ARMOR

january-february 1978

Soviet Armor

US Army Armor School

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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

An article about the development of Soviet armor and recent photographs and descriptive data pertaining to the Soviet T-72 main battle tank are presented on pages 30 through 36. Cover by Karen Randall

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ARMOR

the Magazine of Mobile Warfare

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LETTERS

"The Profession of Arms"

Dear Sir:

A friend has been so kind as to furnish me with a copy of your recent issue in which you reprinted with nice praise an article of mine in the old *Cavalry Journal* of 1922, which later appeared as a chapter in my 1924 book, "The Profession of Arms." I am appreciative of your attention.

Without wishing to appear too critical and unappreciative of the attention, I do wish to point out that I was a regular army officer in the Infantry, well known for this and a series of other books and articles in *The Infantry Journal* and the *Military Engineer.* I retired as a full colonel in 1948 and took up a professorship at the George Washington University here. I cannot understand how you failed to find my name in the "Army Register" or in "Who's Who in America" (until they dropped me as I passed the age of 80). But these matters are entirely immaterial, and my appreciation of your appreciation is great.

ELBRIDGE COLBY
Colonel (Retired), Infantry
Washington, D.C. 20007

And we, Sir, are honored that you wrote to us. The book review section from our July 1924 issue is reprinted in part in this issue's Book Review Section. —*ED.*

Command Vehicles

Dear Sir:

I am writing in response to the article "Should a Captain of Cavalry Command from his Horse?" which appeared in the July-August 1977 edition of *ARMOR.* I enjoyed this article very much and was impressed by Captain Magyera's presentation of the "command facts of life" relative to the location of the troop commander during operations, and the type of vehicle he should employ. I agree with his conclusions.

At one stage of his presentation, CPT Magyera referred to Field Marshal Rommel's statement that the commander should command from the *Schwerpunct.* The fact that CPT Magyera could not find reference to any vehicle known as the "SCHWERPUNCT" is understandable. *Schwerpunct,* as used by Rommel, means "the point of main effort." That is a concept that has been, or should be, basic to any doctrine of armored operations. However, to lead from "the point of main effort" a commander must have the proper vehicle. I feel that CPT Magyera has hit upon the proper solution, given the equipment currently available. It is my hope that those persons currently in a position to effect such a change in TOE have taken CPT Magyera's arguments into consideration.

E. W. HENSLEY III
Director, Washington
Institute of Military Research
Wenatchee, WA 98801

Dear Sir:

The article in the Professional Thoughts section of the July-August 1977 issue of *ARMOR* entitled "Should a Captain of Cavalry Command from his Horse?" by Captain Stephen N. Magyera is a subject that is not unanimously agreed upon by armor officers of my acquaintance. Once the battle was engaged, Napoleon often commanded from the sitting position, as did General Grant. Wellington commanded from his horse during the battle of Waterloo and his troops held the field; so I suppose this is the correct method. General MacArthur, when commanding an infantry brigade of the 42d Infantry Division during World War I led his troops over the top in the attack and therefore commanded by leading. The point, I believe, is not what the commander commands from, but where the commander is located during the course of battle. Field Marshal Rommel's comment "at the critical point" appears to withstand the test of reason.

During the summer months of the last few years, I became acquainted with Master Sergeant Manningsly, U.S. Army Retired, who is employed at Fort Drum, New York. MSG Manningsly was assigned to the 37th Tank Battalion, 4th Armored Division during the European Campaign. One day I asked him from what location or position did Colonel Abrams command the 37th Tank Battalion during combat operations. His reply was comprised of two words, "lead tank."

GEORGE G. CHAPMAN
Major, Armor, USAR
Des Plaines, IL 60016

M-60A3 Tank Program

Dear Sir:

I read with qualified satisfaction the article *"M-60A3* Tank Program" by Colonel Robert E. Butler in the July-August 1977 issue. However, I feel obliged to call attention to two *critical* points that seem to have been overlooked.

The Trinity definition of AFV's, particularly MBT's, is firepower, protection, and mobility. I commend Colonel Butler and his team for the impressive improvements in mobility—power pack, suspension, and track.

Regarding protection: track skirts, the new cupola, and remote-control commanders' automatic weapon, etc. are welcome, if long overdue, improvements. As for firepower, the new fire controls are also welcome. However, I am literally shocked over two glaring deficiencies.

- The omission of add-on *Chobham* armor, at least on the glacis, mantlet, and turret. By COL Butler's own admission, the 1973 October War showed most hits were above the turret ring. I'm certain hull fronts took a beating too.
- The omission of either the British new-technology or the German 120-mm. gun. I know the *M-60* turret ring can take the German 120-mm. smoothbore, and it can probably take the new British 120-mm. rifled gun. I realize my concern may be premature, as both of these main guns are still under development and testing. But, for God's sake, let's not have a reprise of the *M-4* of World War II. Then, at least, we were fortunate in having overwhelming superiority in numbers. While the *M-4 Shermans* could take on the *Mark III's* and *IV's,* they could not tackle the *Panthers* and *Tigers.*

So, history repeats! The 105-mm. can take on the *T-62,* but I don't believe it can effectively deal with the *T-72,* with its beautifully angled glacis and small, ballistically shaped turret, plus its new, revolutionary main gun. Further, it's only a matter of time until the Russians steal the "highly classified" *Chobham* armor, if they haven't already done so.

Give the *M-60A3 Chobham* armor and a new 120-mm. main gun. Then, and only then, will we have technical equality or superiority! With the new suspension and power pack, the tank can certainly take the extra weight.

As General Donn Starry wrote in *ARMOR* several months ago, the United States is the only major tank producing nation in the world that never designed a main gun. So be it. Let's buy British or German. But let's not repeat the horror of *Shermans* vs. *Panthers* and *Tigers!*

MILTON H. SHERMAN
White Plains, NY 10605

Recognition Quiz

Dear Sir:

The Recognition Quiz on page 30 of the July-August 1977 issue shows a Soviet tank, in photograph number 1, which you list as a *T-62*. Unless my eyes deceive me, I believe the bore evacuator is located on the end of the gun tube on the vehicle shown, rather than towards the center of the gun. This indicator, together with the irregular spacing of the road wheels, would seem to indicate that the vehicle in question is a *T-54/55* rather than a *T-62*.

Am I right, or do my eyes require calibration?

ALEXANDER M. MILLER
Captain, Armor
Fort Knox, KY 40121

Dear Captain Miller:

We do not believe that your eyes require calibration, but then we're not all-together sure that you are right, either. After close examination of the original photo from which the recognition quiz was taken, we've decided to use better models in the future. —*ED.*

Fifth Crewman

Dear Sir:

After reading *ARMOR's* July-August 1977 letter's column, I read one item which lead me to believe that the idea of a 5th tank crewman needs to be explained to the Armor population in better detail.

If I remember correctly, the original reason for the idea was to have a ready-trained replacement available, when a member of the regular four-man crew is absent.

Wouldn't it solve the problem of constant absences of crew members caused by details, guard, and other non-armor related work by developing and forming a professional branch of the service, such as a security or detail unit, to perform these jobs instead of interfering with the training and performance of our now, four-man tank crew?

JEFFREY C. HARPER
Staff Sergeant, Master Gunner
APO NY 09452

Winning the "First Battle"

Dear Sir:

In recent months there have been many fine articles in *ARMOR* on the need to fight, and win, the "first battle" of the next war. Emphasis seems to be on short, very sharp campaigns characterized by high material and personnel casualties as well as very high munitions consumption. As evidence for such planning the 1973 October War is often cited. Such articles have been very well taken and, to a former Navy type, seem appropriate. However, after doing some re-reading of military history I wish to both sound a warning and ask a question. What happens when the battle or campaign that starts the war is followed by the next battle or battles? Could we not be preparing to win a battle and lose the war?

Take a look at history in general, but most particulary the major wars of this century. Opening campaigns are characterized by fairly rapid movements of large and powerful forces that *almost,* but not quite, totally knock out the opponent. Each succeeding war shows a much greater rate and scale of munitions and equipment use. Yet, *endurance* as well as fire power/mobility are the ingredients of eventual victory. In other words, prepare for that first battle. But remember, that there are many battles to a war. One has to be able to fight the *whole* war, not just one battle or campaign. The "lesson" of the October War is that a *campaign* can be very violent, but the war (in this case) can last a very long time (almost 30 years).

I do not mean to lecture you who have much more expertise and training than I do. I merely wish to point out that in concentrating on the "trees" of the first series of battles in the next war the "forest" that is the war itself may be overlooked. What happens when the Soviet Armies are stopped in Central Europe? Would Norway and Denmark be overrun, or Turkey invaded, or a cordon of attack boats (SSN and diesel subs) cut our Navy and merchant ships to pieces when they attempt to replenish fuel, men, and munitons? Plan a 60-day war with "options" for up to a year's extension. Then maybe we *can* win the first battle *and* the war.

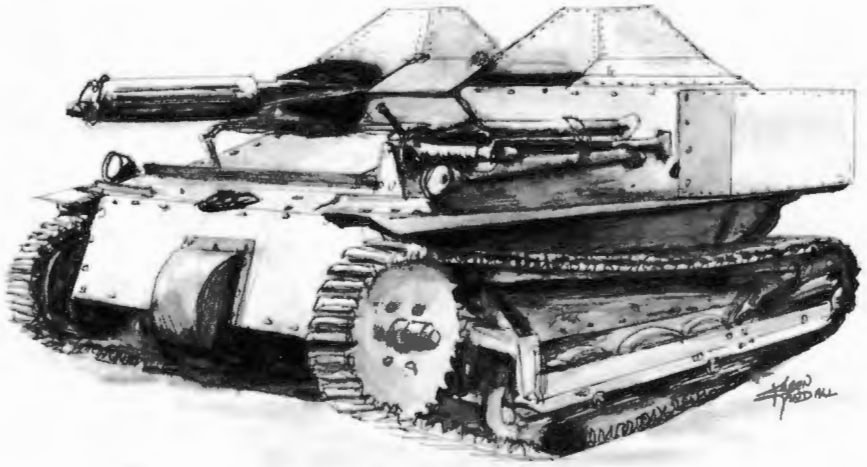
GORDON J. DOUGLAS, JR.
Naval Architect, GS-9
LaHabra, CA 90631

Recognition Quiz Answers

Dear Sir:

In the sub-article "Recognition Quiz Answers" (July-August 1977, p. 73) you stated the tank was a modified *T-55*. The correct reporting name according to the using country is a *TI-67,* and the main gun is an *L7A1* 105-mm. made in England. The tank actually appears to be a *T-54*. I state this because of what appears to be a turret ventilator located just forward of the commanders hatch.

BARRY W. GRAVES
Staff Sergeant
Washington, D.C. 20310



Carden-Lloyd Tractor Tankette

Reinventing the Wheel

Dear Sir:

Having been interested in the design of tanks for some 30 years, I look forward to my copy of *ARMOR,* and its articles concerning AFV designs, however Captain John Lee's article in the March-April issue made me laugh and then a little mad. It brought to mind the Carden-Lloyd tractor tankette with headcovers and light and heavy machineguns circa 1936. I hope our readers know the Carden Lloyd story.

I too remember *MIG-15's* versus *L-19's* and *F-4U* Corsairs in Korea in 1950-1953 and agree with Roy L. Wilson's letter in the September-October issue *ARMOR* 1977.

ROBERT F. SIMON
Ridgewood, NY 11227 ▲

THE COMMANDER'S HATCH

MG John W. McEnery

Commandant

U.S. Army Armor School

Join the Center Team

The purpose of this article is, unabashedly, to encourage many of you to seek assignment to the Armor Center.

For the Armor officer and noncommissioned officer, the Armor Center offers a unique combination of diversity of Armor jobs that can be found here. It has been said in the past that assignment to a Combat Arms Center is not stimulating, but anyone who has been involved in the Training and Doctrine Command (TRADOC) in recent years knows that this is far from the case and that all of our Centers are dynamic and alive. This is particularly true at the Armor Center.

The Army and the world have recognized that the tank is the single most important weapon system on the battlefield. Confirmation of this was the Chief of Staff's recent approval of the Tank Force Management Study wherein a number of changes are being made to enhance the tank force. The Armor Center stands at the center of these changes.

With the stabilization of tours that has now taken place and which undoubtedly will increase, officers and noncommissioned officers can expect to spend at least 2 and probably 3 or more years at one location in CONUS. The Armor Center with its diversity offers the solid possibility of serving both with troops and in other exciting jobs such as with the Armor School, Combat Developments, or with the Armor Test Board. There is a strong possibility that an officer could serve both in his primary and his secondary specialty in one tour at the Armor Center.

As for troop duty, there are three brigades at Fort Knox. The 4th Training Brigade, which conducts basic combat training, offers very satisfying jobs within its five battalions and 22 companies. In these jobs you would be transforming civilians into soldiers in only 8 weeks. In the 1st Training Brigade, you would be turning the citizen into a skilled tanker or cavalryman under the new Basic Armor Training Program and having the satisfaction of knowing that you are making a very significant contribution to the readiness of our Army. The 194th Armored Brigade, with over 6,000 troops in eight battalions, is the largest brigade in the Army. Included are two tank battalions. There you would be involved with unit readiness, field training exercises here and away from the Armor Center, participating in support of the Armor School, and participating in exciting tests with the Armor Engineer Board.

To give you an insight into some of the types of jobs at the Armor Center, a few of the officer jobs that are coming vacant this summer are listed at right. These are but a mere sample and the job descriptions list only a fraction of the duties.

The jobs shown are just a fraction of the total and have been selected from the middle-management level. Space limitations preclude listing a larger sample, including those from the lower and higher level positions.

In summary, the Armor Center is a dynamic and satisfying place to work as well as a great place to live. I hope the best of you will seek to join the Center Team.

ARMOR SCHOOL

Chief, Tank Branch	**Supervises Armor training developments, doctrine, and tactics.**
Assistant Director, Weapons Department	**Resource manager, Weapons Department. Member and chairman of American, British, Canadian, and Australian Information Exchange Group on tank gunnery. Armor School point of contact on design and development of tank gunnery ranges.**
Chief, Individual Design Branch	**Responsible for design of institutional and extension courses, for preparation of soldier's manuals and skill qualification tests. Develops cost and training effectiveness analyses.**

COMBAT DEVELOPMENTS

Chief, Armor Developments Branch	**Writes the Armor Development Plan which provides guidance to Research and Development community on Armor requirements. Prepares annual input to TRADOC's affordability program. Provides Armor Center input to major studies such as Division Restructuring, Army Requirements for the Combat Structure of the Army study III, *Hellfire* Cost Operational Effectiveness Analysis, and the Stand-Off Target Acquisition System.**
Project Officer, Tank Systems Branch	**TRADOC representative to the Main Armament Evaluation Working Group. Analysis/validation of *XM-1* requirements and new family of tank kinetic-energy projectiles.**

ARMOR ENGINEER BOARD

Operations Officer, Combat Vehicle Test	**Responsible for daily management of Seating Position Test, High Mobility and Agility Test (chassis and weapons system), and High Survivability Test Vehicle—Light with budget of about $25-million dollars.**
Project Officer, Tank System Branch	**Plans and executes test projects. Deals frequently with a number of outside agencies, including TRADOC, Development and Readiness Command, Project Managers Offices, and research laboratories.**

FORGING THE THUNDERBOLT

Test Measure and Diagnostic Equipment (TMDE)

Talk to anyone in the maintenance field about TMDE and the conversation immediately centers around the Low-Voltage Circuit Tester (LVCT).

Maintenance officers, motor sergeants, and unit mechanics will tell you that the LVCT is seldom used. Why does this piece of equipment stay on the shelf and collect dust instead of being used for the purpose it was designed? The answer is obvious and justified.

Maintenance personnel hesitate to use the LVCT because they fear it will be damaged through improper use. This fear exists because there are so many different models of the LVCT's in the inventory and maintenance personnel are unable to remain proficient on them all. Although they all do the same job, each model requires special knowledge of how it is to be used. It is very easy to damage the LVCT through improper hook-up. Thus, instead of taking a chance, the mechanic lets it remain on the shelf and uses other means for accomplishing his tasks. The commander can eliminate this fear through a simple educational process. It is imperative that mechanics of today's modern Army realize that they must rely on proper references as an aid in accomplishing their mission. We must provide the mechanic with the proper references and insure that he uses them when performing tasks. TM 9-4910-456-14, dated 15 October 1971, is an excellent TM containing simple instructions for performing tests (troubleshooting procedures) with the LVCT. The Operator's Manual issued with the LVCT also contains specific information on its use. Each model is different in appearance, but they all contain the same components and accomplish identical tasks.

The two illustrations are representative of what is encountered in the field by having different models of the LVCT. Figure 1 shows voltmeter on the right, ammeter on the left; figure 2 shows voltmeter on the left, ammeter on the right. The figures also show ammeter binding posts in different locations. Both figures show the same test being performed, a "battery load test." A close analysis of each illustration will reveal that the same components are in use and the electrical connections to the batteries are identical. All tests remain essentially the same, regardless of the configuration of the LVCT.

There are a few basic rules which, if followed, will prevent damage:

- Observe polarity when connecting the LVCT to the equipment under test.
- Make connections to the LVCT before making connections to equipment under test.
- Make the negative lead connection last to complete the power connection.
- Use a range of sufficient value for each test. If the value is not known, or if there is doubt, start with the highest range of the meter and work down the ranges for an accurate reading.
- Observe and follow safety precautions when using the loadbank.
- Make disconnections in reverse order with all switches and controls in OFF position. The first disconnection will always be the negative lead that completes the power connection.

By following simple directions in the TM, which shows schematic diagrams of each test to be performed, and observing the six basic rules above, the mechanic should be able to use the LVCT in an effective manner, without fear of damage to the equipment.

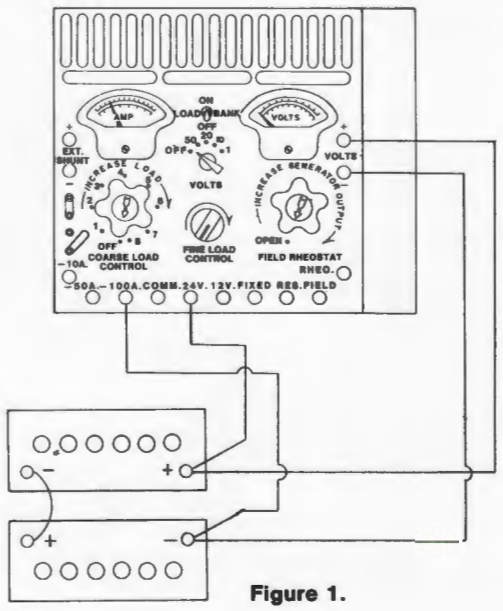


Figure 1.

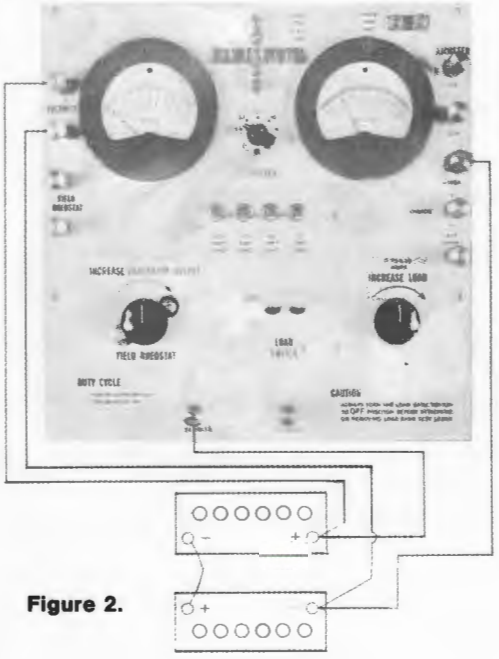
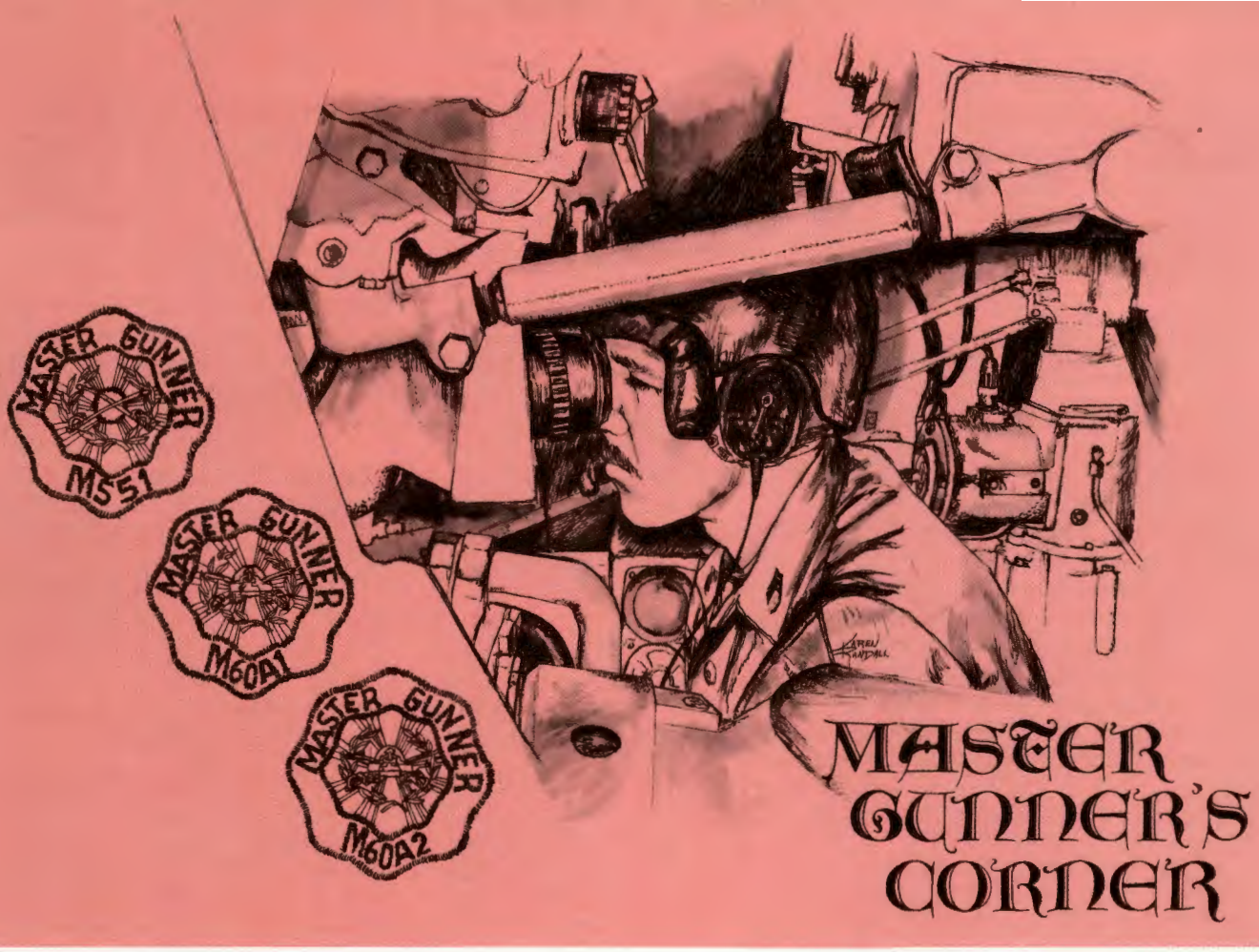


Figure 2.



MASTER GUNNER'S CORNER

WHAT YOUR MASTER GUNNER CAN DO FOR YOU

In June 1978 we will reach our goal of having a Master Gunner in each armor and armored cavalry unit. We realize that there are imbalances from unit to unit, but basically the Master Gunner Course will have fielded the first contingent of Master Gunners. Our next task will be to maintain the quality of Master Gunners produced, upgrade the instruction, and most importantly, to keep new unit commanders apprised of just what the Master Gunner can do and will do for their units' gunnery program.

The concept of the Master Gunner is not an original concept—the British have used the Master Gunner concept with a great deal of success for a number of years. Taking that concept and adapting it to U.S. Army needs was done in 1975 and tested in three pilot courses (*M-60A1, M-551,* and *M-60A2*) for further evaluation. The results of the pilot courses were assimilated into the present course, which is designed to train our best armor and armored cavalry NCO's as Master Gunners to return to their units and assist the commander in preparing, implementing, and maintaining a continually sound gunnery training program. To assist the commander in that task, Master Gunner instruction encompasses three areas: 35 percent Turret Maintenance; 35 percent Gunnery; and 30 percent "How To Train." The student receives approximately 500 hours of instruction. During maintenance instruction the Master Gunner acquires essentially turret mechanic skills that make him a potential supervisor of unit turret mechanics during quarterly services, thus placing the needed emphasis on the turret.

The gunnery segment emphasizes advanced gunnery techniques, crew skills, and necessary crew standards to negotiate the tank tables.

"How To Train" is oriented on designing an annual tank gunnery program and laying out ranges. We use the annual gunnery program as the vehicle to teach the Master Gunners the problems associated with developing a workable and realistic continuing tank gunnery program. Additionally, he learns to solve gunnery training problems, set up diagnostic tests for incoming personnel, and successfully implement his ideas using the assets available in his unit.

Commanders, the Master Gunner was trained to help you drive your tank gunnery program. Let him do his job and I'm sure you will be pleased with the impact his talents, initiative, and leadership will have on the training and maintenance which ultimately results in readiness in your unit.

POINTS OF CONTACT FOR ARMY READINESS REGIONS

Several issues ago in the Master Gunner's Corner, we announced the establishment of a working point-of-contact for all active armor and armored cavalry units within the Master Gunner Branch. As of September, instructors who are assigned as institutional advisors have taken on the additional responsibility for liaison with each Army Readiness Region. (See accompanying table.) The sole purpose of the extension of the point of contact system is to provide Reserve Component armor units a direct link with the U.S. Army Armor School gunnery program.

Readiness Region Points Of Contact

REGION	PRIMARY	ALTERNATE
I	SSG Cash	SFC Fairfax
II	SFC Telfare	SFC Lilly
III	SFC Eldridge	SSG Harrell
IV	SFC Restrepo	SFC Eldridge
V	SFC Fairfax	SFC Dular
VI	SFC Lilly	SFC Restrepo
VII	SFC Dular	SSG Cash
VIII	SFC Serna	SFC Telfare
IX	SSG Harrell	SFC Serna

To date, three working visits have been made to Reserve Component units in San Diego, California; Camp Shelby, Mississippi; and 1st Bn., 195th Armor, Nebraska Army National Guard. Each of these visits involved range surveys, training management assistance, update briefings on tank gunnery training and doctrine, and an explanation of the role of the Master Gunner in a unit. During the visits we have been encouraging qualified Reserve Component service members (SM) to attend the Master Gunner Course, and have recommended to FORSCOM that two slots be allocated for Reserve Component students in each class, starting 1 January 1978. SFC Edwin L. Bowe of the 157th Brigade in Pennsylvania is attending the *M-60A1* Master Gunner Course and will be the first reserve component SM to be qualified as a Master Gunner. We hope that his attendance will encourage others to follow.

CONVERSION TRAINING PROGRAM

Plans to remove the *M-551* from the European inventory have caused concern among the *M-551* Master Gunners with ASI C5. At the request of the 7th Army Training Command (ATC), the Master Gunner Branch has developed a conversion training program of instruction. The approved POI consists of only those maintenance and gunnery subjects which are strictly *M-60A1* specific. The Weapons Department will send a three-man training team to 7 ATC to conduct the conversion training. Total training time is to take 6 weeks.

USAREUR MASTER GUNNER SEMINAR

During the period 31 Oct - 3 Nov 77, representatives from the Master Gunner Branch of the Weapons Department had the opportunity to participate in the first USAREUR Master Gunner Seminar. The seminar was hosted by 7th Army Training Command (ATC) at the Combined-Arms Training School, Vilseck. The purpose of the conference was to provide a forum for exchange of information between USAREUR Master Gunners and the Armor School, to update Master Gunners on new gunnery training developments in USAREUR and at the Armor School, and to better acquaint 7 ATC and the Armor School with the problems of tank gunnery training in USAREUR tank battalions.

The Master Gunner Seminar served several valuable purposes. First, it gave 7 ATC an opportunity to brief and discuss with the executors, 7 ATC's tank gunnery training program and standards. A clear understanding of the standard was the positive result of those discussions and briefings. Second, it surfaced the real problem of nonutilization of Master Gunners at company/troop level. Those Master Gunners serving as platoon sergeants have a difficult task. To do his job as a Master Gunner he must have the support of his unit commander. Several solutions to that problem are currently being studied by the Armor School. However, until such time as a solution is formulated, unit commanders must evaluate the worth of his Master Gunner to his unit's gunnery program and use that highly trained soldier to the best of his abilities, and the best interest of his unit.

From the Armor School point of view, the USAREUR Master Gunner Seminar was an unqualified success. The exchange of thoughts, ideas, and training programs will only enhance USAREUR's total tank forces training effectiveness. We heartily support the continuation of similar seminars.

CURTIS W. SEILER
Captain, Armor
Chief, Master Gunner Branch

CONDITIONS THAT MAY AFFECT THE LASER RANGEFINDER *AN/VSS-1* ON THE *M-60A2*

During the recent firings of the *M-60A2* at Fort Knox by Master Gunners, it was noted on several occasions that the laser rangefinder would not properly range on a flat-black target at a range of 1,960 meters. Even though the rangefinder was unable to obtain the range on that type of target, it was able to obtain the range to the 2 x 4 supports of the target.

The atmospheric condition at the time of the failure was light ground haze. This fact plus the fact that we were ranging on a flat-back target with low reflectivity (below a 3% micron region) were the reasons for not getting a proper range—sufficient energy was not being returned to the receiver of the *AN/VVS-1* laser rangefinder.

The criteria for the laser receiver sensitivity and transmitter energy was dictated by the maximum range requirement of the system of approximately 4,000 meters. Targets expected in a tactical environment and nominal atmospheric conditions, have reflectivities normally around 8%. In addition, there is increased sensitivity designed into the receiver/transmitter unit to compensate for some degradation in the transmitter's and receiver's sensitivity.

When both the targets reflectivity and the visibility conditions are significantly degraded, such as flat-black targets and ground haze, it is possible for the design capabilities of the laser rangefinder *AN/VVS-1* to be exceeded.

The system cannot distinguish between colors of targets, but the reflectivity of these colors can affect the range results. The reflectivity of the target is of some concern only when it is reduced to 3% or less, and then only under poor or adverse conditions. The combination of these conditions will normally exceed the designed capabilities of the system. Therefore, care should be used in the type of materials used in target construction when conducting tank gunnery or laser training for vehicles equipped with *AN/VVS-1* laser rangefinders.

GARY L. ELDRIDGE
Sergeant First Class, Master Gunner

Gunner – Take Over!

Gunner—Sabot—Tank—Driver move out—Gunner take over. What you have just read is the easiest and most effective way to move from a turret-down to a hull-down firing position.

For several years tank commanders have asked "How can we move from a turret-down to a hull-down firing position and still be able to engage a target without presenting ourselves as a target?" In April 1977, the Armor School and Master Gunner Branch made a film called "Battle Drill—Occupying Firing Positions" which shows in detail how this can be done.

It is almost impossible for a tank commander standing in the tank commander's (TC) hatch to judge how far his tank must move forward before the gunner can identify and engage a target. So why not allow the gunner to make this decision? When the gunner hears the TC announce, *Gunner take over,* he will observe through the telescope, since it is on a direct line with the main gun. The gunner now has the responsibility for controlling the driver and allowing him to move forward the minimum distance until the gunner can identify and engage the target. Once the target can be engaged the gunner will tell the driver to stop, and then engage the target, using battlesight techniques if possible.

Now it's time for the tank commander to take back control of his tank. He will observe the target and make the decision for the gunner to continue to shoot or to cease fire. Once the target is destroyed he will announce, *Target. Cease Fire. Driver back up.* The driver will back up until told to stop by the TC, thus putting the tank back into a turret-down position.

This battle drill requires extensive training in *all* tank crews to be able to move into and out of the firing positions with the least amount of time and effort.

The film mentioned earlier is being distributed to all divisions.

GARY M. HARRELL
Staff Sergeant, Master Gunner
Fort Knox, KY 40121

LEOPARD 2AV

Leopard 2 prototype with 120-mm. smooth-bore gun.

Leopard 2 AV, the latest battle tank developed in the Federal Republic of Germany.

by

Richard M. Ogorkiewicz

Leopard 2 AV has already attracted much attention as the first battle tank developed outside the United States to be evaluated in competition with a U.S. design. However, it deserves at least as much attention on its own account, because of its excellent design and its extensive development background.

Development Background

The design of *Leopard 2 AV* stems from studies initiated 12 years ago. At the time, the Federal Republic of Germany (FRG) was collaborating with the United States in the joint development of what was then the world's most advanced battle tank, the *MBT-70*. However, the FRG did not share the contemporary U.S. enthusiasm for guided missile systems as tank armament. As a result, they began work in 1967 on an alternative, more conventional type of tank armed with a high-velocity, smooth-bore gun instead of the 152-mm. gun/missile launcher adopted for the *MBT-70*.

Early Leopard 2 prototype with 105-mm. moving at high speed during trials.

The idea of high-velocity, smooth-bore tank guns was not new. In fact, the U.S. Army had experimented with such guns in the fifties. Unfortunately, as with other U.S. tank projects, too much was expected of the early smooth-bore guns and their development was abandoned before it had gone sufficiently far, in spite of the emergence of such promising models as the 120-mm. *Delta* gun. In their place came the gun/missile launchers. These enjoyed the appeal of a space-age novelty, but they were questionable on several counts, including that of cost-effectiveness. In consequence, although the U.S. Army accepted the 152-mm. gun/missile launcher as future tank armament, the FRG Army decided that further development of high-velocity smooth-bore guns still offered a better solution. The Russians had apparently reached a similar conclusion, as in the early sixties they had already fielded an early type of smooth-bore gun in the *T-62* tank while the British continued to develop high-velocity rifled guns firing armor-piercing, discarding sabot rounds (APDS) that had been so successful in the past.

The development of the new FRG tank began in earnest in 1970. By then the complexity and high cost of the *MBT-70* became too painfully obvious, and although another year had to pass before Congress put an end to its development, the FRG had already decided to pull out of it. At the same time, they built the prototype of a new tank of their own, which they called *Leopard 2*.

Relationship with Other Tanks

The name of the new tank linked it with the highly successful *Leopard 1*, the main battle tank of the Federal German Army which has also been adopted by several other NATO armies and Australia. The new tank is also related to *Leopard 1* by being built by the same industrial organization, the Krauss-Maffei Company of Munich. However, it is even more closely related to the *MBT-70*, as it incorporates the engine and other components which had been developed in Germany for that tank in competition with similar components developed in the United States.

All the new components incorporated into *Leopard 2* inevitably make it superior to *Leopard 1*. But, in spite of this, it was not envisaged as a replacement for *Leopard 1*. Instead, it is intended to replace the U.S.-built *M-48A2C*, about 1,000 of which are still in service with the Federal German Army. The replacement of *Leopard 1* would come at a much later stage. By then *Leopard 2* will be well established and continue in service side by side with whatever new tank has been developed to replace *Leopard 1*.

The replacement of *M-48A2C* by *Leopard 2* and, much later, of *Leopard 1*, by some new design amounts to a very sound program of developing tanks in overlapping phases. Such a program minimizes the risks which are inseparable from the introduction of new models by ensuring that only a part of the tank inventory is replaced at any one time. It also provides greater continuity to tank development and, therefore, eliminates the waste of time and money which occurs whenever there is a major discontinuity in it.

The FRG policy of developing tanks in overlapping phases also automatically produces a "high-and-low" mix of equipment, which has been advocated as the most effective way of using defense money. Moreover, it does so in a realistic way, with the older tanks making up the "low" component of the mix and the new tanks the "high" component. This method of achieving a "high-and-low" mix is very different from the concurrent development of two different, "high" and "low" weapon systems to meet the same basic requirement which is sometimes advocated, but which is quite irrational.

Prototype Tests

Although *Leopard 2* incorporates several major components which had been extensively tested in the *MBT-70*, and has also benefited from all the

experience gained with more than 4,000 *Leopard 1's,* it was subjected to an exceptionally thorough and extensive test program. In fact, no less than 17 prototypes of it were built. Between March 1972 and the end of 1975, they had covered a total of approximately 40,000 miles and fired more than 5,000 rounds under a wide variety of conditions. These included not only tests in Germany, but also winter trials at Shillogh in Canada and desert tests at Yuma, Arizona.

All *Leopard 2* prototypes have been fitted with smooth-bore guns developed by the Rheinmetall Company. However, the guns mounted in the first 10 prototypes were of 105-mm. caliber while those of the last seven were of 120-mm. caliber. Given up-to-date armor-piercing, fin-stabilized, discarding-sabot, (APFSDS) projectiles, guns of 105-mm. caliber should have been more than adequate to deal with any foreseeable threat, but the larger, 120-mm. caliber was considered desirable to maintain a margin of superiority over future hostile tanks and it has been adopted, therefore, for *Leopard 2.*

Like its 105-mm. forerunner, the 120-mm. gun has been developed to exploit the high armor-piercing capabilities of APFSDS projectiles. In addition to its APFSDS rounds, it is also provided with general-purpose, shaped-charge rounds, which are also fin-stabilized. Between them, the two types of 120-mm. rounds are sufficient to deal with virtually all ground targets and *Leopard 2* should not, therefore, have to carry more than two kinds of ammunition. This should simplify its operation, and in action, save its crews vital time.

In contrast to the *MBT-70* which had an automatic loading mechanism, the gun of *Leopard 2* is manually loaded. As a result, it has the traditional 4-man crew. A mechanism to assist the loader was tried in the early prototypes, but was not considered worth adopting. A remotely-controlled 20-mm. gun cupola analogous to that mounted on the turret of the *MBT-70* was also tried, but again was discarded and the secondary armament was confined to the coaxial 7.62-mm. machinegun. Additional machineguns can, however, be mounted externally at the commander's cupola or loader's hatch.

Leopard 2 has also reverted to a conventional torsion bar suspension in place of the adjustable hydropneumatic suspension developed for the *MBT-70.* In principle, its suspension is the same as that of *Leopard 1,* but it incorporates new, multiplate, rotary friction dampers developed by the Porsche Company. Moreover, its single torsion bar springs are of a new, much stronger steel and allow 50 percent more road-wheel movement. In consequence, *Leopard 2* can move twice as fast over some types of rough ground as *Leopard 1.*

On the other hand, the *MB 873* engine of *Leopard 2* is basically an improved version of the engine developed for the *MBT-70.* It is a robust turbocharged V-12 water-cooled diesel developed by Motoren und Turbinen-Union. Its maximum horse power is 1,500 which, in relation to its swept volume of 2,430 c.in., represents a moderate rating. Its maximum output could, in fact, be raised to 1,800 h.p. without any major modifications. Forty-nine engines were built as part of the test program. Including those tested in the *MBT-70,* they have covered 60,000 miles over a period of 10 years.

The Renk *HSWL 354/3* transmission of *Leopard 2* is also an improved version of that originally developed for the *MBT-70* and it enjoys, therefore, a development background as extensive as that of the *MB 873* engine. Like the more recent Allison *X-1100* transmission adopted for the *XM-1,* the Renk *HSWL 354/3* has a hydrokinetic torque converter with a lockup clutch to improve its overall efficiency, as well as four forward and two reverse speeds and an infinitely variable hydrostatic steering drive. It also has an additional steering system, operated through hydraulic couplings, for very rapid turns and a hydraulic retarder which greatly reduces the need to use conventional friction brakes, except at low vehicle speeds. In fact, the Renk transmission of *Leopard 2* is more advanced than any other successfully developed so far for battle tanks.

First prototype of the Leopard 2 AV battle tank.

AV Model

The gun, engine, transmission and other components incorporated in *Leopard 2* have made it a very advanced battle tank. Nevertheless, during the course of its development, it became evident that its design could be improved still further and made more cost-effective. The incentive to do this

became particularly strong when the U.S. Department of Defense became interested in evaluating *Leopard 2* in competition with the *XM-1* prototypes. As a result, a major redesign of *Leopard 2* was started in 1974, and the first of the new *Leopard 2 AV* was assembled in mid-1976.

The principal difference between *Leopard 2 AV* and the earlier versions of *Leopard 2* are greatly improved armor and a simpler fire control system. The tank, which was evaluated in the United States, was still armed with the same type of 105-mm. rifled gun as the U.S. *M-60* and the *Leopard 1*, to make it comparable in this respect with the *XM-1*. However, the Wegmann Company designed the turret of *Leopard 2 AV* to accomodate the 120-mm. smooth-bore Rheinmetall gun as readily as the turrets built by the same company for the earlier *Leopard 2* prototypes. In fact, the *Leopard 2 AV* turret fitted with the 120-mm. gun has been adopted by the Federal German Army.

The new armor of *Leopard 2 AV* represents a further and major advance on the traditional monolithic steel armor. Thus, the earlier *Leopard 2* had already followed the example of the *MBT-70* in having turrets with double, spaced armor plates, but *Leopard 2 AV* has very much more advanced armor which greatly increases its chances of survival on the battlefield.

The new armor has increased the weight of *Leopard 2 AV* to 54.5 metric tons (120,150 lb). But, because the *AV* version has retained the 1,500 h.p. engine of *Leopard 2*, its power-to-weight ratio is still high. In fact, it is 27.5 horsepower (h.p.) per metric ton, or 25 h.p. per U.S. (short) ton. This, together with the Renk transmission and good suspension, provides *Leopard 2 AV* with a high level of mobility and agility.

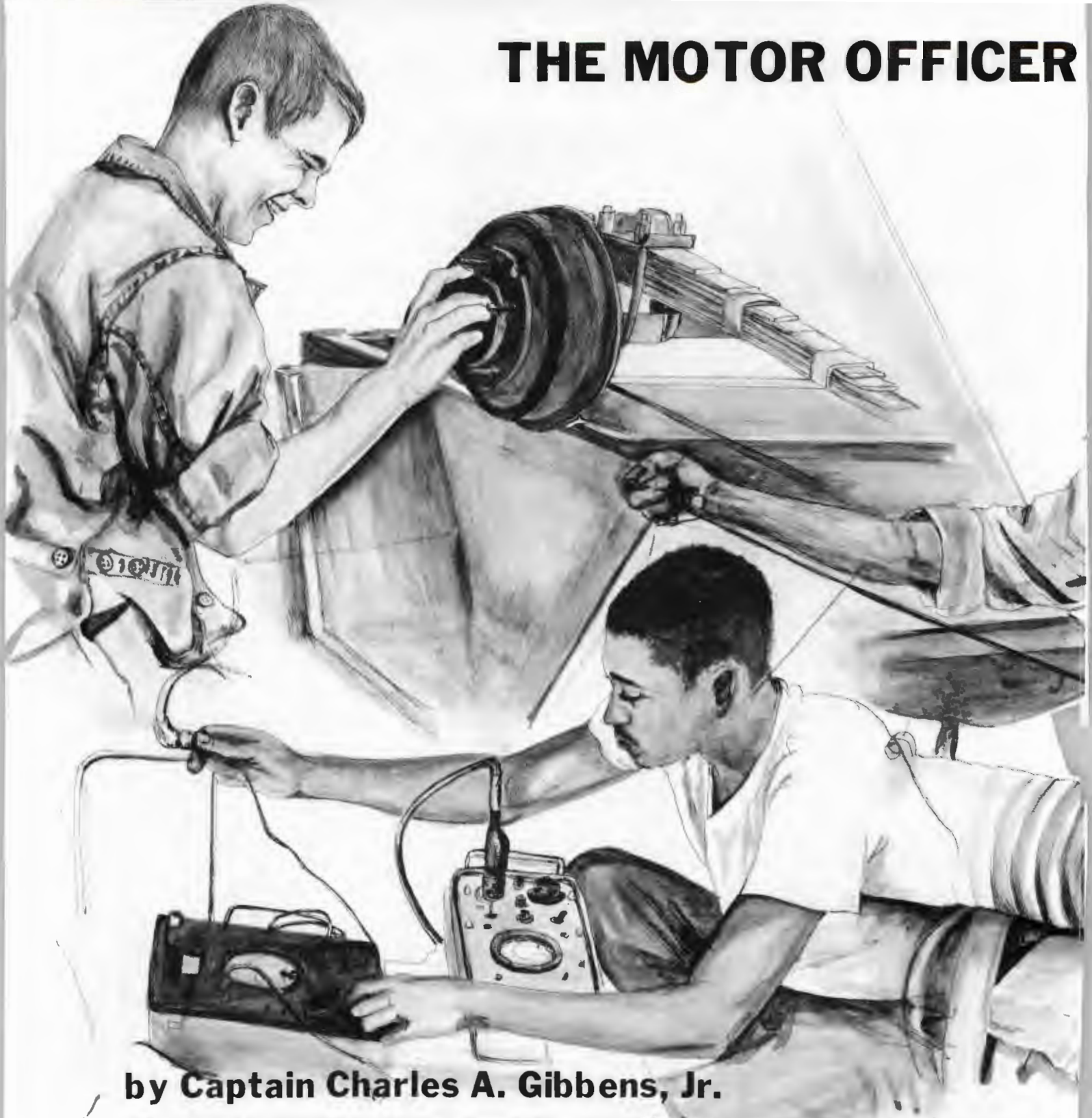
In spite of its much more effective armor, larger engine, and more powerful gun, the overall dimensions of *Leopard 2 AV* are virtually the same as those of *Leopard 1*. Thus its silhouette is commendably low and its height to the turret roof is only 96 inches.

Leopard 2 AV also has a commendably simpler fire control system than its forerunners, which were fitted with the *EMES-12* system incorporating optical as well as laser range finders. Instead, it has a Hughes-developed integrated fire control system with a laser rangefinder only. The fire control system is still sophisticated, however, and incorporates a stabilized gunner's sight to which the gun is slaved, instead of sight-coupled to a stabilized gun as in other tanks with stabilized gun controls. *Leopard 2 AV* also retains an excellent Zeiss-developed stabilized panoramic sight for the commander who is, therefore, better able to observe and to acquire targets on the move.

These and other features place *Leopard 2 AV* as a formidable contender in the evolution of tank design. It represents an advance in technology, soundly based on a very extensive development program.

RICHARD M. OGORKIEWICZ, widely recognized as a leading authority on armored fighting vehicles, is a consulting engineer and author of two books and more than 200 articles, including 65 in *ARMOR*, on various aspects of armor. He has also lectured extensively on the subject not only in the United States and England, but also in Sweden, Israel, Brazil, and South America.

THE MOTOR OFFICER



by Captain Charles A. Gibbens, Jr.

Commanders can give their maintenance program a shot in the arm by sending officers to the Motor Officer Course at the U.S. Army Armor School at Fort Knox, KY.

Attendance at the course prepares officer personnel for assignments as motor officers at the battalion/squadron level, with emphasis on management and supervision of maintenance. The prerequisites for the course are that the student be a commissioned officer in the grade of captain or below in either the Active Army or a Reserve Component, and be assigned or under orders for assignment to a position to supervise the maintenance of conventional materiel. No security clearance is required, nor is there an obligated service requirement incurred for Army commissioned officers. It is highly desirable that personnel attending the course have a minimum of 6 months troop duty in order to better appreciate the problems involved with the maintenance of materiel. This is the U.S. Army's only resident training program which awards MOS 77D, Motor Officer, upon graduation.

The 8-week course has approximately 36 students per class. The emphasis is on small group instruction (six students per instructor) with abundant hands-on training.

The Advanced Attack Helicopter Challenge

by Lieutenant Colonel David L. Funk

COURSE

Almost 66 percent of the 2-wk academic hours fall into this category, and classroom instruction is kept to a minimum. The student receives 70 hours of intensive training in maintenance management subjects such as maintenance service records, repair parts supply, the equipment logbook, and management of maintenance resources. The motor officer becomes thoroughly familiar with all "paperwork" involved in the organizational maintenance program and is trained to inspect and cross-reference the many forms and records. He learns how to establish a viable maintenance program and manage existing resources consistent with the mission.

To prepare the motor officer to be a competent and knowledgeable supervisor of the equipment and procedures used at the organizational level, the student receives approximately 160 hours of hands-on training in automotive subjects. These include, as an example, power plant troubleshooting, quarterly and semiannual services, and vehicle recovery operations. This prepares the motor officer to effectively inspect and evaluate his maintenance operations, and prevents the proverbial "snow job" that many times befalls the inexperienced. The motor officer student learns how to use the multimeter, low-voltage circuit tester, and technical manuals to troubleshoot common malfunctions on representative power plants found in the U.S. Army's inventory. The student learns the procedures and techniques involved in the performance of semiannual and quarterly services by actually participating in the process on a vehicle of his choice. Also, the student will actually recover disabled wheeled and tracked vehicles, using vehicle recovery techniques and recovery equipment.

Weapons and weapon-systems maintenance is as critical to mission accomplishment as is automotive maintenance. Therefore, depending on the officer's branch of service, he receives 6 to 24 additional hours of weapons-systems training. The subjects include weapons maintenance service records, antitank weapons, and turret systems. Turret systems instruction includes the *M-60A1, M-60A2, M-551, M-110,* and *M-109* vehicles. During weapons instruction the student inspects and troubleshoots common malfunctions, using the appropriate technical manuals, test equipment, and tools. This supervisor training compliments the training of turret mechanics and master gunners in the maintenance of weapon systems.

The course is not only popular with male officers, but also with female, warrant, and allied officers as well. The U.S. Army Armor School was accredited by the Southern Association of Colleges and Schools in December 1976, and as a result, Western Kentucky University will award 3 semester credit hours for the successful completion of the Motor Officer Course. The significance of this fact is that other civilian institutions regard the course as equal to instruction received at other accredited colleges and universities. This speaks well of the course content and quality of instruction. Therefore, if you are a commander and your maintenance program could use some help, consider sending your motor officers and platoon leaders to the Motor Officer Course. This is one investment that will pay handsome dividends for your unit.

CPT CHARLES A. GIBBENS, JR. was commissioned in Armor from Virginia Polytechnic Institute as an ROTC Distinguished Military Graduate in 1969. Upon completion of AOB, he was assigned as a cavalry platoon leader in the 3-2d ACR and later became the squadron's adjutant. Captain Gibbens has served as a materiel officer, S3 Air, company commander, and battalion S4. Upon completion of AOAC, he was assigned to the Motor Officer Branch, Automotive Department, USAARMS.

In the early 1980's the *AH-64* Advanced Attack Helicopter is expected to take its place as a major weapon system employed by the combined-arms team. When it does, it will have been one of the most thoroughly tested and studied weapons systems in the history of warfare. Even so, one wonders if we, the Army, are really ready to exploit the full potential of this expensive, revolutionary addition to our arsenal.

In the past our major weapon systems have been primarily evolutionary (i.e., *M-26, M-46, M-48,* and *M-60* tanks and various sub-variants) requiring very little in the way of adaption on the part of the user. Tactics, TOE's, training, and crew selection varied little. Indeed, a good *M-26* crew would find few problems associated with the transition of skills required to efficiently man the latest *M-60A3.* Such has also been true in the recent past for attack helicopter crews. After all, the *UH-1B, AH-1G,* and *AH-1S* helicopters were simply variations on a theme. Admittedly other variables have entered the equation; nap-of-the-earth flight, the antiarmor mission, and increasingly sophisticated aircraft survivability equipment (ASE) have changed the picture a bit, but nothing really drastic has occurred.

Technology will force more drastic changes in the near future. The Threat is rapidly changing and expanding its antihelicopter capability. It's almost as if the Soviets learn more from, or put to use more rapidly, the results of our combat experience and field tests than we do. They are rapidly expanding their airmobile and attack helicopter fleets. *HIND's* and *HIP's* are being employed with ground forces using tactics right out of our literature.

Antihelicopter air defenses are being improved both doctrinally and through the use of advanced technology. The old standby, *ZSU-23-4,* is now overwatched by *SA-8* and *SA-9.* Additionally, like the tank, every weapon on the battlefield that can be brought to bear will attempt to destroy the attack helicopter. Artillery, tank guns, and antitank guided missiles can be expected to take a toll of poorly trained and malemployed attack aircraft. Soviet high performance aircraft and attack helicopters can both be expected to press gun and missile attacks on the unwary. Of course, all of the above presupposes our attack bird gets off the ground. The danger of destruction on the ground, upon initiation of hostilities, at the forward area refuel/rearmament point (FARRP) or in the holding area, cannot be discounted. The Soviets recognize the significance of the attack helicopter threat to their armor and can be expected to expend a great deal of energy in attempts to destroy it prior to engagement, therefore, the threat to survival may begin prior to the first flight of the first battle.

While all the foregoing seems to paint a gloomy picture, fielding of the *AH-64* will offer the Army a significant opportunity to materially offset the prevailing force ratios in Europe. For the first time, a 24-hour-a-day aerial tank killer, with an adverse weather engagement capability, will be in the hands of the troops. A point to remember here is that half the world is always in darkness and 40 percent is covered by clouds. Clouds or darkness engulf most of Europe 70 percent of the time. When such conditions prevail "day-only, attack helicopters" are of little more value than ceremonial cannons.

The effectiveness of the *AH-64* will be more dependent than any previous weapon system on how innovative those tasked with its integration into the combined-arms team approach their mission. Simply replacing the TOW *Cobra* in existing attack helicopter organizations is not even a marginally satisfactory approach. The *AH-64* offers too much; it opens too many doors to be treated lightly. The challenge is to optimize the hardware by innovation. While basic attack helicopter doctrine may not change drastically, tactics, techniques, organization, and nearly every other facet of the attack concept should be open to thorough analysis. The opportunity to effectively kill armor in the target-rich European environment must be pursued. The time to begin this quest is now.

Organization

In any attempt to take advantage of the full potential of the *AH-64,* the temptation is to move first to change tactics and employment techniques. However, the challenge is even more basic. Many variables must be examined prior to addressing the nitty-gritty of the battlefield minuet.

The organization of attack helicopter units deserves more than a passing glance. For starters, some of the weaknesses of the existing attack companies must be addressed. Two primary shortfalls are immediately apparent: first is the lack of sufficient personnel for sustained 24-hour operations; and second is a structure which is patterned after ground combat organizations. The first of these deficiencies becomes painfully obvious to anyone who has tried to fly every available aircraft in one of today's companies all day and all night for a sustained period. The night and adverse weather capability of the *AH-64* will aggrevate this problem still further.

To be effective, the *AH-64* must fly and, to fly, it must have an alert, wide-awake crew. In high-intensity combat, the *AH-64's* sustained operation capability must be exploited. While this point will most likely be universally recognized, the second shortfall of the existing organization (being patterned after ground combat organizations) may not be.

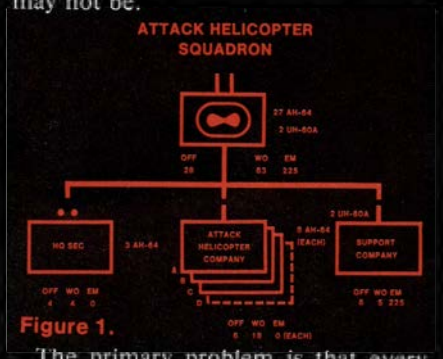


Figure 1.

The primary problem is that every leader in the existing organizations is responsible for a number of diverse functions. For example, attack helicopter platoon commanders are not only responsible for the combat elements of their platoons, but the aircraft and wheeled vehicle organizational maintenance, performance and welfare of enlisted men, and any number of sundry related items. Without belittling the capabilities of attack platoon commanders, in general I think it is safe to say that under conditions that we can expect to exist on the modern battlefield, he will not be in a position to accomplish all of these tasks properly. Therefore, it makes sense to give all but the combat leadership task (and the training and preparation for this task) to someone else. The object is to clear the deck for combat and optimize for

this function. While the platoon commander was picked to illustrate the problem, similar rationale can be applied across the board.

The attack helicopter squadron must be a lean, hard organization designed for close combat. Leaders must be free to lead, and the whole shooting match must function continuously for weeks at a time on a 24-hour-a-day basis.

The squadron organization shown at figure 1 includes a headquarters section, three attack companies, one scout company (if required—more on this later), and a support company. The squadron commander is a lieutenant colonel, while the operations deputy, support deputy, and line company commanders are majors. The support deputy (SUP DEP) is also the support company commander and is by trade an aviation maintenance officer. He is responsible for all support, and owns all the enlisted men and vehicles. On the other hand, the operations deputy (OPS DEP) is responsible for all operations, aviator training, and intelligence functions, in addition to being second in command.

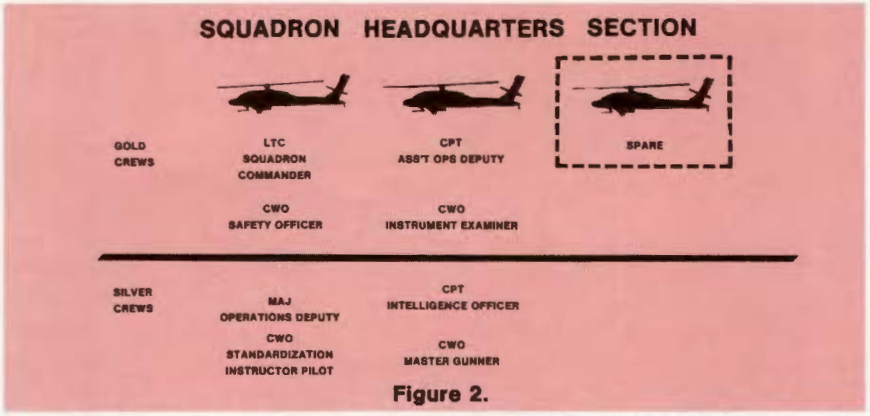


Figure 2.

At first glance the squadron appears to be very short of aircraft. There are two primary reasons for this. First, the reliability, availability, and maintainability of the *AH-64* means better operational reliability (OR) rates and second, this is a 24-hour-a-day squadron. More people are required for fewer aircraft. For those of you with little faith, let me point out (as has been done before) that the *AH-64/Hellfire* combination is far more effective than the *AH-1S*/TOW, so 27 birds will have no problems doing more than those 63 birds in the present squadron.

The squadron headquarters section (figure 2) is the leanest of the lean. Its primary function is to provide a means of combat command and control. Contrary to the present practice in many aviation units, the leaders are also fighters. Two full crews are provided for each required bird. The spare (not a good term because someone may decide it's not necessary—*but it is*) is provided to ensure that full strength is available. "*Less than two birds does not a section make.*" The obvious question regarding the personnel required to man the operations center is simply addressed—they reside in the support company, but are under the control of the OPS DEP.

The attack helicopter company (figure 3) follows basically the same organizational structure as the headquarters section, with one platoon of eight birds and two platoons of aviators. Six aircraft could be expected to be available at any given time for sustained operations; therefore, sufficient personnel are provided to permit round-the-clock combat. Six aircraft permit task organization flexibility by facilitating the employment of either 3 two-ship, or 2 three-ship sections. Of course, a surge capability of eight aircraft is possible if sufficient down time is allowed for an all-out maintenance effort.

While this concept may seem wasteful as far as people are concerned, and certainly drives the *AH-64's* life cycle cost into an upward spiral, anything less probably won't do the job. Officer personnel constraints, including warrant officers, imposed by law will require the Army to think long and hard about where we are going to get these slots for the active force. There is no doubt that the forward-based attack units in Europe must be maintained at full strength and that a CONUS-based rotation base is required. However, there is a fix. Given an equal number of CONUS and Europe-based *AH-64* units and roughly equal numbers of qualified crewmembers assigned to both Europe and CONUS, there will always be a shortfall of available people assigned to CONUS units due to school and training base requirements.

To satisfy the urgent requirement to keep the CONUS-based European reinforcing units up to strength, perhaps a reserve component affiliation scheme similar to that used by MAC to provide adequate manning levels for their *C-141* and *C-5* aircraft could be used. Individual reserve component aviators could be affiliated with and directly integrated into the first-line, high-priority *AH-64* organizations. These aviators would be required to meet the same qualification and training goals as the active duty personnel. This plan would carry the "One Army" concept to its logical conclusion by permitting highly trained, picked reserve component personnel to actually serve as members of elite active Army units. I'm sure that the opportunity to compete for these slots, flying the Army's best, first-line attack birds, will ensure an abundance of highly-motivated candidates. If successful, this plan might be expanded to include a limited number of maintenance and support personnel in the support company.

The fourth line company (D Company) would be the aeroscout unit of the squadron. It is shown by a broken line in figure 1 because there will be no suitable aeroscout aircraft with compatible characteristics when the *AH-64* is fielded. None is presently being developed and based on recent Army development program experience, if we started today, aircraft would not be available for 8 to 10 years.

The primary reason that an aeroscout is not available is that the Army has failed to properly articulate its case for such an aircraft. This may, at least in part, be attributed to a lack of consensus within the Army as to what a scout should be and do.

The support company (figure 4) is exactly what its title indicates. All squadron support, maintenance, and logistical elements are concentrated here under one manager, the SUP DEP. In addition to the normal administration, mess and supply functions, a utility helicopter section and four functional platoons are provided. As previously mentioned, the squadron operations, training, and intelligence

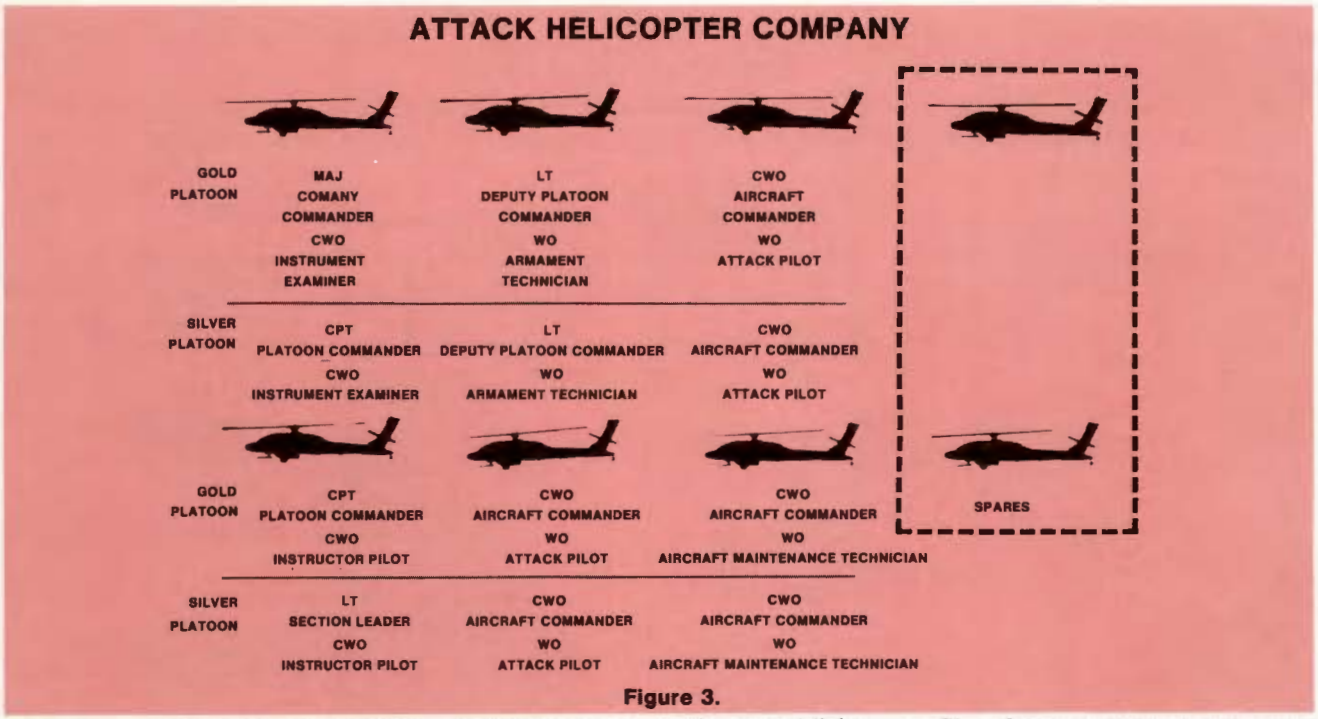


Figure 3.

section is assigned to the support company, but functions under control of the OPS DEP. The utility helicopter section provides logistical lift support to the company maintenance platoons, plus lift for pathfinders and limited lift for FARRP relocation and resupply. The aviation unit maintenance (AVUM) platoon provides a section to support each line company with the required line-chief, crew-chief support. The aviation intermediate maintenance (AVIM) support platoon can, in addition to its primary functions, provide functionally organized contact teams to assist the AVUM platoon in isolated locations. Service and resupply platoons can provide normal support to squadron flight activities and simultaneously operate three remote FARRP sites.

The company is 100 percent mobile with organic vehicles. Assigned vehicles are primarily of the commercial all-wheel drive variety for ease of maintenance and low initial cost. However, the service and resupply platoons require more rugged cross-country vehicles. Since nothing in the present Army inventory really meets the need, the commercial market again is the place to look. The primary requirement is for a highly-mobile, heavy-duty hauler to move fuel and ammunition. Neither the standard 5-ton or *GOER* vehicles fill the bill. Something like the Lockheed *Twister* 8 X 8 might do the job—it seems to be working out well in pipeline, utility, and oil field construction activities. The pathfinders and platoon headquarters sections need light, highly-mobile vehicles for route reconnaissance. Cross-country trail bikes and FMC *XR-311's* are tailormade for this application and, although they are not inventory items, the air cavalry combat brigade (ACCB) has been doing good things with the trailbikes for years. Vehicles of this nature should provide the high degree of mobility required for frequent FARRP moves even in the most rugged terrain.

Crew Selection and Training

Only the most highly-qualified, best-motivated individuals should be selected to serve as *AH-64* crewmembers. Both the importance of the attack mission and system complexity will force us to spend more time and effort in this critical area. The goal must be to optimize the total system by selecting the best potential performers. Extensive research and study efforts must be initiated now to determine those physical and mental attributes that contribute most to attack helicopter crew performance. Hand-eye coordination and the various skills associated with target acquisition and designation system (TADS) and pilot night vision system (PNVS) operation must be explored in depth. The human factors associated with this operation of the integrated helmet and display sight system (IHADSS) require thorough investigation.

Based on the information generated by these studies, physical/mental profiles of those individuals best suited to perform as *AH-64* crewmembers must be produced. These profiles should then be used to assist in selection of candidate crewmembers from volunteers solicited both from the field and the training base. Student volunteers should be solicited prior to the tactics phase of initial-entry flight training so that this phase may be tailored to meet the needs of the potential attack helicopter crewmember.

Selected volunteers must be fully trained and qualified prior to assignment to tactical units. This training should produce an individual ready to fill a position in a combat-ready crew, not just someone qualified to fly the aircraft, thus avoiding the existing on-the-job training (OJT) requirement with its adverse impact on combat readiness. Standards of performance must be identical with those required annually by combat crewmembers in attack helicopter squadrons.

Once trained, attack helicopter crewmembers must be intensively managed to avoid malassignment and utilization outside their area of expertise. Training will be an expensive, time-consuming process, and must therefore not be squandered.

Annual crew qualification must include, as a minimum, an examination of performance in:

- Live fire "Battle Runs," including cannon, rocket, and missile delivery.
- Terrain flight (day/night/adverse weather).
- Use of ASE and electronic counter

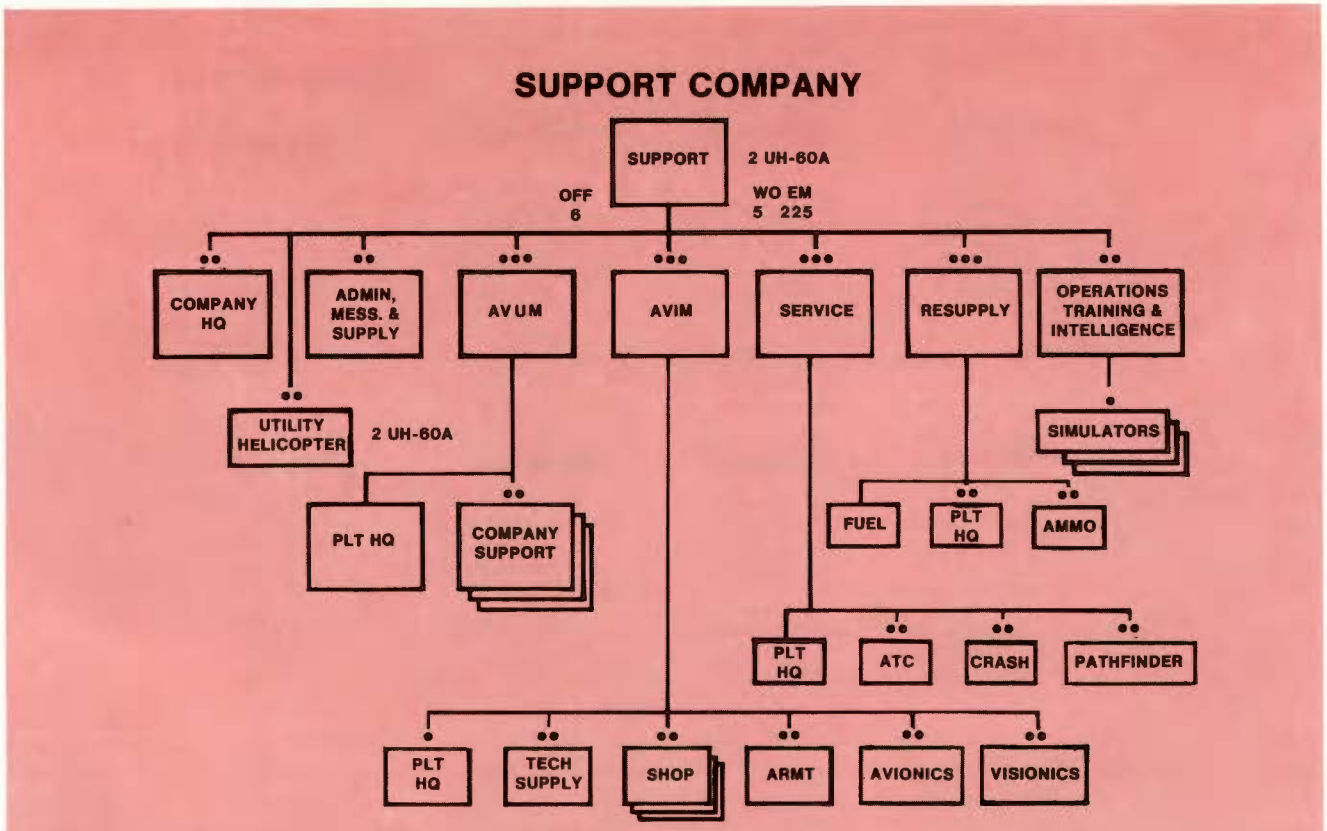


Figure 4.

measures (ECM).

- Air-to-ground and air-to-air tactics.
- Survival and escape and evasion (E&E).

This annual qualification must take place in an environment which includes the complete ground-to-air, air-to-air, electronic warfare (EW), and electronic counter-counter measure (ECCM) threat. Due to the expense of the Threat array and the terrain and isolated location required to employ the radio frequencies (RF), EW, and ECCM, only a location in a remote region of CONUS is appropriate. An adequate location, such as Fort Irwin, could be developed to support annual qualification. Personnel of each unit should be rotated, by platoons, to that site annually for crew qualification. Aircraft to support qualification would be provided by the site. These aircraft and highly-qualified tactics instructors would be assigned to a specialized attack helicopter weapons training squadron. This squadron would provide not only aircraft and instructors for attack helicopter crews, but serve as a medium to develop and evaluate future tactical concepts.

Threat systems and appropriate target arrays would be used to exercise crews to the fullest extent. Air Defense simulators (figure 5) and air-to-air (both high performance and helicopter) threats would employ Soviet tactics and provide appropriate visual and RF signatures. A scoring system similar to that used by the U.S. Air Force Fighter Weapons Center at Nellis Air Force Base, NV, would be used to assist in evaluation of crew performance.

During each flying day in this environment, the attack helicopter crew would face the same threat that they could reasonably be expected to face in combat. Failure to qualify or attend annual qualification would be cause for relief from attack helicopter crew status. It should be noted that no mention has been made of individual qualification. The *AH-64* system is not a one-man operation. A full-time, well-trained, coordinated crew is required to assure realization of full system potential. Crews should be stabilized to the maximum extent possible following annual qualification—perhaps crewmembers could be rotated together. Fully-qualified crews are required prior to moving into the annual unit training phase.

The unit training phase will consist of section, platoon, and company-level exercises conducted in conjunction with major unit field training exercises. Primary emphasis will be on integration of attack helicopters into the combined-arms team, including the use of artillery, close air support, and other means of suppression to assist in mission performance. All attack helicopter units must be trained in the European-type environment with emphasis on their area of projected employment. European area familiarization is increasingly important. The primary thrust of familiarization remains the task of learning and mentally cataloging high-speed avenues of approach, best firing positions, and ingress or egress routes.

Unit training will also include a great deal of full-function simulator work. This will be driven not only by the cost of *AH-64* operation, but by both the cost of *Hellfire* missiles and associated range requirements. Ten thousand dollar missiles and multihundred square mile ranges will both be in short supply. Therefore, when not engaged in other training activities, attack crews must maximize utilization of the *2B-40 (AH-64)* simulator. In addition, a full range of simple, inexpensive, single-function simulators must be developed for use during periods of operational standby at remote dispersals. These simulators, which place emphasis on those functions required to "put-steel-on-target," should be provided to each squadron simulator section and housed in vans for ease of movement.

