Combined Arms Team to work, employing each member of the team to maximum benefit, because no one member can win alone. The history of this century is replete with so many incidents which demonstrate the obsolescence of static warfare that the issue can no longer be seriously argued. Yet history also demonstrates that the factors affecting the conduct of war often change. Massive urban expansion is one of these changes. Built-up areas can no longer be avoided. Consequently, operations in built-up areas are unavoidable and MOBA must be recognized as a significant facet of mobile warfare. Our ability to respond to the challenges imposed by this fact will influence our capability to win future wars.

L. ERICK OHLSSON
Major, Armor
MILPERCEN

CREW ENDURANCE AND TANK DESIGN

In "The Commander's Hatch" in the January-February 1979 issue of *ARMOR*, Major General Thomas P. Lynch points to "our potential foe's ability to force continuous operations upon us using night vision devices to keep up the momentum of operations around the clock, not just for a few days but for several weeks." In his article "Sleep Loss" in the same issue Captain Richard P. Geier writes: "Four days after the battle begins the Threat will have rotated units into the battle. Will we be able to defeat these units or will the Threat forces find American soldiers asleep in (their) tanks?"

Extended crew endurance can be and should be built into any new main battle tank design. It will be achieved by a rearrangement of crew duties within the vehicle and also, ideally, by the adoption of a front-engined, rear-door configuration as in the Israeli *Merkava.* Certain basic principles govern the provision of extended crew endurance in the main battle tank. These principles were put forward in my paper "Configuration and Crewing of the Main Battle Tank" of August 1978. They are:

Concentration of Control. Control of the vehicle must be concentrated in the hands and the heads of a minimum number of crewmen. In the MBT these crewmen will be the commander and the gunner seated one on either side of the gun as in the Russian *T-72.* Both will have all round vision and both will have combined driving and gunnery controls. This duplication will allow them to exchange duties without leaving their seats, giving relief from fatigue and great flexibility in the handling of the vehicle. Automatic loading from a sealed and vented magazine in the turret bustle will reduce the armored volume by eliminating the human loader and increase safety by separating the crewmen from the ammunition. Transfer of the driving function to the two turret crewmen will eliminate the driver from the front of the hull removing the necessity to provide for his vision and escape and allowing increased and unrestricted armoring of the front of the vehicle.

Rest Space. A full-length rest space for one or two crewmen must be provided low down and in the rear of the vehicle. This would normally be occupied by the Third Crewman who would be entirely off duty and resting preparing to relieve the turret crewmen when required. Rest space is best provided by a front-engined, rear-door vehicle configuration which not only increases crew protection by placing engine and transmission forward of the fighting compartment but also increases their safety by allowing them to enter and leave through the rear door and not through the exposed roof hatches.

Cumulative Crewing. The existing conventional four-man MBT (*M-60, XM-1*) will operate at only 50 percent efficiency if crewed by three men and will be almost unusable if only two crewmen are available. On the other hand an MBT using automatic loading and turret driving controls may be fought at the halt or road marched by only one crewman. With two men in the turret the vehicle will operate at full efficiency but with limited endurance. The third crewman in the rest space will provide the vehicle with extended crew endurance. He may transfer rounds from hull stowage to bustle magazine and may drive the vehicle if prolonged firing on the move is required. This cumulative increase in performance according to the number of men available to crew the vehicle will be invaluable when personnel and vehicle casualties are suffered and "remaining assets" must be "redistributed" in battle.

Readers of *ARMOR* will be well aware that these three principles have already been demonstrated in hardware form in either the Swedish *S Tank* or the Israeli *Merkava.* They are not in themselves new. What is new, however, is recognition that these principles form the foundations upon which we may construct a smaller front-engined MBT with turreted 120-mm gun whose three crewmen will be able to keep it in action for several weeks of continuous operations in the face of determined Threat attempts to defeat them, if not by the destruction of their vehicle, then by sheer exhaustion.

It is probably not cost effective to extend crew endurance on the M-60 except by providing harnesses, hammocks, and contoured bunks to assist the four crewmen in operating a vehicle which was designed over 20 years ago without crew endurance in mind.

The more immediate question is whether or not it would be possible to modify *XM-1* to introduce the principles of extended crew endurance without carrying out a total redesign of the complete vehicle. It does appear that it would be possible to introduce a new two-man turret incorporating automatic loading and turret driving controls and to mount it upon the existing *XM-1* hull which would remain virtually unaltered. The third crewman, denied the ideal rest space at the rear of the vehicle, would make use of the existing space in the front of the hull. The introduction of this new turret might be coordinated with the changeover from 105-mm to 120-mm gun in the *XM-1* program providing a significant step toward the extension of crew endurance pending a new MBT design combining both rearrangement of crew duties and new configuration in one and the same vehicle.

Robin H. Fletcher

Over Wallop,
Stockbridge, Hants, U.K.

Whatever happened to

THE ROLLING LIQUID TRANSPORTER?

The thoughts put forth in the article "A Plan for Refueling" are an indication of the time and effort put into the article's prepartion. Captain Pratuch is to be commended. However, the bottom line is, and always will be, dollars in men and equipment.

Many of us are reluctant to look into the past, to see if among the rusty, dusty files an idea may be there that should be brought out and dusted off. Possibly with new technology and a fresh look, it might have some merit worth consideration.

I will try to do just that. Allow me to reintroduce the *M-1* rolling liquid transporter (RLT).

Such a fancy name is not in line with such a simple piece of equipment. Briefly it is/was nothing more than two tires or rollers with a liquid capacity of 250 gallons each joined by an axle, fitted with a tongue that was capable of matching with a standard trailer hitch. Mounted on the tongue was a standard fuel transfer pump of the type found on tanks, and an accessory box with a set of fuel transfer hose assemblies and air hoses.

The operation was very simple. A vehicle was brought alongside and fuel was pumped from the "tire" into the vehicle. A speedier method used compressed air—possibly supplied by the towing vehicle. My personal experience dates from Okinawa, 1960, with the 3rd Tank Battalion, USMC. While serving as platoon sergeant, my platoon was assigned the mission of evaluating the RLT during a training exercise.

Prior to departing on the exercise we "drilled" with the RLT, using both the pump and compressed air from our support truck. Results were satisfactory. The manual refueling time was equal to refueling from another tank or drums. Using compressed air was much faster, but not equal to refueling from a 1200-gal tanker.

Enroute from Camp Hansen to Naha Port to embark on an LST, the RLT was filled with gasoline and attached to my tank (the last in the column), followed by our support truck. Traveling on paved roads in good condition at speeds above 25 mph, the RLT traveled perfectly. No sway was felt in the TC hatch, and the driver reported no effect on the tank's operation or handling. The support vehicle reported no visible bouncing or sway.

At Naha we loaded the tanks into the ship on the tank deck, while the support truck loaded the RLT "topside" in the same manner as any 1½-ton trailer. During the landing, the support truck with the RLT in tow joined battalion trains—without any difficulty!

During the exercise, the support truck with the RLT setup served as a refuel point using the compressed air supply of the truck, with no problems incurred. Toward the end of the problem the RLT was again attached to my tank to evaluate its "off-road" performance. Again no problems occurred, and it behaved in the same manner as any 1½-ton trailer. The RLT backed and maneuvered better on the tank than the truck, due to pivot turning of the tank.

Overall evaluation was fantastic. The fact that I am writing should be an indication of my personal feeling.

Advantages: During administrative marches, each RLT would furnish 500 gallon of fuel to extend the range of the platoon it was attached to. During combat operations, the RLT could be attached to a company HQ vehicle (tank or truck) and brought forward much easier than a 1200-gal tanker. Defilade positions to protect the RLT would be easier to locate. The flotation of the RLT is much better than the 1200-gal tanker in snow and mud. Other advantages are that as many RLTs as tanks can pull can be hooked together and towed any place a tank can go. The RLT can be released from the inside of the tank by a line attached to the towing hitch.

The RLT filled with gasoline was fired on using caliber .50 APT. It was punctured, causing a small fuel loss, but *no fire*. When we received the RLT for testing, I was told that the Army had tested the towing capability on unimproved roads with as many as 10 RLTs being towed by a standard 10-wheel tractor without a problem. I could go on expounding the possibilities of implementation and the many advantages, but I know of no disadvantages.

Before casting the RLT aside—consider the savings in design and procurement costs and the ease of operation!

EDWARD J. HERTERICH
GySgt, USMC (Retired)

San Marcos, CA 92069

THE ELECTRIC PIRANHA

Boris Popov commands a large mechanized army which has invaded the land of Durndl. His offense is rolling along covering the prescribed number of kilometers per day. However, he is losing. His forces are being decimated by an enemy who operates in small highly mobile teams which appear out of nowhere, night and day, to attack his flanks and rear, then disperse before his forces can engage them in close combat. The electric piranha is a combination of our conventional weapons technology and some of the not so conventional tactics we learned in Vietnam. Dispersion, speed and night operations coupled with our superior technology might give us "little guys" an edge if we adopt hit-and-run tactics instead of trying to slug it out "toe-to-toe" with our "big guy" adversaries.

Sometime in the future, in a land not too unfamiliar, a ponderous figure strides about his command post. He is fuming. He screams, "Four days in the attack, no real enemy and I'm losing!" True enough, his great war machine had spearheaded into the land of Durndl, yet, by all reports, it was losing. Following its practiced offense, moving forward like a giant machine, taking measured strides each day. Following its great curtain of fire and under a veil of smoke, it was making ground-gaining progress to be sure. But there were no fixed enemy to key on, and each day's situation reports showed that this force was being eaten away like a cancer.

The commander bellowed again, "Where are they, staff? Where are they?"

One of them offered, "They just can't be seen. They come out at night....They work in small teams; they seem to be everywhere."

"Do you think I'm a fool?" he shouted back. "You know very well Uncle Sam's boys always line up neat clusters on the military crest well forward in the field of battle...and so you tell me they are not to be seen? But they can see us all right, and how do you explain that, Anatoli?"

The staff officer replied, "They wear strange masks, and they can see at night. Not only can they see well, but they can see far. It's amazing! I think their masks have electric glasses."

"That doesn't seem likely. We travel at such a speed, shrouded by such a veil of smoke and dust, that it's impossible for any army to see us from their positions. Our suppressive fires must surely drive them to cover."

"That's what we thought, Commander, but they have small metal shelters called 'boxholes' which they use as temporary shelter to ward off shrapnel and chemicals and afterward shed like so much extra clothing. Those wily devils lay under cover, let us go by and shoot us from the rear where we are not masked by our smoke screens.... They shoot us at night, and they shoot us from unexpected places. They seem to be everywhere."

"Very well, very well, what about our progress? We are moving into the enemy's territory according to the timetable even though we are losing people. Are we going to make the river on schedule?"

"Sir, we may make the river on schedule, but we may not have any effective forces once we get there. Right now, our lines of supply are dangerously unprotected, and ammunition in our lead elements is just about exhausted. We have tanks; we have firepower. But I'm afraid our mass and momentum will be spent by the time we get to the river. I'm not sure our tanks will arrive because of fuel problems."

"What fuel? We just take fuel from the homes and factories, isn't that right?"

"That's right, but they have polluted it with some kind of contaminate, and it's beginning to freeze our engines while they are on the move."

"Damn! Why don't they stand up and fight like men?"

What is an Electric Piranha?

The electric piranha is a tactic, albeit protrayed in somewhat catchy terms, but not so unconventional as it may seem. The electric piranha, as a symbol, represents a simple synthesis of our conventional weapons technology and some of the not so conventional tactics we learned in Vietnam.

We were the big guys in Vietnam, the firepower kids, fighting a shadow enemy. In any way you assess that conflict, you must agree that, pound for pound, our firepower was frequently wasted against their tactics. In the next conflict, it is the enemy who will be the big guy. We will be the side subjected to a massive curtain of suppressive fires and smoke. It is we who cannot afford to become the easy, fixed, concentrated target of those massed fires.

Principles of War or Operational Art

It seems that when you are the little guy—little in numbers or little in equipment—modified principles of war apply.

Lessons learned from the Vietnam and Middle East Wars provide excellent examples. The principles of war we have operated with for so many years would not have served the North Vietnamese very well. But those principles espoused by Mao and Giap could effectively be woven into the fabric of our doctrine of the future. We can be like the fish in the sea; in fact, in order to keep from being easy targets, we must be the fish in the sea. The piranha! The "Electric Piranha!"

The ability to take a force coming at you and direct it away from your sensitive areas, and into an area that will dissipate it, is fundamental. The following principles, sifted from the martial arts, are useful for viewing the battlefield from the perspective of the little guy.

- Multisensory dominance—Seeing the enemy with every interpretive sense you have before and during the engagement will reveal how to use his great strength against him and how to use your reduced strength optimally.
- Critical target focus—Close his eyes with two pointed fingers, then shut his communications with a shaft of fingers in his throat, let the bulk of his power lash out blindly, then sever his spinal cord.
- Spend your opponent's energy—If you cannot stop your opponent's blow before it gains momentum, then, with minimum energy, deflect this blow onto unimportant terrain. Let him overextend himself while you nibble away at his life line.
- Combine and focus your energy—Make a rapid commitment to the area most critical to his defeat.
- Set-strike-set—Focus on a soft spot, then strike with power.
- Have staying power—When two forces are nearly equally expended, the one who claims victory may, in fact, convince the other he has something left. With flags, broadcasts, leaflets and resolve, the fight continues till one side says "uncle," or the other side convincingly claims "victory." (Note: These notions are really more akin to the Soviet idea of operational art—somewhere between principles of war and tactics.)

Technology

Technological achievements can give us great advantages. The question about whether better advantage can be gained from ponderous, complex pieces of equipment or by light and versatile pieces of equipment has been a matter of debate since 1972 when the land combat study completed by the US Army Combat Developments Command suggested that very lightweight tanks and antitank weapons should be the staple for our Army. Somehow, the logic of that study was defeated, and a novel proposal that seems to have the greatest promise, the trail bike, has also received poor reception at the higher levels.

In any case, tactics using light antitank weapons and fast, mobile teams mounted on trail bikes may be just the counter to the tactics of our rather awesome and ponderous potential enemy. Standing in front of this battering ram would be the last way to achieve a favorable exchange ratio. Attacking within an overall scheme of prolonged attrition using the night weapons system mobility, and accurate fires to our advantage seems to be a more intelligent strategy. Hence the notion of a highly technical guerrilla force of small teams that operate at night in small areas of responsibility seems useful.

A technological guerrilla concept is not without precedent in modern armies. The Yugoslavian nation is, in fact, an armed populace. Likewise, the Swiss rely on the citizen-soldier literally fighting in his own backyard. An advantage of operating in this guerrilla mode is the opportunity to recruit partisan help. If during training, the guerrillas would include the citizenry in their operations, the populace could help fight, but, more importantly, it could help with the pre-positioning and delivery of ammunition, fuel and food.

The offense, the primary way to win in war, would be frequently employed. Preemptive strikes by small teams helicoptered or biked into the enemy's rear could cause destruction and confusion by attacks on assembly areas, along approach routes, and on firing positions. We should also operate against his "nervous system" of command and control and fire direction facilities, without which he loses flexibility and confidence during drives for deep objectives.

Characteristics

Each of the following characteristics of the conceptual technological guerrilla features the maximum use of our fighting technology and the best tactics of the guerrilla.

- Small, highly independent fighting teams.
- Highly mobile, man-portable weapons systems, using trail bikes and helicopters.
- Pinpoint accuracy of precision guided missiles.
- Dispersed, difficult to detect or neutralize "killing power" of medium rocket launchers spread throughout the rear service area.
- Chemical and nuclear protection provided by a mobile "boxhole."
- Deep strike capability with Air Force support.
- Continuous day-night operation within a prescribed area of responsibility.
- Reduced vulnerability to electronic warfare, through autonomous action and use of simple, prearrangd audio and visual signals.
- Continued ability to engage the enemy using prepositioned rations and ammunition.
- Partisan support provided by close working relationships in training with the indigenous population.
- Favorable combat power ratios by choosing the point of attack.
- Attacking the enemy system at its weakest points along extended supply lines.

Conclusions

The preceding analogies—electric piranhas or technological guerrillas and the martial arts techniques—are showcase ideas, but they should be examined. Historically, the principles of guerrilla warfare have worked well against a large conventional force. We should use those proven tactics to our advantage.

Another way to gain an advantage over an enemy is to use the precision day/night weapons technology we possess. You cannot use a 3-kilometer-range precision weapon well if you are in the midst of a hail of suppressive fires and your target bobs up and down at 13 kilometers an hour in a veil of smoke. Optimization is the name of the game.

And, remember, we are now the little guys.

Condensed from the article, "Boris Popov and the Electric Piranha," by Lieutenant Colonel James B. Channon, in Military Review, August 1978.

One way of 'Staying in' when you get out

THE NATIONAL GUARD

"If the reenlistment folks have broken both arms and legs, and the individuals still won't re-up, and they're qualified, we tell them about the Guard," says Sergeant Major H. P. Tillis, Army National Guard Recruiting Liaison NCO, USAREUR.

"We're not here to talk anyone out of staying on active duty,but we recognize that it's not for everyone. And some of those people who don't want to stay in on a full-time basis are still interested in keeping some ties with the military. These are the folks we want to reach. The Guard's not all peaches and cream—Guardsmen work hard, carry heavy responsibilities and train vigorously—but it is something worth thinking about."

Tillis has been in USAREUR working out of the 1st Personnel Command in Schwetzingen. He's been giving presentations to career counselors and different units since then, "telling people 'this is what we are and this is what we mean to you.'"

So what is the National Guard? First of all, Tillis explains, it accounts for a sizeable percentage of the Army's total combat forces. The Guard is primarily combat oriented, rather than support oriented.

"A lot of people say I'm going to the Reserves, but they're speaking collectively," says Tillis. "Often they don't know the differences between the Components."

The U.S. Reserve Components include the Reserve and National Guard elements of the Army, Navy, Air Force, Marines, and Coast Guard.

The Guard's primary mission is mobilization in case of national emergency. The President can call up limited numbers of troops for a limited period of time, but then it must be approved by Congress.

"The real difference from other Components comes in our secondary mission," says Tillis, "which is to give aid to civil authorities. The National Guard is State-controlled. It can be activated by the governor, lieutenant governor, or adjutant general. And because it is State-controlled, the States are free to offer extra benefits, like, in some States, educational scholarships."

Soldiers must be separated from active service before enlisting in the Guard. And, in Europe, it's necessary to wait until arrival at the Ft. Dix or Ft. Jackson Transfer Points.

"We're hoping to establish a direct referral system in USAREUR," says Tillis. "We'd like to be able to offer assignments from here. Then it wouldn't be a matter of checking it out later on; the information would be available now. It wouldn't be a matter of "if I go and if there's a space', it would be 'when I go to this particular assignment. . .'"

A prior service soldier may sign up for an initial assignment period of only one year, and is not required to stay in his or her current Military Occupation Specialty.

Soldiers interested in learning more about the National Guard may contact their reenlistment NCOs. If they don't have enough information, they have cards to mail to folks who do, and the answers will be sent back.

This article by Staff Sergeant Jo Ann Mann is reprinted from the February 1979 EurArmy.

AIR SUPERIORITY AT THE TREETOPS

It must be realized now by U.S. planners and our NATO allies that the helicopter will have a significant impact on winning or losing the land battle. This means that our helicopter systems, doctrine, force structure, and training must concentrate on winning the helicopter battle in order to ensure success on the ground. To accomplish this, we must gain and maintain air superiority at the treetops.

To what extent does the Soviet Union appreciate the advantages gained by the helicopter and airmobility? The recent Ogaden War in Ethiopia supplies the answer. Soviet *Mi-6* helicopters supported the Cuban-Soviet attack against Somali forces by flying troops, supplies, and equipment across the Ahmar Mountains. Some observers reported the transportation of *PT-76* tanks by these helicopters.

The entire operation was a coordinated combined arms attack using armor, massed artillery, tactical air and helicopters to envelop the Somali strongpoint in the vicinity of Jijiga. *Newsweek*[1] quoted an Arab military attache as saying, "It was over almost before it started. It was the kind of maneuver that up to now has been done only on paper maps in staff colleges." The implications are ominous.

In this age of systems analysis of tomorrow's possible battlefield in Europe, combined arms planners have attempted to find the best solution to the complex problem of fighting outnumbered and winning. Allocations of NATO ground combat power versus Warsaw Pact ground combat power have been closely scrutinized in order to maximize effectiveness and reduce the risks of defeat. The emergence of the active defense has been the fallout of this scrutiny. It is apparent that Air Force planners have applied themselves to the tasks of developing tactics to be employed in winning the air battle in Europe.

[1]"The Ogaden Debacle," Newsweek. 20 March 1978.

Emphasis has been placed by Air Force planners on fighting air battles above 100 feet and by Army planners on conducting ground combat, but who is looking from ground level to 100 feet? Exactly how will we fight in this vital area of the battlefield?

The JAWS (Joint Air Weapons System) exercise[2] that resulted in a draft manual entitled Joint Air Attack Team Tactics (JAATT) is the first major step toward achieving an understanding of how we should use the air space to our best tactical advantage. Air-to-air engagements by helicopters were examined by the U.S. Army Aviation Center during the ACE (Air Combat Engagements) studies[3] conducted at Fort Rucker, Ala. in the fall of 1977. The result was the funding of a joint project (Air Force and Army) entitled J-CATCH (Joint Countering of Attack Helicopters). This project has been tasked with the development of methods of countering the growing Soviet armed helicopter threat.

How Should We Proceed?

Recent simulator studies imply that the most efficient countersystem to an attack helicopter is another attack helicopter. If air superiority at the treetops is vital to winning and the most effective countersystem to the helicopter is another helicopter, air-to-air engagements between helicopters are inevitable on any future European battlefield involving NATO and Warsaw Pact armies.

Based on preliminary investigations, it also can be expected that helicopter air-to-air engagements at the treetop level will be fleeting, violent, intense, and of short duration. This means that detection, speed, and maneuverability plus accurate, long-range destructive weapons systems will be key factors toward winning victories in the air space just above the treetops.

What must we do? We could increase our buy of the incoming *AH-64* advanced attack helicopter with its basic weapons system, *Hellfire,* or we could increase the purchase of additional *AH-1S TOW Cobras.* Both of these helicopters could prove to be effective helicopter killers.

Will present dollar constraints support either course of action? The question really should be: "Can we afford not to field adequate helicopter countermeasures?" By the mid- to late-1980s, the US Army should have in its inventory the total quantities of *AH-64* and *AH-1S* attack helicopters programmed for purchase to meet force structure requirements. Attack helicopters and air cavalry units have been programmed to offset superior numbers of armor and motorized rifle elements of the Warsaw Pact. Given the additional requirement of providing a defensive capability against Soviet attack helicopters, will there be adequate US helicopters to engage enemy armor while employing a portion of these attack helicopters in an overwatch security role?

The threat will demand that helicopter security forces be employed to protect those helicopters that are engaging armor targets. Additionally, large numbers of attack helicopters will be required to meet enemy airmobile forces to destroy these forces before they reach their objectives. All of these factors imply that an increase in the numbers of attack helicopters is not only justified but is a necessary element of survival.

How can this be accomplished in a climate of severe funding constraints? In addition to the ongoing purchases of *AH-64* and *AH-1S* attack helicopters, could we not increase the numbers of attack aircraft by arming future scout aircraft?

In the spring of 1978, a consensus was reached by the attendees at the Aviation Employment Conference that a definite requirement exists for an advanced scout helicopter (ASH).

Should we not rethink the ASH's mission and design requirements? Could the ASH provide the increase in attack capability while still performing its traditional role as a scout? How survivable must the ASH be? If the decision were to arm the ASH, what armament would be the most effective? Do we really need to undergo exhaustive research and development, or could an off-the-shelf helicopter satisfy our need? It is understood that many alternatives ranging from off the shelf through new development currently are being studied by the Department of the Army.

It is imperative that we forego research and development and seek an advanced scout aircraft that could be purchased off the shelf and armed with air-to-air missiles. The ASH would have to be equipped with a lightweight helicopter radar detector, a miniaturized TADS/PNVS, survivability equipment, and air-to-air missiles. Its primary armored mission would be to intercept and destroy enemy helicopters. Other missions to be performed would be that of a scout. The ASH so equipped would be the nucleus around which we could reorganize air cavalry units.

The air cavalry's mission would remain reconnaissance and security, with increased emphasis on security. The security mission would require the employment of ASH, armed with air-to-air missiles, in overwatch positions when attack helicopters (*AH-1S* or *AH-64s*) were conducting their attacks on armor targets. This would prevent surprise attack by enemy helicopters.

Conclusion

The use of the air space just above ground maneuver systems is critical to winning on tomorrow's battlefield. We must take immediate steps to ensure that we have the capabilities to control this area of the battlefield. Our potential adversaries have recognized its importance and, as indicated by the Ethiopian experience, are moving toward expert use of this air space to gain dramatic tactical advantages. In all probability, he who fails to win air superiority at the treetops will fail to win the war.

Condensed from an article by Lieutenant Colonel Retsae H. Miller, in Military Review, March 1979.

[2]During JAWS, Air Force *A-10s,* Army *TOW Cobras,* air defense artillery, armor and artillery were maneuvered against an opposing force tank battalion in a series of free play exercises.

[3]The ACE tests were preliminary investigations of air-to-air combat engagements between helicopters at treetop altitudes.

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 60)

1

2

3

4

5

6

OPMD

AVIATION MANAGEMENT

New management for aviators is now underway within MILPERCEN. Hopefully by now, most of you have read about or perhaps received a briefing on the new career management program for commissioned aviators recently approved by the Army Chief of Staff. The decision and its major implications were discussed in the "OPMS Corner" of the April and May issues of *Aviation Digest*.

The cornerstone of Army Aviation today is its recognition as a full member of the combat arms, having primarily a combat manuever role as part of the Combined Arms Team. Essential to the accomplishment of this primary mission are the combat support and service support roles within the total aviation program: maintenance, intelligence, and medical. Our personnel management policies and procedures are being revised to support this new direction for Army aviators as is our management organization within the Officer Personnel Management Directorate (OPMD). This month we will review some of the key features of each aviation specialty and show you where every commissioned aviator fits into the OPMD career management structure.

Specialty Code (SC) 15 is the primary aviation specialty, accounting for 80 percent of the total requirements for commissioned aviators. Within this specialty, there are four special skill areas. Those described below are being proposed as a change to the current aviation special skill identifiers (SSIs) listed in AR 611-101. SSI 15A, General Aviation, identifies positions for instructors at aviation training centers, advisors to Army Readiness Regions and commanders and staff officers for Army airfields and various types of TDA flight detachments. SSI 15B, Combat Aviation, identifies positions for commanders and staff officers in assault helicopters, air cavalry, attack helicopter, and combat aviation units. SSI 15C identifies positions in air traffic control, assault support helicopter, and general support helicopter units. These special skill areas are associated only with the Infantry, Armor, Field Artillery, and Air Defense Artillery Branches and their respective officer basic and advanced courses.

The creation of an Aviation Management Branch within Combat Arms Division (CAD) is the initial step effecting company grade aviator management under the new career pattern. By 1 August 1979, *all* company grade aviators (approximately 2,400 officers) having SC15 as one of their specialties (not including Military Intelligence aviators) will be managed in the organization and by the personnel shown in figure 2. Our new management branch will be responsible for the training and assignments necessary to meet the requirements for aviators to fill SSI 15A, B, and C positions worldwide.

This also means that the career management files of those SC15 aviators in a combat support or service support branch will be transferred to the Aviation Management Branch, CAD. Those officers will have the *option* of transferring to a combat

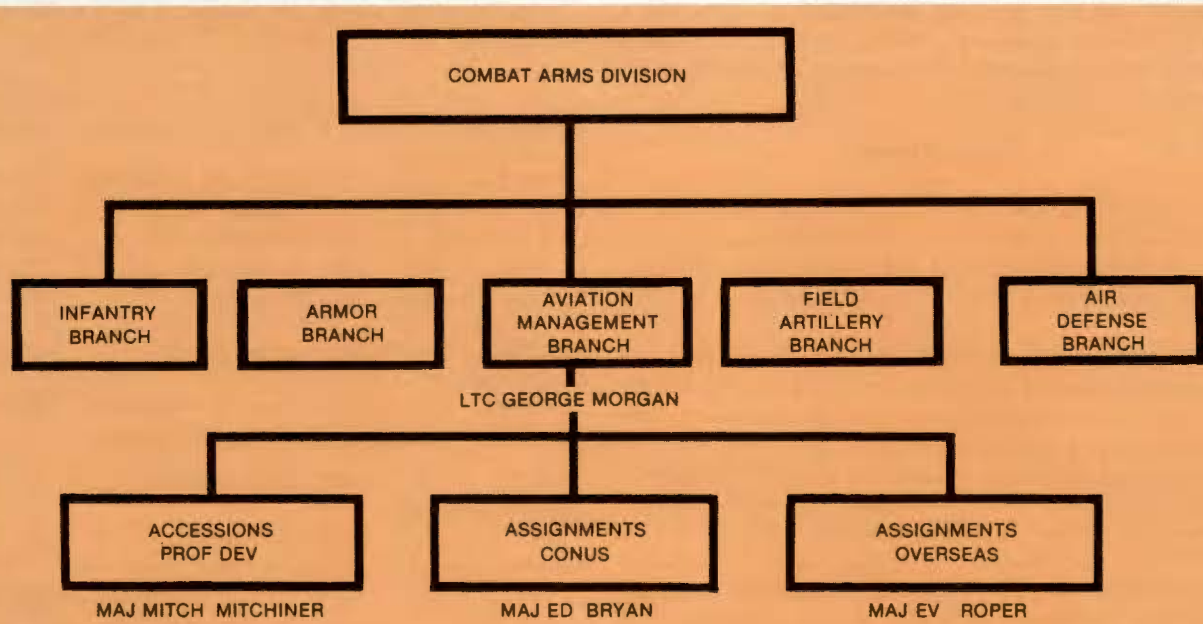


Figure 1.

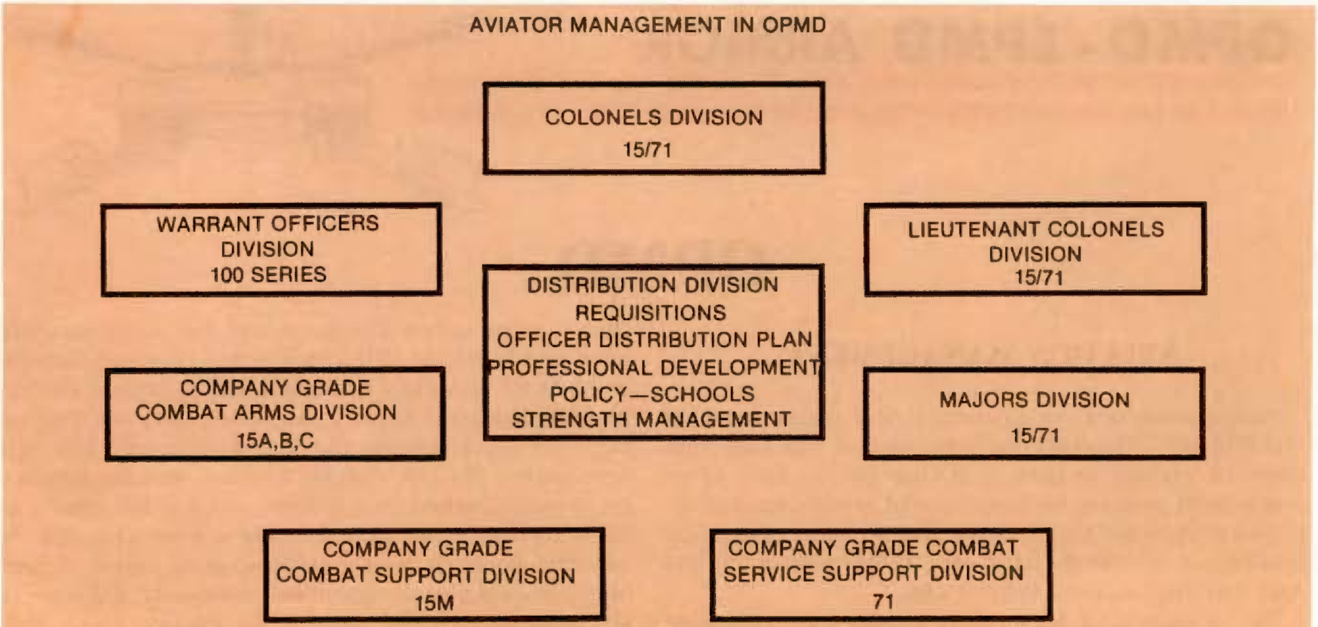


Figure 2.

arm. However, the decision to do so will not, of itself, require a career development change. Management decisions will continue to be made based on the *specialties* held and not the branch.

We realize that there may be many questions concerning the details of this reorganization and the new professional development objectives for SC15 aviators. We intended to do everything possible to keep you informed of our progress and to insure there is no interruption in your professional development. We encourage your questions or comments and look forward to meeting personally with you either at MILPERCEN or during our field visits. Our new phone numbers are AUTOVON 221-7820/9794 or commerical (202) 325-7820/9794.

EPMD

ANCOES Clearance

Individuals previously selected for attendance at the Advance Noncommissioned Officer Education System (ANCOES) were required to have a security clearance for SECRET. This has now been downgraded to CONFIDENTIAL. However, individuals should continue to obtain a SECRET security clearance IAW appropriate regulations for future use.

Armor Branch

The Armor Branch has the responsibility for making Army-wide assignments for personnel in career management field (CMF) 19, in grades E-I through E-8. The branch is composed of an assignment team and a professional development (PD) team.

The assignment managers make the actual assignment on all nominations generated by the computerized Central Assignment Procedures (CAP III). To say that the computer "kicked" me out for a good or bad assignment is a myth. The CAP III System is used to assist in matching the right soldier with the right job based on qualifications and Army-wide priorities. The basic fact is that people assign soldiers.

The PD career advisors are responsible for the career management of all Armor soldiers. In addition, they are responsible for reviewing NCOES, branch clearances, conducting interviews, civilian and military schooling, and providing input to Congressional inquiries. The career advisors are actively engaged in reviewing the career progression of the Armor soldier and monitoring his progress.

Armor Branch Directory

Should you have a question, please call any member of the Armor Team.

		AUTOVON
Branch Chief	LTC Robert F. Grossman	221-8055
Branch NCOIC and PD Chief	SGM Raymond L. Knippel	221-8071
Team Chief	Mr. Douglass Wiggin	221-8072
E7/E8 Manager	Mrs. Eleanor Major	221-8072
E6 Team, CONUS	Mrs. Frances Rawlings	221-9080
E6 Team, Overseas	Ms. Zilpha Pinkney	221-9080
E1-E5 Team, CONUS	Ms. Dianne Miller	221-9192
E1-E5 Team, Overseas	Mr. Howard Traphagen	221-9192
Professional Development Section		
	MSG Robert Horrocks	221-8071
Armor Career Advisor	SFC Fred Brown, Jr.	221-8072
Cavalry Career Advisor	SFC James Ayres, Jr.	221-9080

MSG Horrocks and SFC Brown have replaced Duane Egbert and SFC Charles E. Luster who have both been reassigned.