The means for providing both crew qualification in CONUS for European-based elements and area familiarization for CONUS-based elements can best be accomplished by the exchange of platoon-sized elements. European-based platoons would fly via Military Airlift Command (MAC) or commercial-contract air to the qualification site, while CONUS-based platoons would be dispatched to Europe to take over their aircraft and missions. This approach offers the advantages of establishing a far larger pool of attack crews trained in the European environment, while simultaneously providing live-fire and live-threat training for Europe-based elements that cannot be accomplished on the continent.

Reserve component aviators affiliated with CONUS-based active attack helicopter units would take part in these exercises. Requirements for both annual crew qualification and European orientation would be essentially identical to those of their active Army contemporaries.

Tactics

While gross changes in attack helicopter employment doctrine and tactics will not be required to accommodate the *AH-64*, it is very likely that the reaction of potential enemies to its fielding may force numerous changes. Sensitivity to the Threat must become a way of life for attack helicopter commanders at all echelons. Tactics must be continually evaluated against the best available Threat representation. Training must also be accomplished in a similar environment.

The present Training and Doctrine Command (TRADOC) series of tactics, development, and evaluations (TDE) is a positive step in the right direction. Their tactics development work in helicopter air-to-air combat, close-air-support, and attack-helicopter-integration areas has been very valuable and must continue. Attack helicopters in offensive operations and night or marginal weather operations with TADS/PNVS are just two of the numerous areas ripe for exploitation by future TDE's. We must also spend a great deal of time exploiting the capabilities of the *Hellfire* missile. This is an area where the surface hasn't even been scratched—technology has outdistanced tactics and innovation is required.

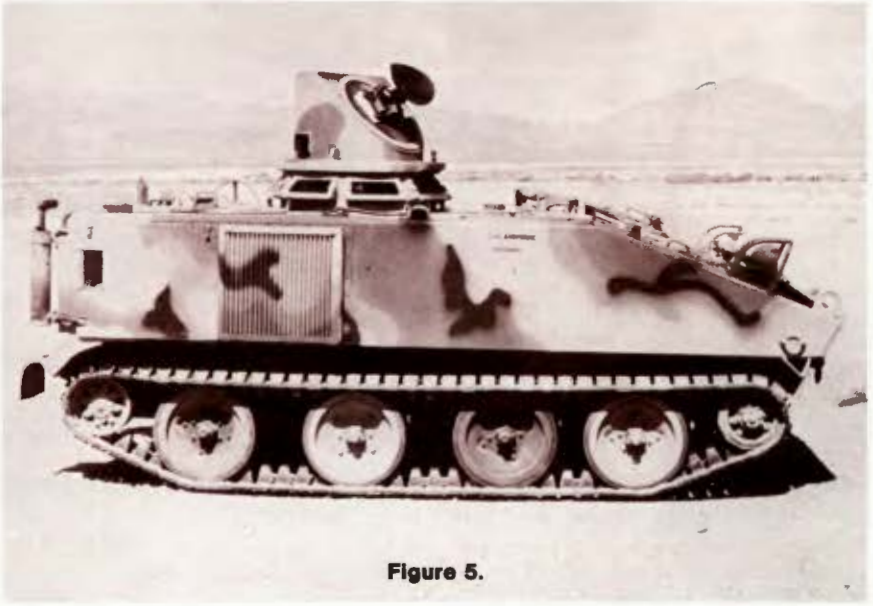


Figure 5.

Needless to say, it is impossible to forecast where we will be in the quest for perfect knowledge when the *AH-64* makes its debut, but tactics development must continue and expand to ensure battlefield success.

Strategic Deployment

Hostilities or even the threat of conflict in Europe will place a premium on both MAC and commercial airlift assets. While the *AH-64* is designed to be air transportable in either the *C-5A* or *C-141* aircraft, priorities will have serious effects on deployment schedules.

However, the effect of airlift priorities may be minimized by using the *AH-64's* 800-plus-mile ferry range to its best advantage. Since the longest leg on the North Atlantic deployment route is 790 nautical miles, range is no longer a problem. (See figure 6.)

Employment of the self-deployment option will present the attack helicopter unit with a number of challenges. Overwater navigation may require some outside assistance, perhaps by trained navigators from other services riding in either accompanying search and rescue (SAR) helicopters or possibly even in the squadron's *UH-60's*. Rescue of downed crews could be accomplished by these same aircraft. Icing and weather over the North Atlantic may present problems, but the track record for World War II multiengined fighters and modern light twins is good, and the *AH-64* is far more capable and reliable than either.

Practice of this means of employment should begin as soon as possible after the *AH-64* is fielded. Annual REFORGER exercises should include self-deployment of CONUS-based attack helicopter units.

Since nonself-deployable maintenance and support elements would be competing for airlift priorities, combat elements may be satellited on USAREUR-based units initially. While this is not the best possible solution, it does serve to get maximum antiarmor combat power forward quickly.

Self-deployment offers some interesting possibilities for rapid reinforcement of areas other than Europe. Deployment to South America, Africa, and the Mideast would appear completely feasible. However, political considerations may force some variance to reach areas beyond existing ferry range. A demountable in-flight refueling probe, similar to that required in the Navy Light Aerial Multipurpose System (LAMPS) program, may be the answer. *HH-53's* have been refueling in flight for years. This approach may be found to be attractive when overflight and refueling base rights cannot be obtained.

Since tankers will be in limited supply during major reinforcing operations, and priority for their use will most likely go to Tactical Air Command (TAC), Strategic Air Command (SAC), and MAC, perhaps a limited in-house capability should be developed. A tanker pod for the *CH-47D* or *CH-54B* might be a reasonable alternative. This approach would also serve to get some medium-lift helicopters into the area of operations for movement of FARRP's.

While we're on the subject of FARRP movement, it might be wise to give

the future AH unit commander an organic means of aerial FARRP displacement. No one wants to be at the mercy of another unit for movement of assets critical to mission accomplishment. Even though the primary means of displacement (almost always, usually, etc.) is by ground vehicle, it is not hard to construct a scenario requiring rapid aerial movement with organic helicopters. While the support company's two *UH-60's* could eventually get the job done, it would be time consuming. Therefore, it would seem that a simple sling kit for the *AH-64* might be desirable. Minus external stores and with minimum 30-mm. ammunition on board, the *AH-64* should be capable of a 7000-plus pound sling load. While this is certainly not a good cost-effective means of normal resupply, it might mean the difference some day (or more likely some night) in whether the job gets done or aborted.

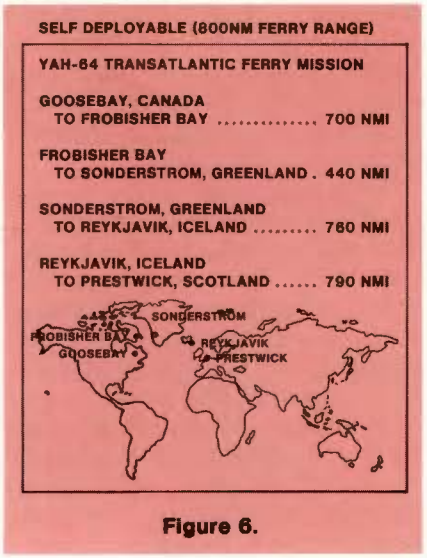


Figure 6.

Dispersal

If the *AH-64* is to survive to assist the ground commander in his effort to win the first battle of any future conflict, it must survive the enemy's first strikes. Based on past experience, any future conflict will be preceded by massive preemptive attacks on our means to resist. Elaboration on the lessons taught by Pearl Harbor, the 1967 Mideast War, and other such actions against aircraft concentrated on airfields should be unnecessary. Therefore, the practice of stationing our combat helicopter units on airfields in Europe should immediately cease. Helicopters, by their very nature, do not require elaborate runways and support installations. Attack helicopters must not be wasted by bunching them together on easily targeted airfields, but should be dispersed into the forests.

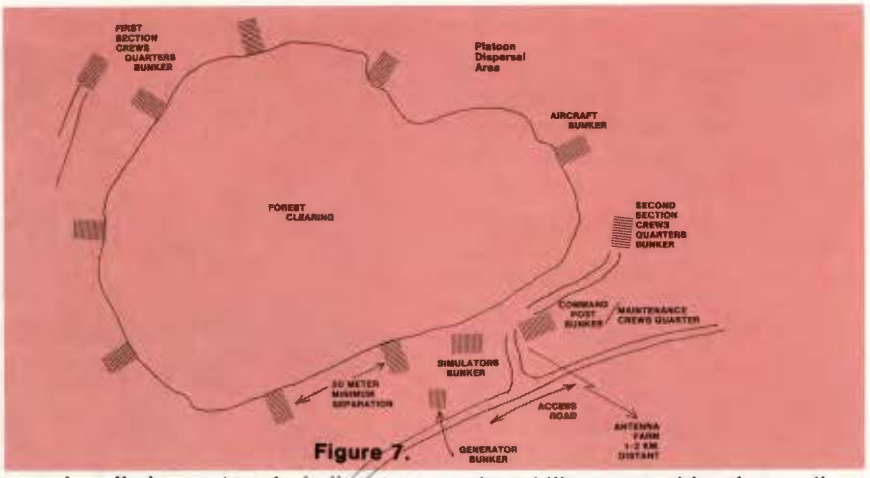


Figure 7.

Hardened, camouflaged dispersal sites should be established in localities that permit rapid reaction to initial enemy action via preselected flight routes which maximize terrain masking. Redundant sites should be provided so that less than half are normally occupied at any one time. In addition to complicating the enemy's task of locating all the attack units and updating his targeting information, these extra sites could be used to house reinforcing units from CONUS if advanced warning of hostilities permits their deployment.

A domed concrete bunker would be safe from anything but a direct hit from artillery, rockets, missiles, or aerial bombs. Helicopters would be moved in and out of the bunker by an electric or manual winch.

Normal organizational and direct support maintenance would be accomplished in the bunker. An important side benefit of this arrangement would be protection of the *AH-64* from constant exposure to the elements, which should increase the reliability of the various subsystems and extend the service life of the helicopter.

A typical company-size site is shown in figure 7. Each site is self-contained. Commercial-type house trailers, which can be moved quickly from site to site and installed in appropriate bunkers, are utilized for command, sleeping, and small mobile simulator shelters.

Upon initiation of hostilities, these hardened sites would most likely be abandoned and attack elements further dispersed to villages, farms, and forested areas. Hardened sites serve their purpose by decreasing vulnerability to anything but a direct hit by a major weapon during the first hours of hostilities.

Summary

There you have it; one man's opinion of how it ought to be. Perhaps this attempt to address the challenges of the *AH-64* will encourage those of you with more experience than I to offer your opinions, ideas, creative thoughts, etc. Full exploitation of *AH-64* capabilities will require the best efforts and innovation of everyone in the attack helicopter community.

LTC DAVID L. FUNK was commissioned in Armor through the ROTC program at Indiana University in 1958. A C&GSC graduate, he has served with the 101st Abn., 1st Inf., 8th Inf., and 1st Cav Divisions; and commanded armor and attack helicopter companies. LTC Funk has served as Chief, Test Branch, ARSV Task Force, USAARMC, and is presently assigned as FISO for the Advanced Attack Helicopter and *Hellfire* Missile, Requirements Directorate, DCSOPS, HQ DA.

Reserve Armor and Cavalry Units

by Colonel James G. Hattersley

This article will address training of Reserve Component (RC) Armor and Cavalry units, with emphasis on those factors which bear heavily on training:

- Army Readiness Region (ARR) Support
- Training requirements
- Obstacles to training
- Available time
- Personnel resource considerations and
- Training objectives.

These are not a great deal different from considerations which impact upon Active Component training and other RC branches, but specifics of these factors do vary considerably.

Readiness Region Organization

The key elements of the Readiness Region Organization to support training consists of the Coordinator, Readiness Group Branch Teams, and Advisers. The coordinator is responsible for monitoring the training progress and concentrating available assets to improve the training readiness posture of the units under his cognizance. Advisers and Readiness Group (RG) teams working with the units, trans-

late training objectives into action. Each RG has branch assistance teams tailored to the training support mission. As an example, in Readiness Region V, two RG's have Armor teams, two RG's do not. In the future, there may be Armor teams at all RG's. The organizational difference lies in the Armor or Cavalry unit density in the geographic locations of responsibility of the RG. Only one tank battalion has a battalion advisory team consisting of an officer and a noncommissioned officer (NCO). Relatively speaking, few battalions have designated advisers; however, this varies from region to region.

RC Training Requirements

The significant training requirements for RC units include Forces Command (FORSCOM) Regulation 350-2, Army Training and Evaluation Program (ARTEP) training, civil disturbance training, annual general inspections, military occupational speciality (MOS) improvement, and recruiting and retention. In addition, Armor and Cavalry units are required to perform gunnery training, which takes precedence over other training. For high-priority units, intensive gunnery training, firing through Table VIII for 2 consecutive years, and tactical training for the third year is directed by Headquarters, FORSCOM. Then the 3-year cycle is repeated. For other than high-priority units, the gunnery training objective is to complete firing through Table VII.

After looking at the above requirements, it becomes readily apparent that the RC units—Armor, Cavalry, and others—require extended periods of time to achieve these objectives or meet the requirements because their training "year," under the very best conditions, equates to 38 training days; 2 days a month and 14 days at annual training. The FORSCOM training objectives are readiness condition (REDCON) C-2 or C-3 for battalions and companies or troops.

Training Obstacles

When the training obstacles such as dispersion of units; competing requirements; civilian occupation; priority changes; reorganizations; and lack of training areas, which RC units face, are added to these considerations, you gain a better understanding of the difficulty in conducting efficient and effective training.

Earlier, I mentioned available time for training as being a key consideration. Ideally, a unit should have 38 training days available each year. However, erosion of training time due to a variety of reasons generally results in a training-time shortfall of about 10 to 18 days per year. What is the effect of these considerations on unit readiness? When we look at selected elements of the DA Form 2715, Unit Readiness Report (URR), or the FORSCOM Form 1R/2R to see the status of random Armor or Cavalry units there is no appreciable change from training year 1975 to training year 1976.

REPRESENTATIVE UNIT POSTURE

	1975	1976
Tank Battalion "A"	C4 ... 11 wks	C4 ... 10 wks
Tank Battalion "B"	C3 ... 5 wks	C3 ... 6 wks
Cavalry Sqdrn "A"	C4 ... 10 wks	C4 ... 10 wks
Cavalry Troop "A"	C4 ... 7 wks	C4 ... 5 wks
Cavalry Troop "B"	C4 ... 10 wks	C4 ... 8 wks

As can be seen, Tank Battalion "A" required 11 weeks to attain REDCON C-4 in 1975 and 10 weeks to attain the same level of proficiency in 1976. Cavalry Squadron "A" required 10 weeks each year in which to attain REDCON C-4. The reasons for the relatively low readiness posture included personnel turbulence and strength, shortages of authorized equipment, unsatisfactory serviceability criteria, and an insufficient number of combat-ready crews.

I've chosen one element—personnel—to emphasize the significance of the areas of personnel which impact on the URR. In a comparison of two different units, it was shown that a unit which was reorganized from an infantry unit to a cavalry unit had only 62 percent of its authorized strength and managed to qualify only 25 percent of its members, while having a 99 percent turnover rate. Another unit with 80 percent of its authorized strength qualified 70 percent of its personnel, while its turnover rate was only 9 percent.

Similar challenges exist in the areas of training and logistics. Some of the problems which a unit commander must deal with in having equipment available to train his unit are locations (mobilization and training and equipment sites (MATES), equipment concentration sites (ECS), armories, centers), models and types of euqipment (*M-48A1, M-48A2C, M-60, M-113, M-113A1),* the conversion to *M-48A5,* the Annual Training Equipment Program, and shortages.

To reduce many of these problems which face an Armor or Cavalry unit commander, or other RC commanders, a significant effort has been put forth over the past few years to improve RC training management and provide better Active Component support to these RC units. A few examples of what is being stressed and provided are quarterly training, training management and ARTEP workshops, Active Component support, the Total Force concept (annual training), the Mobile Training Team, and Affiliation. Moreover, the proliferation of literature, devices, exportable training and other aids provided by TRADOC and the Training Support Center are clear evidence of the recognition of the training needs of the RC and AC units. The major constraint in being able to take advantage of the assistance in the RC is *time*—time to read, to digest, to disseminate, to educate, and to execute. Clearly, the overall readiness of RC Armor or Cavalry units is influenced in large measure by the foregoing points.

RC Readiness Influences

The influences on RC readiness include leadership, Active Component support, strength and MOS qualification, training management and execution, individual and small unit proficiency, 38 days annually for training, equipment availability, and drive and objectivity. I've added the first and last points to indicate that the leadership, drive and objectivity of the unit commander significantly enhance or detract from his unit's training. With the exception of possibly the second and sixth points listed, they are the same influences for Active units—but they take on added meaning and significance due to the limited time which RC units have to get ready and attain a reasonable, achievable level of readiness.

Armor Leadership Award

At long last, the Armor Leadership Awards first mentioned in the September-October 1976 issue of *ARMOR* are being produced. The awards, which are bronze replicas of the Goodrich Trophy, are being reproduced by Indianapolis artist Ray White.

The original Goodrich Riding Trophy came about through a gift of $50,000 from Major L. E. Goodrich, Cavalry Reserve, of Miami, Florida, to sponsor a Mounted Service Ride. The Goodrich Trophy was designed and executed by A. Phimister Proctor, one of America's leading sculptors.

Basically, the Goodrich Trophy was awarded annually to that cavalry troop which excelled all others in general cavalry proficiency—mobility, firepower, and shock action. In selecting the winner, every cavalry regiment in the U.S. Army was given the opportunity to enter its best troop in the competition.

The competition itself was a series of grueling tests over a period of 3 days covered by judges armed with rule books and constantly on the alert. The first phase of the competition was a 50-mile march with full field equipment. At the beginning and end of this march, men, animals, and equipment were subjected to rigid inspections. The condition in which all were found both before and after were taken into consideration for awarding of points.

In the second phase of the test, which involved firepower, personnel in the troop were tested on their ability to use the rifle and pistol. In determining the firepower of the troop, a good deal more than mere target range records were taken into account. Firing exercises included simulated attacks over every conceivable type of terrain, with troopers firing from concealed positions, in the open, and in the advance. In the case of pistol firing, men had to demonstrate their skill while firing mounted and dismounted.

On the final day of the test, the troop was called upon to demonstrate its ability to apply the force of shock action in the assault. The problem in this phase of the test called for the use of both pistol and saber in the mounted attack.

In 1974, the administrators of the Draper Combat Leadership Trust Fund at Fort Knox, KY and Colonel (now Brigadier General) David K. Doyle, began collaboration on a project to revive the Goodrich Trophy as the basis for awarding an annual Armor Leadership Award. By combining the Goodrich Trophy with the Draper Competition (detailed in the September-October 1976 issue of *ARMOR*, p. 27) the historic premise of leadership through effective unit training would be perpetuated.

The purpose of the Armor Leadership Award is to promote and perpetuate leadership in armor and cavalry units. Units may be battalion, squadron, company, troop, or platoon-size at the discretion of the division, cavalry regiment, separate brigade, or armor group commander. The commander of each armored and infantry division, cavalry regiment, separate armored brigade (including mechanized brigade) and armored group of the Active Army, Army National Guard, and United States Army Reserve will select annually from his command the outstanding tank or cavalry unit, including helicopter and air cavalry units. Competition will be limited to these types of units. Combat support, combat service support, and headquarters units are not eligible to compete. Mechanized infantry units may compete at the discretion of the division, cavalry regiment, separate brigade, and armored group commanders. The objective of this program is to recognize leadership as demonstrated through effective unit performance. Selection will be based on the total performance of the organization over the calendar year, with a view towards recognizing the leadership of the commanders of that unit during the evaluated period.

The selection of the winning unit will be accomplished in a manner precluding the necessity for maintaining additional records or conducting additional tactical exercises. Listed below are some factors which may be used to evaluate each unit. The list is not complete nor must it be followed. Commanders may elect to assign weights to those factors considered appropriate for his command. The command may use additional factors or eliminate those not considered appropriate as listed below:

- Selection may be based on records and reports, major accomplishments of the unit, and observation of unit performance by the commander and his staff conducting the competition.
- The following records and reports may be considered when they are applicable to the type unit being evaluated: weapons firing, SQT qualifications, annual active duty for training and Reserve duty attendance, and such other records, reports, and results of testings and evaluations as deemed appropriate by the commander.
- Major accomplishments of the unit during the calendar year as reported by the unit commanders may be considered.
- The staff of the commander conducting the evaluation and the Senior Unit Adviser when appropriate, may submit recommendations based upon observation of the unit being evaluated in such areas as military courtesy and discipline; unit esprit; condition of barracks, day room, and dining facility; supply and personnel economy; energy conservation; race relations program, and community relations.

A replica of the Goodrich Riding Trophy will be provided to each division, cavalry regiment, separate brigade and armored group containing eligible armor units. Forty-three replicas of the Trophy are presently being produced for distribution by the Custodian, Draper Combat Leadership Trust Fund, U.S. Army Armor School, Fort Knox, KY 40121. Requests for additional information concerning the award should be addressed to the Custodian. ▲

by Allan S. Chace

The value of simulators began to be recognized by the military in 1934. In that year, the U.S. Army Air Corps placed the first major military order for flight simulators when they purchased six instrument trainers for the instruction of Army mail-carrying pilots for all-weather flight. This initial order was soon expanded by a large measure when, with the outbreak of war, the Army was faced with the task of teaching men to fly as quickly as possible. In the years that followed the war, electronics and computers were added to the ground-based training systems resulting in the modern flight simulator which "flies" nearly like its airborne counterpart.

Today, simulators are still used primarily as training devices for operation and maintenance of aircraft and to a lesser degree for other systems, including armored vehicles. Another important application of simulators, which has received less attention than the training role, is that of optimizing the design of a system. In this article, the application of simulator technology to the design of armored vehicles is discussed.

The primary objective of an armored vehicle design simulator is to shorten the development time cycle and reduce the cost of development. This is achieved by evaluating system effectiveness of hardware components over a wide range of conditions early in the development cycle, thereby offering an economical and timely alternative to traditional development procedures which require a large investment in hardware before the total system is tested. Computer software simulation cannot perform such evaluations because it is difficult and time consuming to model all of the subsystem interfaces and nonlinear characteristics of hardware over a wide variety of test conditions. The design simulator, therefore, fills the gap in the development cycle between software analysis and hardware field test.

A secondary use of design simulators is in performance of basic research tasks. They are particularly well-suited for human factors experiments.

Potential Benefits of a Design Simulator

Engineering tests or research experiments performed with the aid of a vehicle design simulator offer a number of advantages in comparison to experiments or tests using the actual system. A few of these advantages are:

- **Experiments are Repeatable.** The effectiveness of subsystem components within a total system context is often difficult to assess with field tests because of variations in experimental procedures. The design simulator will permit an engineer to be certain that differences in results are due to engineering changes rather than from unknown variations in experimental conditions.
- **Environment is Controllable.** Tests can be performed for a variety of terrain and environmental conditions within a very short period of time. Therefore, subsystems such as the gun and turret stabilization system can be optimized over a wide range of input conditions in order to achieve optimal system performance. Also, a motion simulator can input either step functions, sinusoidal signals, or white noise functions so that transfer functions of various subsystems under test can easily be obtained.
- **Experiments are Set Up Easily and Rapidly.** Turret walls can be constructed so that space is readily available for nonconventional subsystems that might only be a breadboard or advanced design configuration. The effectiveness of advanced subsystem components can, therefore, be evaluated early in the development cycle.
- **High-Risk Tests can be Performed With a Simulator.** Certain experiments, such as traveling over very rugged terrain at high speeds, create a risk of damaging the valuable prototype vehicle. However, such tests are required to verify subsystem operation, reliability, and alignment retention. These tests could be performed on a design simulator early in the development cycle, thereby minimizing the high-risk test program for the prototype vehicle.

A design simulator will not eliminate the need for field tests, but could significantly reduce the number of field tests which must be performed. In many cases, the simulator could perform tests with greater accuracy, faster, and more economically, and over a wider range of conditions. Also, the effectiveness of advanced subsystem components can be evaluated early in their development cycle. In addition to actual hardware evaluation, a number of research experiments could be performed as well. Thus, design simulators could allow the development time cycle for complex systems to be significantly shortened, thereby providing the Army with technologically superior weapons within a relatively shorter development time.

Existing Design Simulators

Design simulators are not new. They are, in fact, extensively used in the aircraft industry as demonstrated by the results of a 1971 survey which shows that 35 different government laboratories and 46 private industries have major design simulators. These systems are used for a number of purposes, including:

- Stabilization and control studies;
- Armament system development and implementation studies;
- Target acquisition studies;
- Evaluation of tactics and combat;
- Determine feasibility of advanced system concepts;
- Vehicle handling qualities;
- Human performance studies in environment of vibration, heat, pressure, noise;
- Basic studies of motion-visual effects;
- Crew station layout and
- Training research.

In contrast to the wide use of design simulators in the aircraft industry, there are only a few armored vehicle design simulators in the U.S.

The Federal Republic of Germany and the United Kingdom currently appear to be making greater use of design simulation than the U.S. For example, figure 1 shows an existing design simulator located at Proving Ground Meppen in the Federal Republic of Germany. This system, which simulates rotational motions of the turret, was built by Reinmetall in 1970. It is primarily used for stabilization studies. Link Miles has sold two driver's training simulators in the United Kingdom for a price of £ 3 million ($5

Figure 1.
Rheinmetall GMBH photo

million). A secondary objective of one of these simulations is for armored vehicle research and development. Now that Chrysler has been selected to produce the *XM-1*, the U.S. will likely be developing new training equipment within the near future. Hopefully, new U.S. training systems will be designed with thought given to performing experiments that will guide the next generation of armored vehicles.

Examples of Vehicle Design Simulators

Figure 2 illustrates one of several possible configurations for an armored vehicle design simulator. The system allows any full-scale model (mock-up) of a turret or vehicle compartment to be mounted on the motion platform. Each model is equipped with actual brassboard or advanced development test equipment. Candidate equipment includes day and night sights, turret stabilization system, gunner's chair, headrest, operator controls, laser rangefinder, ballistic computer, etc. The walls of the model are constructed of a material which is readily cut or modified to allow mounting of advanced development equipment. This adaptive feature permits rapid and inexpensive testing of subsystems which are not initially designed or "packaged" for an existing turret configuration. For example, the simulator can evaluate the system effectiveness of a brassboard thermal imaging sight before it entered the engineering development stage.

The motion platform, which supports the turret or turret compartment, is controlled by a computer so that a variety of different turret motions could be produced. One method of driving the platform is to command it to move in one-to-one correspondence with prerecorded motion of an actual vehicle (hull) when traveling over real terrain, or a dynamic mathematical simulation model could be used to drive the platform. The computer could also input "engineering functions" such as noise, steps, or sinusoidal variations.

The design simulator is mechanized so that test data is readily recorded and processed. Electrical and hydraulic power supplies are available to drive any subsystem which could be installed in the model.

The simulator is installed so that test personnel in the turret can view static and dynamic targets located on a nearby simulated test range when sighting through the gunner's or commander's sights. The target is instrumented with a matrix of laser detectors so that the pointing accuracy of the simulated gun barrel, which supports a laser transmitter, is continually monitored. An infrared (IR) source is mounted at the center of the target. An IR sensor, which is aligned to the sight in the simulated turret, continually monitors the position of the gunner's and commander's line of sight. An

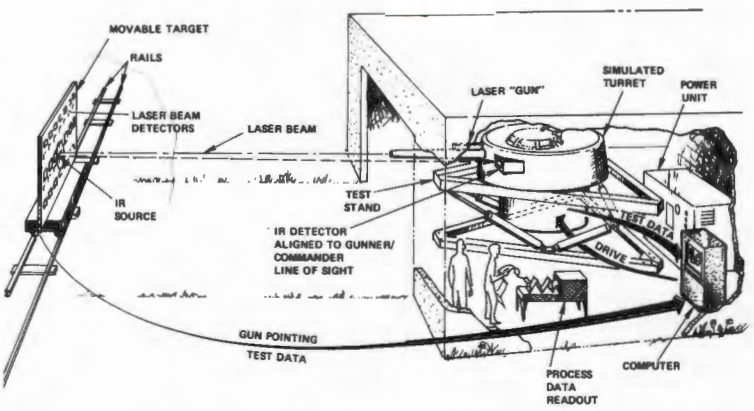


Figure 2.

artificially generated visual display system could be added to the simulator at a later date. Examples of such visual systems include a computer-generated imagery system and a TV camera model visual displays system.

Another version of a model which can be mounted on the motion stand is shown in figure 3. This model can represent a tank turret or the crew compartment of a turretless armored vehicle. Although the model does not "look like" a tank, it is an excellent engineering model of an armored vehicle and its subsystems. The outer structure is designed to support carefully positioned weights so that the inertia of an actual system and its gun barrel is easily simulated for a number of different vehicles.

This outer structure is constructed so that its radius of rotation (when mounted on the motion platform) is considerably larger than the radius of rotation of the turret walls of an actual vehicle. This mechanization offers two signifi-

cant advantages; namely, that the inertia of the turret and gun barrel can be simulated with substantially less mass on the motion platform, and that engineering tests can be carried out without the constraints of a turret wall. In fact, the

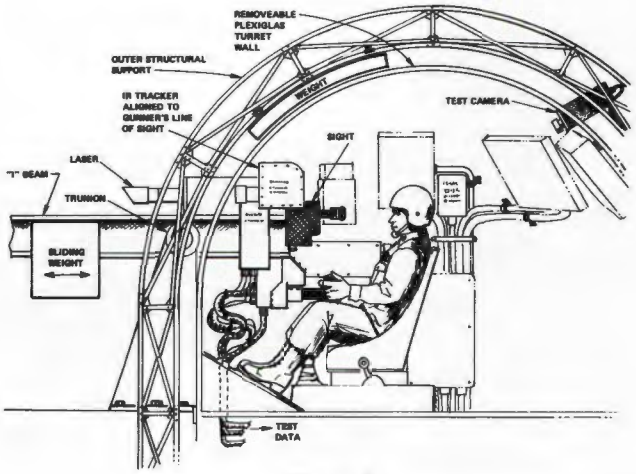


Figure 3.

outer structure provides a convenient location to mount cameras and other test equipment. Although heavily armored turret walls are essential on the battlefield, they are often a severe hindrance to engineering tests. "Snap on" clear plastic turret walls can, therefore, be installed on this model. The walls would be transparent so that crews could be easily observed. This feature is essential for many human-factors experiments.

A more advanced version of a design simulator would incorporate the features shown in figure 2 and support a gun that fires live rounds. Of course, this design simulator is located at a test range. Test stands which are dynamically driven during test firing of aircraft guns have, in fact, been built and successfully demonstrated in 1975 at Aberdeen Proving Ground.

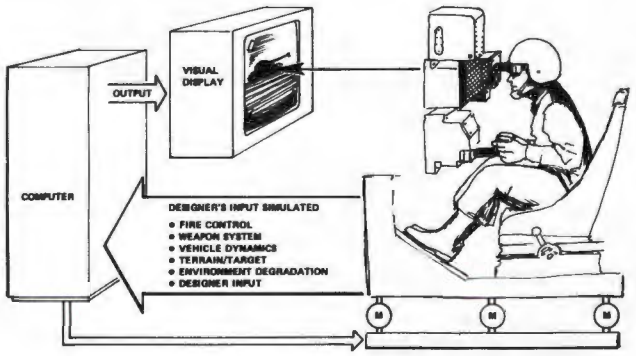


Figure 4.

In contrast to an advanced simulator concept that fires real ammunition, it may be possible to develop a simple design simulator as shown in figure 4. It is shown that a gunner or commander is sitting in a design simulator with his immediate environment being a replica (mock-up) of an actual vehicle. His inputs to the design simulator are as dictated by a simulated visual display of a real-world scene and by simulated vehicle motions. Additional simulated inputs to the human may include sound, heat, and smoke, if they prove to significantly affect human performance.

In any case, the gunner's or commander's signals are input to a computer. In the computer, the simulated fire control and dynamic mathematical model of the weapon system and vehicle are used to drive the hardware visual display. This display may be a simulation of a real-world scene or a simulation of a generated scene (for example, when systems such as Forward Looking Infrared Thermal Imaging Devices (FLIR) are duplicated). The visual display is dependent upon simulated environmental degradation such as weather conditions, firing of the weapon, terrain masking of the target, or enemy action. Further, projectile tracers or missile plumes may be injected into the field of view as a projectile flies to the target. The performances of the simulated vehicle, weapon, and fire-control system, as well as of the human operator, are rapidly evaluated using semiautomatic procedures. With this simulator, the designer can vary the software program which defines the characteristics of the fire-control system, vehicle, weapon system, terrain input, and the hardware of the gunner's and commander's stations.

The optimum configuration of the design simulator is, of course, dependent upon its intended use; and so, it is necessary to perform a design tradeoff study to arrive at other "best" design simulator configurations.

Summary

Several examples of design simulators for armored vehicles are presented. When compared with existing developmental procedures, simulators could potentially perform tests with greater accuracy, faster, and more economically over a wide range of completely predictable conditions. The system effectiveness of subsystem components can be evaluated and optimized early in their development cycle. In addition to actual hardware evaluation, a number of research experiments could be performed as well. Thus, design simulators could allow the development time cycle for complex systems to be significantly shortened, thereby providing the Army with technologically superior weapons within a relatively shortened development time.

Design simulators are extensively used in the aircraft industry, but not in the armored vehicle industry, although their potential for use is highly significant. Therefore, the feasibility of using major simulators to optimize the design and perform basic research for armored vehicles should be evaluated.

ALLAN S. CHACE has developed flight simulators at Link Singer and the fire control system for the *MBT-70 (XM-803)* at General Motors. He currently leads research tasks in both areas at the Battelle Columbus Laboratories.

French Wheeled Combat Vehicles

by Lieutenant Colonel Claude deBisschop

Although the French Army has always been attracted to wheeled reconnaissance vehicles, the current modernization of the French force calls for an increase of such combat vehicles. The major reasons why the French forces are so interested in wheeled combat vehicles are a need for highly mobile units and a search for low cost equipment in both production and operating costs.

Two new wheeled armored vehicles will appear in the French Army in the near future: the 6-wheeled *AMX 10 RC* (R for reconnaissance—C for cannon), and the armored personnel carrier (APC) called *Vehicule de L'Avant Blinde* (VAB) or Forward Combat Vehicle.

AMX 10 RC

Equipped with a 105-mm. main gun, the *AMX 10 RC* is an amphibious reconnaissance vehicle that has excellent mobility over roads and cross-country. The engine and transmission are identical to the French *AMX-10P*. Each of the six wheels can be individually powered and steered, an enhancing feature for mobility. The *AMX-10 RC* is protected against nuclear, biological, and chemical (*NBC*) contamination by a pressurized combat compartment.

MAJOR CHARACTERISTICS
NEW FRENCH WHEELED COMBAT VEHICLES

	AMX 10 RC	*VAB*
Length	20.47 ft.	19.62 ft.
Width	9.2 ft.	8.2 ft.
Height	8.4 ft.	7.1 ft.
Weight	15 tons	10.5 tons
Road Speed	45 to 50 m.p.h.	55 m.p.h.
Cross-Country Speed	25 m.p.h.	
Swimming Speed	2.35 yd/sec	2.41 yd/sec
Range	500 miles	750 miles
Slope	60%	60%
Cant	30%	35%
Towing Capability		4 tons

Manned by a four-man crew, the *AMX 10 RC* is equipped with an advanced fire control system which includes a laser range finder, automatic computation of firing corrections, and passive night sights.

Currently in prototype development stages, the *AMX 10 RC* will be utilized by corps cavalry squadrons and units at division level in the newly reorganized French Army.

VAB

Initially designed as an APC for utilization as a basic transportation vehicle for motorized infantry units, the *VAB* will also be used as a command and control vehicle, as well as a communications, antiaircraft, and antitank vehicle. It may also be employed as a cargo vehicle.

An amphibious, 4-wheeled armored truck, the *VAB* is very mobile over cross country. Its highlighted features are simplicity, low production and operating costs, and comfort. Powered by a 220 h.p., 6-cylinder diesel engine, the *VAB* can carry an eleven-man squad or a load of up to 2 tons. The 4-wheel drive unit is driven by a mechanical gear box coupled with a hydraulic converter. The *VAB* is also armed with a 7.62-mm. machinegun.

Industrial production has begun and initial fielding was scheduled to begin during spring 1977. The program has been adopted for 4,000 vehicles.

These two new wheeled vehicles meet the standards of mobility required for combat on a modern and extended battlefield. Their low production and operating costs come from a design drawn from the tracked APC, *AMX 10*, for the reconnaissance vehicle, and from a commercial truck for the wheeled APC. Both have very low gas consumption rates compared with tracked armored vehicles. Presenting relatively small targets, they give the units a very high degree of mobility while ensuring protection against NBC agents, small-arms projectiles, and shell splinters. ▲

Soviet Armor: A Study In Efficiency

by A. W. McMaster, III

In contemporary, major power, ground force developments, the medium tank is the kingpin. Combined-arms tactics and offensive maneuvers are based on the performance capabilities of the tank. No other conventional weapon system carries the firepower, mobility, and reliability of the modern tank.

Soviet armor developments are noteworthy both for emphasis in quantity, in that over 45,000 medium tanks are now in the Warsaw Pact inventory, and almost 20,000[1] facing Western Europe; and for qualitative improvements including armor protection and firepower. But while the West, and especially the U.S., has spent more and more time and money on larger and more complicated tanks, the Soviets have gone the other way, toward smaller, lighter systems, with greater efficiency.

From the outset, it should be stated that U.S. and Soviet design objectives are different. One reason for differing approaches in design has been expected payoff for dollars and research effort expended. The Soviets are more cautious in translating research and development (R&D) into fielded hardware than the U.S., preferring to upgrade their combat systems, while deploying them as quickly and in as large a number as engineering and production constraints will permit. The Soviets are also much more dependent on operator skill and training.

The U.S. objective has been to build the best tanks money can buy, and certainly the U.S. technology base in armor is far greater. The systems have become technologically superior: larger, heavier, and simpler to operate, both in firing on an enemy and in maneuvering. Increased maintenance problems, however, resulting from a higher technology tank, must be accepted as well. In U.S. armored systems, at least from a technological point of view, the man is largely "out of the loop." This is borne out by the use of the U.S. ballistic computer and laser rangefinder. The most impressive difference between the most modern counter-

[1] *The Military Balance*, Institute of Strategic Studies, London, 1976.

U.S. and Soviet Armor Comparsions Since WWII

	U.S.[1] M-48A2	M-48A3	M-60A1	M-60A2	XM-1[2]	U.S.S.R.[6] T-34/85[7]	T-54	T-55	T-62	T-72[8]
Height	10'3"	10'9"	10'10"	10'10"	7'9"	10'6"	7'10"	7'11"	7'9"	7'4"
Weight (tons)	52	52	52.5	57.2	58	35	40	40	41	38[9]
H.P./ton	15.6	14.4	13.7	13.1	26 est.	14.2	14.4	16.1	15.8	25 est.
Main Gun (mm)	90	90	105	152	105/120	85	100	100	115	115
Basic Load	64	62	63	46[3]	55	56	34	43	40	unknown
Road Speed	30	30	30	30	55 mph	35	48	48	50	55
Range	160	310	310	280	310[4]	180	250	310	310	unknown
Year Fielded	1950s	1964	1961	1967	(1981)	1944	1948	1949	1961	1974[9]
Muzzle Velocity	w/APDS		1,470m/sec[5]			with APFSDS(m/sec)			1,630	1,800[4]

[1]Data extracted from U.S. Army Fact Sheet Series, U.S. Army Command Information Unit, except as otherwise noted.
[2]Army Times, "U.S. XM-1 Called More Effective," by Gene Famiglietti, 5 Dec 1976.
[3]The M-60A2 is a *Shillelagh* missile firing tank; basic load includes 13 missiles.
[4]*Armies and Weapons,* Sept-Oct 76, V, Vol IV, Switzerland, pg. 46.
[5]International Defense Review, "The Modern Battle Tank," 1/72, p. 60.
[6]Defense Intelligence Report, "Soviet Tank Company Tactics," (U) DDI-1120-129-76, May 76.
[7]USAREUR Pam 30-60-1, Feb 73, Part I, Vol III.
[8]*The Soviet War Machine,* by C. Donnelly, et al., Chartwell publ., NY 1976, p. 178.
[9]United States Military Posture, FY 78, by Gen. George Brown (CJCS), Jan 1977.

Figure 1

parts, besides some guesstimates of cost, is in combat weight. The U.S. *XM-1* prototype, which will cost (less R&D dollars) an estimated $728,000 per production copy,[2] weighs approximately 58 tons.

Figure 1 compares U.S. and Soviet armor evolution, culminating in the 38-ton *T-72.* More weight equals more cost for comparable agility. The chart describes numerous post-war characteristics, including overall size, armament, basic load, horsepower-to-ton ratios, and other performance characteristics. The actual silhouettes of the *T-72* and the *XM-1* would show little difference in height, although the relative sizes of the two previous adversaries were strikingly different. A height comparison sketch is provided of the Soviet *T-62* and U.S. *M-60A1* as figure 2.

Figures 3 and 4 show the relative performance capabilities of U.S. and Soviet tanks based on armor protection and penetration of main gun ammunition.

Finally, first round hit probabilities for the *T-62* and the *M-60A1* are depicted in figure 5. It can be seen that the hit probabilities of each potential adversary are quite equal, except for the U.S. 105-mm. HEAT round, which is far less effective than either the U.S. 105-mm. APDS or the Soviet 115-mm.

As to the newest tanks, there are many similarities. Firepower is comparable, as U.S. plans call for the possible use of a 120-mm. main gun for the *XM-1.* But the frightening aspect of this comparison is that it involves one presently fielded system, and one prototype. The *T-72* has already entered series production, with an estimated 800 such tanks now with frontline troops in the Group of Soviet Forces Germany.[3] The U.S. *XM-1,* contracted to Chrysler Corporation in November 1976, will be ready for production in 1979 or 1980. While the *XM-1* is evidently superior to the Soviet tank, the U.S. tank will see no troop utilization until 1981 at best. The Soviets may by than have fielded their *T-80.*

According to "Main Battle Tank," Reuters, 11 November 1977, this newest tank has a 125-mm. main gun, vastly improved armor protection, possibly "special armor," a new suspension system which permits the tank to alter its silhouette, and it may also have a laser designator capability, thus improving its versatility as a component of the Soviet tank killer team.

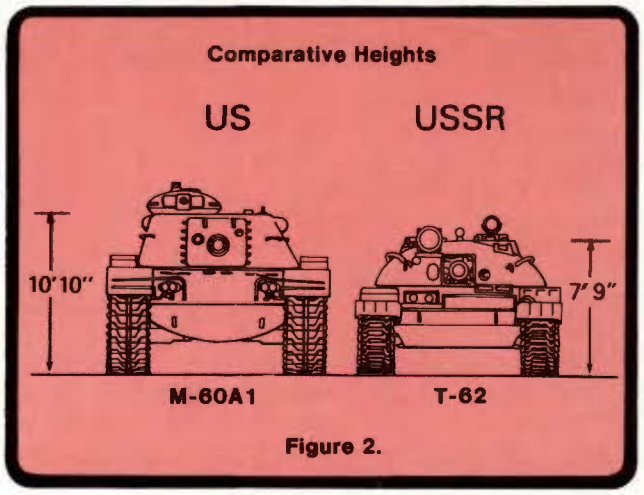


Figure 2.

We should now examine U.S. and Soviet tank developments over the past two decades, comparing the most significant aspects of the evolution. The U.S. medium tank, *M-48,* operational in 1953, has been product improved over nearly 20 years, with five variations having been standardized. The switch from the 76-mm. gun came with the

[2]"*XM-1* Called More Efficient," U.S. ARMY TIMES, by Gene Famiglietti, December 5, 1976.
[3]"The Soviet Buildup in NATO," the Boston Globe, by William Beecher, January 14, 1977, p. 1.

M-26. The many versions leading up the *M-60* used a 90-mm. gun, and since then, a 105-mm., including updated versions of the *48-series.* The *M-48A5* is now undergoing evaluation for additional improvements.

As seen in the Armor Comparison chart, figure 1, the *M-48A3* and the basic *M-60A1* have some features which must be seen as favorable when compared with Soviet counterparts. Most obvious is the 60-round basic ammunition load of the U.S. systems. While not depicted, U.S. optics and ranging systems have long been more accurate. As shown in figure 4, the Soviets have a slight advantage in armor penetration. Probability of hits (figure 5) within given ranges and with similar ammunition, is about equal. In other performance areas, the Soviets have an evident lead over the U.S.

Soviet smoothbore technology is a pioneer effort, and it is noteworthy. The *U5-TS,* 115-mm. smoothbore gun of the *T-62* fires fin stabilized projectiles. The advantages of smoothbore over rifled varieties are numerous. The barrels

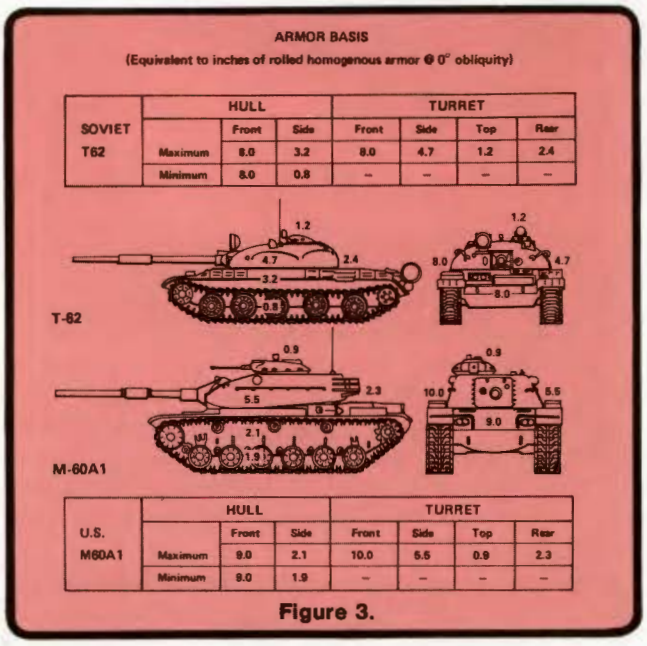


Figure 3.

are easier to manufacture, they weigh less, have greater muzzle velocity, longer barrel life, and less recoil. The recoil aspect allowed the Soviets to develop a remarkably light tank, the *T-62* weighing about 41 U.S. tons, while the West was constrained to a heavier recoil platform. Besides the operational efficiency and maintainability of the *U5-TS,* the kinetic-energy, armor-piercing, fin-stabilized, discarding-sabot (APFSDS) round has a muzzle velocity of 1,630 to 1,660 meters per second.

The APDS round of the U.S. 105-mm. gun has a lesser muzzle velocity.[4] The results of the difference are less penetration, and lower probability of kill with the U.S. round. If the U.S. decides to stay with the 105-mm. gun, when final armament decisions for the *XM-1* are made, the disadvantage in probability of kills over tanks hit will persist. But we are dealing with objectives—design and operational objectives. At longer ranges, such as over 2,000

[4] *Armies and Weapons,* September-October 1976, Lugano, Switzerland, p. 46.

ARMOR PENETRATION CAPABILITY
(within mid-range)

U.S. Weapon		PEN#
M60A1	ADPS	10
	HEAT	17
M60A2—HEAT		17
U.S.S.R. Weapon		PEN #
T-62	APFSDS	13
	HEAT	17

Figure 4.

meters, the U.S. rifled cannon becomes more accurate, and more deadly. However, "...A study covering the mid-European zone postulates that the majority (80 percent) of all targets (armor targets are implied) lie at ranges up to 2,000 meters."[5]

These facts have been brought to the attention of defense specialists before. Equally significant is the Soviet system for automatic expulsion of empty cartridges, ejected through a hatched opening at the back of the turret.[6] Space is a premium in Soviet tanks. The British *Chieftain* tank has also reportedly tackled the problem of wasted room and excess toxic fumes owing to a build up of cartridge cases inside the tank.

In overall size, the Soviet tanks have been considerably smaller than Western tanks—harder to see, harder to hit. The *XM-1* will reduce the overall height from the *M-60*-series' approximate height of 10 feet 8 inches to about 7 feet 9 inches. This height is comparable to Soviet standards. The *T-72* is expected to be just over 7½ feet in height, excluding the machineguns. The Soviets have long maintained a low silhouette as a key component of ballistic defense. This is a Soviet tradeoff; reduced basic load, slower rate of fire, lessened crew comfort, and a generally austere system. The payoff has been operational efficiency.

The *T-72* is not considered to be a true "state of the art"

XM-1

[5] "The Modern Battle Tank," Part 2: Firepower, *International Defense Review,* by F. Schreier, 3/72, p. 60.

[6] *Op Cit., Armies and Weapons,* p. 47.

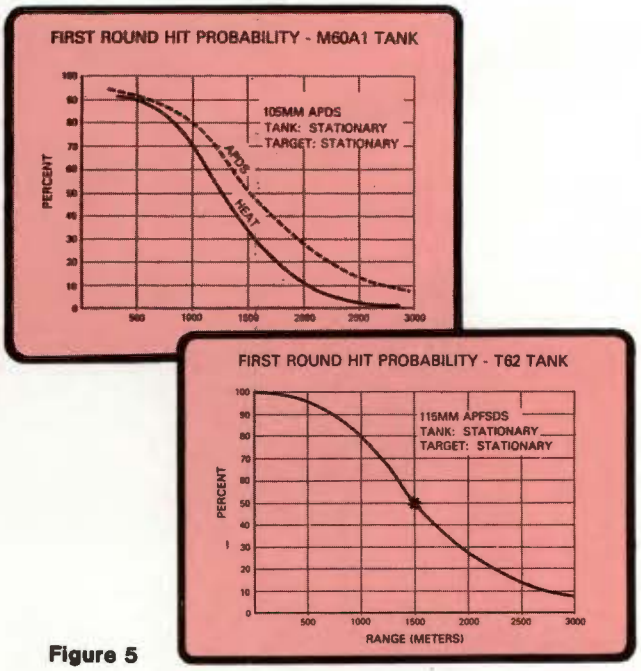


Figure 5

Note: Figures 2 through 5 are reprinted from TRADOC Bulletin Number 1, entitled "Range and Lethality of U.S. and Soviet AntiArmor Weapons (U)." Date of publication 30 September 1976, U.

tank, while the *XM-1* is considered to be just that. The U.S. tank is technologically superior to the Soviet tank, but this very objective has kept U.S. vehicles on the drawing boards and in the engineering and test phases for an extended period of time. Soviet tanks are much simpler, and are incrementally improved. This is what has brought the Soviet tank into the field before the U.S. counterpart, and is particularly obvious today, when comparisons are made between the *XM-1* and the *T-72*. Defense analysts are really comparing the future with the present, the operational with the design model.

There are many similarities between the two most recent systems which can be compared. Improvements in armor materials and/or techniques have been posited. An article appearing in the *ARMOR* Magazine, November-December 1976, suggested that materials such as the British chobham armor may be used in the new *XM-1*, thereby making a quantum jump in armor protection.[7] The comparable Soviet development was also described: "Given the general superiority of the Soviet Union over the West in basic metallurgy, there is little doubt that the Soviet main battle tanks will soon incorporate advanced armor with capabilities similar to chobham armor. Indeed the newest Soviet tank, the *T-72*, may have advanced armor of some type."[8]

The lower silhouette of the *XM-1* is encouraging, but the weight differences in the newest Soviet and U.S. tanks point to different production payoffs, including acceptable life cycle costs. Of two tanks with similar operational characteristics, probability of hits, hit-to-kill ratios, and reliability; even if one is smaller, lighter, and has a lower life cycle cost, the more efficient tank is easily determined.

[7] NOTE: Chobham armor is thought to degrade shaped ATGW projectiles. See *ARMOR*, November-December 1976, Fort Knox, KY, pp. 40-41.

[8] *Ibid.*

How much armor protection will the U.S. *XM-1* have? These data have not been released for public distribution.

The new Soviet tank is estimated to maintain approximately 5-in. to 9-in. of overall armor protection. But with a newly designed chassis, there are many changes from the *T-62*. They have abandoned the long favored Christie suspension system, going to the small, multiple wheel Vickers design used by much of the West. They also have an apparent new engine and transmission, and a redesigned armor protective hull, accentuating a sloping glacis for improved ballistic protection. Thus they have built and fielded a 38-ton tank. Besides improved exteriors, there are apparent automatic loader and possible laser rangefinding improvements inside. This allowed the crew to be reduced from four to three men—no loader. The Soviets have a lightweight, survivable, hard-hitting, efficient tank, with a main gun that can fire a variety of fin-stabilized, high-velocity ammunition.[9] Road speeds of the potential adversaries are comparable. The estimated horsepower-to-ton ratio in both vehicles is also not greatly different, although the *XM-1* will be greater. If the *T-72* has about 920 horsepower, the ratio would be 24 h.p./ton.

What is meant by the idea of getting tanks more quickly into the field? The U.S. and Soviets each discontinued a system which could be operational today, and they did so at about the same time. The U.S. *MBT-70* was seen as too expensive.[10] The Soviet *Dvina* tank was discontinued 7 years ago. It was meant to replace the *T-62*, fielded in 1961. The *XM-1* and the *T-72* are now called comparable adversaries, although the U.S. tank is technologically superior. But which is the combat ready tank? The cheaper, lighter, smaller, simpler one?[11] The more efficient?

Combat development decisions made today affect the battlefield of the mid-to-late 1980's. Such are today's lead times. While the U.S. must keep defense spending in line with other national programs, could we not build more armor systems with accepted tradeoffs in technology? Could we not build more and field them quicker if they were easier to produce?

[9] *The Soviet War Machine*, by C. Donnelly, et al., Chartwell, NY., 1976, p. 178.

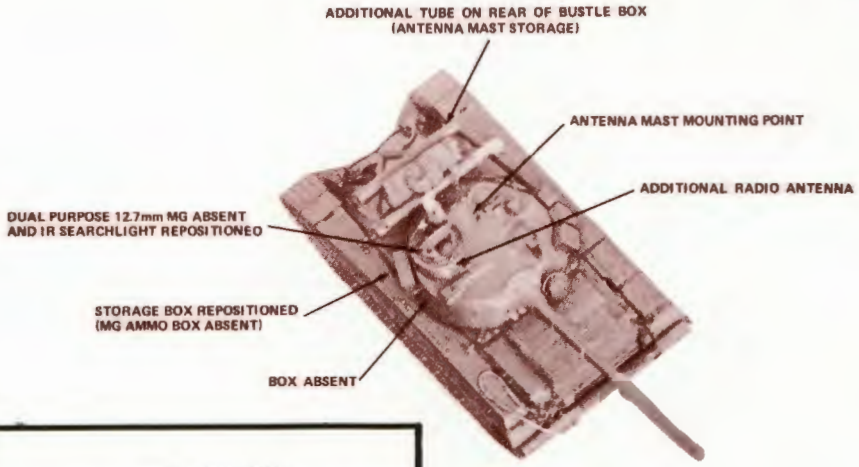
[10] SEE: The *MBT-70* Program, *Armor Development in the Soviet Union and the United States*, RAND R-1860-NA, by Arthur J. Alexander, September, 1976, pp. 107 ff.

[11] *NOTE: The XM-1* reportedly costs 5 times as much as the Soviet tank, while the *T-62* costs between $100,000 and $125,000. *Ibid*, p. 121.

A.W. McMASTER, III is the author of numerous defense articles and book reviews. He received a BA in Government from Indiana State University and an MA in International Relations from the University of Maryland. A reserve component MI officer, Mr. McMaster has served with the Army Security Agency and Military Intelligence units and is currently Senior Intelligence Analyst, Intelligence Division, HQ, TRADOC.

T-72

SOVIET MEDIUM TANK



CHARACTERISTICS

CREW:
- 3 (COMMANDER, GUNNER, AND DRIVER)

ARMAMENT:
- MAIN GUN:
  - IMPROVED OVER *T-62*, w/ AUTOMATIC LOADER
  - BASIC LOAD UNKNOWN (40 ESTIMATE)
  - RANGEFINDER OPTICAL, ELECTRO-OPTICAL, OR LASER
- AUXILIARY:
  - EXTERNAL MACHINE GUN PROBABLY 12.7-mm. REMOTELY OPERATED
  - COAXIAL MACHINE GUN PROBABLY 7.62-mm.

ARMOR PROTECTION:
- INCREASED ANGLE OF GLACIS
- UNIQUE PROTECTIVE SKIRTING

MOBILITY:
- NEW SUSPENSION (TORSION BAR w/ RETURN ROLLERS)
- NEW ENGINE (DIESEL)
- CRUISING RANGE PROBABILY AS GOOD AS *T-62*
- IMPROVED CROSS COUNTRY MOBILITY/AGILITY

NIGHT VISION:
- ACTIVE INFRARED SEARCHLIGHTS
- PASSIVE NIGHT VISION DEVICES POSSIBLE

IDENTIFICATION FEATURES

6 EVENLY-SPACED ROAD WHEELS
4 SINGLE RETURN ROLLERS
DOUBLE PIN TRACK w/ DETACHABLE CENTERGUIDES
DRIVE SPROCKET IN REAR
IDLER WHEEL IN FRONT

LONG FRONT GLACIS PLATE
CENTERED DRIVER'S HATCH

REAR MOUNTED ENGINE
EXHAUST DIRECTLY OUT GLACIS PLATE

V-SHAPED WAVE DEFLECTOR
REAR MOUNTED ENGINE
EXHAUST DIRECTLY OUT THE REAR

ROUNDED TURRET w/ FLATTENED TOP CENTERED ON HULL
LONG GUN TUBE w/ BORE EVACUATOR APPROXIMATELY 1/3 DISTANCE FROM MUZZLE
INFRARED SEARCHLIGHT TO LEFT OF MAIN GUN
2 FORWARD OPENING HATCHES ON TURRET
RIGHT HATCH IS A ROTATING CUPOLA w/ A LARGE EXTERNAL MACHINE GUN

EXTENSIVE EXTERNAL STORAGE
BUSTLE BOX ON REAR OF TURRET (DETACHABLE)
SNORKEL CARRIED ON REAR OF TURRET
FUEL CELLS COVER ALMOST ALL OF THE FENDERS
BOXES HUNG ON BOTH SIDES OF TURRET

COMMAND VARIANT
- EXTERNAL MACHINE GUN REMOVED
- TWO ADDITIONAL ANTENNAS (ONE WHIP, & ONE 10-mm. MAST)
- IMMOBILE WHEN 10-mm MAST ERECTED

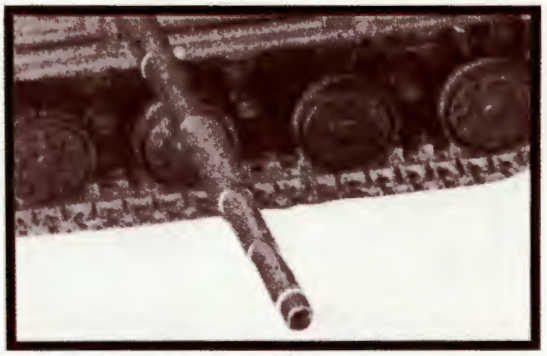
PREPARED FOR SNORKELING

T-72 WITH PROTECTIVE SKIRTING

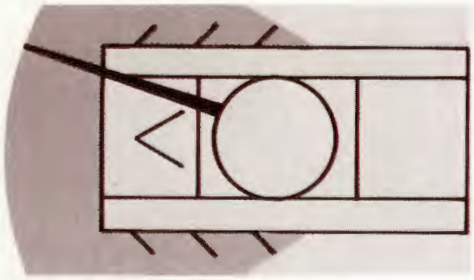
SKIRTING PLATES

MAIN GUN AND INFRARED LIGHT

COMMAND VARIANT (T-72K9)



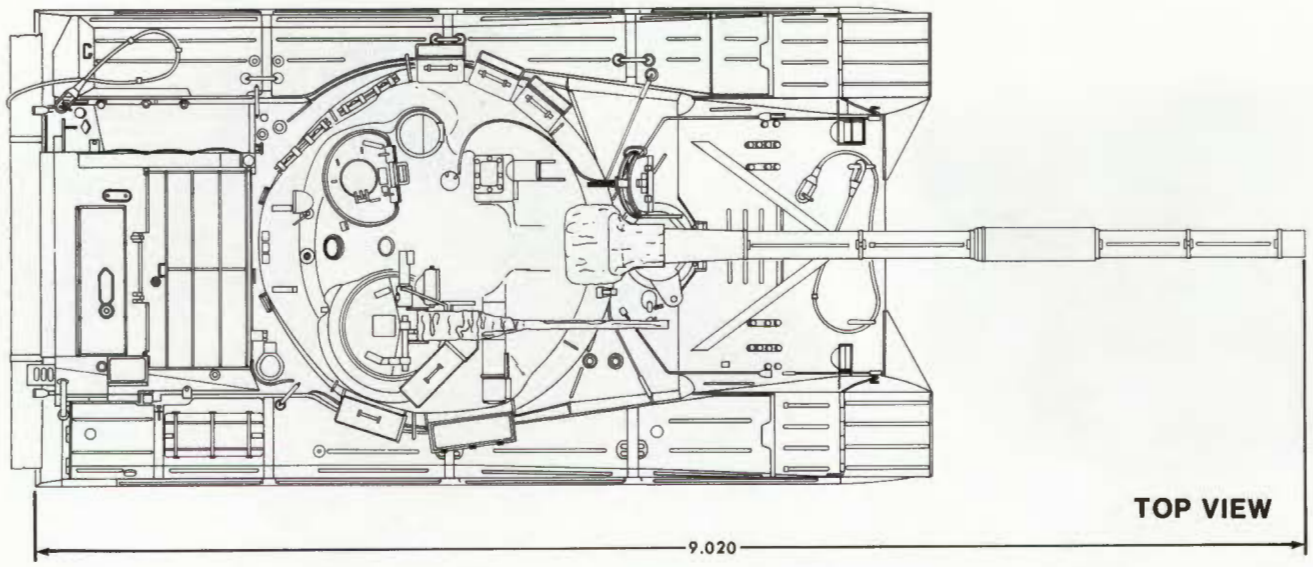
BARREL DETAIL



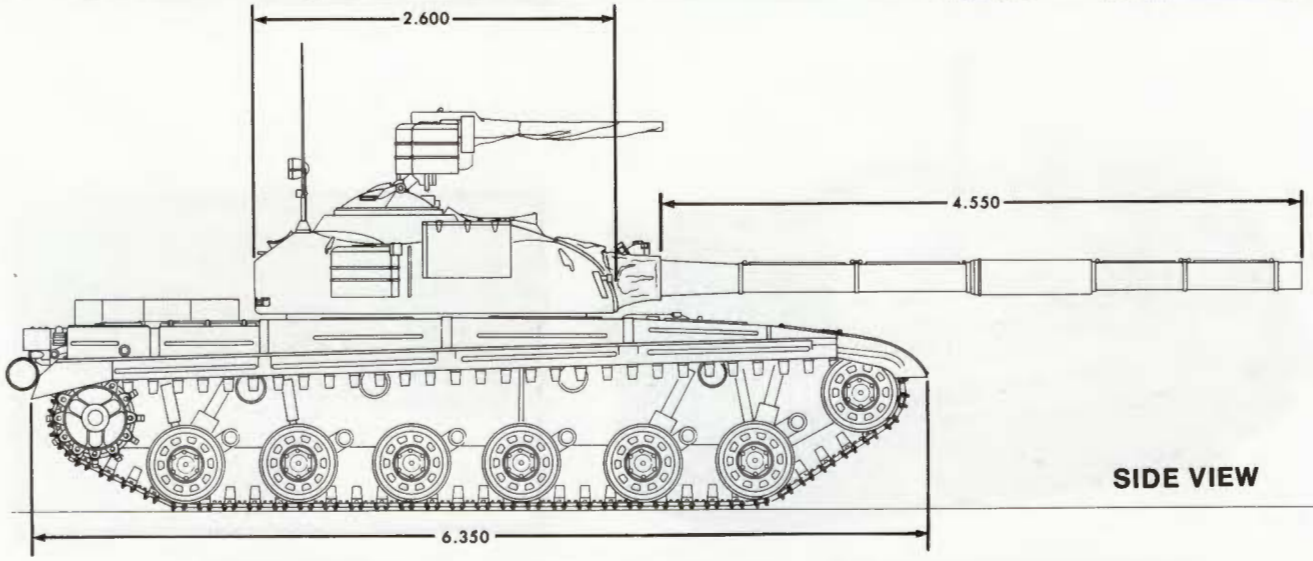
DEGREE OF PROTECTION
SKIRTING PLATES EXTENDED

T-72

ALL DIMENSIONS IN METERS



TOP VIEW



SIDE VIEW

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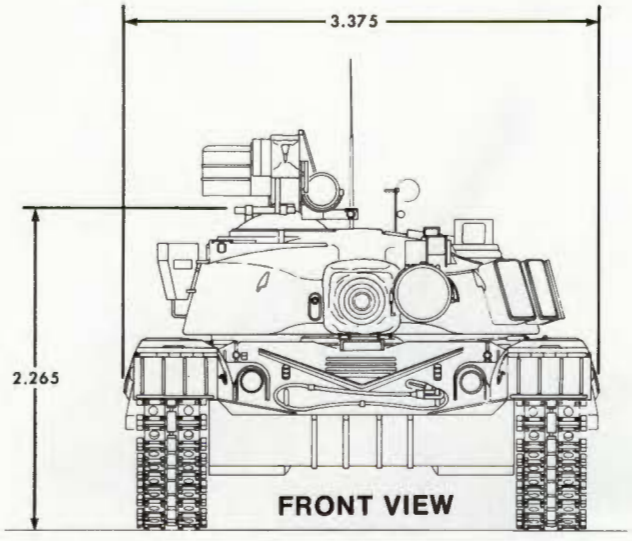
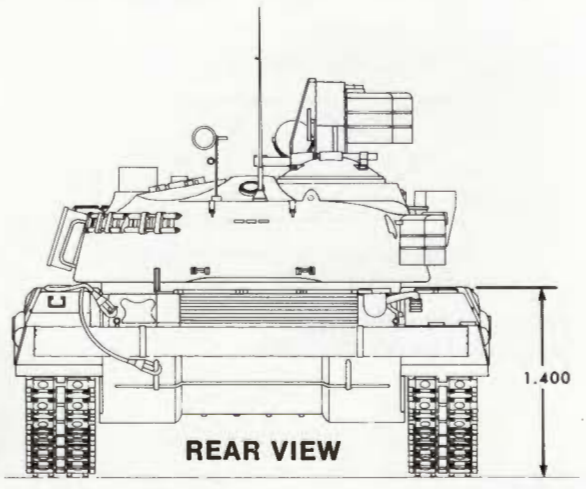


FRONT VIEW



REAR VIEW

Subcaliber Training Devices

by Lieutenant Colonel
Armand E. Racine

Wouldn't it be great if a tank company commander could say, "1st platoon, next week you've got details; 2d platoon, preliminary gunnery instruction; and 3d platoon, you've got the tank gunnery ranges," or, how about, "SGT Jones, take those two new gunners out to the range and see if they know their stuff."

Few units enjoy the luxury of having their own dedicated tank gunnery ranges located so conveniently. Safety requirements for main-gun firing dictate the remote locations of ranges, and the size of these ranges limits their number. Consequently, existing tank gunnery ranges are scheduled very methodically to permit units to fire once, or maybe twice, a year. The problem is particularly acute with Reserve and National Guard units which usually have no ranges of their own and must travel long distances for realistic tank gunnery facilities.

There is also the problem of one range interfering with another. How often have you had to cease fire because the unit on an adjacent range had to replace or repair their targets? Well, a solution may finally be at hand in the form of fully-developed and tested subcaliber training devices (SCTD).

Subcaliber training devices for tank gunnery are not new. There are nine SCTD's of various origins sanctioned by the Armor School. Their description and operating characteristics can be found in TC 17-12-7. For the first time, however, most of the attention has centered around two of these devices—the *Telfare* device and the caliber .50 inbore device for 105-mm. tank guns.

The inbore device was developed by the U.S. Army Land Warfare Laboratory at the request of the U.S. Army Combat Arms Training Board. The device resembles a 105-mm. "dummy" round (at left) with a cliber .50 spotter (for the 106-mm. recoilless rifle) barrel inside. It fires an *M-48A1* cartridge from within the main gun breech. The device is installed in the same manner as service ammunition, and is loaded and is fired by using the regular firing circuits. However, the breech block must be lowered manually to reload the device. Removing some of the tension on the breech block closing spring makes this job easier. It is reloaded by removing the mini-breech to change the caliber .50 cartridge and then rechambering the device (figure 1). Because the *M-48A1* cartridge has a slower muzzle velocity than any 105-mm. service ammunition, the device has its own ballistics cam that must be installed in the computer.

The *Telfare* device, developed by Sergeant First Class Nathaniel Telfare, Weapons Department, U.S. Army Armor School, is essentially an *M-2, HB,* caliber .50 machinegun mounted on the main gun with a 4-inch aluminum collar and bracket (figure 2). A "single-shot" device is used in the circuitry that connects the firing solenoid to the main-gun fire controls. As presently designed, the device requires converting the machinegun to right-hand feed so that the ammunition tray does not interfere with the coax machinegun. The loader charges the gun by pulling a cable extending from his hatch to the charging handle.

Both devices were designed to provide realistic and effective tank live-fire training where range or ammunition restrictions preclude regular main gun firing.

The U.S. Army Armor School requested that TRADOC Combined Arms Test Activity (TCATA, formerly MASSTER) conduct an evaluation of the training effectiveness of the *Telfare* device in an attempt to validate the concept of integrating SCTD's into the tank gunnery program. U.S. Army Materiel Developments and Readiness Command (DARCOM), which now has the proponency for the inbore device, requested that the inbore device be included in the evaluation. TCATA agreed to expand the scope of the test to include a comparison of the training effectiveness of the devices and their operational suitability.

The test which took place on the Dona Ana Range Complex in New Mexico during April 1977, was supported by the 3d Armored Cavalry Regiment.

Upon arriving at the test site, TCATA test personnel discovered that the 3d Cav had developed and was experimenting with its own SCTD. They call it the *Nacca* device. It employs the caliber .50 machinegun in much the same manner as the *Telfare* except that it mounts on the searchlight mount of the *M-60A1* (figure 3).

In consultation with the U.S. Army Armor School,

TCATA decided that a very simple three-way comparison of the *Telfare, Nacca,* and inbore devices would be conducted at the termination of the main test.

The test design was quite simple. Each of the three tank company commanders organized their companies into four sections of four tanks each so that the "talent" was equally distributed. Test personnel then assigned the sections to one of four test groups.

All test groups completed the Gunnery Skills Test (GST) and Tank Tables I, II, and III prior to beginning their separate training programs. Group 1, called the "hot group," fired Tables IV through VII A&B using the main gun. Groups 2 and 3 did the same thing, but fired the *Telfare* and inbore devices in lieu of the main gun. The simulated main-gun engagements were fired at half-size targets at one-half the normal range. Group 4, the "cold group," did no tank gunnery related training during that period. Finally, after boresighting and zeroing all weapons in Groups 2, 3, and 4, tank crews from all groups fired Table VIII A&B for qualification.

Data was collected by TCATA from scoresheets, questionnaires, and by observations of test personnel and training managers. Both day and night main gun engagements on Table VIII were recorded on video tape to assist in scoring (see "Scoring Tank Gunnery by Instant Replay," *ARMOR,* May-June 1977). The crews underwent an extensive debriefing after Table VIII to obtain their assessments of the relative merits of their assigned training programs. The data collected clearly indicates the value of SCTD's and their future role in training. The analysis was quite conclusive.

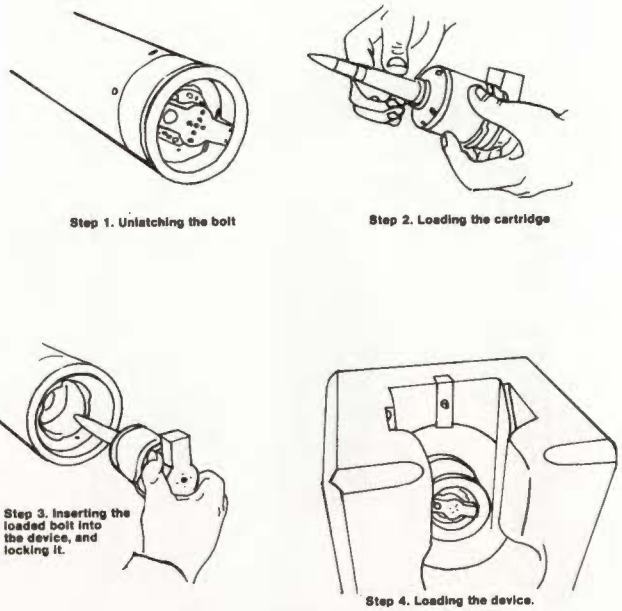


Figure 1.

The subcaliber training device concept is valid. As a matter of fact, the average Table VIII scores of the crews trained on the Telfare device were quite comparable to those trained on the main gun.

The *Telfare* device was found superior to the inbore device because of some operational shortcomings observed with the inbore. For instance, many crews complained of the noxious gases that tend to accumulate in the turret. In sufficient concentration, the gases are flammable and over half of the crews firing the inbore device experienced some "flashing" in the breech. The burning gases are not a critical safety problem because the phenomenon is more accurately described as a very soft flame, which seldom exceeds 18 inches in diameter. Clearing the turret with the turret ventilating blower reduces the problem considerably, but instructing the loaders to roll their sleeves down and wear gloves would be a good precaution.

The time required to reload the inbore device is excessive and results in unrealistic first-to-second round elapsed times. During the test, part of the delay was caused by the spent cartridge case sticking in the chamber of the device. The manufacturer reports having solved that problem, but in the meantime, it was found that oiling the cartridges helped.

One of the more significant shortcomings of the inbore device is caused by its unique ballistic characteristic. Secondary sight engagements must be eliminated from the Tables or the gunner must apply "Kentucky windage" because there is no appropriate reticle in the telescope. Also, the cam provided with the inbore can only partially compensate for the reduced velocity. Even though it does correct for range, the burst-on-target (BOT) and tracking techniques are still affected. The inbore gunners reported that they had to nearly double the normal lead to hit a moving target with the device. On Table VIII, their percentage of second round hits was significantly less than that of the *Telfare* and Hot groups.

On the other hand, out to 1,500 meters the ballistic characteristics of the *Telfare* device nearly match those of 105-mm. high explosive plastic (HEP). This device is fired

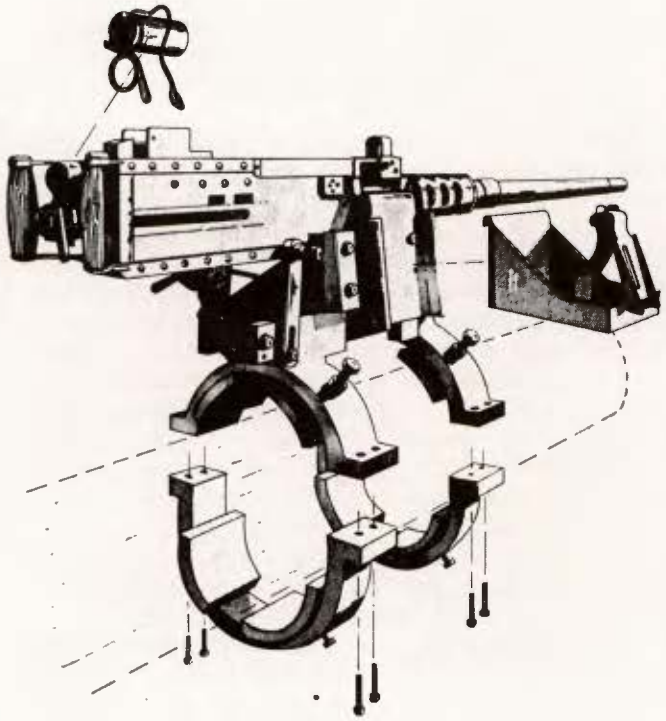


Figure 2.

Figure 3.

using both the HEP cam and telescope reticle with very satisfactory results.

The *Telfare* device is not completely without problems. However, most of them occur only during installation, boresighting, and zeroing. Difficulties in installation stem primarily from a general lack of familiarity with the caliber .50 *M-2 HB* machinegun and the procedures to convert it to right-hand feed. Boresighting and zeroing is very straightforward—it just takes time. (A caliber .50 boresight device is a valuable asset in this situation.) Once it is mounted and operating properly, the *Telfare* is just another "Mod Deuce" with the same legendary accuracy and reliability.

Rounds fired from both devices can be sensed satisfactorily, and the BOT training derived is definitely worthwhile.

Both devices have limited training value for the loader, but the *Telfare* device does have the advantage of permitting the loader to practice with a dummy round during the engagement. Finally, the half-size targets and much shorter ranges used in conjunction with the SCTD's do not give the tank commander all the practice and realism in ranging that he needs. Test results showed that first round hits will suffer unless additional training in ranging is provided. Regardless of the shortcomings mentioned, these SCTD's are valuable training tools.

The U.S. Army Armor School anticipates the SCTD's will be used extensively in the new tank gunnery tables described in FM 17-12-2, dated 31 March 1977. It is prescribed that revised Tables IV and V be fired with SCTD's before any firing with the main gun.

The decision has been made to produce 890 of the inbore devices, apparently as an interim device pending production of the *Telfare* that has just begun the DARCOM developmental cycle. At the same time, the U.S. Army Armor School is going to take a hard look at the *Nacca* device. In the brief three-way subjective comparison at the end of the test, TCATA concluded that the *Nacca* and *Telfare* shared the first place ranking as the devices "liked best" over the inbore device by a ratio of 20 to 1. Test personnel observed that the *Nacca* is very similar in concept and performance to the *Telfare* device but is simplier and, therefore, probably less expensive to manufacture. Unfortunately, it can only be used on tanks mounting the *AN/VSS-1* searchlight. Nevertheless, there could be a *Nacca* in your future.

Now, what does all of this mean to the tank gunnery training manager?

First, and most important, it means more flexibility in tank gunnery training programs. With smaller and more readily accessible ranges and much less expensive ammunition, unit commanders can train at their own pace with realistic exercises that emphasize full crew interaction. It means that ammunition details for SCTD tables may be a private first class (PFC) in a jeep with a trailer instead of a squad and a couple of 5-ton S&P's. Hard targets will last much longer, and the odds on knocking down panel targets are reduced considerably. The main gun ammunition saved by teaching basic gunnery skills and crew drill with SCTD's can be put to good use on platoon and company live-fire exercises. It may even permit more frequent main gun firing. The increased frequency of gunnery training will mean that training managers will no longer have to tolerate wide variations and cyclical proficiency in tank gunnery.

TCATA is not pretending that SCTD's are a complete substitute for the real thing, but they definitely will prepare us to make much better use of the real thing whenever it's available. Subcaliber training devices for tank gunnery are here and more are coming. Just use your imagination and initiative—and fire at will.

LTC ARMAND E. RACINE was commissioned in Armor upon graduation from Norwich University in 1961. A graduate of the Airborne School, Reconnaissance Platoon Leader Course, Motor Officer Course, Armor Officer Advanced Course, and the Jungle Course, LTC Racine has served tours as a Cavalry Troop Commander, Assistant S3 of the 11th ACR and as a Senior Adviser in Vietnam. He is currently assigned as Chief, Plans and Support Division, Training Developments Test Directorate, Fort Hood, TX.

ANTIARMOR NIGHT FIGHTING

The massive firepower which can be brought to bear on an opposing force by our ground elements in conjunction with attack helicopters has the potential of effectively defeating any enemy. But this holds true only when proper coordination of all elements is maintained and weapons are utilized at their most effective ranges. If an attempt is made to deliver aerial ordnance beyond its effective range, or if the aerial weapons systems must be moved into the kill zone of enemy weapons being confronted, our combat potential will be seriously reduced.

The *AH-1Q/S (Cobra)*, utilizing the *XM-65* tube-launched, optically-tracked, wire-guided (TOW) missile subsystem, is the primary aerial antiarmor weapon which presently can be fielded with the combined-arms team. The minimum effective range of this subsystem is 500 meters; the ideal distance for target engagement is 2,500 meters out to a maximum range of 3,750 meters. These distances would normally enable our aircraft to stay out of the effective ranges of the enemies' weaponry (tank main gun and light antiaircraft).

Naturally, an engagement at these ranges is the ideal solution and is always sought by the scout helicopter when locating firing positions. It is hoped that while the engagement is being set up, prevailing conditions will allow maximum use of standoff range. However, as we all well know, smoke, haze, terrain, the dust of battle, and darkness will play a part in reducing the probability of encountering that ideal situation. For the purposes of this article, we will discuss the methods of dealing with darkness and achieving that first-round hit.

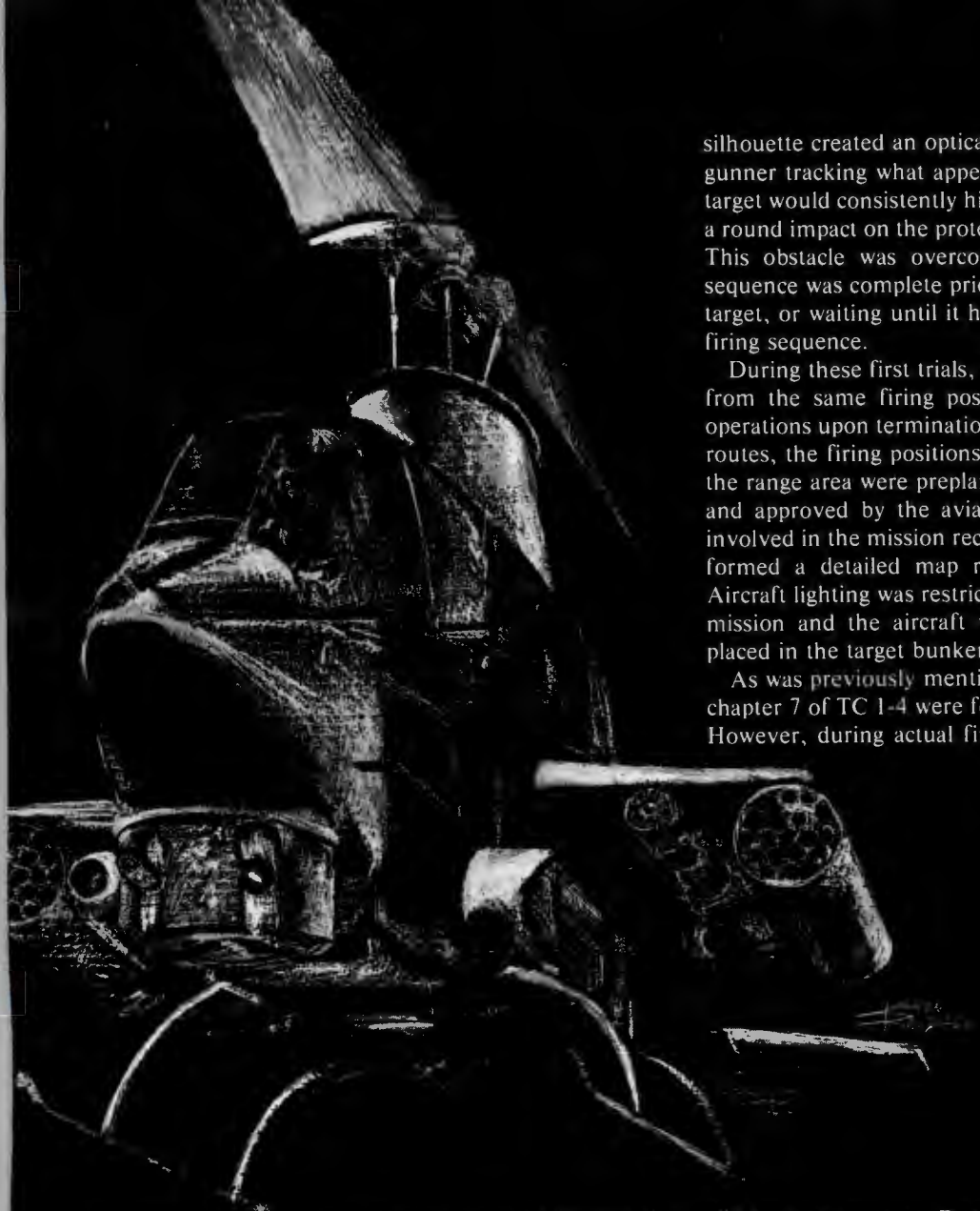
While the *AN/PVS-5* night vision goggles are effective, they have only been issued in limited quantities and may not be available to all crews.

This means that personnel who may participate in a future night engagement must be proficient in night nap-of-the-earth (NOE) flying and night firing techniques without the aid of sophisticated night-vision systems. As any Army aviator can tell you, night NOE over unfamiliar terrain is almost "Mission Impossible." However, unless we can talk our potential enemies into launching their initial attack on the west side of Fort Hood or in your local area, we'll probably come up against this obstacle in any future midintensity conflict. Seriously, though, we must be ready to fly and fight wherever and whenever we are needed. Local unit training must prepare aviators to meet and overcome the hazards of NOE flying at night in a safe and professional manner.

In response to this challenge, the 7th Squadron (Attack Helicopter), 17th Cavalry, 6th Cavalry Brigade (Air Combat) at Fort Hood, TX, has included night NOE and night firing in its quarterly gunnery training program. During a recent gunnery exercise, the 7-17th firing of TOW missiles and 2.75-inch folding-fin aerial rocket (FFAR) flares at night resulted in an overall confirmed hit and kill rate of 80 percent. Of particular note is the fact that none of the crews on this particular firing had fired a missile prior to the exercise, and had no previous experience with flare rockets.

Unit training prior to the gunnery exercise included a TOW missile subsystem ground school with 5 hours of tracking flight training. The tracking training was conducted in the local area with *M-113's* and wheeled vehicles used as moving targets in the kill zone. The attack helicopter utilized firing positions at ranges of 1,500 to 4,000 meters for the purpose of training gunners in range estimation and tracking proficiency. The Gunners Accuracy Control Panel (GACP) was not used due to difficulty in obtaining and maintaining this equipment.

To enhance combat-readiness training, each troop within



the squadron designated one platoon as a night-fighting element. The night platoon performed as much as 80 percent of its flight training at night, and initiated a night vision goggle (*AN/PVS-5*) training program. However, during the night TOW missile firing, night vision goggles were not used.

The range used during this training employed a dark brown, reduced scale, stationary tank silhouette positioned at a distance of 2,500 meters. The attack teams utilized 4.2-inch mortar flares as primary illumination with the 2.75-inch rocket flares as a backup. Illumination adjustment for the mortars was coordinated by the scout aircraft prior to engagement by the TOW *Cobras.*

Problems were encountered when mortar adjustments were made using the observer-target line method. However, the gun-target line method was quicker and more accurate. Initially, illumination was provided by the 4.2-inch mortars until the *Cobra* crew achieved target acquisition. At that time, 2.75-inch FFAR flares were fired by a second *Cobra* to achieve a higher level of illumination during the firing sequence.

Firing procedures used during the exercise were in accordance with Training Circular (TC) 1-4. During the initial firings, it was noted that the position of the illumination in relation to the gun-target line played a critical part in achieving a high degree of accuracy. When wind-drift positioned the flares directly behind the target, the shadow cast by the silhouette created an optical illusion. Due to this shadow, a gunner tracking what appeared to be center of mass of the target would consistently hit low on the actual target or have a round impact on the protective berm in front of the target. This obstacle was overcome by insuring that the firing sequence was complete prior to the flare passing behind the target, or waiting until it had passed prior to beginning the firing sequence.

During these first trials, all engagements were performed from the same firing position to facilitate wire recovery operations upon termination of the exercise. The night NOE routes, the firing positions, and all procedures followed on the range area were preplanned by the mission commander and approved by the aviation safety officer. All aircrews involved in the mission received a detailed briefing and performed a detailed map reconnaissance prior to takeoff. Aircraft lighting was restricted to STEADY DIM during the mission and the aircraft were not detected by observers placed in the target bunker area.

As was previously mentioned, the procedures outlined in chapter 7 of TC 1-4 were followed with a high success rate. However, during actual firing, some minor problem areas did become apparent. Due to the relatively extreme attitude changes required when following the firing procedures for the *M-257* warhead, the firing position for the illumination aircraft must be selected with care. In order to achieve the 15-degree, nose-high attitude for firing, and to effect a safe recovery, it is necessary to allow a 30-meter clear area on all sides of the firing position. During the first few firing sequences, it was noted that many pilots tended to overcontrol the aircraft if a rocket was not launched on the first attempt. This tendency could result in flare ignition at an extremely low altitude, which would fail to provide the necessary illumination. Subsequent crews were directed to attempt only one firing per nose-elevation maneuver. As this was the initial "hands on" training for the crews doing the firing, this trial and error period provided excellent experience for everyone.

As we all know, any future battle will be fought under conditions that will frequently be less-than-favorable for employment of attack helicopters. In order to survive and win under these conditions, our aircrews must have the finest and most comprehensive training available. The 7-17th "Heavy Cav" has indeed taken a step in the right direction.

This article is the result of a joint effort by pilots of the 7-17 Cavalry who participated in the night gunnery program conducted by that unit. —*ED.*

PROFESSIONAL THOUGHTS

IN DEFENSE OF THE '45'

"It's useless," "nine out of ten soldiers can't hit the side of a barn with it," "I'd rather have a .38, a luger, a .357, etc., etc., etc." With that introduction, 99 out of 100 old soldiers (those at least 6 months out of basic) will guess the weapon in question is the oldest in the Army's inventory, the U.S. Army pistol, cal. 45, *M-1911A1.*

The amazing thing about the "45" is that for most of its long lifespan in the Army, only a few people at any one time liked it and did not want it replaced. Every few years, like clockwork, a new move is made to find a replacement. Today, another one is underway at the Armor and Engineer Board at Fort Knox where it is to be compared with a variety of other weapons to determine the best individual weapon for a tanker.

As one of the few "old soldiers" who not only carried a "45" during my years of active duty, but liked and trusted it, I am hardly an unbiased evaluator of its merit vis-a-vis other handguns. With that established, let me start by saying that in my opinion the issue "45" is a piece of junk. It needs two simple, very low-cost modifications.

The first and highest cost modification needed is replacement of the sight with a wider front blade and a rear sight that has a square cut, wider notch opening than the present "V" notch. These are standard items for match weapons. (Note: these sights are not adjustable.) Total cost of a new sight purchased in quantity should be only a few cents. Modifications should be made at depot level where alignment can be carefully checked.

The second modification requires no new parts and can be done at the unit by small-arms repairmen. It entails a reduction in the required trigger pull from 5 pounds to 3. A word of caution on this point is needed, however. We don't want a hair trigger—in truth a 5-pound pull is not all that bad. The biggest trouble is that most small-arms repairmen, fearful of being gigged on an inspection for too light a pull, tighten the spring to require as much as 8-pounds of pull.

I can remember all too well watching a small-arms repairman check trigger pull on the pistols assigned to my tank company. First, he held the pistol in one hand, muzzle up, with the hammer cocked and the grip safety depressed. Then he hung a 5-pound weight on the trigger. The hammer was not released, and the weapon had passed the test. No, not quite. He wanted to be sure there were no gigs on his weapons. Heaven forbid! He jiggled the weapon, bouncing the weight slightly. The trigger held. Then, again, bouncing the weight a little more, it still held. Now he was satisfied. Without a doubt, the trigger had at least 5-pounds pull. It would pass any technical inspection, *but* could the man it was assigned to fire it effectively? I doubted it then and I still do.

What we need to do is give our small-arms repairmen two weights, one that the trigger must support, and one a pound or so heavier that it must NOT! Then all pistols would have a trigger that could be squeezed without white knuckles.

Will these modifications alone make experts of soldiers armed with a "45"? Of course not. Shooters must be trained. Unfortunately, Army pistol shooters in most cases must be *untrained.*

How many essential elements are there in a correct sight picture?

If your answer to that question is three, the chances are

you're a good enough pistol shooter to make somebody's pistol team or you're a poor shot with the "45." Heresy you say? Everybody knows from basic training the front and rear sights must be aligned with the top of the front sight blade held at six o'clock on the bull's eye. Right, if you're shooting a rifle. Right, if you are an expert capable of holding a pistol rock-steady on the target. Dead wrong if you are an average soldier.

The average shooter has as much chance of holding a pistol steady as he does of having a breakfast of "eggs benedict" served to him in bed each morning by his company commander. "That's the whole point," you say, "the '45' is so heavy few soldiers can hold it steady." True, but even lighter weapons can't be held steady for long.

The secret is in the technique of what I call the two-point sight picture. Forget the target for a moment. The two-point sight picture is comprised of the front and rear sight. If you can hold the sights properly aligned, then even if your arm weaves, you'll make a good shot. Pick up a pencil and hold it pointing at a picture on the wall. Keep it aligned and see how much you can move it without getting outside of the target (picture) area. OK, now hold the front end of the pencil still and let the rear end move. A move of an inch will take you out of the target area. Convinced? I hope so.

There are techniques, of course, to achieve the two-point sight picture. Believe it or not, it requires confidence building. To build confidence, I recommend the following:

- First, go to a target range and get a standard "bull's-eye" type target. Make sure that the back of the target is in good condition (one that does not have the middle shot out). Set up the target with its *BACK* facing the firing line. That's right, its back. The shooters must not see the bull's eye; just a large white target.
- Second, take up a natural firing position on the firing line. You do this by facing the target, then doing a left face (assuming you shoot right-handed). Spread your feet to get a comfortable, solid stance. Now, with your pistol still on the stand, or held in your left hand, and your eyes looking anywhere but towards the target, raise your right hand and extend it straight out from the shoulder. (Some shooters even like to close their eyes while doing this). Point your finger at the target (remember, no peeking). Holding your arm and finger steady, now sight down your finger. Don't let your finger move. Pointing off the target? OK, drop your arm, look away and adjust your feet. Repeat the exercise until you point without looking at the target. If you're high or low you may widen or shorten your stance a little. The objective is to get the natural aim in the area of your target. Rarely will it be perfect in elevation, but you should be able to find a natural position near perfect in deflection.
- For step three, pick up the pistol, load it, and take your aim. I like to start high and bring it down slowly. CONCENTRATE ON KEEPING THE FRONT AND REAR SIGHTS LINED UP. FORGET THE TARGET!! As long as the sights are alined, and you see the white of the target, squeeze the trigger. Fire 10 rounds, slow fire.

Clear your weapon and holster or ground it. Now go down range behind your target and see what you did. If you have squeezed off your shots, you'll have a group near target center. I invite you to count your score. In most cases, if you've had trouble shooting the pistol, your score will be higher than what you've usually had.

The rest requires practice. Keep shooting to gain confidence. When you get it, and only then, turn the target so that you can see the bull's-eye. Now you can narrow your aiming point so that you continue squeezing as long as you are aligned in the black. At this point, you should qualify as an expert.

If you're skeptical, you are in the majority. As a young second lieutenant many years ago, I could shoot expert with any rifle but was hopeless with a "45." Then a friend showed me this technique and I qualified expert. Only a short time later, I got a lucky break. My father-in-law, a retired Cavalry (horse-type) officer gave me his old service "45" which had the bigger sights and lighter trigger pull. Man-oh-man, did my scores improve!

A year or so later I was commanding a company at Fort Hood, training our own recruits who would stay in the unit and "gyroscope" to Europe with me. My executive officer, a truly exceptional lieutenant, was in charge of the training in pistol marksmanship. He went right by the book, skipping nothing. In that division, you had better go by the book, or else. Then the company went out to the range for practice, followed by qualification firing. When I tell you that there was strong command emphasis on qualifying with the pistol because: one, for most of the troops, it would be their individual weapon, and two, the trainees were going overseas in our units, you'd no doubt appreciate that by emphasis I mean pressure. By 1500 hours that day every man had fired once for record. Although they had received all the training laid out in the book and had been well-taught, almost 30 percent had failed to qualify.

Fortunately, ammunition was not a problem. While new target faces were posted, bull's-eye onto the target backs, I got the non-qualifiers together and presented the two-element sight picture technique, ending up by firing a demonstration. Then I put them back on the line facing the target backs and had them fire the record course once more. We scored their targets from the back. The result: we qualified 98 percent of the company that day and not one of them with a pencil.

Later, whenever my company went to the range for annual qualification, I offered a standard bet of a 3-day pass for anyone beating my score. I never had to pay off. By the way, if you ever make such an offer, you can be sure that you'll have to shoot what you get. My senior noncoms, anyone of whom could have had a 3-day pass anytime just by asking, all leaned over my shoulders during the scoring to make sure I got no breaks.

Get rid of the "45"? I'd vote no until I see something a whole lot better. Improve it by new sights and lighter trigger-pulls? That's long overdue. Revise our training methods? The proof of the pudding is in the eating. Try the two-element sight-picture technique yourself and you'll see.

As one last point; when you gain confidence in the "45" and you've learned to concentrate first on sight alignment, you'll find yourself able to hold more and more in the center of the bull. Your scores will get continually better, and that 1 day each year you spend on the range shooting the pistol will be a real pleasure.

DAVID C. HOLLIDAY
Lieutenant Colonel, Retired
Ft, Knox, KY 40121

YOU CAN'T FORGET CANT

by Captain James D. Brown

Whether you believe the first battle of the next war will find you drawing a bead on an enemy tank in the desert sun at 3,000 meters or straining to make out the nationality of that indistinct shape out in the Hessian fog at 300 meters, you have a heavily vested interest in a first-round hit on any target in sight. Although first-person accounts are notably scarce, the consequence of missing one's target in a tank duel has been statistically associated with a quick and fiery death and abrupt curtailment of an otherwise budding career.

A sound knowledge of your fire-control system's capability is a first step toward victory in that first tank-versus-tank confrontation. A re-reading of Captain Ed Bryla's article on the error budget ("Reduce your Budget, Yet Buy More," *ARMOR*, November-December 1976) will provide a good overview on what I wish to discuss. This article concentrates on just one of the components of the error budget, trunnion cant, and will explain how you can recognize cant and minimize its effect. For simplicity's sake, the discussion will be limited to the family of 105-mm. gun tanks; however, the principles involved also apply to other tanks, and indeed to any direct fire gun system.

Cant is the inclination of the axis of the gun trunnions with respect to horizontal. In tank gunnery, cant is treated as a "variable bias" in that its effect varies from engagement to engagement, but remains constant for all rounds fired within any engagement. In simplest terms, this means that cant-induced errors will only be apparent for the first round of any engagement. Corrections, such as burst-on-target (BOT), that you make to bring subsequent rounds onto the target will automatically compensate for cant (and all other variable-bias errors) for the remainder of any engagement.

Cant-induced errors are a predictable function of the ballistic characteristics of the ammunition used, the range to the target, and the cant angle of the weapon at the instant of firing. The prediction process is relatively easy for advanced electronic fire control computers, such as those found in the *M-60A2, M-60A1E3,* or *XM-1,* but expensive and difficult for the electromechanical computers on less sophisticated tanks, such as the *M-48A5, M-60,* and *M-60A1.* Further, because of the short time constants involved, no fire control system currently envisioned will be capable of cant resolution from a moving tank.

We may conclude that, for the reasons just stated, many engagements will be fired without benefit of computed cant compensation. However, you need not feel helpless in such a situation.

Figure 1 is a plot of allowable cant as a function of range for each of the major 105-mm. ammunition types. The curves represent the limits at which each type round exceeds its allocated slice of the error budget. (The cant allocation has been arbitrarily selected for this discussion as that which causes .25 mils of horizontal impact shift. The cant values used in the actual error budgets of U.S. tanks are classified. The reader is assured, however, that this assumed .25-mil impact shift is far enough within the range of actual values that conclusions drawn from figure 1 will be directly applicable in actual use.) It should be apparent that conditions of

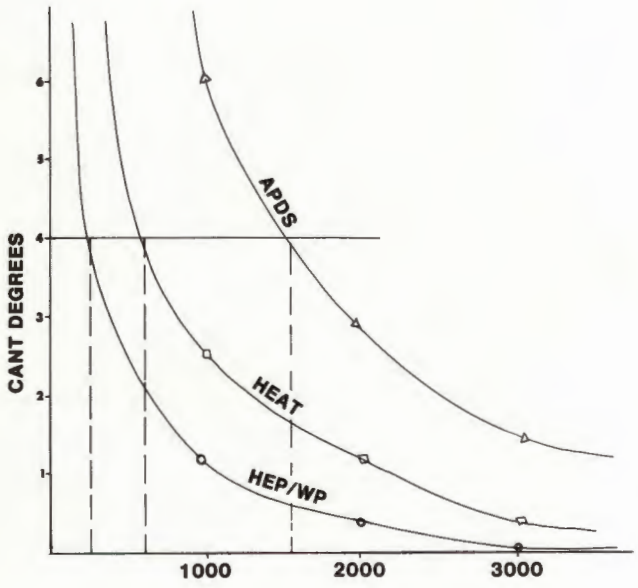


Figure 1. Cant required to cause a .25-mil horizontal shift in point of impact. Source: "M-60A1E3 Fire Control Analysis," AMSAA, October 1975.

cant angle and range which fall above the line for a given round will be sufficient reason to expect a first round miss. This conclusion is based on the assumption that other components of the error budget will be distributed normally. Cant angles in excess of the values shown will not guarantee a miss; however, they will seriously increase the probability.

You can see that the faster ammunitions are less susceptible to cant than the slower ones. Hence, whenever two or more types of ammunition are appropriate for destruction of a target, you should select the fastest round available. In making such a choice, bear in mind that cant errors are variable biases which become constant after the first round is fired and sensed. Thus, for targets which are likely to require several rounds for destruction, such as area targets, accuracy of the first round becomes less important. The fact that high explosive plastic (HEP) or white phosphorous (WP) is likely to be the ammunition of choice for such targets makes the cant sensitivity of these rounds less critical than it would appear at first inspection.

While there may be little true choice in ammunition selection, you will have considerable latitude in selection of firing sites. We have long taught tank crews the importance of selecting level firing positions; however, since defiladed positions are seldom level, tactical use of defilade whenever possible would seem to be at odds with the criteria for good firing. This dilemma is more imagined than real however, and is a subject area in which most tank crews require more training. With a little extra effort, good cant-free firing positions can almost always be found.

Figure 4.

Figure 5.

TRAINING TIP
Measuring Cant in the Field

As mentioned in the text, the following procedure for measuring cant is probably too cumbersome for tactical use, but can be of some value as a training tool. It has the advantage that it requires only the onboard fire control system and can be accomplished by each crew without assistance.

- Occupy the firing position and lay the gun on target.
- Zero the azimuth indicator and index zero mils on the elevation quadrant (the bubble will not be centered).
- Traverse 1,600 mils (90 degrees) right or left and use gun laying controls to center the bubble in the elevation quadrant. If there is insufficient control movement, return to the firing azimuth and make your initial 1,600-mil traverse in the opposite direction.
- Using traverse movement only (start at step 3 again if you inadvertently apply an elevation movement), traverse turret 3,200 mils (180°).
- Use knob on the elevation quadrant to measure the elevation or depression now on the gun. Divide the reading by two to obtain the cant that was on the gun when it was laid along the firing azimuth.

This method is not as difficult as it sounds and can accurately measure cants up to about 20 degrees. Why not give it a try?

Remember that trunnion cant, not hull cant, is the controlling parameter in gunnery considerations. Further, trunnion cant will not be defined until the gun is laid along the firing azimuth. Note here that the component of firing position slope which is parallel to the direction of fire is sensed by the men in the turret as pitch rather than cant, and hence will be automatically removed when the sight is brought onto the target. This is illustrated in figures 2 and 3. If the crew of the tank in figure 2 were to fire to their front, the 13.9 degree cant of this position would seriously lower their hit probability. In figure 3, the same tank has swung its turret to bear in a different direction. The 13.9 degree cant will now be perceived by the gunner as 13.9 degrees of pitch and is removed when the gun is depressed to bring the sights on target.

Inspection of figures 2 and 3 not only illustrates the effect of turret azimuth on trunnion cant, but furnishes examples of the difficulty of deducing cant from unaided observation of the firing position.

Crews must be encouraged to measure firing cant whenever possible. The *M-1A1* gunner's quadrant is the most accurate means, but its use is time consuming and subject to error. Further, this instrument may not be available to all crews. Calculations made from *M-13* elevation quadrant readings are likewise time-consuming and subject to error. Additionally, observation must be made after traversing the turret 90 degrees left and right of the line of fire. Use of the *M-13* clearly becomes too cumbersome for most tactical situations. (This method may be used as a training tool, however. See "Training Tip " at left. An alternative solution would entail installation of a simple clinometer (either bubble level or pendulum type) in the turret. Location of the clinometer is not critical, as long as it is carried traverse to the line of fire. Since elevation of the gun does not influence cant, the clinometer need not even be mounted on the gun itself.

The clinometer could be calibrated in mils or simply in "GO-NO GO" sectors, based on anticipated ammunition/range combinations. As an example, please refer again to figure 1. If a "GO" limit were placed at, say, 4 degrees, you could consider cant to be acceptable for armor piercing discarding sabot (APDS) out to 1,600-m., high-explosive antitank (HEAT) out to 600-m., and HEP or WP out to 400-m. If the clinometer read in the "NO GO" zone, you could exercise one of four options; use faster ammunition, accept a first-round miss and adjust subsequent rounds, take a modified aim point as prescribed in FM 17-12, or select another firing position.

Your option of selecting a new firing position may be more attractive than it appears at first glance. Whenever you are in an overwatch position or in a blocking position, you will often be able to dramatically improve your position by taking the time to move your tank just a few feet. Please refer to figures 4 and 5, which show two tanks in hull defilade positions. (*Note: Due to the location of the camera, the tank in figure 5 appears to have exposed his suspension to enemy fire; however, both tanks were in equally well protected hull defilade as viewed from the target area.)* While both tanks are firing at the same target, the tank in figure 4 has to overcome a 4.6 degree cant, while the one in figure 5 experiences only 1.9 degrees. The cost of this improvement in first-round hit probability is only the time and energy that you and your crews want to invest in training to recognize and overcome cant.

Cant is a critical component of the overall error budget. In the absence of sophisticated fire control systems, crews must be trained to recognize cant when it exists and to take proper actions to minimize the errors induced by cant.

Editor's Note: The author wishes to credit Mr. Ed Christman of Army Materiel Systems Analysis Agency (AMSAA) for his assistance in furnishing data for this article.

CPT JAMES D. BROWN was commissioned as a Distinguished Military Graduate of the University of Santa Clara. He has served as platoon leader, executive officer, and commander of TOE and TDA tank units in CONUS and Europe, and as an advisor with IV Corps in Vietnam. Captain Brown is an AOAC graduate, and is currently serving as an R&D officer at the Armor and Engineer Board, Fort Knox.

ARMOR FORCE MANAGEMENT

ARMOR ENLISTED CAREER MANAGEMENT FIELD and OFFICER CLASSIFICATION SYSTEM

On 1 March 1978, a major change in the way armor enlisted soldiers and officers are managed and trained will take place. This change will not only contribute to improving the combat effectiveness of the Armor Force, but will also enhance the professional development of each tanker and cavalryman. Here's how the change will affect you.

Enlisted Soldiers

Fort Knox now provides the unit a "generalist" who has received training in several crew positions on the *M-60A1* plus additional training on the *M-60A2* and the *M-551 (Sheridan)* for the soldier assigned to a unit with these particular vehicles. When the soldier arrived at his first unit of assignment, time was required for him to be trained "on the job" (OJT) until he became proficient at his crew position. After completion of his initial tour and subsequent reassignment, chances are that OJT was required again for a different crew position or type tank.

Starting 1 January 1978, the Armor Center will train entry-level soldiers to perform at wartime levels of proficiency in a crew position and tank-specific MOS when they arrive at their units. The tanker will be trained either as a tactical driver or a qualified loader/gunner for a specific weapon system, i.e., *M-60A1, M-60A2,* or *M-551.* The scout will also receive system specific training on the *M-113.*

Classification

Currently tankers and cavalrymen share Career Management Field (CMF) 11 with the infantry. Within this CMF,

tankers possess the 11E MOS and cavalry scouts the 11D MOS. Under this concept one MOS applies to more than a single position in the tank, yet each position requires unique knowledge and experience. In an era when tanks are becoming more and more complex, armor soldiers can no longer be expected to perform as "Jacks-of-all-trades," mastering each type tank and crew position. Starting 1 March 1978 a new CMF for Armor will be implemented.

Under this new Armor career field, designated CMF 19, each soldier will be classified by a position-specific, weapon-specific MOS (figure 1). At skill level (SL) 1, tankers will be identified as either loader/gunners (19G, 19E, 19J) or drivers (19H, 19F). Moreover, upon meeting time-in-grade, time-in-service, and other promotional requirements, both loader/gunners and drivers for each weapon system are eligible to progress to SL2 and promotion to grade E5 while still remaining at their original crew position. This is called "the flexible grade structure." Upon advancement to SL3 and promotion to staff sergeant (E6), the drivers will pick up either 19G, 19E, or 19J, depending upon their weapon system. The E6's then proceed to E7 (SL4) with the Delta, Echo, or Juliet identifier, then merge at the senior sergeant

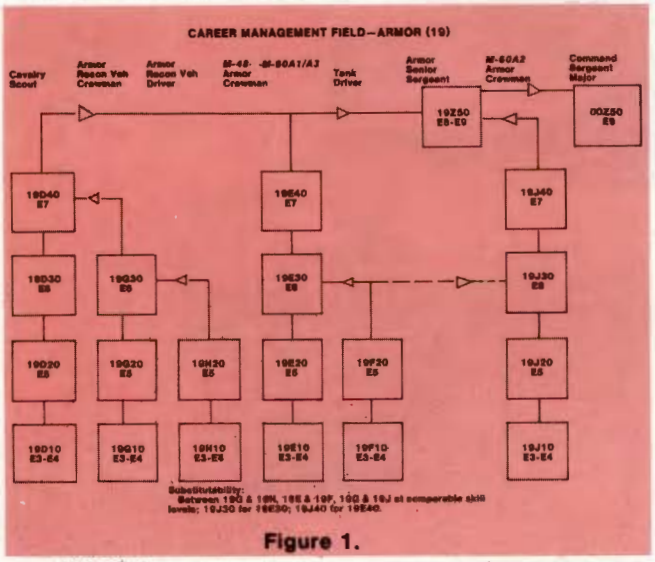


Figure 1.

level (E8-E9) as a 19Z. Similarly, cavalrymen will be trained as reconnaissance specialists with the *M-113* as their primary vehicle at SL1 and will progress through the 19D MOS climaxing at E7, SL4, and then merge into 19Z as an armor senior sergeant.

Even though figure 1 indicates liberal substitutability, commanders and personnel managers will give priority to the assignment of newly trained soldiers to the weapon system and crew position for which they received entry-level training. It is envisioned that this substitutability rule will be operational for approximately 1 year to assist the conversion from CMF 11 to CMF 19.

On 1 March 1978, all armor soldiers in the force will be reclassified. It is anticipated that your PMOS will be awarded based upon your current position. A gunner of an *M-60A2* will have a PMOS of 19J, a loader on a *Sheridan,* 19G, and so on. Personnel managers also will be as concerned with awarding secondary and additional MOS's as they are with utilization of the new PMOS.

There are a significant number of tankers who are school-trained on the *M-60A2* and *M-551* now serving in *M-60A1* units. In addition, some soldiers who have served in either *M-60A2* or *M-551* units, though not school-trained, are fully qualified on these vehicles. Also some armor soldiers are now serving completely outside their PMOS. Depending upon their present assignment and their training or armor experience in the past, one-on-one interviews with every soldier who has an 11D or 11E MOS are extremely important in the conversion process.

Primary, Secondary MOS Combinations

PMOS	POSSIBLE SMOS
19D	19-E, F, J
19G	19-E, F, J
19H	19-E, F, J
19E	19-D, G, H, J
19F	19-D, G, H, J
19J	19-D, G, H, E, F

Figure 2.

For all of these reasons, make sure your records show your particular qualifications so the Enlisted Master File at HQDA can be updated prior to the March conversion. This will assist assignment managers in correcting MOS imbalances in the Armor Force. Other armor MOS's must receive priority over non-CMF 19 specialities in the award of secondary and additional MOS's to armor soldiers. If you have a secondary MOS in another career management field, you should request that your personnel manager redesignate that MOS as an additional MOS, and concurrently award you an armor SMOS. Make sure that the SMOS does not merge with your PMOS at grade E7 or below, e.g., with a PMOS 19D one could not be awarded a SMOS of 19G or 19H. (See figure 1.) Figure 2 illustrates a possible SMOS for each PMOS in CMF 19.

If you are a "hard stripe" E5 and have noticed that CMF 19 contains only the specialist fifth class (SP5) rating for tankers, you are correct. There is however, a "grandfather" clause. Personnel policy provisions will permit, at the commanders discretion, those tankers who are *now* "hard stripe" E5's *or* E4's to retain those stripes. Implementing instructions for change 9, AR 611-201 will permit, on a one-time basis, the lateral appointment to sergeant or corporal of all 11E E5's or E4's who are determined to be qualified NCO's. The scout observer (19D20), however, will remain an E5 sergeant.

For the SP5 tanker who proves himself while serving in higher NCO positions for 60 days, change 59, AR 600-200 will provide for lateral appointment to sergeant. Paragraph 2-63c(4) of this AR governs the lateral appointment of a specialist four (SP4) to corporal, and has not been changed by the establishment of CMF 19. If it becomes necessary for the appointee to move back into a crewman's (scout's) position, he will retain the corporal chevrons, unless the commander determines he is not qualified. Now let's look at the officers.

Officers

The current method of identifying Armor officer requirements uses only one Specialty Skill Identifier (SSI) which is

12A. Regardless of tank weapon system or type platoon training and experience, the junior officer has been expected to step into a leadership role with appropriate expertise. Since this is not possible, the officer, like the enlisted soldier, must depend upon extensive OJT which contributes to some degradation in unit readiness while he learns. To correct deficiencies in training and experience, the Armor Officer Basic (AOB) course will be revised on 1 January 1978 and a new armor officer classification system will go into effect 1 March 1978.

The current purpose of the AOB course is: "to prepare newly commissioned officers for their first duty assignment with emphasis on command as platoon leaders of armor or armored cavalry platoons and to perform company level duties." The purpose of the revised AOB course commencing on 1 January 1978 is "to prepare newly commissioned officers for their first duty assignment with emphasis on system-specific tank leader skills, to perform as a platoon leader of armor or armored cavalry units and to perform executive officer duties and other duties as required e.g., motor officer and duties associated with CABL." To accomplish this mission, the Armor School will teach four separate and distinct courses of instruction by weapon system and type platoon: *M-60A2* tank platoon leader, *M-551 Sheridan* cavalry platoon leader, *M-60A1/A3* tank platoon leader, and *M-60A1/A3* cavalry platoon leader. The new lieutenant will master crew and tank commander duties at skill levels 1, 2, and 3, fire individual and platoon crew qualification courses, spend extensive time learning platoon leader skills in the field, and graduate as a combat-ready professional tanker.

Under a new change to the Officer Classification System (figure 3) each position will have an SSI denoting the type platoon training required and the new additional skill identifier (ASI) denoting the particular tank system technical training required. By March 1978, position coding of all armor units in accordance with change 4 to AR 611-101, *Commissioned Officer Specialty Classification System* will be complete. For a more detailed explanation of position requirements and personnel qualifications refer to FOCUS 10-77, dated 15 August 1977.

Armor Officer Classification System
12 Armor

Specialty Skill Identifier
(Organization)

12A ..... **Armor Officer General**
12B ..... **Armor Unit Officer**
12C ..... **Cav Unit Officer**

Additional Skill Identifier
(Weapon System)

3A ..... ***M-60A2* Tank**
3B ..... ***M-551 Sheridan***
3C ..... ***M-60A1/A3* - *M-48*-series Tanks**

Figure 3.

Tank Management

Raising individual technical proficiency by position-specific, system-specific entry-level training will free units from the demands of OJT and will permit more resources to be devoted to collective, rather than individual, training. Establishing a separate CMF for enlisted soldiers and expanding the officer classification system to identify skills for discrete weapon systems will provide management an effective mechanism for more definitive assignment and distribution of tankers and cavalrymen worldwide.

As a final note, it is significant to point out that there will be many changes to tank force management in the future, not only in the personnel and training areas, but in logistics

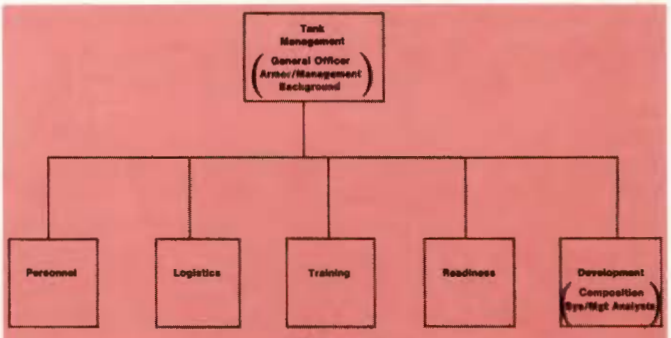


Figure 4.

and weapon system development as well. In recognition of the importance of the tank as a weapon and to provide effective coordination for the contemplated improvements, the Chief of Staff of the Army directed the establishment on 1 October 1977 of a Tank Forces Management Office in the Office of the Chief of Staff (figure 4). This office is directed by Brigadier General Richard D. Lawrence. The office will be manned by six lieutenant colonels and/or majors, each monitoring a specific functional area. Concurrently, an Office of Armor Force Management has been created under the Commanding General, U.S. Army Armor Center, Fort Knox, to assist him in coordinating and supervising the development and maintenance of Armor Force standards worldwide. The goal is to guarantee a properly manned, trained, and equipped tank force. These offices seek the help of all interested tankers in identifying armor problems. As a result, appropriate commanders and managers at all levels will be energized to take action to assure a ready, responsive Armor Force.

TRADOC SYSTEMS MANAGER

The office of the TRADOC Systems Manager (TSM) for Tank Systems Development has been established at Fort Knox. It will report to the Commander, TRADOC, through the Commander, U.S. Army Armor Center.

The TSM will conduct total system management for the *XM-1* tank system, the *M-60A3* tank system, and *M-60A3* product improvements within TRADOC proponency. He will insure that the user total system efforts are developed and fully integrated early and continuously throughout the development, production, and deployment of these tank systems. ▲

CLANDESTINE INTELLIGENCE SOURCES

Because of the outstanding support given to their World War II effort, Soviet planners grew to appreciate and depend upon clandestine operations to fulfill their Cold War plans. Since World War II, the Soviets have devoted vast resources to the establishment of an enormous clandestine apparatus, for Soviet operations as well as those of her satellite states. These satellite services have scored some remarkable coups of their own, particularly in Vietnam.

Since the dust of Vietnam has not completely settled, and many of the wounds are still unhealed, no complete and comprehensive account of clandestine developments there can be told for now. But what is known reflects a pattern of achievement which is no less than remarkable. Unfortunately for the Western World and the cause of freedom, these achievements were at our expense.

During the second Indochina War, after the fall of the French in 1954, the North Vietnamese and Viet Cong clandestine organizations penetrated every level of South Vietnamese social, political, economic, and military life. With detailed and accurate information at their disposal, military and subversive operations were carried out continuously, using economy-of-force tactics which gradually weakened, discouraged, and demoralized a numerically superior foe.

Penetration of Allied military organizations resulted in the enemy's learning some of the most closely guarded secrets of Allied operations, plans, and tactics. Moreover, his clandestine action army constantly sabotaged Allied arms, equipment, base camps, lines of communications, and perhaps more importantly the morale of the people. This he did through a campaign of terror and assassination which touched all levels and ages of society. Through bribes, threats, and intimidation he built up an underground government which undermined the legitimate South Vietnamese government.

Espionage and clandestine activities were the foundation of enemy operations in the second Indochina War, positive proof that such activities can be extremely effective if employed by dedicated professionals with the full backing of the government concerned.

In contrast to the enemy's intelligence effort in Vietnam, which centered on clandestine activities using human sources, our intelligence effort was largely devoted to tactical intelligence, employing primarily technical means and, secondarily, human sources of information at a low level.

Our tactical collection effort, using the most advanced technology available, produced voluminous reports from a variety of unique sources. A dazzling array of machines and instruments recorded, measured, counted, observed, and listened to what was hoped to be enemy activity. Aerial reconnaissance, radar, infrared, sensors, computers, and other devices recorded everything from the gentle stirring of mountain goats to company-sized emplacements. These "indicators of enemy activity" were all very neatly depicted on acetate charts by intelligence officers in multicolored displays for briefing tactical commanders.

The amount of time and money spent on these efforts was staggering, but the question remains: Was the effort worth the cost? For very seldom did the acetates with colored markings reflect the real problems of, *where is the enemy now? Who is he? What are his intentions?* Such information, particularly the latter, can best be obtained by human sources.

Our human source effort in Vietnam was primarily designed as an adjunct to the tactical collection effort, using low (or no) experience personnel and suffering from puny budgets (only a fraction of the sums allotted to the hardware-oriented collectors). With those ground rules, it is not surprising that our human source effort in Vietnam never lived up to its potential and never came close to equalling the extremely effective efforts of the enemy.

Throughout the course of the Vietnam conflict, the enemy used little or no sophisticated hardware in his intelligence efforts — no radars, infrared devices, or sensors — just people. And in doing so his intelligence effort was highly successful.

Instead of making espionage obsolete, modern warfare has done the opposite; it is now more critical than ever before. This is because warfare itself has become more devastating and now threatens to incinerate the entire globe if it gets out of control. Consequently, the intentions of the enemy, his capabilities, and limitations are more vitally needed now than at any time in history.

While experts may disagree as to the exact nature of the next major conflict, everyone seems in harmony on one point — it will happen very fast. Warsaw Pact forces have the capability of reaching the English Cannel within days after an invasion, short of nuclear intervention. If we have no accurate information as to enemy intentions, the Western nations could be checkmated before the game even begins.

Clandestine operations also play a significant role in wartime deception operations, and without good deception no Army can long survive on the lethal battlefield of today.

There is an additional factor which also affects the current picture: the problem of terrorism. This problem is growing in importance and could easily involve the Army in a major military action in the near future. Here again the role of human intelligence is vital and more

appropriate to this peculiar type of problem than machines and technology.

Despite the innovations of satellites, radars, computers, and other advanced technology, the human remains at the center of clandestine operations, and such operations remain at the center of military intelligence operations in wartime. Intelligence has many different parts and we need them all. Looking down the long barrel of history's gun, there is an eerie sameness to it all; in winning battles nothing can be neglected, nothing can be overlooked.

Ours is a modern Army, supercharged with science and technology. That in itself is good. But there are dark and ominous clouds gathering on the horizon which indicate we may be allowing the human in intelligence to be eclipsed by the machine. Moreover, there is a pervasive feeling in the Army that clandestine operations are not part of the military inventory, and should be left with civilian agencies who are better equipped and staffed for these purposes.

The historical examples cited above illustrate time and time again, that the clandestine agent in the right place at the right time means decisive results on the battlefield. With the probability that the most responsive intelligence system may be the key to winning the next war, the importance of human intelligence is paramount.

The cliche, "Win the first battle," takes on real meaning when we ponder the possibility that we may not get a second chance.

Extracted from "Human Intelligence in Warfare" by Major Robert B. Anneberg which was printed in the Fall 1976 issue of MI Magazine.

INTEGRITY AND THE SOLDIER

The following article written by Command Sergeant Major (Retired) William E. Edge originally appeared in ***Vertas,*** *published at Fort Bragg, NC, and was later released as a feature by AR News. Although the article was addressed to Special Forces soldiers, there is a message for all who wear Army green. ED*

I have been increasingly aware of slipping character traits among Special Forces soldiers that, to me at least, are reaching alarming proportions.

I'm talking about the loss in integrity—personal integrity of soldiers—officers and NCO's. If a Noncom in a Special Forces unit cannot be trusted to bring back correct intelligence information, to correctly train other soldiers, or to account for funds, he should make a personal decision to get out of Special Forces and out of the Army as well.

An officer or NCO who will tacitly condone violation of the law, Army regulations, and the spirit in which they are meant, is flatly disloyal. A commander who will condone and make excuses for false claims, bad checks, or even parking tickets is only encouraging more of the same, and he will get it—tenfold.

I sincerely think that a Special Forces soldier, who has given his word and pledged his personal honor, but then lies, cheats, or helps others to do so, should be drummed out of the service in dishonor.

Integrity is NOT the exclusive property of officers or cadets at USMA. (The fact that a cadet who cheats may not remain a cadet but can become an enlisted man disturbs me.) The principle of honesty and integrity applies to each of us. I will never forget this personal incident of distrust: After giving a report, complete with head count and eyewitness descriptions of 150 men in North Vietnamese Army (NVA) uniforms with weapons and equipment, I was told point-blank by a lieutenant colonel in intelligence that "We have heard those stories from you snake eaters before. There are no NVA in that area."

Nine men died because of the NVA unit. I now believe, after due reflection, that the colonel's attitude was shaped by the then-popular media image of a Special Forces soldier. He did not distrust me, but he had been lied to before by people like me, and their reports had been wrong.

Special Forces soldiers are not assassins, "spooks," or war lord mercenaries who specialize in tearing up bars on "Tu Do Street." Those days are gone, but some of the people linger on. There are still hundreds of good solid soldiers who can do any job and can be trusted. Are they becoming a minority among us?

Every soldier must have honor and integrity, but I submit that a true Special Forces soldier must have more. The very name "special" demands it. Why do we permit the shirker, the professional drunk, the bad check artist, to remain in our midst?

Trust is the most important asset we can have. We can train you and polish your skills, but if you do not have basic, rock-steady integrity as your personal guidance, Special Forces doesn't need you. Nobody needs you. If your mission is to road march 12 miles and you allow your team to short cut six miles, who's hurt? You are. You tolerated and abetted a lie, a false report. You compromised your integrity.

If you rate a soldier a solid "5" where you know he should get an average "3," you compromise your integrity. When a commander fails to follow through on a one-day AWOL or a $10 bad check, that is a compromise of integrity, a willingness to tolerate and accept becomes the standard. And so it goes ever downward until there is no standard or trust left.

We who will accept breaches of trust, compromises of integrity, violations of lawful orders, have only ourselves to blame.

In the era of Watergate, conglomerate bribery scandals and political kickbacks at all levels, is the standard of integrity simply outmoded? Is it time to reevaluate and perhaps try to find a more realistic code, one that allows for "some cheating" or "well, everybody does it?"

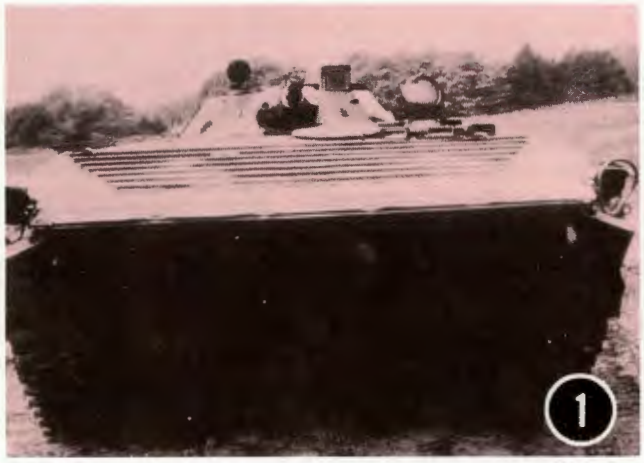
I know these things go on, on a daily basis, but I don't agree with them, especially in the Armed Forces. I think they eat away at the bedrock of discipline and motivation that makes us want to earn our way. I would like to be able to hold my head up and say that my men, my unit, my Army were straight—and so was I.

Can I or anybody else say that and mean it?

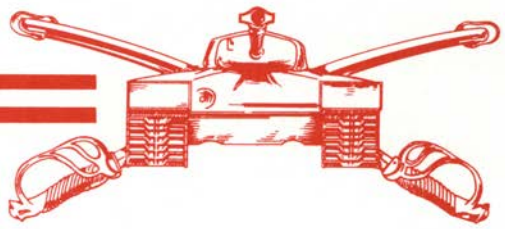
Recognition Quiz

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)



OPMD ARMOR



SHOULD I ENTER THE AVIATION PROGRAM? If So, When?

The decision to make aviation an Officer Personnel Management System (OPMS) specialty and the related policy changes made to support this action have many Armor officers asking the question, "Should I enter the aviation program and, if so, when?" To aid in answering these and similar important questions for the prospective aviator, the following information addresses aviation—its tasks, how it fits in with OPMS, aviator utilization, selection criteria, and promotion potential.

Tasks

Aviation, designated as an alternate specialty upon graduation from initial entry flight training, is concerned with the employment and support of Army aviation elements in the accomplishment of their mission. Some of the functions performed in this specialty include commanding aviation units and activities, participating in development of doctrine, and serving in principal staff positions (personnel, intelligence, operations, and logistics) at all levels of the Army. Officers in the aviation specialty serve in a variety of duty positions such as in Table(s) of Organization and Equipment (TOE) aviation units, airfield commander, aviation adviser, experimental test pilot, and aviation safety officer, as well as other positions.

OPMS's Role

Today, the Army is exerting a degree of management and direction not previously found in officer professional development. Considering the costs involved in training and retaining aviators, the need for these individuals to maintain their skills, and the concentration of requirements in the company grades, coupled with reduced input to flight training, aviation is truly a specialty rather than a skill.

The aviation specialty has not resulted in all aviators being thrown into a single pot any more than they were in the past. Each aviator brings to the specialty his own unique experience and background which is reflected in his personnel file. In reality, the Army's development and utilization of aviators within the specialty concept will not differ significantly from what actually happened when aviation was a skill.

In the past, the fact that an Armor aviator spent most of his time in aviation and in another area, such as personnel management, went unrecognized. The same individual today is designated as Aviation/Personnel Management specialty, recognizing the realities of requirements and developed skills. He continues to wear the Armor insignia, attends AOB and AOAC, and may serve in a tactical environment with an Armor unit. Even though this officer does not have Armor as a designated specialty, his Armor experience will be considered in the assignment and selection equation. Aviators must recognize the need to retain, and even enhance if possible, the ground orientation of Army aviation. They must realize that field grade positions requiring the direct and sole application of Armor skills are not of sufficient quantity to provide an opportunity for every officer to serve in the ground environment at every grade—aviator and nonaviator alike.

Aviator Utilization

Following graduation from initial entry flight training, aviators are assigned to Department of the Army (DA)-directed operational flying assignments for utilization of their aviation training. Normally, these assignments are 3 years in duration and are designated to provide the aviator with a professional foundation in Army aviation. Additionally, aviators are assigned to positions which make maximum utilization of their experience and training.

The Aviation Career Incentive Act (ACIA) of 1974 restricted the flight pay system of the Armed Forces to achieve a more equitable distribution of aviation flying pay. The Act bases entitlement to flying pay on years of officer aviation service in contrast to the previous system of rank and longevity. To be entitled to continuous monthly incentive pay, an aviator must perform operational flying duties for 6 of the first 12, and 9 of the first 18 years of his aviation service. The 12-and 18-year points are called "gates" and represent a 50-percent utilization goal for aviators. Due to the requirements of the ACIA and the high cost of aviation training, aviators will have a high utilization rate in specialty 15 through the grade of major. Prospective aviators may be assigned to nonaviation positions in their primary specialty or to positions considered as developmental to other specialty areas, depending upon Army requirements. Once designated into aviation, Armor officers can anticipate assignments in specialty 15 and their other designated specialty.

Selection Criteria

Armor officers may apply and, if accepted, attend initial entry flight training. To qualify for participation in the Aviation program, the following prerequisites must be met:

- Be a high school graduate or equivalent; preferably have 2 or more years of college.
- Attain or exceed a composite score of 155 on the Officer Battery Flight Aptitude Selection Test (FAST-OB).
- Have completed no more than 60 months active commissioned service prior to entry into flight training.
- Successfully pass a Class 1/1A Flight Physical. (Class II for graduates of AROTC Flight Program.).
- Have completed a basic officers course, plus 1 year of troop duty.

Detailed instructions regarding application and selection procedures are contained in AR 611-110 (Selection and Training of Army Aviation Officers). It should be noted that age criteria (30 years) is no longer a requirmeent for selection.

Promotion and Command

Promotion and command opportunity has long been a

major concern to Armor aviators. There is a general feeling among some officers that a career in aviation is a dead-end street; **nothing could be further from the truth.**

Aviators are eligible for command of both aviation and nonaviation units at the platoon and company level, and many command both if requirements allow. At battalion and brigade level, aviators may be considered by Headquarters, Department of the Army (HQDA) Command Selection Boards for command of both aviation and other designated specialty related nonaviation units, but if selected, will command only one. Additionally, a recent change to command selection procedures permits officers to request in writing that they be considered for command in any specialty in which a recognized degree of proficiency and qualification has been attained. This change—beginning in 1978—will allow Armor aviators to be considered for command in Armor even if they are designated out of that specialty as a result of redesignation action.

As an OPMS specialty, aviation provides job opportunities and professional development to support officer utilization from entry level through the grade of colonel. Additionally, there are positions at general officer level which require aviators. The Armor officer who meets the selection criteria and wants a challenging career in aviation should consider service in the Army aviation program. Whatever an officer's field of endeavor may be—aviation or otherwise—his future as an officer rests, as it always has, in his own hands. So potential Armor aviator, take a close look at Army aviation. Look at its missions, career opportunities, and, most importantly, how you can contribute to the program. If you meet the selection criteria and aviation represents *a personal goal,* then submit your application.

NEW OFFICER BASIC COURSE ASSIGNMENTS

The first graduates of the new Weapon-System-Specific Armor Officer Basic Courses will start arriving at their initial assignments in May and June 1978. A total of 53 active duty Armor officers are expected to graduate from the first three classes which convene in January 78. The assignments breakout by weapon system is as follows:

	M-60A1	*M-551*
USAREUR	16	12
Korea	1	
Ft. Benning	1	
Ft. Bliss	1	3
Ft. Carson	2	2
Ft. Hood	3	4
Ft. Knox	1	1
Ft. Polk	2	1
Ft. Stewart	2	1
TOTAL	29	24

Commanders and personnel managers should be alert to insure that these officers are initially assigned to duties commensurate with their training.

MAILOUT OF OFFICIAL MILITARY PERSONNEL FILES

In recent weeks, there has been some publicity regarding MILPERCEN's program to mail to each officer a copy of his microfiche Official Military Personnel File (OMPF) and to make available to him all of the paper documents from which the microfiche was created.

Some officers have already written, some even including checks, for both the paper documents as well as microfiche copies. If needed you may request copies of your microfiche OMPF as has been previously announced; however, all officers will soon receive copies of their OMPF automatically at no cost through the mailout program.

OMPF's will be mailed out by grade. All Colonels' OMPF's should be mailed by the time this is published. The remaining grades will be mailed prior to 30 June 1978 in the following sequence:

- Warrant Officers
- Captains
- Lieutenant Colonels
- Majors
- Lieutenants

There is a provision for you to be able to obtain your paper OMPF but *only* after you have received your microfiche copy *through the MILPERCEN mailout program.* Accompanying your microfiche will be a letter of instruction explaining how to obtain the paper documents from which the microfiche was created.

This program is a great advantage to you. You will be able to review your official file no matter how distant you are from MILPERCEN. When you receive your OMPF you should go over it in great detail. Remember, this is the file that all Department of Army selection boards see. You owe it to yourself to insure its accuracy.

WHITE HOUSE FELLOWS PROGRAM

The White House Fellows Program offers a unique opportunity for young citizens of the United States. Each year the President's Commission on White House Fellows selects approximately 15-20 individuals from all sectors of our National life—the professions, business, government, the arts, and the academic world—to serve for 1-year as special assistants on the White House staff or with cabinet officers. These gifted and highly motivated young Americans gain some firsthand experience in the process of governing the Nation and a sense of personal involvement in the leadership of our society. Since the program began in 1965, 17 Army officers have been chosen as White House Fellows.

In the most recent competition period, two Army officers were selected from approximately 3,000 civilian and military applicants to be 1977-1978 Fellows.

Army personnel desiring to compete in this program must first request permission to compete, in accordance with AR 621-7, "Acceptance of Fellowships, Scholarships, or Grants," dated 19 Jul 74. Interested Army personnel should submit their "request to compete" to Department of the Army so as to arrive not later than the first week in September 1978. Selections will be limited to individuals who have demonstrated unusual ability, high moral character, outstanding motivation, and a broad capacity for leadership; show exceptional promise for future development; and are dedicated to the institutions of the United States. Additional recommended qualifications are possession of a strong academic background, normally including a graduate degree; primary specialty qualification; and a record of overall outstanding manner of performance.

Upon receiving approval to compete from Headquarters, Department of the Army, individuals submit their White House Fellows application directly to the Commission on White House Fellows, The White House, Washington DC 20500. Application forms and full particulars will be mailed to those personnel granted permission to compete. The deadline for the submission of applications to the Commission for the 1979 - 1980 program has not been established, but is expected to be in the October-November time frame. Final selection of winners for the White House Fellowships will be made in May 1979, and the program will begin in September 1979.

NEW DA PAM 600-3

A reminder that the new DA Pamphlet 600-3, *Officer Professional Development and Utilization,* dated September 77 has been distributed to the field. The new version has been simplified and is a convenient tool for the individual officer to use when planning his career under OPMS.

OFFICIAL & CAREER MANAGEMENT FILES

The response from the field to requests for official photographs, preference statements, and college transcripts has improved considerably; however, many company grade officers still have not fulfilled their responsibility to update their files with these documents.

The importance of these items needs emphasis. An officer's assignment perferences and personal considerations cannot influence the assignment process if they are not communicated to the assignment officer. Many assignment actions cannot be accomplished or are unnecessarily delayed because of missing photographs or transcripts.

Remember, it is imperative that a "complete official file" goes before selection boards. Take the time to check yours carefully when it is mailed to you, and if you receive a request from DA for any of the above documents, respond without delay.

Refer to AR 640-30 for information on official photographs and AR 614-100 for Officers Assignment Preference Statements (DA Form 483).

ADVANCED COURSE BOUND OFFICERS VISITING BRANCH

If you are enroute to the advanced course and find it convenient to visit Armor Branch we encourage you to do so. Branch has, however, had recent visits from officers enroute to AOAC who went to great expense and trouble to travel to Washington only to learn with disappointment that "it's too early to be able to tell where you'll go after the advanced course." Even though Branch will probably not be able to give you specific information concerning your next assignment, it's good to visit MILPERCEN and review your official file.

For your information, Armor Branch representatives will visit you and your class for a career management briefing and individual personal interviews during the first few weeks of the advanced course. Your career management individual file will be brought on this trip for your review. You also will soon be able to review your official file since it will be mailed to you. (See "Mailout of Official Military Personnel Files.")

If you are now planning your PCS to the advanced course and are wondering whether to visit or not, give Branch a call first. You may be able to accomplish everything during the Branch visit to your class and save yourself time and money.

NOTES FROM MAJORS DIVISION

Majors Division functions differently than the Branches of the Combat Arms Division and its Company Grade Branches. In Majors Division you have two assignment officers—one for each of your primary and alternate specialties—and a professional development officer. For Armor Majors (Primary Specialty 12), your assignment officer is Major Beau Bergeron, AUTOVON 221-0686/0687. Your professional development officer is Major Pete Swenson, AUTOVON 221-8105/8106. A minimum of four people (two assignment officers, a professional development officer, and the Chief of Assignments) coordinate and decide on any action concerning you—assignment, civil schooling, extensions, specialty changes, etc.

Your goals as a major should include the following:

- Complete resident or nonresident CGSC. Plan on starting on CGSC nonresident program if you are not selected for the resident course this year or next; however, first discuss your action with your professional development officer.
- Become qualified in both your primary and alternate specialties. Ensure that your specialties are aligned with your education, assignment history, personal preferences and most importantly, the needs of the Army.
- Continue to seek challenging and professionally rewarding jobs. Remember all jobs are important and you should strive to perform well in all assignments.

Regarding assignments in CONUS, the Army Readiness Regions (ARR's) continue to have high priority. This is challenging and rewarding duty and offers the opportunity to apply branch skills in furthering the "One Army" concept. Advisory and assistance positions are spread throughout CONUS, enabling a wide variety of geographic assignments.

Is your preference statement up-to-date and more importantly is it realistic? Ideally you should ask for a location that has significant Armor specialty requirements. Many factors affect the assignment process, including availability, special qualifications, professional development and individual desires. The factor which underpins the entire process and is of overriding importance remains *Army Requirements.*

Of importance to everyone are items such as an up-to-date photo. Is it as good as it could be? Does your uniform appear neat and does it fit correctly? Photos are important and warrant your prompt attention. Other details that should be attended to include a current physical and an update of your Officer Record Brief (ORB). If your records are scheduled to go before a promotion board (LTC, AUS or RA-MAJ) you should review your official military personnel file (OMPF) before the board convenes. This is especially critical now that your file is on microfiche. If it is not possible to visit us, we recommend that you request a microfiche copy of your file. This will provide a good check for completeness. This request should be sent to MILPERCEN, ATTN: DAPC-PSR-S, 200 Stovall Street, Alexandria, VA 22332. (A free copy of your FICHE OMPF will be mailed to you by mid-1978.)

Pages from the Past

SCOUT VEHICLES

Reconnaissance, before, during and after action, is of vital importance in tank operations. Suitable vehicles, in sufficient quantities, must be provided to insure rapid execution of reconnaissance, else the battle mobility of the tank again slows down to the pace of the reconnaissance service. Often reconnaissance must be carried out under small arms fire. Therefore, reconnaissance vehicles must be provided with some armor protection to allow them to negotiate fire-swept areas, secure desired information as rapidly as possible, and stand some chance of returning with the information. A vehicle similar in size to the British Carden-Loyd [*See Letters, page 2*], preferably a wheel-cum-track type, will probably answer the requirements of a tank reconnaissance vehicle.

The Cavalry Journal
January 1930

PREPAREDNESS

If our Government should go to war with some powerful foreign country, could it say as a faithful trustee of an estate might—"I am putting vast armies in the field, trained men, at a cost of production in scientific training and management that will produce maximum results—victory, at a minimum outlay—lives of soldiers and money." Or has the war been brought about without providing any trained men and scientific arrangement of forces and supplies, and therefore, we may expect to reap a large harvest of dead men, maimed men, distressed families and wealth of vast extent destroyed. But "I'll pay a liberal pension to the heirs of the dead and to the cripples for their generosity in fighting my battles. Of men and supplies I have an inexhaustible supply and I'll pour them into the hopper and by sheer force perhaps I shall be adorned with the laurels of victory."

Extravagance, wastefulness, misfeasance and malfeasance occupy many pages of our history in farming, forestry, manufacturing, building towns, use of streams, wildcat banking, frenzied finance, industrial slaughter of workers, unsanitary prisons, commericalized vice, but the people may sincerely wish that to this catalogue may not be added that of a war with a first-class power while the country is in the present state of offensive or defensive military condition.

The Cavalry Journal
January 1915

MORAL FORCES

It has been justly said that moral forces are the preponderating ones in war. Moral force, which gives to troops the will to surmount all obstacles, to dread no danger, and to desire to conquer at any price, springs from sentiments, varying according to circumstances, which animate soldiers and place them in a condition to be influenced by the suggestion of victory in combat.

In a general way these sentiments are religious fanaticism, patriotism, enthusiasm for a commander, discipline and *most of all confidence resulting from experience.*

The Cavalry Journal
May 1911

NOTES

U.S. ROLAND ACCEPTED

The first U.S. *Roland* missile has been accepted by the U.S. Army for testing in France as part of a joint test program. The supersonic missile is a short-range, all-weather, air-defense system. It is one of the major European-designed weapons systems selected for production in the U.S. and deployment by the U.S. Army.

Two American companies are manufacturing the U.S. *Roland,* Hughes Aircraft and Boeing Aerospace. Shown above is one of the qualification missiles undergoing functional testing.

The new system is designed to protect ground troops, airfields, and armored columns against low-level air attackers trying to sneak under radar. The system, consisting of a self-contained fire unit module armed with 10 missiles and mounted on the *M-109R* tracked vehicle, is shown below.

NEW FIELD ARTILLERY TRAINING CIRCULAR FOR MANEUVER

In an effort to more clearly explain Field Artillery and its role in combined arms operations, the Field Artillery School has updated its training circular, TC 6-100, *The Field Artillery System and the Combined Arms Team.* The TC is written for all maneuver leaders from platoon through division and is designed to present an overview of Field Artillery fire support and employment doctrine.

The TC is in a unique format. Each subject is presented on a "baseball card" with a picture on one side and the important information pertaining to that subject on the flipside. Each card is detachable so the maneuver leader at each level can carry with him those cards he feels are most important.

There will be approximately 50 cards covering the areas of Field Artillery weapons and ammunition, target acquisition, gunnery, and command and control. The Field Artillery organization, its various tactical missions, and its employment in offensive and defensive situations are also discussed. Finally, fire support coordination at every level from the company FIST chief to the division artillery commander is discussed, duties are outlined, and operating procedures are explained.

The draft TC has been reviewed by selected maneuver units and the Infantry and Armor Schools. It is expected that the TC will be published by May 1978.

ASSAULT CS WEAPON

An effective deterrent to any well-trained group of aggressors, causing disablement for a period of 5 to 15 minutes, has recently been developed by the Israel Product Research Company Ltd. of Tel Aviv.

The weapon, which uses CS fog and compressed gas, causes temporary blinding and shortness of breath with no after effects. A high-pressure arm projector cylinder, designated as Projectojet Model 5, develops an accurate, powerful CS fog.

With a total weight of less than 20 pounds and small dimensions, the unit can be hung from a shoulder strap enabling hit-and-run tactics with utmost maneuverability.

The device is easily aimed as far as 15 yards in still air, which makes it an ideal weapon against groups of violent rioters in narrow streets and alleys. ▲

BOOKS

THE LESSONS OF VIETNAM by W. Scott Thompson and Colonel Donaldson D. Frizzell. Crane, Russak & Co., Inc. 1977. 228 pages. $16.50.