Pages from the Past

ART OF COMMAND

In these days of such varied duties, which may require officers to be detached from their organizations more than half of the time, it behooves them all to seek to qualify themselves in all respects for these duties, not only by following carefully the courses in the unit and service schools, but by perfecting themselves in the most practical manner while on duty with troops in that highest of all military functions—the art of command.

The Cavalry Journal
April 1923

NO SUBSTITUTE FOR TANKS

It must be emphasized however, there is no question of substituting APCs or SP guns for tanks; it is a matter of increasing the effective utilization of the fire of these components of the battle group in *support* of tanks to counter or nullify the expansion of the antitank threat. The tank remains the kingpin of the armored battle. The task of the mechanized infantry in the tank-infantry team remains the same—destruction of the shorter range antitank weapons while closing with and destroying the enemy—in cooperation with tanks. The tasks of the artillery are also unchanged except that, by the timeliness and accuracy of its fire in the direct role, whereby it can apply HE, smoke and HE with variable time fuzed ammunition as required, it will accelerate exploitation of the tank's mobility and firepower.

Finally, in reply to the question posed in the title of this paper—the answer is NO. During the foreseeable future the *Main Battle Tank* will be the best means of moving and fighting in an environment of high velocity metallic debris extending from 7.62mm bullets to 16 inch mortar fragments. And the tank's response to any type of ground target will continue to be the quickest and most accurate available. What we really need is more of them.

ARMOR
September-October 1968

OBSERVATION

Current research and development has come up with an impressive array of modern battlefield surveillance equipment, mostly electronically operated, as the answer to the age old military requirement of accurate observation of enemy activities.

The cost of this equipment is staggering and in its present state is still subject to numerous mechanical and electronic bugs yet to be worked out. In addition to this, the electronic equipment is subject to enemy jamming tactics. Most people recognize that a suitable replacement does not exist for visual reconnaissance.

ARMOR
January-February 1963

MUTUAL OBLIGATIONS

All soldiers, whether draftees or careerists, view their relationship with the Army as one of mutual obligations. Nothing demoralizes a man more than believing that the Army has failed to fulfill its obligations to him. Whether it be good food in the mess hall, accurately computed pay, or responsive medical care for his dependents, all that is owed the soldier must be his. Because of this, the new commander must stress in words and in subsequent actions, the fulfillment of this implied contract.

The commander must reaffirm his belief in integrity, honor, and duty. His expressed commitment to high principles of professional and personal conduct will reinforce his stature as a leader to be both respected and obeyed.

ARMOR
March-April 1973

NOTES

ARMOR GRADUATES CLASS OF 1979 UNITED STATES MILITARY ACADEMY

On 6 June 1979, 121 graduates of the United States Military Academy Class of 1979 were commissioned as Second Lieutenants, Armor. Of the Combat Arms, Armor was the only branch to exceed its minimum authorized quota. Included were a brigade staff officer, three battalion commanders, five commanders of companies, and numerous company XOs and platoon leaders. Thirty of these men will attend the Cavalry track of the Armor Officer Basic Course while nine will pursue the "Tanker" side of AOBC. One hundred and ten are either airborne-qualified or scheduled for jump school. Ranger tabs are, or soon will be, worn by 84 graduates. Initial assignments number 47 to USAREUR, 3 to Korea, 55 to FORSCOM, and 16 to TRADOC. Congratulations to Armor's newest "Tankers" and "Cavalrymen!"

1st Row: ROGERS EP, WADE EP, CASTLE EP, CRANE JA, ALLMON TA, ENTRINGER RA, MORLEN RA, LABAK SJ, MACDONALD JA, PETTUS CT, KOGUT GM, CLEPPER FD, WOLFF TA, HAWES KA, UNDERBERG RL, NEAL GS, COUTURE TA

2nd Row: PETIT JG, POPE RM, HINCHION RL, CARDENAS WG, SLEDGE NH, LOTT JG, SHAW CH, KELLY JJ, SCHNEIDER SD, MAYNARD JP, SCUDDER JV, VERVOORT M, NYBERG CA, BATES MJ, LESKO JN, DELIA EN, BRYDGES BE

3rd Row: HUTEK SE, HARLOW BA, REED DE, DIBB KL, DOWLING EA, AMBRUSTER RF, SLATER DF, HOON FL, WILKINSON JG, DUNCAN JD, VENEY DW, BERRY GL, DANKO DE, MCBRIDE MP, MOORE JA, HYDE RJ, MISNER JL, MARTZ JE

4th Row: MATSON JF, ULMER WF, KELLEY KD, MCKEDY KE, FRESHWATER DE, LUTMAN TR, TAYLOR CE, ADAMS WG, BUSCH DM, BUCK SD, GARGIULO TG, WELCH DS, COLEMAN JT, THOMAS MS, ORR RE, STAWASZ JM, WATTS AW, KROBOCK RD

5th Row: CONWILL GS, KATHER GR, GARCIA NE, ESTEP ME, NIEDRINGHAUS DA, GRIFFIN WB, HOYT TJ, DARLINGTON LR III, GROLLER RL, MURNANE JH, WABEKE DJ, HAALAND ML, CONZELMAN CE, KRUEGER JL, LINDHOLM DA, JENKINS SN, LEINS DC, WATAI JW

6th Row: DEDMON JF, MAHONEY SM, KNAPP RD, BOZEK GJ, SANDBROOK WJ, DIONNE BA, MODICA ML, WERLING NC, OLSON LF, KROENING RK, ARMSTRONG T, THOMAS SP, WENTZEL RP, PARKER DK, CHARLTON JR, CLARK DS, SHERMAN PL, CONE RW

7th Row: MANN RN, SIMS MC, WALLIS MB, MANKOSA MA, SMAILER DK, BUTLER KM, NOLAN WH, SWARTZ DE, TROXEL RE, ABERNATHY KW, KOPINSKI DF, COLLETTI FA

NOT PICTURED: LITTLE MT

SABERS PRESENTED

Armor Association Sabers were presented to two distinguished cadets from the Class of 1979 during ceremonies at the United States Military Academy on 6 June 1979. Colonel Thomas F. Cole, Director of the Department of Military Instruction made the presentations on behalf of the U.S. Armor Association. The sabers were presented in recognition of the cadets' outstanding achievements in adademic study, physical education, and military leadership.

Lieutentant David Sheridan Clark (center), a cadet company executive officer, graduated 14th in his class. Before commissioning, Lieutenant Clark trained with the 3d Armored Division in Germany, became airborne qualified, played intercollegiate soccer, and served a summer internship with the Office of Management and Budget. After AOBC (Cavalry) and Ranger School, Lieutenant Clark will join the 2d Armored Cavalry Regiment, FRG.

Lieutenant David Alan Niedringhaus (left), a cadet platoon leader, graduated 30th in his class. Prior to being commissioned, Lieutenant Niedringhaus was active in company intramural sports and served as an area representative of the Cadet Public Relations Council. Following the Cavalry track at the AOBC at Fort Knox and Ranger School at Fort Benning, Lieutenant Niedringhaus will join the 2d Infantry ("Indianhead") Division, ROK.

M-240 MACHINEGUN

Three problems have been encountered in the new *M-240* machineguns. The first and most important is burring of the breech end of the barrel. This burr is causing the barrel to bind in the receiver, and if the barrel latch is operated to finish pulling the barrel into the receiver, the threads in the receiver will be damaged.

The second problem is the bolt through the trigger and frame assembly. If this bolt is not kept tight and good lock washers installed, it will work loose and fall out, causing the loss of the hand grips and some of the pins. Reference TM 9-1005-313-20, page 3-25.

Caution, do not tighten grip nut to the extent of cracking grips.

The third problem concerns closing the cover with the bolt closed or forward, instead of charged to the rear. The cover will close with the bolt in either position. If it is forward, the spring loaded roller will depress until the bolt gets to the rear and then it will slip into cam. This action will cause minor wear on cam but not enough for immediate concern.

AIR CUSHION VEHICLES

The Army has type classified the *LACV-30* air cushion vehicle which can be used to transfer supplies from ships at sea to troops on shore. A company of 12 craft will be procured for Army use.

The *LACV-30* can carry two 20-ft containers weighing up to 30 tons. In Logistics-Over-The-Shore (LOTS) amphibian operations, the craft can negotiate surf regardless of tidal and bottom conditions and deliver cargo to the beach or inland to avoid beach congestion and possibility of enemy attack. In addition to its ship-to-shore logistical mission, the *LACV-30* could support secondary missions such as intermediate range logistics support, search, rescue, medical evacuation in coastal, harbor and inland waterways. The craft has also been used by the US Coast Guard for icebreaking operations.

Plans call for the initial production of four craft in August with an option to purchase four more in 1980 and the remaining four craft in 1981.

DAY-NIGHT SIGHT

A day-night sight that will enable gunners of the XM-2 and -3 to see through darkness, smoke or haze is shown being adjusted during development.

Gunners using the sight during tests at Fort Irwin, Calif., scored hits against stationary and moving targets at ranges in excess of 2,000 meters during the day and at night. The sight's thermal imaging sensor uses modules common to other Army thermal imaging systems.

MINEFIELD MARKER

A new Hand Emplaceable Minefield Marking Set, (HEMMS), a means of guiding friendly forces safely through or around our own scatterable or conventional minefields, will soon be available to the units in the field. It consists of a line of poles containing flashing lights connected by fluorescent orange tape.

Each pole has an orange neon lamp which initially flashes about 82 flashes per minute. A light shield inside the dome of the flasher prevents the light from being seen directly overhead. A reflector behind the neon lamp directs the light so that it can be seen from only one direction. The outside of the plastic case has a reflective surface to make it visible in light from vehicle headlights.

The set will be used to mark temporarily conventional indefinite-life minefields emplaced by the *M-57* Antitank Mine Dispensing System. The set could also be used to temporarily mark other indefinite life minefields. However, if these minefields are to be left in place longer than 15 days, the HEMMS should be replaced with Minefield Marking Set Number 2 when time becomes available.

The first HEMMS systems are scheduled for production later this year, and be available to engineer units in the field in late 1980.

BOOKS

THE THIRD WORLD WAR: AUGUST 1985 by General Sir John Hackett and Others. Macmillion, New York. 1979. 415 pages. $12.95.

This book is an effort to depict a hypothetical future war in Europe. The authors are to be commended for the courage to undertake such a tenuous task and for the breadth of their treatment. They attempt to do in 396 pages what future historians would require volumes to accomplish. To depict the events leading to the war, the conflict itself, and the aftermath required a broad brush treatment of each major topic. The result is a series of synoptic chapters which address the major political and military aspects of the war. As in all such exercises in futurology, the authors were forced to resort to many speculations. They are not to be faulted for making these speculations, but they are committed to developing a scenario in which, despite tough going, the best possible outcome for the West is achieved.

Each reader will no doubt take exception to certain assumptions and speculations. Two things that stand out are the lack of technological speculation and the convenience of the political and strategic speculations. The authors project today's technological capabilities, with the attendant presumed strengths and weaknesses, to 1985. One example which is stressed in the book is the West's purported superiority in electronics as embodied in C^3 and EW capabilities. It has become standard procedure to rate Warsaw Pact electronic capabilities as of second quality. Considering their demonstrated capacity to solve priority problems, it is dubious procedure to project current attributed Pact deficiencies so far into the future. It is also peculiar that the Pact was presumed not to have sprung any surprises on the battlefield in 1985. This is disquieting because the Soviets do not readily disclose all their technical capabilities and they appreciate the value of surprise and deception. In the absence of such surprises, today's equipment and tactics are presumed sufficient to stall the Pact advance in 1985.

The absence of technological speculations is more than balanced by the numerous political and strategic assumptions upon which the whole story line depends. These assumptions are perhaps the weakest part of the book because they range from being too simplistic to implausible. Among the simplistic aspects are the straightforward acceptance by the Soviets of the war plan recommended by one of their leading advisors and the automatic committment of French forces to the West in view of the limited aims professed by the Pact. It is easy to imagine that the Pact might pressure the French to abstain from the battle, perhaps using its forebearance in the nuclear arena as an inducement. Further, it is difficult to assume that the undoing of the Pact by domestic unrest would be as simple as depicted. The Communist apparatus is geared to maintaining political order and rear area security and this apparatus would be fine tuned in the event of war. It is unlikely that the offensive would be limited primarily to a military thrust in Europe. If it should come to the showdown, Western interests would most likely be attacked by whatever means available around the world. Finally, it is unrealistic to think the Pact would unilaterally withdraw after one major thrust which brought them so many gains but left them just short of the Rhine. With the Pact having continued numerical superiority, the gradual buildup of NATO most likely would not deter repeated attacks by the Pact until its objectives had been attained. The authors have the Pact give up too easily.

The overall tone of the book gives the impression that it might have derived from one or more war games. The way in which arguable outcomes are achieved suggests the authors settled for a facile assurance of an optimistic conclusion. At each juncture where events are assumed to go in the West's favor, the critical reader will ask what the other possibilities are and what consequences are likely with each. The central message of the book is that NATO was able to hold the Pact advance *only* because of force structure improvements made between the late 1970s and 1985. In short, the book is a warning that the war will be lost if the necessary changes are not made in NATO.

The reader who is looking for small unit action is limited to twelve pages of text near the front. However, the rest of the test will hold most readers' attention to the end and the appendices should not be overlooked. The book is well structured with 28 chapters of manageable length, several maps, a list of abbreviations, and a very useful index.

Larry W. Williams
Battelle, Columbus Laboratories

FIELDS OF FIRE by James Webb. Prentice-Hall, Inc. New York. 1978. 339 pages. $9.95.

James Webb, a former Marine officer and Vietnam veteran, has produced one of the most notable books dealing with the conflict in Vietnam. Drawing heavily upon his tour as platoon and company commander, Webb has ably translated his experiences into a first-rate novel. In graphic terms, he explores the psyche of a small unit. As individuals have characteristics and personality features, so will a unit assume an aggregate personality. Focusing upon a particular squad, Webb shows us how the group personality emerges, evolves, and reacts to situations it must face.

The novel contains nothing that is excess or superfluous. There is a tautness and rapid pacing throughout that does not tolerate the superficial. Sharpness of characterization and exactness of description eliminate irrelevancy.

Despair and isolation are a constant theme, sometimes in the background, but always present. Isolation becomes alienation. The members of the squad are alienated from a great many things: the World (the US); the closer, yet no less unreal world of the Da Nang radio announcer; and corruption in Vietnamese civilian and American military circles. They are removed emotionally, as well as geographically, from their own regiment. The alienation becomes even more pronounced after a staff officer orders the squad out on a questionable mission. Two squad members are killed and the staff officer receives a Silver Star for their action. Despite this alienation, or more probably because of it, the squad does its job very well. They are a close-knit group that is left to its own devices and displays an admirable proficiency in combat. The arrival of a new lieutenant, who exerts a positive influence, alters the group personality. Their performance under strong leadership improves.

Fields of Fire can be approached from two levels. First, it is a good story that is well told, and can be read for pure entertainment. Second, it provides a reminder of the influence of leadership on the small unit, as well as showing the ultimate costs assumed by those who carry out their assigned missions.

Robert Stacy
Fort Knox, Ky.

HITLER'S GENERALS by Richard Brett-Smith. Presidio Press, San Rafael, Calif. 1977.

The work by Richard Brett-Smith attempts to analyze the general officers of the Third Reich. The book discusses more than 80 of the leading generals in an officer corps that included more than 1,200 general officers. Although the task is an admirable one, the book is actually uneven in its analysis of the generals. The author concentrates more on events than individuals, and the personalities, talents, and achievements of the individual generals are often obscured by descriptions of battles and campaigns.

The author argues that the German Army had only two great commanders: Field Marshals Erich von Manstein and Albert Kesselring. His criteria were battlefield success, tactical and strategic skills, judgment, leadership abilities, and willingness to delegate responsibility. According to the author, von Manstein and Kesselring met these criteria best of all, but leaders such as Field Marshal Karl von Rundstedt and Colonel-General Heinz Guderian did not. While von Rundstedt's abilities declined as the war progressed, Guderian "lacked the fine intelligence of the greatest commanders." The accomplishments and talents of other generals are analyzed, but none of them ranked in the "great" category.

In the final analysis, the book is neither a good study of individual generals nor of the general officers corps as a whole. The author relies heavily on works already published, quotes extensively from those resources, and seems to have discovered very little that can be classified as "new." One gains the impression that some of the generals are discussed simply because the author had some information available on them. Similarly, if the reader does not have a sound background in the battles and campaigns of World War II, he can easily be overwhelmed by the author's battlefield analysis. Yet, he will encounter very little that will give him a better insight into Hitler's generals.

If a reader wants a short biography of an individual general, the book can be useful. But if the reader wants more detailed information or desires a substantive analysis of the German generals, he should look elsewhere.

Major Robert A. Doughty
3-8 Cavalry

LAW, SOLDIERS, AND COMBAT by Peter Karsten. Greenwood Press, Westport, Conn. 1978.

This book is difficult to put aside until completely read. Considerable detail is skillfully woven together in such a way as to hold a lay person's attention yet please a discriminating researcher or historian. Professor Karsten researched and analyzed some very thought-provoking subjects, without being caught up in emotionalism. The result is a masterpiece of objective detachment. Officers and sergeants of the combat arms would do well to read and ponder on *Law, Soldiers, and Combat* as seen by Professor Karsten.

The book starts with a survey of the premedieval, medieval, and modern societies to determine the views and evolution of those views as laws regarding treatment of both combatants and noncombatants. This is particularly fascinating and provides information heretofore concerning such little known things as the earliest views on war from the air. A number of recorded war crimes, including the My Lai Massacre, are then examined. The resultant series of analyses views sundry nationalities and so far as possible, both violators and observers, to gain insights as to why war crimes occur. This book concludes with recommendations as to what might be done to reduce the possibility of war crimes in future conflicts and provides an overview of what has and is being done. Currently, the Army has ongoing programs to insure that soldiers are familiar with the Laws of Land Warfare, personal conduct, moral responsibilities, and related subjects. In addition, there are numerous official documents and directives which provide rules and guidance concerning Law of Land Warfare, Personal Conduct in War, the Geneva Conventions, etc. However, the fact remains that in the final analysis,—much depends on the quality of the leadership and the moral conscience and moral courage of all—the led as well as the leader.

RICHARD L. COFFMAN
Colonel, Armor
USAARMC

COMMON SENSE TRAINING: A WORKING PHILOSOPHY FOR LEADERS By Lieutenant General Arthur S. Collins, Jr., US Army (Ret.) Presidio Press 1978. 225 Pages. $11.95

This book by General Collins is worthwhile reading for every Army officer. It is crammed with advice of such apparent good sense that one wonders why anyone has to write these things down. There is not doubt, however, that someone has to. This well-organized book includes both broad philosophy and practical techniques. It should appeal to the student of contemporary military management as well as to the busy troop commander. General Collins wrote an article for *Army* magazine in 1957 entitled "What Are We Doing to Our Commanders?" Unfortunately, the Army has yet to come to grips directly and fully with the basic problems of the over-managed commander that Colonel Collins recognized in 1957.

Chapters 7, 10, and 12 I found particularly appealing. In Chapter 7, "Training Yourself and the Chain of Command," the author talks about our "learning to see," displays current knowledge of a variety of useful performance indicators, and reviews in detail those small but continuously important points of technique of the experienced commander. Chapter 10 on training tips reminds us once more of the tremendous scope of current training activities and the variety of skills needed by the small unit commander. In Chapter 12, General Collins discusses crew training in the very practical, common sense approach of the entire book.

But the larger issues—as well as the tools of the insightful trainers—are exposed in contemporary context. For example, he addresses the insidiousness of an unrestrained "can-do attitude." Surely, an era that demands both tough discipline and acute sensitivity must engender in our officers an understanding that there must be a point past which they cannot bend, and that an officer's fundamental obligation to "do his duty" includes being honest and direct with his commander and to provide his seniors with unvarnished opinions. General Collins also calls the shot on those of us who complain of inadequate authority but, in fact, are simply failing to set and enforce appropriately high standards. General Collins is a great believer in unit schools and this book would serve as a fine source of specific discussion topics. The author also addresses the limitations of the unit readiness reporting system—even in its current revised and updated version—and talks to the dysfunctional aspects of periodic quantification of readiness. He also brings up the point that the Army has yet to explain adequately what is meant by "decentralization." We need to spell out the distinction between "freedom to fail" and the unregulated excursions where any coaching at all is resented.

Junior officers would be particularly pleased to see that at least one senior general knows something about the difficulty and confusion in comparing ESC versus NOR versus 2406 criteria; and that someone above the grade of captain understands that most roadside spot-check systems are worthless; and that we still have difficulty deciding whether or not the ARTEP is, in fact, diagnostic or evaluatie; and that perhaps we wouldn't put on so many training shows if the inspectors and senior officers know their training inspection business a little bit better; and that today's training environment is still referred to by many of our dedicated practioners as "hostile."

My personal bias brings disagreement with a few points. First, General Collins doesn't like changes in training schedules. My thought is that until we get things straight at division and brigade level there must be changes in training schedules and that our best course of action today is to let the commander on the spot modify training, and then, after-the-fact, together decide why we weren't smart enough to put out a schedule initially that would not be obsolete a week later. I also don't agree that unit schooling should not be conducted in prime training time. I would also disagree regarding the uselessness of most large-scale FTX's. True, large exercises are inefficient for most individual and crew training, but they surely are needed to shake down the complex logistics of our current system. General Collins is also for the three-tank platoon and I am "a'gin" it. My feeling is that fire and maneuver should still be a platoon capability. The three-tank platoon also makes the war too much a company commander's game, and the five-tank (XM-1) platoon is too expensive. Therefore, I come out for the four-tank platoon as being the only solution to our technical, leadership, and tactical problems.

As a peripheral matter, I must take exception with General Collins' comments regarding aspects of the 1970 Army War College Professionalism Study. General Collins states: "there was one glaring weakness in the study: its absurd rejection of trends in the whole society as causative factors in the Army's difficulties in the late Vietnam period." A careful reading of the Professionalism Study would indicate that while societal factors were viewed as the cause of many of the *problems* confronting the Army, societal pressures were not seen as justifying Army institutional shortcomings. In fact, the Professionalism Study noted "the military is not immune from the intrusion of parts of the changing value system of society...However, these larger (societal) trends...did not appear to be primary causitive factors to such a degree that they were truly consequential in this (study's) assessment of the professional climate." In other words, Vietnam tour length, the fire base syndrome, the unfortunate proclivity toward ticket punching on the part of some senior officers, and the frequent abuse of statistics—both on the battlefield and at higher headquarters—were traceable not so much to the rioting in the streets as to some inattention to traditional professional standards by some members of the officers corps.

In summary, Lieutenant General Collins has produced a utilitarian book that talks intelligently of leadership, management, and common sense. It is good for both the captain and the general, and a refreshing tonic for everybody in between. This volume plus General Bruce Clarks' *Guidelines for the Leader and the Commander,* and that always inspiring text *The Armed Forces Officer,* would make a neat package for annual reading for all of us.

Major General Walter F. Ulmer, Jr.
ODCSPER
HQDA

Recognition Quiz
Answers

1) GERMAN JAGDPANZER KANON (no turret, flat side armor slopes inward, protruding gun mantlet)

2) ISRAELI MODIFICATION OF U.S. *M-48* TANK (105-mm gun, modified commanders hatch cover, pintle mount for what appears to be a .30 caliber light machinegun, five support rollers)

3) SOVIET *BM-21* MULTIPLE ROCKET LAUNCHER (rack of 40 rocket launcher tubes, 6x6 truck mount)

4) GERMAN *BO-105* HELICOPTER (four rotor blades, box-like fuselage, vertical stabilizers on ends of horizontal stabilizer)

5) U.S. *M-113* MODIFIED FOR USE WITH OPFOR UNITS (mockup turret and gun tube, turret and tube resemble the Cadillac Gage turret equipped with the Cockerill 90-mm light gun that is being mounted on the *M-113A1* and the *Commando* family of vehicles)

6) SOVIET AIRBORNE BMD (low silhouette, 76-mm gun and *Sagger* launcher rail, slightly pointed bow armor, lower bow armor is V-shaped.

ARMOR *Magazine*

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THE ARMOR DESK

Since 1888, there have been 32 editors of ARMOR, the Army's oldest professional journal. I now become the 33rd. My esteemed predecessors each pledged to build upon the quality and prestige of ARMOR and the U.S. Armor Association that his predecessors had established. I, likewise, make this same pledge to you, the Armor Community.

ARMOR has established itself as a highly respected professional journal with an international audience. ARMOR is held in such regard because of the outstanding support that the Armor Community gives to the journal and the association. If I am to maintain ARMOR's prestigious position, I need your continued support.

ARMOR is your forum for "disseminating knowledge of the military art and sciences, with special attention to mobility and ground warfare." To disseminate this knowledge to ARMOR's wide audience, I strongly encourage you to write for ARMOR. Articles from all sources, military of all ranks and branches, active duty and reserve components personnel, retirees, and civilians, will be considered for publication as long as they meet ARMOR's high professional and editorial standards.

The Armor Community is about to embark on a new decade--a decade which is scheduled to bring us long-awaited new steeds of battle. As the new equipment comes into the inventory, there will be much excitement. A goal of ARMOR will be to share in this excitement and help alleviate the challenges associated with the introduction of the new equipment into the inventory.

To achieve this goal the Armor Community must band together and support our journal and association. Efforts will be required by all, but the professional rewards will be bountiful.

I look forward to my association with you.

FWS

Coming in ARMOR

"COUGAR—A CANADIAN CAT"

Captain P.A. Philpot, 8th Canadian Hussars, discusses the Armoured Vehicle General Purpose family, which includes a tank trainer AVGP, an AVGP personnel carrier, and a recovery/maintenance AVGP, all based on the 6x6 version of the Mowag Piranha.

"THE LINES OF TORRES VEDRAS"

The importance of logistics is highlighted in this discussion of the Peninsular campaign of 1810-11 in Spain and Portugal. First Lieutenant Robert Stacy compares the manner in which logistics was handled by the British and French, and explains what resulted.

"ARMOR ASSISTOR"

Captain Frederick G. Lee examines the rile of the armor assistor in a Readiness Group, and the contributions to Reserve Component unit readiness that he can make.

"THE MISSING LINK"

Focusing on what he describes as the missing link, Major John Rose discusses the need for a doctrine of how to fight on a nuclear battlefield.

"AMMUNITION RESUPPLY"

The rearming of a unit during or after a battle is much talked-about, but little practiced. Captain Thomas G. Pratuch outlines a way to move the tons of ammunition involved to the units needing it.

"A NEGLECTED ASPECT OF COMBAT POWER"

Major Ronald J. Williams looks at mine-clearing during World War II, and the need for training today to realistically deal with counter-mine operations.

ARMOR

november-december 1979

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COVER

Cavalrymen of the Peninsular Campaign of 1810-11 in Spain and Portugal are featured on the cover of this issue. Beginning on page 30, First Lieutenant Robert Stacy examines the logistic operations of that campaign and details the lessons learned.

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LETTERS

How Much is Enough?

Dear Sir:

Captain Geier's article, "Sleep Loss: A Debt that Must Be Paid" (***ARMOR,*** Jan-Feb '79) is valuable in calling attention to the need for unit commanders to program sleep for their troops and themselves. Most of the recommendations are good, but a few draw too heavily on the findings of laboratory studies done under idealized conditions which showed that a long period of uninterrupted sleep is the best way to repay sleep debt.

That is true, but more recent field studies of Army units (not yet generally available in the literature) have demonstrated again the truth of the Israeli Defense Force proverb, *"The Best Is the Enemy of the Good."*

One and one-half hours sleep in 24 is not enough to sustain adequate performance beyond 4-5 days, but it is a lot better than none, which leaves men totally ineffective and unable to continue. Three hours of sleep per day is the minimum required to sustain adequate (albeit not perfect) performance for 9 days or more. Four hours of sleep gives substantial recovery of performance after 96 hours of total sleep loss, and continuing with only 4 hours sleep per day thereafter will give continued improvement over the next few days.

Whether 3-4 hours sleep is still enough if it is broken into 6-8 half-hour naps under uncomfortable conditions has not been demonstrated, but it *has* been shown in the laboratory that light sleep ("Stage II" electroencephalogram or brainwave) *is* as effective in sustaining performance as deep sleep ("Stage III and IV") or dreaming sleep ("Stage REM", for "rapid eye movement").

The tasks that are at risk under these conditions of partial sleep loss are as Captain Geier indicated: those which involve learning new information, making complex choices, reacting instantly, or remaining vigilant over long periods. Orders must be kept simple, and should be written down and read back. Doublecheck procedures are especially important. It may be necessary to post lookouts in pairs (even though this means less sleep time) to counteract the tendency of very tired brains to imagine seeing things that aren't there when external stimulus is low or monotonous ("Visual illusions," a phenonomenon well-known in Ranger school).

The biggest problems due to sleep loss will not come when everyone is keyed up. The tired tank driver is less likely to have accidents while advancing across broken terrain or withdrawing under fire than he is during road marches (day or night) as he follows that vague shape or shielded running light just ahead in the dust.

While the human body cannot learn how to go without sleep, the human mind and the human team *can* learn ways of maintaining effectiveness while tired. Individual differences in need for sleep are great. A few people can wake up from brief naps and be alert almost instantly; most take minutes to get up to speed, and their performance is temporarily worse than before the nap.

Only by training under realistic conditions can the individual, the team and the unit commander learn what to expect from themselves and each other, develop SOPs on how to schedule sleep for everyone and still cope with fatigue, and practice these SOPs until they become second nature.

The "best" strategy for scheduling sleep is a simple one (as befits something that must be remembered and practiced by tired troops): don't waste *any* opportunity to give someone a chance to sleep, and be sure everyone gets as much as circumstances allow. Everyone should reread the "Commander's Hatch" in the Jan-Feb '79 ***ARMOR*** for how this can be done.

JAMES W. STOKES, M.D.
Lieutenant Colonel, MC

More on Sleep

Dear Sir:

My plaudits to Captain Geier on his timely and pertinent article. More of the space in our professional journals should be devoted to soldier knowledge that is meaningful rather than a lot of hogwash. In this regard, I find **ARMOR** Magazine (and I am Infantry) to be superior compared to the other branch magazines.

ANDREW M. RUTHERFORD
Colonel, Infantry

Colonel Rutherford's letter was extracted from a "Professional Thought" which appears on page 49. ED.

More on Bahnsen

Dear Sir:

With regards to the recent discussion concerning the essay, "Improving the Army," by Lieutenant Colonel Peter F. Bahnsen, I would like to offer my comments toward the subject of particular interest. While I understand the interpretation of "tenacity" forwarded by Chief Warrant Officer David E. Aldridge in the March-April Issue of ***ARMOR,*** I believe that Colonel Bahnsen has surfaced an idea of critical importance to the future of our Army—that is the necessity for junior officer leadership based upon a sound basis of agreement with fundemental principles, rather than devotion to the ends of a "solid career progression pattern."

As a junior officer with the entirety of my experience based in a TO&E unit with a viable tactical mission, I have seen the "policies" and "programs" Mr. Aldridge refers to in a variety of configurations. I do not agree, however, that the two areas spoken of are, indeed, above reproach. As an initial premise, it should be noted that few field grade commanders I have encountered have ever displayed violent opposition to the presentation of an alternative to the existing "policy" or "program"—provided that the proposal was an *alternative*; and not just a *complaint*. It is my firm belief that complaints are the basis for nothing; they simply perpetrate mediocrity. The junior officers willing to devote the time to an analysis which results in an alternative resolution generally gain the respect of their superiors, whether the two elements agree to change or not. If that concept embraces the "tenacity" Colonel Bahnsen purports, then I am in agreement with his ideas.

The real heart of Colonel Bahnsen's article, as I view it, is to point out the necessity, in our search for combat readiness, that the upcoming officers realize the need for thinking in terms of what is good for the professionalism of the service and the needs of our country, as the priority elements of consideration. I have a personal distaste for those who would subordinate the needs of America and the military service to personal goals, and I believe that the majority of my junior officer contemporaries would agree. While it is true that most young officers like to voice their assignment preferences to Armor Branch, and perhaps envision the "ideal" job somewhere ahead, I feel those are minor considerations when compared to the needs of the service, in the eyes of today's junior leaders.

I am extremely proud of the honesty I have seen displayed in the conduct and dedication to duty of my contemporaries during my brief tenure in the United States Army. One of the primary reasons behind my decision to stay in the military beyond the required term of service is due to the belief I hold that here I perform a task of true value to the preservation of an ideology I hold paramount—the tenets of the United States Constitution. That feeling should, by definition, preclude the commission of the "acts of omission" Colonel Bahnsen refers to, and enable the Army to improve via the progression of today's junior officers into the senior ranks over the course of time. I believe that scenario will come to pass.

Perhaps the original article, created by Colonel Bahnsen, was perpetrated through a belief on his part that the honesty was deteriorating (or in danger of it) in the Officer Corps. If that has been the case, and "tenacity" has suffered, then I have not had the misfortune to witness it. The fears of a career "brief and lackluster" that Mr. Aldridge speaks of should not motivate today's young officers, who must be able to present effectively alternatives based upon sound judgement and proper orientation of priorities. Additionally, we must continue to have the feeling that higher commanders *do* listen to those alternatives, and that, in itself, will stimulate an improvement in the professionalism of our Army.

I was profoundly affected by a recent opportunity I had to speak with the former USAREUR Commander, General Blanchard, at a conference of troop/company/battery commanders. He gave one the unmistakable impression that he was *listening* to the alternatives we presented in an effort to deal with ongoing problems, and I was heartened immensely by our conversation. Led by senior commanders of General Blanchard's caliber, we junior officers can only become more dedicated in our efforts to improve the military service and protect our way of life. I cannot envision a more satisfying or meaningful principle to guide my service career.

ROBERT W. MIXON, JR.
Captain, Armor
Trp L, 3d Sqdn, 11th Cav

Appalled

Dear Sir:

A voice from the wilderness.

I was appalled by the articles about the new Cavalry Fighting Vehicle in the May-June issue.

I remember when European cavalry units were exchanging their *M-114s* for *Sheridans* in the 3 for 5 program. At the time, critics of the program said that the *Sheridan* was too large, too expensive and too complicated to be a scout vehicle. Yet, after years of research, we have produced a "scout" vehicle that is every bit as large as a *Sheridan*, 7 tons heavier, and from all appearances every bit as expensive and complicated. I find it incredible that the Soviet Union can field an equivalent vehicle (in terms of performance and firepower), the *BMD*, 7 feet high, 15 feet long and only 9 tons in weight; and the best we can do stands better than 9 feet high, is over 20 feet long and weighs almost 24 tons! It's going to be damned hard to scout in a vehicle as large as a tank.

There is also a problem with the vehicle's armament: there's too much of it. A scout who has the capability to kill a tank at 3,000 meters is going to be tempted to shoot instead of report enemy tanks. The addition of the TOW system also places another training burden on the commander who has little enough time to train his people to scout.

The only thing I can see doing with this monster is to use it to replace *Sheridans/M-60A1s* in cavalry platoons and find a light scouting vehicle, perhaps the *XR-311*, for the scouts; but of course this won't happen.

And to introduce this vehicle in an issue where General Patton says we should keep Cavalry as light as posible . . . .!?

PETER L. BUNCE
Staff Sergeant

Time Machine

Dear Sir:

Recently, I overheard a group of young Armor officers discussing the philosphy behind and merits of the *XM-1*.

I found it interesting in that its creators knew from its inception that there would be criticism, praise, and compromise in purpose and design. It is sort of a time machine.

I was assigned to the Armor and Engineer Board in December 1971 when Congress killed the MBT 70 (*XM-803*). It did not come as a surprise to most people in the business. Highly important data had been collected during its development. What was surprising to me was a TWX in January 1972 assigning me to a "Main Battle Tank Task Force" to be established at Fort Knox. What the devil they wanted with a 1204 cavalry officer was beyond me.

The nucleus of the task force was comprised of about 33 officers and scientific personnel. This force was backed up by agencies and research officers all over the US and, in some cases, assistance from foreign countries. It was an interesting crew to say the least. There was a great deal of expertise and a lot of professional thinking.

As one might expect, just as the task force was formed in February 1972 the current issue of ***ARMOR*** Magazine hit the mail with an article titled "The Death of the Tank." Of course the *Washington Post* picked all this up and asked if the Army knew what it was doing and was the taxpayers' money being wasted again?

The task force was off to a great start. There were briefings after briefings, many TDY trips, and searching analysis of numerious previous studies and statistics dealing with tanks and tank warfare.

We looked at little tanks, big tanks, light and heavy tanks, tracked concepts, wheeled concepts, armor protection, all kinds of guns and suspension systems. I particulary remember the heated discussion on a turretless tank. The idea was out because Americans have to shoot 360 degrees; I assume a carryover from the Indian wars.

After many weeks of analyzing vast information and listening to one expert after another, a humorous but impacting concept drawing showed up in our "secret chambers." It depicted a huge gun on a small turret; hull so low the driver would have to lie prone; very wide, aggressive tracks; and a huge engine compartment with chrome exhaust headers protuding from each side. Someone was being funny, but its truth was that there was going to have to be a significant trade-off. I kept wondering what aeronautical engineers do in initially designing an aircraft knowing that as an end result the thing has to fly.

There was a cost ceiling on the new "supertanks" and the cost effectiveness people were going to have to take the materiel-need document and see if we could afford it. Again compromise and trade-off were the key and this went on during the entire task force period and for many moons after it dissolved. Once, we even discussed whether it should have a chemical toilet and its cost. This was not serious, but there was much that was if we were going to get the best tanks for the price and most important, the finest battle tanks in the world.

There are more tank buffs in this world than one would believe. The Task Force received letters from retired generals, retired sergeants, civilian engineers, corporations and a 15 year-old boy scout. There were many ideas but it was the dedicated interest that was fascinating.

After several months a very fine engineer from Tank Automotive Command told us that when he returned in a week he would bring a small wooden model of what the *XM-1* would end up looking like no matter who ended getting the contract to build it.

When I saw the model and then several years later the *XM-1* prototypes, I thought that there was one knowledgeable engineer. I suppose working with tanks since 1941 gave him a certain insight.

The material needed for the *XM-1* was basically completed in August of 1972, and the Task Force began to break up. Several of the officers today are generals. Many are retired. A few left the Army for defense industry jobs and a couple had careers that went sour and had to leave the service.

It was a good group. Armor had finally asked and answered the question, "What is a tank and what is it supposed to do?" All the ensuing discussion on the cost of tanks and whether they were obsolete was put to rest in October 1973. I find that ironic.

A captain told me that at the rate we're going he will be a Lieutenant Colonel before he ever sees one [*an XM-1*] in a unit. I told him that if it turns out to be as good as we want it to be, his generation may not have to use it in a fight. It's a consideration, the *XM-1* is sort of a time machine with extensive thought, purpose, and development behind it.

BURTON S. BOUDINOT
Lieutenant Colonel (Ret), Armor

An Aid to Recognition

Dear Sir:

I look forward to the Recognition Quiz feature of each issue of ***ARMOR,*** and I noticed in a recent letter to the editor that one of your other readers favored the pictures from the quiz over the currently available flash card training aids. I agree with him to an extent, but I feel that the cards are a basic starting point for vehicle indentification which should and could be enhanced with a somewhat more advanced tool. I believe that the cards can be used to train in basic characteristic identification and then the advanced aid could be used to present more realistic views of the vehicles.

I believe that this could be accomplished by adapting a childs Viewmaster set to military use by replacing the viewing discs of cartoons with color pictures of military vehicles. These viewers are cheap, durable, easy to procure and offer the same view a soldier would get through a pair of binoculars. If such a device exists, I haven't seen it, and I believe that it would be a very good training tool and one which could a touch more authenticity to the ARTEP evaluation.

CRAIG LENOCKER
Captain, Armor, USAR
2d Maneuver Training Command

Any of you gadgeteers out there care to have a try at developing some viewing discs for this purpose? Your local Training Aids Support Center might be able to lend a hand. If you do come up with a suggested recognition series, let us know—and please include a set of your pictures. ED.

Semper Fidelis

Dear Sir:

As a Marine Corps officer assigned an Armor MOS, I feel that the inclusion of commanding officers of Marine Corps tank, amtrak, and tracked vehicle battalions in your periodic command listings would be beneficial and would acknowledge the contribution that the Marine Corps makes towards the active duty armor force of the United States.

MICHAEL T. SHAW
First Lieutenant, USMC
Subic Bay, R.P.

A good idea. We'll work on it. ED.

Needs Thought

Dear Sir:

I took a great deal of interest in the article "A New Breed, Active Defense Cavalrymen," in the July-August issue of ***ARMOR.*** Major Andrews failed to give the subject enough thought. He sees a problem but fails to suggest any solutions. The few ideas he presented are weak assertions that he appears either afraid or unprepared to defend. I am particularly annoyed by those who suggest that someone else designate "definitive missions and procedures."

Perhaps if Major Andrews himself would explore the various mission possibilities in the active defense along with present or proposed organizations he could come to some potentially valid conclusions. For instance: Does the active defense preclude offensive action above the task force level? Is the cavalry a force that could be used in an offensive role? What about the mobility superiority that the air/ground cavalry team offers?

Another point, armored cavalry is not dead, yet, and any air cavalryman should realize that air cavalry can't survive alone on the battlefield.

I think Major Andrews had better rethink his premise. FM 17-95, as poorly written as it is, does not preclude the use of cavalry in the active defense. Cavalry performs all offensive and defensive missions either as an economy force or as part of the main force. Cavalry's roles in the active defense are only limited by the commander's thought processes and mission requirements.

H. JOSEPH ROZELLE
Lieutenant Colonel, Armor

Time to Crack the Books

Dear Sir:

In the July-August issue, the tank in photo #5 is not a *M-47* being used by the South Korean Army. It is a Japanese *Type 61* Main Battle Tank. It was made after the *M-47* using the *M-47* as an example. It's much smaller (due to the size of the average Japanese tanker.) The *Type 61* was the first tank the Japanese Defense Force was equipped with that was a pure "Made in Japan" tank.

Someone should have caught the mistake. First the *OT-62* being called a *BTR-50* in the September-October 1978 issue and now this. Time for someone to crack the books and refresh.

WADE R. BARTELLS
Staff Sergeant, Armor
Co. A, 3d Bn, 77th Armor

*ARMOR also received letters from Roy L. Wilson, Gary W. Brown, Staff Sergeant Frank R. Shirer, and many others. While the QUIZ was being prepared, two photos were inadvertently swapped. See page 39 for the photo that should have been there. Also, in some magazines, Photos 2 and 4 were transposed. Honestly, the **ARMOR** staff can tell the difference between an XM-1 and a Leopard 2. Editor.*

THE COMMANDER'S HATCH

MG Thomas P. Lynch
Commandant
U.S. Army Armor School

To enable us to win the battles of the 1980's, the Army has developed weapons systems capable of defeating the potential threat. These development programs will soon bear fruit in the form of the *XM-1,* the Infantry/Cavalry Fighting Vehicles and other systems which are due to come on line in the early 1980's. However, we cannot afford to wait until these systems are fielded before gearing up to maximize their combat potential.

The Armor Center, along with other TRADOC agencies, is already planning training programs to provide units with qualified leaders, crewmen, and mechanics capable of maneuvering, fighting, and servicing this new generation of equipment. Now is the time for commanders and staffs to begin looking ahead to the day when the first new fighting system is issued to your units.

I would like to make a few recommendations based on our recent experience with the initial fielding of the *M-60A3* concerning unit acquisition and training on new equipment. If heeded, they will help minimize the problems you may face in the near future.

• First of all, make sure your men are proficient on your present fighting systems. Training packages for the New Equipment Training Teams (NETT), which will provide transition training from your current system to the new fighting vehicle, are developed on the assumption that crewmen are at a given baseline proficiency. One gauge of requisite baseline proficiency for tank crewmen is the Tank Crew Gunnery Skills Test found in FM 17-12-2 for the *M-60A1* and in FM 17-12-4 for the *M-60A2.* Recent qualifications during annual gunnery or a good sustainment gunnery program will help to insure that your crewmen are prepared for the transition. Give serious consideration to minimizing crew shuffling as much as possible prior to gunnery and keeping the same crews together at least through the transition training period.

Additionally, mechanics should be able to demonstrate their capability to service your present tanks. I suggest that you prepare them by using Soldiers' Manuals for the 63 and 45 series MOS. Units which fail to meet baseline proficiency standards will face the problem of programming remedial instruction into an already tight training schedule. Remember, NETT programs are based on the assumption that your soldiers are already proficient at certain skills. Lacking that proficiency, they will not receive the maximum benefits of the transition training program and subsequent training efforts will suffer as a result.

• Second, insure that staffs coordinate with NETT personnel well in advance of your unit's transition training period. Such coordination should key on problems encountered by units which precede yours through the conversion process and actions that were taken to solve them. Most newly fielded weapons have "bugs" to be worked out. Your knowledge and understanding of these problem areas beforehand can help ease the conversion of your unit.

• Next, begin looking early-on at how the acquisition of the new weapons system will affect your unit from the standpoint of training, logistics, and personnel. Your training and maintenance people must plan home station programs including use of local training areas, subcaliber ranges, and training devices. These programs should be based on the capabilities of the new system, as well as your financial and physical resource limitations. Additional reinforcement training should be planned to permit your troops to become completely familiar with complex subsystems. Ranges capable of supporting the new system should be available for a sustainment gunnery program immediately following the transition training phase so your crewmen can immediately reinforce the instruction they have received.

Your logistics personnel will have to plan for a smooth transition from one system to another by drawing down on supply demands pertaining to the old vehicle during its phase-out period. They will not only have to prepare for the turn-in of your present vehicles and possible storage of old and new equipment for a short period of time, but also for all of their related equipment such as *M-85* machineguns, special tools, and test equipment (STTE), and prescribed load lists/authorized stockage lists (PLL/ASL). Only those parts required to keep the system combat-ready or those required to bring the vehicle up to turn-in standards should remain in unit inventories. *M-240* machineguns and radios will be retained for installation in the new vehicles.

The new systems will come to you with STTE and PLL/ASL packages, which simplify acquisition problems considerably. General and turret mechanics' tool boxes will remain essentially unchanged, so you should insure that tool shortages are made up well in advance of the new systems' arrival. In the case of the *XM-1,* plan for the increased fuel consumption rates of the *AGT-1500* turbine engines, as well as acquisition of special lubricants.

Personnel staff members should be prepared for the arrival of systems-trained crewmen and mechanics soon after the conversion program is completed. Notifying servicing military personnel offices of the unit's changeover date to the new system, as well as what new MOS/ASI to expect, will enable personnel managers at higher echelons to funnel replacement personnel to your unit as soon as the "pipeline" opens.

The need for sound planning in the conversion process cannot be over-emphasized. Commanders and staff at all levels must be involved from the earliest stages of planning to insure a smooth transition. Establish written SOPs for the conversion as details become available. This action alone will minimize confusion and wasted effort in the implementation of your plans. With the influx of technological advances, our planning and execution of new fighting system conversion programs must be as effective and efficient as possible to preclude any loss in operational readiness and capitalize on the tactical advantages of the new systems.

Master Gunner's Corner

Dover Device

Faced with the lack of a suitable lighting device for night subcaliber tank gunnery, the New Jersey Army National Guard's 5th Battalion, 102d Armor, decided to find a solution for this long-standing problem for reserve component tankers.

Battalion trainers discussed the problem with CW4 William J. Burkhardt, the automotive maintenance technician in the battalion maintenance section, who developed the prototype of the *Dover* device.

The *Dover* device (figure 1) is affixed to the Xenon searchlight mount on the ballistic shield of the *M-48A5* or *M-60* series tank. It provides a bracket and quick release coupling for mounting one or two of the tank's service drive headlamp units, depending on the lighting requirements. This fixture is identical to that of the normal headlamp mounting position at the front of the hull.

After placement on the searchlight mount, the device is connected to the tank's electrical system at the accessory receptacle in the turret exhaust blower control box near the loader's position, using the device's wiring harness.

Operation is controlled by means of a three-position switch in the wiring harness, which provides a choice of infrared, white, and off. Although the loader normally operates the device, sufficient cable is provided to allow the switch to be placed in the TC's position.

One headlamp unit has been found to provide sufficient light for 1/60 and 1/35 scale ranges, and in fact, some shielding may be necessary. Two units are needed for 1/20 and 1/2 scale ranges.

Installation requires no modification to the existing tank electrical system. Extra quick release couplings for use with the device are available at the driver's position, where the headlamps are stored during combat.

The *Dover* device works better on subcaliber ranges than does the Xenon searchlight because the searchlight is too intense and requires extensive shielding. Additionally, the searchlight places a heavy drain on the vehicle's batteries, particularly when it is used indoors with the engine off.

The device can be easily installed and adjusted by the vehicle crew, and is easily maintained and repaired at the organizational level. It can be boresighted with the *Brewster* device in much the same manner as is the searchlight with the main gun. It may be used for target illumination by the firing tank, or to provide light for other tanks on the firing line.

Additional information concerning the device may be obtained by writing the New Jersey Department of Defense, ATTN: OTS-OT, Box 979, Trenton, N.J. 08625 or telephoning AUTOVON 445-9251 or commerical (609) 984-3606.

CW4 William Burchardt (left) and SFC Edward Snook are shown mounting a Dover Device on a tank of the New Jersey National Guard.

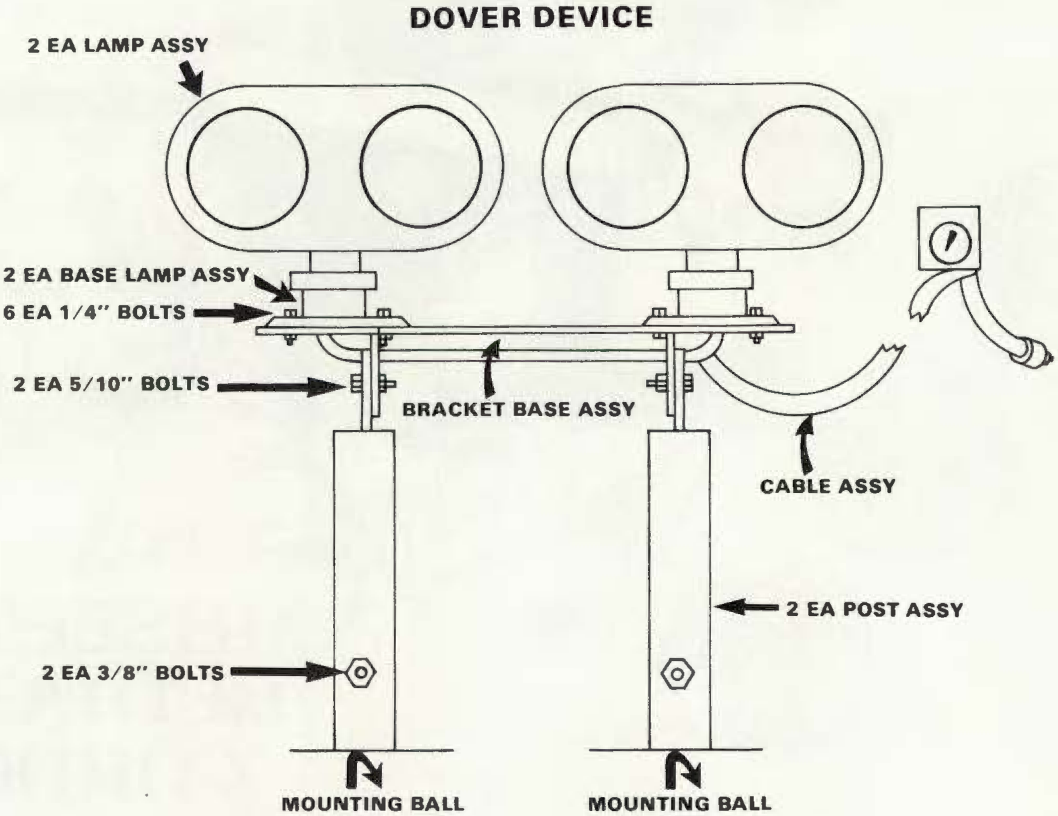


Figure 1

Moving Targets for Tank Gunnery

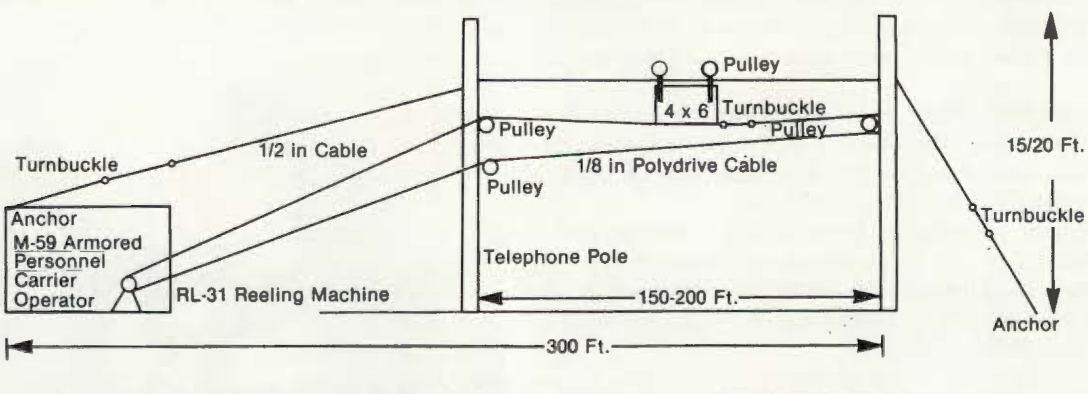
The ARR II Readiness Group Dix Armor Team recently designed and built moving target systems on two ranges at Fort Dix, using locally procured materials.

The targets are designed to support Reserve Component Tank Gunnery training utilizing subcaliber training devices, such as the *Inbore* with the caliber .50 spotter/tracer or the 20-mm *Riley Inbore.* However, machinegun firing at the target is no permitted.

The system consists of two telephone poles 150-200 feet apart with a half-inch cable stretched between them. A 4 by 6-foot target faced with 12 to 18 gauge steel hangs from the cable, and can move along it. (figure 1).

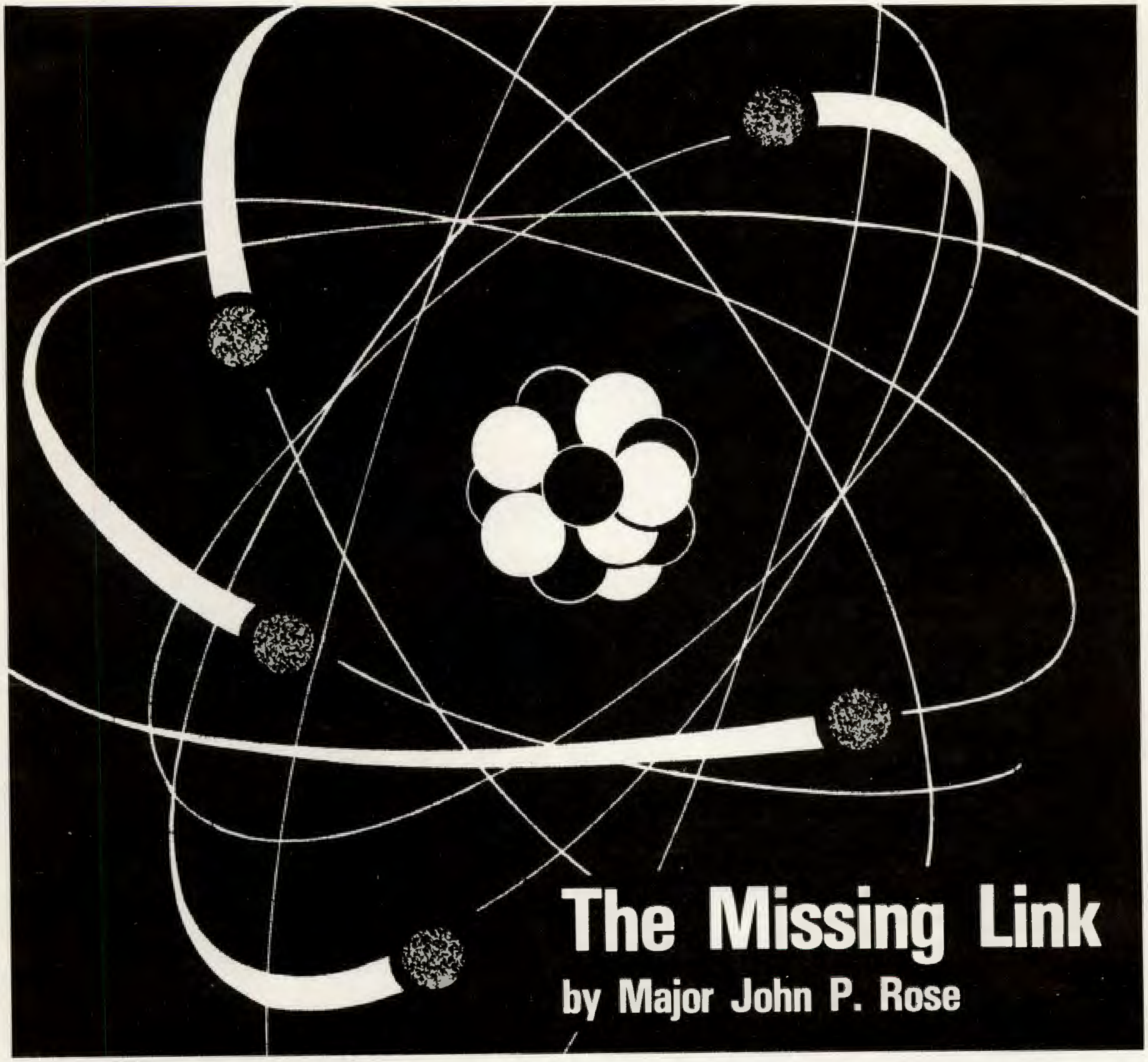
Movement of the target is controlled by a continous 1/8-inch cable attached to the target and looped over pulleys at each end, and an *RL-31* reeling machine, located in an *M-59* armored personnel carrier.

After several months of operations, comments have been generally favorable.



Notes:

1. The personnel carrier has a protective barrier of earth emplaced on the uprange side.
2. The 4 x 6 target has 12 to 18 gauge steel fastened to the front to detonate the cal. .50 Spotter/tracer.
3. Pulleys are the key to the system. Any with aluminum shafts will wear quickly—they should be of steel.
4. Anchors utilized at Fort Dix are other target vehicles—deadmen anchors could be used.
5. The tighter the tension on the 1/2 in cable, the easier the target will move.
6. Operator fatigue is negligible. A communications means is required for the operator.



The Missing Link

by Major John P. Rose

Adherence to outmoded tools, methods, and organization spells obsolescence, one of the most insidious and at the same time one of the most disabling diseases that can attack an army.

General Douglas MacArthur
April 1951

The accelerated evolution in firepower that has already occurred in warfare demands many new tools, tactics, and techniques — but before the men can act in new patterns, they must think in new patterns.

General Willard G. Wyman
September 1958

The Army of the United States is the nation's instrument for the conduct of land warfare. To remain highly professional it must stay abreast of changes in the mechanics of war. As the center of military knowledge, it is in a position to evolve a doctrine of war that both suits the temperament of the organization and fits the requirements of the nation.[1]

Doctrine, defined as tactics and techniques on how-to-fight, is a changing set of guidelines adopted to meet changing circumstances. The process is evolutionary. The only constant factor is change itself. Throughout history the difference between the winner and the loser has often been the greater ability of one side to inject change into a commonly accepted solution to a problem.

In the fall of 1974, a considerable rethinking and reorientation on the basics of combat occurred in Army tactical warfighting doctrine. Substantial revision in both substance and emphasis was initiated. The "capstone" of the series of revised Army tactical field manuals was FM 100-5, "Operations," which set forth the basic concepts on how the Army intends to fight on future battlefields. As the backbone for overall Army doctrine pertaining to tactical operations, FM 100-5 has

[1] Harold W. Rood, "Strategy Out of Silence: American Military Policy and the Preparations for War, 1919-1940," (Ph.D. Dissertation, University of California, Berkeley, 1961).

widespread influence within the Army. It sets the tone and provides the substance for what is taught in the service schools, how units are trained, and how combat developments proceed.

The philosophical foundation of the new Army doctrinal thinking is to prepare soldiers to anticipate going into battle outnumbered and on a weapon-for-weapon basis—outgunned. That the Army may be facing tanks in a future war is an indisputable fact. That the U.S. Army does not have sufficient armor to face our potential enemies on a tank-for-tank basis is equally indisputable. General William E. DePuy, as Commander of the Army Training and Doctrine Command, attested to the changing situation in December 1974:

> U.S. Army objectives are to win the first battle. . . .Undoubtedly, the first battle fought anywhere else is going to be fought by small U.S. Army forces restricted in number by the possible strategic areas and distances involved. The outcome of the first battle could well become the outcome of the war because of the intensity. Readiness in terms of immediate battle effectiveness is essential . . . . Historically, the United States has won with superior numbers of troops, weapons, etc. We are going to have to win while outnumbered. The name of the game is change . . . .[2]

While it is recognized that the Army cannot hope to match the massed manpower and equipment of the potential enemy in any future war, attention must focus on action to overcome this deficiency. The answer obviously lies in fielding an Army better-equipped and trained than potential adversaries.

The program to reorient and restructure the whole body of Army doctrine from top to bottom has had several positive results. "How-to-Fight" manuals do provide vivid descriptions of battle and clear concepts on how to fight against a modern conventionally-oriented enemy. The manuals have acted to thrust the Army back to the business of preparing itself for war—its basic peacetime mission. A period of top priority personnel area problems have been delegated secondary importance to the mission of preparing for war—combat readiness. The Army has refocused on the basic; *shoot, move by making the best use of terrain, surprise the enemy; do not hit him where he is strongest, but where he is weakest.*

The current FM 100-5 is an unequivocal statement that the U.S. Army is committed to high-intensity warfare operations on the European approach to North America. The principal enemy is clearly the Warsaw Pact which is dominated by the strength and overwhelming power of the Soviet Armed Forces.

The Soviets counterpart to the U.S. Army's guiding principle . . . probably would be stated as "fight to win the next war in the first battle."

The mission of the U.S. Army is to win the first battle of the next war—that much is clear. However, that does not resolve the problem. The problem is to insure that U.S. Army combat forces are prepared to meet the challenge of modern warfare. In developing a solution to the problem one must examine and understand the dynamics of the modern battlefield. Current Army "How-to-Fight" manuals visualize the solution in the refinement of tactics and techniques in response to improvements in range, accuracy, and lethality of conventional weaponry.

Today, Army combat doctrine and training literature may be characterized by how the Army would like to fight rather than how it may have to fight. The missing link in U.S. Army fighting doctrine would seem to be the absence of guidance for nuclear battlefield operations. "How-to-Fight" manuals reflect a nonnuclear threat, a nonnuclear battlefield, and an overcompensation for satisfying the image that nuclear weapons are unusable rather than facing the ongoing Soviet emphasis given to warfare in a nuclear environment. The thrust of current Army tactical doctrine leads one to believe that a few tanks along with helicopter gunships and antitank guided missiles are the answer to the 45,000 Soviet medium and heavy tanks, and the plethora of Soviet theater nuclear weapons, firmly integrated into Soviet forces.

The missing link in U.S. Army fighting doctrine would seem to be the absence of guidance for nuclear battlefield operations.

If the Soviets had a counterpart to the U.S. Army's guiding principle of "fight to win the first battle of the next war," it most probably would be stated as "fight to win the next war in the first battle." Indeed, the whole structure of Soviet military doctrine centers upon the concept of achieving decisive results fast. The grim reality is this: doctrine, exercises, organization, and equipment indicate that the Soviet Union and Warsaw Pact place high value on tactical surprise with nuclear weapons.[3] Their doctrine states that if the Warsaw Pact believes NATO is about to launch a major nuclear attack it will seek to preempt with nuclear strikes on military targets. Further, there are indications that the Warsaw Pact fully appreciates the initial advantage to be gained by a first use of theater nuclear forces in the absence of NATO indications to use nuclear weapons. A strong tenet of Soviet and Warsaw Pact planning is on the massive concentration of firepower on key military targets early in the conflict. By disrupting and demoralizing NATO forces, they create the opportunity for an armored *blitzkrieg* across Western Europe. Prime targets for attack include NATO nuclear delivery units, airbases, ground combat forces, command posts and support forces. (Concentration of firepower is not necessarily concentration of forces. The Soviets recognize the difference and strive to achieve the former while minimizing the risks of the latter.)

Soviet and Warsaw Pact armored forces and their direct support (artillery, tactical air, surface-to-air missiles) are postured and trained to exploit nuclear attacks by rapid, deep, and multiple thrusts to destroy NATO forces and seize NATO territory. These armored and motorized rifle units are equipped for operations in a nuclear and chemical environment.

[2] General William E. DePuy, Presentation at the TRADOC Leadership Conference at Fort Benning, Georgia, 22 May 1974.

[3] Soviet emphasis given to warfare in a nuclear environment are noted in the following sources: Mark B. Schneider, "Soviet Nuclear Doctrine" *National Defense* January-February 1979, pp. 51-53. William R. Van Cleave, "Soviet Doctrine and Strategy: A Developing American View" in *The Future of Soviet Military Power* edited by Lawrence L. Whetten (New York: Crane, Russak and Company, Inc., 1975, pp. 41-71). Joseph D. Douglas, Jr., *The Soviet Theater Nuclear Offensive,* (Arlington, VA.: System Planning Corporation, December 1975). William F. Scott, "Soviet Military Doctrine and Strategy: Realities and Misunderstandings," *Strategic Review,* Summer 1975. Leon Goure, Foy D. Kohler, and Mose L. Harvey, *The Role of Nuclear Forces in Current Soviet Strategy,* Monographs in International Affairs, Center for Advanced International Studies, University of Miami, 1974.

Soviet theater and battlefield nuclear forces appear to be an integral part of their ground offensive capability.[4] In and of itself, Soviet and Warsaw Pact equipment and training for a radiological environment indicate a continuing seriousness about nuclear warfare.

The U.S. Army's assessment of the Soviet and Warsaw Pact threat derived from the "How-to-Fight" manuals is where hypothesis appears to take the place of reality. It may be a case where an attempt has been made to fit situations and problems to preconceived solutions and methods, rather than to develop solutions that fit current and future reality.

In reality, technology has developed flexible and discriminate tactical nuclear weapons—better delivery, lower nuclear yields, and weapons with tailored effects: enhanced radiation weapons (the neutron bomb), suppressed radiation weapons, and induced radiation weapons. These developments, due to their nature and the limitation of collateral effects, promote rational use of nuclear weapons in land combat operations. However, the U.S. Army does not have a doctrine that will enable its tacticians to conduct military operations in line with the military effectiveness that tactical nuclear weapons can provide. The Army does not have a tactical nuclear warfighting doctrine in which soldiers are trained, instructed, and mentally and physically prepared to fight, survive, and win in a nuclear environment.

Overemphasis on preparing to fight and survive on a battlefield envisioned to be conventional and the failure to recognize a Soviet nuclear doctrine and force posture may be synonymous with obsolescence in terms of the new Army "How-to-Fight" doctrine. If the U.S. Army should ever suffer military defeat at the hands of the Soviet ground forces, it will likely be because it has failed to grasp the essential elements of Soviets warfighting doctrine and prepare effectively for them.

While the U.S. Army has responded to changes in the conventional military and technological environment, these changes may be inadequate in guiding the preparation of the Army for future nuclear contingencies. If the Army is guessing wrong, the first battle could decide the next war and result in military defeat.

Under the guise of advancement, the U.S. Army's doctrinal developments may have taken two steps backward. The two major deficiencies of FM 100-5 and the other "How-to-Fight" manuals are in the failure to recognize the nuclear nature of the threat and in the failure to address issues on how to fight, survive, and win on the nuclear battlefield.

Current Army doctrine on "Tactical Nuclear Operations" is hardly more than a "how to plan a corps nuclear package manual." Although it describes the methodology for providing nuclear battlefield fire support, it does not teach tactics and techniques for fighting on the nuclear battlefield.

Army tactical nuclear doctrine as it exists seems to avoid the tough issues. For example, how can ground combat units attain protection from a nuclear attack but retain the capability of engage the enemy in decisive operations? Following the employment of a nuclear package, how might ground combat units be tailored to attack, to defend, or to delay an enemy advance? Furthermore, what about command and control, combat support, and combat service support survivability in a nuclear environment? Those that argue that the answer to success on the nuclear battlefield exist solely in strong, aggressive leadership somehow avoid the issue. In a nuclear war it would appear that the force that can live in such an environment, still move, use terrain, concentrate superior force, and employ suppression will defeat the side that cannot.

Nevertheless, the spirit of the offensive would seem essential to success and it comes through teaching and drilling soldiers in the skills necessary to fight and survive on the future battlefield. Units that survive will do so by a combination of dispersion, movement, concealment, rapid concentration, speed of operations, and shielding. The problems facing the modern tactician is to retain from his experience that which remains valid while rejecting that which modern technology has made obsolete. Thus evolves the doctrine for nuclear warfare.

In essence, the U.S. Army does not have what can appropriately be called a "tactical nuclear battlefield doctrine" for tactical nuclear weapons and forces. Instead of addressing nuclear battlefield issues, the current guidelines are basically concerned with conditions which enable a decision to be reached on whether or not to employ nuclear weapons.

How confident can the Army be that the next war will adhere to a conventional character? The answer is, "It cannot." To base planning and training for a war with the Soviet Union on the assumption that nuclear weapons will probably not be used is indeed dangerous. The absence of doctrine can be no excuse for failure.

In closing, a statement from *On War* by Karl Von Clausewitz bears thought:

> Woe to the Cabinet which, with a policy on half measures and a fettered military system, comes upon an adversary who. . .knows no other law than that of his intrinsic strength. Every deficiency in activity and effort then is a weight in the scales in favor of the enemy. . . .[in consequence, he continued,] if bloody slaughter is a horrible spectacle, then it should only be a reason for treating war with more respect, but not for making the sword we bear blunter and blunter by degrees from feelings of humanity, until once again someone steps in with a sword that is sharp and hews away the arms from our body.[5]

[4] Support for Soviet interest in theater nuclear warfare can be found in U.S. Department of Defense, *The Theater Nuclear Force Posture in Europe,* A Report to the United States Congress in compliance with Public Law 93-365, Washington, D.C.: GPO, 1 April 1975, pp. 2, 10, 13; and in James R. Schlesinger, *Annual Defense Department Report,* FY 1976 and 1976T (Washington, D.C.: GPO. 5 February 1975), p. 111-1.