The Lessons of Vietnam is the product of a series of conferences held in 1973 and 1974 at the Fletcher School of Law and Diplomacy. During these sessions papers were presented and discussed by the participants. The volume is not just a compendium of the conference; the editors have sought to publish a coherent and ordered report, if not a comprehensive one.

The participants read like a who's who of U.S. involvement in Vietnam. Their contributions, of course, are their individual opinions. The recentness of our involvement would lead the reader to expect emotion and shortsightedness from the observers. The book is a pleasant surprise in its candor and professional, objective treatment of the subject.

There are lessons for the diplomat, tactician, and soldier alike. Recalling some of the incidents will be difficult, but everyone needs to read this book so they can profit from our experience there.

Colonel C. A. Mitchell
USAARMS

THE FUTURE OF SOVIET MILITARY POWER edited by Lawrence L. Whetten. Crane, Russak and Company, Inc. 1976. 189 pages. $14.50.

This book and a companion piece, "The Political Implications of Soviet Military Power," contain the proceedings of a 1975 conference which explored the nature, political utility, and future of Soviet military power. As the title suggests, this volume addresses doctrine, strategy, organization, and the East-West military balance.

The uncertainties surrounding the East-West military competition are a matter of common concern to the conferees whose papers make up the volume. Perceptions of Soviet military power are, of course, critical to the Allied planning assumptions which drive strategy and the development and deployment of forces. Various papers argue that Western analysis of Soviet military power may not be meeting NATO security requirements. Although no detailed framework is offered to remedy all of the analytical shortcomings, several authors point out that a more careful reading of Soviet open literature on military affairs is one step that might be taken.

No sudden shifts in the Warsaw Pact posture are forecast. Indeed, the future posture is essentially an extrapolation of today's trends. The Soviets may have put aside the notion that theater war will inevitably escalate to strategic nuclear warfare, but the linkage does not appear to have been abandoned. William Scott and John Erickson provide excellent discussions of the fundamentals of doctrine, tactical thought, and force deployment trends. Force modernization and the improved integration of doctrine and tactics have contributed to a more flexible array of Soviet options. Soviet doctrine for theater warfare will likely continue to emphasize deception, surprise, and high intensity combat to achieve rapid breakthroughs in NATO defenses.

There is little new material presented in the book, but it carries an important message. Clearly, no Soviet national capability has contributed as much to Soviet power, influence, and prestige as military power. Military readers will find the discussion of theater warfare doctrine and capabilities quite comprehensive and worthy of their attention.

Colonel William M. Stokes, III
Harvard Program for Science and International Affairs

POLITICAL IMPLICATIONS OF SOVIET MILITARY POWER edited by Lawrence L. Whetten. Crane, Rusak and Company, Inc. 1977. 182 pages. $14.50.

Lawrence Whetten has again produced a skillfully edited volume, this the second in a series, containing insightful and truly analytical articles, mostly by European scholars of Soviet politico-military studies. The first volume, *The Future of Soviet Military Power,* (ed., Lawrence Whetten), and published last year, describes evolving Soviet military power, and suggests likely avenues for the future.

In *Political Implications of Soviet Military Power,* 10 strong essays compare and contrast Soviet political objectives *vis a vis* U.S., Europe, and China, describing relative growth or decline of influence, mostly in Europe, and with some excellent snapshots of the Middle East as well. Soviet objectives are spelled out—sometimes—in the light of enhanced Soviet military might. The reader becomes convinced that Soviet military strength has brought about improved political weight, worldwide. This has been a major goal of Moscow's postwar leadership.

The essay by Malcolm Mackintosh is a synopsis of the entire volume, because it touches on the uncertainty of Soviet power—an uncertainty perceived in Russia and abroad. His paper details the plethora of dilemmas facing a nation on the newly attained summit of superpower status. These of course include the internal problems of competition for resources, a temperamental economy (now exacerbated by a severe hard-currency crunch), and of course the myriad foreign relations which must somehow be balanced.

Many of the articles treat Soviet priorities—essential data for any analytical effort. Some of the essays discuss internal Soviet problems, and suggest that the security of the state is of so much concern that foreign policy must of necessity be dictated by the essential insecurity of the Soviet government. The paper by William Griffith, "The Decline of Soviet Influence in the Middle East," is candid, thought provoking, and guardedly optimistic. The final essay is very nicely written, and coauthored with the editor by Klaus Ritter. It is entitled "Consequences of Future Applications of Soviet Military Power." It fills the bill the title promises, and best of all, will especially interest the professional military reader.

A.W. McMaster, III
HQ TRADOC

POW: A DEFINITIVE HISTORY OF THE AMERICAN PRISONER-OF-WAR EXPERIENCE IN VIETNAM, 1964-1973 by John G. Hubbell. Reader's Digest Press. 1976. 633 Pages. $15.00.

On 5 August 1964, Navy Lieutenant (Junior Grade) Everett Alvarez ejected

from his battle-damaged *A-4* and was captured by the North Vietnamese, becoming their first American prisoner-of-war. Over the next 9 years, as the number of Americans in combat increased, hundreds of other Americans joined Alvarez as POW's. Until now, their story largely has gone untold.

The recent publication of John G. Hubbell's *POW: A Definitive History of the American Prisoner-of-War Experience in Vietnam, 1964-1973* finally and comprehensively tells that story, tells of the base indignities, the solitary confinement, the starvation, the continual torture, and the brutal beatings suffered during captivity.

Denied the protection of the Geneva Convention or even inspections by the International Red Cross, the POW's were at the mercy of their Communist captor—and their captors often proved to be unmerciful. Page after page of Hubbell's book documents carefully-executed torture, some as crude as mere beatings, other as sophisticated as dislocating shoulders with ropes, which causes excrutiating pain without incriminating scars.

Many POW's broke under torture and confirmed what was demonstrated during the infamous Spanish Inquisition: given enough pain, a human being can be coerced into admitting or fabricating nearly anything. Indicative of many prisoners' determined resistance is their lingering guilt for having "cracked" at all!

Part of the occasional humor in *POW* is provided by propaganda statements given after reaching the limits of physical resistance. Staff Sergeant Dennis Thompson, a captured Green Beret, when forced to write a propaganda statement on his compassionate treatment, wrote:

> ...It has been brought to my attention, after my captivity, that the Vietnamese people have been revolting throughout their 4,000-year history. The Vietnamese people have proven themselves to be the most revolting people I have ever met in my life. I hope that soon the Vietnamese Communists and all those who have taken care of me and my friends as prisoners will get what they deserve...

The Communists accepted it.

In many cases, fraudulent statements weren't accepted by the North Vietnamese; in a future war, against a more sophisticated enemy, such statements would be recognized immediately. Seldom did interrogators demand military information. They wanted propaganda statements they could use to shape world opinion through the international press.

If such political-ideological propaganda statements, obviously obtained through duress, were totally discounted by the Western press and interpreted instead as indicators of torture, perhaps the Communists' reason for torture could be checked.

Hubbell does not pass lightly over those captives who willingly helped their captors, but neither does he indict them. He correctly points out—much to the surprise of many returning POW's—that the Code of Conduct doesn't carry the weight of the law; violations are not subject to prosecution. A recent Department of Defense-level review of the Code did not recommend any changes.

American soldiers and airmen could learn much from this book, especially covert methods of prison communications and techniques for evading interrogators' demands. It will definitely counter the "Hogan's Heroes" myth of life in a POW camp.

Traditionally, histories written shortly after a major event tend to suffer from narrow perspective or become bogged-down with controversy. This one doesn't. Based upon nearly 200 detailed interviews with former POW's, Hubbell has written a readable, chronological history of their captivity. A work of this magnitude could have become as laborous as a Russian novel; instead, Hubbel maintains pace and perspective without monotony or confusion.

POW is dedicated to the Americans who died in captivity, several of whom are mentioned in the text. The publisher, Reader's Digest Press, has announced that all proceeds from the book will go to the POW's and their families.

The story of the POW's heroic resistance and their undying faith in America is a monument to patriotism and a paragon for present and future generations.

First Lieutenant John L. Plaster
Minnesota Army National Guard

THE LAST SIX MONTHS by General S.M. Shtemenko, Translated by Guy Daniels. Doubleday and Company, Inc. 1977. 436 pages. $10.00.

The late Soviet Armed Forces Chief of Staff, Sergei Matveyevich Shtemenko, has written a very informative, if heavily propagandistic, account of the Red Army's drive across Europe to Berlin. The focus is on the role of the Soviet General Staff, their decisions, and their successes.

While some events seem to get fairly even treatment, others have obviously been colored (red, of course) to project a particularly favorable Russian image. But the book is so complete with maps and photography one can really overlook this revisionism of events, such as the report of U.S. plans to bomb the beautiful city of Prague, until the Red Army was able to take control of the situation and, by inference, stave off this disaster.

The book is interesting on two planes. The first, of course, is the account of the Russian war effort itself, especially the account of the Wehrmacht's final fall in Eastern Europe. The second aspect is the latter-day Sovietization of history. Also, the author sometimes subtly, sometimes rather broadly, takes a cut at Stalin; insinuating for instance, that the leader might have been both conceited and shallow of personality. He also finds fault with some of Zhukov's decisions.

To read this book, one is convinced that Russia took the lead against the German war machine, while the U.S. and Britain helped, but stepped on their own feet frequently while trying to assist the Red Army. To this end, Shtemenko is particularly critical of Montgomery. Finally, there are some touches of sadness and regret for the reader, as in the plodding manner of most Russian writing, the "liberation" of one East and Central European country after another is recounted.

The propaganda is obvious, benign, and sometimes amusing. The book is recommended to the serious student of political-military history.

A.W. McMaster, III
HQ TRADOC

SLIM: THE STANDARDBEARER by Ronald Lewin. Archon Books. Hamden, Connecticut. 1976. 330 pages.

This biography of Field Marshall, The Viscount Slim, contains many lessons which are of great value to all officers who intend to make the Army their career. Ronald Lewin traces Slim's career from its very inconspicuous beginning, through periods of disappointment and elation until he reaches the pinnacle of success. Even as a successful general, bewilderment and dispair are never far away as illustrated in this book after Slim's successful Burma campaign. This is perhaps refreshing for junior officers who often feel thwarted and ignored at various times throughout their career. The fact that in the end a brilliant soldier like Slim can overcome all obstacles in his path through sheer ability is an inspiration to all Army officers.

Slim: The Standardbearer begins

slowly. However, once Slim arrives in India, the author captures his vitality and it becomes difficult to put the book down. Lewin is an excellent military historian who has the ability to put into words the mood of the period of history he is describing. I would advise readers who have little or no knowledge of the Burma campaign to obtain a map of the battle area as many places referred to are not shown clearly in the book.

Slim's career after World War II is no less remarkable than his previous military service. Lewin gives some interesting thought (perhaps for Montgomery's admirers, a somewhat biased insight) into the handover between these two great generals when Slim became the Chief of the Imperial General Staff.

After leaving the service, his appointment as Governor General of Australia came as a fitting reward to this remarkable man. As a resident Australian during this period, Lewin's description of Slim as the Governor General is very interesting and accurate.

Slim: The Standardbearer is the biography of a very remarkable man and a great soldier. He was an inspiration to all who served with him in peace and war. The book is aptly titled as, throughout his life, Slim indeed was the standardbearer, whether it was for his men, his monarch or his country.

Major David R. Lawrence, Australia
Command & Staff Dept. USAARMS

HUMAN RELATIONS IN THE MILITARY: PROBLEMS AND PROGRAMS. Edited by George Henderson. Nelson-Hall, Inc. 254 pages. $14.00.

Dr. Henderson has laced together the most pressing of the social ills that face the military today. His presentation is quite timely and direct. The use of case studies well illustrates the points made.

This book is an excellent primer for the leader in facing the challenge of command. Race relations, women's equality, military justice, and drug and alcohol abuse are met headon with no "school solution" offered, but rather the wise use of human relations in meeting these demands.

The subject of health care is addressed in the light of effective communication between patient and medical personnel. The factor of being treated as an object instead of a person with feelings is cited quite well. A lesson here is that a soldier is better able to do his job knowing that he and his dependents will have the best medical care available.

It is a rude awakening for many in the military to be working with civilians. The theme of military versus civilian is brought out quite matter-of-factly. Also, the unique problems that civilian personnel are faced with is worth consideration by every leader/manager.

The application of the principles of human relations is a must for any successful leader. *Human Relations in the Military* fills a void with a realistic approach to current leadership problems.

Sergeant First Class Robert R. Cordell
U.S. Army Third ROTC Region
Northwestern OK State University
Alva, Oklahoma

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

THE PROFESSION OF ARMS by Captain Elbridge Colby, Inf., U.S.A. D. Appleton & Co. 1924. 183 pages. $1.50.

This book gives a general description of what American military life is, what it stands for, and what it tries to accomplish. It will be of benefit to young men who are contemplating entering the Army as a career. To many civilians it will give a picture of the Army which will dissipate certain misconceptions they may entertain as to the democracy of our national defense project. The work treats of the army educational system, has chapters on the various arms, their purposes and uses, and emphasizes the value of preparedness. The book is a bit different from others along the same general lines. It will help to fill a place which has had many unoccupied corners.

Reprinted From the July 1924 issue of The Cavalry Journal. (See Letters.)

RECOGNITION QUIZ ANSWERS

The answers for this issue's quiz are:

1) SOVIET ***BMP*** (front view: note circular, cone shaped turret)
2) FRG ***Marder*** (small turret placed centrally on hull; gun mounted on turret; long hull with inward sloping sides)
3) BRITIAN ***Saracen*** (APC, small turret centered on vehicle)
4) SWEDEN ***Ikv 91*** (fully amphibious light tank, infantry support vehicle)
5) U.S. ***LVTP-7*** (U.S.M.C. assault amphibian vehicle carries five tons of cargo or 25 combat loaded troops. Photo provided by 1LT Ronald L. Robinson, U.S.M.C.)
6) BRITIAN ***Centurian Mk 13*** (large square turret, skirting plates)

☆ U.S. GOVERNMENT PRINTING OFFICE: 1978—757-126/5

Views Through the Visor

Each of my 31 esteemed predecessors has improved this journal and the Armor Community. Each has devoted himself to that task. Each considered it an honor. We have identical feelings. This oldest of the military professional journals reigns supreme. Just browsing through the complete file of journals housed here at the John Lannen House is a humbling experience.

I pledge to devote myself to ARMOR and what this journal stands for. We will continue to disseminate knowledge of all the military arts in an open forthright manner. We will continue to provide a forum for ideas on improving our ability in ground warfare.

The astute recognize I'm borrowing some of the words that always appear on the inside cover. Each of us must strive to increase the Armor Community. We are not only tankers and cavalrymen. We are not only officers. The Community includes all those in mechanized units. A signalman in an Armored unit is an Armored Signalman, the men in the S&T Battalion are just as much Armor, and so on. Enlist them into the Community. Enlist all of them.

But first we must enlist ourselves. We have the individual spirit. Our traditions are history. They cannot be taken away. I wonder about our solidarity. In October, not quite 30 percent of all Armor officers subscribed to this journal. Most Armor officers read it. Most Armor officers boast about the quality of it. Most Armor officers do not belong to the organization. Many of you have already received notes from me. Many more will. Response to date has been encouraging. Our rolls have started to expand.

Let's keep the ball rolling, Armor Community. Let's continue improving professionally. Let's band together. Let's support each other and this hallowed, but forward moving journal.

During my tour as Editor-in-Chief and after, I pledge to do that. I pledge that without asking what the Community can do for me. Do you?

MAV

Coming in ARMOR

"ORIGINS OF SOVIET TANK GUNS"

An engineer and a political scientist trace the design and development of Soviet tank guns from the 76-mm. of the T-34 to those that may be mounted in the T-72 that is now coming into use by the Soviet armored force.

"BETTER TANKERS FOR BETTER TANKS"

Major James S. Cary explains how training innovations and additions to the course of instruction will enable the U.S. Army Armor Center to produce trainees who will be capable of performing at wartime proficiency upon completion of basic armor training.

"COMBAT SERVICE SUPPORT"

Logisticians Colonel Robert W. Fisher and Mister A. David Mills set forth some ideas for doctrinal changes and equipment modifications which are being considered for improving forward service support for combat units.

"JUSTICE IN VALHALLA"

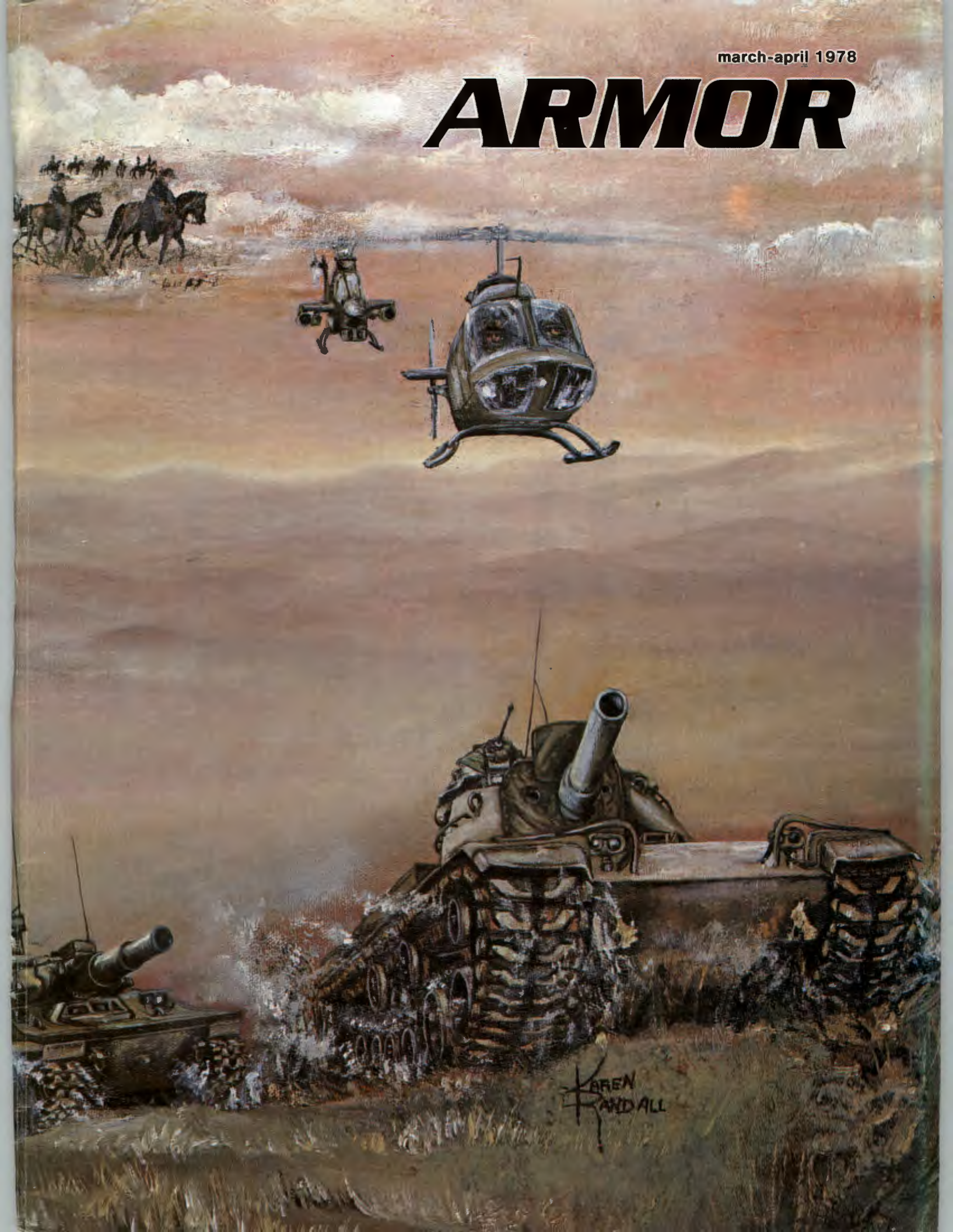
Some interesting imaginary conversation and observations about leadership and great battles of the past emerge when Field Marshals Bernard Law Montgomery, Victor at El Alamein, and Erwin Eugen Rommel, Commander of the Afrika Corps meet in Valhalla in a playlet written by Commander Sushil Isaacs of the Indian Navy.

"DEFENSE AGAINST CHEMICAL ATTACK"

In his informative article on chemical warfare, Lieutenant Austin Bay points out that the Soviet Union's capability to wage chemical attacks on a massive and deadly scale increases the need for effective chemical defense training in U.S. Army units.

march-april 1978

ARMOR



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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."

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ARMOR

the Magazine of Mobile Warfare

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LETTERS

A-10 Capabilities

Dear Sir:

Major Quinn's article, "Deadly As A Praying Mantis," (July-August 1977) while informative and factually correct, does require some qualification.

First, let's look at the statement, "Bad weather should not stop the *A-10* either." The aircraft does have an all-weather flight capability, true, but this is a far cry from an all-weather operational capability in performing the close air-support mission. Although modifications are currently planned to give the *A-10* this all-weather operational capability, it is not available at this time.

Additionally, the ability of an *A-10* pilot to acquire and engage targets with ceilings of 1,000 feet and visibility of 1 mile is also optimistic. Generally speaking and in relative terms, ceilings are not as critical as visibility. With a highly-trained and skilled pilot, target acquisition and engagement is possible with ceilings of 300 feet and visibility of 3 miles. Target acquisition and engagement with visibility less than 3 miles with an airspeed of only 285 knots is in itself challenging without further complicating the problem with an increased airspeed of 450 knots.

A simple time and distance problem should serve to prove this statement. Assume, as Major Quinn claims, that the *A-10* pilot can acquire a target with 1 mile visibility and further assume an airspeed of 285 knots. Five seconds will be required to acquire, fire and break off the target; the distance covered is four-tenths of a mile. If the airspeed is increased to 450 knots, the distance covered increases to over six-tenths of a mile. Target engagement and breakoff at distances of one-half mile or less will give enemy gunners a high probability of hitting and destroying an attacking aircraft. This is particularly true against an air defense weapons system such as the *ZSU 23-4*.

Survivability is of paramount importance and may be enhanced by increased airspeed and maneuverability. The *A-10* is highly maneuverable, can attain speeds of 450 knots, and can carry 8 tons of ordnance. However, in order to maximize any one of the performance specifications, one or both of the other capabilities must be compromised or sacrificed. For example, in order to maximize the load-carrying capability, a degradation of airspeed and maneuverability must be accepted along with a corresponding decrease in aircraft and air crew survivability in a high-threat air-defense environment.

My final comments concern the *GAU-8/A*. This 30-mm. weapon system has proven to be highly effective against armor. Against static *T-62* tanks attacked from the flank or the rear, the depleted uranium round has demonstrated its destructive capability. However, it is doubtful that all tank attacks can be conducted against static tanks from the flank or the rear. Additionally, the effective range of the *GAU-8/A* is approximately 6,000 feet slant range or about 1 mile. What does all this mean? The *A-10* armed with the *GAU-8/A* weapon system can kill tanks under certain conditions (antitank) and is effective against armored targets under almost all conditions (antiarmor). Therefore, on the modern battlefield the *A-10* armed with the *GAU-8/A* will probably be the best general purpose antiarmor weapon system available for some time to come.

Major Quinn is correct, and I support his statement that the *A-10* is a welcome addition to the combined-arms concept. The *A-10* is the first aircraft in recent times to be designed specifically for the close air-support mission and does much to satisfy the stated requirement of the U.S. Army that when required, close air support will be provided the ground commander.

ROBERT A. HEFFORD
Lieutenant Colonel, Armor
Ft. Sam Houston, Tex. 78285

Again on the *A-10*

Dear Sir:

Perhaps this recommendation is late, but regardless of the situation, I submit it.

Major Jimmie B. Quinn was exactly right in his article "Deadly as a Praying Mantis," (July-August 1977, pg. 12) when he stated that we ought to reexamine our premise that, "the tank is the best antitank weapon." He iterated on an awesome jet that has been surmised to yield devastating tank killer capabilities. A new dimension must be added to the battlefield to defeat a weapons system such as the *ZSU-23-4* coupled with enemy tanks of any type.

The new dimension I speak of is the *A-10*, developed for close air support operations. This is the aircraft of the time, a highly survivable and lethal weapon that can deliver more than four times the amount of "hot steel" on the target than a tank can.

Having mentioned the basics of this weapons system, I now make a proposal. A marriage of the *A-10* to Air Cavalry units would insure its availability to the Army on the ground. Although research reveals that much disagreement exists concerning the use of such aircraft in the Army's inventory, the following statements cannot be ignored.

- Organic close air support reacts with less lead time.
- The use of organic close air support precludes confusion.
- Exploitation evolves around the initiative gained through flexible weapons systems.

Perhaps this proposal results in the old argument between the Army's mission vs. the Air Force's mission. Regardless of the results of such an argument, the complexity of the future battlefield cannot be over-considered. Complementation of weapons systems should be accomplished with organic weapons systems to expedite exploitation. Time will be a key factor on the battlefield of the future!

BENNY G. STEAGALL
First Lieutenant, Armor
Ft. Hunter Liggett, Calif. 93928

Of Misspelled Names

Dear Sir:

I very much appreciated the publication of my book review in your September-October issue, but must protest the misspelling of my last name. Fortunately, some of my best friends are Armor officers and you can rest assured that this will have little impact on our friendship. In fact, in my book, Armour [sic] magazine will always rank as one of our top professional journals.

TERRY A. GIRDON
Major, Field Artillery
Princeton, N.J. 08540

Reconnaissance Vehicle Dilemma

Dear Sir:

I must express my concern regarding the tardy and confused development of a proper reconnaissance vehicle for the Armored Cavalry. It would be insulting to emphasize the immeasurable, critical significance of reconnaissance to Armor operations. So what do we have in the Armored Cavalry squadrons? The horrid *M-551 Sheridan*, the huge, slow, noisy *M-60*, and the *M-113* APC, an under-armored obsolescent infan-

try carrier, are the only available vehicles.

What we do need is a fast, small, light, well-armed vehicle in the category of the British *Scorpion* although I don't advocate adoption of this vehicle with its front-mounted gasoline engine—an all too-obvious shortcoming. Colonel Fitzmorris' article on the HIMAG vehicle in the July-August issue of *ARMOR* is an encouraging step in the right direction.

I hope this concept is pursued diligently and quickly. Although cavalry must be able to fight, its primary function is reconnaissance and stealth.

MILTON H. SHERMAN
White Plains, N.Y. 10605

Added Impetus

Dear Sir:

Some years ago when the Special Armor Board sitting at Fort Knox asked for ideas and comments, I suggested among other things, the inclusion of a self-propelled anti-aircraft vehicle in every tank platoon. The obvious basis was that a tank commander has enough to do keeping his eyes on the ground without having to keep scanning the skies as well. Since then, in several published articles, I have continued to advocate this idea.

The Soviets are now reported to be reorganizing their tank divisions to include a self-propelled *ZSU 57-2* or *ZSU 23-4* in every tank platoon. Perhaps that will provide a much stronger advocacy than mine.

ROBERT J. ICKS
Colonel, AUS-RET.
Elmhurst, Ill. 60126

"Scaled Targets" Correction

Dear Sir:

The article "Scaled Targets," published in the September-October 1977 issue, contains an error that might prove troublesome to someone trying to construct scale targets using the dimensions as listed in the article's chart. The last sentence of the article should read: "All measurements are in centimeters; to convert to inches, *divide* by 2.54."

JOHN F. HESS, JR.
Platoon Sergeant, NJARNG
Hamburg, N.J. 07419

ARMOR thanks PSG Hess for pointing out our error. We'll make better use of our metric conversion booklet in the future. —ED.

"Dual-Tex"

Dear Sir:

Many thanks to Major O'Neill for his thought-provoking article, "Dual-Tex Camouflage Pattern," in the November-December 1977 issue.

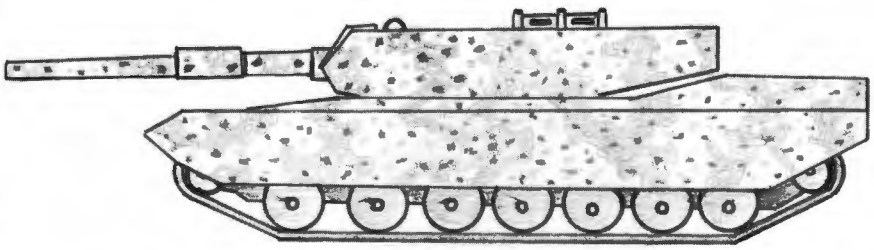
As a new lieutenant in the semi-gloss, white-starred Army he refers to, I was disturbed by the negative reactions of superiors and subordinates alike about camouflage for both personnel and equipment. I still remember the resentment stirred by my insistance that, when we were training in the field, my troops had to either wear OD T-shirts or keep their collars buttoned all the way up to hide the neat little white, triangular aiming point at the base of the throat. In my humble opinion, subdued insignia for our combat/utility uniforms was the smartest thing we've ever done for them, and I hate to hear revisionist (or is it reversionist?) rumblings based on pride in unit insignia, or "that it's too hard to tell the EM from the officers."

If I may, I would like to offer a couple of comments relating to the "Dual-Tex" camouflage pattern described by Major O'Neill. Late in World War II, the German army, faced with ever dwindling supplies of fuel and repair parts and sustaining heavy and irreplaceable losses in tanks and self-propelled guns, began to employ its armor in static "ambush" positions. They also needed "concealment, very effective concealment, to reduce vulnerability and keep the weapons in action," to use Major O'Neill's words. The camouflage designed to provide this concealment used the three colors they had available at the time: a dark yellow, an olive green, and a red brown. These colors were painted in a "macropattern" of broad light and dark areas. Then, small irregular spots of the yellow were applied over the larger areas of green and brown, and spots of green and brown were painted over the larger areas of yellow, providing a "micropattern" of color bits which closely matched the environment. The end result was a camouflage startlingly like the "Dual-Tex" pattern! Anyone interested in seeing color renditions of this "ambush" camouflage should check out a book entitled "Panzer Colors, Camouflage of the German Panzer Forces, 1939-45," by Squadron/Signal Publications.

My final comment is that whatever camouflage pattern we use, we automatically paint it over the entire vehicle. Major O'Neill makes a good case for the effectiveness of the "Dual-Tex" pattern on concealing armor from ground-level eyeball or optical view. But what about from the air? We are so used to having air superiority that we tend to ignore that aspect of the concealment problem. How do we know that perhaps some other pattern is not actually better than "Dual-Tex" when it comes to making an armored vehicle more difficult to see from the air? We may need a mixed system, with the horizontal surfaces painted differently than the "Dual-Tex" vertical and sloped surfaces.

I look forward to reading more about camouflage development in your fine magazine.

RONALD L. KIRSHMAN
Lieutenant Colonel, Quartermaster Corps
Professor of Military Science
Kalamazoo, Mich. 49008



Dual-Tex Alternative

Dear Sir:

Regarding Major O'Neill's fine article on the Dual-Tex camouflage system, since from a distance the Dual-Tex pattern forms a pattern that is not so unlike what we are using now, and since Major O'Neill himself admits to problems by user elements in application, why not adapt it to what we are using now? By simply using the same three color scheme that the major proposes, and a little bit different method of application, I feel the results can be duplicated in an easier way for the troops in the field.

Instead of rollers and checkerboard pattern why not use the lighter color as the base coat, with irregular patterns of the intermediate color, and apply the darkest color all over in irregular splotches. Now, the lighest color is applied in the same irregular splotches as the dark color to the medium color areas. And finally the medium color is applied to the light color areas in splotches also.

The advantages are that the troops in the field and garrison can do the job with either a paint brush (the usual method) or with a spray gun. From a distance I believe the results will be the same.

Lest anyone think this new or novel the Germans were using this same scheme in 1944-45 with excellent results.

EDWARD L. PINGSTON
Specialist Four
Ft. Bliss, Tex. 79916

THE COMMANDER'S HATCH

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

As some of you may know, I have just returned to Fort Knox after approximately 51 months in USAREUR. During my overseas tour, I had the good fortune of serving as a brigade commander in the 1st Armored Division and later as Commanding General, Seventh Army Training Command.

On the 18th of January 1978, I assumed command of the U.S. Army Armor Center and U.S. Army Armor School. I, like many of you, have previously served here as a student and instructor. Since my arrival, I have been involved in a series of briefings which have been designed to bring the total mission of the U.S. Army Armor Center into perspective. On the occasion of my first remarks from the Commander's Hatch, I would like to share with you my initial impressions of the Armor Center and some of its missions and goals.

First, Fort Knox has been and will continue to be the U.S. Army's Home of Armor. As the Home of Armor, we are the leading proponents of mobile warfare built upon the full optimization of ground and aerial weapons systems designed to rapidly kill threat armor vehicles and associated supportive forces and equipment. We will continue as we have in the past to develop our doctrine, weapons systems, training developments, and training systems in complete coordination and cooperation with the combat support and combat service support branches. As Armor, as well as other combat arms, we must not only talk combined arms, we must also break out of our cocoon and make the combined arms concept work.

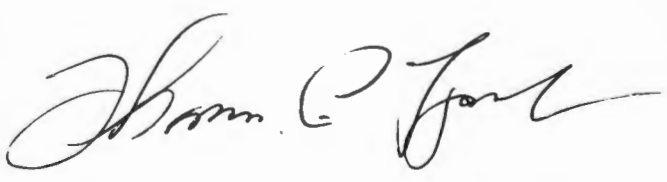
Second, our greatest contribution to the operating combat forces are the armor leaders, weapons system crewmen, and maintenance personnel we graduate weekly from the Armor Center. With limited resources, we must do this by establishing better feedback, and then responding to this feedback from the armor and mechanized forces in the field, and by taking advantage of modern educational technology. I intend to gain better control of our educational system and improve our utilization of this feedback process.

Third, we must aggressively seek ways to improve the training and operating efficiency of our armor weapons systems. The recently completed Tank Force Management Study contained recommendations which will result in an improved combat-effective armor force. I intend, as my predecessors have done, to fully implement those recommendations and monitor their progress. Additionally, I am taking similar initiatives to insure that the armor force is moving in concert with the mechanized infantry forces and, most important, that we in Armor fully recognize our responsibilities to exploit the tank killing capabilities of the attack helicopter. Air Cavalry and attack helicopter units are an integral part of mobile warfare. These armor units are an aerial extension of the urgent requirement to provide ground maneuver commanders the means to see the battlefield, fix the enemy, and destroy him. I accept as one of my most important tasks the orchestration of all the available armor-defeating weapons systems on today's battlefield. I will do this by preparing a roadmap that leads from today's battlefield to tomorrow's.

I'll attempt to expand on these goals in subsequent issues of *ARMOR* magazine. I'll be prepared to comment on the progress we are making as well as some of the obstacles that confront us.

I am fully dedicated to insuring that armor, tanks, ground and air cavalry, and attack helicopters are full participating members of the combined arms team.

Take care of the soldiers.



FORGING THE THUNDERBOLT

Improving Turret Maintenance

Ask any Armor commander where his unit needs to improve, and turret maintenance will be somewhere near the top of his list. As our equipment becomes more sophisticated, maintenance is becoming more critical than ever. From the turret mechanic to the company commander, we, as Armor leaders, need to do more to properly prepare these men to do their jobs.

There are basically two phases to an individual's training. The first is his school training which consists of Basic and Advanced Individual Training for enlisted soldiers; and Armor Officer Basic (AOB), and Armor Officer Advanced courses (AOAC), and for some officers, the Motor Officer course. This training for Armor officers and tank turret mechanics is conducted at the Armor School and, in most cases, is designed to provide the student with the basic knowledge required for his job. It does *not* make him an experienced soldier or expert.

The second phase is field or unit training, sometimes called on-the-job training (OJT), or learning by doing. OJT in Armor units ranges from excellent to nonexistent, yet it is probably the most important phase of a soldier's development. It is as a member of a unit that our soldier puts into practice what he has learned in school and becomes truly qualified in his MOS.

In response to the first phase requirements, major revisions have been made in training conducted at the Armor School:

- Turret Mechanics—Currently underway is a program within the Maintenance Division of the Weapons Department to upgrade both our training and graduation standards, with increased emphasis on troubleshooting and use of diagnostic equipment, alternative test requirements for each task, and a GO/NO GO grading system rather than a numerical percentage.
- AOB—As a part of the AOB triple track, our new lieutenants will receive turret maintenance training only on the vehicle they will be supervising in their initial assignment. Training is based on operator/crew maintenance and will give the student a basic working knowledge of his equipment's maintenance requirements.
- AOAC—The turret maintenance training received by the AOAC student has been increased sixfold. This program keys on the company commander's supervisory requirements, and gives him the knowledge needed to perform effectively as a maintenance supervisor.
- Motor Officers—The Weapons Department has completed and implemented a major revision of the turret maintenance portion of the MO course. Instruction has been lengthened and intensified so that the motor officer student will receive 40 hours of turret maintenance training on the primary tank in his battalion or squadron rather than on several different types of vehicles. In this 40 hours, 90 percent is hands on training designed to teach the student the capabilities of his maintenance section and the manuals and equipment available, and necessary, to execute an effective maintenance program.
- Master Gunners—One of the courses most highly regarded by Armor commanders is the Master Gunner program. This course is divided into three areas: maintenance, gunnery, and training management and development. When the student graduates from this course he is a highly skilled technician in these areas. While the Master Gunner must be assigned against presently authorized tables of organization and equipment (TOE) positions, much greater utilization of his capabilities can be made if he is given certain company or battalion-wide responsibilities. In gunnery and maintenance, he is capable of performing management and training operations, some of which will be discussed later.

Over the past 10 months, representatives of the Weapons Department have visited 15 Armor/Cavalry battalions in the continental United States (CONUS) and U.S. Army, Europe (USAREUR) specifically to find out where we are and where we need to go in turret maintenance. What they found was sometimes encouraging, sometimes disappointing, but always enlightening. These trips also confirmed what we thought needed to be done to our courses, and this input was the basis for a substantial number of the changes we have made. During these trips they also found that units operating effective OJT programs:

- Are most satisifed with the performance of their men.
- Have the best maintained equipment.
- Are shooting best on tank gunnery ranges, and combined with other training, are the best units.

The impact of the Master Gunner, if properly utilized, can be substantial.

What is an effective OJT program? Ask 10 soldiers what

OJT consists of, and you will probably get 10 different answers. In some units it is nothing more than a chart that reflects cross training that may or may not have occurred. In other units it is a highly centralized, formal program with a committee-type structure organized at battalion or brigade level. In between are many other formats at company and even platoon levels that are enjoying various degrees of success. In whatever shape it takes, an effective program is one that:

- Is well planned and organized.
- Has specific, attainable goals.
- Imparts knowledge to its participants.

We just haven't got the time to be platoon sergeants and Master Gunners for everyone else.

Who can supervise a maintenance OJT program? Probably the most qualified turret maintenance trainer in any unit is the Master Gunner. Two-thirds of the instruction he receives at the Armor School consists of turret maintenance and training development. For the *M-60A1,* the Master Gunner receives 172 hours of maintenance instruction; for the *M-551,* 160 hours; and for the *M-60A2,* he receives 284 hours. This time is spent on such subjects as gun and recoil systems, fire control, hydraulics, electronics, elevation and traversing systems, extensive troubleshooting, use of diagnostic equipment, and organizational maintenance services. The training the Master Gunner receives in these areas is the same that the turret mechanic receives; however, because the Master Gunner is more mature and already possesses a relatively high level of experience, the training is substantially more effective for him. The impact of the Master Gunner, if properly utilized, can be substantial. For example:

- One battalion-sized unit visited in Europe was having a major problem with its laser rangefinders. The crews were burning out the laser electronics unit by repeatedly operating the system without allowing the power supply to recover. The problem was so severe that the unit literally gave up on the rangefinders and conducted its annual gunnery program without using them. This unit had several Master Gunner graduates who were assigned as platoon sergeants, but none were working solely as Master Gunners. It was interesting to note that laser operationally readiness (OR) rates were near 100 percent within these sergeants' platoons. The answer? "Sir, the other platoons are burning out their lasers because they don't know how to use them. We just haven't got the time to be platoon sergeants and Master Gunners for everyone else."
- An *M-60A2* battalion in Europe organized a training program for their turret mechanics that was managed by their battalion Master Gunner and 45K30 turret maintenance supervisor. These two NCO's shared the training duties, each teaching those areas in which he was strongest. Result: 54 operational *M-60A2* turrets for their trip to Grafenwohr.
- A cavalry troop commander in Europe assigned his Master Gunner to the training room. Working with the training NCO, he coordinated a gunnery and maintenance training program, with all training conducted by the unit. Through this careful management and solid training, his loss as a tank commander was more than compensated for. Result: Highest OR rate and tops in gunnery in the squadron!

Where can you get training materials? One of the first stumbling blocks to any training program is finding or designing the material to base it on. It is difficult at battalion level to find people with the ability to put together a highly technical training program. However, there are several sources of information and assistance available for your use.

The Training Materials Support Branch (AWTS) of the Armor School's Directorate of Training (DOT) has the mission of providing the Armor community with extension and selected resident training materials. DOT publishes the *Hot Loop* which is a monthly update of new instructional and support material. It lists such things as new lessons available through AWTS, in addition to Training Extension Course lessons, TV tapes, and Graphic Training Aids which are available through your supporting Training Aids Support Center. It also provides information on new and revised correspondence subcourses that could be integrated into an OJT program. The address for AWTS is:

Directorate of Training
USAARMS
ATTN: ATSB-DT-EMF (AWTS)
Fort Knox, Ky. 40121

ARMOR magazine often carries articles in "The Commander's Hatch," "The Master Gunner's Corner," and from members of the Armor community in general, that can provide excellent information in setting up many types of training programs. It also provides an excellent forum for the exchange of ideas, new concepts, and theoretical and practical discussions on topics of current interest.

Another valuable channel for turret maintenance information is through the Master Gunner point-of-contact program initiated by the Weapons Department. The Department's gunnery and maintenance experts can often provide immediate answers to requests for assistance, either written or telephonic. If your Master Gunner doesn't know who the point of contact for your unit is then write directly to:

Director
Weapons Department
USAARMS
Fort Knox, Ky. 40121

In addition to the point of contact program, the Maintenance Division of the Weapons Department also has the capability to provide assistance. Any question relating to specific maintenance problems, the establishment of a training program, or to a limited extent, requests for training material can, and will, be honored immediately. The Maintenance Division also has maintenance assistance teams that visit units experiencing unusual or stubborn problems in turret maintenance or maintenance training. Although funding support from the unit being assisted is necessary, it is money well spent. Contact the division directly at:

AUTOVON 464-6155/2215
or Chief, Maintenance Division
Weapons Department
USAARMS
Fort Knox, Ky. 40121.

ARMOR FORCE MANAGEMENT

FLEXIBLE GRADE STRUCTURE

A major finding of the Tank Forces Management Group (TFMG) was that "tank crew turbulence degrades armor unit combat readiness, and vertical progression (grade matched to crew position) contributes to unit/crew turbulence." This finding was surfaced in the Training and Doctrine Command Total Tank System Study (T^2S^2). While many factors such as losses through permanent change of station (PCS) and expiration of term of service (ETS) and force structure changes contribute to this turbulence, about one-half is generated within the battalion. For example, temporary duty (TDY), special duty, sickness, disciplinary measures, and promotions all contribute to the instability of individual crews. Concurrent with establishment of Career Management Field (CMF) 19, provision has been made to reduce turbulence caused by promotion. Under current criteria, when a tank crewman is promoted, he usually has to be moved into a new duty position, i.e., when a PFC (driver) is promoted to SP4, he should become a loader and for the most part cease to drive. In this situation, a young soldier has comparatively little time to become a seasoned professional in any one duty position. The vertical grade structure of the tank crew follows.

CURRENT TOE

DESCRIPTION	GRADE	MOS
Tank Commander	E6	113E0
Gunner/Ass't Tank Commander	E5	11E20
Loader	E4	11E10
Driver	E3	11E10

On 1 March 1978, Armor unit tables of organization and equipment (TOE) will be revised to reflect a "flexible grade structure" similar to that now applicable to many noncrew military occupational specialties (MOS). As a result, individual Armor soldiers will be able to progress through grade E5 as either drivers, loaders, or gunners without having to assume new duties or changing crews upon each promotion. Commanders will no longer need to move the newly promoted soldier and will be encouraged to keep intercrew reassignments to a minimum so that a higher level of crew integrity can be maintained.

The new grade structure will result in approximately the same number of E3, E4, and E5 authorizations per company as under the current system. However, the commander will have considerable flexibility in application of his total grade complement to individual platoons and tanks. It will be possible, although unlikely, to allow the driver, loader, and gunner on one tank to be all E5's with all E3's in another. However, a combination of E3, E4, and E5 is much more likely for most units. A comparison of enlisted tank crew grade structure follows.

CURRENT TANK COMPANY TOE				EFFECTIVE 1 MAR 78 TANK COMPANY TOE			
POSITION	RANK	MOS	NO	POSITION	RANK	MOS	NO
PLAT SGT	(E7)	11E40	2	PLAT SGT	(E7)	19E40	2
PLAT SGT	(E7)	11E40C5	1	PLAT SGT	(E7)	19E40C5	1
TK CMDR	(E6)	11E30	11	TK CMDR	(E6)	19E30	11
ASS'T TK CMDR	(E5)	11E20	3	SR TK LDR/GNR	(E5)	19E20	11
				TK LDR/GNR	(E4)	19E10	11
				TK LDR/GNR	(E3)	19E10	12
TK GNR	(E5)	11E20	14				
TK LDR	(E4)	11E10	17	SR TK DRV	(E5)	19F20	5
				TK DRV	(E4)	19F10	6
TK DRV	(E3)	11E10	17	TK DRV	(E3)	19F10	6
			65				65

With the flexible grade structure, the Army will:

- Benefit from more highly developed expertise in a particular duty position by providing for longer tenure.
- Provide a meaningful career for tank drivers, loaders, and gunners through grade E5.
- Improve crew proficiency by keeping individual crews together longer.

OJT Programs

by Captain Charles W. Farnham, III

On the job training programs come in as many forms as there are units and skills in the Army. However, I would like to offer two ideas on what a program might look like. The first is an initial-entry program for new personnel. The second is a continuing refresher program that may be used throughout the year.

Sample Program for *M-60A1* Battalion

Purpose: **To provide initial training, evaluation, and orientation to all newly-assigned turret mechanics.**

Instructor: **Battalion Master Gunner assisted by company Master Gunners and senior turret mechanics.**

Scope: **On a continuing basis, conduct training and orientation for all new turret mechanics immediately upon assignment to ensure basic skills and knowledge, build upon them, and maximize his immediate contribution in support of the unit's mission.**

Schedule: (Based on 80-hour program)	Length (hours)	Sample Reference
DAY 1-a. Introduction, orientation, and review of unit SOP's and administration procedures.	4	Bn SOP
b. Pre-test.	4	TM 9-2350-215-20, Table 2-17
DAY 2-a. DA maintenance forms, records, and publications.	4	TM 38-750, para 4-6
b. Unit PLL and parts procedures.	4	TM 9-2350-215-20, Appendix B
DAY 3-Tour and orientation of unit's support activities.	8	Bn SOP
DAY 4-Care, inventory, use, and capabilities of organizational tools and equipment.	8	TM 9-2350-215-20, page 2-35
DAY 5-Troubleshooting, diagnostic, and repair procedures.	2	TM 9-2350-215-20, para 2-105
—Gun and recoil system	3	TM 9-2350-215-10, Table 3-6, items 47 thru 57
—Fire control	3	TM 9-2350-215-20, Table 2-17, items 1 thru 20
DAY 6-Above continued	2	TM 9-2350-215-20, page 2-564
—Cupola and searchlight		
—Turret power and hydraulics	3	TM 9-2350-215-20, Table 2-18, items 1 thru 17
—Elevating and traversing systems	3	TM 9-2350-215-20, Table 2-18, items 1 thru 17
DAY 7-a. Above continued	4	TM 9-2350-215-20, Table 2-17, items 82 thru 109
—Stabilization system		
b. Turret quarterly services	4	TM 9-2350-215-20, Table 2-15
DAY 8-Quarterly services continued	8	TM 9-2350-215-20, Table 2-15
DAY 9-Quarterly services continued	8	TM 9-2350-215-20, Table 2-15
DAY 10-a. Course review	4	All of above
b. Post-test.	4	All of above

Sample Program for *M-551* Troop

Purpose: **To provide refresher training for troop turret mechanics on a continuing basis.**

Instructor: **Troop Master Gunner in coordination with troop training NCO and Squadron Motor Officer (for tool and equipment support).**

Scope: **On a weekly basis the troop Master Gunner conducts training for the mechanics, focusing on troubleshooting and use of diagnostic equipment. It should be limited to**

2-3 hours and conducted in the middle of the week to avoid the normally hectic pace of Monday and Friday.

Schedule	Subject	Length (hours)	Sample Reference
Week 1-a.	Review of maintenance forms and records	1	TM 38-750
b.	Use of technical manuals, related publications, and wiring diagrams.	1	DA PAM's 310-4, 310-7, TM 92350-230-12, TM 11-6625-366-15
Week 2-a.	Use of diagnostic equipment.	1	TM 9-2350-230-12, Fig 10-3, Table 10-3, TM 9-4933-216-12, Fig. 1-1, Table 2-3,4,6
b.	Firing circuits - review and troubleshooting.	2	TM 9-2350-230-12, pages 8-36, 8-37, TM 9-4933-216-12, Table 2-4
Week 3-	Turret power and electric drive control systems - review and troubleshooting	2	TM 9-2350-230-12, Tables 10-3, 8-4, TM 9-4933-216-12, Table 2-3
Week 4-	Missile system - review and troubleshooting.	3	TM 9-2350-230-12, Tables 2-12 and 8-4 pages 8-38, 39
Week 5-a.	Check valve - review and service.	1	TM 9-2350-230-12, Service Table 8-17
b.	Grenade launchers - review and troubleshooting.	1	TM 9-2350-230-12, Review pages 11-26 and 11-27
Week 6-	Purging fire control system.	1	TM 750-116
Week 7-	Loading tray assembly - review and adjustment.	3	TM 9-2350-230-12, pages 11-16, 11-21, and 11-23
Week 8-	Breech electric drive system - review and troubleshooting.	2	TM 9-2350-230-12, Table 8-4, pages 8-40,8-41, TM 9-4933-216-12, Table 2-4, pages 2-21 and 2-31
Week 9-	Using the fault isolation test set for component test.	2	TM 9-4933-215-12, Table 2-5, page 2-32
Week 10-	Compressor review and service.	2	TM 9-2350-230-12, Service Table 8-17.1, pages 8-85 and 8-86

NOTE: With a schedule of 2-3 hours per day, you can maintain the ability to continue regular maintenance missions.

These subjects and times are examples of what you might do. If your unit has an unusually severe problem, with missile systems for example, you can easily vary your emphasis accordingly. In this example, we started with forms and publications because if your mechanic doesn't know how to use them, his effectiveness is greatly limited.

In following weeks, or any interval you choose, you can shift your emphasis to other areas such as gun and recoil systems, scavenging system, commander's cupola or searchlight; or you can reinforce material already covered. You may also want to use a pre-test to measure the abilities of your mechanics and a post-test to measure progress. In the execution of your training, maximize the use of manuals and diagnostic equipment. You can use operational vehicles with induced faults for training aids, or you may prefer to use a deadlined vehicle and use correct diagnosis of faults or repair as a training goal. You can have your mechanics train individually or, to maximize use of time and equipment, as teams.

With careful planning, you can conduct your program on a quarterly cycle, and cover every critical skill required of your mechanics with minimum disruption of normal activities.

It must be noted that the key to the success of any such program is flexibility to meet the needs and capabilities of the unit. These examples of training programs can provide your unit with the ability to ensure itself of fully-qualified turret mechanics. Similar programs can provide like benefits for every member, enlisted and commissioned, of your unit.

In Closing

As we look into the future there are several programs under development that will have a major impact on the maintenance capabilities of armor units. The Weapons Department, USAARMS has redesigned the motor officer's turret maintenance training and the course has been implemented. Field trials of this self-paced programed instruction were conducted at Fort Bliss, Tex., in cooperation with the 3d ACR, to determine if the material could be successfully used by units to train their own personnel. The Master Gunners of the "Brave Rifles," with minimum assistance from the USAARMS team, were successful in presenting the 40 hours of instruction to officers and NCO's of the regiment.

Finally, the new training already designed at Fort Knox, for all students, will have a positive impact on our ability to fight and maintain our tanks. With these programs as a foundation, and effective followup training in our units, we can meet the challenge of the future with every expectation of success.

CPT CHARLES W. FARNHAM, III was commissioned in Armor upon graduation from Marquette University in 1970. He has served with the 2d, 14th, and 11th Armored Cavalry Regiments as a platoon leader, troop executive officer and staff officer. Captain Farnham was then assigned to the Automotive Department of the Armor School and subsequently commanded a troop in the 2-6th Cavalry. He is presently assigned to the Maintenance Division, Weapons Department, USAARMS.

MASTER GUNNER'S CORNER

"Hey, Master Gunner Branch! I don't have a TOE slot anymore." "What are my chances of coming to the Master Gunner Course as an instructor when I PCS?" "My orders don't identify me as a Master Gunner." "When I PCS can I get back into the Master Gunner business after being a First Sergeant?"

These are just a few of the many questions which have been asked of the Master Gunner Branch since its beginning in January 1975, very valid questions that affect all Master Gunners in the field and if not asked, at least thought about and not often answered to the satisfaction of the asker.

To attempt in this article to answer all such questions would be futile; however, there are some questions asked repeatedly which indicate a need for clarification and information.

To better enable me to answer these, I've consulted with Sergeant First Class Charles Luster, MILPERCEN Assignments Branch, who works with Master Gunner reassignments. The following is an excerpt of our discussion:

Q: How hard is it for MILPERCEN to keep up with Master Gunners as a result of PCS?

A: Not difficult, as long as the individual insures his standard name line contains the ASI the Master Gunner is trained in and if, when he gets to his unit, he informs the battalion Master Gunner to notify Master Gunner Branch. The Armor School in turn will inform MILPERCEN. This will insure that his location is noted by both USAARMS and MILPERCEN.

Q: Is there any problem with the School awarding the ASI as opposed to the old system of the unit awarding it?

A: The awarding of ASI's by the school is not a problem as long as a DA 1059 is filled out on each student completing the course. The form is made by an attendee's faculty adviser and distributed to MILPERCEN and the individual. If he does not receive a copy of the DA 1059 after a reasonable amount of time (usually 90 days), he should write to the Master Gunner Branch to check on the location or status of his evaluation. This form is the sole report of his completion of the course so if he doesn't receive one, it's a good assumption MILPERCEN doesn't show him as a graduate.

Q: Is there any possibility of course graduates going to other than active component Master Gunner positions when PCS is within CONUS?

A: Yes. As a matter of fact, FORSCOM has initiated a study within National Guard and Reserve units to determine the feasibility of Master Gunner usage in their commands. In addition to feasibility, they have been asked to identify a slot for the Master Gunner where he will be most beneficial.

Q: What is the probability of Master Gunners returning from the field being assigned to the School?

A: This would really be hard to answer because of availability of slots and the requirements of the Army.

The most important thing to consider in any reassignment is the needs of the Army at that time. However, this doesn't necessarily mean a Master Gunner will always be on the line or will never have a chance to be an instructor or adviser to a Reserve or National Guard unit. It's important for him to keep DA and Master Gunner's Branch of USAARMS posted on his location for better monitoring of his assignments. Another consideration is the Enlisted Preference Statement. If the preference statement is not up to date or doesn't reflect an individual's real preference, it's very possible for him to go to an area he doesn't want. Contrary to popular belief, the preference statement is a very important document and it is looked at very closely at Department of the Army level when personnel are being reassigned.

Q: What's the percentage of malassigned Master Gunners?

A: Unbelievably quite small for the number in the field to date (324). Don't confuse malassigned with *mal-used.* No one can dictate to a commander as to how to best employ and use his personnel, nor will anyone try. However, as is sometimes the case, the commander is not fully aware of the capabilities of his Master Gunner unless he has seen him perform. Also, in a few isolated cases the Master Gunner may not have used all of his knowledge to the best of his ability to prove his worth to a commander.

Q: What is the status of separate slots for Master Gunners?

A: In April of this year, the new Tables of Distribution and Allowance (TDA) and Tables of Organization and Equipment (TOE) did not reflect a separate slot for Master Gunners at company or battalion level.

NOTE: Since the conversation with SFC Luster, it has been learned that the separate slot for the battalion Master Gunner has been approved and will be reflected in the TDA's and TOE's to be printed in April 1978.

In later articles we will answer some of the other technical questions, but in this one we hoped to answer those concerning assignments and reassignments which are most often asked and probably least often answered.

ROBERT S. SLATER
Sergeant First Class (P)
Chief Instructor, Master Gunner Branch

FROM THE FIELD

When "Master Gunner's Corner" was originated, it was envisioned as becoming the forum through which Master Gunners Army-wide could share their ideas, experiences, and lessons learned with our readers. The following after-action report concerning the fiscal year 1977 tank gunnery program of the 2-68th Armor is one of the first responses from the field. —ED.

This article will present a summary of one tank unit's gunnery program. Each phase of the program will be discussed, including training techniques employed and problems encountered.

The pre-level II concept of gunnery consisted of both classroom and hands-on training. Generally, introductory-type instruction on the weapon systems and associate fire control was presented. Practical exercises were designed to complement classroom instruction and insure complete refamiliarization with all turret components.

Subordinate commanders were given the latitude to identify and schedule subject matter in which they felt their respective units were weakest. Although topics and depth of coverage varied across the battalion this *unit introspective approach* resulted in accurate targeting of training inadequacies.

Level II of the program began with a gunnery skills test (GST) conducted and scored by an *ad hoc* committee. The skills tested generally conformed to the GST in the now superseded TC 17-12-5. Initially it was this unit's goal to administer a test exactly as portrayed in the training circular. However, closer examination revealed that an extremely large number of examiners and a high equipment density would be required. Expenditures of such large equipment and personnel assets was felt to be prohibitive and uneconomical from a *training value returned* standpoint. Ultimately the hybrid GST fielded by the battalion provided maximum diagnostic output with minimum overhead. The resultant *hard copy analysis* was used by commanders at all echelons to program relevant remedial training.

Turret-ring up maintenance was enhanced through the use of the armament readiness condition (ARC) report. The bimonthly ARC identified both existing and potential problem areas and verified the existance of job orders and requisitions. A massive maintenance effort was made to turn in unserviceable components while tracking down the status of those items still in support maintenance channels. As a result, numerous items of equipment were repaired prior to and during level II gunnery which upgraded the overall readiness profile for level I. Additionally, internal maintenance evaluation team (MET) inspections and external turret "peak-ups" increased the collective maintenance awareness which resulted in fewer crews being imprisoned in the tank park with the deadline syndrome.

Crew turbulence was kept to an absolute minimum through intensive ongoing personnel management. This stabilization effort reduced the adverse impact of unexpected attrition, particularly at the critical tank commander and gunner positions.

Subcaliber firing exercises at the combat training theater were employed to sustain basic gunnery skills and refine crew duties. The *M-55* laser, mounted in place of the coaxial machinegun, was the principal device utilized. Although the laser is acknowledged as one of the best available subcaliber training devices it has two vexing disadvantages:

• System parallax negates the effectiveness of the device on targets moving perpendicular to the firing vehicle.

• The devices spent more time at the training aids repair facility awaiting replacement parts (e.g. the plasma tube) than they did in operational service training tank crewmen.

As of this writing both of the aforementioned problems persist.

The culmination of level II was the firing of service ammunition on local training area (LTA) ranges. A battalion-controlled zero exercise facilitated the required quality control and provided each tank commander with a semipermanent record of his weapon system's performance. USAREUR regulation 350-704 (Draft) was used as the primary planning paper for the design of modified Tables VI and VII. The creation of these modified tables was driven by the obtainability of range time and ammunition. Both of these critical considerations were subject to continual change in spite of the meticulous planning and coordination effort that attempted to define their availability. Fortunately, the elasticity of the program's base compensated for these adverse factors and provided workable solutions to the majority of the problems encountered.

When pre-level I activities began, a follow-on GST II was conducted in an effort to overcome training shortfalls that surfaced during LTA service firing. This exercise was essentially a training bonus rather than a test in the conventional sense.

Sandtable exercises were used to good advantage and were particularly valuable in gaming various engagement options and target handoff techniques. In retrospect, the seemingly innocuous sandtable proved to be one of the most effective mediums for preparing tank commanders, especially platoon leaders, for *the Grafenwohr experience.*

Dry runs of the tank crew proficiency course were used to polish crew interaction and validate the engagement options developed on the sandtables. Platoon leaders were critiqued on their ability to designate Threat target locations accurately, with minimum verbiage, to the firing tank.

The unit's recently constituted learning center provided a single point-of-contact for audio-visual services and a central reference library for field manuals and technical publications. Tank crews were provided the time and encouraged to use this facility to sharpen their collective knowledge.

Due to compression of the gunnery timetable, detailed plans were published at the start of level I to alleviate loss of firing time due to disorganization. The latest changes to training and qualification standards were well publicized and updated as required. A simple scoring system was devised to capitalize upon the competitive aspect of gunnery within the unit and various incentives were offered to enhance the prestige of qualification. Personnel required to operate the ranges (officers-in-charge, safety officers, and details) were identified by name or duty position well in advance of the unit's arrival at the major training area (MTA). Sound planning freed the leadership to concentrate on the execution phase and allowed rapid neutralization of small brush-fire problems before they could intimidate the quality of the training. Additionally, range support packets of higher-headquarters provided equipment and personnel assistance and interfaced with the MTA headquarters.

Unfavorable weather (fog-out) precluded use of backside ranges 45, 42, and 79 during a substantial part of the unit's assigned priority window. The inordinate amount of time spent on "fog-watch" and the ever present demand to be prepared to fire at a moments notice, contingent on a break in the weather, combined to produce a real test of the ability of crews and platoons to maintain their fighting edge.

The absence of a *limited visibility course* on contemporary tank ranges is scarcely compatible with a realistic battle simulation. The ability to *fight outnumbered and win* will never be realized until the restraints imposed by atmospheric conditions are overcome.

In conclusion, last year's gunnery program stands as the planning base upon which our current program is founded. Last year's mistakes and likewise its strong points have become valuable leassons learned.

JAMES B. PURKHISER
Sergeant First Class (P)
Master Gunner, 2-68 Armor

After completing the after-action report for the gunnery cycle described above, it appeared that a few additional words concerning the role of the Master Gunner might be appropriate. Therefore, I offer the following thoughts.

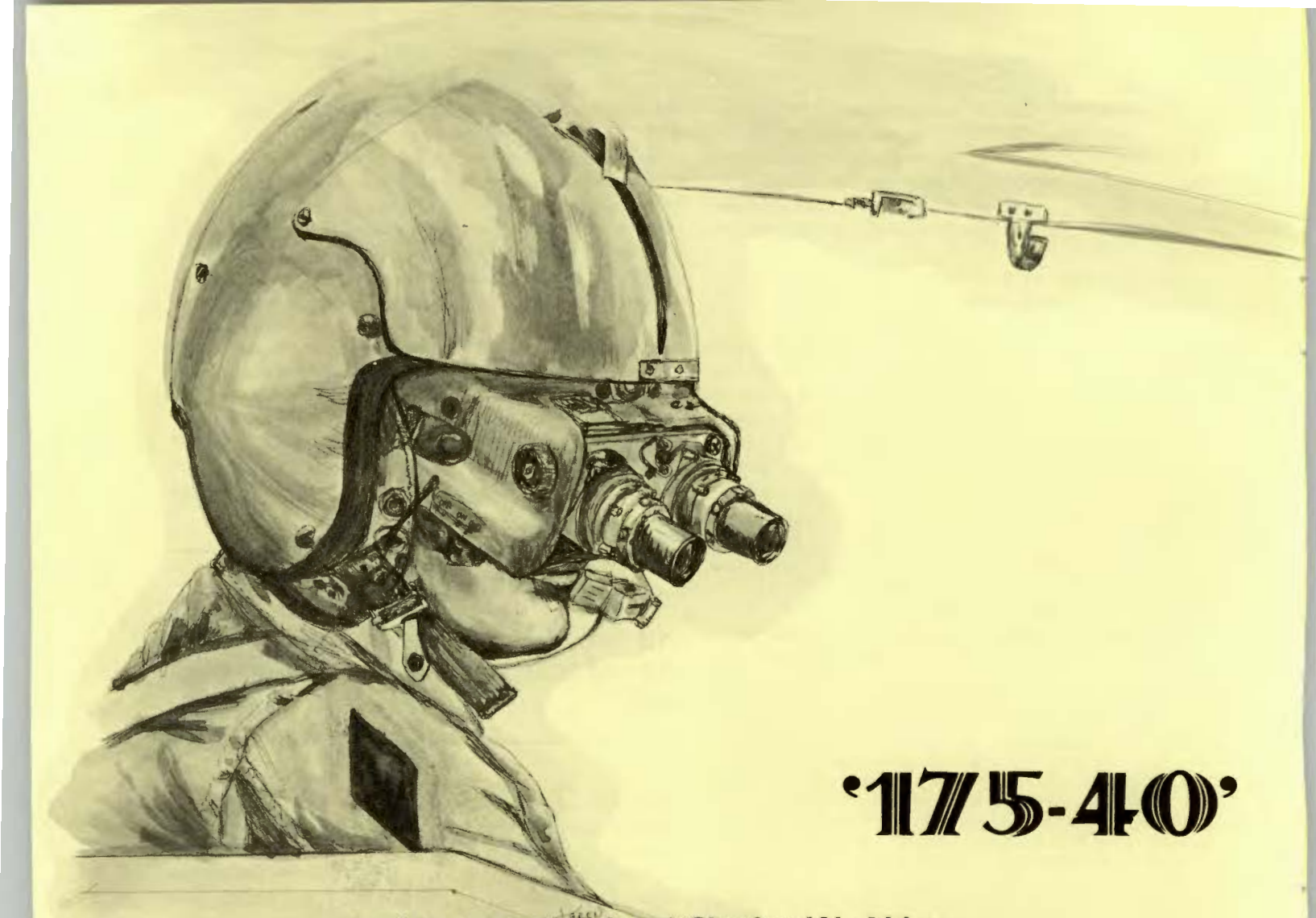
The master gunner is the unit commander's primary adviser in the area of tank gunnery. The measure of his worth is the amount of *confidence* his commander and the unit's tank commanders ascribe to him. He should be granted the latitude to establish his professional credibility. Only after the Master Gunner proves his ability will he be regarded as an asset to his unit and commander. An effective Master Gunner must be aggressive. He must always be on the lookout for ways to improve and refine his unit's gunnery training and more importantly he must seek out ways to draw attention to the integration of gunnery related subjects into each phase of the yearly training program. The Master Gunner must make himself the conduit through which the unit's gunnery expertise flows. He must study the topography and facilities layout of his LTA in order to extract the last drop of its training value! He must innovatively attack all problems of the unit's gunnery program as if solutions were just around the corner.

Some suggested areas where the Master Gunner must be a prime mover are:

- Turret maintenance
- Short and long-range training plans
- The conduct of boresight and zero exercises
- Sustainment gunnery
- SQT
- Gunnery skill(s) test
- Pre-*ARTEP* training

J.B.P.

"The ability to fight outnumbered and win will never be realized until the restraints imposed by atmospheric conditions are overcome"



'175-40'

by Lieutenant Colonel Charles W. Abbey
and Captain Raymond N. Krause

For the first time, selected combat arms and combat support aviators attending the U.S. Army Aviation School will receive training which will prepare them for immediate service as aeroscouts in armored cavalry and attack helicopter units.

This innovation in initial-entry rotary-wing flight training is commonly known in the Aviation School as "175-40—Dual Track" because the program contains 175 hours of actual flight training in the helicopter and 40 hours in the synthetic flight training system (SFTS). The new course consists of 2 weeks of preflight academic training and 32 weeks of flight training.

The time-tested *preflight phase* has evolved slowly through the years. Here, the students learn the essential fundamentals of flight in classroom academics before their first flight. In the *primary flight phase* the student receives 50 hours in the *TH-55 Osage* learning basic flying skills and techniques. After primary, in the *contact flight phase* the student becomes qualified in the *UH-1H*. Each student learns to fly the *UH-1* safely during daylight in a nontactical environment. Next, each student learns to fly under instrument flying conditions. Here, the trainee receives 35 hours in the SFTS and 20 hours of simulated instrument flight in the *UH-1H*. Wrapping up the work in the *UH-1*, all students receive 1 month of night-flying training.

The student undergoes 3 weeks of *Nighthawk* (no light-unaided eye) and 1 week of night vision goggle (no light-aided eye) training. Both stages include standard and emergency maneuvers. During the final 8 weeks of flight school the dual-track combat skills phase is introduced. Taught mainly by specially selected and trained military personnel, the student acquires the knowledge necessary to employ the helicopter in a tactical environment. The *UH-1H* combat-skills track teaches the aviation and related skills necessary for the employment of the utility helicopter in a combat environment. Formerly, all rotary wing student aviators received this type of training.

Aeroscout Track

Now, however, the *OH-58* aeroscout track will teach certain students the aviation-related skills necessary for the employment of the aeroscout helicopter in a combat environment as an integral member of the combined arms team. Who will be selected for this training, and what aircraft will be used? What subjects will be taught and what flight maneuvers will be demonstrated?

Approximately 25 percent (10 students) of each flight class will be selected and will receive this special

training. Those in combat arms or designated by MILPERCEN as going to cavalry or attack helicopter assignments are given priority. Students will be interviewed and tested early in the primary flight phase to ascertain their interest in and aptitude for service as an aeroscout. Instructor pilots in primary and contact flight phases will evaluate each individual; appraising their aptitude, control touch, reaction time, motivation, composure, and other basic qualities.

Initially, the *OH-58A* model helicopter will be the training helicopter. During calendar year 1978, the improved *OH-58C* helicopters will be delivered to Ft. Rucker and training will be conducted in both models.

Table 1 shows the subjects which will receive greater emphasis or will be unique to the aeroscout.

Table 1

Observation Techniques
Target Recognition & Identification
Air Cavalry Organization
Air Cavalry Operations
Aerial Adjustment of Artillery
Attack Helicopter Organization
Attack Helicopter Operations
Attack Helicopter Weapon Systems
Target Handoff
Threat Organization

The student will receive approximately 10 hours initial transition into the *OH-58A*. Tactical training in the role of the aeroscout will include the maneuvers and techniques shown in table 2.

Table 2.

Reconnaissance Missions
Security Missions
Call for and Adjustment of Artillery Fire
Selection of Attack Helicopter Firing Positions
Target Handoff Procedures
Aerial Observation
Selection of LZ, PZ, Assembly Areas
In-Flight Mission Change
Target Detection/Range Determination
Terrain Flight Operations
Terrain Flight Navigation
Cockpit Teamwork
Evading Enemy Fire
Use of *M-24* Mask
Tactical Instrument Flight

Most skills will be practiced during day and night in low level, contour, and nap-of-the-earth flight modes. Flight periods will be couched in a tactical scenario to help the student become familiar with tactical terms and situations. Further, realism will be injected by the use of live 105-mm. artillery fire during the artillery adjustment training. Actual coordination with *Cobra* helicopters will acquaint the student with attack helicopter operations during simulated and live fire exercises.

The End Product

All flying hours in the aeroscout track are devoted to teaching the student to fly observation helicopters and the combat skills of the aeroscout. What does the Aviation School expect to graduate at the end of 32 weeks? Obviously, not the highly-trained and experienced "battle captain" the cavalry and attack helicopter units must have in the future to operate effectively, but rather, we envision a new officer or warrant officer aviator who possesses the basic abilities and fundamental knowledge of an aeroscout. When these aviators reach the field, each active or reserve component unit need only teach procedures and special techniques unique to their unit, thereby completing the process of training an aeroscout to meet the needs of the individual organization.

The Future

The aeroscout program and instruction will be continually reviewed and revised as required. Ideas are sought for additions, deletions, and other changes to the course once graduates begin to reach the field in March 1978. New techniques and procedures which are perfected in the field can be incorporated into formal instruction if unit commanders inform the school. Let the "Home of Army Aviation" combine with the "experience" of the unit to keep Army aviation in step with the needs of today's changing Army.

LTC CHARLES W. ABBEY was commissioned in Armor from Penn State in 1959. He has served as an aeroscout in air cavalry units in CONUS and has commanded air cavalry troops in Germany and Vietnam. LTC Abbey has served as chief of the USAARMS's Aeroscout Observer Course, Officer/Warrant Officer Air Cavalry Course, and the Air Cavalry/Attack Helicopter Commanders Training Course. He is currently commander of Hanchey Division, Department of Flight Training, U.S. Army Aviation Center, Ft. Rucker, Ala.