[5] Karl Von Clausewitz, *On War*, trans. by O. J. Matthis Jolles (Washington D.C.: Infantry Journal Press, 1950), p. 164.

MAJOR JOHN P. ROSE is assigned to the Department of Social Sciences at the U.S. Military Academy. He is a graduate of C&GSC and has served with *Hawk* missile batteries in Germany and Vietnam. He holds a Ph.D in International Relations from the Univ. of Southern California. He has had articles published recently in *Air Defense* and *Marine Corps Gazette*, and contributed to a soon-to-be published book.

Finding and Clearing Mines

by Major Ronald N. Williams

By early May 1944, the Allied landing force at Anzio had been confined to a narrow beachhead for 4 months. It was expected that the breakout would be timed to support the main attack of Clark's Fifth Army, which had been stalled some 50 miles to the southeast. When the order came, the 1st Armored Division found it was to lead the attack on a narrow front with Combat Command A (CCA) on the left and Combat Command B (CCB) on the right.[1] Both commands were organized in a similar manner, with one battalion of tanks, two battalions of infantry, one battalion of reconnaissance elements, two engineer companies, and a tank destroyer company.

The troops moved up to the attack positions early. Corps artillery had been firing periodic heavy preparations for a week, and there is little doubt that everyone knew the big moment was at hand. The attack was delayed first one day, then another, as the troops remained poised to attack. The final preparation ended with an intense aerial bombardment at 0630 on 23 May. Moments later the 1st Armored Division crossed the line of departure. They found the enemy badly disorganized and without any communications.[2]

CCA passed through the protective mine fields of the 45th US Division as planned. Four tank crews pushed ahead explosive mine clearing devices known as "snakes," until they

1 Vincent J. Esposito, *The West Point Atlas of American Wars,* Frederick A. Praeger, New York, 1960, p. 104.

2 George F. Howe, *The Battle History of the 1st Armored Division,* Combat Forces Press, Washington, 1952, pp. 318-20.

spanned the enemy minefields and were close to his strong points. The snakes were detonated with "appalling violence," clearing a path for the tanks and stunning the defenders. Surprised German defenders were quickly rounded up and passed to the rear. Engineers with the lead elements began probing for and removing mines that were beyond the effects of the snakes. Tank losses were light. By dusk CCA had advanced 500 yards beyond the objective.[3]

The situation in CCB was completely different. While crossing the line of departure, CCB discovered that someone had forgotten to coordinate the clearing of lanes through the protective barriers of the 34th Division. In the resulting confusion, no one could find the minefield records. Furthermore, apparently no thought had been given to clearing the enemy mines either because the battle history indicates that neither engineer company was employed in the initial phases of the attack.

Burdened with this combination of factors, the lead element, Company D, 13th Armored Regiment, lost so many of its tanks to mines that it had to be replaced. The Division Commander ordered the use of snakes, but by this time there were 40 tanks disabled on the battlefield and the devices could not be maneuvered among them. German antitank guns had opened fire on the force and the commander of the 3rd Battalion, 5th Infantry ordered his troops to attack ahead of the tanks and silence the enemy guns. Shortly afterward, Company C, 16th Engineers arrived and cleared two lanes through both friendly and enemy mine field.

What remained of the tank battalion caught up with the infantry. By nightfall the enemy had recovered from the devastating artillery preparation and had reorganized on the objective. CCB was able to outpost some points near the objective, but spent most of its efforts that night recovering damaged tanks.[4]

In a situation almost identical to that of its sister command, CCB had barely escaped a disaster of its own making. The singular difference was that one command had paid strict attention to the problem of mine clearing, while the other had ignored or forgotten it. Up to this time it was common to find that minefield breaching was completely ignored by US commanders.[5] But, things were improving, as intensive training had been underway for a year in England, preparing officers to face the mined beaches on Normandy.

To understand how such a critical element of combat power as mine warfare could be neglected, one must trace the development of equipment and doctrine from early World War II. This look at history will provide the framework for examining the three elements of today's mine clearing capability: The equipment available, the state of training of available troops, and the doctrine for conducting clearing operations. First, however, let's look at past US efforts in countermine doctrine and equipment, and contrast them with those of the Soviet Army and our principal allies.

The widespread problems encountered by our commanders throughout World War II in dealing with mines can be traced directly to a decision at the highest War Department level. Early in the war the responsibility for both laying and clearing mines was assigned to engineer units. The tone of the decision was such that it appeared to remove this burden completely from the maneuver unit commander.

It is reported that infantry and tank units had practically no training or hands-on experience with mines before combat.[6] In fact, the United States was 6 months into the war before an adequate training program was established for engineers. We went into the war without a device for detecting mines, although one was issued early in 1942. This first portable detector, the *SCR-625*, was described as "basically a good instrument that could not always be relied upon to perform the task for which it was designed."[7] The Corps of Engineers had tried a large number of far out ideas for finding and getting rid of mines, but had come up empty-handed every time. No matter how poor the troops thought our portable detector was, it was far better than the other clearing devices available.

The greatest progress had been made by improving the invention of a British officer of long Indian service. It was designed to blow up obstacles and traps in the Bangalore region of southern India, and came to be known as the "Bangalore Torpedo." Our production model was a tube of thin metal 5 feet long, 2 inches in diameter, and containing 8½ pounds of explosive. It was issued in the spring of 1942. Several of them could be hooked end to end and could be pushed across a minefield. When exploded, it would clear a narrow gap. The troops decided it was too narrow a gap and since the explosion was unreliable in disabling mines, the bangalore torpedo was rarely used for anything but clearing protective barbed wire. The troops in North Africa at the time preferred to probe with a thin rod and remove or explode mines one at a time.[8]

In 1943, the Engineer Board began testing the Canadian "snake" that allowed the troops of CCA to break out of the beachhead at Anzio a year later. It was similar to the bangalore torpedo, but had a 3-inch diameter and enough strength to allow it to be pushed by a tank. It did prove to be superior to the bangalore torpedo and with some minor improvements it was procured for American troops.[9]

The efforts of various boards and agencies to produce mechanical mine clearing devices resulted in failure. Rollers, drag weights, dozer blades, and a flail device had all been rejected, although some had shown promise. The best of the devices tested by the Ordnance Board in 1943 turned out to be a heavy disc roller.[10] Variations of this device have reappeared many times, in other armies, as well as our own. In February 1944, the Engineer Board intensified the effort to find a breaching device. Twenty-five novel devices such as hoses filled with liquid explosive, plywood rollers, and detonating cord throw lines were tried. As you might have guessed, none of these were judged better than the snake already in use.

While the snake had been adequately clearing a path for tanks, a serious shortcoming had been noticed. The explosion

3 *Ibid.*, p. 322.

4 *Ibid.*, pp. 323-4.

5 *United States Army In World War II, The Technical Services,* U.S. Government Printing Office, Washington, D.C., 1958, pp. 347-8.

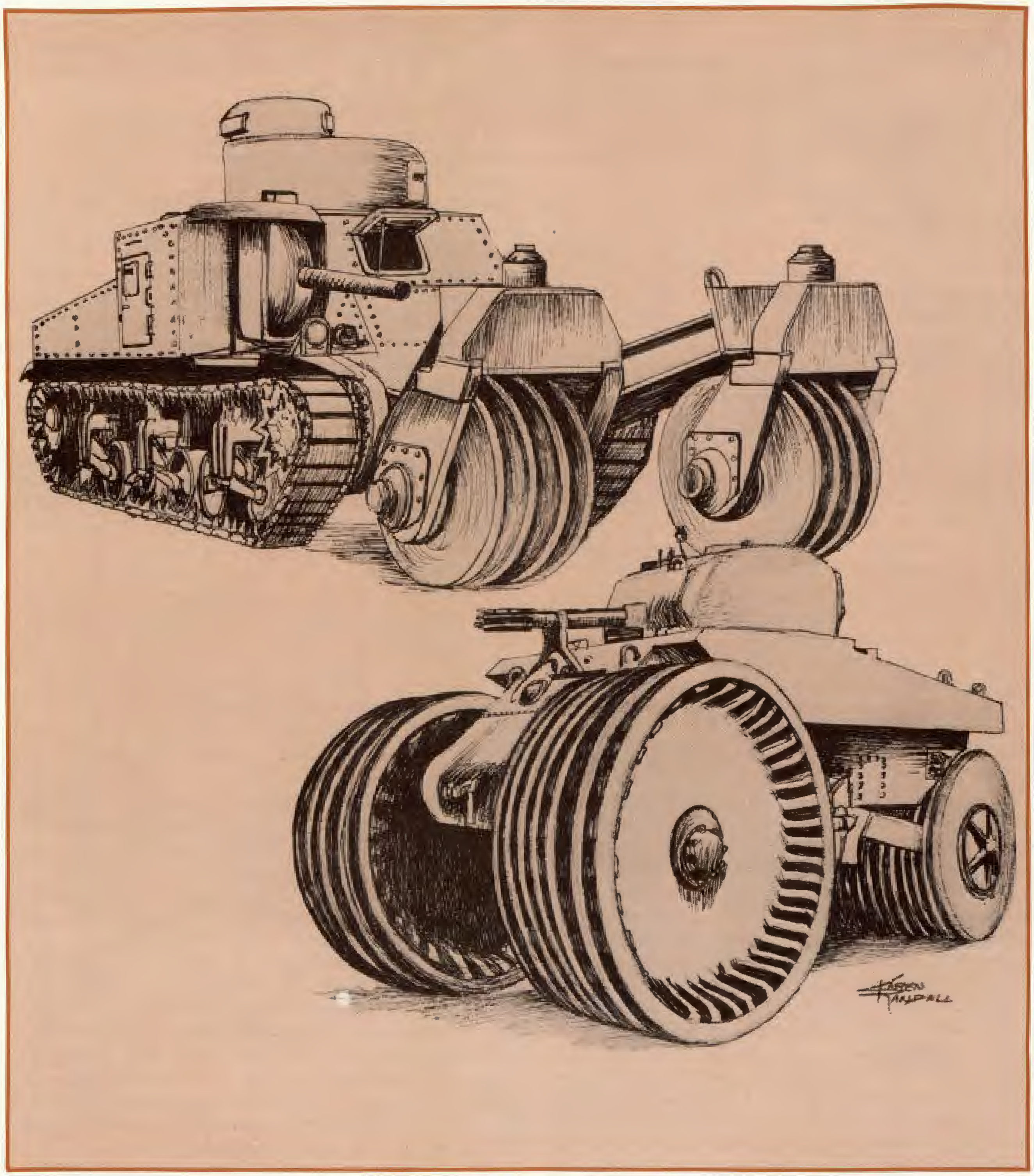
6 *Ibid.*

7 *Ibid.*, p. 468.

8 *Final Report of the Chief Engineer, ETO,* U.S. Government Printing Office, Washington, D.C., 1948, p. 163.

9 *United States Army In World War II, The Technical Services, op. cit.,* p. 470.

10 *Ibid.*, p. 480. This information is also found in the report of the Chief Engineer, ETO, cited in note 8, although it is not so emphatic.



had the effect of "tenderizing" the mines on the edges of the gap, making them both easy to detonate and difficult to remove. These tender mines were killing substantial numbers of infantry and engineer soldiers.[11] In an effort to end this problem, the Ordnance Board, in 1944, issued the *Scorpion,* modeled after a British flail device, and a disc roller of original design. Both were soon discarded by the troops.[12]

It is a sad fact that by the time of the Anzio breakout, most mines were still being detected by a soldier on his hands and knees probing for and removing mines by hand. No effective machine had been provided to assault a mine field or any other obstacle. Only six marginally effective tank dozers were delivered to the Normandy beaches on D-Day. Engineer casualties reached 40 percent on Omaha Beach as men did by hand what should have been done by machines.[13]

11 *Ibid.*

12 *Final Report of the Chef Engineer, ETO, op. cit.,* p. 164.

13 *United States Army In World War II, The Technical Services.*

It is during this period that a peculiar American mind set began to appear. Since then, our developers have insisted on finding and clearing mines with near perfect accuracy, while sustaining no casualties.[14] After WW II, development was concentrated on the roller type devices. Such massive systems as the *Larruping Lou* and *High Herman*, which were full tank width rollers, were tried. While the rollers were good enough, using them destroyed the drive trains of the tanks.[15] These improved rollers were not issued.

More recently, Martin Marietta's Aerospace Division proposed a system in which a soldier on foot would spray chemicals in his path to produce rigid foam stepping stones on which to cross a minefield.[16] Others have proposed an extension of this idea in which a tanker vehicle would advance to the minefield and begin to pave it with a chemically produced rigid foam. It would lay a thickness and width adequate to allow it and the following tanks to cross without detonating antitank mines.[17] The fuel-air mixture explosive method of mine clearing is another example of the high technology approach to mine clearing, and is one that holds great promise for clearing single pulse mines. It is obviously going to have great advantages for the hasty breaching situation, especially when delivered by artillery or air.

While our approach has been to try to clear all the mines and do it safely, other armies have taken a higher risk approach. The British were more successful during WW II by clearing only that percentage of mines that would allow them to pass most of their armor undamaged. They sacrificed some equipment for speed in breaching.[18] General Eisenhower quotes Soviet Marshal Zukov to the effect that Russian casualties were actually lowered by their technique of assualting straight through mined areas. They accepted losses from enemy mines while reducing losses from covering fire.[19] This doctrine, like most lessons learned in their "Great Patriotic War," remains in force in the Soviet Army today.

Today's Soviet soldier and his Warsaw Pact ally have some rather effective equipment that should enable them to avoid the high loss rates of WW II. There are three classes of mine clearing equipment in the Pact force. The most important is their disc roller. When their tanks find a minefield, they back out of the area to covered positions where the rollers are fitted to the tanks. A large number of each series of tanks are equipped to use rollers.[20] The roller is a set of three or four discs, depending on the model, mounted in front of each track of the pushing tank. The discs have an axle hole that is considerably larger than the axle itself. This gives each disc freedom to exert pressure independently as it follows the terrain, and to recoil independently as well, when a mine is exploded. This very basic concept is what allowed them to build a practical roller of a size that a tank could handle.

The Soviets recognize that no roller can be 100 percent effective in detonating mines. To take care of those few mines that escape the roller, they have issued a mine clearing plow. It can be used in tandem with the roller, and is mounted between the discs and the tank track. The plow has tines that follow the terrain and are independently controlled by hydraulic mechanisms. With this combination, the roller clears most pressure, vibration, and magnetic influence mines. The plow casts aside all mines missed by the roller. Should the combination be damaged, the crew can quickly drop it so the tank will not become a stationary target.[21] The third type of clearing equipment found in the Pact armies is the rocket-delivered line charge. Rockets fired from stations on the rear deck of the tank carry explosive line charges 150 meters to the front of the tank. On exploding, these charges clear one lane through the minefield.[22] By comparison, the US Army has progressed very little in our ability to clear mined obstacles.

Even before our involvement in Vietnam we did very little training for mine laying or clearing. During the sixties, the emphasis was on the booby trap aspects of mine warfare. Only recently, with the advent of Skill Qualification Testing, has individual proficiency in this area become important. There is still very little being done at the unit level to prepare for land mine operations.

During a tour in Europe, I saw large quantities of mines being trailered around. I never saw anyone training in their use or removal. On field exercises, when a task force encountered an obstacle, there was usually a long discussion with an umpire about the time required to cross it given various levels of engineer support. Typically, if it was a road crater with a minefield around it, the advance would be stopped for 45 minutes. The commander could accept this delay, or he could ask for more support. Normally, this was a good time for a quick meal, and always there was a meeting with the company commanders. Often I had the impression that the task force commander felt he had done his duty by pointing out the problem to the first engineer lieutenant he got his hands on. His job at the mined obstacle was too easy. If he had to deploy troops to provide covering fire, or even provide the troops to find and clear mines, he would gain a far better appreciation of his problem. It is too easy for engineers to simulate the reduction of minefields and other obstacles. Until we actually get mine-clearing equipment, engineer, armor, and infantry soldiers should be practicing the detection and removal of mines as part of maneuver training.

The equipment available for training today is limited to the metallic and nonmetallic detectors. Both are much improved over those issued in 1942 and are lighter and more reliable. But after all the effort expended, we still do not have a useful piece of equipment for minefield clearing. There have been rumors of new equipment since the late fifties. Nothing has been delivered.

It is possible that in 1979 a disc roller will be issued in Europe. Partly an extension of our own technology, and partly a copy of the current Soviet mine clearing roller, this device is expected to provide the combat commander a true minefield

14 *Mine-Countermine Warfare, Net Technical Assessment*, Report of Project Tenet I, p. 4.

15 John Kitching, *Minefield Breaching*, International Defense Review, March, 1977, p. 524.

16 James N. Marsden, *Defeat of Tactical Mine Fields*, National Defense, Sept-Oct 1975, pp. 127-9.

17 *Ibid.*

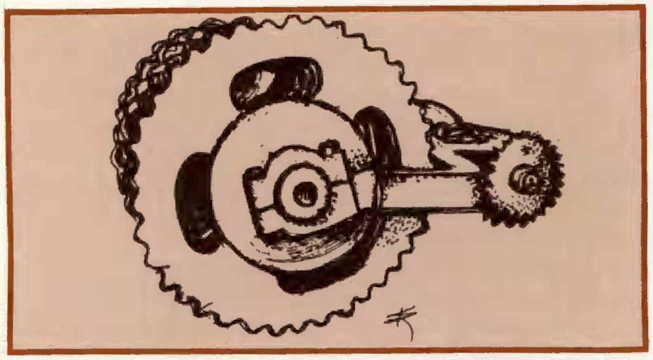
18 *United States Army In World War II, The Technical Services, op. cit.*, p. 482.

19 Dwight D. Eisenhower, *Crusade In Europe*, p. 467.

20 Friedrich Wiener, *The Armies of the Warsaw Pact Nations*, Translated by Williams J. Lewis, Carl Ueberreuter Publishers, Vienna, 1976, pp. 294-5.

21 Kitching, *op. cit.*, p. 294.

22 Wiener, *op. cit.*, p. 375.



assualt capability.[23] In January 1978, the plan was to issue one roller per tank company. Discussions were already being conducted with the view of increasing the density to one per platoon. This roller, like the Soviet model, will only clear the narrow area directly in front of each tank track. Unlike the Soviets, our armored personnel carrier has a wider track than our tank. To move an effective combined arms team through a minefield, it will be necessary to echelon two or more rollers across the minefield. For this reason,if for no other, we need more than one mine roller per company.

In the May-June '77 issue of *ARMOR,* Captain Michael Tesdahl made a persuasive argument for a doctrine that returns the full responsibility for countermine operations to combat engineer units. Current thinking seems to be on his side, especially when account is taken of the trend to limit the combat commander's job to fighting those systems he is primarily responsible for. He states that minefields are an important aspect of mobility-countermobility, and this is the stock in trade of the combat engineer.[24] I believe that there are two very important considerations, however, that will lead to another conclusion.

First, when the new disc roller is issued to the troops in Europe, we are going to find that the only vehicle suitable for pushing it is the main battle tank. It takes tremendous tractive effort plus armor protection to employ such a roller. Admittedly, we could mount rollers on the combat engineer vehicle, but an important point is that we need a lot of rollers, and we need them up front with the troops who discover the minefields. Breaching of obstacles requires that it be done with continuous momentum. We would surrender this momentum if the maneuver commander has to send back to an engineer company for a mine roller every time he encounters a mined obstacle. If the rollers are up front with the tank units, then it can only be the tank unit commander who must exercise responsibility for their employment.

The idea of responsibility characterizes the second consideration. Since the minefield is so important to mechanized warfare, I cannot conceive of a doctrine in which someone other than the maneuver commander is responsible for countermine operations. While engineers may well do the major part of the detection and clearing in the absence of effective mine clearing devices, the commander must never relax just because the minefield clearing has been subcontracted to an engineer lieutenant. That may well be a good reason for his personal involvement.

Like Captain Tesdahl, I think it is time that we clarified the question of who does what at the minefield. Contrary to his view, I feel that placement of the mine roller in the tank company and increased involvement of the maneuver commander argue for a doctrine that places responsibility for mine clearing with the task force commander. To do otherwise would invite the sort of neglect that stopped CCB at Anzio.

In addition to issuing the mine roller, increasing unit training in land mine warfare, and clarifying the associated doctrine, there is one further item that deserves our attention. Having copied the mine roller, at least in part, from the Soviets, I think we must go all the way and provide a mine clearing plow to complete the combination. It will not be long before there will be a fuze that can discriminate between the vibration patterns of tanks and rollers, or would perhaps measure the pressure duration to provide the difference. A well designed plow would serve to complement our tank and roller combination, casting aside those mines that the roller misses.

The Soviets make it clear in their writings that the land mine can be used as an effective offensive weapon. Minefields will be used to repulse counterattacks, to cover exposed flanks, as economy of force measures, to consolidate objectives, and most important, to repel "attacks of enemy reserves approaching from the depth."[26] If, in the active defense, our generals are going to successfully concentrate combat power at the decisive place, there is going to be a need for mine clearing, even though our actions will initially be defensive. This capability is required now. It has been 36 years since the US Army discovered in North Africa how effectively mines can hamper an armored attack. All the intervening years have not given us a better mine detecting and clearing capability. The best we have produced is a man operated portable detector and a nonmetallic probe, plus the promise of a mechanical device somewhere in the future. Mine clearing capability is an important aspect of combat power that has been neglected long enough!

MAJOR RONALD N. WILLIAMS was commissioned in the Engineers from the U.S. Military Academy in 1965. He holds a master's degree in science from Oklahoma State University and has completed the Engineer Officer Advance Course and the Air Command and Staff College. He served as the leader of an engineer platoon in USAREUR and an aero-weapons platoon in Vietnam. He commanded an engineer company in the U.S. and Vietnam and served as an assistant resident engineer in Alaska. He was an operations officer in the Career Training Division, Fort Rucker, Ala., and is now enrolled in the Navy Test Pilot School, Patuxent, Md.

23 TRADOC sources report that there has been a significant delay in the operational testing of the new mine roller, but it is expected to be issued no later than spring of 1979, to units in Europe.

24 R. Michael Tesdahl, *Probing for a Solution,* Armor, May-June 1977, p. 55.

25 Kitching, *op. cit.,* p. 294.

26 Col. M. Belov, USSR, *Remote Mining,* Soviet Military Review, July 77, p. 26.

Cougar: A Canadian Cat

by Captain Paul A. Philcox

During the early 1970s, there was serious thinking in the Canadian Forces about getting out of the tank business and converting Canadian Armoured Units to an all-reconnaissance role. This debate was fueled by the immediate after-action reports obtained from the 1973 Arab-Israeli War, which on initial analysis appeared to sound a death knell for the tank on the modern battlefield.

Fortunately for all armoured forces, this early analysis proved to be false. It was, however, in this atmosphere that the Canadian Armoured Corps was fighting for its life. There were those in the Forces who were convinced, through a combination of the Arab-Israeli War results, rising capital costs and operational and maintenance costs, that the days of the main battle tank (MBT) were over.

The Corps made no headway in its attempts to change the policy that decreed that the *Centurion* was to be our last tank; so, maneuvering to another position, the Canadian Armoured Corps opted for a stand-in vehicle which we called the Armoured Vehicle, General Purpose (AVGP). It was envisioned that this type of vehicle could be purchased in sufficient numbers to meet our training and operational requirements. The vehicle would be produced in three versions, a tank trainer AVGP to maintain, at a minimum level, the skills of the Armoured Corps, an AVGP personnel carrier to allow the infantry to work alongside the armoured forces and maintain the effectiveness of the combined arms team and, finally, a recovery/maintenance AVGP.

Canada carried out intensive trials on three potential AVGPs, and in 1975 decided on the Swiss 6x6 version of the Mowag *Piranha.* Canada will produce all three variants under license in Canada at the General Motors Diesel Division in London, Ontario.

In 1976 the Government announced the purchase of the *Leopard* MBT for Canada's armoured units. This surprising turn of events left the Armoured Corps in a exceptionally good position. Not only would we be able to equip all our Canadian Regular and Reserve Units with a modern advanced tank trainer, but our first line units in Europe and at our Armour School would be equipped with one of the most advanced MBTs in the world.

Deliveries of the AVGP began in the fall of 1978 with the *Cougar* (tank trainer), the *Grizzly* APC, and the *Husky* recovery vehicle. A total of 350 vehicles will be produced in the first production run with one-third going to the Reserves. The Armoured Corps is under no illusions about this vehicle. It has been provided as a tank trainer and although it offers the advantages of excellent operational capabilities in internal security or peacekeeping operations, it is not intended for use in a high-intensity environment like the European theatre.

The *Cougar* has a monocoque steel hull of all welded construction which provides the crew with protection from small arms fire and shell fragments. The driver is seated in the front of the hull on the left side and is provided with a single-piece hatch cover and three periscopes for driving while closed down. The engine is to the right of the driver. An Alvis *Scorpion* two-man turret with a 76-mm gun is mounted slightly left and to the rear of the driver. There are two doors at the rear of the vehicle in addition to the hatches provided for the driver, gunner, and commander. All vehicles have the facility for a front-mounted winch. The *Cougar* is fully amphibious.

Two of the three versions of the Canadian general purpose armoured fighting vehicle are shown here. Three views of the *Cougar* appear at left, above, and center. The *Grizzly* is at the lower right. Note the gun ports adjacent to the vision blocks in the rear third of the *Grizzly's* hull.

The suspension is independent with wishbone-type coil springs in front and torsion bars in rear. Hydraulic shock absorbers are at all wheel stations. The tires are Michelin run-flat tires with Hutchinson inserts. The vehicle can run at 25 km/h for a distance of 70 km with two wheels out of action.

The *Cougar* is powered by a 300-hp turbocharged Detroit diesel and is linked to a Allison *MT-653* five-speed automatic transmission. Acceleration is from 0 to 44 km/h in 10 seconds. The combination of diesel and turbocharging not only gives the engine a longer maintenance cycle, but also keeps it incredibly quiet (it is virtually silent to the human ear at 100 meters). Mowag transfer boxes permit selection of four- or six-wheel drive and propellers. Power is transmitted to three differentials through propeller shafts. Brakes are power assisted air/hydraulic drum type on all wheels. The AVGP is equipped with the Jacobs brake system which is a hydraulic attachment to the engine that converts the diesel into a compressor; this produces a power absorbing condition in which the engine becomes an effective vehicle retarder, thereby reducing the driver's work load and vastly extending brake life.

AVGP Characteristics

	Cougar	Grizzly	Husky
Crew	3	2 and 8	3
Length	5.97m	5.97m	6.79m
Heights:			
turret roof	2.62m	2.53m	2.66m (to crane)
hull roof	1.85m	1.85m	1.85m
Width	2.5m	2.5m	2.5m
Weight	10,500kg	10,500kg	10,500kg
Ground Clearance	39cm	39cm	39cm
Tires	11.00x6	11.00x6	11.00x6
Turning Radius	5.65m	5.65m	5.65m
Max Road Speed	100km/h	100km/h	100km/h
Max Water Speed	10km/h	10km/h	10km/h
Range Road	600km	600km	600km
Fuel Capacity	300 litres	300 litres	300 litres
Fording	Amphib	Amphib	Amphib
Gradient	70%	70%	70%
Max Step	40 to 50cm	40 to 50cm	40 to 50cm
Engine	Detroit Diesel 6053 Turbo-Charged Diesel Producing 300 BHP	Same	Same
Armament	1x76-mm L23A1	1x.50-cal H2MB	1x7.62-mm GPMG
	1x7.62-mm GPMG	1x7.62-mm GPMG	
	2x4-barrel SMK Dischargers	Same	Same

The *Cougar* is inherently amphibious. Preparation for water crossing requires only that the driver hydraulically deploy the one-piece trim vane. Propulsion in the water is by propellers. Each propeller has steering vanes and is controlled by the normal steering wheel. Water speed is 10 km/h.

The *Cougar's* performance on land is excellent. Its maximum road speed is 100 km/h and it is capable of 40 km/h cross-crountry. The large tires and independent suspension provide a smooth and quiet ride whatever the terrain. The performance in snow is excellent.

The *Cougar* has been fitted with an Alvis *Scorpion* turret mounting a 76-mm medium-velocity gun which fires HESH, smoke and cannister ammunition. The turret is a welded aluminum alloy and has powered traverse through 360 degrees and manual elevation of +35 degrees to −8 degrees. The gunner has a RADNIS (Rank Day/Night Sight) and two No. 43 episcopes. In night operations the RADNIS will give the gunner the capability of detecting an MBT at 1,500 meters. The commander's station is equipped with a No. 71 periscopic binocular sight with the same graticule pattern as the gunner's sight. Additionally, the commander has one No. 43 episcope and six No. 48 episcopes arranged around the hatch. The *Cougar's* secondary armament is a 7.62-mm Browning machinegun coaxially mounted to the left of the main armament. The *Cougar* can stow 40 rounds of main ammunition and 4,180 rounds of secondary ammunition. The turret is also equipped with eight smoke grenade dischargers, four on either side. These will produce a smoke screen 60 meters in front of the vehicle for approximately 90 seconds.

The *Cougar* has a 24-volt electrical system supplied from four 12-volt batteries which power the turret and ancillary equipment. The *Cougar* has a facility for either a single or dual radio system mounted in the turret. This system also has a remote facility and cable reel.

The *Cougar* possesses an advanced fire suppression system. Each vehicle is equipped with a Halon 1301 gas system which will snuff out fires in seconds with no discomfort or disruption to the crew.

The other variants in the AVGP program are the *Grizzly* and *Husky*. Both vehicles are in many ways (engine, suspensions, etc.) identical to the *Cougar*. The most notable difference is that the *Grizzly* APC has a much smaller one-man Cadillac Gage powered turret mounting a .50-calibre machinegun with newly developed *C-44* armour piercing .50 cal. ammunition and a 7.62-mm machinegun operating coaxially. The vehicle commander sits immediately behind the driver while the remainder of his eight-man section sits to the rear along the center line observing through vision blocks. They also have gun ports adjacent to the vision blocks and in the rear doors.

The *Husky* is a turretless vehicle which because of its role as a recovery vehicle is somewhat longer and slightly higher than the other AVGPs. The *Husky* is equipped with a hydraulic crane capable of lifting 5,000 kg and a rear-mounted winch capable of pulling 10,000 kg. It is armed with a pintle mounted 7.62-mm machinegun.

As a final point, it is interesting to note that an article in the July-August 1978 issue of *ARMOR* by Richard M. Orgorkiewicz stressed the benefits of Armour Training Vehicles, both in training flexibility and in lower costs. Whether he realized it at the time or not, Canada's armoured units were then in the forefront of putting these theories to the test.

It is a refreshing change to have the uncertainties of a few years past give way to renewed confidence among our armour troopers as a result of the arrival of the *Cougar*. The real work of meshing old skills to new vehicle now begins and we are ready.

REGI PATRIAEQUE FIDELIS

CAPTAIN PAUL A. PHILCOX was commissioned in the Canadian Forces Reserve from the Canadian Officer Training Corps in 1966 and served as a reconnaissance troop leader, training officer, and adjutant. Commissioned in the Canadian Regular Forces in 1973, he attended Basic Officer Training, Combat Arms School, and the Tank and Reconnaissance Troop Leader Courses. Assigned to the 8th Canadian Hussars (Princess Louise's) in 1975, he served as a recon troop leader, operations officer at the '76 Olympics, and as a squadron umpire during REFORGER 76. He joined Mobile Command Headquarters in 1977 and is currently serving there as a staff officer. Captain Philcox also attended the Parachute Course of the Canadian Airborne Centre and the Canadian Forces Staff School.

"Eyes"—An Innovation in Air Cavalry

by Lieutenant Colonel Clyde A. Hennies

This article was presented as a briefing before the Armor Conference, Fort Knox, Ky. in May 1979. Editor

A recent innovation in air cavalry strategic deployment which was developed and is still under refinement in the 1-17 Air Cavalry has far ranging implications—from rapid strategic deployment to helicopter research and design to cavalry reorganization.

The innovation is simply an air cavalry reconnaissance package which we have appropriately named the *Eyes* package. It has also opened our eyes to the problem of getting air cavalry—or any aviation for that matter—to the battlefield in sufficient numbers and in a timely enough fashion to be of any benefit to the ground commander. We simply do not have enough strategic airlift assets. The problem is not so much in the transportation of people but rather in the transportation of combat equipment. This has been addressed somewhat in Europe by increasing U.S. forces, including attack helicopter units. The concept of prepositioning organizational material configured in unit sets (POMCUS) in Europe for units based in the United States is another measure taken to relieve the surge requirements on strategic airlift.

But what about the majority of FORSCOM units that may be tabbed to deploy on short notice to Europe or elsewhere in the world?

With limited airlift assets, commanders of these units are forced to think the deployment problem through to insure that a balanced force, capable of holding its own, arrives at the strategic objective. Those of us in the air cavalry and aviation business must get on board early in the planning process to insure that we get a piece of the Combined Arms Team action.

For discussion purposes, let's use a light infantry division as a model for strategic deployment. With limited strategic airlift, the division and brigade commanders must take a critical look at the combined arms options available to determine what goes and when. They face hard choices in the logistics planning, knowing that this is a "come as you are war." They're faced with a dilemma when it comes to the air cavalry picture. They know they need "eyes and ears" but they also know that except for those aircraft airlifted by the *C-5A*, any army aviation that goes will have to be disassembled for loading and subsequently reassembled. This takes time, and time is critical to the operation. They also realize the logistics effort to support one air cavalry troop is massive and can literally devour available strategic airlift. In the final analysis, these commanders, with three maneuver brigades, the air cavalry squadron, a tank battalion, and an ADA battalion, must take critical choices to initially get the right mix of maximum combat power into action with the available strategic airlift assets.

They look to the air cavalry commander for recommendations on what to send to insure ample reconnaissance and limited security forces for the first units to go in.

These commanders are saying, "I need you cavalry guys, but I can't afford all of you, at least at the outset. Now it's up to you to develop something that can initially do the job without dominating the airflow."

Like the division commander just described, this commander also faced some hard choices while developing a cavalry package for deployment. It soon became apparent that our standard and well advertised deployment package of two scouts and two *Cobras* was inadequate.

This configuration requires three *C-130s* just for the transportation of the helicopters. Another four *C-130s* are required for fuel, ammunition, parts, and heavy equipment for the reassembly of the Cobras. Using *C-141 Starlifters* reduces the requirement by only three aircraft. In short, this small package plus the airlift for its logistical and maintenance support requires seven *C-130s* or four *C-141s*. What does this mean to the division commander who must allocate the assets? In terms of reconnaissance, it means that he would initially have only two scout aircraft available for operations because of the reassembly times required for the *Cobra*. This does not take into consideration the possibility of any problems of reassembly. Even if everything worked fine, this package would only be able to sustain itself for the limited duration of fuel accompanying the package and find itself competing early for the follow-on logistical support.

Compounding the problem is the wide variance in fuel consumption between the scout and attack helicopters, which means greater resupply needs.

Our standard package of two scouts and two *Cobras* was cumbersome, shortwinded, and questionably effective under best-case conditions. Its main advantages were balance and a highly mobile antitank capability for the lead elements of the division. But with only two *Cobras*, it would not have enough density upon enemy contact to implement the aviation rule of one-third engaging, one-third enroute to the contact, and one-third refueling and rearming. In the final analysis, the division commander would not be getting his money's worth of cavalry relative to his investment.

Keeping in mind the mission of the cavalry—to extend by aerial means, the reconnaissance and security capability of the division—we had to retune our minds to the traditional cavalry role of *eyes* and *ears*. With great pain, we concluded that we could conduct our initial mission without the S-model *Cobra*. As I reminded my hardcore cavalry commanders and staff, "Stuart and Custer didn't have *Cobras*; their failures were through failing to properly employ their forces."

The issue here is how to deploy while dealing with real-world constraints in order to accomplish our basic mission.

The criteria we developed was based on providing the division or brigade commanders with a reconnaissance and security capability for the minimum investment. Application of these criteria resulted in the *Eyes* package, consisting of four *OH-58* aircraft, 7 crews, and a support package, which has a number of advantages.

The four *OH-58s* can be disassembled in approximately 30 minutes, and loading is relatively fast and simple. Upon arrival, the first team can be in action in less than 3 hours, with the other two aircraft close behind.

We have enough fuel in this package to sustain us for at least 24 hours. We're talking about deploying with full tanks plus 1,000 gallons in two fuel bladders. Planned very early in the airflow is a resupply of additional fuel through airborne delivery by the low altitude parachute extraction (LAPES) and heavy drops.

Four helicopters plus double crews allow us to field two teams on a continuous basis and provide adequate crew rest without impeding operations.

There are ample air and ground communications to talk to the brigades or divisions.

We also possess some night capability because of our night vision goggles.

The support package has enough personnel and equipment to keep the packages going and to reassemble or assist follow-on scout elements.

Because of the size of the package, it should be landed as close as possible to the brigade.

After landing, the first team would deploy and concentrate initially on the main route into the brigade or division area. The teams of the *Eyes* package are capable of directing available tac air and artillery while providing early warning for the ground forces. Because the priority of our first mission is to concentrate on enemy armor approaching along main routes, we conclude that this package would provide adequate coverage for a brigade during early stages of deployment. Airlift requirements for fuel resupply of this package are quite low. One *C-130* can deliver 2,000 gallons of fuel by LAPES which would provide 20-40 hours of flying time for the *Eyes* package depending on team configuration.

Disadvantages of the *Eyes* package center primarily on a lack of organic antiarmor firepower. The ground commanders are aware of this and to compensate, we offer another option in air cavalry deployment. It is a follow-on antiarmor *Kill* package consisting of four S-model *Cobras* and supporting equipment and supplies. It is expensive, however, in terms of airlift.

The follow-on air cavalry forces, whether they be another *Eyes* package or a *Kill* package, would be determined jointly by the squadron and ground commander based on a combination of the enemy and airlift situations.

There are some numerical and procedural similarities between the *Eyes* and *Kill* packages indicating there would not be a great difference in airlift requirements. They both:

- Require approximately 35-40 personnel and four aircraft, and take 1,000 gallons of fuel in two bladders.
- Have approximately the same number of ground vehicles.
- Require disassembly and reassembly of aircraft and have specialized teams to do this as rapidly and carefully as possible.
- Use an aerorifle squad to assist with loading, unloading and local security.

The similarities stop there.

The *Cobras* require double the *C-130s* and almost double the *C-141s*. The lift capability of the *C-5A* for *Cobras* is still a question mark. A load-out test is to be conducted at Fort Hood to determine how many *Cobras*, completely intact and ready to hit the start trigger, can be loaded and hauled on the *C-5A*. Each *Cobra* will be restricted to 600 pounds of fuel, enough for 30 minutes of flight to reach a FAARP. The planning figure is five *Cobras* per *C-5A*.

When compared with our *Kill* package, this test package shows the price in airframes for deploying *Cobras* intact or disassembled, with or without support.

It would take approximately 29, or 40 percent, of the *C-5A* fleet to transport just the helicopters of three air cavalry squadrons with some disassembly involved.

Looking at the cavalry mission and then comparing the utility of these packages relative to the investment in strategic airlift, it looks as if "the Eyes have it." I realize there is a danger in trying to draw any one-sided conclusions, but it points out that we haven't made sense of rapidly deploying army aviation. At the beginning I stated that the innovation opened our eyes and I believe we have more than adequately identified the major problems associated with getting sufficient numbers of helicopters to the battle in a timely fashion. Therefore, considering the limited airlift situation, the variety of helicopters and their deployment peculiarities, and the missions we must conduct, the interim key to air cavalry deployment—and I underscore *interim*—is packaged tailoring.

The remainder of this presentation represents the views of the author and not necessarily those of the 82d Airborne Division nor the U.S. Army Armor Center.

There are neglected areas in our training which impact on our deployment. The emphasis of training now ranges from occupation of a forward assembly area to the execution of combat operations. The "How to" manuals, field manuals, and other training literature set forth doctrine and details for fighting the war *after we arrive.* Missing are the details of *getting there.*

Most air cavalry units appear to have the disassembly, loading, unloading, and reassembly of helicopters down fairly well. The training objectives in these tasks are usually time-relative and the training is valuable to the doers. But I wonder how much involvement takes place with the planners other than laying on one or two Air Force aircraft for a small scale early deployment readiness exercise (EDRE) or static load-out. I just don't believe aviation in any quantity deploys physically or mentally by airlift from CONUS to an overseas landing site to immediately self-deploy to a forward assembly area and then commence tactical operations with the assets available. It is a terribly weak area. Ask yourselves when you last conducted an ARTEP, FTX, JTX, or CPX in the sequence and conditions I have just described. I recommend an ARTEP sequence that includes the deployability picture. The ARTEP would start with detailed staff planning based on the division commander's guidance, the factors of METT, and available strategic airlift. It would force air cavalry, attack helicopter, and other aviation commanders to think through strategic deployment which would culminate with a deployment plan aligned to the ground tactical plan rather than the usual OPORD which gets the unit from garrison to the field.

Upon completion of the planning phase, they would be required to execute the deployment plan which would put their forces into the battlefield according to the airflow.

Much of what I have just described could be worked out with a series of CPXs long before the ARTEP starts. Logistics must be played to the maximum with the knowledge that if you blow it through bad planning or execution, you won't be able to operate until you can work it out relative to real time.

The ARTEP would realistically take a few weeks or more if done as just described.

There is a final point on training. We all know that, next to people, our most precious commodity is time, and the thought of sitting around waiting for your turn to deploy, from the individual through largest element, just goes against our training grain. However, it might be beneficial to see and study the effects of this real-world situation on actual performance of missions upon arrival.

The next implication of the *Eyes* innovation deals with research, design, development, and production of the advanced scout helicopter (ASH). I say this in a singular sense because the cavalry needs one easily deployed helicopter to do two jobs—a lot of scouting and some killing.

The cavalry ASH, and I underscore *cavalry*, should be small. Something about the size of the *OH-6* or no longer than three-fourths the length of the *OH-58*. It should be simple enough for quick, easy cost-effective disassembly and reassembly for deployment. It should burn no more than 25-30 gallons of fuel per hour. These first three conditions are very important because they are the key to getting a lot of helicopters to and into the battle quickly and keeping their fuel tanks full.

The ASH must also have a system of radios to communicate with both ground and air elements including tac air. The missile system should be as simple and reliable as possible with few, if any, cockpit adjustments.

ASH must also have a system of radios to communicate with both ground and air elements including tac air. The missile system should be as simple and reliable as possible with few, if any, cockpit adjustments.

The ASH should also be capable of carrying a minigun, which could be mounted when needed. What we're looking for is a lean, mean machine. Readers of *Aviation Digest* were recently asked to look at a shopping list of 29 potential systems, and select the best combinations that could be placed on a scout aircraft. In my opinion, every one of those systems are of varying benefit to the scout mission, and interface with major systems of the future, including the AAH, TACFIRE and FIST. The right mix of these systems will significantly improve our present scouting capability and insure interface of the air cavalry as a member of the Combined Arms Team. We must however, insure that it does not get too big or we'll be back to square one on deployment—not getting enough helicopters to the battle in a timely fashion to be of any benefit to the ground commander.

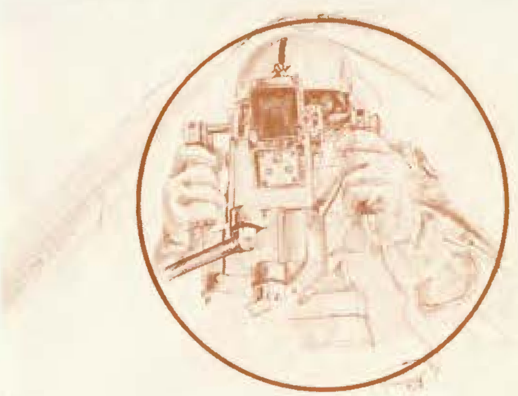
Another issue under consideration and study, which has great bearing on strategic deployment of helicopter forces, is that of helicopter long range self-deployment capability. This would probably be accomplished by in-flight refueling, complemented by an external fuel system.

The idea sounds exciting, especially for the AAH and *Blackhawk*, but will not add anything to getting scout helicopters there quickly and in great numbers. Long-range self-deployment flying at helicopter speeds translates out to training scout crews for extended cross-country and overwater missions. They would have to practice in-flight refueling in all weather, day or night, and be able to perform their combat mission upon arrival. These prospects are going to require a hard look at what we are trying to accomplish by having a long-range capability in the cavalry scout helicopter. I find it difficult to envision alert and ready scout crews after such a flight. We should keep deployment of the ASH simple and focus the crew's flying effort on look, see, report, and fight duties.

The last implication of the *Eyes* package innovation—that of air cavalry reorganization—is one which I believe to be essential to deployment, and a driving force in the development of the ASH. The present air cavalry organization has several undesirable characteristics. It is not compatible with a "come as you are war." The complicated mix of aircraft, and redundant missions between the scout and gun make it a deployment nightmare. It is difficult to support logistically because of the wide variance in air speed and fuel consumption between the three types of aircraft. There is also a big question in my mind of the need to have both a scout and weapons platoon. We are living with an antiquated TO&E that we've applied to meet the demands created by the modern battlefield and—to keep the post-Vietnam helicopter inventory busy.

Therefore, I propose the following air cavalry organization, beginning with the air troop. The main difference from the traditional TO&E is the absence of an aeroweapons platoon. In its place is an additional scout platoon. Each platoon is equipped with 12 ASHs that have an antitank and antihelicopter capability. Their missions include reconnaissance and security with selective killing of tanks and helicopters. The troop commander's aircraft would be an ASH. The aeroreconnaissance platoon would be the ground element of the troop. It would consist of four reconnaissance squads equipped with two motorcycles per squad. The two lift sections of this platoon would provide the air transportation for these squads using the *UH-60 Blackhawk*. I would also have all the personnel of the reconnaissance squads airborne qualified. This ground force would have an all weather capability day and night as well as the means to defeat armor forces at maximum ranges.

The remaining element of the troop would be a platoon to handle unit maintenance and supply using two *Blackhawks* and ground vehicles. The AAH would be found in the attack helicopter company or battalion in each division. Although I have not included ground vehicles, their density and type would vary depending on the type of division the squadron would be a part of.



The squadron would consist of three air troops and a headquarters and headquarters troop. In terms of aircraft density, there would be an overall increase of 15 helicopters over the present total of 85. In terms of deployment, having only two types of aircraft, with the majority being the smallest and most economical, this organization can get to the battle quickly and perform all the cavalry missions. It is easier to tailor for deployment and more economical to support logistically. It is also compatible with available strategic airlift. With the self-deploying capability of the AAH and *Blackhawk* helicopters, the ASH could logically be given priority on strategic airlift for army aviation.

We are at a junction in development of helicopters where some very critical decisions are going to have to be made. I believe there is a need for a cavalry ASH that can be deployed rapidly and do a job that now takes two helicopters to do. If we base the development of this helicopter only on what it does on the battlefield and disregard the problem of *getting there* rapidly, we will be out of the Combined Arms picture before we start.

Air cavalry squadrons must be streamlined and equipped with the ASH and *UH-60 Blackhawk*. A new organization like the one described will most assuredly be able to get there in a variety of tailored configurations to provide the most flexible cavalry coverage for the minimum investment in strategic airlift.

Leadership

by Major John W. Woltersdorf, Jr.

Indifferent leadership is a term I apply to an apathetic attitude toward the responsibility a superior has toward his subordinate. It entails the responsibility for the welfare of a soldier as well as for his conduct and efficiency. Traditionally, there has been a close relationship among a soldier's welfare, morale, discipline, and efficiency.

Since the industrial revolution, it had been recognized that a person's effectiveness can be measured in proportion to the fulfillment of certain basic needs. Historically, the military establishment has attempted to fulfill the physiological and, to a great degree, psychological needs. The military has fed, sheltered, clothed, entertained, and counseled its men. The "chain of command" assumed full responsibility for everything the soldier did, or failed to do. As he gained experience, he began participating as a leader of younger men, with the effect that the command structure sustained itself.

Currently, there is sufficient empirical data from which to conclude that this sustaining power is being abridged. Observation of soldiers within their units reveals a breakdown of the old system of learning by osmosis. There is an obvious lack of confidence by the soldier in his superiors. Evident, too, is a widening gap of understanding and trust between the young soldiers and the "lifers." When asked, each will voice animosity toward the other.

During my assignment as a field artillery battalion S-3 officer, I developed a "profile" of the ineffective soldier who fails to adapt to the military setting. In what has become a highly structured technological environment, there are usually soldiers from disadvantaged backgrounds finding themselves unable to compete successfully. The result is often frustration, increased alienation, and lowered self-esteem, followed by ineffective performance and antisocial behavior.

Much existing research compiled by experts explains the soldier's behavior in terms of his background. Most of the data on behavioral determinents takes into account what happened to the man before he entered the service. But, how may performance be adversely affected by a person's contacts within the service?

We can turn to Sweden for recent research in this area. A study of relations between officers and conscripts noted that it is within the unit that the social environment in which the conscript's attitudes toward his training and national defense are formed or influenced. The study concluded that respect for authority did not follow rank of position in the military hierarchy, but was created by professional skill. However, to motivate and interest the conscripts in their task, good relations were also required between the officers and conscripts (i.e., a relationship which satisfied the conscripts' socially acquired needs of security, affinity, and self-actualization).

Good relations were not identical to familiarity, but were a form of equilibrium between the demands to obey orders and the need for man-to-man relations. It is noted that many officers were not able to maintain such an equilibrium, and the questioning and criticizing of the contemporary conscript may have been interpreted as a threat to their authority. It was suggested that professional skill, knowledge of human reactions and relations, experience, and maturity are necessary for good leadership.

The Swedish Army suggests what can happen under interested leadership. But what is the opposite degree to which performance will be affected by disinterested leadership? Because of the totality of the Army's influence on every sphere of a soldier's life, the impact of one's direct supervisor is tremendous. Unfortunately, the Vietnam buildup promoted many individuals into the supervisory role without the benefit of valuable experience. In many cases, the Army acquired sergeants with as many personal problems as the privates and officers with little experience for command.

Still, this is the man who becomes the military leader, who has the thankless task of interfacing with superiors and subordinates to reconcile the considerable difference in orientations. It is the military leader who must bring troop welfare and mission accomplishment into balance. Failure of the leader to achieve that balance becomes highly visible. This visibility is evident when talking to the soldiers. In terms of mission failure, they will blame the officer for a lack of professional skill. In terms of the private's own shortcomings, the recent trend has been to still blame the military leader, this time for indifference shown toward the individual.

Therefore, it is the duty of today's military officer to be intimately aware of the value and techniques of basic military leadership in molding a group of diversified men into an effective military unit. True leadership involves all that is finest in man. There is such a myriad of desirable qualities that enter into proficient leadership that it is impossible to reduce the attainment of true leadership to a formula.

Men will respect and follow an officer who knows his profession; the men always realize that their lives and the success of their cause depend upon the officer's professional skill.

When an officer knows his profession and knows that he knows it, he will have a self-confidence that will not be easily shaken. It will enable him to make quick and positive decisions. Decisiveness is an essential quality of effective leadership. Once all available information is considered, evaluated, and a decision made, the decision should remain unchanged except for the most urgent of reasons. An officer who constantly changes his decisions soon loses whatever confidence his men may have had in him.

Once a decision as to the course of action or policy has been made, it should be carried out with aggressiveness and speed. Every successful leader possesses these qualities and they can be learned by the young officer who requires himself to act forcefully and aggressively while doing his daily duty.

Next to the knowledge of the military profession, a leader must have a knowledge of human nature and of the basic principles of human behavior. This knowledge should be as broad as possible and should include an insight into the effect of internal and external stimuli on behavior. It should include a cognizance of individual differences and their causes. This knowledge leads to an increased ease in predicting and controlling the actions of the men in his command. To some a great measure of this ability seems to come readily, while to others it comes only as a result of hard study and considerable practice. It can, however, be acquired by any officer.

Closely akin to a knowledge of human nature in general is the need for a specific knowledge of every man under the officer's jurisdiction. This knowledge will be more detailed in the case of the junior officer, since he commands fewer men. A platoon leader, for instance, should know the name, nature, and something of the background of every man in his platoon. A company commander should know all these facts about all the company officers and senior noncommissioned officers, as well as many of the lower noncommissioned officers and "troops." Commanders of larger units may know few others than the key men under their command.

In order to learn something of the nature, abilities, and background of the men, the officer must frequently observe them at work and play. Many times the traits of character that tend to make a man a good noncommissioned officer will first be observed on the athletic field. Even the reactions of the soldier-spectator may prove to be a valuable index of character, since it may be determined whether he is stolid or excitable, enthusiastic or indifferent, quick-witted or slow. Other characteristics will also be revealed from time to time.

In addition, the officer should learn enough background information about his men that personal conversations with them will put them at ease, and it pleases and impresses the men with the fact that the officer is interested in them as individuals.

The officer must always be fair. His men must realize that their officer is always scrupulously honest; that he treats everyone with equal considerations and courtesy. When punishment is needed, it is his duty to administer it. When praise is merited, his men must realize that their officer is sure to recognize superior performance and to applaud it. Soldiers are as quick to resent a failure to punish a miscreant as they are to resent an unjust punishment. In general, the successful leaders are good disciplinarians. The men recognize and respect this and follow them because they realize that this is for the good of all concerned.

Tact is a characteristic that should be possessed in a high degree by the military leader. It can be cultivated. The officer should bear in mind that much needless friction and resentment can be avoided by a diplomatic choice of words and deeds. Even an admonition or a reprimand can be administered in such a way that it does not cause resentment. If the reason behind the action is explained and its necessity shown, a reasonable man will not resent having the errors of his ways indicated. At times, it may be advisable to couple a compliment on some good point, any good point, with a reprimand or a caution about some derelictions of duty or a performance that might have been better.

A characteristic that seems to be possessed by all great leaders is that of indefatigable energy. Behind this, of course, is excellent physical condition. Every officer, consequently, should strive to keep himself in the best of physical condition at all times. This involves systematic and vigorous exercise throughout the officer's career. Good physical condition is reflected in a cheerful outlook and a vigorous optimism even in adversity. This attitude has a healthy effect upon the men, who are quick to perceive it. Their reaction is, "Look at the Old Man. If he can take it, I can, too."

Every officer should develop the qualities of initiative and enthusiasm. He should be continually planning his next move. Merely to perform the routine duties as they arise is not sufficient. The effective officer has an abiding enthusiasm for his profession that serves as a constant drive toward bettering himself and his men. The enthusiasm, if genuine, is contagious, and the initiative of the officer's subordinates is developed by an appreciation of their suggestions, regardless of their practicality.

Initiative, too, is stimulated by giving all subordinates duties commensurate with their ranks. Once such duties are assigned, there should be no interference with the manner of performance. If it is found that a particular duty could have been handled in a more efficient manner, this fact should be pointed out later instead of the officer taking over the supervision of the task while it is still under way. This procedure impresses the subordinate with the fact that he is on his own; he develops self-confidence and decisiveness.

In delegating authority to subordinates, the officer is never able to shift responsibility. The effective leader is eager to accept responsibility, and when a task is assigned to a subordinate, the officer understands full well that the responsibility remains with him. He has given the task to his subordinate indicating trust and confidence in that person. This mutual support results in the engendering of a feeling of mutual confidence—the essence of true leadership, which should always exist between an officer and his subordinates.

The military leader should always set an example for his men in neatness of uniform. When he appears before his men, he is the cynosure of them all, and any dereliction in the appearance of his uniform or equipment will be the subject of discussion among his men. The officer's men will have greater respect for him, and will, therefore, be more easily led, if he presents a favorable appearance.

The officer's bearing is of importance for similar reasons. He should maintain a dignity of bearing. If he is nervous or ill at ease, this will at once be apparent and will arouse an unfavorable reaction from his men. The officer, consequently, must attempt to be at ease under all situations. Good physical condition, knowledge of the subject at hand, and habituation to various situations all contribute to this end.

Every officer is required to exercise moral courage in some degree and at all times in his daily duties. By this is meant the desire to do that which is believed right and proper regardless of the consequences to the officer. The cultural training of the individual and the deep roots of his temperament are factors here.

The ingrained habits of character such as honesty, honor, fairness, justice, and decency enable an officer to distinguish between right and wrong. An officer has moral courage when he lives up to the standards based upon these habits and upon the code of conduct of the society in which he lives.

In summary, no person can have all the aforementioned desirable traits. To preclude indifferent leadership, however, every leader must have certain of those qualities that cause man to look up to him, to respect him, to have faith in him, and consequently, to follow him. An officer must be able to inspire his men; therefore, he must be decisive. He must be forceful and aggressive.

The officer must possess a thorough knowledge of human nature in general and of his men in particular. He must be loyal to his men at all times and under all conditions. He stimulates a feeling of community of interest between himself and his men; he fosters the belief that they are all comrades-in-arms. The officer is fair at all times, and he shows no favoritism. He can be relied upon by his men to reward meritorious performance and to punish their misdeeds.

While it is not necessary for the leader to be popular in the ordinary sense of the word, the effective leader gives no cause for unpopularity, other than those actions required for the good of the service and the betterment of the organization. Tact in administration and in personal relationships, however, always yield beneficial results.

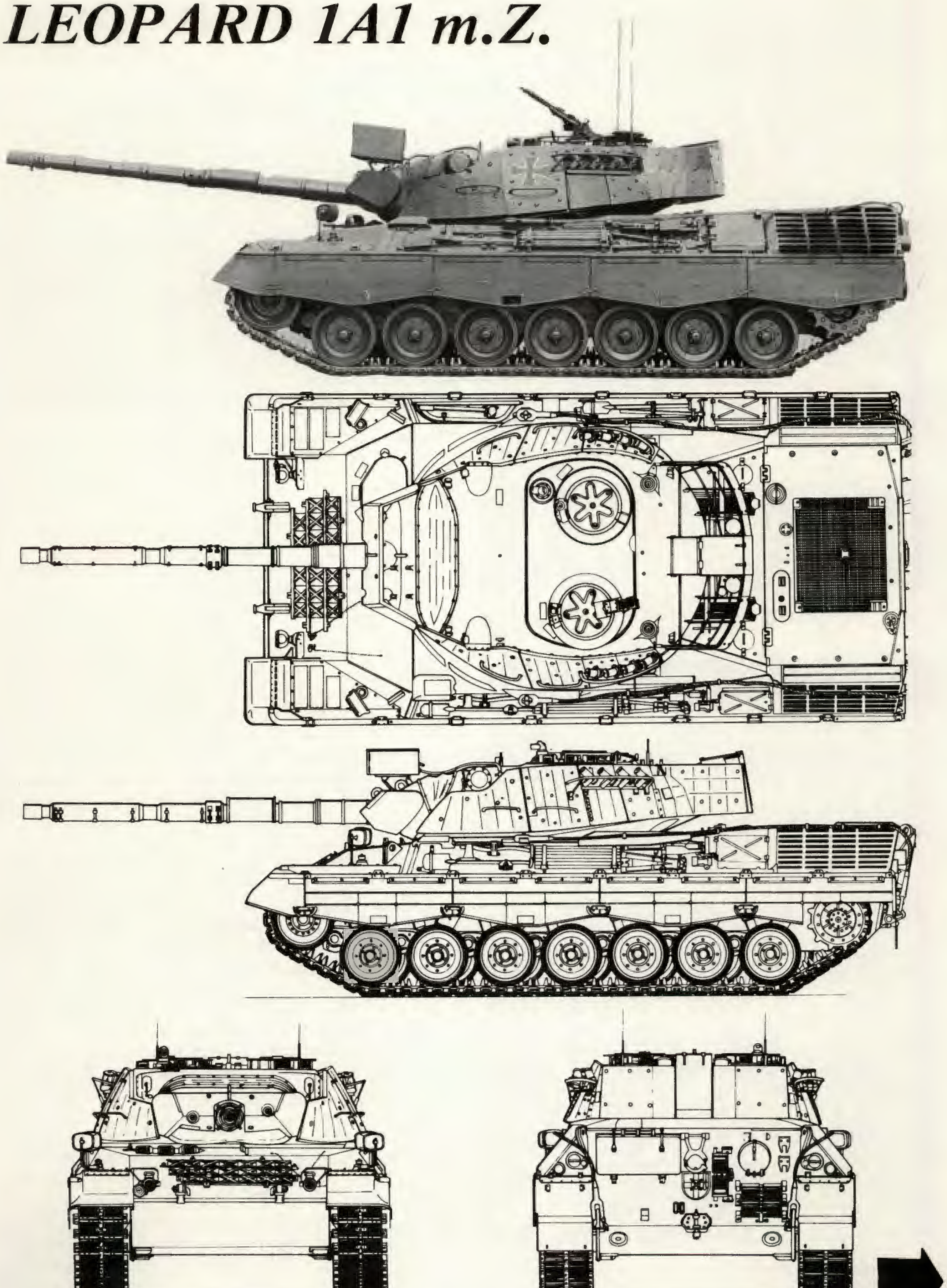
Soldiers respect energy, initiative, and enthusiasm in their officers. They will follow a leader who inspires the development of these qualities in themselves. While an officer must have dignity, this must not be carried to such a degree that his men consider him too remote to be interested in them and their problems. He must be human!

No coward is ever respected. The successful military leader must have both moral and physical courage. He must accept full responsibility for his acts, his orders, and the actions of his men.

Finally, the successful leader must be deeply and thoroughly imbued with the justice of the task of which he is performing. He must be able to import this feeling to his men. The officer must be able by sheer ability, bearing, and enthusiasm to inspire them to follow him even into death itself.

MAJOR JOHN W. WOLTERSDORF, JR. was commissioned in the Field Artillery through OCS in 1965. He earned a bachelor's degree from the University of Nebraska and a master's from North Carolina State. A graduate of C&GSC, he has served in various positions in battery command and battalion staff, served as squadron S3 with the 3/2 ACR and was an operations officer in a district recruiting command. He is currently serving in the Recruitment Div. of ODCSPER, Washington.

LEOPARD 1A1 m.Z.



Detail of the right side of the turret of the *Leopard 1A1* showing the new armor plate's installation. The right rangetinder cover is open.

Right side of the gun mantlet, showing the armor protection added. Note rubber shock absorbers on either side of the gun tube on which the armor is mounted.

The rear of the turret with armor plates around the basket and the searchlight stowage box in the center.

(This article is reprinted from ARMIES & WEAPONS, No. 47, October 1978, with permission. Editor.)

After more than eight years of development and prototype trials, the NATO MBT *Leopard* entered service in the German Bundeswehr in 1965. But permanent technical evaluation and improvement did not end there.

The *Leopard* was produced in consecutive patterns (so-called "Lose"), each of these deriving benefit from constant testing and also from the proposals of the military users. Some hundred improvements and technical changes constantly raised the combat value of this MBT, still in production, and of all those vehicles already issued to tank forces.

This improvement in combat effectiveness (in German "Kampfwertsteigerung") affected all parts of the tank. Besides many minor alterations, the first real changes were carried out in the track laying mechanism, improving the durability of all moving parts. The next major step forward was installation of the gun stabilization system. This version was called *Leopard A1.* In 1976/77 the German *Leopard 1 A1* (after development of the *Leopard 2* the number *1* was added to the *A1*) was altered in its external appearance. The upper part of the track-laying mechanism was protected by rubber shields with steel plates inside designed to cause HE projectiles to detonate before penetrating the hull. This was also the aim in attaching armor plates around the turret and in front of the gun mantlet.

This version of the *Leopard 1* is called the *Leopard 1A1* mit Zusatzpanzerung (*Leopard 1A1 m.Z.*), which means *Leopard 1A1* with additional armor and has the official designation *Leopard 1A1 A1.* Modification consists of the addition of four armor plates on each side of the turret and two on the turret rear, together with a shield for the mantlet. The upper front part of the turret has also been armor strengthened. This increase in the armor protection raises the tank's weight by 900

The *Leopard 1A1* in its winter camouflage.

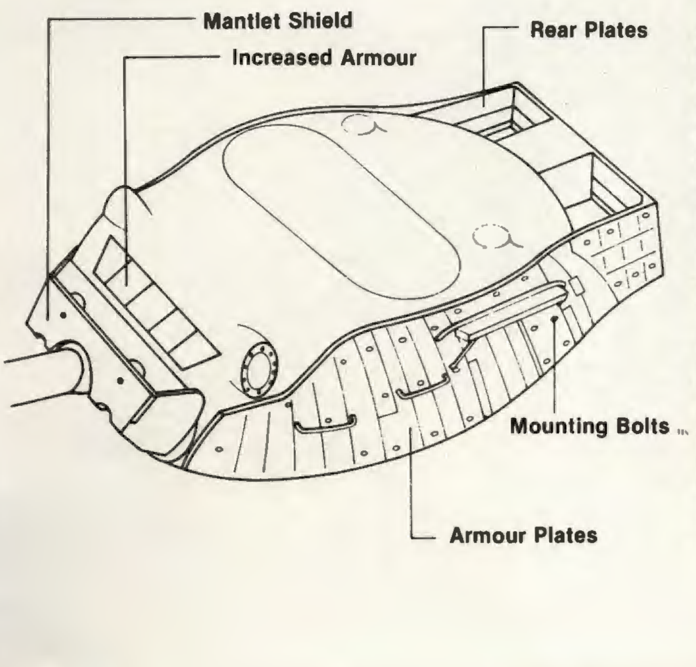
Detail of the right side of the turret of the *Leopard 1A1* showing the new armor plate's installation. The right rangefinder cover is open.

kg to a total of 42.4 tons. The plates are attached to rubber buffers developing additional shock resistance. This brings the *Leopard 1A1* cast turret to almost the same level of ballistic resistance as the armor strengthened *A2* or the welded steel turret of the *A3/A4*.

This armor strengthening was also accompanied by many improvements involving the crews' comfort, the electric and hydraulic systems, the air filtering and the transmission. Alterations were effected by Blohm & Voss at Hamburg.

A further improvement currently being effected involves exchange of the infrared sighting systems for those of the light intensification type.

These very successful efforts to raise the combat value of a fighting vehicle already in service for more than 10 years, represent an intention to keep pace with up-dated techniques and the growing threat of modern antitank ammunition.



Front view of gun mantlet, showing the additional protective armor.


KAREN RANDALL

The Lines of Torres Vedras: A Study in Logistical Management

By First Lieutenant Robert Stacy

"No troops can serve to any good purpose unless they are regularly fed. A starving army is actually worse than none."—Duke of Wellington

"Supplies?—don't talk to me about them. Twenty-thousand men can live in a desert."—Napoleon

The quotations above illustrate two vastly different approaches toward logistics. Better than any allusions to the playing fields of Eton, Wellington's comment shows a principal reason for his consistent success.

From 1809 to 1814, the Duke of Wellington commanded a small Anglo-Portugese army in the Iberian Peninsula. With this force, he eventually defeated and drove out an enemy force that consistently outnumbered him. Leadership, tactical ingenuity, and efficient management of logistics made victory possible.

The 1810 campaign in Portugal provides an excellent insight into the Duke's technique of waging war. Wellington's premise in this and other campaigns was that 90 percent of warfare is logistics. His knowledge of supply and transportation did not end with his own forces, but included a study of his opponent's methods. He succeeded in exploiting the weaknesses of the French in this area and turned them to his own decisive advantage.

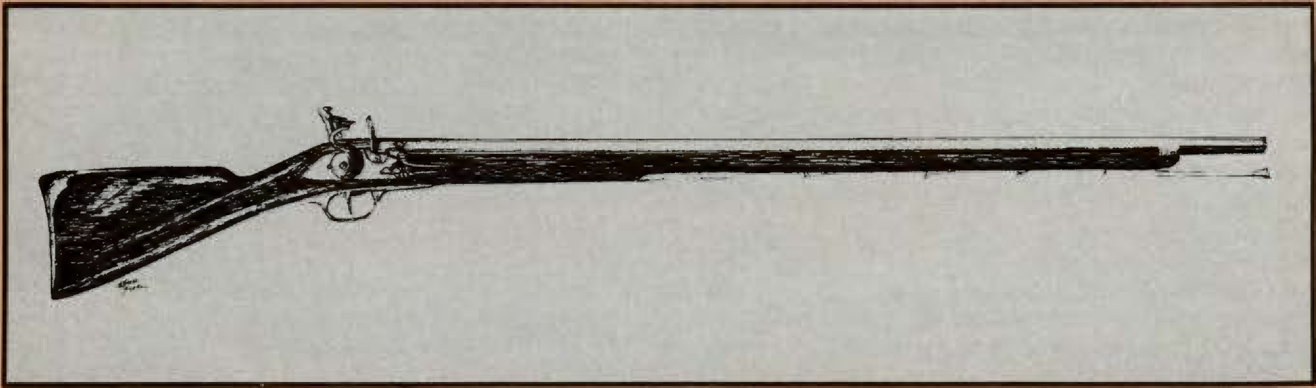
Before examining the 1810 campaign, we should take a look at the restraints imposed upon Wellington and how he managed the resources allocated to him. His army was, man for man, the equal of any in Europe. It could not, however, sustain heavy casualties and remain in being. If lost, this small army could not be replaced. Although the Peninsula was Britain's main theatre of war, it was only one of several. At the same time, Britain was dispatching troops to North and South America, the West Indies, India, the Netherlands, and Denmark. Wellington, therefore, had to be cautious and keep his army intact. To sustain that army and defeat the French, his effort took two directions.

First, Wellington never committed his army to a high-risk situation. He would pass up a sure victory if it would cost him a large number of casualties. Often, he would place his army in such a way that his opponent would have to attack him. Thus, placing himself on the tactical defensive, Wellington would utilize his troops and available terrain to their best advantage. Very seldom did he fight a battle on ground that he did not choose. Once committed to battle, the Duke would deploy his troops to maximize their safety and effectiveness. Contrary to established practice, he would set his men on the reverse, rather than the forward, slope. Not only did this decrease casualties, but often deceived the enemy as to his true strength.

Secondly, Wellington placed great importance upon the utilization of his available means of supply and transport. England's vast material and financial resources in conjunction with naval superiority insured that material would reach ports under British control. Getting supplies to the men in the field, however, was by no means assured. Wellington left nothing to chance. Although he had a staff to manage logistics, he familiarized himself with all supply details and maintained close supervision.

The Duke gained two substantial benefits from his interest in and knowledge of logistics. He could insure that requirements were met and that the system was working up to full capacity. Also, his intimate knowledge of transport and supply allowed him to plan his campaigns with an accurate knowledge of his army's capabilities and limitations. He could realistically assess his objectives and chances of success.