CPT RAYMOND N. KRAUSE was commissioned in Armor as a Distinguished Military Graduate from Sam Houston State University in 1970. Upon graduation from flight school, Captain Krause served in various troop and platoon positions in the 4-9th Cav during testing and formation of the ACCB. An AOAC graduate, he has been an instructor pilot and operations officer, and is now a flight commander in the Attack/Aeroscout Branch, Ft. Rucker, Ala.

being taught to tankers, this technique has the potential for cutting losses significantly. As the tank, on being warned of a missile being fired in its direction, abruptly changes its maneuver pattern, the tank commander salvos the smoke canisters to screen the movement. Considering that in any future conflict even the slightest advantage will help, this is another good ploy to add to the tanker's repertoire.

A third reason is to deceive the Threat force as to an armored fighting vehicle's true location. In moving from primary to alternate firing positions, the timing of the move can be concealed by laying and leaving a smoke screen in front of the evacuated position. This would be helpful particularly if the evacuation from the position is performed under fire since the enemy gunner will be hindered from directing aimed fire at the moving vehicle or may assume he has hit his target and cease trying to engage it.

A fourth reason is the ability to screen the removal of the crew from a hit vehicle. It is not possible to direct *aimed* small arms fire, for instance, at escaping crew members shrouded in smoke. When a crew member is wounded, such concealment is all the more important since it may allow sufficient time for evacuation.

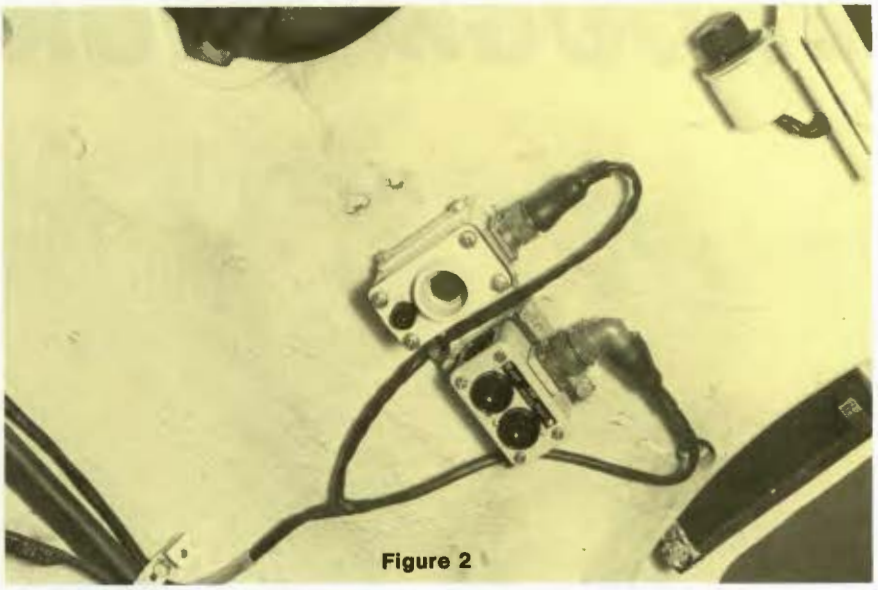


Figure 2

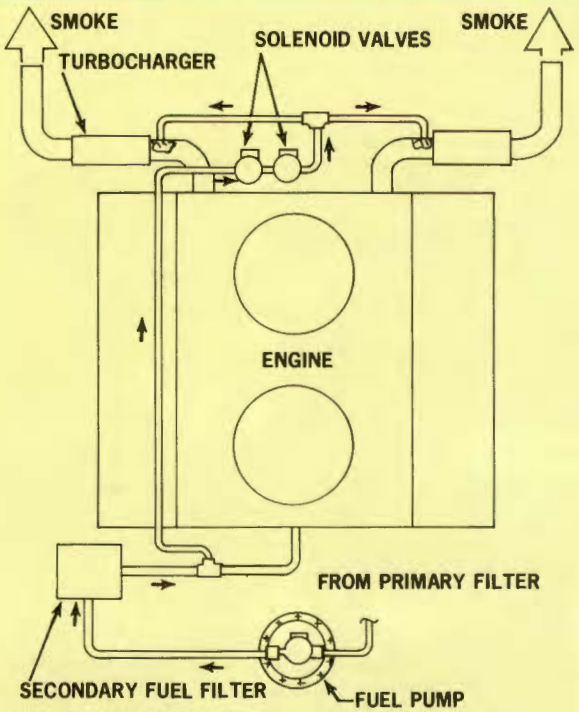
Thus, since we assume today that the Threat force can hit what it can see, these defensive attributes of smoke are more important than in the past. They also provide us with one more weapon to be used in our arsenal when we must be prepared to fight overwhelming odds.

From an offensive point of view, smoke can be effectively used as well. For instance, smoke can be used to deceive the enemy as to the size of the attacking force. General Erwin Rommel used trucks with aircraft engines mounted on the truck beds to create dust clouds which simulated tank movement. Such deceptive means were designed to mislead the more numerous British forces as to the true strength of Rommel's tank force. A similar analogy is possible here, but using large amounts of smoke generated by the tanks themselves.

The use of smoke canisters alone, however, would be inadequate to achieve results like Rommel. An armored vehicle carries only a limited number of canisters and cannot reload under armor protection while under fire, and the tank commander will certainly want to conserve his smoke launcher ammunition for that crucial defensive situation. What is required is a relatively inexpensive, simple and high-volume dispensing system which complements the canister launchers that are generally effective only for quick reaction defensive purposes. A device known as the Tank Engine Exhaust Smoke System (TEESS) is now being experimented with and holds much promise. (See figure 3.)

Essentially, an armored fighting vehicle would make smoke much as our old fleet destroyers made smoke. A fuel mixture would be ignited which emits clouds of dense smoke through the exhaust system, thus providing the required concealment.

Such a system would even more effectively permit bold and aggressive tactics like those described in this example taken from S.L.A. Marshall's book, "Sinai Campaign."



Schematic of TEESS smoke-maker systems.

Figure 3

This was the plan: the half-tracks followed by the tanks would ride in column up the road toward the cliff until reaching the point where the "bullet swarm" really thickened. Then all vehicles would deploy in line astride the road with the armor on the right. The tanks would concentrate their fire against the enemy pits of the opposite flank; that way, because of perspective, they had a better chance of hitting pay targets.

Then after firing for about ten minutes the tanks would dash to within 350 yards of the minefields covering the enemy front. There, they would lay a smoke screen, dropping smoke canisters just in front of their own hulls. That done, they would drop back just a few yards to get maneuver room, then upward through the notch, in the column, firing to both flanks as they came up and over the rim.

When the *XM's* (light French-built tanks) topped the rise and charged past the strongest enemy perimeter at the cliff front and leftward of the road, all guns going, though no tank slowed to give the redoubt searching fire, the whole enemy position from front to rear—that is, this frontal resistance center and all the fortified parcels of ground behind it collapsed.

The converse of this bold maneuver is the skillful withdrawal under pressure from large enemy forces, a situation that U.S. forces fighting in Europe would undoubtedly encounter. We must add, therefore, the employment of smoke wherever possible, to the array of tools in the hands of our Armor units in Western Germany.

So far it looks as if we should more strongly endorse the idea of more utilization of smoke. We have examined the advantages accruing to the individual tanks, the need for two systems and just a couple of large scale uses. We should also look at some of the disadvantages. Smoke used in small quantities is difficult to control once it is employed. If a "lapse" condition exists, that is during the day when wind speeds are less than 10 knots and cloud cover is less than about 30 percent, smoke has a tendency to rise and disperse quickly. The obvious answer is to employ more smoke, and the TEESS system quickly appears as a possible solution.

More important, however, is the presence of wind, its direction and speed. If you face into a strong wind and launch your smoke canisters close to the vehicle you might find yourself highlighted or framed by the smoke blowing back into your face. Rather than obscure you from the enemy, you might find your ability to function impaired.

Another disadvantage is the limited amount of smoke that can be generated by salvoing all the canisters in situations as described above. In a situation where continuous smoke is required, the "panic" capability has to be supplemented by a system which produces large amounts as required.

In spite of these disadvantages, the potential of smoke, using both vehicular-mounted grenade launchers and a high-volume exhaust system, has to be exploited. But the question then arises as to the doctrine to realize this potential.

FM 17-12-5, *Tank Gunnery,* has a requirement for the employment of smoke in its qualification tables. The purpose of the exercise is to practice screening the movement of the tank or the *M-551.* Unfortunately, it is difficult to find any literature on how to either discharge the smoke canister or how to employ the smoke.

In a larger context, the employment of smoke has been a matter of United States military doctrine over the years. FM 3-50 is devoted to the employment of chemical smoke generator units as well as to general doctrine. The Chemical Smoke Generator unit TO&E's are still extant although the 4.2-inch mortar battalions manned by Chemical Crops troops have long been disbanded. The most widely publicized use of large concentrations of smoke by U.S. troops was on river crossings, both deliberate and hasty, during World War II. Today, white phosphorus smoke ammunition is part of our artillery ammunition inventory, and a variety of smoke bombs and canisters exist.

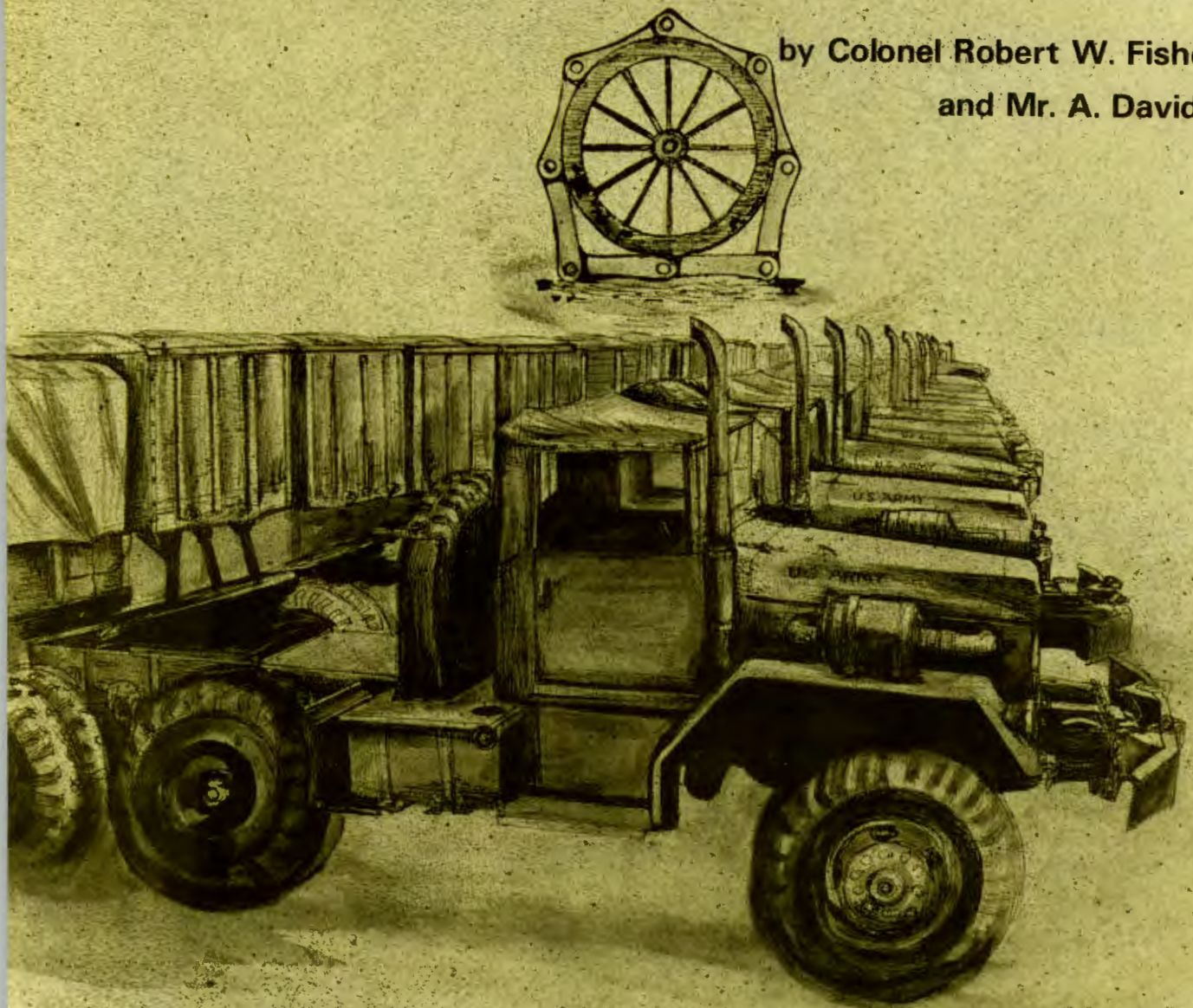
DARCOM and TRADOC are very much attuned to the potential of smoke. They have not tread lightly in developing doctrine and equipment as well as procuring it. But it hardly helps if the armored soldier does not take advantage of this great support effort, so let's start "blowing more smoke," and add a potent tool to our mobile arsenal.

LTC (P) RAYMOND E. BELL, JR., U.S. Army Reserve, is a graduate of the nonresident course of the Army War College. He has recently been an instructor at the C&GSC (USAR School). An instructor with the 1163d USAR School, LTC Bell is currently a civilian consultant to the Historical Evaluation Research Organization.

CPT TERRY J. TREAT was commissioned in Armor upon graduation from the USMA in 1970. An AOAC graduate, Captain Treat has served as platoon leader, XO, S-3 Air, troop commander, and assistant Bn. adjutant. He is currently attending advanced degree studies in Germany prior to becoming a German language instructor at the USMA.

Forward Support

by Colonel Robert W. Fisher
and Mr. A. David Mills



The U.S. Army's primary objective is to "win the land battle" and is so documented in the June 1976 Operations Field Manual 100-5. As is very aptly stated in the same publication, "Today, the U.S. Army must, above all else prepare to win the first battle of the next war." These principles, coupled with the single criterion that "the only measure of combat service support effectiveness is the percentage of battlefield-operable weapon systems," have caused the logistics community to carefully reevaluate its capability to support today's Army in the field. The purpose of this article, therefore, is to review one aspect of the "fix the systems" category of the "arm, fuel, fix, and man the systems" combat service support doctrine. Again borrowing from FM 100-5, resources must be "austerely supplied, properly applied and efficiently used to the degree that combat equipment can be armed, fueled, and, when necessary, fixed close to the battlefield" with "support functions critical to the battle being conducted as far forward as possible." This doctrine recognizes that our Army has been historically unprepared for its first battle, and that our nation has been accustomed to victory as a result of applying its material and population resources after the onset of hostilities.

What must be done today then to prepare best for tomorrow's possible wartime requirements which pertain to fixing equipment in forward areas? One of many areas that have been examined has been that of determining what repair

parts of Class IX are required and how do we get them forward for use. Specifically, this article will address:

- Current regulations and doctrine, including Tables of Organization and Equipment (TOE) authority, which affect mobility standards and performance within the maintenance battalion of the armor, infantry, and mechanized infantry (AIM) divisions.
- The semitrailer equipment assigned to this mission.
- The scope of authorized stockage list (ASL) inventories that must be mobilized.
- How we now align our ASL mobility capabilities and requirements in the field.
- Those efforts that are now underway to address this problem more effectively in the future.

Current Regulations and Doctrine

Existing Army regulations, such as AR 710-2, state that a direct support unit (DSU) should be able to move 90 percent of its ASL inventory in one single displacement under normal operating conditions and using organically assigned transportation. However, such regulations also state that only 50 percent mobility is an acceptable range of performance with intensive management required only when such an acceptable range is not achieved. Called an "ASL mobility index," this criteria does not vary by size or type of DSU, nor does it specify the time frame within which such a mobile operation should be executed.

Today's ASL mobility doctrine is readily illustrated by the TOE under which our AIM divisions operate to meet the guidelines provided by the regulatory mobility index. Excluding modified tables of organization and equipment (MTOE) that tailor equipment to the needs of each division, the headquarters & light maintenance and forward support companies of the AIM divisions have organically assigned transportation within a baseline authorization of equipment as follows:

Armored Divisions (TOE 17H)

Company (TOE)	Repair Parts Van	S&P Trailer	Total Carrier Transport*	Prime Movers	Forklifts Cranes Wreckers
HQ & Lt Maint (TOE 29-36) (TOE 29-26)	11	9	20	14	2
Fwd Spt (3) (TOE 29-37) (TOE 29-27)	9	6	15	12	9
Total	20	15	35	26	11

*Excludes heavy equipment transport (HET), 33 2½-ton shop vans, one electronic shop semitrailer and one 2½-ton truck, tractor.

Infantry Divisions (TOE 7H)

Company (TOE)	Repair Parts Van	S&P Trailer	Total Carrier Transport*	Prime Movers	Forklifts Cranes Wreckers
HQ & Lt Maint (TOE 29-16)	5	9	14	12	1
Fwd Spt (3) (TOE 29-17)	9	6	15	12	6
Total	14	15	29	24	7

*Excludes HET and 32 2½-ton shop vans, one electronic shop semitrailer and one 2½-ton truck, tractor.

Mechanized Infantry Divisions (TOE 37H)

Company (TOE)	Repair Parts Van	S&P Trailer	Total Carrier Transport*	Prime Movers	Forklifts Cranes Wreckers
HQ & Lt Maint (TOE 29-26)	9	9	18	14	1
Fwd Spt (3) (TOE 29-27)	9	6	15	12	9
Total	18	15	33	26	10

*Excludes 30 2½-ton shop vans and one electronic shop semitrailer.

Today's Equipment

The "backbone" of the U.S. Army's mobility capability in the AIM divisions has been the *M-750* repair parts van which was introduced for use at the direct support/general support level in 1967. (See figure 1.) It is an expandable sidewall van internally configured with:

- Four banks of 28 rigid shelves each measuring 11 inches high, 10 inches deep, and 17 inches long.
- A desk with ADP card drawers.
- Heaters, ventiliation, and lighting.

Although it has the advantages of being tactically configured and well-lighted and ventilated, it has many major disadvantages for most ASL mobility needs. Its rigid design and small shelf height and depth are compatible only with the movement of small size stocks, such as quick service supply (QSS) and communications and electronics (CE) items. Its outside shelf banks are accessible only in an expanded configuration. Its inner shelf banks do not have restraining devices to cover the bin opening in transit. Its predominately military peculiar design and heating plant makes it an extremely expensive repair parts carrier. Also, its short length requires a greater number of prime movers than, for example, an *M-129A2C* 28-foot van.

A review of doctrine and equipment of some of our allies

reveals that, although carrying a larger number of lines, some provide for 100 percent mobility at brigade level and have unique special equipment for accomplishing this requirement. (See "ASL Mobility is Logistics' Achilles' Heel," *Army Logistician,* September-October 1976.) The Federal Republic of Germany Bundeswehr uses a palletized steel box system on dropside trucks and trailers for their maintenance battalion repair parts. It consists of about 20 steel doored compartments in a four-way pallet steel frame with compartments adjusted for size and number of locations by wooden shelves and inserts. The number of size and compartments is therefore determined through adjustments

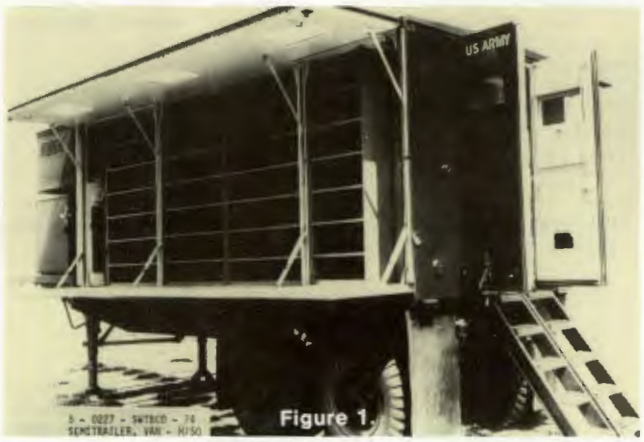
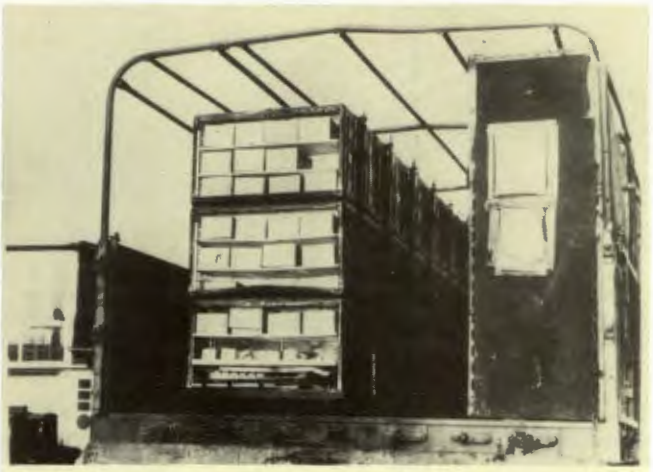


Figure 1.

to meet the characteristics of varying ASL configurations. It is designed primarily for use in a downloaded mode in an area protected from the weather and is not necessarily compatible with our "on-wheels" forward support requirements. (See figure 2.)


Figure 2.

The equipment used by the British Army is similar to that used by the Bundeswehr. It too is designed for rapid uploading and movement by truck for operation in a downloaded and protected mode. It consists of fiberglass boxes with handles which can be stacked and locked together by plastic plugs on a wheeled dolly pallet for loading and movement on the cargo carrier. Again, such equipment does not represent a desirable system for "on wheels" operations within our Division Support Command (DISCOM) and its building block approach requires the steady handling of both the container and the repair parts in it. (See figure 3. Photo and comments provided by G4, V Corps, and 3d Support Command, V Corps.)



Rear view of 10 Ton cargo truck shows open Thomas Bins on the left and locally fabricated shelves for larger items on the right. Two columns of three (6) Thomas bins are loaded on to a steel framed dolly which has four grooved wheels. The wheels of the dolly fit on two steel tracks fixed to the truck bed. The banks of six Thomas Bins may be moved freely back and forth along the steel tracks, thus creating cross aisles which provide access to the bin openings.

The Scope of Today's ASL's

What our divisional maintenance battalions are required to move forward in the form of ASL inventories consists of CE repair parts, QSS, direct exchange (DX) items, and other repair parts and spare parts stocked under the provisions of AR 710-2. A Training and Doctrine Command (TRADOC) ASL mobility study recently completed by the U.S. Army Logistics Center, has generally assessed the mobility requirements for the following ASL inventories for the average AIM division:

Average AIM Division Mobility Requirements

Type Company	Average Number of Lines/Locations*	Approx. Total Cubic Feet of Required Mobile Storage Capacity
HQ & Lt Maint	6,370	22,850
Fwd Spt	1,800	4,977

*Excludes bulk ASL items to be transported via *M-127* S&P trailers, i.e., approximately 130 line items for the HQ and Lt Maint Co, and 50 line items for the Fwd Spt Co.

In view of the baseline TOE's that exist today, it is easy to see that an unmodified TOE would require the tactical commander to be prepared to move more than 22,000 cubic feet of ASL inventories in his headquarters and light maintenance company and almost 5,000 cubic feet of these inventories in each of his forward support companies, using organically assigned transportation capability totals of only 4,131 cubic feet and 1,377 cubic feet respectively. This requirement to fit a large volume of parts into a small volume of space does perhaps come close to meeting the acceptable range of performance for the current AR 710-2 mobility index. However, it is a far cry from meeting the forward support operational requirements of the modern battlefield.

How Do We Align Capabilities with Requirements Today?

Up to this point, we have largely addressed a problem that is well-known and many readers will be more than ready to agree that there is an urgent requirement to enhance this

area of combat effectiveness. Obviously this problem has not gone entirely unnoticed, nor has it gone without aggressive and effective action on the part of our tactical commanders.

One method by which we are seeking to achieve the mobility required for our forward direct support operations is found in the concept of stocking fewer items forward and relying on the panacea of "premium" transportation to meet our objectives, a very popular idea for the money minded. In the field today you will find a number of examples where for both monetary and mobility reasons this concept is being applied. All AIM divisions are constantly seeking to minimize ASL inventories, consistant with mission requirements. They are using such approaches as extracting Non-Operationally Ready Supply or "NORS-causer" data from the Division Logistic System (DLOGS) Demand Files, reviewing FM 42 series Wartime Repair Parts Consumption Planning Guides data and/or existing equipment technical manuals, and reviewing past demand data to develop a tailored list of essential stockage items. These tailoring actions are frequently accomplished by an appointed Technical Review Board and the listings developed are used to streamline ASL/prescribed load list (PLL) inventories in the following manner:

- Increasing the stockage amounts of those items currently indicated on the unit's ASL/PLL to the quantity listed on the combat stockage list. (AR 710-2, Ch. 4, para. 3-28)
- Increasing the number of lines on the unit's ASL/PLL to include those listed on the Combat Stockage List. A message change to AR 710-2 authorizes the stockage of nondemand supported items in an amount not to exceed 5 percent of the demand supported items.
- Deleting noncombat essential items from the ASL/PLL.

As another approach to aligning capabilities and requirements our TOE's can also be modified by the major commands (MACOM)'s or letters of authorization can be executed to authorize a greater carrying capacity. Many of these types of actions have been accomplished, although the degree of success that might be achieved through this means is limited at best. Our tactical commanders and the MACOM's have used these methods to obtain military van (MILVAN) carriers and to fabricate storage bins for additional carrying capacity. This is perhaps the biggest area of improvement that can be seen in the field today. (See figure 4.) For example, the 8th Infantry Division, V Corps, has obtained, through a letter of authorization, the use of 26 MILVAN's to augment the 15 *M-750* repair parts vans that it is currently authorized (See "A LOG Digest," *Army Logistician,* May-June 1977). The 124th Maintenance Battalion has successfully obtained 26 MILVAN's on a similar basis and for the same purpose which it recently documented in an Army Training and Evaluation Program/Modified Table of Organization and Equipment (ARTEP/MTOE) Evaluation after-action report. The 27th Maintenance Battalion, 1st Cavalry Division has obtained 56 MILVAN's (See "Operation First Team Logistics," *Team Logistican,* January-February 1977), and is perhaps one of the best known examples of how the mobility of the division support commands is being significantly improved in this manner. Finally, actions are also in process to distribute approximately 183 additional MILVAN's with chassis to USAREUR/7th Army's V and VII Corps to further enhance their forward support capabilities.


Figure 4.

What We Are Doing for the Future

A number of doctrinal and "develop and authorize" actions are underway in the Army to enhance our capabilities in the future as a result of the TRADOC ASL Mobility study report. Basically this study recommends that:

- The AR 710-2 mobility index be revised.
- TOE's be changed.
- MILVAN's with chassis and commercial bins be fielded as an interim fill for those TOE requirements.
- An improved repair parts carrier/ASL storage system to be developed and fielded to fill these TOE changes.

Although firm Army decisions on the disposition of these recommendations are yet to be made, we are heading down the road toward an early implementation of such actions as follow:

ASL Mobility Index

The U.S. Army Logistics Center has recommended that the cover-to-cover rewrite of AR 710-2, which was scheduled for publication this past fall, include the following ASL mobility index.

Objectives:	**Forward DSU—100 percent mobile within 4 hours (one move).**
	HQ and Lt Maint Co and other rear elements—50 percent mobile within 4 hours (shuttle moves).
Management Level:	**Forward DSU—80 percent mobile within 4 hours (one move).**
	HQ and Lt Maint Co and other rear elements—40 percent mobile within 4 hours (shuttle moves).

Changes to TOE

The U.S. Army Ordnance and Chemical Center and School has prepared proposed TOE changes to increase the repair parts carrying capacity of the maintenance battalions of the AIM Divisions to the total cube required. The current proposal is that MILVAN's with chassis, or a cubic foot equivalent number of *M-192A2C* vans, and appropriate commercial adjustable bins be authorized along with additional prime movers and stake and platform (S&P) trailers with operating/maintenance personnel as follows:

Type Vehicle	HQ & Lt Maint	Fwd Spt	Total per Div
MILVAN with chassis	26	5	41
S&P Trailers	7	3	16
Tractors	15	9	42

Carrier Development

Short-term (1 year).

The troop test of 20-foot MILVAN's with chassis outfitted with repair parts storage kits consisting of adjustable commercial bins, lights, ventilation, and steps began in November 1977. If the test provides for satisfactory acceptance of an internal MILVAN storage kit, procurement and issue of the kits will begin in early 1978.

Midterm (2 to 4 years).

A Concept Evaluation Program (CEP) test effort for the 28-foot *M-129A2C* semitrailer outfitted in a manner similar to the MILVAN's also began in November 1977. Since the *M-129A2C* is a tactical vehicle, is more rugged, is lower masted, is currently being used in aviation, amphibious, and general support level repair parts operations, and requires approximately 30 percent fewer prime movers than the 20-foot containers, it is being considered as a possible early replacement for the MILVAN's with chassis. Successful completion of the CEP evaluation for this vehicle could lead to the fielding of a mobile ASL *M-129A2C* configuration in mid-1979.

Long-term (5 to 8 years).

The U.S. Army Quartermaster School is currently coordinating a Letter of Agreement for the development of a long-term replacement vehicle for the *M-750* repair parts van and those other ASL mobility augmentations that may be fielded. It is conceptually possible that this long-term improvement could consist of a design similar to the *M-129A2C* being considered for a midterm improvement. However, it is also possible that for an ultimate replacement for the *M-750,* it may be more desirable to make the necessary investment in a mobile repair parts van that might provide for some improvements that will not be found in the *M-129A2C,* such as ease of loading (drop sides), greater off-road maneuverability, and compatibility with host nation prime movers (fifth-wheel and lunette-hitch configurations).

ASL Mobility

Just as our current doctrine for the operations of the fighting force will not permit future planning on the basis of our ability to "take a licking and keep on ticking," the doctrine by which our support of these combat forces is structured must also fall in line. Contained in this article are some of the ideas and proposals which are currently being considered to significantly improve this area of effective combat service support. These ideas have been generated and refined through the discourse of a number of divisional, corps, and major commanders as well as general officers throughout the logistics community. What is more important, perhaps, is the fact that much of the requirement that has gone unappreciated in the past is being well-documented, well-illustrated, and well-articulated by the fine performance of a number of the division support commands throughout the Army. It is hoped that the recommendations and actions that are currently in process for resolution will make those efforts pay off for the Army in the field.

COL ROBERT W. FISHER was commissioned in Cavalry in 1949 after graduation from the University of Wisconsin. He has served as Cmdr, Div Spt Cmd, 3d Armored Div; Cmdr. 23d Spt Grp. Korea, and as Chief of Staff and Dep Cmdr. for 19th Spt Bde, Korea. Colonel Fisher is a graduate of the C&GSC and the Industrial College of the Armed Forces. He served as the Dir of Matl, U.S. Army Log Ctr, Fort Lee, Va., from Aug 1976 to Sep 1977 and is currently assigned as the Chief of Staff, U.S. Army Log Ctr.

A. DAVID MILLS entered Civil Service at the U.S. Army Wpns Cmd in 1961. He was commissioned in Field Artillery in 1965 with the Illinois ARNG. After 3 years as the Dep Chief, U.S. Army Sup and Svc Actvy., Thailand, Mr. Milles was assigned as the Ch Repair Parts Div., U.S. Army Log Ctr, Fort Lee, Va., in Sep 1975. A graduate of the University of Oklahoma, he is also now enrolled in the Florida Institute of Technology, Master of Science cooperative degree program at the U.S. Army Logistics Management Center.

Pages from the Past

THE FIGHTING MAN

Battle is the final goal of armies and man is the chief instrument of battle; nothing can be ordered intelligently in an army—constitution, organization, discipline, tactics—all mutually dependent like the fingers of a hand—without an exact knowldge of the chief instrument, of man, and of his moral condition in this definitive moment of battle.

It often happens that those who discuss the art of war, taking the weapon as their point of departure, take it for granted that the man called on to wield this weapon will always make of it the use foreseen and ordered by their rules and precepts. But the fighting man considered as a reasoning being, given up his mobile and variable nature to transform himself into a passive pawn and to play the part of an abstract unit in the combinations of the battle field, is the man of theory—not at all the man of reality. This latter is a being of flesh and bone, of body and spirit, and, strong as this spirit often is, it cannot so master the body that there will be no revolt of the flesh and disturbance of the mind in the face of destruction.

The Cavalry Journal
October 1914

IN SEARCH OF MEN

Whatever may be the public spirit, whatever may be the patriotism of the citizens, whatever may be the number of volunteers, battles will be won only by trained men. The day is passed when unpreparedness and defeat can be retrieved by subsequent preparedness and victory. If wars must come and must be met, our opponents must be met by trained men, but trained men we have not got in sufficient numbers or they are not available. How shall they be secured and preserved for use in time of need?

The Regular Army is about as large as the people seem to think it ought to be and with the ideas possessed by a democratic people there is not much probability of its being greatly increased. Viewed by the citizen class from the present standpoint it is largely an economic waste, inasmuch as its trained product turned out yearly is lost to the Government.

The Cavalry Journal
January 1915

COMBAT SERVICE SUPPORT

Behind the combat echelons of tanks follow the vital services of supply and maintenance. There is nothing more useless or annoying on the battlefield than a tank out of gasoline or broken down due to the failure of some small part. At St. Mihiel an entire American tank battalion was completely immobilized for nearly twenty-four hours because its supply train was jammed in a road block. Then, and now, supply and maintenance vehicles were of the heavy truck type which must confine their movements to roads. Fast cross-country cargo carriers, capable of negotiating the same type of terrain as the tanks, should be provided to insure adequate maintenance and supply service close behind the combat elements. A cross-country combat unit which must depend solely on roads for vital supply is far from a well balanced, efficient organization.

The Cavalry Journal
January 1930

WASTED RESOURCES

The Campaign of 1898 that called out a half-million of untrained men is an illustration of the unpreparedness of our government, and, while beholding the suffering and hardships endured by our untrained men, a well known politician who held a commission in a volunteer regiment exclaimed: "This is not patriotism, it is paresis." Judges are harsh with, and we use strong language in criticising an inexperienced man who attempts to operate some complicated and dangerous piece of machinery that through his carelessness and unintelligent actions may injure not only others but himself. The untrained soldier surely places himself in a similar situation.

The Government even has no right, moral or legal, to send inexperienced men to war; it is a crime against society and the murder of individuals; it is a wanton waste of the resources of the country.

The Cavalry Journal
January 1915

BAT

by Major James S. Cary

Today's Armor forces, which provide 36 percent of a corps' fire power, is manned by 2-3 percent of the Army. Recognition of that anomaly was one of the driving forces behind the Tank Force Management (TFM) program.

The mission of the Armor Center, assigned by the Chief of Staff in July 1977, is to produce trainees capable of performing at combat proficiency levels upon their initial unit assignment. As a result, the Armor Center is preparing to initiate the most extensive overhaul of entry-level Armor training since the introduction of One Station Unit Training (OSUT) in January 1976. The Basic Armor Training (BAT) program designed to support the TFM concepts is judged to be an optimum mixture of the best thinking of the Armor Community to meet the threat.

TFM BAT is a departure from several of the basic tenets of the OSUT concept. For example, the OSUT program witnessed the dispersion of basic and advanced subject matter throughout the entire length of the training cycle. In contrast, TFM BAT presents material in a grouped, functional manner. The trainee is immersed in one type of subject matter at a time, which is presented in more challenging ways to seize, focus, and retain his attention. The various approaches applied to each portion of training are prescribed by committees in the Armor School and the Training Center.

Today the 1st Training Brigade conducts OSUT for tankers on the *M-60A1* tank. Under OSUT the inductee comes straight from the Armed Forces Entrance and Examining Station (AFEES) to the Reception Station for in-processing and is subsequently assigned to a training company. There he begins his training in the Fundamentals of the Soldier. He progresses from such basics as first aid, drill and ceremonies, and weapon qualification to those skills required of an entry-level tanker. The OSUT charter for an entry-level tanker is three fold:

- Teach and license a trainee as a driver.
- Qualify the trainee as a loader.
- Familiarize the trainee with tank fire-control instruments.

He accomplishes the preponderence of these tasks in a daytime environment with little attention to nuclear, biological and chemical (NBC) aspects of training.

An examination of the advances made in tank optics best illustrates the inadequacy of today's training efforts. To survive on the modern battlefield at night a tanker must be able to perform in a total blackout environment, inside and outside the tank. Training must require performance of tasks in an NBC environment. Because today's entry-level tanker is little more than a generalist, TOE units are required to expend a disproportionate amount of time to train these graduates up to combat standards in their individual skills. This task is further complicated when adverse training conditions, common to many units, provide relatively little time for unit training. When a unit must devote scarce training time to individual rather than collective skills, combat readiness degradation is the result. Improved system-specific and position-specific individual training in BAT should allow units to spend time on collective training.

The New BAT Program

Table 1 shows changes in training for both the tactical driver and gunner/loader. Note that cross-training is retained for some skills. For example, the tactical driver receives familiarization as a gunner and loader. Similarly, the gunner/loader will receive the same training on driving skills as today's trainee.

BAT

*TACTICAL DRIVER	GUNNER/LOADER*
• Day/Night Driving	• Qualified Gunner
• Use Terrain	• Day/Night
• Negotiate Obstacles	• Moving/Stationary Targets
• Select Firing Positions	• Qualified Loader
• Troubleshooting Skills	• Licensed Driver
• Increased Maint. Capability	• Troubleshooting Skills
• Recovery Techniques	• Increased Maint. Capability
• Loader	
• Familiarized Gunner	

Table 1

Procedurally, the trainee will report from the AFEES to the Reception Station at Fort Knox. At the Reception Station he is administered two tests added to the normal processing; the English Comprehension Language Test (ECL) and the Selection Criterion Test. If a man fails the ECL Test he is sent to a special training company where he undergoes an intensive program to enhance his reading ability. A program is tailored for each individual based upon his own needs and capabilities. If he does not demonstrate proficiency within a specified period, he is discharged from the Army as untrainable. If within that period he achieves the minimum ECL standards he is sent to a BAT company and commences training.

The Selection Criterion Test provides the strongest indicator as to whether the future tanker will receive specific-position training as gunner/loader or driver. Other considerations are the needs of the Army; the individual's enlistment contract; i.e., area of choice or unit of choice, and his stated desires.

TFM BAT is broken down into three distinct phases. Phase I is soldiering skills training, Phase II is tank-common training, and Phase III is position-specific training.

Phase I is 3 weeks in duration and is devoted solely to the transformation of the civilian to a soldier. This phase approximates basic training and is designed to totally immerse the trainee in the military society and culture. The thrust is to instill in the trainee an unprecedented enthusiasm for the Army and the armor force and to train him in the basic soldiering skills necessary for the armor crewman. Graduation from this phase, as with the subsequent two phases, is dependent upon the trainee's ability to pass a Graduated Armor Training Evaluation (GATE) examination. This is a comprehensive examination on the subject matter contained in that phase, with primary emphasis on *hands-on* testing measurements.

In the tank-common-training phase, the concept is to provide the trainee

Driver

	Current	TFM
Miles/Hrs. Per Student on Stick	15 mi./2½ hrs.	75 mi./13 hrs.
Terrain Driving	Negligible	Substantive
Obstacle Driving	None	Significant • Natural • Manmade
Select Firing Positions	Talked At	Practiced
Recovery	None	Yes • Like Means • Self
Troubleshooting	None	Selected Items • Reduces Maint. Downtime

Table 2

with those skills common to all tankers. At the culmination of this phase in the 8th week, the TFM BAT trainee will be approximately at the same level of training as today's OSUT graduate.

During Phase III position-specific training the concept of total involvement by the trainee is most clearly demonstrated in that the gunner/loader and the driver receive training only in the discreet MOS (under CMF 19) for their particular tank system.

Driver Training

A bit deeper examination of the TFM BAT program content is in order by looking first at the driver's training. Recall that yesterday's trainee had only to move the tank from point A to point B without hurting himself or the equipment. Contrasted with tomorrow, significant differences are apparent in the number of miles and hours per student of actual "stick time" as well as obstacle driving, terrain driving, recovery, and troubleshooting (table 2). Today, each individual spends 2.5 hours in driving, whereas a TFM driver trainee will spend 13 hours. In support of learning the driving tasks, several extremely challenging courses have been developed at Fort Knox. Driving Course A consists of both natural and man-made obstacles. The objectives of this course are to challenge the trainee with negotiation of obstacles, to prepare a tank for fording and, what is probably paramount, to generate driver confidence in his equipment, his tank commander, and his driving skills. The first challenge the trainee encounters is a shallow watercrossing with the water level just below the sponson boxes which requires preparation of the vehicle for fording. In the next event the trainee must negotiate a vertical wall. He then drives over an implanted AVLB, descends a vertical wall, and proceeds through a simulated minefield. Next he encounters a Threat trench line, followed by a battlefield rubble area representative of a destroyed European village where the sizable task is to drive over disrupted concrete, brick, and cobblestones without damaging the suspension systems. The trainee next encounters a slalom-like course in a wooded area representative of unimproved trails encoun-

Gunner/Loader

	Current	TFM
Main Gun Rounds per Student	6	17
Subcaliber Engagements	0	60
Night Firing	No	Yes
Firing on Move	No	Yes-Tables V A & B, VIIC
Tables	• I, II, III Laser • IV & V -Modified -Day Only	• I, II, III Laser • IV Day/Night • V Day/Night • VI Day/Night • VIIC -Tank Combat Course -Day/Night

Table 3

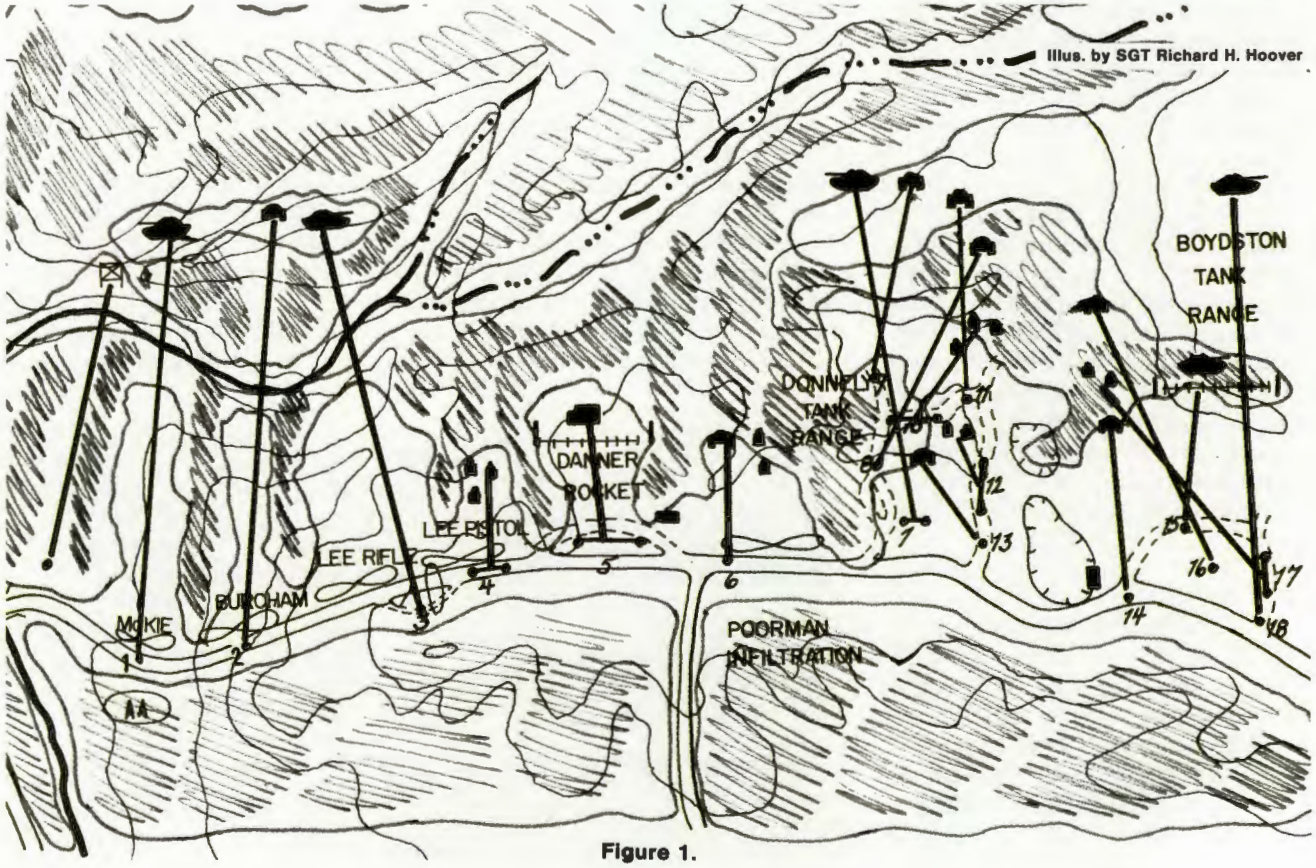


Figure 1.

tered in cross-country movement. His next major challenges are crossing an AVLB which spans a small creek, driving over a very narrow bridge, and finally, a 2-mile, high-speed run to the finishing point. There is no intent for the trainee to attempt to negotiate this entire course in just a few hours; on the contrary, he will spend 3 days on the course. He will train on it by negotiating a few obstacles the first day, mostly those which have a lesser degree of difficulty, and then incrementally encounter more difficult and a greater number of obstacles, with the same principle employed at night. The trainee makes the final qualification run at night, under total blackout conditions, with hatch closed and wearing a protective mask.

There are two integrated training stations on this driving course. The first station teaches the loading of a tank on a heavy equipment transporter (HET) and the second teaches loading the tank on a railroad car.

Driving Course B centers around selection of routes, firing positions, and how to conduct evasive action. It is here that the principles and objectives are taught which a driver applies to make decisions independent of the tank commander while driving in combat. Rationale for this training lies in the conviction that in combat the tank commander is going to be busy fighting the tank, thus the driver must select the best route between point A and point B. He must see and evaluate the terrain in front of him, appreciate the tactical situation, and identify and use terrain in order to provide cover and concealment. The precise requirement will be selection of firing positions. The driver must seek and occupy a hasty hull-down firing position if his tank is to survive while returning fire. Equally critical training is conducted in evasive action against antitank guided missiles. Three different evasive procedures outlined in FM 17-12 will be used on this training course under three tactical scenarios.

As the driver proceeds through the course he also learns techniques of concealment from overflying aircraft. An enemy aircraft formation sighted in the vicinity of his tank dictates that the driver immediately seek concealment in terrain features which he must closely and continually examine while driving. These are types of thought processes to be instilled in the tactical driver.

Gunner/Loader Training

Now let's look at the gunner/loader track of the TFM BAT. Today, trainees fire six main gun rounds in a daylight enviromnmnt (table 3). Research indicates that it takes the average trainee his first three rounds before he remembers to keep his eyes open. Under TFM BAT, each gunner/loader trainee fires 17 main gun rounds. Today's student fires no subcaliber engagements; under TFM BAT, at least 60 engagements are fired by the gunner/loader trainee. He will fire Tables I-VIIC both day and night.

Tank Tables I-III are conducted as we know them today. Tank Table IV becomes a subcaliber exercise fired on a 1/35-scaled range employing the *Brewster* device. Table IV has 20 firing points, with each lane having up to 7 popup scale targets and one moving target, all of which are electronically controlled. Ten existing firing lanes are representative of a European environment, and plans include 10 additional lanes representative of the Middle East environment.

Tank Table V is a moving tank range firing at stationary targets. The firing is at targets 1/20 scale, again using the Brewster device.

Table IV is a stationary tank firing at stationary or moving targets and it is here that service ammunition is first fired at ranges varying from 700 to 1,400 meters.

Tank Table VIIC is a graduation exercise for the gunner and a practical exercise for the trainee driver. It is a combat course designed to train all the tank crew members to function effectively and to use the main gun and coax during daylight, night, and periods of limited visibility. A subcaliber *Telfare* device to simulate main gun engagements is used on ½-scaled targets (figure 1). Tank Table VIIC, presently with 13 firing positions, runs along the Main Range Road. Firing points 1 to 5 are target engagements fired over the left sponson box. Firing points 6 thru 13, all in the vicinity of the Donnelly Complex and Boydston Range, require the tank to leave the Main Range Road and remain off it for the duration of the exercise. There is no course road or specific route for the tank to follow when moving down range; rather each event has a tactical scenario which guides the crew in terms of target acquisition. The absence of a course road fulfills the objective to test the driver on all previous instruction related to route and firing-position selection. Tank Table VIIC is the culmination of all previous training for both the gunner/loader and driver. It is visualized that a training company will spend 4 days on this Table. It is hoped that each man will fire the course at least twice during the day and night. The final qualification run is at night with the hatch closed under an NBC environment, and is the first event for the gunner on the final GATE III examination.

In summary, beginning in March 1978 graduates of TFM BAT will provide Armor units with a solid entry-level tanker—a man to meet the challenges of the eighties and nineties.

MAJ JAMES S. CARY was commissioned in the Air Force upon graduation from Concord College, Athens, W. Va., and The U.S. Air Force Officer Training School, Lackland AFB, Tex., in 1966. In 1968, he received an interservice transfer to the Army and was commissioned in Armor. Major Cary attended AOB, rotary wing flight training and AOAC. His assignments include various staff positions at the Aviation School and the Armor Center. He is currently assigned to the Army Training Study and is working toward a Ph.D. at the University of Louisville.

THE CAVALRY CHARGES ON

BY HANSON W. BALDWIN

Reverse the stirrups, turn out the mounts to pasture; the Cavalry has gone. The crepe is on the pommel, the mourning bow upon the sword hilt; the Cavalry has gone.

No more the glint of sunlight on the saber, the sweet music of the creak of saddle harness, the champ of bits. The sound of "Boots and saddles" sings no more across the great plains; the horse has retired from the field of battle. The "Yellowlegs," who won the west with carbine and with colt; the "Garry Owens" of the famous 7th, who died with Custer at the Little Big Horn, ride no longer; for the Cavalry has gone forever....

Even the gallant name....

Today for the first time in a century and a half of "Progress" there is no Cavalry in the United States Army. A signature last week—that of Harry S. Truman—was its requiem. But the president's endorsement of a bill reorganizing the Army, abolishing the Cavalry as an arm and substituting Armor for it represented merely legal recognition of historical fact.

The Man-Made Horse

Nostalgia for the past, melancholy pride in great achievements, and all the panoply of jingling harness and troopers at the charge could not hide the doom of the horse on the field of battle. Inanimate mechanisms made by men were his undoing; the machinegun, the tank and the plane were the robots which inherited his world.

Not since the 26th Cavalry, harried and bloody, tired but gallant, covered the rear guard of the Army from Damortis to Bataan had the "Yellowlegs" straddled their mounts. The 1st Cavalry Division, a fighting outfit, was in the van of combat from Australia to Japan, but it fought dismounted, and improvised horsed commands and mule pack trains toiled in small units over the bitter mountains of Italy. In World War II, the horse, in the United States Army, had but a small role.

And so the cavalry, like all things mortal, has died.

But its soul goes marching on.

For the soul of the Cavalry is elan, aggressiveness, the will-to-fight, dash, the debonair, reckless but ordered discipline that took the Six Hundred into the valley of death at Balaklava, that rode with Stuart and with Sheridan, with Custer and with Lee. The spirit of the Cavalry is the spirit basic to any Army, a spirit not exclusive to this arm alone, but one of which it was peculiarly possessed.

A Sense of Tradition

For the Cavalry has a sense of tradition, an awareness of its responsibility to history, to the men who have gone, to standards of the past, to those who died that the way of life we want, the things for which we fight, might live.

It has been popular in these times of fatalism and doubt to impugn tradition, to cast aside as worthless the bright heritage of valor and hope the past has given us. No more fatal mistake to army or nation is possible, for tradition, sound tradition, both civil and martial, is the inspiration for the past which must light the future.

The history of the Cavalry, gone in name but never in spirit, provides some of the finest of our Army traditions. The lilt of Von Borcke's songs, he who rode with "Jeb" Stuart, long has been stilled; Pelham's guns thunder no more; "Light Horse Harry" Lee, and Marion, "The Swamp Fox," are long dead; the dragoon with brass helmets and horsehair plumes who fought with Wayne at Fallen Timbers, live only in old prints.

Forgotten, Far-Off Things

Resaca de la Palma and the wild charge with sabers are but an incident in the history books now, and the Indian Wars, when the "Yellowlegs" fought from Red River and the Rio Grande to Montana and the Rockies, are but dates and figures. The Cheyenne, the Sioux, and the Apache are mere ghosts from a dim, forgotten past.

The men are dead, the graves grass-covered, the horses gone, even the monuments weather stained and strange, a bronze or marble charger oddly out of place in this mechanized age.

But the tattered battle streamers and the silver battle rings bear the great name of the past into the future: Bull Run, Chancellorsville, Gettysburg, Commanches, Oklahoma, The Admiralties, Leyte, Luzon, Tokyo. And the great names will not die. From Henry Dodge, the first colonel of the American Cavalry Service, to George Patton, the roll call of the Cavalry will live on.

The Cavalry is not dead; its spirit, its traditions, its immortal intangibles endure. Its tactics, its esprit are the heritage of Armor and of the Army; the "Yellowlegs" are gone but they have left behind them the things that soldiers live by.

Then we in Armor, regardless of our mount, are the preceptors and custodians of the traditions of the Cavalry and mounted combat.


F. Remington

9 January 1978

Dear Colonel Vargosko:

Congratulations to ARMOR magazine on its 90th anniversary. In this day of technological achievements it becomes increasingly vital to communicate the essence of our scientific concepts and its application on the battlefield. ARMOR magazine provides a vehicle of communication for our working soldier with competent and professional constancy.

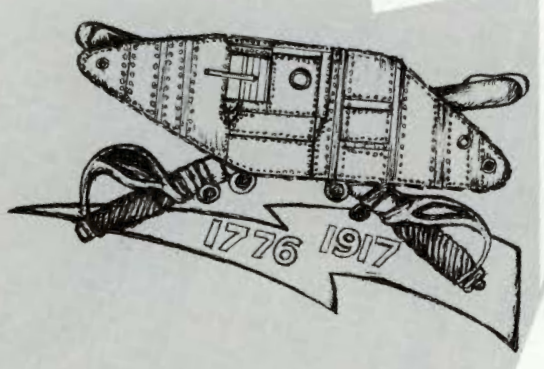
My compliments to you and to your staff.

Sincerely,

Omar N. Bradley

OMAR N. BRADLEY
General of the Army

LTC Michael A.
Editor
Armor Magazine
U.S. Army Armo
Ft. Knox, Ken



HEADQUARTERS
UNITED STATES ARMY TRAINING AND DOCTRINE COMMAND
OFFICE OF THE COMMANDING GENERAL
FORT MONROE, VIRGINIA 23651

9 January 1978

Dear Colonel Vargosko:

I am pleased to be able to take this opportunity to extend my congratulations on the occasion of the 90th year of ARMOR Magazine. ARMOR has throughout its history been the leading professional publication for those involved in mounted combat. Not only is it widely read by all branches of our Army, it has, because of its excellence, become a standard to those of like interests all over the world.

I commend you, the editorial staff and all those who contribute to success of ARMOR. Best wishes for many more years of continued and dedicated service to the men and women who serve our nation.

Sincerely,

Donn Starry

DONN A. STARRY
General, United States Army
Commanding

DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY, EUROPE, and SEVENTH ARMY
THE COMMANDER IN CHIEF
APO 09403

AEAPA-CI

8 February 1978

Lieutenant Colonel Michael A Vargosko
Editor-in-Chief
ARMOR Magazine
U.S. Army Armor School
Fort Knox, Kentucky 40121

Dear Colonel Vargosko:

It is a pleasure for me to extend congratulations on the occasion of the 90th anniversary of ARMOR Magazine. In chronicling the development of Armor from its infancy as the "combat arm of decision" through its present vital role as a cornerstone of our defense in Europe, ARMOR has made a unique contribution.

Throughout its distinguished history, ARMOR Magazine has always provided the best in professional reading to the Armor officer no matter where he might be serving. Today, in a time of constantly changing tactics and battlefield technology, it is reassuring to know that there are journals such as ARMOR available to keep everyone informed.

I am confident that ARMOR Magazine will continue to provide a dynamic forum for the exchange of ideas so important to the profession. On behalf of all members of the United States Army, Europe, I wish ARMOR every continued success as the spokesman of the Armor soldier.

Sincerely,

George S. Blanchard

GEORGE S. BLANCHARD
General, USA
Commander in Chief

Views Through the Visor

We are 90 years old, the Army's oldest professional journal. What has changed? We are no longer a quarterly journal. We have a different name. We write about newer equipment with identical tasks of old: horses with shoes then, tanks with tracks and helicopters with blades now! The authors' names have changed. We are no longer funded by the Armor Association. The magazine and Association are separate entities. Ninety years ago the journal was because of the Association. Today the Association is because of the journal.

How have we not changed? All ranks and civilians still may present their ideas. Anyone may be considered for publication, but no one is automatically granted approval. We invite representatives from all branches to write for us, especially infantry and artillery battalion commanders. We care about what all of you have to say. Review our author lists and you will agree.

How else have we not changed? The magazine is not dominated by any one person. It is no man's firearm. It is an open forum for all. Those that disagree are those who refuse to express their professional views in the forum.

What else has not changed? We are a professional journal. We are not political. Our pages will not be used to trumpet the accusations of political groups, large or small. Nor will we allow ourselves to be used by any group.

We are also not a sounding board for complaints. Our editorial policy will not change to satisfy those who think ARMOR should be a forum for attacking commanders, fellow soldiers, and other personalities. We are too professional for that.

We are 90 years young. We are modern in layout and format. We have been, we are, and we will continue to set the standard that others emulate. We are good because we have a devoted staff, the support of the Armor School, the Armor Center, and the Armor Association.

And so we look forward to another 90 years. The name may change. Authors will change. Equipment changes everyday. Some things will not and should not change. The forum will remain open to new ideas, and to all. We will remain devoted to the combined arms and total force concepts. Most of all we will remain professional.

MAV

Justice in Valhalla

PRELUDE

History, says Carlyle, is the biography of great men. To Karl Marx and Lenin, it is the story of impersonal struggles and movements. The war in North Africa was a quaint admixture of both. On the one hand, a clash of armored forces, unmatched in mobility and striking power; on the other, a tremendous clash of personalities that wielded those instruments of power.

As the armored divisions of the 8th Army and the Afrika Korps swept across the Western Desert, the names of Montgomery and Rommel were etched on the burning sands as living legends for all time to come.

These two dynamic characters that remained interlocked in fierce combat never in fact met on earth. Montgomery is said to have constantly carried a photograph of Rommel on which he had inscribed "This is the man I must defeat." Montgomery never became an obsession to Rommel, though he is known to have remarked to his Chief of Staff after the Alamein disaster, "This general they call Monty, has an astute mind. I wouldn't rate him as a dashing commander, but he planned this operation to perfection."

Such admiration was mutual, as when Winston Churchill, speaking of Rommel's exploits in the Western Desert, said in the House of Commons, "We have a daring and skillful opponent against us, and may I say, across the havoc of war—'a great general.'"

There is no doubt that both these characters would one day meet in Valhalla, that select place in heaven reserved for heroes. It is interesting to visualize what would be the reaction of either when summoned before the Court of Supreme Justice. The author has tried to depict such a situation.

by Commander Sushil Isaacs

THE SETTING

The action of the play passes in the court of justice in Valhalla. The year is 2044, almost a century after El Alamein.

Rommel, in his characteristic desert outfit complete with top boots, peak cap, and binoculars, is standing right. To the extreme left is Montgomery, wearing his familiar double-badged beret. Three judges are seated on a raised platform positioned in the center and to the rear of the stage.

Faint amber lighting provides an ethereal touch to the setting.

Voice Erwin Eugen Johannes Rommel, Field Marshal, Commander, German Afrika Korps.
(Rommel nods toward the jury)

Voice Bernard Law Montgomery, Field Marshal, Viscount, the Victor of El Alamein.
(Montgomery proudly assumes a stance as he looks askance at Rommel)

Rommel "Victor of El Alamein; *(With Scorn)* You never won Alamein, neither did we lose it. We gave it to you on a platter."

Monty "Well, I realize Alamein is a sore point with you. But that is history, Old Boy. The world knows that I, Montgomery, Commander of the British Eighth Army defeated the invincible German Afrika Korps at Alamein and chased the notorious 'Desert Fox' and his Panzers 1,400 miles back to Tunisia where they were flung into the Mediterranean."

Rommel "I was not present at El Alamein. I arrived after it was lost. In fact, it was lost before it was fought. I never had any illusions about that—you had a 3 to 1 superiority. I would have rated you a very poor general had you lost. But Montgomery, had I just half that superiority over you, I would have crushed your 8th Army into the desert sands, the way I smashed the Maginot Line. When I took command of our retreating army, I had only 40 tanks against 800 of yours. I had no option but to fight a holding action—yet I held you at bay for 7 months. History will record my action as the greatest masterpiece of evasion."

Monty "Well, it is not without reason that they called you the 'Desert Fox.' And I dare say, you did give me a few anxious moments."

Chief Judge "In the name of justice we pronounce: To Montgomery is accorded the perfection of planning and executing Alamein: To Erwin Rommel goes the credit of exemplary resistance in the face of overwhelming odds, having created Kasserine despite Alamein."

Voice And it came to pass that latter day military historians contrived to unravel the enigma that surrounded these two antagonists in the weird drama of the Western Desert. You, Montgomery, were a strategist and a planner, and above all, a brilliant organizer. Erwin Rommel, military thinkers regard you as an unparalleled tactician, an outstanding animator, and an audacious operator.

Rommel "I know your type—the epitome of the Staff College man, with your classical concepts of planning and execution. Camberly, I suppose, taught you not to attack until you had a 3 to I superiority. Any fool can win a war with such preponderance as you had. Imagine trying to conduct or invigorate a mobile operation from a caravan, in which you went to bed each night leaving strict orders that you were not to be disturbed. You British Generals surprised me the way you conducted operations sitting 70 miles behind the front."

Monty "I reckon there were a few drawbacks in our system, and I rectified a few, but that does not mean I endorse your action of springing up on the frontline from tank to tank like a damned blue-arsed fly."

Voice Language Monty, language, You are in heaven now!

Monty *(Half embarrassed, regaining his composure).*
"You were plain lucky, Rommel. It's your '*FINGERSPITZENGEFULH*' that worked every time—that peculiar intuition or sixth sense that is supposed to have made you a legend. But I am afraid you cannot fight a modern war from the point of a spear like Napoleon on the bridge at Lodi. Under any other circumstances you would have been a dismal failure. You were plain lucky—just plain lucky."

Rommel "Montgomery, has any admiral ever won a naval battle from a shore base? I identified tank warfare with war at sea. I defied the textbooks written by military pundits because I realized that in mechanized warfare it is mobility that always proves decisive. The only way to achieve such mobility is to remain embroiled in the changing fortunes of the battle, right there at the point of the spear. If I am not mistaken, it was your own C-in-C Alexander, who dubbed me the 'master of mobility.'"

Chief Judge "It is for the court in Valhalla to confer upon Montgomery superiority over Rommel in preparation for battle, superiority in knowledge, thoroughness, and versatility. To Rommel is given the unparalleled distinction of boldness and daring in action, coupled with a rare tactical sense that surpassed that of Montgomery. In essence, Montgomery was the Planner and Rommel the Executor."

Voice Rommel, as a Commander in the Western Desert, you constantly devised the essential element of victory—surprise. In what has been termed "the terrible etiquette of the battlefield," you were never a conformist. It has been said of you that in the forties you were the personification of the 20th century captain, about whom the British theorists in their speculations about the future war had dreamed in the thirties. Perhaps with your bold decisive actions, typical of your mastery of the *Blitzkrieg,* you brought to a world war slowed down by the memory of its predecessor, the dash and splendor of the cavalry. But Erwin Rommel, against you in the balance rests a charge. You took grave administrative risks, often unjustified, and certain military critics even charge you as having lacked any logistical sense.

Rommel "Yes, I agree, I often strained my logistic chain to a breaking point. But not without reason. I never let my offensive spirit be inhibited by administrative restrictions. I accepted logistics as a hazard of war and I attacked when no other general would have dared—least of all a general like Montgomery. But mark you, it was not always that I took such risks deliberately. More often than not, my promised supplies never reached me. Had I been there at Alamein with even matching strength to oppose Montgomery, the British would have been deprived of the legend of the Viscount of El Alamein. And reflect for a moment, Montgomery, had I been there on your side

instead of Horrocks, the breakthrough to the airborne bridgehead at Arnhem might have been a different story. Who knows, you might even have ended up as the Duke of Arnhem."

Voice Montgomery, you always preferred a balanced attack with your resources strictly arranged. But in striking contrast to Rommel, you always had to be spurred into action. You tended to exercise excessive caution, and had to be constantly urged by Churchill to launch the offensive.

Monty "I was never a gambler such as Rommel. Neither was I a bit anxious about my battles. If ever I was anxious, I never fought them. I waited until I was ready. To Hitler, North Africa was a side-show and therefore of little concern. To the Allies it was vital. Therefore, I could not afford to lose. Besides, Rommel, I was eventually destined to be in command of greater numbers than you could ever have managed. It was I who quantified the meaning of administration in large-scale operations. Quite clearly you never understood this, for as Von Rundstedt once remarked, you were unsuited for higher command, even though you were truly a capable commander in the desert with limited forces at your command, mind you."

Chief Judge "The war in the desert was in truth a Quartermaster's nightmare. Rommel could never be confident that his spearhead would be firmly supported by its shaft. Montgomery was a careful compiler of victory like Monash, Allenby, or Haig. Rommel's type of instinctive, split-second command always involved tactical and administrative hazards. In the war of sea on land, which is how the desert campaign was fought, Rommel was more of a Beatty while Montgomery chose to play a Jelicoe."

Voice In leadership and morale we discern the greatest enigma. Erwin Rommel, in your papers you wrote a treatise on leadership stating, "A commander must try above all to establish personal and comradely contact with his men, but without giving away an inch of authority." Your relationship with your troops was more of trust than of deep affection. Montgomery, you went the other extreme to achieve popularity of a kind unknown to Rommel. Wellington was "Daddy Hill" to his troops. Allenby was the "Bull," Eisenhower was always "Ike" and you, Montgomery, were always "Monty." But when the Afrika Korps talked of Rommel they just called him Rommel.

Monty "When I came to North Africa you were already a legend. My troops referred to you as the 'Phantom General.' It was I who electrified the morale of the battered 8th Army. They needed a general like me."

Rommel "You, Montgomery, were the general for your soldiers—the public relations type with your fancy headgear and flashy press interviews. I on the other hand, was a 'soldiers' General.' If I became a legend it was despite myself. You strived to become one, admidst a flash of controversy."

Monty "Nothing succeeds like success. What the 8th Army needed was success and I was the only man who could create Alamein."

Rommel "Not really, Monty. Had Strafer Gott's plane not been shot up by my fighters, he would have faced me at Alam Halfa and Alamein. No, you were only second best. Though I must admit, you proved better than I expected and I sometimes wished I had a Chief of Staff like you."

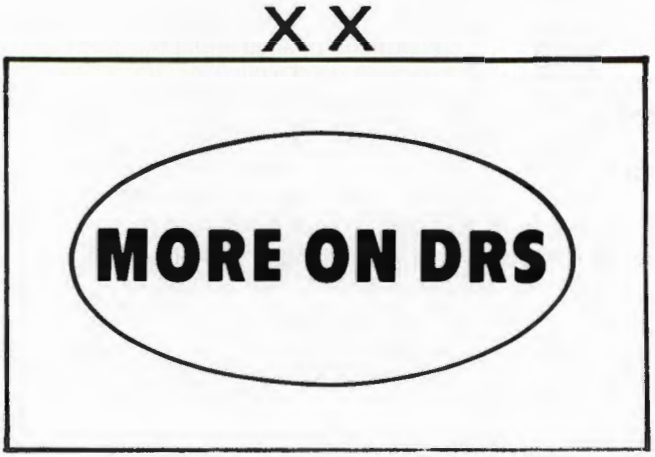
Monty *(Advancing toward Rommel)* "Do you know Erwin, now that you mention it, I have often dreamed of reenacting the Arnhem assault with you on my side. It would have been a different story."

CURTAIN

Voice When all the lesser men of our times have passed into the oblivion of darkness, history will strike forth the names of Rommel and Montgomery, the former as the "Phantom General" affectionately known as the "Desert Fox," the latter as the controversial "Monty," the victor of "El Alamein."

COMMANDER SUSHIL ISAACS was commissioned in the Executive Branch of the Indian Navy. He is a graduate of the U.S. Naval Amphibious Warfare School, having attended the Senior Officers Amphibious Course at Coronado, Calif. in 1976. Commander Isaacs is presently on the faculty of the Defense Services Staff College, Wellington, India.

PROFESSIONAL THOUGHTS



The November-December 1977 issue of *ARMOR* carried a superb article by Lieutenant Colonel Nicholas Andreacchio addressing the Division Restructuring Study. Entitled "The Armor Battalion of the Heavy Division," the article addressed a number of weaknesses of the proposed organization. As a fellow tanker I offer my thanks to LTC Andreacchio for initiating a public debate of DRS—a debate that has been too long in surfacing. His article points out the false economies created through the proliferation of small fighting units. More battalions and significantly increased officer strengths will greatly increase personnel costs, without addressing the problems posed by more lethal weapon systems on the battlefield. Filling our road nets with more battalions of less combat power is clearly not the answer to the questions posed by FM 100-5. The answer is to strengthen the squad, the crew, and the platoon—that portion of our Army that kills. We don't want to reduce the ratio of killers to helpers. We don't want to buy more headquarters.

Almost two centuries ago Napoleon observed that, "God favors the big battalions!" Napoleon was absolutely correct, and what is more—God has not changed his mind! The reason God favors big battalions is that they focus greater killing power and more sustaining fires and logistics in each engagement. Battles are normally won or lost at the battalion level. The reason for this is that the balance of force on the battlefield shifts significantly with the loss of a battalion—boundaries are significantly altered, terrain is sacrificed, a valuable unit and its colors are lost to the enemy, and a demoralizing shock is transmitted throughout the division. This was true in Napoleon's day, and it is still true today.

The answer to our current problem lies in fielding strong battalions composed of strong platoons and companies. The platoons and companies fight and win the engagements by generating superior combat power, killing the enemy at the point of contact. Large battalions sustain the combat of their companies and they ensure that it is the enemy that is the first to report: "The battalion has been wiped out. . .the commander is captured. . .the unit is overrun." The virtue of large battalions is that they allow us to crack enemy battalions, forcing the enemy to digest the news that his units are the first to sustain defeat in the next battle. While he digests this news, we will prepare the next kill.

The advocates of the three-tank platoon have made "much ado" of the October War. They have pointed out that the Soviets, the Germans, and the Israeli Defense Forces have all adopted the three-tank platoon; ergo, it must be the solution to winning the next war. Wrong! The reason the three-tank platoon is a must in these armies is that they are forced to rely almost entirely upon the lieutenant for command and control. Although the circumstances are quite dissimilar in the three armies, all three have been required to rely upon the lieutenant inasmuch as they do not possess the equivalent of the U.S. noncommissioned officer. For the German and Israeli Defense Forces, it is a question of the recruitment of the qualified noncommissioned officer in a critically short labor market. There are simply not enough qualified personnel to go around. Suffice it to say, we do have a superb noncommissioned officer in our tank platoons. He is a natural killer. The solution of his problem on the battlefield is a tank that can outshoot the *T-72* and the necessary indirect fires and support to sustain him. The solution of his problem is not to take his tank section away from him, or to put a lieutenant into almost every other tank on the battlefield. Heaven forbid! Such a solution flies in the face of U.S. military experience and the traditions of the American fighting man.

It would degrade our NCO's and cause redundancy in command and control capability, while simultaneously stripping away 40 percent of our fighting power from where it is most needed—within the platoon. Here is reason enough to kill the DRS without even looking at the shambles the DRS makes of our new doctrine, as LTC Andreacchio has clearly pointed out.

We have observed many proposals for reorganization in recent years. Some of them have been "get rich quick" schemes that rob Peter to pay Paul. The DRS appears to be another such scheme to rob both Peter and Paul, and then it

beats them and leaves them for dead. The DRS reduces the fighters in the platoon, the company, and the battalion. It eliminates the "eyes and ears" of the battalion—the scout platoon. And it fails to solve the TOW problem, i.e., the organization and employment dilemma posed by its long range and vulnerabilities.

Instead of a solution to the TOW problem, the DRS offers us an expanded problem. In the absence of a solution, the DRS gives the TOW dilemma to every line battalion commander. The ultimate solution of the TOW problem lies in the improved MICV. Once our infantry fighting vehicle has a built-in TOW capability, we will have eliminated the doctrinal problem caused by separation of the infantry platoon from its antitank (TOW) capability. Until we can give the platoon leader the organic TOW capability he needs, we must retain the existing TOW capability (GS) within the combat support company. The DRS proliferation of TOW companies without a workable doctrine to employ TOW companies is not a solution. It only serves to aggravate the problem.

The elimination of the scout from the line battalion is perhaps the greatest folly of the DRS. At a time when we are literally crying for more intelligence to enable the generals and colonels to do their jobs, the DRS takes from us our greatest combat intelligence source. It is the equivalent of beating Saints Peter and Paul after robbing them of 40 percent of their combat power. The scout magnifies the combat power of the battalion by allowing the commander to best employ his unit against the threat. The highly mobile, aggressive scout has paid our Army great dividends in the past. The elimination of the scout in the DRS violates basic principles. We must reinforce success, not failure. Thus we must retain the proved capabilities of the scout, and not eliminate him.