Basically, the British system in the Peninsular campaigns worked in this manner; supplies from all over the British Empire would arrive in a port such as Lisbon, Portugal where



they would be transported to forward magazines scattered throughout the occupied countryside. The magazines provided direct support to the field units. Although Wellington's army occasionally suffered through lean times, the system worked quite well throughout the Peninsular campaigns. At no time, did Wellington's force have to rely upon the land's resources for their subsistence.

By contrast, the French system relied almost exclusively on taking whatever the countryside had to offer. There was some augmentation by horse-drawn wagons, but in Spain and Portugal that was the exception rather than the rule. In the Portugese campaign of 1810, the French commander, Marshal Massena, did not have a line of communication back to Spain. His subsistence was to be based totally on the territory he marched through. Note in passing that even if he had maintained a supply line, the hostile population would have created a very successful interdiction operation as they were to do later in the war.

In the continental wars, Napoleon had waged war successfully by relying upon the resources he found. He had two factors in his favor, however: the pace of his campaigns was usually so rapid that his armies did not deplete the countryside, thus leading to starvation, and his army was dispersed into corps elements when on the march. A corps could subsist more easily on a given piece of terrain than a whole field army. Massena, on the other hand, fulfilled neither of these conditions in Portugal and increased his vulnerability.

Wellington could not have adopted the French means of supply even if he had so desired. There were three main reasons, the first being political. Since Spain and Portugal both were allies of the English, he could not afford to alienate a population already hard pressed by the French. Second, Massena and his successors took everything in their path of any use, leaving nothing for a pursuer. Finally, Wellington's experience in India had convinced him that an army must have a steady and dependable means of supply in order to be effective.

As the time of confrontation in Portugal approached, the difference in the two armies' means of supply would play a critical role.

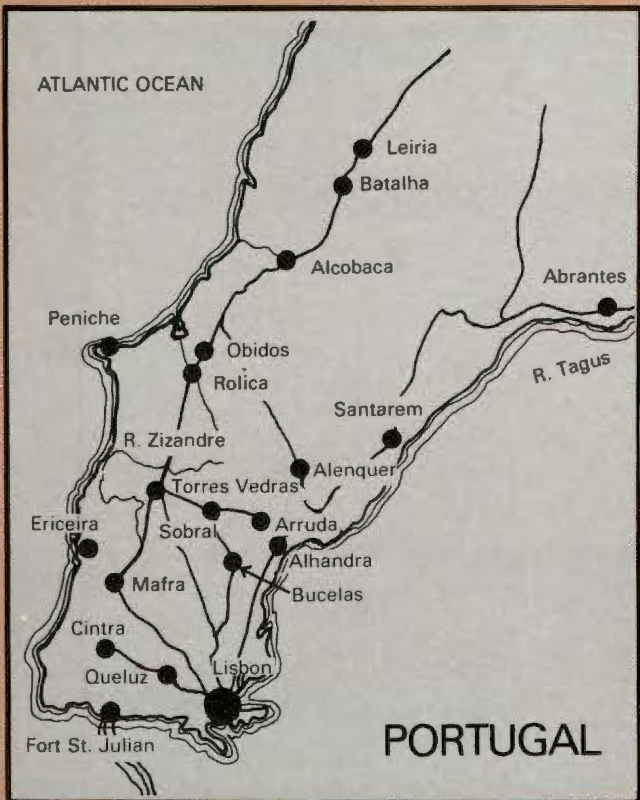
In April 1810, Massena's Army of Portugal numbered 65,000 men. Massing on the Spanish-Portugese border, his forces converged on the fortress city of Ciudad Rodrigo which controlled the approaches to Lisbon. From the very start, Massena took a leisurely pace in attempting to subdue Portugal. The city was not invested until 25 June and did not surrender until 9 July. Massena then ran into Wellington's screen of light infantry. As they met the French advance guard, British soldiers slowly gave way and commenced what would become standard procedure throughout the Portugese campaign. Anything that could be used to support the French was either carried off or destroyed. Civilians left their homes, many of them forming partisan bands that harassed the French. Massena's troops entered a country that was almost totally bare of subsistence.

Massena now captured the fortress at Almeida and continued his progress toward Lisbon. In late September he was brought up short. Advance parties arrived at a location known as Busaco, dominated by a very high ridge almost 10 miles long. Expecting only a small number of British troops on the heights, Massena ordered a general assault on the morning of 27 September. What he did not realize was that Wellington had deployed his entire Anglo-Portugese army on the reverse slope. In the ensuing battle, Wellington lost 1,250 men and kept the ridge. Massena's losses exceeded 4,500, including five of his generals.

As his enemy tried to regroup, Wellington turned his army back on their retreat toward Lisbon. Coimbra was bypassed as being indefensible. Massena pulled his army together and entered Coimbra on 1 October, departing 3 days later and leaving behind many of his sick and wounded. These were captured shortly thereafter when a Portugese force recaptured the city.

Wellington now entered Lisbon. Months before, when he had led his army out of the city, he left behind a substantial number of engineers. With assistance from the civilian population, they constructed a defensive system utilizing the surrounding hills to their best advantage. The Lines of Torres Vedras, as they were called, were strong enough to withstand assault from a force much larger than Massena's. The French vanguard first spotted the Lines on 11 October and 3 days later, Massena himself arrived to inspect them. He found himself in a severe quandary.

His one sure chance to defeat Wellington would occur only if the Duke abandoned his lines of defense and met him on the plains. He knew Wellington well enough by this time to realize that this would never happen. A long siege was out of the question. In this particular instance, those within the walls were well supplied while his men could barely subsist. Normally, the roles would be reversed. As a matter of fact, with his supply lines so constricted, Wellington's army was growing larger daily. An all-out assault on the Lines of Torres Vedras was doomed to failure. There was no possibility that Massena could force the defenses and capture the city by storm. The factor of time and logistics had forced Massena to the point where he could do nothing. He had brought fifteen days supplies that had been gleaned from the countryside. Additional foraging brought in about two weeks of additional



supplies, but Wellington's soldiers had done their work well. The vicinity around Lisbon simply could not support extended French operations.

After a month, Massena moved his army 25 miles away. His supply situation was relieved by this move, but it did nothing to assist him in capturing Lisbon. Winter arrived and Massena's supply situation worsened. On 1 January 1811, he found that his strength had diminished by 20,000 men since April.

On 6 March, Massena admitted defeat and his army began the long retreat back to Spain. Wellington's army began its pursuit but did not catch up to the rear of the French column until 11 March. A series of actions was fought as the French marched east, culminating in the battle of Sabugal on 2 April. The next day the bulk of Massena's army crossed the border, never to reenter Portugal. The pursuit would continue for four years until Wellington drove the French out of Spain and invaded France itself.

Throughout the remainder of his time in Spain, Wellington would be attached to a long and cumbersome supply line. His pace at times would be slow due to his reliance upon that line. Yet, his supply and transport system gave his army a greater endurance and versatility than the French. To the very end, Wellington put his logistical planning on a par with his tactical and strategic plans. In this way, he knew at all times what his army could and could not do. By familiarizing himself totally with his supply requirements, he was able to keep a tight rein on is staff and ensure that they did their jobs and kept his army in supply.

Even at the distance of 170 years, there are valid lessons to be drawn from the Peninsular campaigns. In the matter of logistics, this is particularly true. It would, of course, be absurd to attribute the French defeat in Portugal and Spain solely to logistics. Wellington's tactical and strategic abilities were a critical factor. However, it can be argued that the French logistical system rendered them more vulnerable to Wellington. At the same time, Wellington's army had a greater staying power in the field.

Certain principles, borne out by the Peninsular campaigns, are as valid on the high-intensity battlefield as they were in Wellington's era. A commander without a thorough grounding in combat logistics cannot operate to full capacity. He will be planning and making assumptions without a full knowledge of his unit's capabilities and limitations. Simply stated, a commmander cannot get the best from his unit unless he knows what he's got.

A more or less benign neglect by the commander will create another stumbling block toward unit efficiency. Staff sections that are not supported and supervised by the commander, have a tendency to atrophy. They lose sight of what their true purpose is and activities such as "empire building" develop, accompanied by "busy work" to justify the staff's existence. When the critical time approaches, it will frequently happen that the staff cannot deliver what is appropriate when needed. The commander who has not been familiar with his staff and who leaves them to their own devices has only himself to blame.

Wellington saw the inherent danger in letting a staff go its own way without guidance and support. Today a commander cannot have the same mastery of detail that Wellington possessed. Even for his own relatively uncomplicated age, Wellington's grasp of the minutia of war was remarkable. What the present day commander can easily do, however, is to place logistics on a high priority and see that his support is both timely and appropriate. An important difference between our time and Wellington's is that a commander will not have the luxury of time that was available then. In sharpening his logistical as well as tactical skill, he will be better able to deal with an exceedingly small margin of error.

FIRST LIEUTENANT ROBERT N. STACY was commissioned in the Medical Service Corps upon graduation from OCS at Ft. Benning in March, 1975. He received a B.A. in History from the U. of New Hampshire in 1972. He entered active duty in 1974 and completed his M.A. at New Hampshire in 1975. Lt. Stacy served as Medical Platoon leader in 5-33 Armor, and is currently a surgeon's assistant in the surgeon's office of the 194th Brigade.

Australian Armoured Centre

by Captain John Muir
and Captain David W. Marlin

LEOPARD DRIVER TRAINER

The Armoured Centre, Royal Australian Armoured Corps, located at the Puckapunyal Military Area, Victoria, Australia, trains personnel in all matters pertaining to organization, command, mission, employment, communications, techniques, tactics, and weapons which are the responsibility of the Royal Australian Armoured Corps. The Centre also undertakes research, trials, and investigations related to armoured equipment, and assists in production of training publications and corps doctrine and the development of new techniques. The Armoured Centre proffers a professional centralized armour training facility, reflecting a mounted tradition and heritage equal to any the world has ever seen.

Early History

Similar to many present day armour units, the mounted cavalryman was the beginning of Australian armour. This was a transition that caused the soldier to retire the horse and utilize a machine that offered both transportation and protection. However, the change was emotionally dramatic due to the excellent combat record achieved by Australia's famous Light Horse and Mounted Infantry regiments.

Australia is such a vast country that horses played a major role in the day-to-day life of the colonists and it was inevitable that mounted troops would play a key role in the Australian Military Forces. The earliest mounted regiments were formed in 1854 during the Crimean War, but as the "Russia scare" passed they were disbanded. Although other troops were raised over the next few years, they tended to be of short-lived and of the "posse"-type for the specific purpose of terminating criminal acts. Formal mounted troops began as separate units in each of the colonies as the British withdrew their troops in 1870. These troops or mounted infantrymen became the forerunners of the Light Horse units despite their sectarianism.

In 1889, under British leadership, the Australian horsemen were shipped to South Africa to fight alongside the British, Canadians, and New Zealanders in the Boer War. In the ever-burning sun, dust, mud, and hard frosts of winter the Australian horsemen demonstrated that they were great fighters and scouts, that they could endure continuous hardship and danger with courage, and that Australians could spontaneously bring forth the sudden brilliant bravery that earns the Victoria Cross.

After Federation and prior to World War I, Australia had 23 Light Horse regiments. World War I projected these regiments onto the international scene. The Light Horse units earned an excellent combat reputation at Galipoli, Romani, Gaza, Syria, Palenstine, Sinai, and Damascus for their determination, stamina, and soldierly skills. Specific engagements highlighted the campaigns; the Battle of Beersheba on the 31st of October 1917 was listed as one of the greatest actions in history, and the famous race for Damascus as the greatest cavalry feat the world has ever known. The bond between horse and man had become as inseparable as the Light Horse regiments and their deeds.

Mechanization

In 1908, authority was given for the formation of the "Australian Volunteer Corps," and is considered to be the beginning of the mechanization of the Australian military forces. The "Volunteers" were disbanded in 1916, but some of its members formed the nucleus of the 1st Australian Light Car Patrol which engaged in operations in the Western Desert and Palestine in World War I.

In 1920, the requirement for a Tank Corps was discussed, but it was not until 1928 that the purchase of four Vickers medium tanks was approved, and a militia unit, the 1st Australian Tank Section, was formed at Randwick, New South Wales. In 1933, the 19th Light Horse Regiment became an Armoured Car Regiment and in 1939 was redesignated the 1st Armoured Car Regiment. The 2nd Armoured Car Regiment was then formed in New South Wales. Both of these units were equipped with Australian-built Ford armoured cars. Eleven *Mark VIA* light tanks arrived from Britain in 1937 thus forming the 1st and 2nd Australian Tank Sections in 1939.

The Second World War 1939-1945 initiated a rapid expansion of Australian Armour. The first Australian troops in action were members of the 6th Australian Divisional Cavalry Regiment, which contacted the Italians at Fort Maddalina and Fort Dain, on the 11th and 12th of December 1940. On return to Australia to face the Japanese, the regiments were reorganized and saw action in the Pacific area as the 6th Cavalry Commandos. During 1941-1942, there was a regrouping of cavalry formations and further additions of an armoured brigade and a tank brigade. Equipment for these units were *Matilda, M-3* light, and *M-3* medium tanks.

The 1st Armoured Division was to embark for the Middle East early in 1942, but this never came to pass, although many units of the division eventually participated in the Pacific island engagements. In 1943, the armoured divisions were redeployed to counter the threat of a Japanese invasion. As the threat lessened, units were disbanded until, at the end of the war, only the 4th Australian Armoured Brigade remained.

From April 1946 to January 1949, the 1st Australian Armoured Car Squadron served with the Occupation Forces in Japan. The squadron returned to Australia on 7 July 1949 and was renamed the 1st Armoured Regiment and issued *Churchill* tanks. In 1948, due to a major reorganization of the army, two Citizens Military Forces, Armoured Brigades, and some independent Citizens Military Forces regiments were formed. The only regular tank unit remaining on active duty was the 1st Armoured Regiment. In 1952, this unit was issued *Centurion Mark 3* tanks.

Royal Australian Armoured Corps units served in the Republic of South Vietnam from May 1965 until late 1971. This was the only time Australian tanks had been employed in combat since World War II. The effect of the war in Vietnam on the overall experience of the Royal Australian Armoured Corps is impressive. As of December 1972, 75.5 percent of all officers and 62 percent of all enlisted men had combat experience.

The *Leopard AS1* main battle tank was introduced in 1977 to both the 1st Armoured Regiment and the Armoured Centre.

Home of Armor

The development of the Armoured Centre closely coincides with the mechanization of the Royal Australian Armoured Corps. In 1910, Lord Kitchener made an inspection of Australia's military position and recommended Seymour as a suitable training area. The First World War, 1914-1918, saw Seymour Military Camp raised.

In November 1939, Puckapunyal, an area adjacent to Seymour, was acquired as a site for the Armoured School. Puckapunyal is located approximately 104 km north of Melbourne and is the Aboriginal word supposedly meaning "Valley of the Winds." The terrain is grassy with rolling hills and is the epitome of armoured fighting terrain. The climate tends to be arid as Puckapunyal is on the west of the Great Dividing Range. Despite initial administrative and equipment shortages, the school began to function on 24 February 1941.

With the outbreak of the War in the Pacific, the general tempo of the training area increased and there was a shift in emphasis from desert to jungle warfare. Equipment gradually became plentiful and the scope of courses at the school increased. By the end of World War II, some 7,000 students had been trained at Puckapunyal and the Seymour Camp was occupied by the School of Tactics and Administration, the School of Infantry, and was also a Cadet and Citizens Military Forces Camp area. At this time, Puckapunyal became the "Home of Armour," with the Armoured School permanently being established. The end of the war brought about a natural slowdown. However, in 1952 the arrival of the *Centurion* tank saw the Armoured School progress at a full peacetime rate.

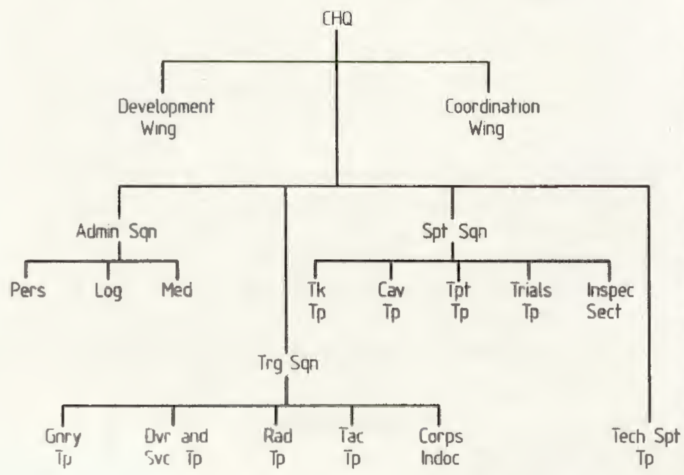
The post-1955 era saw some years of expansion and reorganization with the eventual disbanding of the Citizens Military Forces brigades and their replacement by seven independent armoured regiments. In 1960, due largely in part to the reorganization, the old Seymour Camp was closed.

With Australia's involvement in the Vietnam conflict in 1965, the Armoured School was again working at full pace, training personnel to build up units to operational strength.

Organization

At present, the School, now renamed the Armoured Centre,

executes a full schedule of courses in gunnery, communications, driving, preventive maintenance, and armour tactics. The Armoured Centre's organization is outlined below.



The Centre is commanded by a lieutenant colonel and as the Centre is totally self-sufficient, the command position is held in great esteem. The Centre is served by officers of varying tactical and technical backgrounds. The staff has 18 officers backed by a dedicated, professional staff of 56 senior noncommissioned officers who are selected by the Armoured Corps Directorate.

The Development Wing, formed in 1978, has been established to advise on Armoured Crops doctrine and to maintain corps field manuals and pamphlets. This includes nonarmour pamphlets that require corps input. However, as the national emphasis in armour has increased, so has the need to establish Australian tactical and strategic doctrine. With the new-found abilities of the *Leopard* tank and a strong move toward a conventional war setting, the Armoured Corps is experiencing a tactical growth heavily influenced by the Australian environment. To date, armour doctrine has been borrowed from the British and American allies, but 1980 will see the fruits of the Development Wing as it produces the first written Australian Armoured Corps Tactical Doctrine under the auspices of the "Manual of Land Warfare Series" which is Australian Army-wide.

The Armoured Centre's publication of *Ironsides* magazine permits armour-oriented personnel to keep abreast of armour developments, and history, and to share personal philosophies. The Development Wing is the overseer for this magazine, although all articles are individual efforts. The magazine was first published in 1978 and was an immediate success. Future issues will be forthcoming and the Centre believes the magazine has a greater potential for increased circulation and more frequent publication.

The Coordination Wing has the difficult task of scheduling and coordinating all the resources required within the Centre to execute the instruction. The Headquarters, Training Command at Sidney maintains open channels of communication with the Coordination Wing on armour training. This wing serves as the liaison with all agencies outside the Armoured Centre on matters of routine and nonroutine training.

In addition, the training and development section provides the key to all instruction provided at the school—objectives. These are supplemented with training aids and lesson plans made available by the training development section. Formalized instructional packets can be requested through the training development section, if the student or instructor requires instructional material upon reaching his assigned unit.

The Administrative Squadron provides the overall administration to both staff and students. This includes all personnel actions, logistic requirements, medical requirements, and the overall function of the Officer's and Sergeant's Messes.

The messes, similar to regimental messes, are well-kept facilities offering and performing functions usually sought elsewhere in a larger community. The corps history is reflected throughout the mess, which can easily be mistaken for a museum, despite the fact the messes are functional in every respect. The silver alone would have a value over $50,000. However, in the crafted form the silver and other trophies remain priceless. Some of the more prominent pieces include the Annual Challenge Cup presented by the Prince of Wales in 1904, a solid silver *Mark V* tank model commemorative of WW I, The Hutton Challenge Shield commemorating the Light Horse units, and hundreds of individual trophies and silver pieces dating back to the last century. The Centre's social calendar revolves around the mess activities, as the mess offers the same services a person would expect to find at any private club, but caters to a smaller, select clientel.

The Training Squadron is organized into five troops. These troops provide the instructional tasks in the area of gunnery, communication, driving and preventive maintenance, tactics, and corps indoctrination. The squadron has the task of carrying out the initial employment training for recruits, conducting courses for officers, and carrying out the advanced training of instructors and crew commanders.

Initial employment trainees are assigned to Trainee Troop on march-in and receive their armoured corps indoctrination training at the Centre. Upon course completion, soldiers are posted throughout Australia.

The Gunnery Troop is responsible for teaching all aspects of gunnery for both the *Leopard AS1* main battle tank and the *Scorpion*-turreted *M-113A1*. The new gunnery facility was completed in 1977, at the introduction of *Leopard,* and is the showplace of the Centre. A two-story, integrated building with office, lecture, display, simulator and recreation rooms on the top floor, and five vehicle bays underneath; each capable of housing a *Leopard* tank; providing a field miniature range subcaliber facility and a natural laser rangefinding panorama, makes this building second to none in the world of gunnery schools. The Gunnery Troop has numerous additional responsibilities and plays a key role in establishing the safety and quality standards of gunnery training.

The Driver and Servicing Troop differs in respect to many driver and preventive maintenance training programs, in that the majority of recruits have yet to drive a car, much less a tank. Therefore, the driver training tends to be more comprehensive than just driving the vehicle. With the use of driver training vehicles for both the *Leopard* and APC, the student is thoroughly drilled prior to actual driving, and his technical knowledge of the automotive system will exceed most military driving programs.

American-made radios dominate the armour communications system. The Radio Troop provides all technical and procedural training. This includes use of secure equipment.

The Tactics Troop is the key to both troop-leading procedures and mounted tactical warfare. Using two newly constructed terrain boards depicting Australian and European terrain, emphasis is placed on armour in a combat environment. War gaming has been expanded and will continue in the near future to expand a student's knowledge of armoured combat. The Tactics Troop provides the followup to classroom instruction with actual field exercises and terrain studies.

Within the last 4 years, the Centre has executed an exchange of officers for permanent duty with the U.S. Army Armor Center, Fort Knox, Kentucky. More recently, the Centre saw the arrival of the first Canadian exchange officer in January 1979. These officers, in addition to exposing and reflecting their countries' doctrine on armour and training, are placed in the Training Squadron as instructors to teach Australian Armour doctrine and techniques.

The Support Squadron provides the heavy equipment, transportation, and manpower to operate the Centre on a daily basis. This squadron actually maintains 51 Armoured Fighting Vehicles, including 15 *Leopard* tanks, and all other heavy equipment assigned to the Centre, thus allowing active duty units to retain their unit integrity. The Support Squadron has the additional responsibility of maintaining the Centre's Tank Museum.

The Tank Museum is an intregral part of the Armoured Centre and best depicts the Australian Armour past. The museum features well-kept indoor displays, a souvenir and model shop, and over 40 WW I and early WW II armoured vehicles. Some of the most noteworthy armoured vehicles are a *Vickers* medium tank, *Mark* I, 1923; a full, complete line of five specialized *Matilda* tanks 1939-1944; an Australian *Cruiser* tank, *Mark I* 1942; a *Crusader Mark I,* 1938-1940; a Chicom Medium *T-59*; a full line of three specialized *Grant* medium tanks *Mark I,* 1941; a *Bren* gun carrier, 1936; and a *Vickers* light tank *Mark VIB,* 1935. With over 30,000 visitors in 1978, the museum's popularity has increased rapidly causing longer and larger goals to be established for the future. The museum maintains its own maintenance facilities and has restoration capabilities. It is a must visit for any tank buff.

The Technical Support Troop is the Centre's internal direct-support maintenance organization. This troop is a multipurpose organization with the responsibility of repairing all weapons and automotive systems assigned to the Centre.

As the Armoured Centre occupies only a small portion of Puckapunyal's 40,250 acres, the area is also host to the School of Transportation and the 1st Armoured Regiment. The School of Transportation is a fairly recent complex, since the school was initially stationed in Syndey and moved to Puckapunyal in the late 1960s. The 1st Armoured Regiment is adjacent to the Centre and with the acquisition of *Leopard*, a closer rapport was acquired as the Centre's function was to retrain the tankers. Puckapunyal offers all the community facilities and activities found on most large military bases and is identical to an American military post, including the commercial aspects. While Fort Knox has Radcliff, Puckapunyal Military Camp has Seymour.

The Eighties

The future looks bright as the Armoured Centre is about to leap into the 1980s with a new lease on life and the recording of a number of historical events. From its humble beginnings in the 1940s, the Armoured Centre has changed little over the past 30 years, but is about to embark on a major rebuild program to become the showpiece of the arms schools and a fitting place for the showpiece of the battlefield—the *Leopard* tank.

In the early 1960s, the Armoured Centre initiated an annual firepower demonstration on the military area. This demonstration was open to the public and defence administrators as well as other service dignataries. Although the initial demonstration was solely armour oriented, the event now encompasses all branches of the army and includes select weapons systems of other services. The demonstration eventually reached a grander scale and responsibility was taken over by Headquarters, Training Command. The Centre, however, continues to play a key role in the annual event and has provided a meaningful outlet of essential training and an honest exposure to the civilian populace of their nation's defence capability.

The Centre continues to grow at a rapid pace. Additional responsibilities, newer techniques, and developments can be seen on a daily basis. In October 1978, the Centre hosted the eighth meeting of the Quadripartite Working Group on Armour, an organization concentrating on standardization. This group consists of representatives from the United States, Britain, Canada, and Australia. The conferences are held every 18 months, and the Centre will continue to host the conference every fourth meeting; again in 1984 and 1990.

Commencing in 1980, the remainder of the Centre will see a complete facelift and renovation with each of the other Training Troops of Tactics, Driving and Servicing, Radio, and Trainee Troop moving into new facilities specifically designed to suit their role. This update comes at a time when the complementary training facilities awaited for so long also come to fruition. These include a specially designed driver training strip where trainees can experience all types of obstacles, including an immersion tank for deep or underwater fording.

Further, the rebuild coincides with an expansion of the range area, with a large adjoining land acquisition, enabling greater use of live ammunition, realistic battle runs, and tactics training through more varied vegetation and terrain.

Conclusion

The Armoured Centre is capable of meeting the commitments of mobilization of an armoured force, as evidenced in the Vietnam conflict. The Centre is constantly updating and expanding the material and training methods in all courses of instruction in order to produce a well trained basic armoured fighting vehicle crewman in the shortest period of time without foresaking safety or quality.

The Armoured Centre, from its modest beginnings, to present state, offers a bright, hopeful future as Australia continues to recognize armour as the most formidable land warfare force available. The 1980s will usher in a new era of doctrine and technical expertise, as the Royal Australian Armoured Crops continues the present *surge* towards the progressive need for a well-trained, professional, combat-ready armour force.

CAPTAIN JOHN MUIR graduated from the Officer Cadet School, Portsea, in June 1969 and saw active service in 1970-71 with A Sqn, 3rd Cavalry Regiment in South Vietnam. After regimental appointments with the 1st Armored Regiment and an appointment as Officer Commanding Tactics Troop at the Armoured Centre, he completed the Long Armoured Infantry Course at Bovington, United Kingdom. After a further tour with the 1st Armoured Regiment, he was appointed Officer Commanding Gunnery Troop at Armoured Centre in Jan 77, where he was responsible for the introduction of *Leopard* tank gunnery to the Australian Armoured Corps. He is currently serving as the Adjutant of the Armoured Centre.

CAPTAIN DAVID W. MARLIN was commissioned in Armor from Old Dominion University. He has attended Ranger, Airborne, and Motor Officer Courses, and is a 1976 graduate of the Armor Officer Advance Course. His assignments include duty with the 3rd Armored Division as a tank platoon leader, executive officer, battalion S-2, aide-de-camp, and the 1st Cavalry Division as an assistant brigade S-3, and tank company commander. He is currently assigned as the American Exchange Officer to the Armoured Centre, Royal Australian Armoured Corps.

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 appear on page 57)

OFFICER PROFICIENCY TEST

BY CAPTAIN MICHAEL L. JONES

Since the U.S. Army prides itself in being ahead of the "pack" a good share of the time, it is somewhat surprising that it does not have an officer proficiency testing system comparable to those of other armies of the world.

The rating system that has evolved since World War II in the U.S. Army has not been able to produce favorable results in indicating an officer's effectiveness. Yet, many feel that nothing can be done to overcome the major disadvantage of the rating system—inflation.

The current officer rating system and any future one based solely on subjective ratings detracts greatly from the desired ideal. Historically, numerical and subjective ratings have been relatively shortlived, with an average life span of 4 years. Do the desired characteristics of an officer change that often? Will all raters and indorsers be brought into an equality of written expression and vogue terms with the next system? Recent history dictates against both.

Too often in the peacetime Army, the rudiments of basic soldiering arts are not emphasized for officers. It is not always foremost in mind that the Army exists as an extension of the political power of the United States to be called upon for destruction and the imposition of our national will on another nation overnight.

Our defensive doctrine is built on anticipation of the current Soviet offensive doctrine and a thickening of the active defense to attrite the breakthrough forces to a halt and defeat. When a corps commander makes the wrong decision and doesn't properly anticipate the main attack, the fates belonging to officers not knowing basic operating procedures for weapons organic to their unit may not be as rare as we would like to believe. This doctrine should strongly illustrate the fact that every person in the U.S. Army should be trained, tested, and updated in the rudiments of basic soldiering skills of killing and surviving. This is especially true for officers.

Yet, another skill is demanded of them—leadership. To help accomplish this goal, the DA Form 67-7 can still be useful when used as a part of a comprehensive evaluation designed to ensure dedication to the basic Army skills needed to survive in combat and accomplish key leadership tasks. However, further separation needs to be introduced within the rating scheme to identify the truly outstanding officers from the vast herd of "superior" and "outstanding" ones that flood the market because of inflated ratings.

This separation can be achieved by classes on OER preparation for all officers (with emphasis on raters and indorsers) and mandatory effective writing courses for all officers through the rank of colonel. This training would improve the rating system and present a more valid view of the professionalism and dedication of the individual officer.

The most important change necessary for evaluating officer performance, however, is the institution of testing used in conjunction with the OER form. This test should be comprised of a written section, a challenging physical training (PT) test, and a demonstration of basic weapons proficiency. It is rather paradoxical that our NCOs and enlisted men have been required to perform tests for many years in order to demonstrate proficiency. It is difficult to reconcile how the Officer Corps has remained aloof from such a system since World War II. This is a glaring discrepancy in an army where the "leadees" are, in too many cases, more qualified in surviving than the officers who lead them. If leadership by example is a desired trait, then the introduction of an officer's test is a positive, dynamic method of demonstrating it.

In this era of specialization, the "rounded man" concept is still necessary for the basic soldier/officer task of engaging the enemy. The "rounded man" provides the foundation for flexibility in later years. An OER system that provides for ratings by direct superiors, testing by centralized authority, and verification of physical fitness would contribute to a broader view of an officer's abilities and weaknesses. Such a system would have an overall benefit to the Army by improving officer professionalism, presenting a truer promotion potential for each individual, and providing dedication to leadership by example. It would also provide an excellent means for the inculcation of information in areas of changing doctrine by forcing officers to stay current in anticipation of testing.

The testing system would need an evaluative system by superiors. The DA Form 67-7 could be a valid part of this *if* efforts were made to deinflate it at the highest Army levels and to enforce stringently deinflation at the lowest levels. Specific guidelines should be published that would limit application of *outstanding, superior* and *promote immediately* comments to those officers who can be clearly identified with specific examples in the narrative space provided. These guidelines must be designed to prohibit specifically the padding of scores that is so often done to protect a command's officers during the infancy of a new rating system. In emphasizing this area, major commanders should return all OERs bearing *outstanding, superior* and *promote immediately* comments that do not contain specific substantive evidence in the narrative section to support such ratings.

Mandatory instruction on the OER and its impact on the proficiency of the Army is also necessary at all levels. Once new guidelines have been established, the importance of adherence to them must be stressed and *enforced* at all levels. A program of this nature could be implemented with little effort. Classes at all major officer service schools could be incorporated. Lesson plans and content could be standardized throughout these schools. Content could be consolidated at OPMD with the actual instructional guide prepared, controlled, and forwarded by Training and Doctrine Command (TRADOC). For those officers that would be between schools, a mandatory programmed text for one-time issue could be provided with the officer record brief (ORB). A record of completion of the instructions would be maintained in the officer's field file until attendance at the next-higher service school.

In conjunction with this base year of instruction on the OER, three division-sized units and one major headquarters area would be selected to test initially and establish norms for a general written test for all officers. A base period of 2 years with testing every 8 months would be necessary to validate types of questions and establish norms for the test. Compilation and updating from these base test questions would then provide an information bank to begin storage for types of questions and standards to be used for each grade.

The administration of the PT test would be the responsibility of the local post commander. Scores would be reported through personnel channels for enclosure with the Branch andOfficial Files via the OER. There should be no major complication in testing officers annually for fitness, as it is a requirement at this time. By including it as a strict "for the record" item, most posts would probably evolve a system of several tests per year.

The final portion of the test would be familiarization with small arms and weapons qualification. This portion of the test would again be the responsibility of the post commander with results forwarded in the same manner as the PT test. Standardization for all weapons familiarization would have to be accomplished and a *pass/fail* criterion established. The basic weapons familiarization test could closely parallel the *go/no go* testing found in the hands-on portion of the 11B series of the skill qualification test (SQT). A suggested method of conducting this testing is the establishment of a post committee comprised of the commanding general, all sergeants major and brigade battalion operations sergeants. Weapons qualification could be handled during normally scheduled firings.

The basic written test would be conceptualized by TRADOC from all officer schools. It would be mandatory for the test to be given by grade and touch on areas common to all branches. In testing by grade, matters that rely on the responsibilities received by rank and experience would need to be stressed. Although map reading is a subject that all officers must know, it has few changing parameters. Compare this with the differences in the basic interpretation and administration of the Uniform Code of Military Justice (UCMJ). A platoon leader must know the basics of legal procedure, such as search and seizure, and Articles 15 and 31 and their proper application; the company commander must concern himself with the collection of evidence, availability of legal counsel, assuring the accused's rights, investigation, judgment, "45-day rule", appeals procedures, etc. This is a simple example that clearly indicates a need to test by grade. The subjects that should be tested by grade can be ascertained by a continuous review of Officers' Basic Courses, Advanced Courses, the Command and General Staff College, and the Army War College.

The PT test should be a basic proficiency test for endurance, upper body strength, agility, and weight. All officers would be required to take it on an annual basis. Those medically excused for any reason would have a profile forwarded to their official file. If the current 5-event test is maintained, a minimum passing score of 350 should be imposed with a 70-point minimum required for passing in each event. Included at the test site would be a mandatory weigh-in conducted by medical personnel. The results of the weigh-in would be recorded on the PT test score sheet and forwarded to personnel centers for inclusion on the OER.

The weapons test should include all small arms and antitank weapons in the active inventory. The test would require each officer to demonstrate basic assembly and disassembly, immediate action, and correct firing procedures. the list of weapons should include the standard service pistol, rifle, and squad machinegun. Familiarization firing of such weapons as the .50 caliber machinegun, *M-203*, LAW, *Dragon*, and TOW should also be required. Additionally, it would be mandatory for each officer to qualify anually with his assigned weapon. Those officers not assigned a weapon by TO&E would be exempt from this requirement and their most recent score carried forward. It would be mandatory for qualification scores to be verified by the signature of the first general officer in the chain of command.

On initiation and full implementation of this system, an administrative control for enforcement policies would have to be solidified. The only truly new aspect that would require implementation is the control and administration of the written portion of the test. Standards and actions taken in the event of test failure also need to be determined. A suggested system would be based on an initial failure with light action against the officer involved and continued, consecutive failures would result in heavy penalties.

A first failure on any phase of the test might result in a $50 pay reduction per month. A second consecutive failure could result in the loss of an additional $50 per month, suspension from all favorable personnel actions, and loss of any higher military schools and government-funded civil schooling. A third consecutive failure might result either in dismissal from the service for cause or retention at a grade one lower than the tested grade.

Administration and records keeping of the weapons and PT tests can be handled through existing OER processing channels. Compilation of these scores can be accomplished at the local personnel centers and recorded in field personnel files until an OER is prepared for action. When the form is prepared, the PT, weapons and weigh-in results can be included as initial entries in the job description. Utilizing a method of this type, no duplication of effort would be necessary at higher Army levels and no further paperwork would need to be inserted in official files for officers who pass all tests.

The moral questions that can be argued in the current rating system and the threat of the wide and ruthless confrontations that will probably be the rule rather than the exception for all soldiers in the next war are the only justification needed to show that our "leadees" are entitled to the best qualified leaders possible. The reality can be summed up as:

> "There they shine in meaningless splendor, a
> group of undistinguished supermen."

CAPTAIN MICHAEL L. JONES was commissioned in Infantry from the U.S. Military Academy in 1970. He has served as platoon leader, rifle company XO and commander, and battalion S-3 Air and S-3. A graduate of AOAC, he recently received a master's degree in Higher Education. He is serving currently as an admissions officer at the U.S. Military Academy.

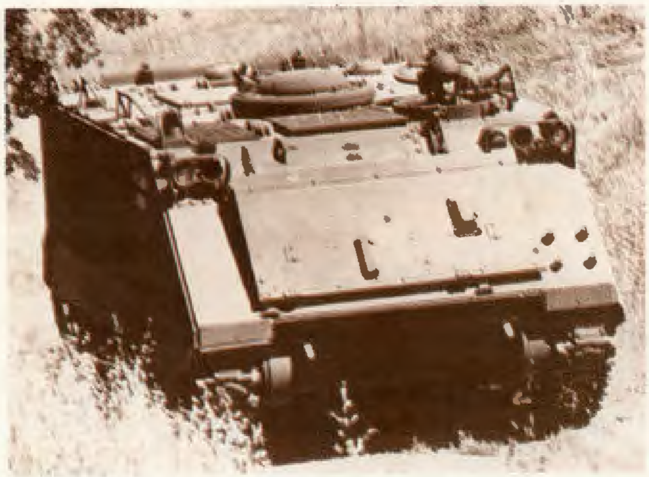
NOTES

M-113 sets speed record

A tracked-vehicle speed record was set by a modified *M-113* APC during tests by the US Army Engineer Waterways Experiment Station (WES) at Vicksburg, Miss. The *M-113* used two Chrysler engines in a standard chassis and suspension, and achieved speeds averaging 75.76 mph over three test runs.

The tests were part of the Armored Combat Vehicle Technology program conducted by US Army Training and Doctrine Command, US Army Tank-Automotive Research and Development Command, and WES to increase the survivability of ground vehicles in combat.

M-113A2 Rolls Out



The latest model of the *M-113* APC, the *M-113A2* features improved cooling and suspension systems, as well as optional and external fuel tanks.

The improved cooling system draws in cooler ambient air through the radiator, increasing efficiency and reducing oil film and subsequent dust buildup on the radiator core. The changes greatly increase engine life.

The suspension allows for 9-inch road wheel travel, which is a 50 percent increase. Improved shock absorbers are fitted throughout, with additional shock absorbers being installed at the second road wheel on each side. A stronger rear idler assembly raises the rear idler 2 inches, and overall ground clearance has been increased to 17 inches. The improvements give a better ride and cross-country capability, with cross-country speeds being increased 3 to 10 mph, depending on the terrain.

Two optional rear-mounted fuel tanks reduce the fire hazard to the crew, while retaining the 95-gallon capability. The tanks are identical and interchangeable, and provide the same level of ballistic protection as the internal tanks. Removal of the internal tanks increases internal stowage space by 16 cubic feet.

First significant deliveries of the *M-113A2* will go to the 24th Infantry Division at Fort Stewart, Ga.

1-34 Armor Activated

The 1st Battalion, 34th Armor was recently activated in ceremonies at Fort Riley, Kansas. The battalion, part of the 1st Infantry Division, is commanded by Lieutenant Colonel Nicholas P. Vanvakias, and the Command Sergeant Major is Ronald Dokken.

The battalion was originally constituted August 28, 1941, and was activated October 1, 1941, as an element of the 5th Armored Division. It was reorganized and redesignated the 722d Tank Battalion, and sent to Europe early in 1945, where the battalion was credited with campaigns in the Rhineland and Central Europe. After the war, the unit returned to Camp Shelby, Miss., where it was inactivated. Between 1949 and 1965, the unit was variously designated as the 306th Heavy Tank Battalion; the 1st Medium Tank Battalion, 44th Armor; ant the 1st Battalion, 34th Armor.

Testing Continues on GSRS

Testing continues on two competing General Support Rocket Systems for the Army. Recent tests at the White Sands Missile Range involved ripple firings of up to six rockets in rapid succession from the Self-Propelled Launcher Loader (SPLL). The successful firings confirmed predictions that the system can fire its entire 12-rocket load in less than 1 minute. During ripple-fire operations, each rocket is automatically fired by the fire control system, which repositions and reaims the launcher loader after each shot.

Individual rockets are preloaded and sealed in tubes contained in a six-rocket launch pod container. The loader container will have a 10-year storage life without requiring any special environmental protection or field maintenance. The launcher loader carries two pods containing a total of 12 rockets.

Shown firing is Vought's Self-Propelled Launcher Loader. The other SPLL is being developed by Boeing.

Mine Roller

The first production units of the Army's new Mine Clearing Roller System, capable of all-weather, day and night, rapid-assault breaching of defended enemy minefields, have rolled out of Chrysler's Defense Operations Facility.

The system consists of roller assemblies, a removable mounting kit, and two hand winches. It is mounted on a tank that has been fitted with hard points which are provided in a separate retrofit kit. The roller can be mounted by the tank crew in 15 minutes using the winches. After breaching the minefield, the roller can be quickly released from inside the tank by the driver using a hydraulic disconnect system.

The rollers destined for armor units in Europe will undergo preproduction testing at the Army's Test and Evaluation Command at Aberdeen Proving Ground, Md. and follow-on evaluation by the Training and Doctrine Command at Fort Hood, Tex.

Replacement for the "Mod Deuce"

Move over "Mod Deuce." The "Dover Devil" is on the way. The "Dover Devil" is the first .50 caliber machinegun to be designed for infantry use since the introduction of the Browning in 1917. The .50 caliber Browning was made in both air- and water-cooled configurations, but the best known version is the heavy-barrel, air-cooled *M-2* or as the troops sometimes call it, the "Mod Deuce."

The gun that is proposed as the replacement for the veteran Browning was developed by the Fire Control and Small Caliber Weapon Systems Laboratory of the Army Armament Research and Development Command.

The "Dover Devil" has a highly adaptable receiver built around three tubes, which allow the gun to fire rounds ranging from .50-caliber through 20-mm. The gun also has a dual feed capability, enabling the gunner to select antipersonnel rounds or antiarmor rounds as needed.

Designed for mass production using modern technology, the "Dover Devil" uses three modular units—barrel, feeder, and bolt head—that can be quickly changed for different caliber ammunition.

A research program is also underway to develop new ammunition for the Devil.

Conduct of Fire Trainers

The Army recently awarded contracts for the development of conduct of Fire trainers for the *XM -1* and *M-60*-series tanks. The trainers will have stations for the tank commander and for the gunner, and an instructor's console will control the training exercise and evaluate the student performance.

The system will use a computer generated Image system to provide scenes for the sights and vision blocks of various terrains, moving targets, and other special effects, including the simulated motion of cross-country travel and the flash and smoke of firing the main gun. The crew will be able to engage a variety of threat equipment at ranges of 200 to 300 meters. Recoil will be simulated in the gunner's brow pad and in the sight images.

Trainers will be developed be Chrysler and General Electric and installed at the Armor School at Fort Knox for testing. After testing, the Army will select one system for production and development worldwide.

_M-901_ Improved TOW Vehicle

The *M-901* Improved TOW Vehicle is shown above firing during evaluation testing. Note the ground TOW launcher in front of the vehicle.

Draper Award Winner

Company A, 3d Battalion, 77th Armor has been presented with the Draper Armor Leadership Award in recognition of an impressive record of unit performance over the past several years, including 26 months without a soldier being absent without leave. The unit has also received honors for its military bearing and the skill with which it deployed to Germany in 1978 on the REFORGER Exercise. The unit was, until recently, commanded by Captain William G. Webster.

First *M-60A3* Battalions in Europe

The first units in Europe to be equipped with *M-60A3* are the 1st Battalion, 32d Armor, and 3d Battalion, 32d Armor, both of the 3d Armored Division. A third unit, scheduled to receive their tanks this month, is the 1st Battalion, 70th Armor, 8th Infantry Division.

Pages from the Past

INDEPENDENCE OF CAVALRY

The cavalry of the near future will be conspicuous for its *independent* employment; that the changes in its organization, armament, and instruction will combine in the new force qualities heretofore divided between two arms of service; and results commensurate with its increased power will therefore be expected from its use.

The Cavalry Journal
March 1889

THE CAVALRY ATTACK

An enthusiastic cavalry leader, gifted with a quick eyesight, will find, in almost every case, some opportunity to approach in person very near to the enemy, and there await the favorable moment for the cavalry attack. How he makes this attack, and when the special moment has come, the commanding general must leave to his judgment, for there is no rule by which it can be foretold.

The Cavalry Journal
March 1889

COMPULSORY SERVICE

It is not probable that compulsory military service in the regular army will commend itself as the result of the great war, but universal training of our young men by and through the regular establishment is so essential and so wholly in the interest of national efficiency and economy of life and treasure, that we may expect its careful consideration at the hands of Congress when the subject of military organization is again before it.

The Cavalry Journal
October 1917

MORALE TRAINING

Soldiers, in the democracies, are assumed to come to the army with patriotism and enthusiasm for the cause. Their initial endowment is insufficient. They need further education. To support the discipline of war, they must be given an overmastering faith in their cause that will survive all the hardships and disintegrating influences of modern battle and hostile propaganda. A minor staff officer, called the "morale officer," who supervises athletics and the like, is merely an avoidance of the problem. The maintenance of the discipline of morale is as important as the planning of military operations. It requires the primary attention of the commander. Patriotic and morale training must be organized with as much attention as is devoted to food and munitions. It is the basic of the will to fight.

The Cavalry Journal
May-June 1939

OBEDIENCE

Obedience is the foundation of discipline, but obedience can no longer be blind. At one time it was literal and formal. It tends to be so in peace. In war, with superiors invisible, with conditions often different from those assumed when orders were issued, the combatant is the sole judge of how best to obey. His formidable duties will only be performed if his own initiative takes control. The back-seat driver cannot be heard in the roar of battle.

The Cavalry Journal
May-June 1939

Due to an editing error, the name of Mr. Henry E. Gardiner, author of the article "Kasserine Pass," was misspelled in the September/October issue.
The staff of ***ARMOR*** *regrets the error.*

BRIEFS FROM OTHER JOURNALS

THE SUCCESSFUL SUBORDINATE

A subordinate is one who is "submissive to or controlled by authority"—so says the dictionary. In the military each of us is a subordinate, and it would be well for us to concentrate on the concerns and responsibilities of that status for a few moments. Many volumes have been written about leadership, but the position of the subordinate—and what makes a successful subordinate—is much less discussed.

The key words and central ideas that ought to motivate the subordinate are *reliability* and *dependability*. Whether one is a chief of staff, division officer, or chief petty officer, the quality of work and the way that job is viewed from above are greatly influenced by how completely and how consistently it gets done.

Why is this? A simple look at the chain of command tells the story. Superiors are where they are in the chain because of demonstrated competence, technical proficiency, and experience. Their responsibilities are to use those attributes to solve problems, manage projects, and drive ships. They are not in the business of details; their work is decision-making. The job of their subordinates is to prepare the ground for those decisions.

The responsibility of the junior, is to study and assess the problem and present a solution or choice of solutions to his superior. What remains for the supervisor to do is to make the final decision. When viewed in this light, the concept of the chain of command becomes clear. The subordinate who is consistent, precise, and reliable in defining, researching, and organizing the problem and solution(s) before making a presentation to the boss is the valued performer. Why? Because he made his senior's job easier by spending his efforts in pursuit of the best possible solutions to problems.

There are significant benefits from viewing almost any military task in this way. The freedom of action gained by a subordinate who has established himself firmly in his superior's confidence is the foundation of job satisfaction. Since the job is accomplished well, the superior doesn't feel he has to watch it so closely—which allows him an added degree of freedom. The subordinate is accordingly allowed to organize his own priorities and therefore can better manage his time and work. This in turn prevents "crisis management," because fewer situations slip up to the deadline undetected.

It is a common failing, particularly prevalent among more junior personnel, that in many cases subordinates are not attuned to their superior's priorities. Make no mistake here: superiors are paid for making the right decisions; subordinates are paid to present the case for the required action, and then to support the decision fully and completely. Yet, inevitably, the degree of support given by the subordinate is related to how much he agrees with the decision made—even though it is not his prerogative. There can be no compromise in the case of moral questions, of course, but apart from this, the subordinate cannot consider himself an effective aide if he does not back his boss completely. The best leaders will grant their staff members a full and fair opportunity to present all sides of an issue when possible. But their responsibility is not to operate a democracy, it is to make correct decisions. The successful subordinate believes that his superior tries to do this, and expresses this confidence through full support.

Given a reasonable degree of competence at the decision-making level, the full and unqualified support of a dedicated staff will go far to ensure the success of the command. This logically follows from the foundation of reasonable goals set forth by the superior and a sincere interest on the part of command subordinates in best meeting the needs of the unit. Combined, these elements spell success both at the command level and for each subordinate so dedicated.

There is a valuable training lesson in all of this as well. Few juniors have not been faced with the most frustrating of tasks; solving an undefined problem. Nothing is as detrimental to one's view of his job as to have a general task given in unspecific terms, spend countless hours pursuing a solution, and then find the finished product sent back for rework because the problem solved was not the problem intended. But by being efficient and reliable, today's subordinate will be tomorrow's superior with a sure grasp of exactly what he needs to do a job and how much detail he requires. He will go far in increasing the efficiency and productivity of his staff by ensuring against guesswork, undesired detail, and wasted time. He will also contribute to overall morale by providing an objective base against which each of his men can measure his worth. When no such basis exists, talk of thankless work, lack of recognition, and vacillating standards arise.

If the advantages of this approach are so obvious, why is the successful subordinate the exception rather than the rule? There may be no pat answer to this, but there are some faults that characterize the majority which can be summarized in the phrase "completed action." Completed action occurs when all forseeable actions on a project or problem have been either finished or well enough defined and researched to allow the superior to make an intelligent, informed decision on the matter. The unsuccessful subordinate either does not understand or does not care to achieve this goal.

To elaborate, one aspect of the concept of completed actions deals with some of the common pitfalls in pursuing that end. It points out the natural tendency to present the problem to the supervisor in piecemeal fashion to effect the illusion of progress. It deals with the impulse to ask immediately the supervisor what to do and rely on his experience to make the task easier—which draws him into doing the job rather than keeping it at the subordinate level where it was assigned. It further discusses the unsatisfactory practice of submitting half-baked ideas and partial memos as an intentional unfinished product, counting on the supervisor to draft the final copy in the format he wants. This idea presupposes that the subordinate is not going to be able to satisfy the requirements of the initial assignment. And this constitutes default, which is no more appreciated in the areas of leadership and management than it is in sports.

In summary, this overview approach to the responsibilities of the subordinate provides valuable insight into the mechanics of success. Those characteristics most valued in subordinates are the very traits that make the superiors' jobs more enjoyable and, to a certain extent, easier. It ought to be a subordinate's goal to be that valuable to his superiors. And the result from such an approach will bear rich professional and personal dividends.

Condensed from an article by Lieutenant Commander Glenn R. Whaley, U.S. Navy in the April 1979 Issue of Proceedings.

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SOVIET ENGINEER SUPPORT

If armed conflict should occur in Europe, it is in the Soviets' interest to bring it to a successful completion by accomplishing the military and political collapse of the NATO alliance as quickly as possible. The main goals of the conflict must be achieved in a matter of days, before NATO troops can be reinforced. If this is to be accomplished, it will require a rapid rate of advance in which no defensible obstacle can be left to hinder the progress of the Warsaw Pact Armies.

Since the conclusion of the World War II, Soviet engineer equipment has taken a dramatic upswing, both in quantity and quality. The Soviet program for a high-speed offensive is now supported by rapidly deployable and mobile bridging equipment.

Today each Soviet motorized rifle and tank regiment has an organic engineer company; divisions have an engineer battalion; and armies probably possess two engineer regiments, with an additional three to four engineer regiments under front (army group) command.

The foundation of the Soviet engineer capability is the engineer company at regimental level. This company consists of 4 officers and 77 enlisted men. The company has three platoons—sapper, bridge, and technical.

The sapper platoon has the missions of entrenching, camouflaging, and conducting limited mine warfare and demolition. To carry out these tasks, the platoon is equipped with three *PMR-3* mine-laying trailers and three armored personnel carriers.

The bridge platoon has the mission of constructing bridges and ferries so that the entire regiment can quickly and easily cross small streams. To accomplish this, the engineer company has four *TMM* bridges which are mounted on trucks for easy deployment. These spans can bridge obstacles up to 40 meters in width and can be launched and emplaced within 30-45 minutes during daylight and 45-60 minutes at night. With a specialized crew, emplacement times can be cut in half.

Another piece of equipment found in the bridge platoon is the *MTU-20* tank-launched short assault bridge. There are four of these in the engineer company of a motorized rifle regiment and six in the engineer company of a tank regiment. The *MTU-20 (T-55)* can be identified by the folded end ramps and the higher silhouette of the bridge and vehicle. It can be launched in 90 seconds and span a gap of up to 18 meters.

The technical platoon has the missions of constructing field fortifications and clearing obstacles. The platoon has one *BAT/BAT-M* tracklayer with auxiliary crane equipment to lay off-road surfaces and assemble bridges from readymade elements. This piece of equipment is electrohydraulically controlled to heighten reliability and effectiveness.

For the construction of field fortifications such as trenches, the technical platoon has one *MDK-2* trencher which is designed to dig trenches for various purposes. It is also equipped with bulldozer blades for leveling. According to the Soviet Engineer Officer's Handbook, the *MDK-2* can replace the labor of 400 men.

Although the Soviet engineer company is well-organized and well-trained, it does have one noticable shortcoming: personnel are not cross-trained to operate a different piece of equipment. By eliminating an equipment operator of the bridging crew, another operator and piece of equipment will have to be brought forward. This most definitely would slow down the Soviet engineers' timetable.

Engineers have always been considered important in the Soviet Army; but in recent years, combat engineers have an increasingly important role to play, especially during a high-speed offensive. Engineer tasks have become more complex. They are on a much greater scale and must be accomplished in a much shorter time frame. It is this time factor which has had the most significant effect upon engineer tasking.

The following references may prove helpful in conducting further research into the capabilities of Soviet engineers: *Soviet Army Operations,* IAG 13-U-78, April 1978; *International Defense Review,* February 1978; FM 30-102, *Opposing Forces Europe*; DDI-1150-13-77, *Soviet and Warsaw Pact River Crossing Doctrine and Capabilities*; FSTC-HT-23-1122-73, *Engineer Support Combined-Arms Combat,* September 1973.

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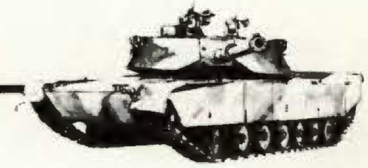
PROFESSIONAL THOUGHTS



Winter Safety Thoughts

By now, your tanker jacket has come back from the cleaners, your tomatoes won't ripen, and it's chilly morning and night. Maybe you wonder, as I do, what sort of training is in store for you and your crew in the winter months ahead. What can you do to make things better, more liveable and more conducive to good training under cold or extreme cold weather conditions? I offer several considerations I think are necessary to crew safety, good training, and an understanding of winter effects on tanks and men.

The nature of the given mission must continue, as combat does, regardless of the weather conditions. To be able to do this, we must train in anticipation of lousy weather, bitter cold, icing, and generally miserable conditions. One lesson already on record is the one learned by the German Sixth Army on the Russian Front during World War II. "General Winter" may have been the Soviets' most influential ally. With this in mind, the following list of winter considerations may be helpful when planning an exercise this winter:

Icy tank trails: Many of us have had the unnerving sensation of riding an uncontrolled 52-ton toboggan sideways down a stretch of frozen tank trail. It's like trying to run on watermelon rinds! The first consideration should be to find a way around potentially dangerous road sections or terrain. Drivers and tank commanders (TCs) should plan ahead and conduct a thorough route or map reconnaissance. Locating alternate passages could easily save a recovery operation or an injured crewman. The TC must be aware of the main gun's position, and the potential danger of an unexpected slide. Too many times the main gun has speared something or someone through simple inattention or preoccupation with something else. Why not schedule some training to include a driver training course teaching how to compensate when applying power or steering on ice; overcorrection and skidding; the use of existing aids, i.e., high road sides, brush, etc.; and knowing when to back out of trouble before it's too late.

Maintenance of ammunition in extreme cold: Handling, storage, and preventive maintenance of ammunition during cold weather is understated in my opinion. Crews should be instructed regarding special handling, care, and safety when moving, uploading, and loading frozen ammo. Prevention or removal of ice from links, primers, belts, and casings to insure proper seating and reduce malfunctions or misfires is critical. Command emphasis and briefings concerning ammunition safety when the temperature is in excess of factory tolerances should be conducted prior to firing.

Cold weather injuries: Probably the most important item is the training, understanding, and application of cold injury prevention and care to the lowest level. Crews must understand how to recognize and treat hypothermia, or the subtle loss of body temperature, frost bite, trench foot, immersion foot, and other cold-weather dangers that can eliminate your crew.

Here's a few more general items to think about:

- Care and use of tank heaters.
- Whiteout, snow blindness, dead reckoning and winter land navigation techniques, vision impairments, ranging difficulties, and infrared system limitations.
- Ice fog, vehicle signature, and making use of adverse conditions to work to your favor.
- Visability and survival in a subzero NBC environment.
- Sight system purging and maintenance during icing conditions.
- Care of batteries, recommended lubricants, protective coatings, anti-icing agents, and helpful preventive maintenance tips.
- Survival techniques for extended periods of bitter cold, cooking, sleeping, sanitation, etc.
- Machinegun maintenance: cold to hot, hot to cold, and icing inside the barrel.

With these items in mind, I would recommend the following actions prior to the cold weather months:

- Thorough winterization of equipment *and* personnel through a comprehensive program based on lessons learned the hard way.
- Issue winter clothing along with instructions on how to use it. This fits in well with the prevention of cold injuries. Equipment items may include the following:

  Vapor barrier boots.
  Parka and liner, with hood.
  Gloves, not Arctic mittens. (Something warm without losing agility.)
  Tankers masks.

- Preliminary training prior to cold weather to inform the troops and to eliminate the many myths regarding cold weather care.
- Input from the Arctic Research and Development Center at Fort Greely, Alaska, providing other tips to compensate for extreme cold.
- Other lessons learned or ideas from the field regarding cold weather tank gunnery, tactics, and some of the areas mentioned above.
- Command and control during extreme cold, communication disruption, etc.

Nobody likes to be cold and miserable. However, we can't schedule "convenient" garrison class work or cancel normal training progession just because it's cold outside. For those of us in the Reserve Components, our training time is already severely limited. To allow the weather to shut us down for 3 or

4 months each year, at the peak of the yearly training cycle, would throw us into an annual regression of hands-on doing until warmer weather.

I'm sure the tank crews of the Warsaw Pact forces are thinking about their winter training. Maybe we should emphasize our own more comprehensively.

SAMUEL T. CONN
Captain, Armor, KanARNG

Training Weaknesses

We are weak in the training of our armored vehicle crewmen and it will cause the most casualties in the next war. This applies not only to tank crews, but to scout, TOW, ADA, engineer, mechanized infantry, and somewhat to artillery vehicle crews—all armored vehicle crews. The problem can be broken down into three areas, *firepower, mobility,* and *survival.* TC 17-15-11 is a first step in the right direction, but more comprehensive work is needed. Following are some random thoughts about those areas of training that are either overlooked or not sufficiently emphasized during gunnery programs or ARTEPs or in training circulars.

Firepower

The tasks, conditions, and standards vary greatly for gunnery for each MOS. Gunnery can be practiced anytime by parking in view of a road and using passing cars as targets. The firing angle can be varied and you can operate in the stabilized mode. Crews must learn to engage several targets quickly; a tank crew should be able to hit three targets on line in 10 seconds with the main gun. All gunners must learn the vulnerability and points-of-aim on threat armored vehicles, and they must learn the penetration ranges of their kinetic energy and SABOT ammunition. Closed-hatch firing must be emphasized for those vehicles that have this capability. Night firing should be the same as day firing for vehicles equipped with passive sights and no illumination should be allowed, but the range should be reduced instead. Good planning, along with help from Mother Nature, can insure that varying moonlight conditions are available for night firing. A task should be added to TC 17-15-11 to require a main gun engagement of helicopters flying nap-of-the-earth.

Mobility

Few drivers ever really learn to drive a vehicle to its maximum potential. High-speed steering, sharp cornering, crossing water and bumps, shifting, how to avoid throwing a track, closed-hatch driving, and night driving are little known and used skills. Additionally, closed-hatch and night-sight driving are almost unheard of. Vehicle commanders tend to over-control the driver in these activities. Find the best driver in the platoon and have him train the other drivers if necessary. At first their driving will be rough, but it will smooth out. Slow-speed driving gives drivers bad habits and decreases vehicle reliability.

Survival

TC 17-15-11 lists the survival drills that should be taught. The *evade-missile drill* should be renamed *evasive-driving drill.* The zig-zag should be used by any vehicle that is bounding in bounding overwatch. The vehicle travels as fast as possible in a zig-zag pattern toward the enemy, changing direction every 2 to 4 seconds as the driver counts 1001, 1002 and so on. Start counting after you have finished your turn. Vary the time a second every few turns and use 3 seconds as your average time. The *water-crossing* and *combat-refueling* drills should be in the mobility section and the *load-ammunition drill* in the firepower section of the circular where the following new drills need to be added.

Task:	Clear an obstructing feature.
Condition:	In a field location, given a crew and vehicle in day and night.
Standards:	Observe beyond a vision-blocking feature and locate the enemy, if present, before exposing the vehicle and without giving your position away.

Task:	Move into a hull-down position.
Condition:	In a field location, given a vehicle and crew in day and night.
Standards:	Move into position without exposing more than the turret and have enough clearance to fire all weapons.

Task:	Move a vehicle across terrain that is covered by enemy direct and indirect fire.
Condition:	In a field location, given a vehicle and crew in day and night.
Standards:	Using terrain, evasive-driving, and self-screening ability, move by an enemy position without exposing yourself for longer than necessary and be able to use all your weapons, as fast as possible.

Many of the drills in TC 17-15-11 can be conducted without moving the vehicle from the motor pool and several drills can be conducted at once or in easy succession with a little planning. TCQC should be replaced by a "combat vehicle qualification course" usable by several MOSs. The tasks, conditions, and standards would be the same in mobility and survival so everybody would be on common ground. Only gunnery would be different. This training would be for crews, so it should be conducted at crew level by the vehicle commander.

The vehicle commander must meet the standards, so he can train his crew to the same standards. If he can't, replace him. When you move out to the local training area, let the commander train his crew by himself. Don't do one crew at a time or they will become bored with waiting their turn and lose interest. Overtraining on one subject becomes boring also. Have a competition between crews at the end of the training session to see where each stands.

Having complete and stable crews makes training more effective. Evaluators should watch to see if drills are being done on ARTEPs and grade the unit on them.

The constant push for uniformity needs to be replaced with "*if it works for them, let them use it,*" but within reason. Uniformity instead of helping to accomplish a mission has become the mission and several senior personnel believe it. For example, a first sergeant once told me that what was worn to a PT formation was more important than doing PT. What I am proposing is an example of useful uniformity, not the eye wash we have to put up with now.

The NCOs will have to do this training and ensure its scheduling. The sergeants, staff sergeants, and sergeants first class need the support of the first sergeant and sergeant major. These senior NCOs, in turn, must be as proficient as possible in or have a good working knowledge of skills involved to do the job professionally.

The officer checks to make sure the training is being done and done to standard. He also helps set up the training.

The grass may have to go uncut a few extra days, the rocks and curbs go unpainted once, and the mess team may have to do without a KP, but those are the conditions of war.

The demands of the next war are great and so our training must be just as great. The article "One Tiger" in the July-August 1978 issue of *ARMOR* is a good example of what can be achieved by well trained crews.

CHRISTOPHER F. SCHNEIDER
Sergeant
Trp B, 3d Sqdn, 12th Cav

Sleep Loss

I applaud Captain Geier's article, "Sleep Loss." As an infantryman in three wars, this situation has been of great concern to me. Not that the various phenomenons connected with sleep loss are surprising or unknown, but that they have been ignored by so many commanders, particularly those of higher rank.

I will never forget one wintry day in Germany, during the early 1960s, when I was participating in a corps-level exercise. As a G-2 controller, I was checking the armored cavalry regiment who was playing the opposing force. I came upon a squadron CP and checked into the operations tent. The commander and his S-3 came up to brief me on their situation and to coordinate their future scheme of maneuver. Those two had had no sleep for almost 3 days and were literally out on their feet. They had difficulty talking, let alone doing any coherent thinking. It was evident that this squadron would make little meaningful contribution during the rest of the exercise (which went on for 2 more days).

In another instance, I was the acting commander of a company during the Korean War during the relief of a South Korean unit on line. Including the planning, preparation, coordination, reconnaissance, movement forward and the relief itself, I was awake about 3 days. I felt that I just could not take the time to sleep. About 12 hours after the relief had taken place the company commander arrived upon the scene to find a zombie. I practically collapsed into a deep sleep to be awakened 4 hours later by rainwater running onto my chest off a bunker.

I realized after the incident that during the last 24 hours I was operating at very low efficiency, and that any cognition was indeed difficult. Constant checking of positions, coupled with coffee and cigarettes, helped me stay awake. After the 4 hours sleep, I was able to function, but not well. I could tell that I was not at 100 percent. After that the company commander and I worked out a schedule so that one of us was awake at all times, but we each got sufficient sleep.

I thought that every point that Captain Geier made was factual and physiologically significant. I do think that if the period of initially going without sleep is not too long, that 4 hours sleep is sufficient to carry a person for a fairly extended period—say a week or even two. We are talking in terms now of a crisis-type situation, where there is no alternative. There will be a falloff in efficiency toward the end of the period, and then a requirement for a recuperation period where the soldier must literaly be immersed with sleep so he can "catch up."

As the G-2 briefer for VII Corps during a field exercise, I was required to present the morning and evening briefings during a 2-week period. I existed on 4 hours sleep per day during that time in that I arose at 0300 to do my analysis and briefing preparation for the 0700 briefing. The evening briefing did not end until 2100, after which I would usually consult with the G-2 and assist in writing the daily intelligence report and estimate, if required. I will not pretend that I was not glad when the exercise was over, as the lack of sleep was getting to me. The point is, that it can be done.

I will add that I believe that probably a soldier can go indefinitely on 6 hours sleep per 24 hour period. Nevertheless, Captain Geier's point is well taken that commanders (and others) *must* be prepared to delegate actions to others and get enough sleep so that they are *always* ready to function at the highest efficiency level possible. It is like physical exercise. It is no use giving it lip service and then not doing it "because the demands of the job" leave one no time, or not allow the commander to schedule it for his subordinates. It must be done.

Like everything having to do with existing in a battlefield environment, it must be practiced and procedures worked out so that it can be done.

Any combat action lasting over a period of time will put great demands upon soldiers at all levels. Yet there must be some kind of balance struck between immediate demands (such as in an exploitation situation) and the absolute requirement to conserve some modicum of capacity for the next day, and the next day after that. An experienced Special Forces noncom once told me, "A job is always easy for one who doesn't have to do it!" If there is one thing that burns me, it is the commander who steps, refreshed from his sleeping trailer, and then, without checking, throws a tantrum because some grunt is sleeping on position even though there is adequate security.

I believe that the use of 100 percent stand-tos every day, say starting at 0400, or not allowing personnel to sleep during the day are anachronistic. Stand-tos, yes, but perhaps 50 percent alert would serve the same purpose as long as the procedures allow for instantaneous response.

In Vietnam none of my sentries slept on post because I made sure that they all had sufficient sleep prior to coming on duty. That isn't to say that there were not sleepless nights. There were, and we were always capable because during "routine" periods everyone received sufficient sleep to include making sure that those who were up at night were allowed to "sack in" during the day even if "brass" were in the area.

Once again, my plaudits to Captain Geier on his timely and pertinent article.

ANDREW M. RUTHERFORD
Colonel, Infantry

On The Right Track

Throughout my 18 months as a cavalry troop commander in the 11th Armored Cavalry Regiment (and 36 months in a line unit prior to command), I have come to the firm conclusion that *cavalry force development is headed in the right direction*— at the squadron level and below—in the regimentally organized units. The major TO&E conversion of 1978 represents a significant step forward in enhancing the application of combat power to the covering force battlefield. The increasing deployment of the improved TOW vehicle and related equipment will continue that positive trend, with successful results in the first battle of the next war—a battle we must win.

Note, however, that with the coming of new firepower assets there arises *a need for in-depth analysis* of the obstacles that must be crossed in matching better equipment with the troopers that must win with it. For the troop commander, a special series of dilemmas continue to appear. First, the *employment of the platoons*, both internally and externally, must be reexamined. I decided, upon consideration of the alternatives, to employ one *M-60A1*-equipped platoon internally as a unit of teams, wherein the platoon leader moves with the scouts out front, and the platoon sergeant controls the movement of the four tanks (under the guidance of the platoon leader). In the European scenario, this often resulted in a 1- to 3-km distance between the scouts and the tanks, meaning radio communication was critical to the effective movement of the two elements. From an external standpoint, I realized that the sectors of responsibility for each platoon—in terms of lateral as well as depth distances—would remain essentially the same as the *M-551* platoon. This would mean a greater emphasis must be placed on the *maintenance of contact between platoons,* and the careful selection of vehicle positions to deny the enemy a penetration capability. I trained my lieutenants within the framework described, and tested it during the 1978 REFORGER exercise and a later ARTEP in November 1978.

The results of those two major tests were extremely favorable, as the troop consistently displayed an ability to conduct all assigned missions with a remarkable degree of success. Some modifications evolved in the course of the tactical play from which I learned a great deal.

First, the platoon sergeants became increasingly involved in maneuvering tank sections on the battlefield. I was able on many occasions, with the scouts having located the enemy's direction and strength, to employ the tanks as a killing force of amazing power. The platoon sergeants demonstrated a keen sense of maneuver techniques, which allowed them to respond immediately to any developing situation in quick, decisive fashion. Many times we surprised a stronger force with a heavy concentration of firepower at his weakest point, thus enjoying a favorable kill ratio.