As professional soldiers, we the readership of *ARMOR* have the responsibility to study and comment on the new changes proposed for our divisions and our tank battalions. We have seen many changes in the last 20 years. Changes have been imposed upon our Army all the way from the JCS to the squad and crew level. Most of the changes may well have been necessary and appropriate, but one unnecessary change is one too many. The thrust of allowable change must be to incorporate necessary technological advancements into our fighting units and to insure effective organizations to employ that technology. Such changes must build on experience and lessons of the past. The DRS departs from lessons of the past. It assumes that sauce for the Soviet goose is sauce for the U.S. gander, without understanding the difference between the American and Soviet NCO's. The DRS dangerously reduces the tooth-to-tail ratio, which will ultimately increase command and control problems throughout the division if DRS proposals are adopted. The restructured division would increase personnel costs and reduce combat power. To accept the proposals of the DRS would be a giant step backwards.

Having lived through the turbulence in our troop units caused by the last two decades of change, I have been saddened to see yet another major change in organization on the horizon before we can thoroughly digest the recent changes in training and doctrine. Having examined the proposals of the DRS, I am appalled at its proposals that would greatly reduce our combat capability. I salute LTC Andreacchio for his astute analysis of the weakness of DRS and I encourage the readers of *ARMOR* to speak out and be heard, lest we are forced to accept the dangerous and debilitating organizational changes incorporated in the DRS.

ANDREW P. O'MEARA, JR.
Lieutenant Colonel, Armor

Box 157, USAWC

ANTILOGISTICAL WARFARE

If there is a future war in Western Europe, it can be correctly assumed that Warsaw Pact forces will be on the offensive and NATO forces on the defensive initially since Western policy and public opinion will not tolerate a preemptive strike. Military thinkers have traditionally calculated a three-to-one ratio in favor of the defense, but a Warsaw Pact attack, spearheaded by 15,000 tanks, would have a ten-to-one advantage against many key areas of the NATO defensive line, especially if the political decision were made not to use nuclear weapons.

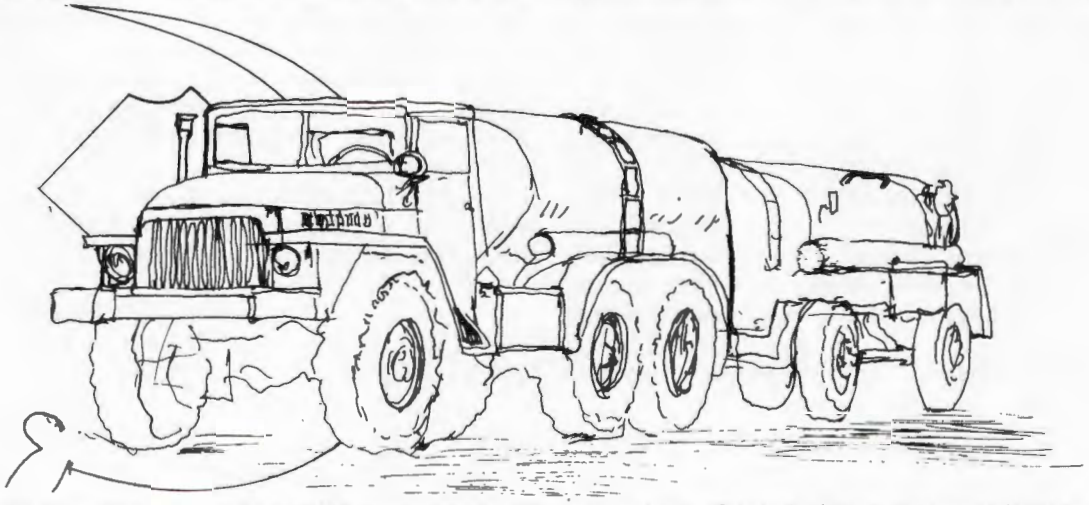
In his classic work, *On War,* General Carl von Clausewitz emphasized other factors in war besides numbers of troops and weapons, and these other factors could not be calculated in rigid ratios. The psychological condition of the troops, or morale, was one of the factors discussed, as was chance, and neither of these factors could be reduced to a law or principle of war in the absolute sense. However, there are other factors—the enemy's weakness—that can be calculated more precisely and which can be used to give the defending forces a much greater advantage, if properly exploited. In the case of a Warsaw Pact attack on Western Europe, the weakness that must be exploited is the attackers' logistics system.

There are many historical examples of campaigns won because of breakdowns in the enemy's supply and transportation systems. When Napoleon attacked Russia in 1812 his supply lines, like Hitler's 130 years later, were critically overextended. Russian raids on French supply trains together with the scorched earth policy of the Russian people denied forage to the horses of the Grande Armee, and after the battle of Borodino, the cavalry and artillery were hard hit by the shortages. Although the French entered Moscow, the critical shortages in all classes of supply made it necessary for

Napoleon to order a retreat. This decision was hastened by the fact that the Russian troops had burned their own stores before the French entered the city. Of the 612,000 men who entered Russia with the Grande Armee, 112,000 returned to France after the retreat from Moscow.

The forage of modern armies, especially highly armored and mechanized forces like those of the Warsaw Pact, is petroleum, oil, and lubricants (POL). One of the keys to winning the first battle will be to deny POL to the attackers by violent offensive forays against enemy logistical facilities. If the facilities are hurt initally, as they should be, the front line units will start to feel the shortages at their first refueling stops after crossing the West German frontier. For the mechanized infantry, this will be 325 kilometers from their assembly area.

The attacking forces will use rail transportation to bring fuel forward to the front. The fuel will then be transported from the front to the divisions and regiments of the combined-arms and tank armies by special-purpose tank trucks or by vehicles carrying portable bulk containers. Since rail is stationary and vulnerable, every effort should be made to destroy all rail lines and railway bridges early in the war.



Sabotage by friendly partisans in satellite countries should supplement air attacks, especially since bridges are such difficult targets to hit from the air. Railway lines should also be destroyed by all friendly forces executing delay or withdrawal operations. Railway trains and truck convoys should be vigorously attacked by NATO figher-bombers looking for targets of opportunity with special emphasis on tank trucks and vehicles with bulk containers.

The Soviet forces also have pipeline brigades to supply POL to frontline units. The pipeline brigade is attached to the front and can lay 70 kilometers of tactical pipeline a day. Portable tank farms are established in the front logistical area and the pipelines are laid from the tank farm facilities to the front line units. Pumping stations are located every 15 kilometers or closer in rough terrain. The tank farms should be prime targets. After they are located by reconnaissance aircraft, they should be attacked with air-delivered incendiaries. Airmobile raids should be planned and executed to destroy pumping stations and to cut sections of pipeline. Also, work parties from the pipeline brigade should be attacked by air or ground elements whenever possible.

POL that does reach regiment will be transported to battalion and company level by fuel trucks. Packaged fuel deliveries may also be employed, and 200-liter drums or 20-liter cans will be the usual containers in this type delivery. Since the trucks carrying packaged fuel will be hard to tell from other less important vehicles, it will be necessary to destroy this fuel before it leaves the regimental trains area. Those armored and mechanized forces conducting counterattacks in the NATO mobile defense should go for the enemy's rear areas quickly and seek out fuel dumps for destruction. Artillery should also attack trains areas by fire. Although Soviet tactical doctrine requires trains areas to be beyond the range of most artillery weapons, this will not always be possible in fast-moving and fluid situations. Every effort must be made by maneuver units to assist artillery in the acquisition of logistical targets.

The Warsaw Pact forces will have greater difficulty with their supply system the farther they move into NATO areas. They will be operating with exterior lines of communication and supply while NATO forces will have the advantage of interior lines. That is to say, the Warsaw Pact's supply lines will get longer as they attack forward, while NATO forces will be operating in their own territory with shorter, better protected, and more responsive supply lines. It was the advantage of interior lines that contributed to the Confederacy's success during the first years of the War for Southern Independence in 1861, and the South was not defeated until her own logistical bases were destroyed by Sheridan in the Shenandoah Valley and Sherman in Georgia.

In summary, NATO must win the first battle of any future war in Europe. An important element in that victory will be the destruction of the logistical system of the Warsaw Pact forces, especially that portion of the system transporting and delivering POL to armored and mechanized maneuver units. This can be done by a coordinated effort on the part of air and ground elements in locating enemy regimental trains, tactical pipelines, pumping stations, and portable tank farm facilities. Once located, these facilities must be attacked and destroyed by air or ground forces, or a combination of the two. This effort will not, by itself, bring about victory nor stop the aggressors dead in their tracks, but it will make an important contribution towards weighting the scales in favor of the defending NATO forces, and this will be a key element in the final victory.

KELLY M. MORGAN
Captain, Armor
Marion, SC 29571

SOLDIER TRAINING VS. SCHEDULED TRAINING

Unit training schedules which are routinely not worth much — give us a measure of a commander's subdivision of available time. Such schedules probably have some redeeming social value. Anything that makes the G-3 and S-3 feel good can't be all bad.

However, most commanders and training inspectors know that we must go a step further to analyze properly what is actually happening day-by-day or hour-by-hour, enroute to the Skill Qualification Test (SQT) and the Army Training and Evaluation Program (ARTEP). One approach that some of us have found to be helpful is that of trying to visualize the training day from the perspective of a typical participant in the training.

Although the training schedule announces "*M-16* Rifle Zeroing - 0730-1130" we know that what will happen will not be "4 hours of training." The unit may be engaged as an entity in *M-16* zeroing as a primary effort for 4 hours. But the soldier who is to receive this training will be doing many things only marginally relevant to the basic purpose of the exercise during the 4-hour block.

At one time in basic combat training (BCT) we allocated 97 hours of program of instruction (POI) time to basic rifle marksmanship. How many hours of instruction and practice did the typical trainee get from the 97 hours in which his company was scheduled? In general, his percentage of productive learning time on this exercise in the BCT environment probably exceeded anything he has seen since. He may have been listening, watching, practicing, shooting, coaching, or scoring for better than 75 percent of the time.

We really do not know as much as we should about teaching even the basic military skills in terms of actual time for an *individual* to learn. We know considerably more about time allocation at the unit level, although in only a few exercises — such as tank gunnery tables or physical training (PT) test execution — do we normally provide time breakouts based on definitive need. The SQT should eventually generate some reliable, useful data for the training manager. Still, there is great difference between the specified or typical time it takes for one individual to emplace the *Claymore* and the time a platoon needs to have scheduled for either practice or testing on the emplacement of the *Claymore.*

The "Unit Training Analysis Worksheet" shown is one method of reviewing or planning a particular block of training. In completing the form, one must keep the perspective of an individual soldier who is participating. The total time of all 16 items must add up to the total time of the training from start to finish. The basic assumption in completing the form is that the soldier is doing one thing at a time. (If, for example, the soldier is simultaneously and equally accomplishing two items for 10 minutes, give him credit for 5 minutes of each.)

UNIT TRAINING ANALYSIS WORKSHEET

OF THE TOTAL TIME AVAILABLE, HOW MUCH OF THE TRAINING — FROM THE STANDPOINT OF AN *INDIVIDUAL* PARTICIPANT — WAS SPENT ON: (Show approx time in minutes)

1. **MOVING TO AND FROM TRAINING SITE:** _____
2. **ON-SITE ADMIN PREP AND ADMIN BRIEFINGS:** _____
3. **ADMIN CHORES (AMMO PREP, POLICE, ETC.):** _____
4. **TAKING BREAKS OR ONLY WAITING IN LINE:** _____
5. **LISTENING TO INSTRUCTION ON SUBJECT:** _____
6. **OBSERVING DEMONSTRATIONS:** _____
7. **OBSERVING OTHER SOLDIERS PARTICIPATE IN THE EXERCISE:** _____
8. **INDIVIDUAL "HANDS-ON" PRACTICE:** _____
9. **CREW/SQD/PLT PRACTICAL EX OR DRY RUN:** _____
10. **INDIVIDUAL OR CREW LIVE FIRING:** _____
11. **BEING ASST INSTRUCTOR, COACH, OR GRADER:** _____
12. **CONCURRENT TRAINING ON** _____**:** _____
13. **MAINTENANCE OF MATERIEL:** _____
14. **BEING TESTED - INDIVIDUAL OR CREW:** _____
15. **CRITIQUE OR GETTING FORMAL FEEDBACK:** _____
16. **OTHER (EXPLAIN)** _____**:** _____

START TIME: _____

END TIME: _____ ***TOTAL TIME:** _____

***Total time must be sum of all items 1-16. (One soldier can do only one item at a time.)**

Obviously our aim is to maximize productive time. But a first step should be the capturing of reliable data to the extent that we know what is happening at the training site in useful terms. To me the worksheet is most helpful when used by the officer-in-charge (OIC) or noncommissioned offier-in-charge (NCOIC) both in planning and during the execution. (Any temptation by higher headquarters to require submission of such data routinely should be resisted at all costs!)

W. F. ULMER, JR.
Brigadier General, U.S.Army

Fort Hood, Tex. 76544

MYTH OF THE SOVIET DRIVER-MECHANIC

by Captain Joel M. Grover and
Captain John Kirby

The purpose of this article is to investigate the capabilities of the Soviet driver-mechanic as compared to the U.S. Army tank driver. This comparison considers differences in vehicles, training, responsibility/authority, and the repair parts, tool sets, and maintenance equipment available to these drivers. The critical point in this comparison hinges on the title, mechanic, which the Soviet army has appended to the duty position of tank driver. The important difference between the American and Soviet drivers' capabilities seems to rest in their job titles rather than their performance as mechanics. Therefore, the major question is: How much actual repair work or maintenance is performed by the Soviet driver-mechanic? To answer that question, facts were compiled based upon the extensive resources available at the U.S. Army Armor Center at Fort Knox, Kentucky. Throughout this research and in this article, all conclusions and discussions were kept unclassified.

Drivers' Controls; T-62 vs M-60A1

Overall, the *T-62* is not as mechanically advanced as the *M-60*. Consequently, the Soviet crewman must physically perform more adjustment of steering linkage than the American driver. Steering is accomplished by two independently operating laterals, much like the U.S. *M-4* and *M-26* tanks of World War II, where gear ratio is controlled by a manual transmission consisting of five forward and one reverse gears. Additionally, the *T-62* is equipped with a brake pedal, a manual clutch pedal, and an accelerator pedal. Steering the *T-62* normally requires only minor adjustments of the two laterals. Frequently, however, the driver must shift gears and activate the clutch while maintaining steering control. Thus, maneuvering across rugged country requires continuous concentration and manipulation of all vehicle controls.

The *M-60A1* driver can manipulate the driver's T-bar with one hand, the transmission range selector with the other, and either the accelerator pedal or the brake pedal simultaneously while on the move with no more difficulty than he has in operating his private automobile. The improvement in our tank control and transmission design allows our drivers to concentrate on the vehicle's course, his combat duties, and the monitoring of instruments, whereas the Soviet driver, like his U.S. counterpart in World War II, often finds himself engrossed in simply maintaining the vehicle's course.

Basic Training

On entering the service as a recruit, the Soviet soldier goes through a two-phase school much like our basic and advanced individual training (AIT). In the basic course, he is taught general military subjects. It is not until his advanced training that crewmen are sorted out as driver-mechanics, gunners, or loaders. During AIT, the driver-mechanic receives a majority of his training on driving simulators. This training consists of the driver's learning the basic maneuvers of the tank, practicing them to build proficiency, then performing the maneuvers for the record. Complexity of maneuvers and speed of execution are increased until the driver passes a final test. His formal mechanical training during this time is minimal. He is required to memorize the operating capabilities of the vehicle, number of grease fittings, etc., and, as the operator's manual of the *T-62* is classified and not readily available for crew use, he must memorize maintenance checks to be performed on his vehicle.

Prior to 1968, the driver-mechanic was taught the operating principles of his vehicle in detail. During that year, however, the Soviets realized this was a waste of time, as most components of the vehicle are sealed and access to them is forbidden. Today, the driver-mechanic is taught only what he needs to know about the components to which he has access.

Up to this point, the student has done most, if not all of his training on simulators. Much of the driver-mechanic's mechanical training takes place in his first unit where he is assigned to his tank. His unit driver training incorporates servicing of the vehicle and normal operating checks. Articles on Soviet unit training emphasize the driver's basic responsibilities as being similar to those of his U.S. counterpart (monitoring instruments, detecting indications of overheating of parts, low oil levels, and abnormal noises) rather than the more technical skills normally associated with the term, "mechanic."

The American driver currently receives 51 hours of maintenance training and 13 hours of drivers training in his basic and advanced courses. Under the new Tank Force Management Group concept, the U.S. driver will receive approximately 99 hours of maintenance training and 100 hours of drivers training. This increase in maintenance training emphasizes track and suspension systems, preventive maintenance, electrical systems, transmissions, engine and air induction systems, and troublelights. The new driving training will place increased emphasis on night driving, advanced driving, and gunnery range driving. A listing of the course of instruction (COI) for the Tank Force Management Group concept in driving and maintenance training is shown in Table 1.

Table 1. U.S. Program of Instruction—Basic Armor Training vs Tank Force Management Training Program.

DRIVER (Maintenance)

SUBJECT	CURRENT HRS	TFMT
Automotive systems maintenance	4	0
Track and suspension systems	4	12
TM's, lub orders, publications and forms	6	4
Preventive/on vehicle maintenance	37	56
Lube hull	0	2
Hull troubleshooting	0	4
Electrical systems	0	2
Maintain basic issue list (tools)	0	2
Remove and install power plant	0	4
Engine and air induction systems	0	1
Before, during, and after operations maint.	0	8
Perform ESC	0	4
TOTALS	51	99

DRIVER (Driving)

Basic driving (day)	3	4
(night)	4	3
Convoy driving	0	4
Advanced driving	4	0
M-34 driver trainers	2	6
Negotiate obstacles (day and night)	0	32
Escape from a tank	0	2
Tactical driving (day and night)	0	17
Recovery operations	0	8
Tank gunnery driving (day and night)	0	24
TOTALS	13	100

Responsibilities or Authority

As the Soviet driver-mechanic receives very little "hands-on" training in his advanced courses, much of his actual learning comes from experience in his first unit. During his AIT, he learns daily checks and how to service his vehicle. This parallels U.S. training except for the Soviet's lack of an operator's manual. His first unit then takes the novice driver and assigns him to a vehicle. His general duties consist of checking oil levels, tightening nuts and bolts, ensuring correct track tension, and monitoring his instruments. Changing track and other crew functions are also learned here. The driver does learn more technical monitor operations which are peculiar to his vehicle. As mentioned before, the driver has many more controls than his U.S. counterpart which require periodic inspection to ensure detection of wearing, slippage, etc. Therefore, the driver must go through several checks of his driving laterals, his clutch pedal linkage, and his brake pedal linkage. These checks can be compared to our check of the clutch pedal on a 2-½-ton truck.

As for actually taking items apart or repairing them, the Soviet concept is that the technical officer at company level is responsible for overall maintenance in his unit. With his group of maintenance specialists, he monitors the operation of all vehicles, even to the point of completing entries in the dispatches or logbooks. He maintains close liaison with the company and platoon commanders and, being considered the most experienced in his field, directs the maintenance effort of the unit. If equipment failures occur, he inspects and diagnoses the problem and directs his specialists in repairs. Although at this point the specialist is responsible for accomplishing the repairs, usually the crew does the work under his supervision. One source stated that "a well-motivated crew could change the clutch of their vehicle in 5 hours," however, this seems to be the exception. As most crewmen strive to learn more about their vehicle, their proficiency in higher levels of maintenance will increase. Eventually, crews are able to perform certain maintenance functions with only cursory supervision. Apparently, the Soviets are trying to capitalize on this tendency.

The biggest drawback to the idea of the driver as a mechanic comes from his lack of repair parts, adequate tools, and heavy equipment support such as wreckers and lifting apparatus. The crew must have at least company-level wrecker support to pull the back deck of the tank and gain access to any major component. Repair parts must then be requested by the company technical officer from the battalion technical officer. Finally, the sparse array of tools on board the *T-62* suggests that intricate maintenance is beyond the driver's capability. Other sources indicate that the more intricate maintenance, such as electronics or engine exchange, is authorized only at the regimental level by the regimental maintenance company. Division maintenance has the same capabilities as the regiment, but is apparently authorized to do more. In the end, though, the Soviet crew, much like the U.S. crew, does most of the physical maintenance under the supervision of a specialist from either company or battalion level.

In contrast, the responsibilities of the U.S. Army tank crewman, specifically the driver, are simple and spelled out in detail in the operator's manual which is carried on board every vehicle. In general, however, the driver and other crewmen are responsible for inspection and cleaning of items on the vehicle. The authorized inspection can be more detailed in that the crew must check to ensure items are in good condition; that they are stowed properly; if nuts and bolts are loose, that they are secured; and that any item excessively worn is reported for replacement. The crew duties spelled out in the operator's manual give the driver a list of daily preventive maintenance checks that must be carried out. Beyond this point, maintenance is referred to organization or higher level as specified in the maintenance allocation chart. Although the crew is authorized to do no more than their preventive maintenance checks, the majority of physical maintenance is done, in the end, by the crew, under the supervision of a mechanic. Less supervision of the driver and crew is needed as their maintenance proficiency increases and the company or battalion work load increases.

On-board Tools

Table 2 lists the maintenance and repair tools found on the *T-62* and *M-60A1*. Comparison of these lists indicates little difference in on-board maintenance capabilities.

Conclusions

The *T-62* is harder to drive than the *M-60A1* because its controls are more primitive. Therefore, the Soviet driver must receive more mechanical training in the adjustment of steering linkage to maintain vehicle control. Additionally, the Soviet driver requires more practice to maintain the same level of driving proficiency as his U.S. counterpart.

The Soviet driver and U.S. driver currently receive an equal amount of mechanical training in their post induction schooling. With the new Tank Force Management Group concept, the U.S. driver will actually receive more maintenance training than the Soviet. Although current driver training in the U.S. Army is below the level taught in the Soviet army, this new concept would bring our training up to an equal level.

T-62	M-60A1
Tankers bar	Crowbar, pinch point
Sledgehammer	Hammer, 10-lb.
Wrench, open-end	
(for track blocks)	Wrench, open-end, adj
6mm. X 10mm.	Wrench, open-end, fixed (track tension)
8mm. X 10mm.	Handle, T-socket wrench 3/4-in. dr
10mm. X 11mm.	Wrench socket, 15/16-in. op
10mm. X 12mm.	1 5/16-in. op
12mm. X 14mm.	1 1/8-in. op
14mm. X 17mm.	3/8-in. op
17mm. X 19mm.	15/16-in. op (12 pt)
19mm. X 22mm.	Screwdriver, flat-tipped
22mm. X 24mm.	Fixture, track-connecting
24mm. X 27mm.	Puller, mechanical
30mm. X 32mm.	Punch, drive pin
Screwdriver flat-tipped	

Table 2. Maintenance and Repair Tools (BII)—T-62 vs M-60A1

The Soviet driver must perform more mechanical checks and inspections due to the primitive design of the driver's controls in his vehicle. Duties and responsibilities seem to be equal between the Soviet and U.S. crews, although they are spelled out in more detail in the U.S. operator's manual. The major factor of capabilities in both cases seems to be the motiviation and experience of the crews, and the degree of flexibility which the commanders will allow.

The number of tools available for driver maintenance does not significantly favor either the Soviet or U.S. crew. As shown, the number of tools is almost equal, but both tool sets lack the necessary items for higher or more complex levels of maintenance.

From the above conclusions, we can say that the Soviet driver-mechanic is not a mechanic at all. He is better termed an inspector and adjustor of driver's controls. He is no more mechanically proficient than is the U.S. driver and, in many cases, is less proficient. His title, mechanic, is given to him solely because he receives a degree of mechanical training, and should not be thought of in terms of being a specialist.

CPT JOEL M. GROVER was commissioned in Armor upon graduation from the University of Alabama in 1971. He attended AOB, the Motor Officer Course, and airborne training. During a tour with 2d Sqdrn, 11th Cav, he served as platoon leader, troop XO, and assistant S1. Captain Grover is currently assigned as Commander, Troop A, 2d Sqdrn, 9th Cav.

CPT JOHN D. KIRBY was commissioned from Infantry OCS in 1970. He served with the 2d ACR as platoon leader, cavalry troop XO, and also worked in the regimental S4. Captain Kirby received an MA in History from Virginia Tech in 1976. An AOAC graduate, Captain Kirby is currently squadron maintenance officer, 1st Sqdrn, 3d ACR.

Copperhead

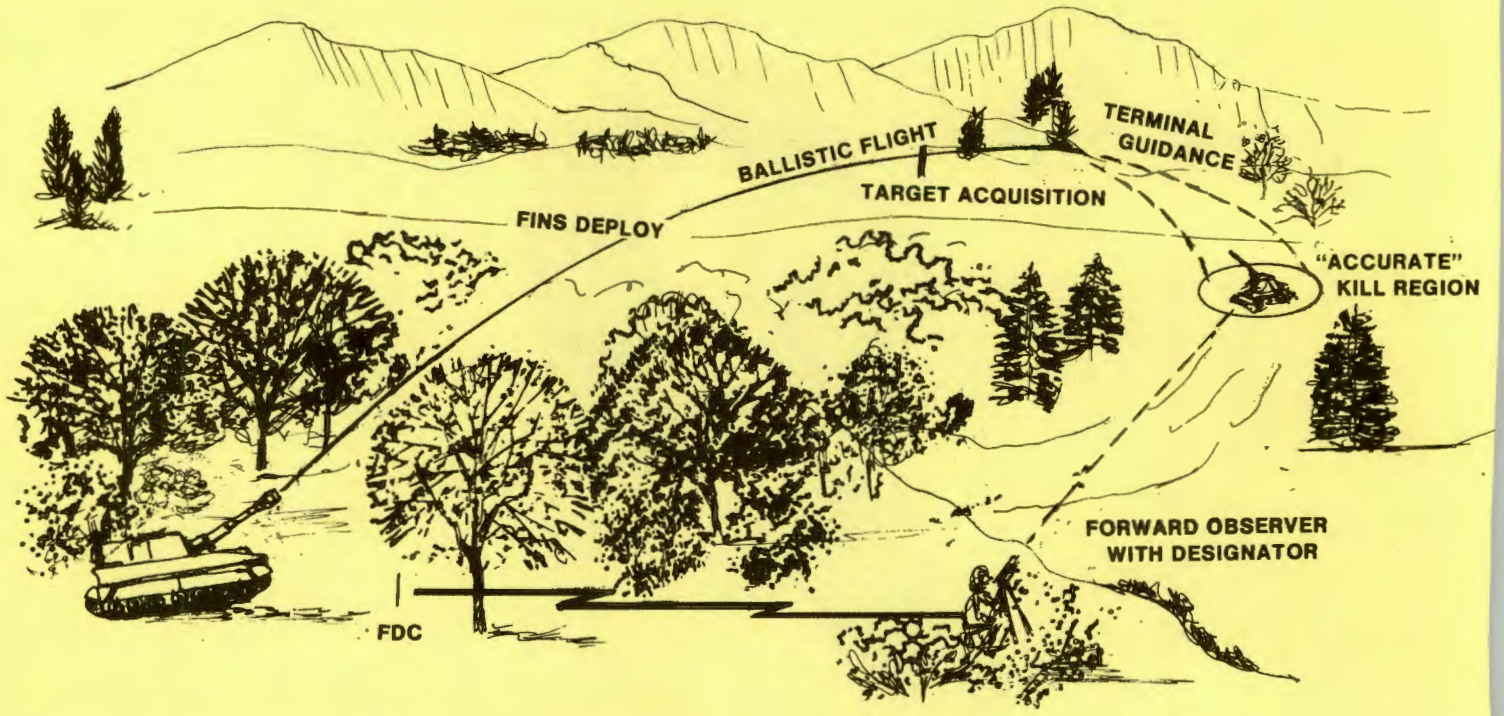
by Major Robert A. Doughty

In recent years a number of precision weapon systems have been introduced which pose a great threat to the tank on the battlefield.[1] These weapons include the TOW, *Dragon, Milan, Swingfire, Swatter,* and *Snapper,* but the most recent addition, the U.S. Army's Cannon Launched Guided Projectile (CLGP), or *Copperhead* is vastly superior to anything yet developed for the attack of moving or stationary vehicles on the battlefield. Its introduction will force a revolutionary redirection of armor tactics, organization, and equipment.

The *Copperhead* system[2] consists of a 155-mm. laser-guided round and a laser designator, which will be operated by fire support teams of a direct support battalion. One of its most important advantages is that the *Copperhead* round can be fired from the standard 155-mm. self-propelled or towed howitzer and requires no changes in the artillery piece itself. Theoretically, an artillery piece could fire *Copperheads* and conventional rounds on an interchangeable basis. The CLGP round apparently weighs about 135 pounds and carries a high-explosive antitank (HEAT) warhead. A laser seeker is

1Colonel John T. Burke, "'Smart' Weapons: A Coming Revolution in Tactics," *Army,* Vol. 23, No. 2 (February 1973), pp. 14-20.

2R.D.M. Furlong, "The U.S. Army's Cannon Launched Guided Projectile," *International Defense Review,* Vol. 9, No. 1 (February 1976), pp. 117-119; Peter J. George, "Endphasenlenkung—die neue Panzerabwehr," *Wehrtechnik,* (March 1976), pp. 54-55; Colonel Frank P. Ragano, "Smart Projectiles for Sharpshooting Artillery," *National Defense,* LX, No. 332 (September-October 1975), pp. 120-123; LTC Charles L. Williams, III, "CLGP," *Field Artillery Journal,* Vol. 43, No. 2 (March-April), pp. 29-32.



fitted in its nose, together with the necessary electronics.

In operation, a forward observer calls for antitank target fire. The *Copperhead* round is loaded in the howitzer and fired. It flies ballistically to the general area of the target in the same manner that artillery rounds have always travelled, but upon entering the target area it detects the laser energy reflected from the target and ceases to fly a ballistic trajectory. Its guidance and control equipment takes over the control, acts as a terminal guidance system, and maneuvers the round toward the target.

Its Strengths

Authorities at Fort Sill say the round promises "incredible accuracy."[3] Apparently the *Copperhead* can hit stationary or moving targets with ease, and can penetrate the armor of the latest battle tanks. The combination of remarkable accuracy and ability to penetrate makes the *Copperhead* potentially the greatest tank killer on the battlefield.

The *Copperhead* is also a highly flexible system. The designator can be operated by a forward observer who is on the ground, or in the air. It can also be controlled by a remotely piloted vehicle which carries a television camera and laser illuminator. This remoting capability will provide an easy and safe method of employment on the high-risk battlefield of the future. Beyond a doubt, the weapon's potential for employment is limited only by the imagination of the man who controls it. An important advantage of the *Copperhead* is its ability to mass against large armored formations. In the past the concept of blitzkrieg was based on the mobility of armor. Large armored formations could be massed along a very narrow portion of the front, overwhelming combat superiority could temporarily be achieved, and a penetration could thus be made through enemy lines. For the first time, the massing capability of the *Copperhead* offers the potential of neutralizing armor's massing capability. The ability of artillery to quickly shift its fires does not encompass our normal concept of mobility, but the men on the ground who face a mass armored attack will be able to call on the entire *Copperhead* resources of the units on their flanks and to their rear. Every 155-mm. howitzer battery within a range of approximately 12 to 15 kilometers[4] should be able to concentrate its antitank fire on the area of the attempted enemy penetration. The mobility of the *Copperhead's* firepower can thus be used against the mobility of the tank.

In the past only a small portion of a unit's firepower could be brought immediately to bear against an attacking enemy force. Now, the entire firepower of all supporting artillery will be able to concentrate against the massed enemy; hence, there will be a marked increase in the amount of antitank firepower available to any infantry unit. In short, the massing capability of the *Copperhead* offers a true foil to armor's massing capability.

Another important advantage of the *Copperhead* is its relatively low cost. Compared to other guided missile systems, it is inexpensive. One observer has speculated that the cost of each round will be about $3,500.[5] When we recall that the major additional cost is the laser designator, the cost effectiveness of the new system is apparent. While FADAC and TACFIRE will also be used, they are required for the upgrading and improvement of all artillery, and are not essential prerequisites for the adoption of *Copperhead.*

The *Copperhead* thus offers a number of advantages. Its accuracy, killing power, flexibility, ease of resupply, massing potential, and cost effectiveness all combine to produce a remarkably effective system. The former project manager has concluded, "In the 200-year history of the U.S. Army, probably no development has promised to revolutionize the concept of field-artillery employment as has the Army's newly developed Cannon Launched Guided Projectile (CLGP)."[6] In the same sense, probably no other develop-

[3]Williams, "CLGP," p. 30.

[4]Although the range of the CLGP is classified, the heavier projectile will undoubtedly result in a range reduction for the 155-mm. howitzer.

[5]Furlong, "U.S. Army's Cannon Launched Guided Projectile," p. 118.

[6]Rango, "Smart Projectiles," p. 120.

ment has promised to revolutionize the employment of armor as has the *Copperhead.*

What is Armor to do?

If the tank is to remain on the battlefield, armor officers must consider how tank units will operate against this type weapon system. While the United States apparently has a monopoly on the weaponry at this time, the great potential of the *Copperhead* should result in almost every major power having it within the foreseeable future. At the same time, no weapon system is omnipotent, and every system has its weaknesses, including the *Copperhead.* There are two major ways to reply to the *Copperhead:* technological improvements and tactical improvements. When we consider the technological alternatives, several seem feasible.

First of all, technological advances must be made in laser sensors. Some type of electronic hardware must be added to the tank to make the tank commander immediately aware that he is the target of a laser designator. Such a sensor must also enable the tank commander to immediately identify the source of the laser beam, since a high explosive round aimed at the laser designator will quickly make the aimer lose his tank target. Similarly, tank platoons and individual tanks will have to be highly trained in methods of reacting quickly after being identified as being the target of a *Copperhead*-type weapon.

Another technological improvement, which is apparently available, is chobham armor.[7]

Another example of technological improvement is in the area of electronic warfare. The great vulnerability of the *Copperhead*-type of weapon system is its need to communicate with the artillery battery. If the individual controlling the laser designator cannot call for fire, he will not be able to direct the round against individual tanks. Thus, the vulnerable link is the communication link between the individual designating the targets and the battery firing the rounds. If that link can be broken, the potential of the *Copperhead*-type weapon will be severely retarded.

Tactical improvements can also be made to improve the survivability of the tank on a battlefield dominated by the *Copperhead.* One should recognize that the introduction of indirect fire against vehicular targets is very similar to the introduction of indirect fire against personnel targets which occurred in the late 19th and early 20th centuries. In the period before World War I, when artillery converted from a direct fire role to an indirect fire role, most military officers failed to recognize the military revolution which was occurring with the introduction of the new artillery and the machinegun. When World War I began, most nations involved in the war initially used formations that emphasized masses of individuals. It was not until after the terribly bloody losses in the initial battles that military leaders concluded that completely new tactics were necessary. These new tactics emphasized dispersion, fire and maneuver, and protective use of the terrain.

The combination of hand-held infantry antitank weapons and *Copperhead* fire have created a situation analogous to that of 1914, except the tank is being threatened, rather than the infantry. New tactics will obviously be necessary for the tank, but they may only remotely resemble those that are currently being articulated. Just as World War I troops were forced to use the terrain to the maximum and were forced toward ever-greater dispersion, tanks on the future battlefield will also be forced to use the terrain and will be forced toward ever-greater dispersion. The tank charge, which is more a myth than it ever has been a fact, will definitely disappear, just as horse cavalry charges disappeared in World War I. Tank tactics may eventually resemble those of an infantry squad, using fire and maneuver, deception, and every piece of protection to destroy an enemy postion. Great masses of armor, such as those envisioned by the Soviets, will undoubtedly be a thing of the past.

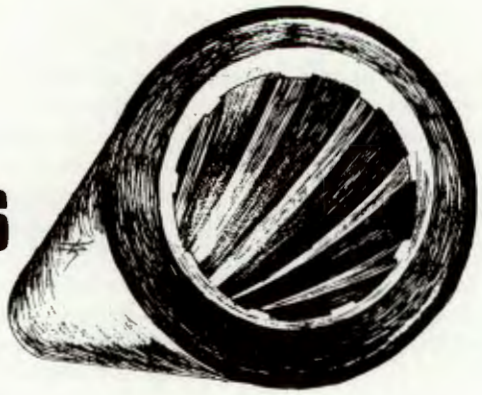
The introduction of the *Copperhead* thus promises to fundamentally alter previous methods for employing armored vehicles on the battlefield, but the tank is not yet obsolete. Its advantages of protection against small arms fire, mobility for moving across or to distant battlefields, shock action against dismounted infantry, and precision fire are as important today as they ever were. Nevertheless, when *Copperhead*-type weapon systems are widely available, the tank may never again dominate the battlefield in an unchallenged and unscathed fashion. During the first three decades of the tank's existence, its major function was to destroy enemy soldiers, machineguns, trucks, etc. Only in the latter phases of World War II did the killing of other tanks become the tank's most important function. In the future, the tank may return to its original function.

As armor officers and professionals, we must avoid parochial rejections of the new weaponry represented by the *Copperhead.* Our overriding mission is success on the battlefield, and if we closely study the *Copperhead* we can learn to use its potential for employment against enemy tanks. In a real sense, its introduction not only offers a great potential for use against enemy vehicles, but also presents the possibility for the development of a similar weapon by Threat forces for use against us. We must remain aware of technological advances, and we must be willing to modify and improve our own organizations, tactics, and equipment if we are to remain a dominant force on the battlefield of the future.

MAJ ROBERT A. DOUGHTY was commissioned in Armor from the USMA in 1965. He has served in various positions in Germany and as an adviser in Vietnam. Major Doughty holds a master's degree in history and was an instructor at the USMA in European history. A C&GSC graduate, he is currently an instructor in the Unified and Combined Operations Department at the C&GSC.

[7]For a description of chobham armor, see "Improved Chieftain for Iran," *International Defense Review,* Vol. 9, No. 4 (August 1976), p. 641; and Senator Robert Taft, "A Critical Look," *ARMOR,* LXXXV, No. 6 (November-December 1976), p. 40

Origins of Soviet Tank Guns



by Mr. Larry W. Williams and Mr. Joseph E. Backofen, Jr.

With its unique combination of protection, mobility, and firepower, the main battle tank is the backbone of the modern army. Although precision guided munitions threaten the tank's previous dominance in combat, the tank remains the major ground weapon system that must be destroyed in order to defeat a modern army.

Throughout its history, the principal threat to the tank has been the enemy tank. Other antitank systems have lacked mobility or protection or both, and their usage has required either increased firepower or a tactical advantage. In the final balance, such alternate antitank systems cannot be employed so effectively as to preclude tank-versus-tank combat. Thus, in addition to the other "softer" targets which the tank must engage, its main armament must be capable of destroying the "hardest" major target on the battlefield—enemy tanks.

The versatility and the destructive power of the large bore gun has won it the honor of being the main weapon on the tank, both historically and for the foreseeable future. In view of the issues raised by the controversy over selecting a standard gun for the tanks now under development by NATO countries, it is interesting to examine the developments which have driven the design of the guns on Soviet medium tanks.

Table 1. Evolution of the Soviet Medium Tank[1]

	WEIGHT	PROTECTION		FIREPOWER		MOBILITY		
TANK	Average Weight (tons)	Average Maximum Armor (mm.)		Main Gun Bore (mm.)	No. Rds.	Ave. Max. Rd. Speed (m.p.h.)	Horse-power	Avg. Power Wt. (h.p./ton)
		Turret	Hull (front)					
T-34/76	28.4	45,then70	45	76.2	77	30.5	493	17.4
T-34/85	32.5	75	47	85	55	31	493	15.7
T-44/85	31.9	120	90	85	56	32	510	16.0
T-44/100	34	120	90	100	34	32	510	15.0
T-54	37	210	100	100	34	31	525	14
T-55	37	210	100	100	43	31	580	15.8
T-62	37.5	210	100	115	40	31	580	15.5
*T-72**	41	?	?	125	40	?	700	17.0

*Values based on available estimates.

The Relationship of Firepower to Other Characteristics of Soviet Medium Tanks

The *T-72*, the most recent Soviet medium tank, is the present culmination of a trend toward tanks having more powerful guns while attempting to minimize penalties in terms of vehicle weight, armor protection, mobility, and the number of rounds carried for the main gun. Indeed, the data in table I demonstrate that over the past three and a half decades, the Soviets have provided increasingly more powerful guns for their medium tanks while still accomplishing the following:

- Increasing or at least retaining previous levels of armor protection.
- Maintaining desired levels of mobility in terms of speed and agility.
- Carrying ample ammunition for the main gun.
- Controlling total vehicle weight for each upgrade in protection, firepower, and mobility.

Overall, Soviet medium tanks represent a series of evolutionary design changes. However, with regard to the tank guns, the basic evolutionary pattern which prevailed for two decades was broken when the Soviets fielded a smoothbore tank gun and new munitions in 1961.

The Evolutionary Pattern

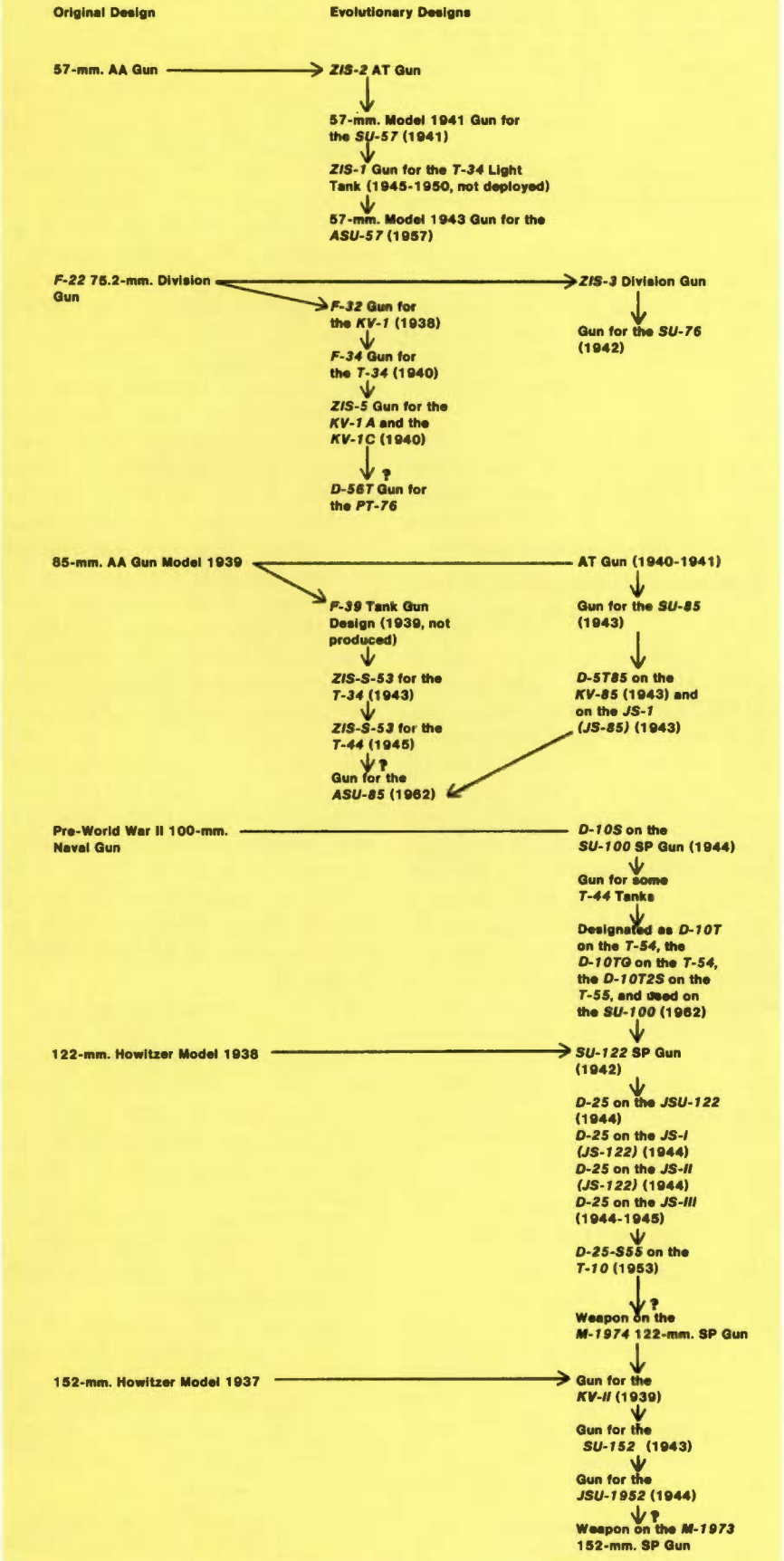
From studying the development of Soviet tank guns during World War II, it is known that the design of these guns proceeded in a directly evolutionary pattern in response to developments in German armor. The destruction of enemy armor was the prime consideration, and each iteration of German armored vehicles elicited Soviet responses in terms of improved guns on tanks and self-propelled casemated guns. As figure 1 demonstrates, there was a great deal of borrowing from and adaptations of other types of gun systems as the Soviets tried to upgun their tanks and self-propelled guns to defeat increasingly heavy German armor. Evolutionary modifications to guns and vehicles resulted in the fitting of increasingly larger guns to armored vehicles. The history of the guns used on the medium tank provides specific illustrations of this more general pattern.

The gun which was originally used on the *T-34* had been developed for the *KV-1* heavy tank. Exploiting what they had learned in the Spanish Civil War, the Soviets decided in late 1937 that they needed a more powerful tank gun. They further decided that the munitions used in the 76.2-mm. *F-22* division gun were sufficient. Even though it had not previously worked on tank guns, the design bureau at Plant 92 was

References

[1]John Milsom, *Russian Tanks, 1900-1970* (Harrisburg, Pa.: Stackpole Books, 1971).

Figure 1. The Origins of Guns Used on Soviet Tanks and Self-Propelled Guns



assigned the task of designing the new tank gun. The result was the *F-32* Model 1938, 76.2-mm. gun which was used on the *KV-1*. Building on this design, the bureau proceeded to develop the *F-34*, Model 1940, 76.2-mm. gun for the *T-34* tank. To meet the technical requirement for increased muzzle velocity, the barrel length was increased from 30 inches to 40 inches.[2]

A whole family of divisional antitank, and tank guns ultimately evolved from the basic *F-22* gun. Within this family, the commonality of parts was quite high. For example, 30 percent of the parts in the *F-34* were borrowed from earlier designs.[3]

The 85-mm. tank gun was developed from a Soviet antiaircraft gun, as was the famous "Eighty-Eight" of Germany. The 85-mm. gun was developed along two lines. The first line of development started with Zh. Ya. Kotin's *F-39* gun design for a heavy tank. Work on this design was interrupted by the German invasion and this gun was never produced.[4]

However, the plans were on file when the Germans introduced their more heavily armored *Panther* and *Tiger* tanks in 1943. Upon finding the 76.2-mm. gun on the *T-34* tank to be inadequate against these new targets, the Soviets held a competition between three 85-mm. gun designs. A design which was derived from Kotin's plans, and which incorporated features suggested by V. Grabin's Central Artillery Design Bureau (TsAKB) and designers from Plant 92, won the competition and became the new main gun on the *T-34*.[5] Subsequently, this same gun was installed on the *T-44*.[6]

The second line of development from the 85-mm. antiaircraft gun started with its adaptation as an antitank gun in 1940-1941. Based on its success in this role, F. F. Petrov's design bureau installed this version of the gun on the *SU-85* self-propelled gun, on the *KV-85* heavy tank, and on the *JS-1* (or *JS-85*) heavy tank.

The same family of munitions was

[2]P. Muravyev, "Guns for Tanks," *Tekhnika i Vooruzhenniye* (Moscow: Military Publishing House of the Ministry of Defense, USSR), No. 5, May 1970, pp. 12-13.

[3]Ibid.

[4]Ibid.

[5]M. Olevskiy, "One Hundred Thousand Guns," *Tekhnika i Vooruzhenniye* (Moscow: Military Publishing House of the Ministry of Defense, USSR), No. 5, May 1975, pp. 22-23.

[6]Milsom, *op. cit.*, p. 112.

used with all of these 85-mm. guns. It is likely that the current *ASU-85* assault gun evolved from the earlier weapons.

The 100-mm. gun used on today's *T-55* tanks can be traced to a 100-mm. naval gun that was in use prior to World War II.[7] During the war, this gun was adapted to the *T-34* chassis to produce the *SU-100*.[8] Later in response to the heavy armor on German *Panther* and *Tiger* tanks and on Ferdinand self-propelled guns, two artillery pieces were developed for the 100-mm. munitions: the *BS-3* antitank gun, Model 1944,[9] and the *D-10S* assault gun, Model 1944. After the war, the decision to upgun the medium tank led the Soviets to fit the *D-10S* 100-mm. gun to the *T-44*.[10] Subsequently, this remained the basic gun design on Soviet medium tanks until the introduction of the *T-62* in 1961.

The evolutionary development of Soviet tank guns during the war can be attributed largely to the urgency of the situation. Many guns were placed on armored vehicles which might not have been were it not for the continual upgrading of German armor. The number and variety of armored vehicles and guns combined by the Soviets between 1939 and 1945 are testimony to their frantic search for near-term responses to immediate threats. In responding to these threats, they relied on new combinations of proven technologies and hardware. The time available to them did not permit elaborate research and development programs.

Postwar Developments

After World War II, the Soviets continued to demonstrate a basically evolutionary approach to tank guns and SP guns. This is evidenced by the origins of the weapons on most armored vehicles which have been introduced since World War II. However, two important features of Soviet tank gun design practices since World War II represent departures from the wartime practices:

- The Soviets chose to retain the same basic 100-mm. gun on their medium tank from 1948 until 1961, with incremental improvements over the years.
- When they did upgun their medium tank in 1961, the Soviets introduced tank gun and munitions technologies that departed drastically from their previous design practices.

Table 2. Incremental Improvements to the Basic 100-mm Gun System on *T-54* and *T-55* Tanks[11]

DATE	TANK AND GUN	MODIFICATIONS
1949	*T-54* Gun: *D-10T*	Basic system. The drive had IR. Very early gun did not have bore evacuator.
1954	*T-54A* Gun: *D-10TG*	Elevation stabilizer. IR added for the gunner and commander.
1956	*T-54B* Gun: *D-10T2S*	Gun stabilizer in both planes.
1958	*T-55* Gun: *D-10T2S*	Two-plane gun stabilization, more stowed ammunition, factory-fitted IR.

Incremental Improvements to the 100-mm. Tank Gun

The Soviets were able to retain the rifled 100-mm. gun on the *T-54* and the *T-55* from 1948 until 1961 because there were no radical advances in Western armored vehicles and the 100-mm. gun and munitions could reach and penetrate Western armor. Another reason they could retain the same basic gun for so long was that they were able to make incremental improvements in its combat performance by upgrading auxiliary components of the basic gun system. Table 2 summarizes the modifications which gave incremental improvements in the effectiveness of the gun on the *T-54* and the *T-55*. These advances enhanced target acquisition and accuracy capabilities, while the available munitions would effectively defeat Western armor.

The Introduction of Advanced Technologies

In 1961, the Soviets departed from their evolutionary pattern by introducing a smoothbore 115-mm. gun, a long rod penetrator munition, and a fin-stabilized high-explosive, antitank (HEAT) munition for the *T-62* medium tank. In so doing, they demonstrated a capability for exploiting advanced munitions and gun technologies in order to counter Western armored vehicles. The Soviets believed it was necessary to deliver effective ordnance against modern armor at greater ranges than before. This meant that higher velocities had to be attained in order to keep the trajectories as flat as possible (so that engagement would be simplified), to minimize flight time (hence, increase hit probability), and to assure the effectiveness of the kinetic-energy penetrators. The Soviets selected a smoothbore gun apparently because the HEAT munitions required fin stabilization for their effectiveness.

On a historical note, the smoothbore gun, the long rod penetrator, and fin-stabilized HEAT munitions had all been in development by the Germans before and during World II. During and after the war, the Soviets acquired the basic concepts from the Germans and applied their own research and development (R&D) efforts. Western nations were also pursuing these concepts. For example, the United States experimented with a smoothbore gun and armor-piercing, fin-stabilized, discarding sabot penetrator (APFSDS) on its *T-95* tank in the mid-1950's.[12] However, the Soviet Union was the first and only country to standardize a smoothbore tank gun with fin-stabilized munitions. In fielding these advanced technologies on the *T-62* in 1961, the Soviets were seeking terminal effects sufficient to defeat the increased armor on the United States' *M-60* tank.

The *T-72*: What Type of Gun?

In view of the above findings, two assertions can be made about Soviet tank gun design practices.

- The dominant tendency in the past was for them to rely on proven technologies.
- More recently, they have demonstrated a capability to field advanced technologies which depart significantly from prior practices.

What does this tell us about the gun system on their latest main battle tank, the *T-72?*

For one thing, the Soviets had several options available in choosing the basic weapon. They could rely on

[7] N. Kurin, "By Decision of the State Defense Committee," *Tekhnika i Vooruzhenniye* (Moscow: Military Publishing House of the Ministry of Defense, USSR), No. 6, June 1975, p. 10.

[8] "Self-Propelled Mounts," *Tekhnika i Vooruzhenniye* (Moscow: Military Publishing House of the Military of Defense, USSR), No. 10, October 1974, p. 15.

[9] F. Kaleganov, "The Tiger's Roar," *Tekhnika i Vooruzhenniye* (Moscow: Military Publishing House of the Ministry of Defense, USSR), No. 5, 1970, p. 13.

[10] Milsom, *op. cit.*, p. 112.

[11] Milsom, *op. cit.*, pp. 112-116.

[12] Nathan N. Shiovitz, "The *T-95* Tank," *ARMOR*, Vol. 85, No. 1, January-February 1976, pp. 25-27.

the smoothbore technology from the *T-62* or go to a rifled gun. The considerations which led them to field the smoothbore gun on the *T-62* might have continued to influence their choice for the *T-72*. Even though the most advanced Western[13] tanks (with their *Chobham*-type armor) will be more vulnerable to long rod penetrators than to HEAT rounds, there will be a continued necessity for the *T-72* to fire both types of munitions. The Soviets certainly possess the technology required to use both types of munitions in either smoothbore or rifled guns. The type of gun which has been selected depends upon the tradeoffs they have made between velocity, accuracy, and bore wear. Most likely they have chosen a smoothbore gun which would yield comparatively less bore wear, higher velocities, and acceptable accuracy. The smoothbore gun would obviate the necessity to install slipping bands on HEAT munitions, and would deliver acceptable accuracy with APDS rounds.

Another option available in the selection of the gun for the *T-72* was to retain the 115-mm. bore or to go to a larger bore. Again, the decision as to bore size would depend on tradeoffs by the Soviet designers. Assuming they anticipated the introduction of advanced armor systems and improved guns on Western tanks and considering their demonstrated capability for installing ever-larger guns on medium tanks, it is reasonable to conclude that the weapon on the *T-72* is somewhat larger and more powerful than the 115-mm. gun on the *T-62*.

Even though the Soviets have been concerned with the range and accuracy of their tank guns, they have exhibited just as much concern for the performance of the associated munitions. Over the past three decades Soviet munitions designers have demonstrated great inventiveness in projectile design, both for terminal effectiveness and for achieving desired performances from rounds before they exit the tube. While further advances in warhead design can be expected, we should also anticipate innovations in terms of propulsion technology and loading. One such advance would be the use of combustible or semicombustible cartridge cases. The basic technology has already been demonstrated in the British and German 120-mm. tank gun munitions.[14,15] Several advantages might be realized with such propellant cases. One of these—the reduction of the empty case problem in the tank—would be especially appealing in designing a tank such as the *T-72* with its reduced weight and volume.

The overall picture of the *T-72* gun which emerges from this analysis is that this system departs in some ways from previous Soviet practices, but that it represents a continuation of certain general trends in the development of guns for medium tanks.

- A larger gun would be a continuation of the practice of installing more powerful guns on medium tanks without sacrificing other performance characteristics.
- The gun could be either rifled or smoothbore; either type of bore would be a continuation of previous technologies.
- Advances in warhead design can be expected since the Soviets have traditionally emphasized this area of munitions technology.
- The possible use of caseless propellants would represent a continued capability and willingness to exploit advanced technologies as was previously demonstrated by the introduction of the smoothbore gun on the *T-62*.

The developers of American tanks should be particularly attuned to the trend in Soviet tank guns and tank design in general. Even though a strong case can be made for the incremental pattern in Soviet tank design, significant departures from this pattern have occurred. And while the Soviets continue to praise the exploits of the *T-34*, that is not the level of technology which is in the field with Soviet forces.

[13]Walter Trinks, *et al.*, "Grenzen der Schutzwirkung von Panzerwerkstoffengengen Hohllandungen," *Jahrbuch der Wehrtechnik*, No. 6, 1971, pp. 46-50.

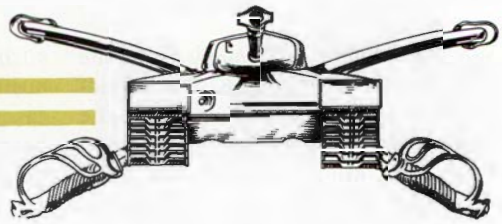
[14]R. D. M. Furlong and R. B. Penegelley, "Main Armament for the *XM-1* Tank—Storm Over of the Selection Process," *International Defense Review*, Vol. 9, No. 6, December 1976, pp. 989-991.

[15]R. Meller, "Rheinmetall's 120-mm. Smoothbore Gun—Tank Armament of the Future," *International Defense Review*, Vol. 9, No. 4, August 1976, pp. 619-624.

LARRY W. WILLIAMS is a Ph.D. candidate at Ohio State University and a political scientist in the International Studies Center, Battelle Columbus Laboratories, Columbus, Ohio. In the past 10 years, he has engaged in a variety of studies requiring an interface between the social sciences and the engineering and physical disciplines. Mr. Williams was recently involved in a study of technology transfer in tactical weapons.

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.

OPMD - EPMD ARMOR



OPMD

MILITARY PROMOTION CERTIFICATES STILL AVAILABLE

Before 1 January 1963, DA issued certificates to all commissioned and warrant officers when they were permanently promoted. Certificates were not issued for temporary promotions. The size of the Officer Corps and expense involved necessitated curtailment of this policy. From 1 January 1963 to 16 June 1972, certificates (DD Form 1A) were issued only to officers receiving permanent brigadier general and major general promotions.

Since 16 June 1972, certificates (DA Form 3877) have been available on request to all commissioned and warrant officers for both permanent and temporary promotions; however, few officers have requested certificates.

Officers may continue to request issuance of an appropriate certificate when promoted. They may also request certificates for promotion to the rank they now hold or all ranks previously held regardless of the date of promotion. If you want a certificate of promotion to your current or previous rank, write to:

- **Active duty commissioned and warrant officers**

  HQDA (DAPC-PSR-SR)
  200 Stovall Street
  Alexandria, Va. 22332

- **Retired or separated commissioned and warrant officers and reserve officers not on active duty**

  Commander
  USA Reserve Components Personnel & Administration Center
  ATTN: AGUZ-APD-P
  9700 Page Boulevard
  St. Louis, Mo. 63132

- **Active Army Enlisted soldiers holding concurrent USAR commissions or warrants**

  Commander
  USA Enlisted Records & Evaluation Center
  Ft. Benjamin Harrison, Ind. 46249

INCLUDE: FULL NAME (include middle name)
SSN:
Current Mailing Address
Current Military Status
Promotions/Dates of Certificates you want - For example: "Captain (AUS), 14 Jan 68"
Copies of the Promotion Letter or Order for each certificate (IF AVAILABLE)— these will be returned with the certificates.

FOREIGN AREA OFFICER SPECIALTY

Armor Officers who have had Foreign Area Officer (FAO), Specialty Code 48, designated as their alternate specialty are participating in a specialty whose emphasis is on political-military affairs. Foreign Area Officers receive assignments throughout the world in security assistance, psychological operations, attache affairs, civil affairs, and political-military affairs.

Developmental training includes the 6-month FAO course at Fort Bragg and functional courses in psychological operations, civil affairs, and security assistance.

Many FAO positions, but not all, require specific regional expertise. Selected officers are provided the opportunity to participate in a graduate program in area studies, in language training at the Defense Language Institute, and in an in-country training program under the supervision of the attache in the geographic region of study.

Selection for these programs is competitive and normally is limited to captains and junior majors. Officers who desire to compete for regional specialist training programs need to apply early for this training. They also must plan for professional development needs in their primary specialty to insure that the developmental goals of both specialities are fully integrated. Because some of the training programs are long, officers are encouraged to consider self-study language programs or degree completion, either full time or through off-duty education.

Graduate disciplines supporting the FAO specialty include:

Anthropology	**History**
***Area Studies**	**International Relations**
Economics	**Language/Literature**
Foreign Affairs	****Military Arts and Sciences**
Geopolitics	**Political Science**
Civil Government	**Psychology**
Military Government	**Social Psychology**
***Shortage discipline. Only subject available for fully-funded civil schooling.**	**Public Administration**
	Social Science
	Sociology

****Degree conferred by C&GSC in a political affairs concentration.**

Officers, designated as FAOs should:

- Take the Defense Language Aptitude Battery Test (DLAB), if they have not already done so. Generally speaking, 73 is the minimum standard score. For more difficult languages such as Russian, Chinese, Korean, or Japanese, a higher score is desired.
- Outline a self-study program in consultation with their career managers at OPMD.

For additional information, officers may consult DA

pamphlet 600-3, *Officer Professional Development and Utilization,* Chapter 28, and contact their respective career management divisions: (AUTOVON NUMBERS)

LTC Division—LTC W. Rodger Waldrop 221-9799
MAJ Division—MAJ James Bigelow 221-9765
Combat Arms Division—MAJ Haspard Murphy . 221-7818

NEW FACE IN ARMOR BRANCH

Captain(P) Everette L. Roper, Jr. has replaced Captain Peter J. Schoomaker as the Lieutenant Assignments Officer in Armor Branch. Captain Roper was previously assigned to the Personnel Action Section of Combat Arms Division, OPMD. He has served in a variety of Armor and Cavalry units overseas and in CONUS. Captain Schoomaker has assumed new duties within Combat Arms Division.

FLIGHT SCHOOL QUOTAS

During FY 77 the Combat Arms Division of OPMD received and filled a total of 106 flight school quotas. FY 78 quotas were increased to 226. Some quotas for classes starting late in the fiscal year are still available. FY 79 will see an increase to 310 quotas.

The extremely stiff competition for flight quotas during recent years may have discouraged some well-qualified potential applicants. If you are interested in flight school—read on!

All qualified officers desiring to attend flight school should apply as shown in AR 611-110. Selections are made from the "best qualified" applicants with demonstrated manner of performance being the primary consideration. Prerequisites include:

- Have less than 60 months Active Federal Commissioned Service upon enrollment.
- Be able to meet standards of a Class IA flight physical (Graduates of U.S.M.A. Flight Program and ROTC Flight Training Programs require a Class II Physical).
- Have a minimum score of 155 on the composite FAST-OB test. (For officers who completed the AROTC Flight Training Program in college, DA Form 2220).
- Have served a minimum of 1-year of troop duty.
- If USAR, be in a Competitive Voluntary Indefinite (CVI) status.

Additional information concerning eligibility and applications may be obtained from Mrs. Jean Arnold, Aviation Management Office, Company Grade Combat Arms Division, AUTOVON 221-7818/19/20.

AVIATION GATE STATUS REPORT

Aviators with less than 12 years aviation service or those who meet the requirements for the 12- and 18-year "GATE" will be entitled to continuous incentive pay, regardless of the position they occupy. At 12 years of aviation service, aviators must have 72 months of operational flying credit and at 18 years of aviation service, they must have 108 months of operational flying credit for flight pay eligibility through 22 years of total federal officer service, or 132 months for pay through 25 years of total federal officer service. Aviators who fail to meet the gate requirements will be eligible for monthly flight pay only while occupying an operational flying position. The Aviation Gate status determinations for January 1978 have been completed and flight pay transmissions made to the U.S. Army Finance Center, Fort Benjamin Harrison. A breakdown follows:

18-Year Gate	12-Year Gate
23 passed	42 passed
6 failed	8 failed

EXCEPTIONS TO DA STABILIZATION POLICY

The DA stabilization goal in CONUS is a minimum of 36 months on station prior to reassignment. Due to the dynamic nature of the Army's requirements, some company grade officers who have completed the advance course and a successful command may be required to move after only 24 months.

EPMD

SECONDARY/ADDITIONAL MOS — CMF 19

On 1 March 1978, all armor soldiers in the force will be reclassified. It is anticipated that your primary military occupational specialty (PMOS) will be awarded based upon your current position. Make sure your records show your particular qualifications so that the Enlisted Master File at HQDA can be updated prior to the March conversion. This will assist assignment managers in correcting MOS imbalances in the armor force. Other armor MOS's must receive priority over non-CMF 19 specialities in the award of a secondary and additional MOS to armor soldiers. If you have a secondary MOS in another CMF, you should request that your personnel manager redesignate that MOS as an AMOS, and concurrently award you an armor SMOS. Make sure that the SMOS does not merge with your PMOS at Grade E7 or below, e.g., with a PMOS 19D one could not be awarded a SMOS of 19G or 19H.

With military requirements both in CONUS and overseas, and soldier assignment policies being what they are, we have been required over the years to cross-train our tankers and reconnaissance specialists on more than one weapon system. Lets not lose those skills — label them his SMOS and/or AMOS.

The benefits of having other armor skills designated as SMOS and AMOS are twofold: first, it allows DA greater flexibility in filling worldwide armor requirements; second, it provides the soldier with a better chance of being assigned to his area of preference. For example: a SSG E6, PMOS 19J (*M-60A2*), SMOS 19E (*M-60A1*) and AMOS 19G (*M-551*), has a preference on returning from overseas, to be assigned at Ft. Carson, Colorado. Although there would be no requirement for a 19J30 at Ft. Carson, there are requirements for 19E30 and 19G30. This helps the assignment manager fill the requirement and aids the soldier in receiving an assignment to his CONUS area of preference. This will make assigning the armor soldier a smoother operation and also provide a happier soldier. ▲

U.S. ARMY

What if they canceled the Army?

What if they...painted all the GOER's yellow and sold them to construction companies?

...gave all the tanks to museums?

...turned all the Fort Hoods into national parks?

...converted the National Guard Armories into recreation centers?

...made civilians out of 750,000 soldiers?

...recycled all the paperwork to make children's books?

Would all of this be any worse than "if they gave a war and nobody came"? Or if they "gave a war" and nobody *qualified* came?

That's where we're headed! When the mechanics don't mechanic, the clerks don't clerk, and the leaders don't lead, then if they do "give a war," nobody worthwhile shows up!

Each of us has a job to do...tankers move, shoot, and communicate, infantrymen close with and destroy, mechanics keep the machinery running, clerks keep us paid and promoted on time, and sergeants and officers keep the system running and plan for its future.

That system is a complex and difficult thing to keep in balance. It doesn't take a saboteur to slow it down or stop it. It takes little more than a tanker who forgets to close the oil fill cap on his tank, an infantryman who drops a TOW missile, a clerk who drinks coffee instead of typing the duty roster, or an officer who fails to check on training.

If the system is so easily put out of whack, why do we bother to work so hard to keep it going? Can we live with the consequences of foreign domination and defeat by default because we couldn't fight? If so, we don't have to worry about all the hassle of buying, maintaining, and training the system. If we can live with the results, then why not cancel out the Army?

The answer is...we can't live with the results. But it's too easy to trap ourselves by saying that someone else will do what we don't or will cover for us. The "system" will get it done.

An army system any less than the best we can make it is as bad as not having the system at all. If the system depends on its parts (soldiers, machines, plans) to get something done, and it isn't done, what have we got? We have something as useless as a watch without hands, a baseball team without a pitcher, or an airplane without wings.

The important part of the system is the soldier. All of the services, machines, and plans are useless unless the soldier does his or her part. And that part is fixing, or shooting, or typing...whatever the job at hand is. And doing the job correctly, efficiently, and quickly. An unsecured flank is as bad as not ordering the right parts or bringing the chow out to the field too late.

The consequence of these errors is that the system doesn't work properly. That's as bad as not having the system at all, because the job doesn't get done.

Our job is the defense of the nation. Do we break out the yellow paint or do we get to work?

Reprinted from an editorial in the Cavalier, the 1st Cavalry Division newspaper, by Major Wayne Munson.

BINARY MUNITIONS

Critics of the U.S. chemical warfare (CW) program have often drawn attention to the small research and development effort conducted in that area. The subject of chemical warfare is so volatile that it draws great media attention whenever there are new developments or events in the public domain.

Although the Army is convinced that binary munitions offer many advantages, there is no intention to produce any binary munitions at this time. The Army has requested funds to construct a binary weapons production facility to be ready should such munitions be required. Further congressional approval would be required before any production could begin.

The United States has quite rightly attempted to elimi-

nate the risk of chemical warfare. The Army, which would undoubtedly bear the full and direct impact of a chemical attack, certainly has the most at stake in eliminating the possibility of chemical use. The best guarantee against the employment of chemical warfare is a credible chemical deterrent and this deterrent would be significantly enhanced by the capability to produce binary chemical munitions.

People fear chemicals because they fear anything not detectable with the five senses. This is the fear of the unknown. Public misunderstanding about CW causes public opinion to be negative about anything that has to do with the subject. Popularizations about World War I, visions of gas chamber executions, and great industrial disasters work to create a general climate of mistrust and suspicion.

The Army has been working to alleviate the danger of accidental contamination by reducing the vulnerability of the chemical munitions. The old stockpiles of obsolete nerve and mustard gases are being destroyed or detoxified. Newer munitions are inspected frequently for safety and serviceability. But the most significant improvement in the safety of chemical weapons will be the binary munition.

The binary munition offers a major advance in safety over current lethal chemical munitions. It consists of two non-lethal components in one casing separated by a membrane. They remain separated and harmless until the round is fired. Upon firing, the membrane ruptures and the two components mix to form a lethal nerve agent.

The two components of the munition are not stored together. They will not be adjacent to one another until loaded into the projectile near the gun site at a forward combat location. The projectile is completely safe even from accidental detonation up until the time of firing.

Binary munitions are not a new and bizarre creation of science as some critics have maintained. They do not pose a threat to international peace and stability as others have charged. Rather they reduce the hazards normally associated with the manufacture, transportation, storage, and disposal of the current family of lethal munitions.

Extracted from DA Spotlight, March 1977.

REFUELING

We have talked about, written about, and expended a great amount of effort on deciding how we are going to win the first battle of the next war. But in all of our talking, writing, and expenditure of effort, we seem to have overlooked one rather important point—we are going to encounter a lot of problems in refueling the combat vehicles of our mechanized infantry battalions when they operate in a battle area. I shouldn't have to say this, but . . . a mechanized army without fuel loses its mobility, and without mobility a mechanized army loses a lot of its combat potency.

As I see it, this is our problem. Today, a mechanized infantry battalion has only two *M-559,* 2,500-gallon fuel tankers (commonly called GOER's), and one 5-ton, 1,800-gallon tanker with a one-and-a-half-ton trailer. (Although the GOER vehicles are the subject of some controversy, in all probability they will continue to be used as the mechanized infantry battalion's primary tankers for the next decade.)

That same battalion has 146 vehicles which use diesel fuel, plus another 29 gasoline-powered vehicles. Of the 146 diesel-fueled vehicles, 87 are *M-113A1's,* all of which (under ideal conditions) we can expect will be in a battle area.

If we consider just the 87 *M-113A1's,* each of which holds 95 gallons of diesel fuel, the most diesel fuel the battalion will need at any one time will be 8,265 gallons. Since the battalion's organic fuel tanker capacity is 6,800 gallons, this should be sufficient to handle most refueling situations — if all of the tankers are available. The battalion's refueling problems could be compounded, of course, if a tank company were attached.

With only three tankers, though, a battalion is going to find it quite difficult in a combat situation to refuel its vehicles. The loss of any one of the three would have a devastating effect on the unit. And that could easily happen, for the GOER's are extremely vulnerable to destruction because of their large size, unmistakable configuration, noise signature, lack of armor, and low speed. They are simply too large and too vulnerable to move about in a combat area, particularly if they are used to refuel those mechanized vehicles that are committed along the forward edge of the battle area.

Since the GOER tanker is not an acceptable vehicle to use in a battle area, I suggest we supplement it with *M-113A1's* converted into fuel tankers by turning their troop-carrying compartments into fuel pods.

While the converted *M-113A1's* could carry relatively small amounts of fuel, they could operate in conjunction with a GOER so that the latter would never have to go all the way forward. For example, a GOER could stop in a covered and concealed position a mile or so behind the battle area while an *M-113A1* tanker platoon could carry the fuel from that location to the foremost units.

The *M-113A1* tanker would provide some armor protection; it would be difficult for an opponent to distinguish from any other *M-113A1;* it could go anywhere any *M-113A1* could go, and it could travel at the same speed; and it would be relatively inexpensive to refit.

Refueling is of critical importance to our mechanized infantry battalions, and I don't think our present refuelers can do the job. By converting some of our *M-113A1's* to fuel tankers, we can overcome a number of our problems in this area and retain our mobility on the battlefield.

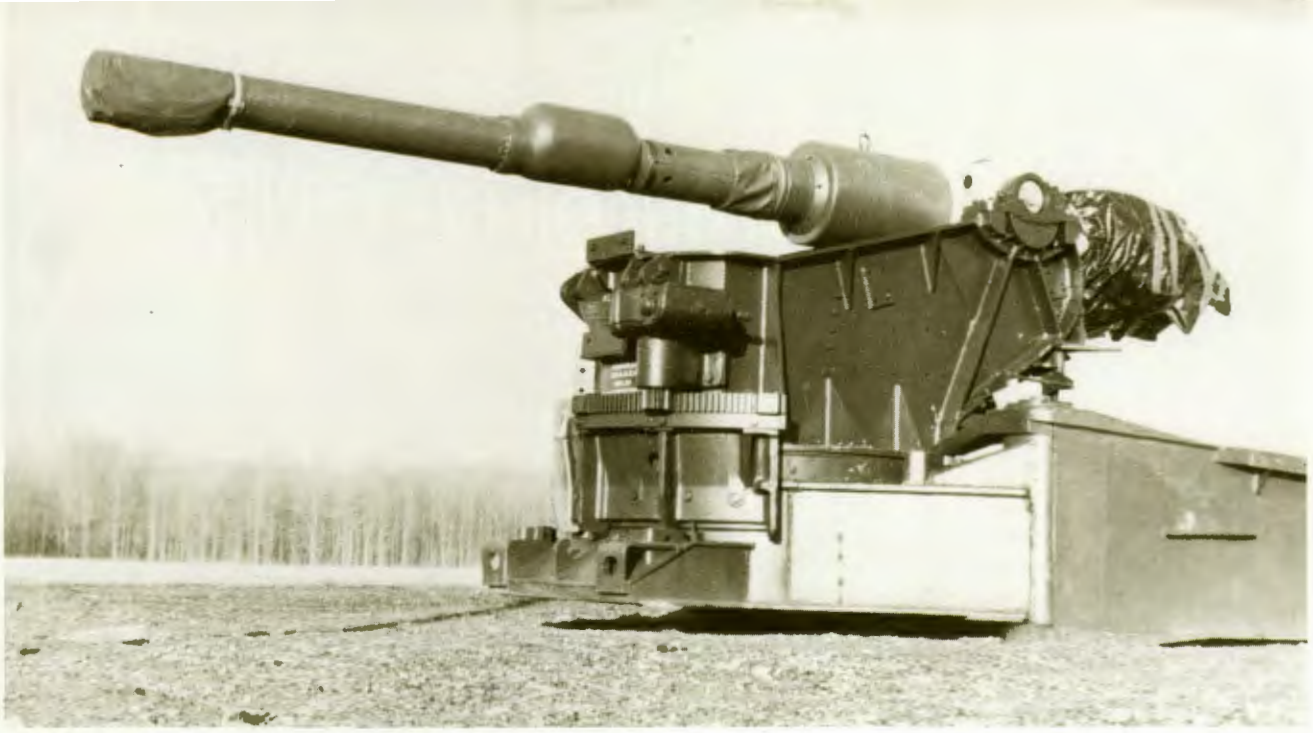
Reprinted from an article by Captain Donald S. Stewart in the Infantry Journal.

NOTES

WWII UNIT RECEIVES AWARD

The 761st Tank Battalion was awarded the Presidential Unit Citation "for extraordinary heroism in action against the enemy" during the period of 31 October 1944 to 6 May 1945. The award was made by President Carter on 26 January 1978.

During 183 continuous days in battle without relief, the predominately black battalion inflicted high casualties and equipment losses on German forces despite adverse weather conditions and problems in resupply peculiar only to a dispersed unit attached to several other units. The battalion was a major participant in the Allied thrust which drove across France, Belgium, and Germany and culminated in a link-up with Soviet forces in Austria. Fighting both as a separate battalion and as company-sized elements dispersed among numerous larger units, the 761st conducted major assaults on over 30 towns across Europe.



120-MM. GUN FOR *XM-1*

The Army will begin testing for adaptation the German-designed 120-mm. smoothbore gun for the *XM-1* tank, Army Secretary Clifford Alexander announced recently.

If development efforts are successful, *XM-1* production with the 120-mm. gun could begin in 1984.

Changes to the *XM-1* will include a new gun mount, modifications to the fire control and gun turret drive, relocation of many components, and different arrangements for ammunition storage.

The altered tank will still have a four-man crew.

Estimated research and development costs for the gun, ammunition, and integration into the *XM-1* system is $142 million, officials said.

The gun and breech will be produced at Watervliet Arsenal in New York. Chrysler, prime contractor for the *XM-1*, will manufacture the mount and recoil system. No decision has been made on the ammunition manufacturer, although it will be a U.S. company.

The German system, chosen over designs from firms in the United States and Great Britain, will not be refitted into *XM-1* tanks with 105-mm. guns.

FIRST *XM-1* PILOT MODEL

The first of 11 pilot production models rolled off the *XM-1* assembly line recently.

Developmental and operational testing of these 11 vehicles will be conducted at Ft. Bliss, Tex., Aberdeen Proving Grounds, Md., and Ft. Knox, Ky. during 1978.

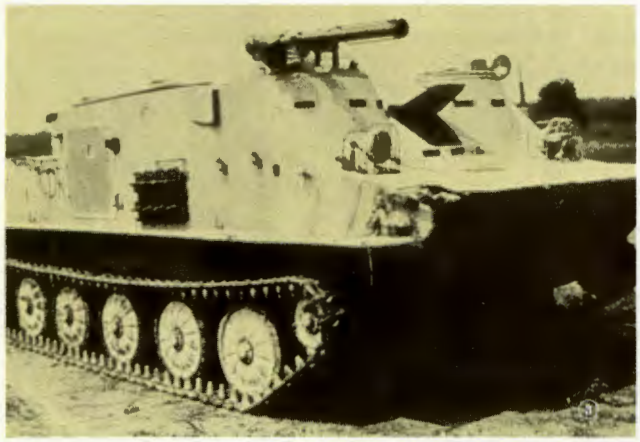
The above photo shows the redesigned turret mounting the 105-mm. gun.

A detailed examination of the *XM-1*, including several pages of technical data and new photographs, will appear in the May-June issue of *ARMOR*.

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)



BOOKS

SYMBOL, SWORD, AND SHIELD by B. Franklin Cooling. Archon Books. 1975. 300 pages. $12.50.

By limiting his topic to the defense of Washington, B. Franklin Cooling has artfully created a place for his work on the Civil War among the thousands of books already filling library shelves. The capitol city, from the start of mankind, has been a critical objective. Mr. Cooling centers his account on Washington to trace the construction of its defense system and to show how it influenced the movement of the Union Armies.

Today's urban sprawl makes it difficult to imagine the problem that the defense of Washington presented to the U.S. Army Engineer charged with the construction of a viable defense system under the guns of a hostile force along the Arlington Heights. The book traces the construction efforts that were slowed due to lack of interest and funds. The dedication of one man drove the construction of over 60 forts and 93 batteries which housed 762 cannons and 74 mortars. This defense system was never seriously challenged, but it held down at least 30,000 men throughout the war and cost millions of dollars.

Every movement by the Confederates toward Washington resulted in a countermovement by the Union to protect the capitol. One can only wonder how much shorter the war would have been had Grant's strategy of defeating Lee's Army been adopted earlier. Since even Grant was forced to return forces to defend Washington the question becomes moot. *Symbol, Sword, and Shield* is a book of great interest and value to the Civil War buff.

Colonel C. A. Mitchell
C&S Dept., USAARMS

RANK AND FILE by James I. Robertson, Jr. and Richard M. McMurry. San Rafael, Calif. Presidio Press. 1976. 164 pages. $8.95.

Bell Wiley is a noted professor and prolific author among whose literary accomplishments was describing in his own words, the common soldiers' lives during the Civil War. His *Life of Johnny Reb* and *Life of Billy Yank* are classics in the Tolstoy vein. He was also an outstanding teacher at Emory University, where for a quarter of a century, he taught aspiring historians. So it was perhaps natural that several of his former students, now professors in their own right, should prepare this collection of essays in his honor, attempting to follow his lead in meticulous research and straightforward, vivid description.

This slim book contains seven essays on Civil War characters, but they belie the title. Three concern politicians. One describes a senior general, and another a hapless political colonel. One describes a chaplain, and one the rich industrialists who didn't fight. They hardly resemble Wiley's common troops. Nor does the writing resemble Wiley's. The authors are careful historians. Each essay is heavily footnoted, but the writing is unimaginative and pedantic. The essay on the chaplain comes closest to catching the reader's interest, but the lot falls short.

The prefacing biographic sketch of Wiley notes "...I never saw anything any bloodier than one of my dissertation chapters after Dr. Wiley's red pencil had done its work!" Bell Wiley would have had a field day with this book.

Colonel (Retired) John R. Byers

SHATTERED PEACE — THE ORIGINS OF THE COLD WAR AND THE NATIONAL SECURITY STATE by Daniel Yergin. Houghton Mifflin Company. May 1977. 526 pages. $15.00.

Potsdam, Yalta, Fulton, and Berlin are names which are better known in the west for the conference, speech, or event that took place there than for their geographical location. While these events have been documented in the personal memoirs of many of the participants, the results or impact of these events still have various interpretations. Daniel Yergin, who received his Ph.D in International Relations at Cambridge University in 1974, takes advantage of the 30 years passed since these events to translate them from current events to history.

Dr. Yergin's book traces and evaluates U.S. and Soviet relations from the time of U.S. recognition of the U.S.S.R. in the late 1930's through World War II to the beginnings of the Cold War. He does this by evaluating what he calls the Riga and Yalta axioms. Stated simply, the Riga axioms are based on the Wilsonian tenets of internationalism and the Yalta axioms are founded upon a recognition of a world balance of power.

This book is written in the style of the Durants and is heavily referenced, giving the reader the impression that he is witnessing the events himself. In this regard, the reader is cautioned by the author at the outset, "The policymaker and the historian see events from different perspectives, for they have different obligations. The policymaker's duty is to his policy, to minimize the risks it faces in the world. He must look to the future. The consequences of his errors, unlike those of the historian, can sometimes have immediate impact on the lives of millions." Dr. Yergin records the policymaker's actions in a remarkable way. He does this in such detail that the current policymaker can surely learn from what has already taken place.

Dr. Yergin further cautions us that his book is not for those who want a simple story, a morality play, a confirmation of prejudices, or a rationalization for or against present day policies. He hopes that his narrative will enable us to penetrate the myths and the policies so that we might learn how and why the confrontation between the United States and the Soviet Union came about—not as people have chosen to remember it, but as it really happened. He has succeeded.

Colonel C. A. Mitchell
C&S Dept., USAARMS

AUSTERLITZ: 1805 by Christopher Duffy. Hamden, Conn.: Archon Books. 1977. 194 pages. $14.50.

The Battle of Austerlitz was the first, and some would say the greatest victory of Napoleon's *Grande Armee*. Although not an extremely large engagement nor one of exceptional carnage, it was historically decisive. Napoleon marched on to Vienna and imposed a settlement upon Austria extracting great territorial concessions. The map of Europe was decidedly altered. This was the peak of Napoleon's power. He defeated the Prussians in 1806 and the Russians again in

1807, but neither victory rivaled the glory of Austerlitz. Beyond its historical significance, Austerlitz has been immortalized by Leo Tolstoy's epic narrative, *War and Peace.*

Russian, Austrian, and French participants immediately began to examine and analyze the battle. Several studies emerged throughout the 19th century, but none matched the vivid impact of *War and Peace* completed in 1896. New discoveries and perspectives on the battle appeared in the 20th century, but the focus tended to remain narrow, treating the battle as a classic example of Napoleonic warfare. Christopher Duffy's study is the first comprehensive examination utilizing new Austrian and Russian archival material to present the viewpoint, the strategy, and tactics of the vanquished as well as the victor.

The author is eminently qualified for the task. Senior Lecturer in War Studies at the Royal Military Academy at Sandhurst, author of several books on Tactical Warfare of the 18th and early 19th centuries, and editor-in-chief of the *Historic Armies and Navies* series, he specializes in military history of 18th century Germany and of the Napoleonic era. The book is well researched, suberbly organized, and tightly written. Numerous diagrams, maps, and illustrations add to the narrative. For all its merits, the book will not have a large audience. It is written primarily for the military buff. For students of tactics and strategy of past centuries, it will be delightful reading.

Dr. Joe P. Dunn
Director of International Affairs Program
Converse College
Spartanburg, South Carolina

STRATEGIC SURVEY 1975. The International Institute for Stragetic Studies, 18 Adam Street, London WC2N 6AL. 130 pages. $4.50 (soft) and $16.75 (hard—the hardcover edition is published by the Westview Press of Boulder, Colorado).

STRAGETIC SURVEY 1976. 134 pages.

The highly respected International Institute for Strategic Studies is perhaps best known for its widely referenced annual volume, *The Military Balance,* which provides reliable data on the military establishments of all the nations of the world. In contrast to the definitive *Military Balance, Stragetic Survey* treats only the most serious problems in international affairs for the year in question. The essays in each volume will range from geographical foci, such as "Asia after Vietnam" in the 1975 edition, to broader topical issues, such as the proliferation of nuclear weapons in the 1976 edition. Each volume is introduced by a chapter which succinctly overviews international developments for the entire year. A useful chronology (organized geographically) is provided, unfortunately an index is not.

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

Characteristically, *Strategic Survey* is terse and staid, and unfortunately sometimes rather colorless. Despite the dry style, this publication should be a key source for those who would like to delve further into international affairs than the daily newspaper allows. For the reader with deeper interests, *Strategic Survey* is an intelligent entree into a number of complex problems.

As an example of the treatment provided, pages 81-89 of the 1976 edition treat the Middle East. The chapter begins with a discussion of relations among the Arab states. It then treats the Israeli position in the Arab-Israeli conflict, and regional diplomacy. The conflict in Lebanon also receives careful attention, as does the regional role of Saudi Arabia. In a mere eight pages, the reader is provided a pithy and intelligent essay that is far more informative than many journalistic accounts.

In summary, the *Stragetic Survey* is highly recommended as an addition to any serious soldier's reading list. It deserves a place in any military-science-related library.

Major A.R. Norton
University of Illinois

RECOGNITION QUIZ ANSWERS

The answers for this issue's quiz are:

1) **SOVIET Mi-6 Hook** (has 2 machineguns in nose, 5-bladed rotor, elevated tail and tail rotor)
2) **U.S. LVTC-7** (U.S.M.C. command/communications amphibian vehicle. Photo provided by 1LT Ronald L. Robinson, U.S.M.C.)
3) **SOVIET (CZECH) OT-62** (has mini-turret with 7.62 machinegun and 82-mm. recoilless gun, 6 roadwheels, flat sides, top, step-down rear deck)
4) **SOVIET PT-76** (cone shaped turret, flat rear deck)
5) **U.S. A-4 Skyhawk** (attack bomber, used by U..S Navy and Marine Corps, Argentinian forces, Australian Navy, Israel, New Zealand and Singapore. Early versions without pronounced dorsal hump.)
6) **SWITZERLAND Mowag Piranha 6x6** (has 20-mm. gun turret)

☆ U.S. GOVERNMENT PRINTING OFFICE: 1978—757-126/6

Coming in ARMOR

"TARGET—CEASE FIRE!"

A proud gunner tells how good training, unit pride, and motivation brought honors to his cavalry troop and particularly to his platoon.

"A NEGLECTED RESPONSIBILITY"

In his discussion of combat service support, Captain John R. Drebus suggests that, "Should the combat arms community continue its level of logistics disinterest, TRADOC and the service schools should force-feed the supposedly distasteful subject."

"TAILORING FOR TOW"

"TOW is not just a qualitative change," says Lieutenant John J. Midgley. "It is a different breed of tank killer with characteristics that require a fresh approach to its employment."

"MORE ON CAMOUFLAGE"

Major William Emerson describes mechanical devices that can be used to affix natural camouflage and disruptors to the M-60A1 tank to improve the effectiveness of pattern painting.

"IMPROVING TOW TRAINING"

A squadron S-3 and a master gunner present a design for an inexpensive, reliable, performance-oriented TOW training aid.

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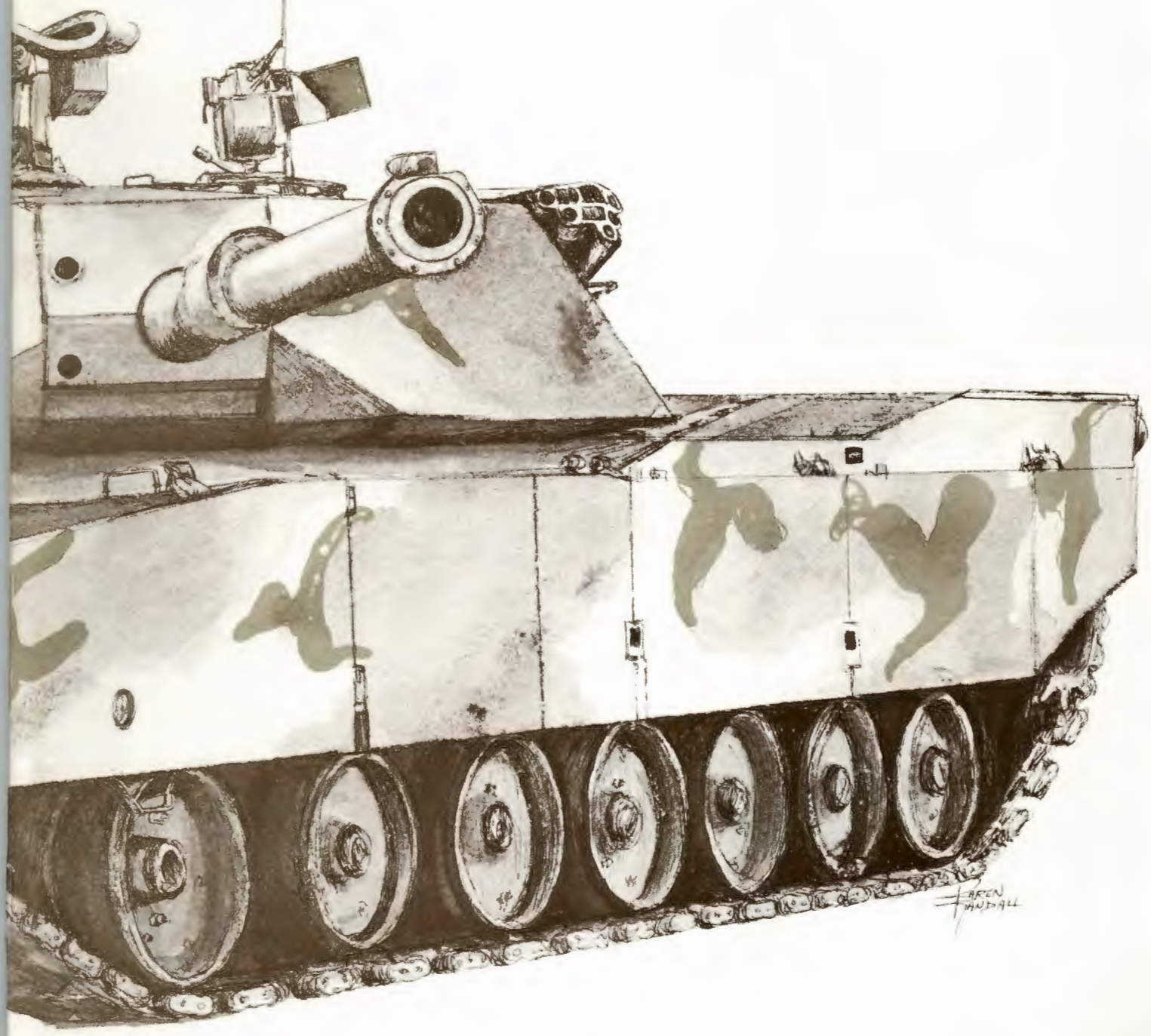
ARMOR

may-june 1978



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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."

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the Magazine of Mobile Warfare

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LETTERS

Fire Support

Dear Sir:

The Redlegs are on the move. In my quest for new members, I asked a good friend, Major General Charles P. Graham, Commanding General, 2d Armored Division, to join the Field Artillery Association.

He replied that he would if I joined the Armor Association. As the President of the Field Artillery Association, I respectfully request a membership application.

JAMES W. WURMAN
Colonel, Field Artillery

On the way!- ED.

Mask Clearance

Dear Sir:

After reading the article, "Gunner—Take Over!" in the January-February issue of *ARMOR*, I recalled an incident on Battlerun-North at the Bergen-Hohne Ranges in 1955 which left a young tank commander very red-faced. As a result of this, I believe some revision is necessary in the procedure outlined in the article.

The procedure described in the article was followed for one of the firing points on the battlerun. When the round was fired there was a cloud of dust and a tracer trail rising skyward. After the run, I researched what went wrong by going to the FM 17-12 of that day and found that my procedure should have been waiting until the gunner commanded "Driver, Stop," then checking the clearance to mask by sighting along the bottom of the bore before firing.

ROY D. NELSON
Command Sergeant Major (Ret.)
Severn, Md. 21144

The Right Idea

Dear Sir:

Thank you for Lieutenant Colonel Andreacchio's fine article on the new Division Restructuring Study (DRS) Armor battalion. He ably expressed many of the reservations I and many people I know have expressed. I have felt for some time that the three-tank platoon smacked a bit too much of faddism. The Israelis and the Russians use the three tank platoon, and look at their results; we must have it also!

Being a Cavalryman rather than a tanker, I might be missing some of the subtleties of this new type battalion, but I have noticed the tankers in the squadron's tank company refer to the three-tank platoon and the DRS battalion in tones of voice usually reserved for reference to the ideas of hopelessly deranged persons. Many of these NCO's, staff sergeants and platoon sergents, seem to cynically pass off the DRS battalion as a scheme to increase the number of officer command slots in the Army.

Little faith in any test of the DRS battalion is being expressed. Most tankers I have talked to feel that any "test results" that come out of the test will be "adjusted" for one reason or another until the DRS battalion is "proven." We've already seen this type of adjustment in the *Gama Goat*, the GOER, and the Conceptual Cav Platoon.

TRADOC and the DRS Group will have a hard time retaining the confidence of the Army's fighting soldiers unless they can convincingly present their reasons for this drastic and, to many eyes, unwarranted change to the Army's tank battalions.

PETER L. BUNCE
Staff Sergeant
APO N.Y. 09330

AH-64 Addition

Dear Sir:

I read the January-February issue of *ARMOR* with considerable interest, especially Lieutenant Colonel Funk's article on the *AH-64*. I share his concern about the all-weather 24-hour capability of our weapon systems. I am in no way a part of the Air Force *A-10* development program; however, I am in munitions development and therefore, am concerned about its limited all-weather, all-night capability (my opinion). I have suggested that a quick-change, pod-mounted weapon delivery system be developed for the *A-10* to provide it with a tank "find and kill" capability. I feel that the suggested quick-change pod concept would reduce down time, permit a smaller buy of expensive weapons delivery systems (can actually increase total system buy because all new aircraft dollars can be spent on aircraft), and would increase overall capability due to its modular concept. I believe that this pod concept, which I have named Advanced Digital Avionics Pod System (ADAPS) is an appropriate concept for advanced systems like the *AH-64*.

WALTER G. SMITH
Eglin AFB, Fla. 32548

Praise

Dear Sir:

I continue to admire and enjoy *ARMOR* magazine, and must admit the other branch magazines do not even come close in content, audience appeal, format, and quality. Keep up the good work!!

GERALD T. CECIL
Major, Infantry
APO NY 09827

Bravo

Dear Sir:

Regarding A.W. McMaster III's comment in "Soviet Armor: A Study in Efficiency" (January-February 1978) that touting the superiority of the *XM-1* to the *T-72* is really "comparing the future with the present, the operational with the design model"—I can only say Bravo!! All too often, it seems to me, we are ready to crow over the excellence of weapons which our armed forces have yet to field over the quality of systems which the Soviets have already produced in quantity.

A system like the *XM-1*, no matter how it reflects state-of-the-art technology, is of no worth until it is produced, fielded, and serviced by personnel who know how to make it work. The old watchword which stated that NATO quality would overcome Warsaw Pact quantity is rapidly being turned into a truism.[?] The threat is producing large numbers of high-quality weapons, whether you are speaking about tanks, attack helicopters, or artillery.

As a civilian observer, I am hard-put to understand the motives and direction of our armored forces. The shrill-voiced resistance of the defense community to developing common components between the *XM-1* and the *Leopard* (let alone the possibility of adopting the *Leopard* as our MBT) also relates to the greater picture of what our commitment to NATO means in terms of seeking commonality in equipment with our allies. All too often in recent years American military publications have talked about "winning the first battle of the next war" at disadvantageous odds as if the U.S. Army would stand alone in Europe. It seems to me that this attitude is a return to the days when America controlled NATO simply because she was the least scathed by World War II and was therefore the alliance's major supplier. Can we afford a return to this stance? I think not.

I am well aware of the difficulties involved in producing new weapon systems in our free

society, whose checks and balances (and lobbies) place great stress on the delivery of effective and much-needed weapons. However, this does not justify the production of weapons which look great on the drawing board, but which are outclassed by the time they reach the field.

ROBERT E. STONE, II
Ann Arbor, Mi. 48104

Help!

Dear Sir:

I am a subscriber to your excellent magazine *ARMOR,* but have misplaced my records and do not remember when my current subscription expires. Could you please send me this as I would like to renew soon enough to avoid missing an issue. Thank You.

EARL ADAMS
Winnipeg, Manitoba,
Canada R3L1B6

This is just one of many exactly like this. Information concerning subscriptions should be addressed to: U.S. Armor Association, P.O. Box O, Ft. Knox, Ky. 40121 **-ED.**

"Dual-Tex"

Dear Sir:

I found Major O'Neill's article "Dual-Tex Camouflage Pattern" highly professional and most interesting. Yet, certain comments need to be made.

In deference to the MERADCOM pattern, other factors favored its adoption besides its effectiveness, which Major O'Neill does not question. One is its adaptability at the user level to any terrain/climate or changes thereto. With the same pattern and a change of one or two colors the camouflage scheme can be made suitable for any location. Second was its ease and speed of application by troop labor without special tools or extensive training. Although I do not doubt the effectiveness of Dual-Tex, I wonder if it meets these important qualifications.

Additionally, it is pointed out that the MERADCOM pattern's problems were due not to pattern design, but to execution by commands. Would Dual-Tex solve this, the true problem? I have observed highly effective MERADCOM camouflage in both the desert and forest, when properly planned and applied. I have also viewed it abused and dangerously ineffective. A change of pattern will not solve the basic problem. Only education and a continuous sound application of camouflage principles can help.

Commanders have staff specialists to advise on other vital and technical matters, so why not on camouflage or better "countersurveillance and counter target acquisition"? A staff officer trained in camouflage and deception who can advise and guide the command's efforts would be a decided improvement. These duties might logically be assigned as a task for the intelligence officer, if he could be trained. While that training and direction are lacking, so to will be the quality and effectiveness of the United States Armed Forces' countersurveillance effort.

S.W. MILLER
Captain, USMC
Twentynine Palms, Cal. 92278

Words with Impact

Dear Sir:

The July-August 1976 issue of *ARMOR* contained an article by Major Bill Highlander and me, "Writing a Readable OER." There followed an exchange of letters concerning the merits of our guidance on OER writing.

Some cited our techniques as undesirable! That is a matter of opinion in the eyes of the viewer, whoever he may be. But the fact remains, the article alerted the "total force" to how really important writing is in our profession.

If Bill and I were to write our article again, I think we'd press harder on a different theme. The key factor in any OER narrative is *"ENTHUSIASM"* or lack thereof. A lack of enthusiasm can detract significantly from a report which otherwise would be of good quality. Enthusiasm requires clear, colorful, meaningful writing. It requires complete dedication to the writing art. Our suggested use of capitalization, skipping spaces, underlining, using quotation marks, etc. was not meant to be a substitute for good solid writing. Big words—NO; words with impact—YES. Trite phrases—NO!

It is my observation after 21 years service that the Army has a very small number of "writing artists." I was told early on in my career to develop skills in that area and I'm still developing. Writing is easy for only a very few individuals, but it can be developed. I will offer one item as a stimulant to those who look for indicators of success in our profession. I have never known a general officer who was not talented with his pen!

JOHN C. BAHNSEN
Colonel, Armor
Ft. Rucker, Ala. 36362

ARMOR Subjects

Dear Sir:

For several years now, I have been reading and enjoying your very fine publication.

As you have no doubt realized, there are many current books about Armor that conflict with each other on details. Not having any access to current knowledge leaves me somewhat in the dark concerning these areas. As military personnel, you may not know what it feels like to be in this predicament (then again maybe you are all too aware of it) because you are constantly receiving information much faster and more accurately than I am. My desire to know all I can falls squarely on the shoulders of the one publication I can trust, *ARMOR*.

I am writing to inquire about the feasibility of *ARMOR* doing an article or series (like General Starry's "Tank Design: Ours and Theirs") about the new AFV's of the Soviet Union, and perhaps the major nations of the world.

I wish to again congratulate you on a fine magazine that has brought me many hours of interesting reading, and the sincere desire that you not forget us less educated, but not necessarily less enthusiastic, civilian armor buffs who look to you as the sole source of new and reliable information concerning the fluid world of AFV's.

REV. GARY W. BROWN
Fredricktown, Ohio 43019

***We will continue to print articles about other nation's Armor as they become available.*—ED.**

Mounting for Telfare

Dear Sir:

In reading Lieutenant Colonel Racine's article on subcaliber training devices in the January-February issue, I noted the picture of the *Telfare* device on page 38 and further in the article read where the device was thought to be complex and expensive to manufacture. This is probably so, but the mounting system of the device need not be so complex. A simpler solution is to install the .50 caliber machinegun on the main barrel in the same way telescopic sights are mounted on sporting rifles—by drilling and tapping mounting holes in the barrel itself. A few shallow screw holes shouldn't weaken the barrel unduly. A simple metal bridge with a pintle mount forward and some form of lockable traverse and elevation mechanism for boresighting at the rear would be simpler than the complex saddle mount proposed. If drilling into the barrel bothers some people, then a modern method of welding such as heliarc might be considered.

Permanently attaching a subcaliber device mounting base to the barrel might reduce the adaptability of the original *Telfare* device, but it might also be cheaper in the long run.

GEORGE A. FIGULA
Columbus, Ohio 43212 ▲

THE COMMANDER'S HATCH

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

One of the findings of the Tank Forces Management Group stated, "Current tank crew training worldwide is not standardized, degrading crew proficiency and compounding the effects of normal rotational turbulence." As Commanding General of the Armor Center, I am charged with responsibility for developing gunnery training programs which will clearly manage the problem of Army-wide tank gunnery standardization.

Our Tank Gunnery Field Manual, FM 17-12, fielded in May 1977, was widely received as a significant step forward in gunnery doctrine. Since publication, however, experience and additional analysis of critical crew and platoon tasks indicated necessary evolutionary changes to gunnery doctrine emphasizing training-up the Armor Force to meet the numerically superior force we expect to see on the battlefield. Our analysis further revealed that engagement times and tank-to-target ranges in FM 17-12 were correct. However, more emphasis needed to be placed on the critical task for crews and platoons to kill multiple targets quickly.

As our first effort to tackle that problem, USAARMC hosted an Army-wide Tank Gunnery Standardization Conference 14-17 March 1978. The purpose of the conference was to open communications to all Armor commands including Reserve Components, express opinions, and discuss gunnery standardization problem areas and solutions, with formal input being provided from all major commands. An Executive Committee was formed of members from the major commands. It was charged with developing Army-wide gunnery standards and recommending to me those standards to be published as Army-wide gunnery doctrine.

My philosophy as Armor Center Commander is to provide the Armor Force with tank gunnery doctrine which is Threat oriented and clearly stated in realistic terms with standards directly related to crew and platoon performance. First the Threat. We took an analytical look at how the Threat will be seen by our crews and platoons. That close examination drove us to the conclusion that crews and platoons must be trained to service multiple targets quickly and accurately. Thus, the first step to standardization required us to revamp the crew and platoon firing exercises in our current field manual. All firing exercises must be Threat oriented and designed to engage targets in the range band we expect to acquire, engage, and kill armored vehicles. Platoon battleruns must be developed in

a similar manner, as will future company and battalion combined arms exercises.

With those marching orders, the Executive Committee met and recommended to me a series of gunnery-related areas to standardize Army-wide.

Army Zero Policy

Ammunition costs will not permit continued expenditure of main gun rounds for rezeroing the main gun each period we fire (for example, qualification, sustainment, or ARTEP). Repeated zeroing wastes ammunition and training time. Commanders must ensure that crews follow the procedures set forth in the Operator's Manual and FM 17-12 when boresighting, zeroing, and recording the zero in the vehicle logbook. Zeroing will be only accomplished after the following events:

- Receipt of a new tank or a tank without established zero recorded in the logbook.
- Gun tube replacement.
- Replacement of a major component in the gun mount/recoil system. Zero procedures will be accomplished under the supervision of the commander, assisted by the master gunner. The established zero will be recorded in the logbook. Prior to each main gun firing period, a confirmation round, using established zero, will be fired at the appropriate zero panel. If the confirmation round hits within the prescribed circle the zero is confirmed. If the round strikes outside the circle, the master gunner and turret mechanic will inspect the turret for maintenance deficiencies. Following correction of deficiencies, fire a second round. If outside, fire two more rounds to complete a shot group, then complete the zeroing exercise. Experience indicates most tanks can confirm with their established zero.

Standard Tank Gunnery Targets

Standard tank gunnery targets were the second area agreed upon. Nine primary targets were selected from the Federal Republic of Germany target catalog. The targets selected range from zeroing, tank full front, flanks, tank turret, *BMP*, and machinegun targets. These targets are of Threat size and approximate form. All NATO countries and USAREUR units are currently using these targets. Army-wide standardization of tank gunnery targets, and in the near future targets for use by all the combined arms will greatly enhance training interoperability with NATO nations, target construction, and decrease the cost of target preparation.

"All Weather Firing."

There are several statements in the current field manual applicable to "All Weather Firing" which say:

> During periods of reduced visibility caused by rain, fog, snow, or other adverse atmospheric conditions, range firing must continue in any conditions under which combat would continue. Under these circumstances, however, commanders may reduce ranges which bring targets within the limits of visibility.

We felt that several general guidelines and preparation and planning notes were needed in the FM for commanders when reducing tank-to-target range. These are:

- What is the unit's operational mission?
- When reducing the tank-to-target range, when does training effectiveness stop?
- What safety restrictions must be considered? Additionally, points to consider in planning and preparation for "All Weather Firing" are:
- Preplacing range boots for rapid target repositioning.
- Preplacing range boots for safety fan markers.
- Adjustment of range start points.
- Adjustment of firing positions.

These guidelines will assist the commander on the spot in coping with difficult weather conditions. The ultimate decision still rests with the commander executing the gunnery program. The critical issue is that "we must continue range firing under those conditions the unit will fight under during combat."

The largest effort of the Executive Committee was to develop standards for crew and platoon qualification. My guidance was to build a realistic, Threat-oriented qualification course, state in TASK — CONDITION — STANDARD format.

Crew Qualification

Individual crew qualification will require all multiple main gun engagements or simultaneous engagements (main gun/cal .50 or coax/cal .50). No tasks will be duplicated, either day or night. There will be 10 tasks for each crew to accomplish. Nine are firing tasks and one concerns ammunition conservation. Examples of representative crew tasks look like this:

DAY A

TASK/CONDITION	AMMUNITION	STANDARD	TROOP BRDM TRUCK	CREW RATING
Main gun loaded, two Threat tanks, range 1,800-2,000m, approximately 75 meters apart. One Threat BRDM, range 1,000-1,200m.	4 TPDS-T	0-28	Hits	Distinguished
	50 Cal .50	29-40	Hits	Qualified
		+41	No Hit	Unqualified

The task spells out what the targets are and the conditions, (i.e., main gun loaded). Four rounds of TPDS-T and 50 rounds of caliber .50 ammunition are allocated. For a crew to receive a Distinguished rating they must acquire, engage, and hit all three targets within 28 seconds. There is no sliding scale, points for opening time, or points for crew duties. Total engagement time is the key here, with each task scored individually.

DAY B

TASK/CONDITION	AMMUNITION	STANDARD	TROOPS BRDM TRUCK	CREW RATING
Main gun loaded, Threat tank platoon (three tanks), range 800-1,100m.	5 HEAT-TPT	0-26	Hits	Distinguished
		27-40	Hits	Qualified
		41+	No Hit	Unqualified

As above, the task and conditions are clearly defined. You will note the crew is only authorized five rounds of HEAT-TPT and must "kill" all three tank targets within 26 seconds to receive a Distinguished rating. If all three targets are not hit within 40 seconds the crew will be Unqualified on this task.

NIGHT

TASK/CONDITION	AMMUNITION	STANDARD	TROOPS BRDM TRUCK	CREW RATING
Range card prepared. Main gun loaded. Two Threat tanks, range 800-1,200m. One Threat infantry squad, range 800-1,200m. One Threat tank is hull down. NBC environment. Hatches closed. Passive/IR. Fired from hull down position.	4 HEAT-TPT	0-23	3/5 or more coverage	Distinguished
		24-40	2/5 coverage	Qualified
	50 .50 cal	41+	Less than 2/5 coverage	Unqualified

This task indicates targets will be engaged with both the main gun and the caliber .50 machinegun. The conditions indicate a night engagement to be fired from a range card lay with the crew buttoned up, in hull-down position, NBC protection gear on, and utilizing the passive or IR sight. In addition to obtaining target hits on both tank targets, the tank commander must also engage the infantry squad and obtain three-fifths or better coverage, all within 23 seconds, to be rated Distinguished.

For a crew to receive an overall Distinguished rating nine of 10 tasks must be rated as Distinguished. That's a tough standard, and it should be. If you qualify Distinguished under this stringent standard you are without doubt among the top 5 to 10 percent of our tankers in the Army. To be a Qualified crew, seven of 10 tasks must be rated as either Distinguished or Qualified. Superior has been dropped as a crew rating. Local commanders can arrange the nine firing tasks in any order they desire to fit their piece of terrain. Who scores is also at the discretion of the local commander. The Armor Center's job is to prescribe the doctrine, tasks, conditions, and standards. The technique is the responsibility of the commander executing the gunnery program.

Crew preparatory Tables VI and VII will be written in the same TASK—CONDITION—STANDARD format. Table VII will be identical to crew qualification but will be fired on a different piece of terrain. Stationary Tank Table VI will be used to practice those tasks which are evaluated on crew qualification and prepare the crew to advance to the moving tank range. Ammunition prescribed will be 60 percent TPDS-T and 40 percent HEAT. That mix supports the direction in which we're going on basic load. HEP and tank commander engagements will be evaluated on Table VI.

Additionally, the preparatory tables will require "crew cuts," for vigorous evaluation of crew duties. Without that vigorous evaluation on the preparatory exercises, crews will not be quick and precise in completing their tasks and it is doubtful they will qualify.

Platoon Qualification

Platoon qualification is written similar to crew qualification but in more general terms, allowing the commander wide latitude in developing his scenario to fit the terrain available, adopt any number of ARTEP subjective evaluations, and not restrict him to a rigid set of rules. The TASK—CONDITION—and STANDARD will be spelled out. For example:

Day/Night Defense

TASK: Engage a Threat battalion of 50 tank or tank-like targets. Targets will be presented in Threat formations (platoons and companies).

CONDITIONS: Defending platoon will be required to displace defensively at least one time, preferable twice.

STANDARDS:

- 70 percent target hits/kills.
- Targets exposed 40 seconds day/60 seconds night.
- Total time on course established by units.
- Tank targets presented in a range band of 800-2,000m.
- Minimum of 10 machinegun targets will be presented.
- Subjective evaluations per the ARTEP—selected by commander.
- Mixture of night illumination.

Platoons will be rated as Qualified or Unqualified. To assist field units in developing their battlerun, a detailed scenario with sketch map showing maneuver will be illustrated in the FM as a "SAMPLE," or guide, for units to use or modify as they please. We believe this format allows the greatest flexibility for commanders and yet clearly states the doctrine.

The final topic addressed by the Executive Committee was Sustainment Gunnery. Our stated goals for gunnery are:

- Fire the main gun twice annually plus ARTEP.
- Conduct some form of gunnery training monthly.

The commander will decide which crews require the training. Some highly proficient crews may not require formal gunnery training each month. Other crews which are weaker or have experienced high personnel turnover may require weekly training, if possible.

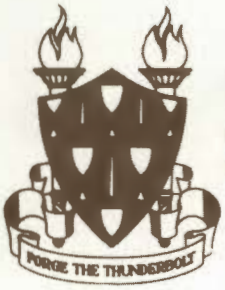
- Fire, if possible, subcaliber quarterly.

We believe it essential to crew proficiency and unit readiness to fire main gun engagements a minimum of three times per year. This will be accomplished by qualification, sustainment, and ARTEP firing periods. There are a number of specific reasons why we must fire this often. First, crew turbulence. Second, we know that crew proficiency decays between long periods of nonfiring. Additionally, we are emphasizing collective platoon gunnery by firing battleruns in all three periods. Although the specific amounts of ammunition to be fired have not been finalized, this program accounts for crew turbulence by more frequent main gun firing, while emphasizing collective unit performance by more platoon battleruns. We believe this plan will maintain required levels of unit combat proficiency, use a realistic amount of main gun ammunition considering Army-wide costs, and preserve crew and unit levels of training critical to combat readiness.

The final topic is concerned with how the Armor Center will evaluate the published doctrine? I propose to send teams annually to every Armor battalion and Cavalry squadron in the active Army. The purpose of these visits is to assist and advise. They will check range layouts and the standards which apply to that particular qualification course, either crew or platoon. They will listen to your opinions and recommendations, and finally report back to me recommended doctrinal changes based on field input. Secondly, I propose to host a Gunnery Standardization Conference annually. By doing this, the Armor Force maintains open communications, updates standards, and provides a disciplined review of our gunnery programs.

The Tank Gunnery Standardization Conference accomplished its stated purpose to standardize areas of tank gunnery training and standards. Now, we must finish the staffing of the recommendations and get on with the business of training our tank crews and platoons.

Maintain high standards.



FORGING THE THUNDERBOLT

VULCANIZED BINDING FAILURE REPAIR

Failure of the air cleaner hose vulcanized bonding which holds the metal flanges to the outlet hose ends on *M-48* and *M-60* tanks has been reported from the field. A bonding failure of this type on either V-band or finger band type hose assemblies will accelerate engine wear by allowing engine dust ingestion with possible end item failure. Corrective action required is as follows:

- Open the last three top deck grille doors on each side of the vehicle.
- Visually inspect the air cleaner outlet hose for damage (cuts, tears, deformation, wear, etc.). If damaged, replace.
- Check air cleaner hose clamps for proper tightness. If clamps are loose, tighten them.
- Install two clamps *MS-21920-43** (NSN 4730-00-840-8989) on all V-band or finger band type hose assemblies.
- Tighten clamps securely with a ⅜ in. open end wrench.
- Repeat above steps for the air cleaner outlet hose on the opposite side of the tank.
- Close all grille doors.

**NOTE:* *Do not use serrated type clamps in place of MS-21920-43. Clamp 4730-00-840-8989 can be requisitioned through S9C.*

SELF-PACED INSTRUCTION

"Reduce training manhours, provide a better trained 63C10, *Track Vehicle Mechanic* to the commander in the field by using available personnel and equipment." With these objectives in mind, the Directorate of Training Development, U.S. Army Armor School began the task of revamping the Armor School's 63C10 course. The culmination of over 2 year's effort and planning has resulted in a self-paced program of instruction. The 63C10 course was chosen as the initial program to go self-paced because 40 percent of the students attending the Armor School are track vehicle mechanics and this course lends itself to hands-on training. The designers of the new course were instructed to keep records of its development which would be used as a basis for the establishment of future self-paced programs at the School.

As opposed to the previous "lock-step" course, the self-paced program allows the student to progress at a speed compatible with his or her learning ability. This eliminates the problem inherent to the old "lock-step" instruction of the fast student becoming disinterested in the training and the slow student not grasping all the instruction. In addition, a student can challenge any lesson he feels he can successfully accomplish without taking the training phase. If he can pass the criterion test the student immediately moves to another task.

Initially, the designers observed other self-paced programs at the Skyline High School in Dallas, Texas, at the Chrysler Mechanic's School, and at Fort Rucker's helicopter mechanic's school. This gave them firsthand information on how the self-paced mode could be adapted to the 63C course.

The next step taken in revamping the 63C10 course was to conduct extensive research, better known as front-end analysis, to determine the tasks in which the 63C needs to be proficient in order to accomplish his assigned duties. The Automotive Branch of the Course Development Divi-

sion conducted the analysis. The researchers interviewed 52 maintenance supervisors to determine what they expected of a recent graduate of the 63C course. In addition, hundreds of mechanics were questioned to ascertain what tasks they were taught in the course that they were not performing in the field, and what tasks they were performing in the field that they were not taught in the 63C course.

Using the information obtained from these sources and data provided by maintenance allocation charts, the material readiness support activity, and the Automotive Department of the Armor School, the designers prepared a list of 530 tasks. After coordination with the Automotive Department, interviewing job holders, eliminating simple tasks that could be taught in the unit, and eliminating tasks that were common to different vehicles, the list was reduced to 75 tasks and covered by 103 lessons. The entire success of the program depended on accurate preparation of this list. Every possible step was taken to ensure the accuracy of the task list.

In addition to identifying the 75 essential tasks, the task analysis was successful in identifying two major problems that have been plaguing the Army's maintenance program: mechanics do not know how to troubleshoot or use technical manuals. Serviceable items are being replaced needlessly, resulting in a hit-or-miss maintenance operation. A substantial savings in Class IX repair parts dollars and a reduction in unproductive manhours will be realized if mechanics are more adept at troubleshooting. Eliminating these two major problems was one of the goals to be obtained in the development of the 75 tasks into lesson plans. The lessons are job oriented, using actual vehicles and emphasizing hands-on training.

The lesson plans are written so that the tasks are divided into 14 different clusters (figure 1). After completing the first three clusters, the student is allowed to proceed to any of the next 10 clusters providing he successfully completes all assigned tasks in that cluster. The student is given a performance test after the completion of a task lesson plan to ascertain if he has obtained the desired performance level. All thirteen clusters must be completed before proceeding to the PM cluster.

On 10 January 1977 one self-paced 63C10 class was started. The class was a test class in order to identify problems with the new system. Although numerous problems were identified during the first class, the conclusion reached during the course's validation was that the self-paced program of instruction is a viable means to train 63C10's. On 5 January 1978, all 63C10 classes were converted to the self-paced mode.

The success of the course is dependent on the accuracy of the front-end analysis. It is realized that the initial task list may need modification. The only way necessary modifications can be made is by accurate feedback from the commanders and maintenance supervisors in the field concerning the proficiency of the newly assigned 63C's. Are they able to perform all expected tasks? What additional tasks are needed? These are questions the Armor School needs answered if the School is to produce the best trained vehicle mechanics. If Armor is to maintain its role on the modern day battle field, trained mechanics are needed to keep the vehicles operational. Vehicles that are not properly maintained quickly become costly junk.

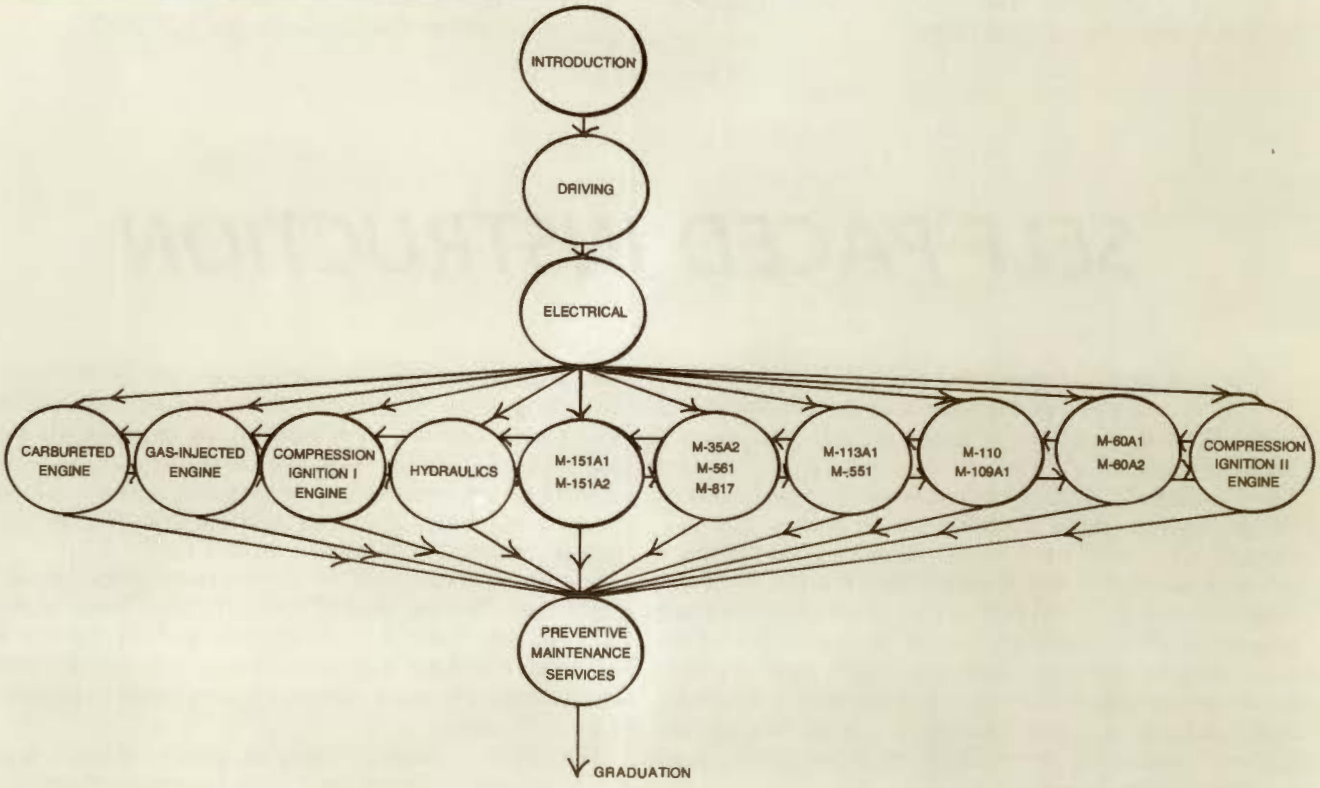


Figure 1

MASTER GUNNER'S CORNER

The Master Gunner is universally recognized as an expert in the field of tank gunnery. Often overlooked, however, is the fact that the Master Gunner is also a highly trained turret maintenance expert. For example, the *M-60A2* Master Gunner receives 284 hours of turret maintenance training, the *M-60A1* Master Gunner 158 hours, and the *M-551* Master Gunner 164 hours. Specifically, in sighting and fire control instruction on the vehicles, the training breaks down like this, *M-60A2*—67 hours, *M-60A1*—40 hours, and *M-551*—28 hours. Approximately 15 percent of the student's time is spent in a classroom environment, 78 percent is spent conducting hands-on training, and the remaining 7 percent is spent in testing. We would also like to point out that we do not test with written examinations. For example, if we teach a Master Gunner to synchronize the fire control system, we examine the individual to insure that he can, in fact, perform synchronization.

Now that you have a better idea of what the Maintenance Division of the Weapons Department teaches the Master Gunner, we would like to explore some ideas on how the Master Gunner might be used to improve your turret maintenance.

SQT Training

Currently in the armor battalions and cavalry squadrons of the Army, there is no one to assist or train the turret mechanic for his SQT, though substantial emphasis is placed on CMF 19 personnel. When the Master Gunner leaves the Maintenance Division, he takes with him all the knowledge and information necessary for battalion or squadron level SQT training for the turret mechanic.

Periodic Training

Situation: A unit maintenance section takes 2 days to restore a turret to normal operation, when in fact the component is on hand and the task should take only 2 hours. The Master Gunner has the capability to identify and correct problems of this nature. If his evaluation is that there is a lack of knowledge on the part of maintenance personnel, he can develop a training program for their weak areas. If the problem was due to the lack of special tools for removing, installing, or troubleshooting, the Master Gunner can show the unit's maintenance supervisor what tools are needed and how to get them.

Refresher Training

The Master Gunner can, on a weekly, monthly, or other basis, conduct refresher training. For example, the Master Gunner knows what training is received by the turret mechanic at the Armor School. He may also know that the turret mechanic doesn't always get a chance to work in all areas during a normal month or quarter. The Master Gunner can schedule classes to make up for the lack of work experience.

The training received at the Armor School by the Master Gunner is divided into three major areas; turret maintenance—35 percent, gunnery—35 percent, and how to train—30 percent. The reason we are pointing this out is that commanders may not be aware as to how fully trained the Master Gunner is in the turret maintenance field. That is not to say that a Master Gunner should devote 100 percent of his time preparing instruction, teaching, or supervising turret mechanics. We would suggest, however, that 35 percent of the Master Gunner's time might be spent in turret maintenance and training. Right now, in the battalions and squadrons of the Army there is no one that has the ability to supervise and train the turret mechanic better than the Master Gunner. If the turret mechanic's technical ability is maintained, and if he is supervised by someone with knowledge greater than his own, then that turret mechanic will do a better job for himself and his unit.

DONN W. GEORGE
Sergeant First Class
Master Gunner Instructor

Decisions

The following is a speech presented by General Walter T. Kerwin, Jr., Vice Chief of Staff, U.S. Army, to the Abrams Chapter, U.S. Armor Association on 4 April 1978. —Ed.

Almost 60 years ago the Commander of the Tank Corps, Brigadier General S. D. Rockenbach, told a General Staff College audience, "The Tank Corps has resisted entangling alliances and to date is not Infantry, Artillery, Motor Transport, Engineers or even Aviation, notwithstanding its great value to each of these services, causing deep thought as to which of them it should be."

This deep thought produced a decision, and a year later in 1920 the Tank Corps was broken up, and the tanks were assigned to the Infantry. Doctrine was "A tank is a mobile armored attack unit, designed to assist the advance of the infantry, and the Tank Service is a branch of the Infantry."

As you can imagine this decision created discussion in the ranks. Ten years later, in 1930, then Chief of Staff General Douglas MacArthur made another decision. "The Cavalry has been given the task of developing combat vehicles that will enhance its powers in roles of reconnaissance, counter-reconnaissance, flank action, pursuit and similar operations. . . . The infantry will give attention to machines intended to increase the striking power of the infantry against strongly held positions."

We paid the price for these decisions in the beginning

days of World War II. Our tanks were too light and too lightly armed to stand up to the best German tanks.

I throw in this bit of history to make several points. First, the argument over the proper role of the tank on the battlefield did not begin with the 1973 Mideast War. It began over 60 years ago. Second, decisions that are being made today will not only affect our current security and our current organizations but will also have an impact many years in the future. Our children will have to live with these decisions just as those of us who fought in North Africa in 1942 had to live—and too many had to die—with decisions made 22 years earlier.

Basically, there are two types of decisions concerning the Army. Most people concentrate their attention on the second set of decisions—how should the Army be organized, trained, equipped, and deployed to serve the best interests of the United States? They forget that before this set of decisions can be made there has to be an earlier set of decisions—decisions not made by the Army so much as by OSD and OMB budget analysts, and by the Armed Services and Appropriations Committees in the House and Senate.

While it's true that the Army exists to serve the nation, we must not forget that before it can serve the nation it must first exist. Much of the time of the Chief of Staff and much of my time is spent on this first set of decisions—convincing our civilian leaders in the Executive and Legislative Branches that we need an Army of a certain size with a certain set of equipment in order to accomplish our mission.

An example of this first set of decisions is our current materiel program for the *XM-1* tank. We in the Army know that we need the *XM-1* tank as soon as we can get it. It gives us increased acceleration, speed, and overall maneuverability over the *M-60* series. Through the use of special armor and compartmentalization of fuel and ammunition it gives us increased survivability.

As it now stands, in the approved program for FY 78, we have a continuation of facilitization program at Lima, Ohio, as the initial production site, procurement of training equipment and initial spares, and advance procurement to support FY 79 procurement.

In the FY 79 Budget Request we have a continuation of facilitization program to establish surge production capacity of 150 tanks per month, procurement of 110 vehicles to be delivered February 1980 through January 1981, advance procurement to support FY 80 procurement, and procurement of training equipment and initial spares.

Our review committee believes we need a rate of 120 tanks per month to achieve the total of 7,058 tanks we need by 1987. The House Armed Services Committee has recommended a rate of 90 tanks per month. The FY 79 Budget Request limited the rate to 60 tanks per month due to funding constraints. We will not know the exact authorized rate until final congressional action is taken on the FY 79 budget.

After this first set of decisions is made, there comes the second set of decisions. Later this month we will make a decision on the Army's Tank Distribution Policy. These decisions will serve to lock in what the Army's tank forces will look like during the very critical next 10 years. This decision will impact on the Army and the Department of Defense in just about every functional area.

In personnel, it will determine what type of tank crewmen we recruit, what MOS will be given (the crewmen and mechanics for the *XM-1* tank will have their own discrete MOS), how these individuals will be distributed, and how they will be used.

In training, it will cause the development of new courses of instruction at the entry and professional development levels, generate requirements for new Skill Qualification Tests and revised ARTEP's and force the Army in the field to conduct extensive unit transition from one tank model to another every 3 years or so.

In logistics, it will require the Army to modify how it handles fuel and ammunition—e.g., more fuel and heavier ammunition. The maintenance will require a switch from the diesel to the turbine engine, from coincidence to laser rangefinder, and from mechanical to solid-state computer.

Our operators will have to modify the way they do business to accommodate a faster, more mobile, more survivable tank that can fight all day and all night.

Our force structure people will have to make a recommendation about whether or not they want more tanks fighting part-time or more crews fighting fewer tanks all the time.

The resource managers will have to wrestle with how much is enough? How much combat effectiveness can be lost to peacetime efficiency?

The materiel and combat developers must strike out and find ways to improve upon what is still the future, decide upon what man and technology can do better, more efficiently, and more effectively.

The commanders must have the vision of their perceived needs and the practicality of their limited resources to mesh the present and the future together without a loss in readiness.

While making such a decision, we must recognize that it is dependent on other decisions that have not yet been made, such as the production rate of *XM-1* tanks and the quantity of *M60-A3's* produced and converted, whether or not the 120-mm gun will live up to its potential and be accepted for production, and how severe the imposed reductions on our training base resources will be.

There are about 40 other systems also being introduced that we must be aware of, and must ensure do not conflict. And then there is the enemy. Will he counter our advances? Will he gain or regain the tactical and/or strategic advantage?

These two decisions, the decision to procure a new tank for the Army and the decision as to where our tanks should be distributed, will have an effect on our national security until after the turn of the century.

As members of the Armor Association you have a vital stake in these decisions. As your predecessors did 60 years ago, you have a responsibility to speak out on the proper role of armor on the battlefield. Many of you here today had a hand in the decisions on the *XM-1*, and the Army needs your continued interest and support as these systems move toward maturity.

I know the Army can count on your assistance and advice.

ARMOR FORCE MANAGEMENT

AOB-78

The Armor School's Resident Armor Officer Basic (AOB) Course has undergone an extensive facelift. A graduate of the course will emerge as a new breed of Armor lieutenant. When he reports to his unit, he will be better qualified than previous AOB graduates to lead his platoon in battle and to establish and supervise a viable training program for his platoon. The new course was kicked off in January 1978 and began providing armor lieutenants to field units in April. The 12-week course has been completely redesigned and lengthened to 15 weeks for lieutenants to be assigned as tank platoon leaders and to 16 weeks for lieutenants to be assigned as armored cavalry platoon leaders.

The decision to revamp AOB was based on conclusions drawn from an Army-wide Armor survey and on discussions and research conducted at the Armor School and by the Tank Forces Management Group (TFMG) headed by Lieutenant General (Ret.) James G. Kalergis, (November-December 1977, *ARMOR*). What came to light was that AOB, for newly commissioned officers, is

their first substantial exposure to active Army training and responsibility. During the AOB course the young lieutenants form the basic impressions and skills that guide them and, hence, their subordinates to either success or failure. The previous AOB course did not prepare a platoon leader to perform combat-critical tasks at an adequate level of technical competence. The survey showed that most of the AOB graduates began their first assignment with only rudimentary ability to perform tasks expected of them. Subsequently, those graduates usually took 4 to 6 months on the job to become proficient in the basic skills required to train and employ their subordinates. In May 1977 the Chief of Staff of the Army approved the TFMG recommendation to revise the AOB course with the scope of fully preparing the students for their first duty assignments as platoon leaders.

To develop the new course, the Armor School systematically identified the vehicle specific skills most critical to battlefield success and concentrated instruction in those areas. The revised course requires students to master the loader, driver, gunner, and vehicle commander tasks to the degree necessary to train his platoon and to function adequately as a tank commander. Students are drilled extensively in the tactical employment of their platoons using realistic field situations that could be faced by U.S. Forces worldwide.

The term best used to describe the new AOB course is that it is "tracked." There are four separate paths that a student can follow:

- Tank training with the *M-60A1*
- Tank training with the *M-60A2*
- Cavalry training with the *M-60A1*
- Cavalry training with the *M-551A1*.

This design requires that each lieutenant entering AOB be assigned to one of these four tracks at the beginning of the course based on Army needs for the armor force. A lieutenant going to a tank unit concentrates on either the *M-60A1* or *M-60A2* tank and armor tasks, while the student assigned to a cavalry unit concentrates on either the *M-551A1* or the *M-60A1* tank and cavalry tasks.

The revised course provides as much hands-on, performance-oriented training as is practical. Testing is criterion referenced and scored on a GO/NO-GO system. Student ranking within sections or classes is no longer computed. Testing will certify student competence through performance, and graduation from the course requires attainment of a GO on all training objectives that are tested.

To illustrate how the revised course accomplishes the mission, the hypothetical progress of two new lieutenants is sketched out from arrival at Fort Knox to departure for assignment to either a tank or a cavalry unit.

The first man, Second Lieutenant Smith, is to proceed to an *M-60A1*-equipped tank unit after graduation. The second man, Second Lieutenant Jones is to be assigned as a platoon leader in an *M-551A1*-equipped cavalry unit. To begin the course, both lieutenants go through similar in-processing and training in common general subjects. The initial instruction consists of training in leadership, supply, communications, and administrative subjects that will enable them to assimilate further instruction efficiently. Additional instruction and reinforcement in these areas is interspersed throughout the course, coupled with the performance of the job tasks that require these skills. From common general subjects training, Lieutenants Smith and Jones move to instruction in basic automotive skills that enables them to effectively supervise vehicular maintenance, including maintenance forms and records and technical documentation.

The two lieutenants are then given system-specific automotive instruction. Lieutenant Smith, looking forward to an *M-60A1* armor assignment, concentrates on the *M-60A1* tank. Lieutenant Jones, on the other hand, who is going to an *M-551A1*-equipped cavalry unit, concentrates on that vehicle. The training of both men is directed toward maximum hands-on performance in all crew positions, thus enhancing the platoon leader's ability to properly supervise and train his platoon.

The two lieutenants also complete common weapons instruction. Here Lieutenants Smith and Jones master the mechanics and functioning of the .45 caliber pistol, *M-3A1* submachinegun, 4.2-inch mortar, mines, TOW and *Dragon*. They also practice firing the pistol and the mortar before embarking again into specialized armor and cavalry instruction on weapons.

Lieutenant Smith focuses on *M-60A1* tank weapons systems. He receives preliminary training acquiring basic gunnery skills on turret trainers, then proceeds to the range to fire Gunnery Tables 1 through VIII. He serves in all crew positions—gunner, loader, and driver—and qualifies as a tank commander. Lieutenant Jones goes through a similar learning sequence on the *M-551A1* from laser trainer manipulation and zeroing, through stationary and moving subcaliber exercises, to service firing and completion of the Table VIII qualification course under day and night conditions. He, like Lieutenant Smith, performs in all crew positions and qualifies as an *M-551A1* commander. Additionally, Lieutenant Jones receives special training in forward observer and fire direction center procedures, and on all the weapons that are organic to the cavalry platoon. This additional training causes Lieutenant Jones to spend most of an additional week in AOB.

Lieutenants Smith and Jones receive instruction on tactics. They study organization, movement, supporting arms employment, and tactical missions of the type of platoon for which they are being trained.

Having mastered the fundamentals of tactics, Lieutenants Smith and Jones culminate their AOB training in a unit-specific combined arms field exercise organized under conditions and standards approximating the ARTEP. They serve in all crew and platoon positions. This exercise is their opportunity to use all the skills and

knowledge they acquired in the course. They go on road marches and set up assembly areas. They defend and withdraw, attack, rearm, refuel, and report casualties. They practice distribution of fire by firing Tables VP (section and platoon subcaliber firing exercise at stationary and moving targets) and IX (platoon battlerun, main gun). At this point, the two lieutenants have completed the course.

What have they accomplished? The tracking system enabled Lieutenants Smith and Jones to avoid spending costly time learning to perform tasks and acquiring skills and knowledge on subjects for which they will have little use. Instead, they have concentrated on practicing those tasks and acquiring and practicing those skills directly applicable to their first assignments. They are able to perform maintenance, employ weapons, and are proficient in all crewmen's skills. They have qualified on Tables I through IX and they have assimilated and practiced tactical skills essential to battlefield success of tank or cavalry units. These men know how to command a platoon in the field and can effectively control the firepower of that platoon. Additionally, Lieutenants Smith and Jones are able to perform functions common to all Armor officers—supply, administration, personnel management, leadership, and maintenance management.

Lieutenants Smith and Jones will begin their unit assignments trained in tasks expected of their subordinates. They are qualified on their assigned vehicles and weapons and are tactically capable platoon leaders and effective trainers.

Revision of the Armor Officer Basic Course goes a long way toward development of a "total" armor force fed by four integrated subsystems—personnel, training, hardware, and logistics by providing bright new leaders to the field who can MOVE, SHOOT, and COMMUNICATE.

ADDITIONAL CREWMEN

Manpower Sensitive

One of the Tank Forces Management Group's (TFMG) most significant findings in the personnel area was that "there is a shortage of authorized tank crewmen in armor units; manpower is insufficient to operate the tank to its full combat potential." To achieve its maximum potential, the tank must be crewed by four fully-trained individuals who are integrated as a crew. Subjective data indicate that the loss of one crewman results in a loss of over 50 percent of the combat effectiveness of the tank; loss of two crewmen renders the tank almost ineffective.

The combat effectiveness of a tank unit is related to the number of operational tanks it can field with fully-trained four-man crews. A tank battalion with 80 percent of its trained tank crews can only man 43 tanks and is by definition at Authorized Level of Orginization (ALO) -3 in manned tanks and therefore, only marginally combat ready.

In a tank unit there are also no readily available, fully trained, integrated tank crew replacements who can fill in for peacetime absences or combat losses. Of the 225 enlisted men with tank crewmen MOS's in a tank battalion, 12 percent are not assigned to tank crews and they all fill critical positions.

- First Sergeants
- AVLB crewmen
- Vehicle drivers
- Ammunition specialists
- Operations sergeants
- Intelligence sergeants

To create full crews for training and combat, tank units must continually reorganize internally. This turbulence further degrades the proficiency of the crews and the effectiveness of the unit.

Manpower Evaluation

There have been no definitive studies or tests to determine the manpower required in a tank unit to maintain full tank crews for training and combat. Current manpower authorizations reflect four crewmen and fail to take into account administrative absences or combat losses.

Current Status

In order to conduct an evaluation of this concept, United States Army Europe (USAREUR) has been authorized 648 spaces or 12 battalions worth of additional crewmen in the 4th quarter of FY78. Training and Doctrine Command (TRADOC) directed the U.S. Army Armor Center to develop the Outline Test Plan (OTP) which will be submitted to the Test Schedule and Review Committee (TSARC) during May 1978. Upon approval of the OTP, it is anticipated that the evaluation will begin during the 2d quarter of FY79 in USAREUR and last for approximately 6 to 9 months. The general purpose of the test will be to evaluate the manpower requirements necessary to fully man authorized tanks with tank crewmen and to assess the support necessary to optimize the operational capability of the armor unit. Evaluation results will be used by Department of the Army as a basis for future TOE changes.

Improving TOW Training

by Major V. Paul Baerman and Staff Sergeant(P) Lawrence E. Wilke

The tube-launched, optically-tracked, wire-guided missile (TOW) is one of two main long-range direct-fire weapons in the U.S. Army. The ability to train gunners with present training aids has been and is being debated by Army TOW trainers. This article gives a brief description of how one unit, using a little ingenuity, developed a training system to improve its TOW gunnery training.

The 1st Squadron, 10th Cavalry at Fort Carson, Colo. suffers from the same major training problem that afflicts any armored cavalry unit—how to adequately train its great variety of MOS's in their individual and crew skills, and yet find time to do the necessary unit-level training. Training Extension Courses (TEC) and other training methods have done a

great deal to help solve this dilemma, but the need for reliable and accessible performance-oriented training aids remains. This need is particularly true in the case of mortar, tank, and TOW crews.

The squadron was quite happy with the variety of subcaliber devices available for the *Sheridan* and had its own mini tank range. It also had a mini mortar range for its mortarmen. Its TOW crews, however, had to rely on the one *M-70* infrared tracker available to the squadron and the tracker's readiness rate made its use sporadic at best. Combined with the TOW battery charging problems, the tracker's difficulties caused TOW training in the unit to suffer. To improve the situation, the squadron S3 and his master gunner designed their own TOW training equipment.

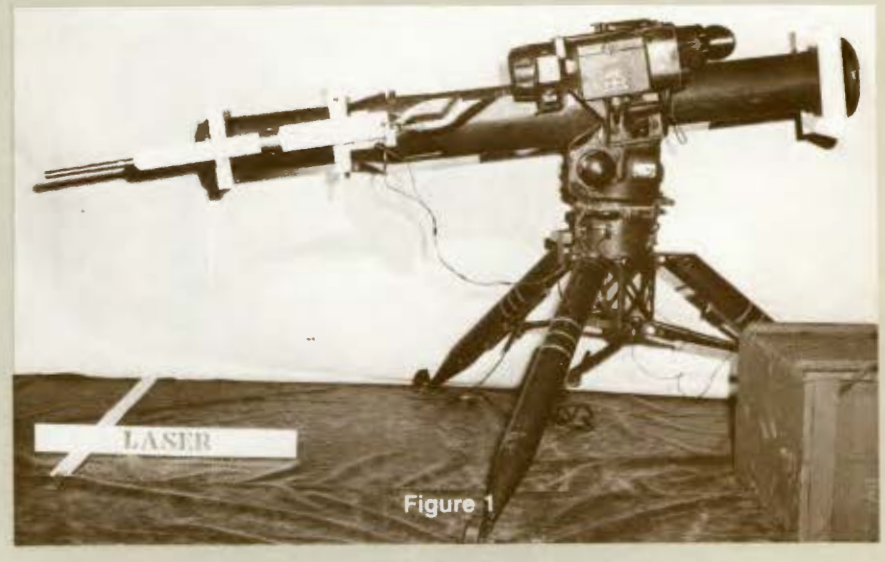


Figure 1

The resulting system is shown in the illustrations. It consists of two brackets mounting either the *M-55* laser (figure 1) or a standard *M-16* rifle (figure 2), a rear counterweight, and a timing device with associated wiring. The *M-55* laser is available from the local Training and Audio-visual Support Center (TASC). The two brackets mount on the TOW fiberglass launch tube. The front bracket adjusts for deflection while the rear bracket corrects for elevation. The counterweight balances the two forward brackets and their weapon so that the TOW feels the same when firing as it does without the added weight. The counterweight is mounted on the missile simulation round. The timing device may be either hand-held or mounted on top of the missile simulation round. When the system is used with an *M-16* rifle, a TASC-issued solenoid is used to fire the rifle in the remote mode.

The system is zeroed at 60 meters by simply adjusting the two front brackets for elevation and deflection based on the strike of the round or laser beam. The system is designed for a 1/35th scale range so 60 meters approximates 2,000 meters (See FM 17-12-7). Because of the design of the front brackets, parallax between the TOW optical sight and the weapon presents no problem and the zeroed weapon can hit any target between

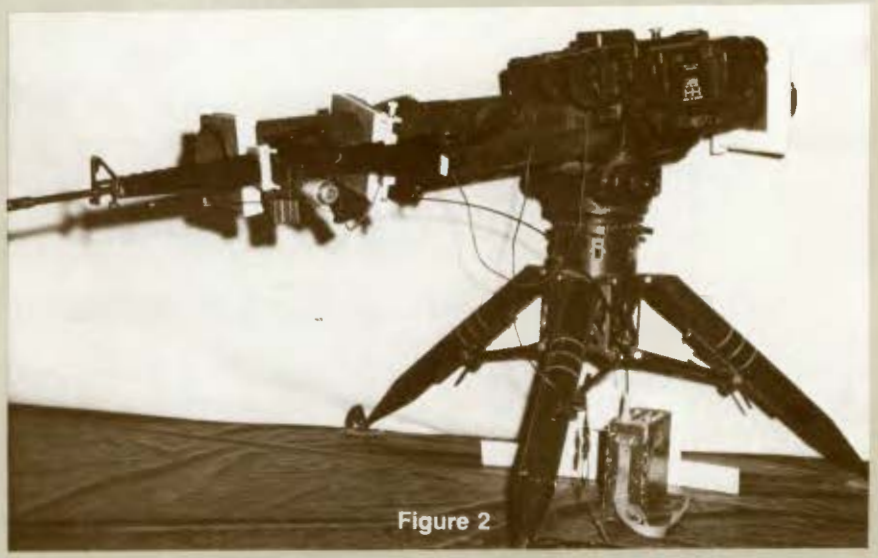


Figure 2

FURTHER MEANS

Another inexpensive TOW training device has been developed by Captain Robert L. Conway, assistant S3, 1st Brigade, 1st Infantry Division. CPT Conway has devised a means of mounting an *M-55* laser device inside an expended TOW or *Dragon* tube. The laser is activated by a press switch mounted on the firing mechanism. When "fired" the laser projects a beam of light onto a motion picture screen on which is displayed a variety of tanks and other targets, photographed under all types of conditions at various ranges, and at a variety of angles and speeds.