Second, *I noticed that overwatch, in the classic sense, could not be practiced on a visual basis.* The dense woods and irregular terrain of our maneuver area simply would not allow the tanks to "watch over" the scouts; rather, the platoon leader had to settle for keeping them close enough to provide help when he and the scouts got into trouble. That was no easy task, but it worked. That's probably the most important aspect of all.

Upon hindsight analysis, I perceive several problems in the continuation of tactical improvement on the troop level. *Logistical support without the executive officer poses an extremely tough obstacle.* If the XO is to control the TOC (and thus be prepared to assume control of the battle), then resupply operations will be severely limited.

There is simply no one else to get supplies where they need to go, or recover and rearm vehicles effectively. The first sergeant plays a key role in some aspects, but he cannot manage the tasks alone. The squadron has no one to bring supplies forward of the trains, thus a choice must be made without one prospect of a good solution. My choice has been to commit the XO to logistics and keep him informed as much as possible.

Lack of scout vehicles is also a crippling hindrance to full realization of the cavalry troops' potential—I only had two *M-113A1* vehicles per platoon to be the "eyes and ears" of the unit—and that is not enough. I *fear* that the long-awaited *ITVs will be regarded as tank systems* in a heavy firepower role, and that will not help. Without four scouts per platoon, the reporting capability of the platoon will be drastically reduced—particularly when operating over a broad front. That aspect of the new TO&E needs to be addressed at some higher level.

Finally, I am concerned about the lack of motorcycles or messenger vehicles because we are extremely vulnerable to EW in our present configuration. When I cannot talk to my platoon leaders, there will inevitably be confusion. I feel the same problem exists with the platoon leader in talking to his scouts and tanks. Flag signals are of no use, and other visual signals are almost entirely dependent upon fighting the battle in a 3,000 meter visibility environment. In central Germany, I would venture that such an environment is far more the exception rather than the rule.

With regard to the quality of personnel and their training to operate the equipment on the covering force battlefield, I find that theory differs dramatically from reality. *My officers, like myself, were poorly trained for the mission of the unit upon arrival—largely due to a lack of understanding of the nature of the cavalry platoon in Europe.* A 41-man cavalry platoon is far different from the 19-man tank platoon, in every respect. I believe the armor force would benefit greatly by taking two significant steps in this regard: Train cavalry lieutenants on a separate track than the armor lieutenants for an extended period; and organize the Armor Officer Basic Course separately in terms of Reserve Component, inactive unit officers versus those to be on active duty with combat outfits. One final recommendation here would be to organize cadres with officers and NCOs of first-line quality who have extensive troop-level experience of high caliber—rather than have Armor Branch broadcast the message that recruiting and readiness region assignments have priority in selection of the most seasoned captains and platoon sergeants. I believe the results would be much in line with the ideas of John C. Calhoun who as Secretary of War in the 1820s, fostered the "expansible Army" concept, including the creation of a superior core of instructors which could rapidly and effectively form a base level of quality teachers—a base that could be expanded in time of war. The enlisted soldiers I have received have steadily improved in quality—except that their training must be dramatically tailored to the cavalry unit—especially in MOS 11C. But I realize that's one reason I have a job to do.

I remain completely dedicated to the cavalry force as one of the critical keys to success on the battlefield, and I am proud to be in the best Regiment in the Army—Blackhorse.

ROBERT W. MIXON, JR.
Captain, Armor
Troop L, 3d Squdn, 11th Cav

Subsequent to the receipt of this "Professional Thought," the Armor School has instituted separate tracks for armor and cavalry in the Armor Officer Basic Course, with the cavalry track receiving an additional week of training in tactics and small arms, including TOW and Dragon. Presently, no distinction is made in training Reserve and Active component lieutenants. ED.

Crew Stabilization

Today's force, Active Army, National Guard, and Reserve, is faced with many serious but solvable problems, one of which is crew stabilization and integrity. Effectiveness in a team or crew is largely dependent upon maintaining those same four faces working together for as long as is humanly possible. One could offer many excuses or explanations as to why turnover occurs, but when the last word is in, command emphasis is where we should be looking for possible solutions.

Granted, the platoon leader or the XO cannot be held totally responsible because they are only human. However, there must be a positive attitude projected by the junior officers and NCOs if enthusiasm is to be promoted in the individual crews or teams. The emphasis to excel has to come from command levels as was vividly demonstrated by the late Mr. Lombardi and the Packers. The same has to hold true in the Army if we hope to realize crew stabilization and integrity.

Along with command emphasis, the team or tank commander (NCO type) must be willing to further his education on and off the range, beyond the normal scope of daily requirements. There are so many demands placed on a TC or team leader, that he sometimes feels as though it is a perpetual struggle to achieve the desired level of success. That word success, however, is defined as "The progressive realization of a worthwhile goal or dream." In other words, success is never where we are, but always the direction in which we are going. By extra time and effort spent in the area of technical training, the light does become visible at the end of the tunnel.

I recently had the opportunity to run a tank range for a company of Montana Guardsmen. Upon arriving at the range, I was cautioned by some of the ranking NCOs that their company was having problems in the area of crew stabilization and integrity. I wondered then if this was going to be another one of those 20-hour days spent trying to get six tank crews down range and fired. I was blessed, however, with two Master Gunners from the Ft. Carson area who were well-trained and well-motivated men, and before long, they had the attention of all who were present.

They conducted crew instruction before going down range, and it was both amazing and encouraging to see so many sour attitudes change that day. What I thought was going to be 24 hours of total chaos, turned out to be 8 hours of truly worthwhile and motivated training. The events of that day produced for me one of the most enlightening days of my career. It also reaffirmed my belief that positive mental attitude and enthusiasm are definitely key remedies for a decaying crew environment. Those tankers at the end of the day were excited about what they had learned, even in the way of a few simple fundamentals, and expressed their desire to improve as crews and stay together and work as teams. What did it take? A little motivation, some long-overdue fundamental refresher training so that they knew what they had to accomplish and how to get it accomplished, and at the end of the exercise, praise for a job well done.

As I said earlier, tank commanders must be willing to sacrifice a little more of their time to remain technically and tactically proficient because not many men are going to want to remain inside a 52-ton keg of explosives with an idiot at the helm. Through correspondence courses and the use of the Training Extension Course trainer coupled with practical experience and practical exercises, I firmly believe that there should be no excuse for incompetence in that TC hatch. If the TC displays confidence and knowledge, those other three men are going to be hanging around because they feel that they will learn in that environment. It has been proven that if a person is kept in a learning environment he will be happier, become immeasurably proficient, and most of all, remain loyal and dependable. Then we'll have the stabilization and integrity we need if we're to win the first battle of the next war.

There are, however, many uncontrollable variables when looking at crew disruption. Men are for some reason or another, attracted to a different field, or are taken out of tanks for medical reasons, or some just plain get out of the Army. In any event, these variables account for only a small percentage of crew breakups.

Changing tactics have also taken their toll on the once dyed-in-the-wool tankers. There has been much controversy in the area of Armor necessity, but being a General Patton worshipper, I'll never be convinced that a declared war will ever be won without a tank force.

There is much to be learned in the realm of human psychology as to what it takes to get and keep men and women working together harmoniously. My contention is that if we are to achieve maximum crew stabilization and integrity, we must not be swayed by a few men's disbelief or by a lack of enthusiasm that is evident in some of our peers. We have to take the bull by the horns, seek self-improvement in our field, and drive on. Today we are just as much a part of the combined arms mission as were those tankers in the Patton era. To be successful in that mission, we have to strive for and thrive on continued improvement through constant practice, correspondence programs, and through all the aids that we have at our disposal.

I don't proclaim to be an expert in the 19E field, nor do I boast of degree in psychology and human relations, but I'm only encouraged to become a better tanker and soldier when I hear and see all that can be accomplished if an honest effort is put forth. I'm encouraged to see topnotch Master Gunners who a year ago couldn't even spell tank. I'm encouraged to see four men working and progressing as a team through intercrew competition when months ago, they couldn't even get along as men. Most of all, I'm encouraged and determined to progress, knowing of and having used some of the many, many tools of the trade that are available for the asking through the finest vocational school in the world—The U.S. Army Armor School.

What I'm saying is this: crew stabilization and integrity will increase as we increase our knowledge and as we increase our belief in ourselves and in our fellow crew members. So I toast the rest of you in the 19E field and I encourage you to keep believing in yourselves and your overall mission, one of these days you'll be glad you did.

DOUG HARMON
Staff Sergeant
Montana ARNG

Commandership

In 1940, I started to practice "commandership," which progressed from a company to an Army Group. I have also tried to teach it for the past 35 years, with spotty success perhaps. In that length of time, I have seen many commanders relieved for "breakdown in command." These have been in all echelons from company to corps commanders. The harmful results to the Army when these occurred were great, not only within the Army, but also to its prestige in our country.

In 1967, the Department of the Army let a contract to the Franklin Institute Research Laboratories to make a study of the techniques used by outstanding commanders in World War II. I was hired to direct the study. From 150 questionnaires, we received 85 replies. From these we distilled these 10 essential characteristics of outstanding commanders and managers. They:

- Were practical and advanced planners.
- Issued good, timely, adequate directives to staffs and subordinates that not only could be understood but that could not be misunderstood.
- Adequately coached their staffs and subordinates in how to play on the teams they commanded.
- Were good and constant observers of situations and results, using their staffs to assist.
- Critiqued their staffs and subordinates periodically, pointing out the good and the not-so-good actions, and giving more coaching when needed.
- Were able to motivate their people to carry out well their instructions and duties.
- Were skilled in performing effectively the techniques of command.
- Did not procrastinate in carrying out their responsibilities.
- Did not fail to recognize outstanding results produced by their subordinates and to publicize them as appropriate.
- Constantly remembered that their commads did well only those things which they checked.

Of course, these characteristics apply to all levels of command from company on up—also to managers.

BRUCE C. CLARKE
General, U.S.A. (Ret)

OPMD - EPMD ARMOR

OPMD

Changes in OPMS Terminology

Since the article "Professional Development Planning for the Company Grade Officer" in the July-August issue of *ARMOR* Magazine was submitted for publication, a major change in terminology has occurred. The Chief of Staff of the Army has approved a DCSPER recommendation that the terms "primary" and "alternate" be discontinued when referring to officer's specialties. Although OPMS Publications have emphasized that neither of an officer's specialties has preeminence, some officers continue to perceive one specialty as being "more important" than the other.

As an evolutionary step in the implementation of OPMS, this decision will further emphasize that officers are to be proficient in two specialties which are considered equally within assignment and selection processess today and will continue to be in the future.

This change will be incorporated into Army publications as they are revised. Future Officer Record Briefs (ORBs) will display an officer's specialties in numerical order, regardless of the sequence of designation.

Civilian Schooling Programs

The following is an update of the civilian schooling programs for FY 80.

Selection for graduate study is designed to meet specific Army requirements in predetermined disciplines. Prerequisites for selection are an outstanding preformance record, entry specialty qualification, and an academic record which will support an officer's designated (or anticipated) couse of study.

Prior to requesting graduate schooling, officers should study DA Pamphlet 600-3, "Officer Professional Development and Utilization," to ensure that the field of study they are pursuing will support the career pattern that interests them. All officers interested in graduate schooling should contact the civil schools officer to determine current shortage discipline (Army requirements) prior to submitting an application: Company Grade, Combat Arms Division—Major Magaw, AUTOVON 221-7819. This advice is also applicable to those officers who, because of a PCS are unable to complete a degree being pursued during off-duty hours.

Company Grade, Combat Arms Division, has 38 openings remaining in the following disciplines for fully-funded advanced civil schooling during FY 80. Selected officers study for a period up to 18 months and required to serve a three year utilization tour immediately following graduation. If interested, call as discussed above and or apply under the provisions of chapter 4, AR 621-1, dated 6 May 1974.

Disciplines

Command, Control, Communications
Procurement
Guided Missile Engineering
Comptrollership
Engineer Nuclear Effects
Area Studies
Geodetic Science
Journalism
Organizational Effectivencs/Personal Management
Electronics Engineering
Nuclear Physics
Operations Research/Systems Analysis (Engineering)
Auto Data Processing (Engineering)
Education Management/Curriculum Design
Aeronautical Engineering

Armor Branch has limited openings for officers to enter graduate school for the purpose of obtaining a masters degree and remaining at the same institution to serve a 3-year tour as ROTC instructor. In cases where a university does not have a masters program, the graduate degree will be pursued elsewhere. If interested, call and apply under the provisions of AR 621-101, dated 1 May 1974. Officers must study in one of the shortage disciplines listed above.

Undergrauate schooling (Degree Completion Program) is currently available to officers whose records support promotion and retainability. Consideration is generally limited to those officers who have completed the officer Advanced Course and can complete the degree in 12 months or less. Civil schooling applications (see AR 621-1,dated 6 May 1974) are accepted anytime and remain in your Career Management Individual File (CMIF) until you are selected, notified of nonselection, or otherwise become ineligible.

OPMS - US Army Reserve

The Officer Personnel Management System--US Army Reserve (OPMS-USAR) is a centralized personnel management system which provides coordinated individual career guidance, professional development, and assistance to the officers of the Army Reserve, both Individual Ready Reserve (IRR) and members of Troop Program Units (TPU). The final phase of OPMS-USAR implementation began on October 1, 1978, at the US Army Reserve Components Personnel and Administration Center (RCPAC). With completion of the final phase, all 83,000 USAR officers will be under OPMS-USAR's "Management for Mobilization" by the end of Fiscal Year 79.

RCPAC officals say that OPMS-USAR will develop and retain Reserve officers in the right numbers with the right skills to meet the Total Army's critical mobilization needs and make the most effective use of training funds. Current mobilization requirements reflect a need for over 25,500 IRR officers and Standby Reserve Officers in the M to M + 30 time period and approximately 40,000 in M to M + 60. The IRR officer pool, with an approximate strength of 43,500, is barely adequate to support early deployment mobilization plans, but could increase substantially if the officer discharge rate is stabilized, according to RCPAC planners.

Officals say that OPMS-USAR improves officer readiness by spending training dollars for mobilization related training. Data at RCPAC show that this management system has significantly increased retention rates.

Adjutant's Call, 20 April 79

EPMD

You and the Promotion Board

Several letters have been received at MILPERCEN from soldiers in the field inquiring as to why they were not selected for promotion. Most commonly, it is the E6 who was not selected for promotion to E7.

There is no specific reason that can be given as boards are not permitted to divulge their deliberations, and their records are destroyed upon approval of their recommendations.

Board members are sworn and tasked to keep accurate records, and to review impartially the files and safeguard the board proceeding. There are not secret rules in the selection process; the whole-person concept is the basic guideline for the board. In fact, the guidelines to the board are published with the board results. The best-qualified persons within a Career Management Field (CMF) are selected. The qualitative criteria for selection are very stringent and the board, in their judgment, identify and select those individuals who possess an outstanding history of past performance and the highest potential for continued outstanding performance in the next higher grade. Not every one who is qualified can or will be promoted because of the budget restraints that are imposed by Congress. Before a selection board convenes, an analysis is made regarding the current strength and projected losses of a particular grade. At that time, a promotion ceiling is established. Each Career Management Field is then examined to determine how many projected requirements there will be and how many can be promoted in each CMF.

Those selected were considered best qualified by the board in their CMF, and its decision must be accepted as the collective judgment of its members.

What You Should Do

Ensure that the information in your file is current and accurate, try to improve overall duty performance and MOS proficiency, keep physically fit, and seek the jobs within your MOS that challenge your abilities. You should expand your education and, as leaders, set the example for others to emulate.

Remember the primary responsibility for the accuracy and completeness of your Official File rests with you, the soldier.

Some factors used for selection include:

- Awards, decorations, commendations, and recommendations.
- Degree and level of responsibilities.
- Duty performance (EER/SEER).
- Education—Military and Civilian.
- General physical condition to include meeting current weight standards.
- Integrity and character.
- Length of service and maturity.
- Moral standards.
- Scope and variety of assignments.
- Trends in efficiency.

Note: There is no single factor that becomes overriding in determining whether an individual should be promoted.

Selection boards consider the individual's personal efforts at self-improvement. Soldiers who study regularly to improve their technical qualifications, who take MOS-related correspondence courses, and who seek opportunities to serve in the next higher grade and serve well, probably have better prospects for selection.

Finally, a request to your career branch asking why you were not selected for promotion will provide you with a personal evaluation by a Professional Development NCO as to the possible reasons for your nonselection. They will look at your Official Military Personnel File (OMPF), including your official photograph, and attempt to analyze your strengths and weaknesses. The branch does not have access to any information that is not available to the soldier in the field. No one in the career branch can provide the specific reason or reasons you were not selected for promotion. Again, reasons for nonselection are not provided by the promotion board to anyone.

BOOKS

PANZERABWEHRKANONEN 1916-1977 (ANTITANK GUNS 1916-1977) by Franz Kosar. Motorbuch Verlag, Stuttgart. 1978. 195 pages. DM 45.

The development of armored fighting vehicles has been the subject of a vast and exhaustive literature in the United States and Europe. On the other hand the development of antitank weapons has been dealt with more meagerly. A new book, which appeared in West Germany in 1978, now covers the gap insofar as towed antitank guns are concerned. Its author, an Austrain engineer, is well known in German-speaking countries for his fine articles on weapons development which have appeared principally in the Austrian military magazine *Truppendienst.* In addition, he has published a three-volume handbook entitled *Artillerie des 20. Jahrhundrets (Artillery of the 20th Century).* The latter work was originally planned to include a volume on infantry support cannon and towed antitank guns, but now Kosar has used the material on antitank guns for his new book.

Kosar's book opens with a very instructive discussion of the problems of armor penetration and of armor defeating ammunition. Although towed antitank guns no longer play the dominant role they did decades ago, these chapters can be read with profit by all tankers and professional antitankers, since tank guns are essentially antitank guns mounted on armored tracked self-propelled mounts. These chapters are followed by two chapters dealing with the development of antitank defenses in general and antitank guns in particular.

The main part of the book has long chapters, broken down by country, dealing with the development of towed antitank guns and their place in the organizational structure. These chapters deal with the First World War, The Interwar Years, the Second World War, and the Postwar Period. They are followed by 40 pages of technical data on the weapons mentioned in the main text.

The book is profusely illustrated, thus satisfying the demands of the weapons buffs, as well as other readers. Many rare antitank guns are illustrated, such as the German Rheinmentall 37-mm *Tak* with wooden wheel, a picture this reviewer has been searching for for years. The treatment of the development of German antitank guns in World War I is excellent, bringing material not even found in Alfred Muther's standard work *Das Gerat der leichten Artillerie vor, in und nach dem Weltkrieg,* Part II (Berlin: 1932). This subject is still of interest for it gives an instructive example of the response of a modern army to a new weapons system which had been introduced by the enemy.

Of great interest also is Kosar's treatment of the French R&D in squeezebore weapons just before World War II. The author also deserves credit for tracking down information and photographs on the many models of towed antitank guns used and developed by the smaller countries both before and during World War II.

Of note were the French Schneider 47-mm antitank gun *L-44* in Romania, the various Austrian developed guns used in many countries, the variants of the German Rheinmetall *3.7-cm Pak* employed abroad, the Bofors developments and the Romanian 75-mm gun *M-1943 Resita.* An especially interesting treatment is made of the developments in Czechoslovakia. Unfortunately, Kosar, probably due to space limitations, has not been able to cover completely the self-propelled antitank gun developments in these countries, such as the Romanian "Marshal" which incorporated many interesting ideas.

On the critical side the reviewer would like to note Kosar's weakness in regard to the antitank guns used in the Soviet and Finnish armies, a point which also applies to his treatment of these forces in his artillery handbook. It is in part due to the lack of original source material from these countries. For example, the 37-mm gun *Maklen* was far from a superweapon, but rather was the American McClean automatic gun of which 218 arrived in Russia before the Revolution, and were then later mounted on a locally designed towed carriage. It didn't even have a proper armor-piercing round. Also, the total number of 4,000 37-mm Rosenberg and McClean guns is incorrect. Less than 400 were available.

Further, the 85-mm division gun of the Soviet Army was originally known as the *M-1944,* later *D-44.* Models such as the *M-1945* and *M-1943* are unknown. Also, the designation *D-48* applies to a special 85-mm auxiliary-propelled gun, which is actually known as the *SD-44.* Finally, the postwar 100-mm gun *M-1955* (a Western working nomenclature) should not be confused with the later and more effective 100-mm smoothbore high velocity antitank gun *T-12.* Further, it should be noted that the Finnish Army used German *5-cm Pak 38* and *7.5 cm Pak 40* and developed prototypes of a 75-mm antitank gun. All three of these can be seen in military museums in Finland.

In spite of all that has been said in the above paragraph, which reflects the reviewer's specialized research, Kosar's book cannot be too highly recommended. There is nothing like it to the reviewer's knowledge. Hopefully, some publisher in the United States or Great Britain will see fit to bring out a translation.

ARTHUR G. VOLZ
USAI for Advanced Russian and East European Studies

DEFENDERS OF THE CHESAPEAKE: THE STORY OF FORT MONROE by Richard P. Weinert, Jr., and Colonel Robert Arthur. Leeward Publications, Inc. Annapolis, Md. 1979. 293 pages. $14.95.

Fort Monroe has recently been selected for possible closure. Thus, this book is both timely and relevant. Weinert, a historian at the U.S. Army, Training and Doctrine Command, has edited and rearranged Arthur's *History of Fort Monroe* (1930) and updated it.

Weinert has done a masterful job of tying in events at Fort Monroe with the history of American military policies. For example, after the War of 1812, a policy of fortifying key harbors was adopted; Fort Monroe was a result of this policy.

The moat-surrounded fort became the first Artillery School (1824), the first step in the service school system. Later, it would become the Coast Artillery School when the Artillery branch was split into Field and Coast.

Fort Monroe played a key role in the Civil War. It was the base of operations for the Peninsular Campaign, capture of Norfolk, and several amphibious and riverine actions. It also was the scene of the famous declaration by General Benjamin Butler that escaped slaves who reached the safety of the fort were property and "contraband of war." Although less than 100 miles from Richmond, the fort was never attacked by the Confederates. One theory is that Robert E. Lee, who had served at the fort, knew it was impregnable. Weinert discounts this theory and indicates the Confederates never had the opportunity to attack.

With the end of the Civil War, the fort became the prison of Confederate President Jefferson Davis. His treatment there has caused controversy, since many considered him a political prisoner. However, Weinert points out Davis was believed to have been implicated in Lincoln's death and was being held as a criminal.

Activities at the fort following the Civil War characterized the depression of the Army. The authors vividly describe life at the post including barracks and family quarters conditions. Post-war ordnance development made the fort inadequate for coast defense. Toward the end of the century, a modernization program took place. Ten and 12-inch disappearing guns, 12-inch mortars, submarine mines and weapons emplacements outside of the moat were part of the modernization program.

During the Spanish-American War, the fort again served as a base of operations for organizing and shipping out units. WW I found the post engaged in training artillerymen for coast, antiaircraft, and railway artillery units. Fort Monroe in WW II was responsible for protection of Hampton Roads, a minefield and other functions. It served as headquarters of the Chesapeake Bay Sector and again was the scene of coast and antiaircraft artillery training.

The postwar decades saw Fort Monroe as the location of various headquarters—Army Ground Forces, Continental Army Command (CONARC) and now TRADOC. These years also witnessed the departure of the Coast Artillery School.

Wienert has produced a work which accurately portrays the "life" of a fort within the larger framework of the American military policies. This book is very readable for the professional soldier and casual reader as well as the historian. It is well documented and graced with fine photographs. Enough technical detail is provided for those with interest in fortifications and ordnance. Those interested in day-to-day life of soldiers for the last century and a half will find this a rewarding book. *Defenders of the Chesapeake* belongs on every shelf of American military history.

JOSEPH P. FRANKOSKI
Lieutenant Colonel (Ret)

THE SEASONS OF A MAN'S LIFE by Daniel J. Levinson, et al. Ballantine. 1979. $5.95.

The Army, so the saying goes, is more than a job; it's a way of life. And even recruits quickly realize this cliche is true. The Army is one institution that affects virtually every facet of a member's existence. This sometimes complicates the task of identifying a professional book; a work of such clear importance to the development of a professional soldier that it should be read, on or off duty. Occasionally, however, one comes across a multidisciplinary work of general importance that should be read by all professional soldiers.

"The Seasons of a Man's Life", authored principally by Daniel J. Levinson, is just such a book. The principal author, a psychology professor at Yale, and four highly qualified assistants, present the results of their 10-year study of the adult male life cycle.

The systematic nature of the progression from infancy to adolescence has been recognized for some time and studied in considerable depth. The systematic nature of the regression which occurs in old age has also been recognized and studied in some depth. Conversely, the 40 or more years between adolescence and old age have merely been regarded as adulthood and relatively little study of these years undertaken. Dr. Levinson and his assistants sought to establish this developmental perspective on male adulthood by examining the span from the late teens to the late forties. The study group consisted of 40 men between the ages of 35 and 45. The group was further divided by race, occupation, religion and ethnic origin.

The author concludes that there are three distinct eras in the male life cycle, after adolescence. He goes on to identify phases or periods within each of these eras. He believes that the life structure evolves through a sequence of alternating periods of stability and change. It is during these periods of change that one must make the choices upon which one's future is built. Surprisingly little variation in the age at which each begins and ends was noted.

Some of this may sound dull, but it is not. This is not a dry clinical report. The narrative is smooth and written in layman's language. The author's data and conclusions are presented by relating the biographies of one man from each occupation represented in the group.

The Seasons of a Man's Life is not another "How to . . ." book. It will not tell the 21-year old sergeant or 28-year old captain that he will be happy if he stays in or gets out of the Army. Why then should a professional soldier read this book? To gain insights. To understand that we and the men that we lead all go throught much the same, often agonizing, growing process. As members of a profession which places a high premium on effective leadership, this book offers the opportunity to gain and understanding of the human condition that may result in more effective leadership.

L. ERICK OHLSSON
Major
MILPERCEN

THE KILLING GROUND: BATTLE OF THE FALAISE GAP, by James Lucas and James Barker. B. T. Basford, Ltd. of London. August 1978. 176 pages. $5.95.

"The 84th Corps, like the rest of the German Forces in Normandy, was bleeding to death." This brief statement enlightens the reader on what is to come in this very exciting book.

The Killing Ground paints a vivid picture by discussing important areas that influence the coming battle. The first of these was the allied effort in which the authors discuss activities of the allied forces prior to the invasion of Normandy. They also deal shortly with the activities of the U.S. and Great Britain between 1942 and 1945. The authors conclude that the island nation of Great Britain could have had no better war-time ally than the United States during this dark period of their nation's history.

In the following chapters the authors address in detail the growth of "The Allied Invasion Plan, the Allied Armies Themselves, the German Army," the influence of Hitler on his generals and his devastating effects on the tactical concepts to be used by these officers in the Falaise area.

One of the more important areas discussed is that of the terrain, tactics, and air power. The authors could have expounded more on the terrain and could have helped the reader understand the future problems which were encountered by both allied armies, as well as the German Army, through the use of detailed maps of the area. The authors do point out that one of the most decisive roles played during the battle was that of the Allied Air Force, which was able to maintain air superiority ano was never seriously challenged by the German Air Force. Through the use of air power the allies were able to execute a crushing defeat of the German Army when it was moving along the roads of Normandy.

The short chapter on the personalities involved in the conflict is extremely well written. The authors sketch a brief history of each of the commanders of both forces with special emphasis on the German Army.

The concluding chapters address the

battle itself, thereby allowing *The Killing Ground* to evolve into an exciting look at the German experience during this battle. The authors have drawn heavily on German sources and materials. Using these sources they have attempted to describe the actions of the combat forces down to platoon level. *The Killing Ground* is an in-depth look at the attempt by the German Army to extricate itself from the Falaise pocket, which the authors ably depict as "The Killing Ground."

The book is well written but one glaring drawback must be noted. Maps which would have enabled the reader to understand the situation were either not used, or when used were in the wrong chapters, thus forcing the reader to look for a specific map to better understand the battle and actions taking place.

The Killing Ground gives the reader a valuable insight into the problems encountered by the German Army and their attempt to solve them. The results, as history has pointed out, were disasterous to them.

MAJOR RONNIE NALL
USAARMS

Recongnition Quiz Answers

1) CZECHOSLOVAKIAN *AM-50* TRUCK-LAUNCHED BRIDGE (mounted on *Tatra 813* 8x8 trucks. similar to Soviet *TMM* bridge.)

2) ISRAELI *MERKAVA (CHARIOT)* MBT (105-mm gun—same as NATO stantard—thermal shroud, front-mounted Continental AVDS-1790 powerpack, welded turret, suspension derived from *Centurian/Chieftain* technology, rear compartment)

3) SOVIET *M-1974* 122-mm SP HOWITZER (chassis based on *PT-76* with seven roadwheels, drive sprocket at front, turret at rear of hull, double baffle muzzle brake, bore evacuator)

4) SOVIET *T-54* TANK AND *ZSU-23-4* SP AA VEHICLE (*T-54* has 100-mm gun, muzzle bore evacuator,and space between first and second roadwheels. *ZSU-23-4* has radar dish, four 23-mm cannon, and distinctive sound of 4,000 round-per-minute firing rate)

5) SOVIET *BRDM-2RKH* CBR RECON AND MARKING VEHICLE and *TMS-65* DECON SPRAYER *(BRDM-2*, also known as *BTR-4OPB*, mounts turret with 14.5-mm and 7.62-mm guns. *TMS-65* is a *Ural-375E* 6x6 truck chassis with a modified *VK-1F* jet engine mounted on the rear. Two 1,500-liter tanks behind the cab contain fuel and decontaminant solution)

6) SOUTH KOREN *M-47* TANK (elongated turret bustle, high cupola, bore evacuator near muzzle, muffler and exhaust pipes mounted on fender) *This photo should have appeared in the July-August QUIZ as Photo 5. Photos 2 and 4 were also transposed in some copies. Editor.*

LES VEHICULES BLINDEES FRANCAIS 1945-1977 by Pierre Touzin, Editions E.P.A. 1978. 279 pages.

Editions E.P.A., which has already published other specialized works on French cars, fire engines, and the workhorse of World War II—the GMC 2½-ton truck—now brings us French armored vehicles from 1945 to 1977. The author, Pierre Touzin, has taken 10 years to complete this definitive study of this 30-year period. He has had the utmost cooperation of the French government and the many companies engaged in military production.

Starting with the national defense policy which requires both heavy equipment for a major war in Europe and light formations for civil disturbances or employment in the Third World, M. Touzin describes in detail the development cycles of the light, medium, and heavy tanks. Through historical example he gives one of the best presentations of the wheel versus track argument, a debate which is touched upon every time developers meet. His study groups material under the type force in which it is found: Heavy European Forces, Nuclear Forces, Light Interventation Forces, and Foreign Sales. Within each chapter he subgroups each type of vehicle and shows both experimental and production models. Indeed the highlight of this book is the almost 400 high-quality pictures and drawings, some of which have not been seen by the public prior to this publication.

The historian and combat developers, who up to now may have been unaware of the genius of French military engineers, will become cognizant of the impact the French continue to play in innovations and technological breakthrough in military hardware. One will recognize the technology in other countries' hardware.

While in French, the book is so well written that most with only high school French will profit from the text. For those with no French the book is organized in such a manner, with pictures and vehicle details, that they too will enjoy this study.

C. A. MITCHELL
Colonel
C&S Department

ARMOR *Magazine*

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Armor Magazine Index—Volume LXXXVIII, 1979

TITLES

AUTHORS

BOOKS

BRIEFS

DEPARTMENTS

NOTES

PROFESSIONAL THOUGHTS

☆U.S. GOVERNMENT PRINTING OFFICE: 1979—657-046/4

General Jacob L. Devers
1887-1979

On August 4th, 1941, Major General Jacob L. Devers, then the youngest major general in the Army's land forces, assumed command of the Armored Force at Fort Knox. He succeeded Major General Adna R. Chaffee, whom he named "The Father of the American Armored Force."

Continuing the ground work of General Chaffee, General Devers brought with him a fresh concept of organization and operations, and his assignment was not based simply on his availability at the time. He had been selected personally by General George C. Marshall, Army Chief of Staff, who wanted to place an expert in organization and administration as well as in firepower in control of the emerging, highly mechanized, and mobile tank force.

General Devers' boundless energy coupled with a keen mind and outstanding organizational ability proved equal to the task of developing and expanding the Armored Force far beyond the concepts of the initial planners. During his command, Fort Knox and Armor grew from a struggling force of two armored divisions, fashioned from extant organizations throughout the Army, to a formidable force of 16 divisions and 63 separate tank battalions.

One of General Devers' organizational innovations at Fort Knox was the addition of light aircraft to armored field artillery battalions to increase the mobility of firepower of the armored division artillery. In later years, as Commander, Army Ground Forces, he continued his pioneering in force development when he directed the development and organization of helicopter-borne units in the post World War II Army.

When expansion of the force made it impractical to continue control from Fort Knox, General Devers was reassigned and command and control passed to the respective army and corps in which the units were located.

General Devers had done his task well, his guidance and leadership had met the challenge. His next assignment was to prepare the United States Forces for the invasion of the European continent and he departed for England to establish the Supreme Headquarters, Allied Powers Europe.

General Devers' earlier service following his graduation from the US Military Academy in 1905 and commissioning as a second lieutenant of field artillery, included assignments in Hawaii, France, and Germany during the early 1900s. He subsequently was graduated from the Command and General Staff College and the Army War College and continued his service with artillery units in the United States until 1939, when he became Chief of Staff of the Panama Canal Department. Following that assignment and his service at Fort Knox, General Devers served successively as Commander of US Forces in the European Theater of Operations and North African Theater of Operations. He was later Deputy Commander-in-Chief, Allied Force Headquarters, and Deputy Supreme Allied Commander, Mediterranean Theater of Operations. He also commanded the 6th and 12th Army Groups, and following World War II, he was named Commander of the Army Ground Forces.

General Devers retired in September 1949 and made his home in the Washington, D.C. area until his death on October 15, 1979. Interment was in Arlington National Cemetery on October 19, 1979.

Coming in ARMOR

"TANK—A WAR MACHINE FOR LAND COMBAT"

In the first of a series of articles, Joseph E. Backofen briefly discusses the development of the tank as a weapons system that combines firepower, protection, and mobility.

"MONEY IN THE TRENCHES"

Colonel John R. Borgman looks at costs facing a unit commander, and some of the problems of stretching a limited amount of money to complete the mission.

"HOW READY CAN THE RESERVES BE?"

Many factors need to be considered when judging Reserve Component readiness, contends Lieutenant Colonel Arthur T. Carey. He believes that the potential for readiness depends on manpower, equipment, available time, and training.

"GAMES SOLDIERS PLAY"

Battle simulation games offer a low-cost, high-yield way to practice procedures and techniques before committing resources to field training exercises. Major James A. Probsdorfer takes a look at the games currently available and how they can be used.

"SHORT WAR SYNDROME"

In a historical context, Major Kelly A. Morgan examines the pitfalls of planning for a short war and counting on a negotiated settlement.

"TRAINING: ONE WAY"

Lieutenant Colonel Robert R. Hardiman discusses how one battalion trained. "We told our soldiers what was expected, gave them the 'what with,' and then demanded that they rise to the standards set," he says in closing.