To simulate time-of-flight, a delay timer can be set to simulate any number of seconds of missile flight. The gunner must hold the weapon's cross hairs on the target for that number of seconds before the laser projects against the screen.

If desired, the film can be stopped at that time, so that gunner and evaluator can observe whether a hit was scored or how far off target the gunner aimed.

The total equipment necessary for fabricating the device includes:

- An *M-55* laser device.
- A PP-2593 power source or a transformer, bridge circuit, and 24-volt relay.
- An expended TOW or *Dragon* tube.
- A few common relays, switches, and lights.

CPT Conway's trainer is presently being evaluated by the Missile Command and the Antiarmor Committee of the Infantry School.

A more detailed description of CPT Conway's device can be found in the January-February 1978 issue of Infantry Magazine.-Ed.

1,000 and 3,000 meters on the scale range. (See figure 3 for a sample range layout.)

To fire the system, the gunner acquires the target and presses the trigger. The trigger of the subcaliber device is not the TOW trigger, but a similar one placed beside the real trigger so the gunner experiences no change. The trigger activates the timer, which after a pause of 1.5 seconds to simulate gyro warm-up time, fires the TOW blast simulator in the missile simulation round and begins the time-of-flight function, simulating the time of flight of the missile based on the scale range to the target. This period is variable and is set by the vehicle commander or assistant instructor. The weapon, either laser or rifle, will fire at the end of the prescribed flight time. If the gunner is on target at the end of the set time period, he will obtain a visual target effect—the target will turn over (an *M-16* hit) or there will be a red flash (a laser hit).

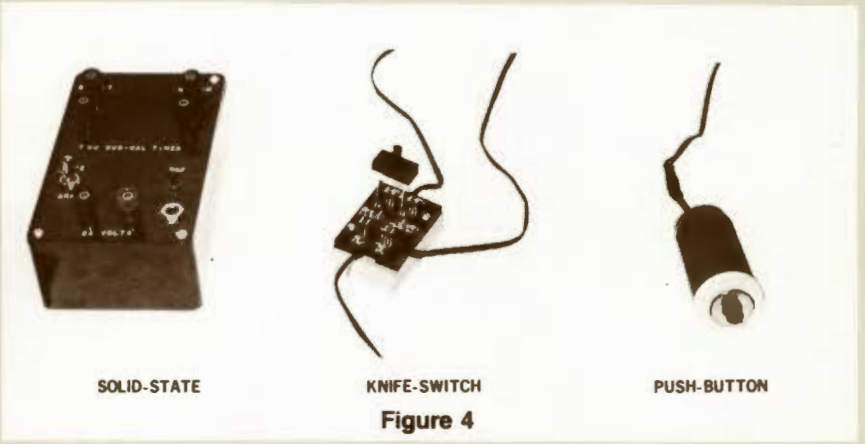


Figure 4

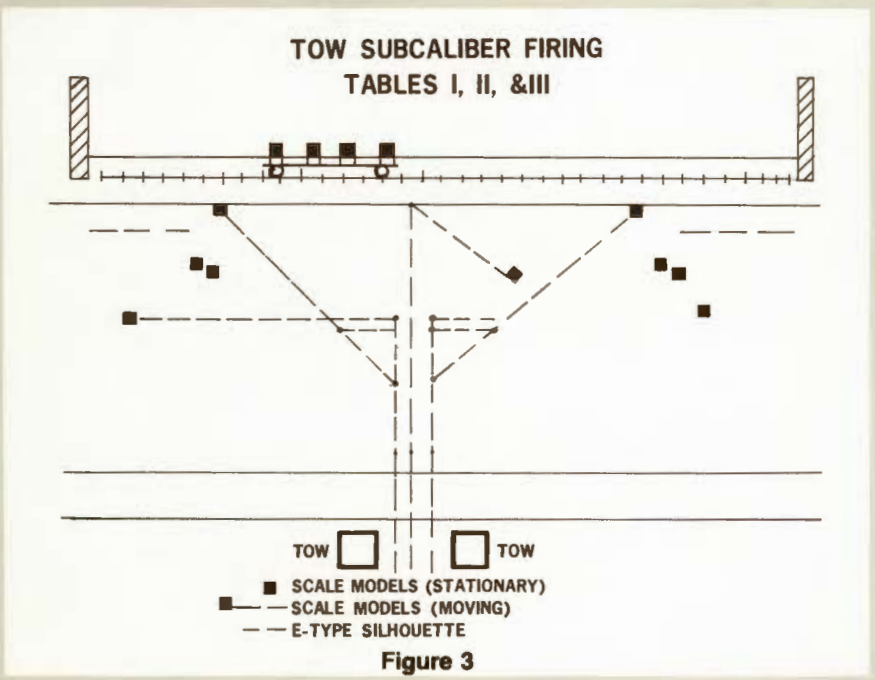


Figure 3

Once the basic design of the system was verified, it was built in quantity by the Fort Carson TASC to make it readily available. The timer was built nearby at the Department of Electrical Engineering at the Air Force Academy. The final design of the timer consisted of a solid-state, integrated circuit device about the size of a pocket calculator. Two other timers are also available: a manual and extremely sturdy knife-switch that first sets off the blast simulator and then the weapon, and a push-button device that can be held continually in the ON-position for use with the laser in order to determine tracking proficiency. (See figure 4 for illustrations of the three timers.)

The principal advantages of this TOW training system revolve around its simplicity. The Fort Carson TASC estimates that it costs less than $60 per copy making it readily available for frequent use by the troops. It is sturdy, can be easily mounted and put into operation, and is simple to maintain. It makes extensive use of the subcaliber ranges and scale targets developed for tank gunnery. Based on the type weapon chosen, it can be fired either indoors or out. If fired using an *M-16* rifle, the system requires no more room than a standard rifle range. Even less room is needed for the laser. Unlike the *M-70* trainer, no target jeeps, crews, or infrared sources are required. Of particular importance, since the entire system is "bolt-on," is it has no effect on the operational readiness rate of the TOW itself. Equally important, the system is powered by the standard military 24-volt electrical system, thus eliminating the TOW battery problem entirely.

As for its training value, the system is highly realistic in that the TOW gunner actually sees and tracks a three-dimensional scale model target in his sights rather than simulating tracking with the *M-70* target board. With a mixed array of friendly and enemy targets the gunner can also be tested on armored vehicle recognition. Another key to its value is that the training is enjoyed by the participants. The gunners like to see the visual target effect and it keeps them tracking until they see that effect. Because of the nature of the system, gunners can also engage multiple targets and targets taking evasive action or performing tactical maneuvers, something not really possible with the *M-70*. Night training presents no problem with the system using indirect or simulated searchlight illumination. When the TOW thermal image sight reaches the field, the scale model, hard rubber target-tanks should be easily discernible.

With this TOW training system each TOW gunner fires a series of exercises similar to those now used in tank gunnery. Table I is a zeroing exercise to prepare the gunner for the following tables. Table II is a manipulation drill to test the gunner's ability to handle the TOW quickly and accu-

rately against a series of stationary paper targets. Table III consists of firing against a series of moving paper targets to test tracking ability. Here, firing the laser on continuous mode can be used to check the gunner's tracking throughout the missile's time of flight. During these three firings, blast simulators are not fired so as to conserve ammunition. Table IV consists of live firing on a range similar to that shown in figure 3. The gunner fires at moving and stationary two- and three-dimensional scale targets. Some targets can be surprise popup types. The gunner uses both the blast simulator and the time of flight functions of the timer. Concurrently, since a mixed array of both friendly and enemy targets is on the range, the gunner is tested on his armored vehicle recognition proficiency.

The TOW subcaliber system was originally tested to the squadron's satisfaction by firing over 3,000 rounds of *M-16* rifle ammunition and by more than 2 weeks of laser firing. In the tests, the gunners found the subcaliber training very worthwhile and enjoyable.

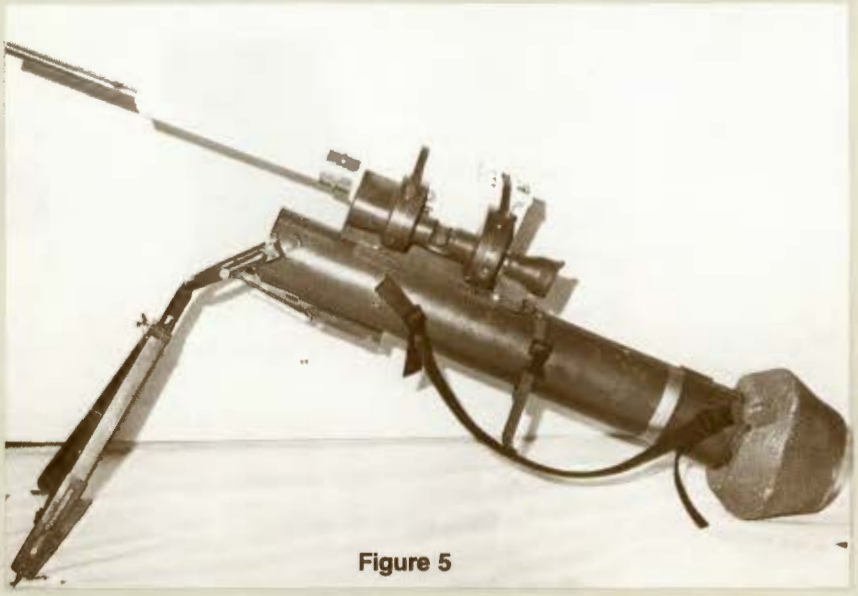


Figure 5

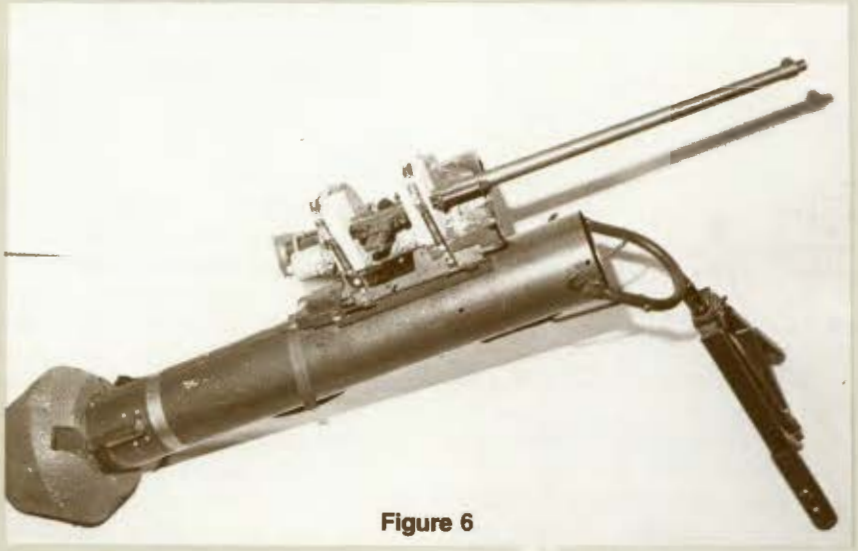


Figure 6

Recently, because the *Dragon* training aids situation is generally the same as the TOW, the squadron also applied the ideas outlined above to the *Dragon*. The unit developed devices (see figures 5 and 6) that use the *M-55* laser or 22 cal. weapon that are both in the TASC inventory. *Dragon* subcaliber systems operate on the same principle as the TOW subcaliber devices using the same triggers and targets, and are operational using dummy equipment available through the Fort Carson TASC. These *Dragon* training aids, like the TOW, are operated by a 24-volt power supply.

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For additional details on the above equipment contact Fort Carson TASC, Attn: Mr. Alpha Morgan, Fort Carson, Colo., 80913 or S-3, 1-10 Cavalry, Fort Carson, Colo, 80913 (Autovon 691-2288/5292).-Ed.

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 S3 and division G3 training officer. An AOAC graduate, Major Baerman is currently assigned as the S3, 1-10 Cavalry, Fort Carson, Colo.

SSG (P) LAWRENCE E. WILKE entered the Army in 1966. He has been assigned to armored cavalry units in Korea, Germany, and the United States. He is a graduate of the Advanced 11D NCOES Course and Master Gunner Program. Staff Sergeant (P) Wilke is currently assigned as the Master Gunner, 1-10 Cavalry, Fort Carson, Colo.

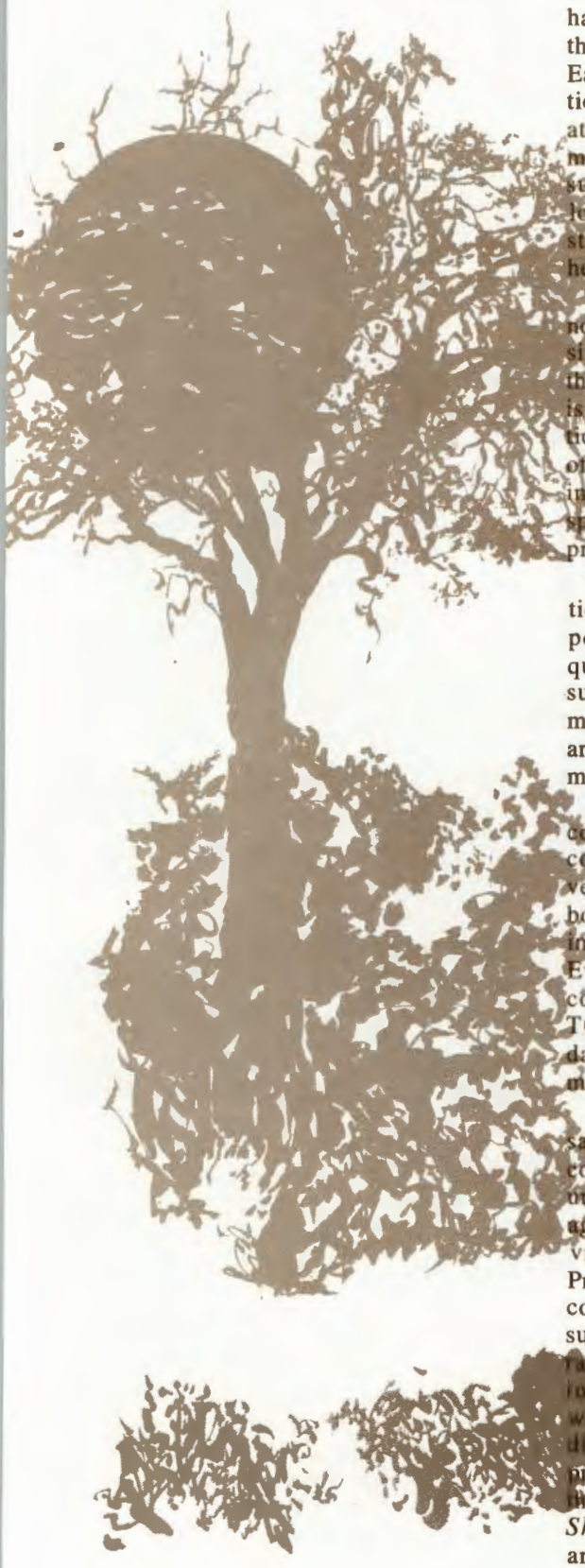
Tailoring for TOW

by First Lieutenant John J. Midgley

Troopers armed with tube-launched, optically-tracked, wire-guided (TOW) missiles represent a potent addition to cavalry's armor-killing punch. Unlike past improvements in cavalry weapons though, TOW is not just a qualitative change. TOW is a different breed of tank killer with characteristics that require a fresh approach to its employment. As a result, the H-series and transitional platoon tables of organization and equipment (TO&E's) that have slotted the TOW vehicle as an up-gunned scout may be shortchanging the platoon's combat effectiveness.

Using TOW in the scout squads makes effective employment of the weapon difficult, and complicates the maneuvering of the platoon. These difficulties center around five problem areas:

- *No Continuous Coverage.* TOW's role in reconnaissance or movement to contact is that of extending the platoon's antiarmor capabilities while overwatching the advance. Under ideal conditions, a cavalry platoon could rely on a continuous antiarmor shield 3,000 meters deep to serve as a buffer to provide time for developing a situation or withdrawing before decisive engagement. Maintaining this shield requires continuous attention, but with TOW vehicles widely separated and



under separate leaders, this attention is hard to provide.

The two scout squads ordinarily have separate areas of responsibility; they may not even be intervisible. Each squad's movements are a function of the terrain over which it operates and the squad leader's requirement to maintain overwatch. As a result, each scout squad leader overlooks the location, orientation, and status of the other squad's TOW when he moves his elements.

Similarly, the platoon leader cannot dictate movements for each TOW, since they must remain responsive to the squad leader's needs. The upshot is that the platoon leader has no practical means of controlling the location of TOW firing positions and, more importantly, he cannot determine and specify the time at which they will be prepared to fire.

This is not critical with conventionally armed vehicles which can position themselves and engage quickly. Unfortunately, TOW cannot survive that way. Frontal engagements from hastily selected positions are the nemesis of TOW crews; they must have time to position properly.

So, if "hip shots" are out, and coordinated movement is difficult to control, the 3,000-meter shield is a very porous one. At any time, one or both TOW's may be moving, preparing to move, or preparing to fire. Even if a platoon leader could fully coordinate the bounds of the two TOW's, he would probably be dangerously overcontrolling his elements.

- *No Mutual Support.* The same factors which impair continuous coverage — lack of intervisibility and uncoordinated movement — operate against a platoon leader trying to provide mutual support between TOW's. Preferably, two TOW crews should coordinate their engagements to make suppressive fire more difficult, and to rapidly capitalize on new targets firing at the launcher. Practically, widely separated TOW crews under different squad leaders are unable to provide this mutual support. Instead, the crew must rely on missile-firing *Sheridans* (*if* the platoon has them and *if* it is operating with light armor up) or risk firing without support. Unsupported firing is likely to focus heavy, accurate suppressive fire on the gunner, and will probably waste at least one missile.

- *Limited Target Acquisition.* TOW crews operating as scout squads cannot be relied upon to search for targets at the weapon's maximum range. The crew tends to orient on the immediate security of the other vehicle in the squad, which is usually only a few hundred meters forward of the TOW. At these ranges (under 1 km.), TOW is only marginally useful. Therefore, the crew has effectively adopted the TC's .50 caliber machinegun as its main armament.

The reason for this misorientation is rooted in the TOW crew's function in the scout squad, providing overwatch for the cannon vehicle. Since the TOW crew is moving as part of the platoon's forward element, the scouts naturally concern themselves with the dunes or woods to the immediate front which may conceal an ambush, rather than the ridgeline 3,000 meters out which may conceal a more dangerous enemy. Neither training at long-range orientation nor restating the squad's mission is the answer, since overwatch must still be provided within the scout squad.

In short, the scout squad's TOW is armed for a long-range threat, but aimed at the short-range threat.

- *Ineffective Suppression.* Scouts need an overwatch element capable of providing quick suppression of dismounted patrols, dug-in observation posts, and armored targets at medium range. TOW crews are simply not configured for this role. They can provide only a limited number of slow-flying missiles which are easily suppressed by tanks and machineguns. The present carrier is also highly vulnerable to variable time fuzed (VT) artillery. The TOW vehicle is simply not the stand-and-fight weapon the squad may need to extract itself or develop a situation.

- *Complicated Maneuver.* The size and dispersion of the cavalry platoon make control a continuing problem. The problems of coordinating and controlling TOW fires with widely separated squads has already been discussed.

Another problem is reorganizing the platoon from three teams for a hasty attack. Since TOW is best used to overwatch the assault, the platoon leader must quickly collocate TOW

squads operating with separate elements, as well as consolidate infantry, cannon vehicles, and light armor, call for artillery fire, and report his actions. The difficulty is that in scrambling the platoon, squad integrity is lost from the outset of the attack, and some momentum is sure to be lost while everyone regroups.

Retrograde operations — particularly withdrawals under pressure — are greatly complicated when TOW's are part of the scout squads. Although the decision as to which should be withdrawn first — TOW's or *Sheridans* — is influenced by a variety of considerations, such as the effectiveness of enemy artillery, two factors are always present; TOW's should be employed together in retrograde, and cannon vehicles should be withdrawn early. These factors, combined with the need to maintain squad integrity, present a dilemma for the platoon leader. He can either keep TOW's in place and sacrifice squad integrity and control, or he can move the scout squads as units and lose firepower in the detachment left in contact. Neither choice is desirable.

These problem areas underscore a need for a reorganized platoon which balances the mission requirements of cavalry with the capabilities of cavalry weapons. The H-series and transitional platoons might be improved by reorganizing them into four sections incorporating an overwatch squad.

During reconnaissance or movement to contact, the platoon would maneuver with two scout squads forward and the overwatch squad in the rear, providing long-range protection under the platoon sergeant's immediate control. If terrain precludes support of both scout squads, the platoon leader has two options: he can either coordinate TOW support for the masked scout squad with the adjacent platoon or he can simply deploy the overwatch squad in the sector with the most TOW-suitable terrain or most likely armor contact.

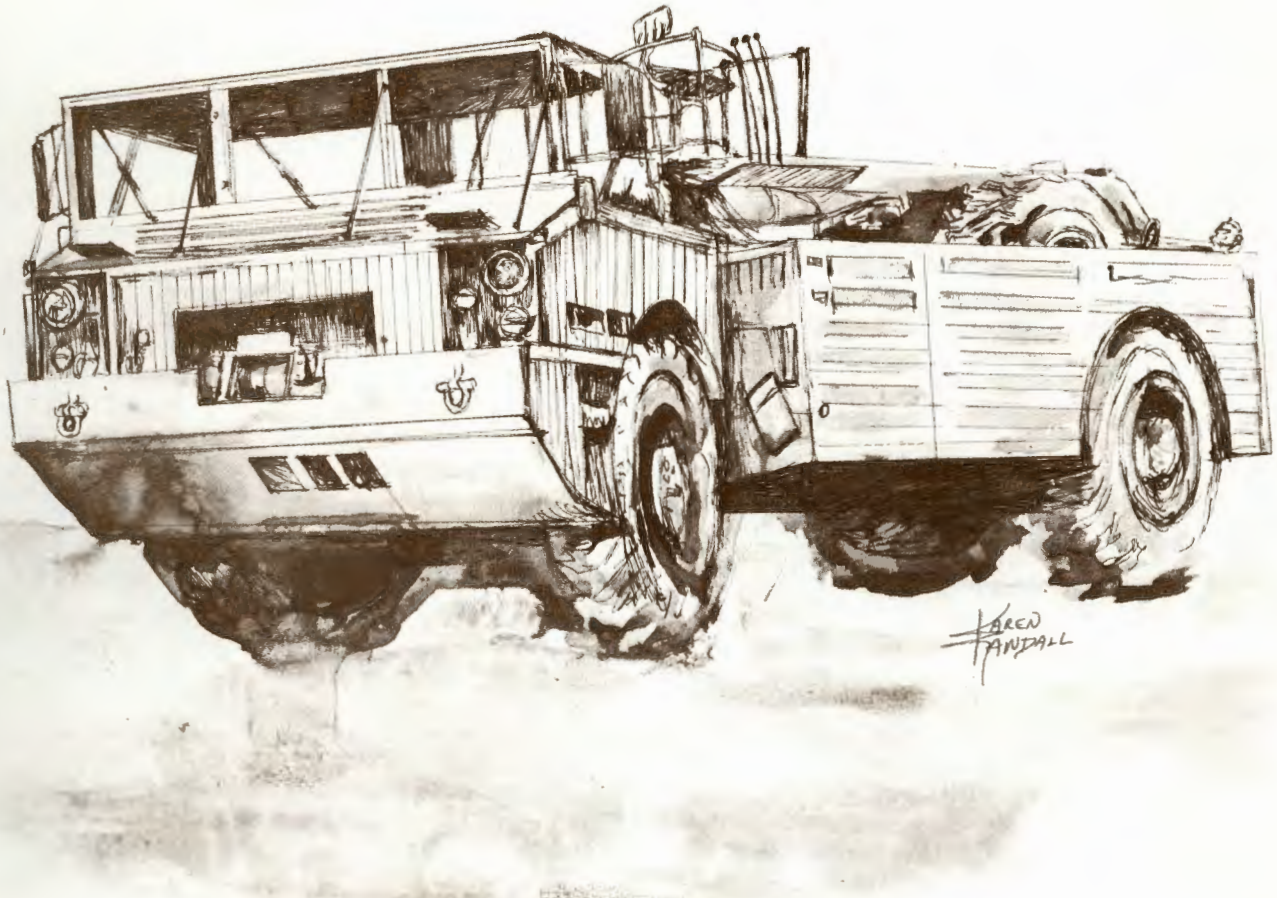
The platoon's fires can be better controlled with this reorganization. For example, a platoon leader receiving a spot report of a TOW-suitable target would have three readily evaluated courses of action. He can order the scout to continue to observe or engage with organic weapons, issue a fire command for the overwatch squad, or coordinate TOW or other fires from other units.

Many of the other shortcomings of the conventional organization are eliminated by adopting an overwatch squad. Since they would operate together, TOW crews could provide continuous coverage to the extent permitted by the terrain. Target acquisition would improve because the TOW crews would have the assigned mission of long-range security for the platoon, rather than immediate security for a scout squad. Mutual support is provided when the platoon sergeant coordinates the movement and fire of the TOW's with flag signals and section fire commands. From the scout squad's standpoint, suppression is improved with the *Sheridan* or the main battle tank's responsive, flexible firepower and greater armor protection.

TOW can greatly increase the combat effectiveness of cavalry platoons, but only if it is used in its intended role. No major revisions are necessary; just tailoring for TOW. This new weapon is not a tacked-on feature; TOW has fundamentally changed the structure of cavalry platoons. Why not reorganize to make the best possible use of this deadly weapon?

1LT JOHN J. MIDGLEY was commissioned in Armor upon graduation from the U.S.M.A. in 1976. He attended the Armor Officer Basic Course and is a graduate of the Infantry Officer Advanced Course. Lieutenant Midgley is presently assigned as platoon leader, L Troop, 3d Sqdn, 3d ACR, Ft. Bliss, Tex.

A Neglected Responsibility



by Captain John R. Drebus

Combat service support consists of those elements of a unit which arm, fuel, fix, feed, evacuate, and otherwise assist the combat and combat support soldier. Within a battalion these elements consist primarily of the personnel administration center and the support, maintenance, communication, and medical platoons. The performance of these functions involves approximately 36 percent of a tank battalion's personnel and 43 percent of its vehicles.[1]

Fortunately, some degree of attention has been afforded maintenance, communications, and medical evacuation. The communication platoon leader is a Signal Corps captain. The medical platoon leader is a Medical Service Corps lieutenant. Both the maintenance and medical platoons are assigned a warrant officer. These officers provide a considerable amount of expertise. Also, numerous manuals exist which describe the performance of these tasks.

On the other hand, the S1 and S4 responsibilities, particularly those involving tactical support, have been virtually ignored. Combat arms officers appear to have elected to avoid the subject of logistics. A survey conducted by *ARMOR* in 1975[2] asked readers to list subject preferences in order of interest. Of nine subject areas offered, the two extremes are listed at right:

	Subject Area	High Interest	Good to Fair Interest	Low Interest
Most Preferred:	Tactics & Doctrine	81%	15%	4%
Least Preferred:	Logistics	3%	23%	74%

An examination of all issues of *ARMOR* published since September 1973, reflects the journal's response to reader preference. Excluding maintenance, only *one* article directly concerning battalion level service support has been published. Ironically, that article[3] focused on the deficiencies of battalion service support and the lack of published guidance available.

EDITORS NOTE:
The author is correct, but ARMOR has changed its attitude. The new editor has been down the author's road. We hope that "Testing the Tail" in the November-December 1977 issue is just a beginning. We have others scheduled for publication, and we solicit your assistance.

–MAV

[1]Based on TOE data from *U.S. Army Armor Reference Data*, Vol. 1, USAARMS, Fort Knox, Ky., pp. 176-183.

[2]Lieutenant Colonel Burton S. Boudinot, "From the Editor," *ARMOR*, Vol. LXXXIV, No. 4, July-August 1975, p. 61.

[3]Captain William F. Greer, "Another Mission for the CSC Commander," *ARMOR*, Vol. LXXXV, No. 6, November-December 1976, p. 47.

"Let the logisticians worry about supplying me; my job is to fight," is a phrase often uttered by the combat arms officer. Logisticians are, to his way of thinking, the transportation, quartermaster, and ordnance officers.

The fallacy of this supposition is demonstrated by a comment of Major General Erwin M. Graham, Jr. He has stated, "Appropriately, the description of support begins at the edge of the combat battlefield where direct support to combat elements is provided. This is by far the most important place in the logistics system; all other elements support it."[4] Surprisingly, Major General Graham's "foward edge of the battlefield" is the division support element located at the *brigade trains!*

This philosophy of support is reinforced by the editor of *Army Logistician* who has similarly stated, "Forward logistics support to combat forces is the cutting edge of the Army Logistics System. According to Army doctrine, the foward area support coordinators, or FASCO's, are the key figures in providing this support in Army divisions."[5]

The service support branch officer has, in other words, accomplished his doctrinal mission when he issues supplies from the brigade trains. However, one problem remains; the brigade trains are roughly 20 km. behind the fighting elements. The responsibility for moving supplies and personnel these last 20 km. rests with the combat arms officer—the S1, S4, support platoon leader, and finally the company executive officer.

Where do combat arms officers learn the techniques of combat service support? There are basically three sources of knowledge: service schools, on-the-job training (OJT), and doctrinal manuals. Let us examine each of them:

Service Schools. A review of Armor School instruction reveals that there is insufficient emphasis placed on some of the combat service support roles.

The Armor Officer Basic Course is primarily designed to produce a tank or cavalry platoon leader with some additional emphasis on mortars. It is no wonder that the job of support platoon leader is the most avoided lieutenant's position in the battalion, despite the fact that it offers the most responsibility for personnel and equipment.

The Armor Officer ADVANCED Course (AOAC) does a good job imparting the skills required of an S2, S3, company commander, and battalion motor officer. Of 852 hours of instruction, however, only 3 hours are devoted to logistics planning and 4 hours to the techniques of combat service support.[6] Logistics considerations are also broached during the sessions on planning for the offense and defense. Furthermore, there are also several classes on the administrative aspects of service support such as property book procedures and the Standard Installation/Division Personnel System (SIDPERS). Still, considering the difficulties involved in tactical service support, the AOAC graduate is inadequately prepared to deal with the responsibilities incumbent on the staff positions of S1 and S4.

The Armor School Learning Center's catalogs list well over 500 available lessons and training extension courses (TEC).[7] There are none concerning combat service support. There is a lesson on the tactical operations center, but not one concerning the operation of the trains.

OJT. It is not uncommon for an officer to be assigned to a job position for which he has had no formal training. At one point in time, a tank battalion in U.S. Army, Europe (USAREUR) had five staff officers and three company commanders who had not yet attended AOAC. In such instances, one is forced to quickly learn on his own. But how?

The atmosphere in which the support officer operates is often disconcerting. How many commanders have exclaimed, "I don't care how or where you get it, just get it to me yesterday or I'll find someone who can!" This roughly translates as, "I don't know how to accomplish it either; you figure it out."

An example of misplaced command emphasis was illustrated by an assistant division commander conducting a tank battalion's Army Training and Evaluation Program (ARTEP) outbriefing. The general brusquely condemned the ineffectiveness of the unit's service support and then launched into a long dissertation on the new tactics and the latest techniques in fire support, areas in which the unit had supposedly performed well!

Doctrinal Publications. For the confused officer who is trying to learn his job, there are few things as useful as a well written manual. Let us examine what is available.

FM 100-5, *Operations*, July 1976.

FM 100-10, *Combat Service Support*, April 1976.

FM 101-5, *Staff Officer's Field Manual on Staff Organization and Procedures*, July 1972. Note: This manual contains an entire appendix on how to establish and operate a tactical operations center (TOC) but contains nothing on the trains.

FM 101-10-1, *Staff Officer's Field Manual on Organizational, Technical, and Logistics Data (Unclass Data)*, July 1976.

The above manuals vary in their usefulness, but are alike in one respect—they are written primarily for the staff officer at division level and above. Those officers performing comparable tasks at lower echelons are required to correlate the information to their needs.

FM 71-2, *The Tank and Mechanized Infantry Battalion Task Force*, June 1977. This is one of the newest "How to Fight" manuals and is the basic battalion tactical guide.

- Chapter 8, which deals with combat service support, is a disappointment. Although it emphasizes that, "Mobile, continuous combat service support will be vital to the success of the maneuver and combat support elements," the manual lacks detailed guidance on how to carry out that mission.

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[4]Major General Erwin M. Graham, Jr. "The Emerging Logistics System," *ARMOR*, Vol. LXXXV, No. 5, September-October 1976, p. 16 (condensed from article originally printed in *The Army Logistician*).

[5]Editorial comment, *Army Logistician*, Vol. 9, No. 4, July-August 1977, p. 32.

[6]Tentative Instructional Schedule (AOAC 2-77), August 1977, Director of Training, USAARMS, Fort Knox, Ky.

[7]"Armor School Learning Center Catalog - Training Extension Courses," August 1977, and "Armor School Learning Center Catalog," September 1977, USAARMS, Fort Knox, Ky.

- The one page devoted to illustrating how to echelon and locate trains is simply two landscape drawings with attached labels.
- No mention is made of such a simple, but important concept as a release point, designated to facilitate transfer of supply assets between battalion and company.
- Nuclear, Biological and Chemical (NBC) rescue and decontamination teams are described as being comprised of service support elements, utilizing mostly thin-skinned vehicles. Elsewhere in the manual, Appendix G is instructing armor crewmen to remain buttoned up under the same conditions!
- Appendix C, *Records and Reports,* contains only one example of logistics and personnel reporting requirements.
- Utilization of local Standard Operating Procedures (SOP) is emphasized. An effective SOP is based upon experience and doctrine. From where does a neophyte derive this knowledge?

FM 71-1, *Tank and Mechanized Infantry Company Team, June 1977.* A companion to FM 71-2, this manual contains many of the same deficiencies.

- An example of "comprehensive guidance" is in Appendix B, *Reports,* which states that administrative, SIDPERS, and casualty reports are prescribed by local SOP. Big help!
- One encouraging trend is indicated in Appendix C, which reminds the commander of the logistics resupply problem encountered when employing heavy and medium antitank weapons (HAW and MAW) due to their bulk and weight.

ARTEP 71-2, *Army Training and Evaluation Program for Mechanized Infantry/Tank Task Force, June 1977.* Combat service support is covered in a few brief pages and treated almost with disdain. An example is the single monolithic level-one task requirement for the support platoon:

Task	Conditions	Training/Evaluation Standards
8-20-D Provide logistical support.	Task force in a tactical environment. Conditions prescribed for the task force apply.	Insure continuity of operations by providing supply, transportation, and mess support for the task force. Food and water are delivered to unit mess locations in the forward areas in accordance with unit feeding plan. Supplies are delivered forward to the requesting unit.

Compare this with the four detailed pages dedicated to each of the smaller *Redeye* and Ground Surveillance Radar sections.

ST 29-50-1, *Armor Combat Service Support, Oct. 1973.* This is the best attempt yet to compile, under one cover, the information required by the S1, S4, and support platoon leader. The content is applicable to both garrison and tactical responsibilities. Unfortunately, there has been no revision since 1973.

- Such subjects as SIDPERS, Officer Personnel Management System (OPMS), Enlisted Personnel Management System (EPMS), and Consolidation of Administration at Battalion Level (CABL) are not addressed.
- The Division Logistics System (DLOGS) remains an obscure annex.
- The discussion of trains operations is the best available, but still could be expanded to more effectively instruct the uninitiated officer.
- Unfortunately, distribution is limited. The cover states, "This publication is provided for resident and non-resident instruction at the U.S. Army Armor School only."

The free-for-all, catch-as-catch-can attitude towards battalion-level service support should cease. Literature directed at the higher echelons of service support and all levels of tactics do not reflect this attitude. Granted, every situation is different and assets vary from unit to unit. Still, the tactician has been given detailed guidelines and precedents to draw upon when learning his trade; the unfortunate combat arms logistician is left with his imagination and a prayer. Why does he not have a "How to Support" field manual, attacking in earnest the obstacles he faces?

The 20-km. gap which exists between the brigade trains and the fighting element is the most vulnerable link in the supply chain. It is also the most difficult to cross.

Should the combat arms community continue its level of logistics disinterest, then perhaps the mission of transporting supplies and personnel forward to the forward edge of the battle area (FEBA) should be assigned to the quartermaster, adjutant general, and transportation branches. Do they belong there?

If the vision of reefer vans and semitrailers pulling abreast of your tanks and foxholes sounds ludicrous, then the combat arms had better accept their supply responsibilities. The Training and Doctrine Command (TRADOC) and the service schools should begin to force feed the supposedly distasteful subject of logistics. We need to support as well as move, shoot, and communicate.

CPT JOHN R. DREBUS was commissioned in Armor 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 Bn, 68th Armor. A recent graduate of AOAC, Captain Drebus is scheduled to attend Automatic Data Processing school at Ft. Benjamin Harrison, Ind.

"Target - Cease Fire!"

by Specialist Four Edward L. Pingston

The *Sheridan* gunner stood outside his tank waiting for the word to move out. He was chain smoking cigarettes. As he waited he kept thinking of all the briefings he attended and now wished he had paid more attention to everything that had been said. Everyone had done their best to fit him into the platoon, but he was still unsure of himself. "Curse the way the Army sends untrained men into situations like this," he thought. He hadn't even seen what a *Sheridan* looked like until he came to this forsaken desert. Sure, he'd been on *M-60's* for 2 years, but they were nothing to compare to the *M-551*. His mind raced with the thoughts of what failure would do to him, his platoon, and the troop. Finally the word came to mount up and move out. Why is it that after hours of waiting it is always "hurry up and move out," he wondered?

With a reassuring roar the tank moved out, and the gunner was feeling a little better knowing that the crew was together and functioning like a team. As they moved down the desert track the tank commander (TC) saw it, the great steel hulk of the enemy tank. The spinning turret, the fire commands, all were like a dream to the gunner. Hitting his switches, he saw the monster through his sights; lead, choke, range, sight picture all clicked into place. With the roar and kick that only a *Sheridan* produces, the 152-mm. HEAT round was on its way. Through his sights the gunner saw the flash of impact and with the flying pieces of the enemy vehicle he knew that from now on everything was going to be all right. "Target...cease fire," called the TC. And with that the assistant instructor (AI) riding on back scored the engagement and moved them off to the next target on Table VIII.

That gunner, who had never fired a *Sheridan* before, ended up not only qualifying, but earned the Distinguished rating by firing third highest in the troop. As a whole the rest of L Troop, 3d Squadron, 3d Armored Cavalry Regiment did an outstanding job. It had five Distinguished and four Expert rated tank crews. Not one bolo in the group!

How Was It Done?

It was accomplished by training—extensive training by the squadron using a rotating system of classes taught by *qualified* NCO's and officers, men the troops knew and respected for their knowledge. Many classes were dull but necessary, as many of the loaders were 11B's and 11D's filling the position. Some of the classes were a bit overdone; no one really cares how many candlepower the searchlight has — they just need to know how to turn it on and how to use the range card to illuminate for night range

firing. Most importantly, the Master Gunners not only taught, but freely gave of themselves in helping the less knowledgeable men. No question was silly or stupid, and this was one of the biggest factors. Every question was explained and answered until there was no doubt that it was understood. The Master Gunner can be the deciding factor in whether your tank gunnery is exceptional or only mediocre.

Motivation and Esprit

Nothing gets the troops going like competition. The troops saw many "public" and "private" incentives being offered: tankers jackets complete with all embroidery and name of crew member on it, passes for the high shooters, and side bets between the tank sections. Every crew wanted to outshoot the Master Gunner, get the passes and most importantly, get the jackets. Another factor was that the second platoon had built itself a reputation for always doing the best job it could no matter what the task, and this worked for the troop. Not only was everybody trying to outshoot the platoon, but the second platoon knew it and resolved to work that much harder to not let down the reputation it had earned. Esprit was therefore working both ways.

Encouragement

The troop Master Gunner was constantly moving from platoon to platoon answering questions, giving advice to the less experienced crews, and helping to ensure that each crew was as ready as it could be. The squadron Master Gunner gave of himself to help the new crew members and encouraged the men over any rough spots they were having. The officers from troop commander and executive officer to the platoon leaders maintained a high profile among the men. They didn't spend all their time in the tower or at the communication track, they were always there to ask how each tank's run had been. A genuine concern was shown for how each man was doing. The weaker crews were given more ammunition and allowed to make another run on the practice tables. This wasn't sink or swim tank gunnery; we came to hone the tanker's skills to a fine edge. Every crew that was having a tough time was helped along by the people who could give the best advice, training, and encouragement.

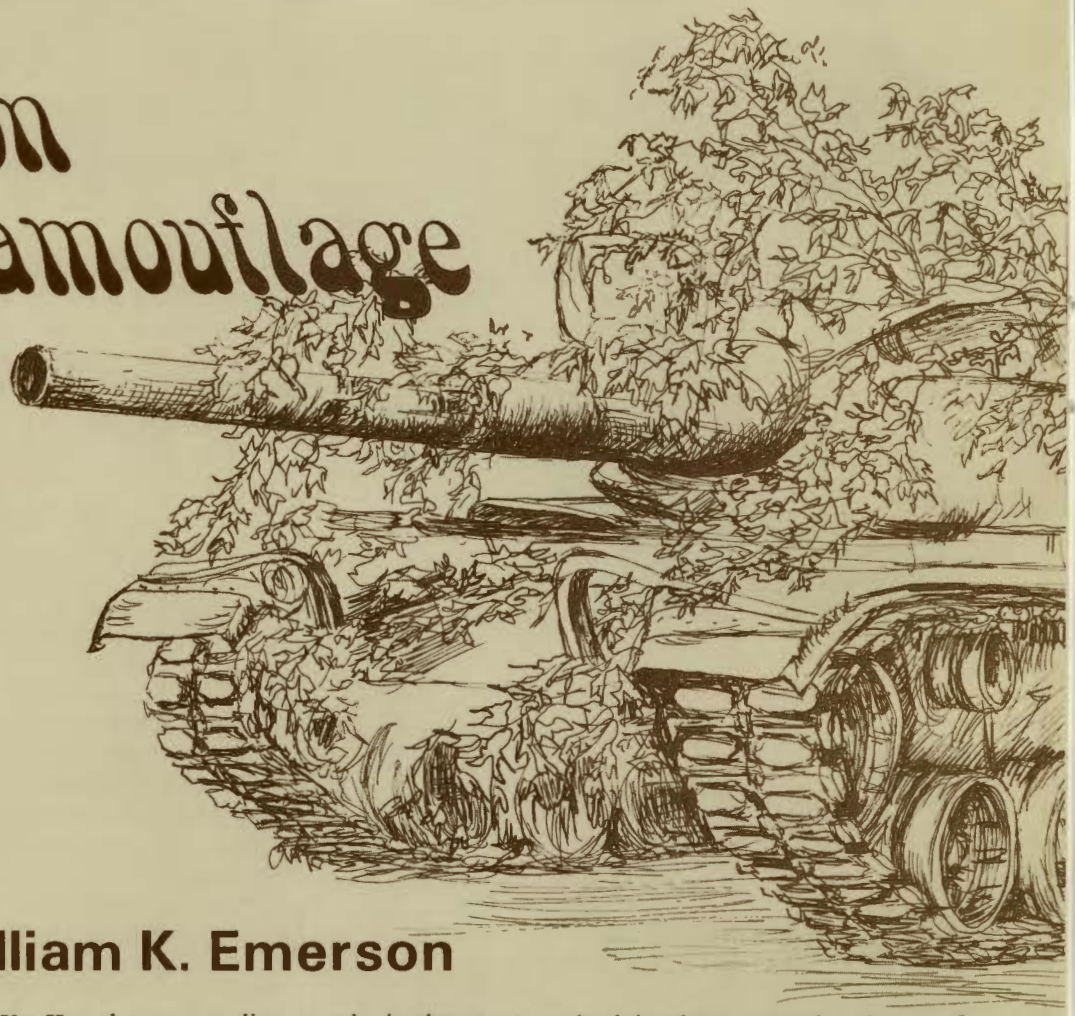
Results

Target after target exploded with *first round hits!* Five tanks brought back four rounds or more on their day runs. Most of the crews were getting their opening times or less! The troop earned itself the high gunnery troop in the squadron and the second platoon was the high platoon. The efforts of all the men, from the overworked mechanics to the range guards, contributed to this being very successful tank gunnery.

Oh, by the way, our chain smoking gunner at the beginning of the story wasn't the only one that was a bit unsure of himself; the TC was a reclassified marine engineer, the loader was a reclassified scout, and the driver was a reclassified *Redeye* gunner. I should know, I was that gunner.

SP4 EDWARD L. PINGSTON graduated from the U.S. Army Armor School, Ft. Knox, Ky. in April 1976. He has served with the 1-72 Armor in Korea and is currently assigned to the 3d Squadron, 3d Armored Cavalry Regiment, Ft. Bliss, Tex.

More on Camouflage



by Major William K. Emerson

From near the end of World War II, through the Korean Conflict, to the close of the Vietnam War, the U.S. Army enjoyed the luxury of protection from air attack. Now, Soviet and Warsaw Pact forces appear to be attaining air parity with NATO. As a result the Army is again heeding the old axiom "If you can't see it, you can't hit it," and turning to camouflage to protect its troops and equipment from detection and attack from the ground as well as from the air.

Three years ago, Headquarters, U.S. Army Materiel Development and Readiness Command decided that material developers should plan for and apply appropriate camouflage treatments, and where possible, incorporate camouflage into new equipment. In the spring of 1975 the U.S. Army Mobility Equipment Research and Development Command, the Army's laboratory for camouflage, began a joint DARCOM-TRADOC program to camouflage the *M-60A1* tank. A number of significant hardware items, and an evaluation of their military worth, evolved from this 16-month program.

Foliage Brackets. Blending with the surrounding terrain is the most basic element of camouflage. The use of fresh cut foliage is facilitated by the use of brackets—strips of metal bent and attached to a steel base. Twenty-two brackets were spot welded to each tank and fresh foliage inserted. A number of screen door springs, with "S" hooks at each end to attach them to the brackets and existing projections on the tank, provided a means to attach foliage between brackets. The springs were also hooked together and wrapped around the gun tube to provide additional foliage cover. Initial tests by the 2d USMC Tank Battalion, Army armor units at Fort Hood and Fort Bliss, and Test and Evaluation Command (TECOM) tests at Aberdeen Proving Ground proved favorable—foliage stayed in place even when the tanks were in motion and provided significant camouflage. This capability provided a means so that as soon as a tank halted, even briefly, additional camouflage was provided. Cost per tank: $84.00, including labor to install the bracket bases.

Fender Nets. Because of deployment time and stowage volume required in the conventional use of camouflage nets, a more rapid means had to be found if nets were to be used with the tank. A concept evolved to disguise only the high-signature areas of the tank—primarily the characteristic long fender shadow. Trapezoids cut from the new standard Lightweight Camouflage Screen System (LCSS) hexagon net are supported by special fiberglass rods topped by 6-inch discs. Four support rods made to fold into 2-foot lengths to facilitate storage are mounted on each side of the vehicle. A small net supported by two rods is mounted on the front of the tank. The rods were bolted to the tank, but could easily be made removable. Nets are rolled or folded lengthwise and stowed on the fenders, meshed in and around brackets, boxes, and support arms. Prototypes were manufactured in August and September 1975, and field evaluations were made by the 2d USMC Tank Battalion in September and October. Additional field tests were conducted in a desert environment by the 3d Armored Cavalry Regiment in February 1976. Tests prove that the nets result in a major reduction in the

hull signature in a daytime-static environment. It takes a crew 30 minutes to deploy or stow a standard net, 3 modules and support systems per tank. Two men can emplace and stow the fender nets in less than 15 minutes. The one disadvantage of *all* netting is its tendency to snag. However, the smaller, lighter test panels were easier to move about on the *M-60A1*. Cost: $840.00 per vehicle. Conventional nets cost $2,200.00 per vehicle.

Vision Port Filters. One of the most interesting fixes in the aided-visual zone are filters which were applied to the inside of the tank's vision ports, using two existing bolts. Image intensifiers detect light over a broad spectrum, and the tank's red interior light emerging through the vision blocks can easily be seen by these devices. The tested filters, placed on the inside surface of vision blocks, allowed the crew to see out while not allowing red interior light to be detected by image intensifiers.

The crew can still observe through vision ports and see all activities except light in the red spectral zone. Exact changes in detection range will be determined in additional tests. When these tests are completed, and if the results are as expected, production tanks can be modified on the production line, and a special kit can be provided for fielded tanks.

Headlight and Taillight Glare Covers. To reduce glint and glare during daylight hours, special kits which make use of existing bolts prevent headlight and taillight glass reflection.

Textured Nonslip Surface. Under certain lighting conditions, even the new lusterless camouflage paint reflected light from turret surfaces and aided in the detection of some tanks. Thirty-two square feet of standard nonslip textured surface applied to the cupola and parts of the turret top reduced the glare. Cost: $10.00 per tank on the production line; $14.00 per tank in the field.

Because we seldom look for a single tank, and most often encounter them in groups, how does camouflage help armor units? Several agencies attempted to answer this question through the use of computer simulation models. The two most detailed studies were undertaken by the Army Materials System Analysis Agency (AMSAA), Aberdeen Proving Ground, Md. and by the Combined Arms Center, Ft. Leavenworth, Kans. The results were similar.

The analysis of the military worth of these camouflage measures consisted of a comparison of the results of simulated daytime battles involving both camouflaged and pattern painted tanks in the defense. From the outcome of these computer simulated battles it was determined that camouflage applications made a significant contribution to the effectiveness of the force. Data from Ft. Ord's Tactical Effectiveness Testing of antitank missiles and other tests were used in AMSAA's analysis to fill in the data for the difference between firing and nonfiring tanks. These analyses revealed that not only did a greater number of *M-60's* survive when camouflaged, but a greater loss was also inflicted on the enemy.

Overall, the results of the *M-60A1* tank camouflage program are encouraging. As a result of the joint DARCOM-TRADOC pilot program, selected camouflage techniques are being applied to the *M-60A1*, the *XM-1*, the *M-109A1* howitzer, and other tracked vehicles.

Units can add foliage and brush as natural camouflage during their training without waiting for brackets and other product improvements to arrive through channels. The foliage can be held to the vehicle by using wire fencing, communication wire, or locally purchased screen door springs with "S" hooks. For machineguns mounted on *M-113's* the spring can be wrapped around the weapon several times, and brush inserted into the spring loops.

Various camouflage techniques, made available to every tank crew, will reduce detection by hostile eyes and sensors. This, when combined with skillful use of terrain and modern tactics, *can* increase the survivability of our armored forces.

MAJ WILLIAM K. EMERSON was commissioned in Armor upon graduation from Oklahoma State University in 1965. He has been assigned as a tank battalion S4, cavalry squadron S3, and as commander of tank, cavalry, and infantry companies. He has also served as an instructor in the USAARMS Weapons Department, and R&D Coordinator at the Mobility Equipment R&D Command, Ft. Belvoir. Major Emerson received his M.S. in Mechanical Engineering in 1972. He is currently assigned as XO, 3d Squadron, 11th Armored Cavalry Regiment.

by Lieutenant Colonel (Ret.) R. R. Taylor, Jr.

Information for this article was obtained from the XM-1 Project Manager's Office and other open sources.—ED.

A new era for the U.S. Army's Armor Force opened recently when the first pilot vehicle of the production version of the *XM-1* tank rolled out of the Chrysler Corporation's tank assembly plant.

The new tank incorporates the most advanced tank design with the latest electronic, optical, and metallurgical technology to increase the effectiveness of fire control, and greatly improve survivability, reliability, and maintainability.

Although the *M-68* 105-mm. gun will be used as the main armament on the first vehicles produced, the turret of the *XM-1* has been designed to accept the German manufactured 120-mm. gun which will be undergoing further tests in the U.S.

Fire Control

It is in fire control and stabilization where some of the greatest improvements over existing tanks have been made. The gun and turret drive are hydraulically powered, with the gun's elevation and depression achieved by a hydraulic cylinder. Turret traverse is accomplished through a hydraulic motor-gearbox combination.

Stabilization of the main gun and turret is achieved through rate gyroscopes, a hydraulic gun-turret drive, and an individually stabilized sight in the elevation mode. The gun is slaved to the sight in the elevation axis with precision resolvers and the hydraulic system. The turret is stabilized in azimuth in a fashion similar to that of current tanks.

The primary sight also presents the gunner with a constant display of range and an indication of GO/NO GO of the armament and fire control system.

The fire control system also includes a full-solution, solid-state digital ballistic computer; a passive thermal sight; a dymium YAG laser rangefinder, and a gunner's auxiliary telescope.

External elements of the primary sight system, protruding through the turret to the right of the gun, are protected by ballistic shields that are operated from inside.

Another feature of the fire control system, the muzzle reference device, permits the gunner to measure and correct tube droop and bend through the computer to ensure a continually-accurate boresight.

The digital computer, which is linked with the fire control system, accommodates changes in ammunition and ballistics data, and contains multiple lead filters which are selected automatically by the computer to provide accurate lead correction for moving targets. Functioning of the fire control system is continuously monitored by the computer. The computer also performs fire control system built-in test functions by direct interrogation to locate malfunctioning elements.

Other features of the computer include solid-state construction, self-checking of functions, and a 6,000-word

XM-1 UPDATE II

memory. Thermocouples are also available for temperature settings. Additionally, battlesight ranges can be preindexed as often as required and set for each type of main gun ammunition.

Data from wind and cant sensors and the rangefinder, plus lead angle information, are automatically fed into the computer. Other inputs, such as muzzle reference compensation, ballistic characteristics of ammunition being fired, tube wear, barometric pressure, and ammunition temperatures, must be set manually.

Optical requirements of the primary fire control system have been minimized by integrating the laser into the system. The primary aiming reticle and laser beam are combined in the laser transceiver to ensure accuracy. The system also permits the gunner's primary optics to be used from the commander's station, giving him a complete day and night vision fire control capability. The commander and the gunner can both lay on the target and the commander is also equipped with a 3X sight for the caliber .50 machinegun.

An auxiliary sight system is provided by the gunner's 10X telescope.

Suspension

Although the capability to deliver accurate fire on the move is largely dependent on the efficiency of the gun and sight stabilization system, the tank's suspension system also plays a significant part. The suspension is designed not only to provide a gun platform that is as stable as possible, but to also minimize mine damage. It consists of 14 road wheel stations with steel torsion bars at all positions and advanced rotary shock absorbers installed internally at stations 1, 2, and 7.

The four forward road wheel stations have been reinforced to form a box-like structure to resist mine damage that bends torsion bar housings, or null mounting faces, out of alignment with the centerline of the bars. Aluminum tubes also seal these first bars from exposure to foreign matter from the bilges, and the armored housings provide the driver with added protection from mine blast.

Another aspect of the suspension system is its smaller road wheels which allow a lower sponson height and silhouette. The smaller road wheels also have an increased durability and provide better ground pressure distribution. This in turn enhances cross-country mobility.

The *XM-1* is equipped with two different types of track. One is a modified *T-97* type with integral grousers and the other is a replaceable pad track similar to the *T-142* design. A decision as to which track will be used in production is still to be made.

Gas Turbine Engine

Improved mobility and agility for the *XM-1* is provided by the AVCO AGT-1500 gas turbine engine that moves

the 59-ton tank from 0 to 20 m.p.h. in 6.1 seconds. The engine's light weight coupled with its high horsepower gives a horsepower-to-ton ratio of 25.4:1 compared to 13:1 for the *M-60*. Other features of the turbine power plant include: cold starts at temperatures down to -25 degrees Fahrenheit without assistance, modular maintenance, fewer moving parts, less vibration, and reduced number of accessories.

Turbine Engine

Survivability is also improved by the gas turbine engine because it leaves no smoke plume and emits less noise. The noise signature is reduced by 20 percent inside the vehicle and by 50 to 55 percent outside.

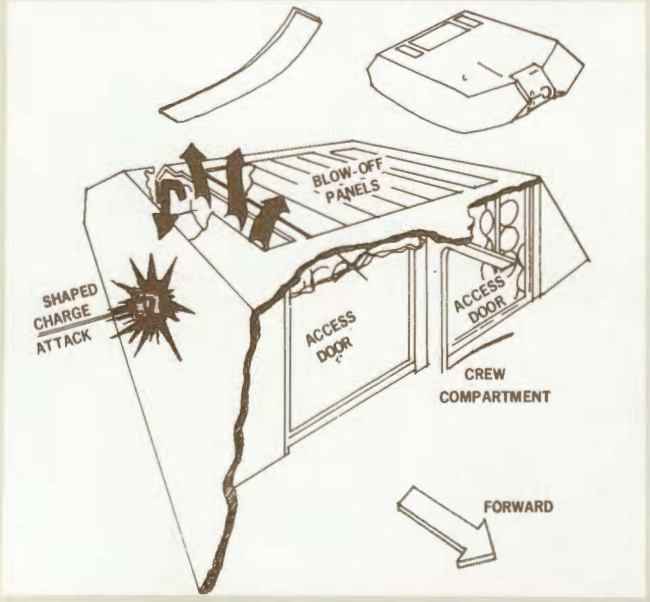
Most accessories of the turbine engine can be serviced or replaced without removing the powerpack. However, if the powerpack must be removed, it can be removed and replaced by a four-man crew in less than 60 minutes. Trained crews have accomplished this in 15 minutes using a GOER 10-ton wrecker.

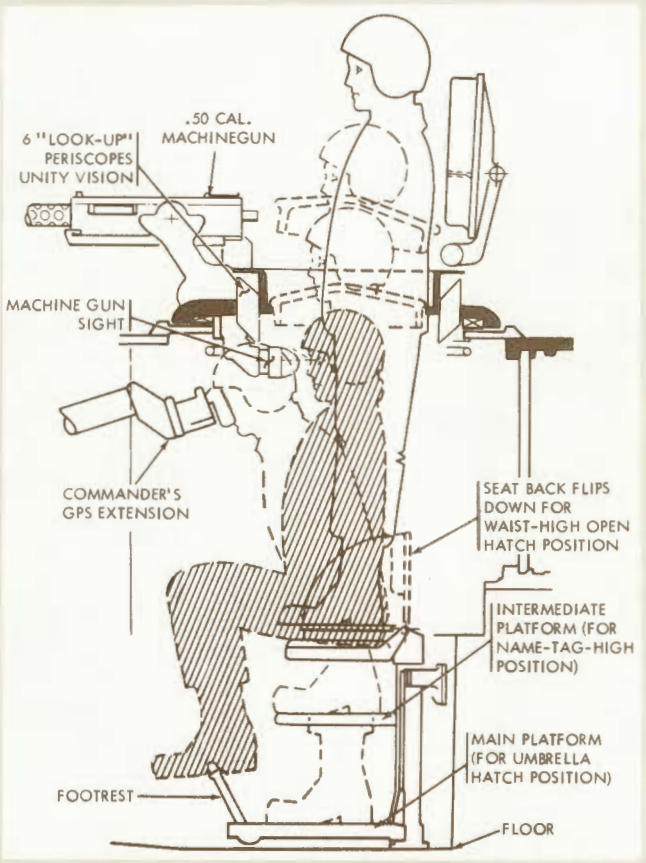
Power generated by the gas turbine is transmitted to the final drive through an Allison X-1100 transmission that features a hydrostatic steer system with pivot steer, a four-speed range pack, integral power brakes with mechanical backup, and a torque converter. The range of the five hydraulically-applied clutches and three planetary gear sets is four speeds forward and two in reverse. Two hydraulically-applied, oil-cooled, multiple-plate brakes develop a deceleration capacity of 14 ft. per sec.[2]

Steering is accomplished by rotating a motorcycle-type "T" bar which actuates the steering lever on the transmission to produce the steering speed bias of the tracks. There are twist grip controls on both ends of the "T" bar which serve the throttle for the electronic fuel management system. Conditions of fluid levels, filters, batteries, electrical connectors, and circuit breakers are displayed on the driver's maintenance monitoring panel.

Survivability

Regardless of its power plant, speed, agility, and the sophistication of its weapons and fire control systems, the combat effectiveness of the tank is highly dependent on its





survivability. That survivability is governed primarily by four factors: the probability of being detected; the probability of being hit; the tank's armor protection; and the protection afforded the crew, vulnerable components, ammunition, and fuel in the event of a penetration.

Detection of the *XM-1* by the enemy has been made more difficult by reducing the tank's silhouette and its noise and smoke signatures. Once detected, however, the *XM-1's* agility, maneuverability, cross-country speed, and its smoke grenade launchers and smoke generator provide it with considerable protection from being hit. For example, the *XM-1* is nearly four times more agile and maneuverable than the *M-60*, accelerates twice as fast, and can travel cross-country at speeds three times faster.

Protection against hits is provided by special armor and greater obliquity of the hull and turret surfaces and by armored skirts that partially cover the suspension system. But should the tank be hit and penetrated, several innovative protective measures will enable the crew to survive what would have been fatal explosions in the past. Ammunition stowage has been compartmentalized with 44 main gun rounds being carried in the bustle behind sliding armor doors. Eight main gun rounds are stowed in a compartment in the hull and three on the turret floor protected by spall plates. In the event of a hit in the bustle, the blast of the resultant explosion is vented upward and out of the bustle through blowout plates. Should those rounds stowed in the hull compartment detonate, the blast is vented away from the turret and its occupants through blowout plates in the top and bottom of the hull.

Adding to the survivability of the vehicle and its crew is an automatic fire extinguisher system containing Halon 1301. The system includes seven dual-spectrum infrared

detectors which sense the radiation characteristics of a hydrocarbon fire, but will not give a false alarm because of stimuli from a flashlight, cigarettes, lighters or matches, sunlight, metallic insignia, or red clothing. The sensors will detect a fire of 18 inches in diameter at a distance of 1.6 yards within 1.5 to 6 milliseconds. The system will respond to a fire and will extinguish it within 150 milliseconds before an explosion can take place.

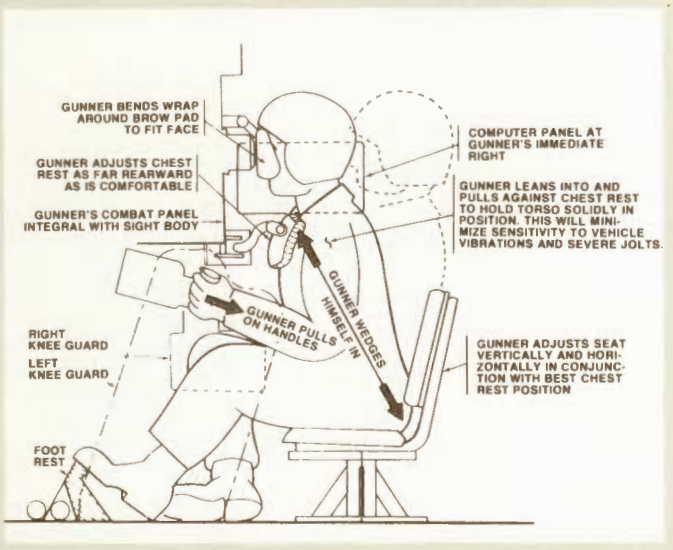
Crew Stations

Survivability, fire control, speed,and maneuverability are recognizably of prime concern in the design of any weapon system. However, the ability of the crew to fight in a hostile mobile environment for extended periods must be considered in the equation for system effectiveness, and the developers of the *XM-1* have not neglected the human engineering factors. The commander's station has excellent visibility, a protected open-hatch capability, and ease of movement without exposure. The driver sits semi-reclined; has close proximity, hatch-mounted periscopes, and excellent visibility. The gunner has a wrap-around brow pad and swing-out chest rest, and the loader's station has swing-out guards and a spent case ejection guard to insure protection when operating over rough terrain.

Maintainability

Nor has maintainability been overlooked. The *XM-1* is equipped with quick-release top deck fasteners and functionally grouped mechanical, electrical, and hydraulic quick-release disconnects. The majority of maintenance actions can be performed without removing the power pack and quarterly services have been eliminated. Special tools required for maintaining the *XM-1* have been reduced to 85 as compared with the 214 needed for the *M-60A1*. The maintenance ratio is 1 hour of maintenance for 1 hour of operation. Adding to the tank's maintainability are built-in test equipment and warning lights that indicate such malfunctions as low oil pressure, engine overspeed, low fuel level, and clogged oil filters or air cleaners. These maintenance features mean reduced crew maintenance times, deadline rates, and more tanks available for operation.

In summary, performance of the *XM-1* will provide maximum armor-protected firepower for the total force.



SYSTEM CHARACTERISTICS

Physical Characteristics

Weight, combat loaded (less kits)	58.9 tons
Ground clearance (center portion of hull structure)	19 in.
Ground clearance (other portions of hull structure)	17 in.
Height (ground to turret roof)	93.5 in.
Maximum vehicle height (overall)	114 in.
Maximum vehicle height (reducible overall)	103.5 in.
Length (overall main weapon forward)	384.5 in.
Length (overall main weapon rearward)	353.2 in.
Width (overall)	143.8 in.
Width (reducible)	137 in.
Vehicle center of gravity	
(X) Longitudinal (above ground line)	52.17 in.
(Y) Lateral (forward of final drive centerline)	126.13 in.
(Z) Vertical (positive, right of vehicle centerline)	1.54 in.
Vehicle frontal area	75.9 ft.^{2}
Vehicle side area	162 ft.^{2}
Vehicle top area	311 ft.^{2}

Performance

Gross horsepower-to-weight ratio (combat loaded tank)	25.4 hp./ton
Maximum forward speed (paved level surface-governed)	45 m.p.h.
Sustained speed (60 percent grade)	5.2 m.p.h.
Cross country speed	30+ m.p.h.
Acceleration (forward direction from 0 to 20 m.p.h.; dry level surface)	6.1 sec.
Range (constant speed of 25 m.p.h. on dry and level secondary roads, without refueling)	275-300 miles
Fording depth	
• Without kit	48 in.
• With kit	Turret roof
Braking	
• Deceleration from speeds between 30 m.p.h. to maximum speeds on dry and level hard surface	14 ft. per sec.^{2}
• Deviation from straight line path (equal to or less than)	6 ft. in 50 ft.
Obstacles	
• Vertical step (forward direction)	49 in.
• Trench crossing (forward direction)	9 ft. width

Armament

Main weapon	105-mm., M-68
Coaxial machinegun	7.62-mm., M-240
Commander's machinegun	.50-cal. M-2
Loader's machinegun	7.62-mm., M-240
Rifle (collapsable stock)	5.56-mm., M-16A1
Grenade launcher	40-mm., M-203
Smoke grenade launcher	XM-239 RP

Ammunition Stowage

Main weapon (105-mm.)	55 rounds
Coaxial machinegun (7.62-mm.)	10,000 rounds
Commander's machinegun (.50 cal.)	1,000 rounds
Loader's machinegun (7.62-mm.)	1,400 rounds
Crew weapon (5.56-mm., rifle)	210 rounds
Grenades (40-mm. LV M-406)	18 rounds
Grenades (XM-239 RP, smoke grenade launcher)	24 rounds

Fire Control and Surveillance

Gunner's primary sight (GPS)	
• Dual day optics (narrow field of view)	6.5 deg. at 10X
• Dual day optics (wide field of view)	21 deg. at 3X
• Close-in surveillance	10 deg. at 1X
• Night vision optics (narrow field of view)	2.6 deg. by 5 deg. at 10X
• Night vision optics (wide field of view)	16 deg. at 3X
• Sight stabilization	Elevation
• Laser rangefinder ranging capability	200 to 8,000 meters
Gunner's auxiliary sight	8 deg. at 10X
Elevation quadrant	Indirect fire control
Emergency firing device	Standard M-60A1-Type
Ballistic computer	Digital self-checking
Gun turret drive and stabilization	Elevation and azimuth
Commander's primary weapon sight	Optical extension of GPS
Commander's weapon sight	21 deg. at 3X
Commander's day vision periscopes	6 per tank 360 deg. at 1X
Loader's day vision periscope	360 deg. at 1X
Driver's day vision periscopes	3 per tank 120 deg. at 1X
Driver's night vision periscope (image intensifier)	35 deg. by 45 deg. at 1X

Suspension

Type	Hydromechanical
Road wheels	7 per side
Torsion bars	7 per side
Shock absorbers (modular rotary)	3 per side
Track	Integral or replaceable pad

Electrical system

Electrical power (6 batteries, 12 volts)	24 v.d.c.
Electrical capacity (battery only)	300 amp. hours
Alternator (charging system)	650 amp.
Voltage regulator	Solid state

Communications

Intercom	AN/VIC-1
Radio set	AN/VRC-12
Security system	T-SEC/KY-57

Engine

Type (free-shaft turbine)	AGT-1500
Gross horsepower	1,500 hp. at 3,000 r.p.m.
Gross Torque	2,620 lb. ft. at 3,000 r.p.m.
Maximum torque	3,952 lb. ft. at 1,500 r.p.m.
Engine output at maximum tank speed (45 m.p.h.)	1,000 hp. at 3,100 r.p.m.
Fuel capacity (usable)	508 gals.
Oil capacity (including oil cooler and line capacity)	7 gals.

Transmission

Type (hydrokinetic-fully automatic)	X1100-3B
Torque converter (TC-890)	3-element
Transmission ranges	4 forward 2 reverse
Steering (integral steer/throttle T-bar control)	Hydrostatic
Turning radius	Pivot to infinitely variable
Braking (two fully independent systems)	Hydraulic and mechanical

Final Drive

Type	Coaxial planetary gear drive
Gear reduction ratio (final drive input to sprocket drive output)	4.30 to 1

Turret

Main gun/coaxial weapon	
• Elevation limit-forward (110 degrees right and left of tank centerline)	-10 deg. to +20 deg.
• Elevation limit-rearward (70 degrees right and left of tank centerline)	0 deg. to +20 deg.
• Traverse capability (in either direction)	360 deg.
• Elevation tracking rate (powered)	0.25 mils per sec. to 25 mils per sec.
• Elevation tracking rate (manual)	10 mils per crank rev.
• Traverse tracking rate (powered)	0.25 mils per sec. to 75 mils per sec.
• Traverse tracking rate (manual)	10 mils per crank rev.
• Elevation maximum slew rate (control handles)	400 mils per sec.
• Elevation maximum slew rate (stabilization commands)	750 mils per sec.
• Traverse maximum slew rate (control handles and stabilization commands)	750 mils per sec.
• Traverse tracking rate (silent watch control)	up to 30 mils per sec.
• Elevation tracking rate (silent watch control)	up to 16 mils per sec.
• Slew rates for 1,500 mil duration (silent watch control)	up to 300 mils per sec.

Commander's Weapon

Elevation limit	-10 deg. to +65 deg.
Traverse capability (in either direction)	360 deg.
Traverse tracking rate (powered)	variable up to 500 mils per sec.
Traverse tracking rate (manual)	178 mils per sec.
Elevation tracking rate (manual)	445 mils per sec.

Loader's Weapon

Elevation limit (skate mounted on turret roof)	-30 deg.
Firepower coverage (loader's sector of responsibility to left of turret)	to +65 deg. 265 deg.

Pages from the Past

A MATTER OF PRIORITIES

The preparation of a nation for war is of two kinds; one of material things, the construction of forts, arsenals, fabrication of weapons, munitions, etc., the other the training of its people. And the second is more important than the first, though in the United States the estimate of their relative importance is reversed. The people of the United States are willing to vote immense sums for preparations that concern materiel, but begrudge time and thought devoted to the war training of the fighting unit — the man.

The Cavalry Journal
March 1914

FREELANCE OPERATIONS

The chain of command functions well in military organization and, except in emergency, should not be violated, not even on the battlefield. Generals and colonels leading platoons under fire make good copy for war correspondents but, although such acts may win medals, they seldom contribute anything worthwhile to final victory. Our officers as well as our soldiers must know and perform their assigned tasks in combat and none must jeopardize the victory by freelance operations, however heroic these may appear at the time.

The Cavalry Journal
November-December 1944

LAMP OF EXPERIENCE

Improvement is the main object for which we strive. It is found in two ways, either by a furious habit of change or by seeking for experience as a guide. The first is said to be characteristic of democracies which frequently ignore the principles which made them great and revert to Simian characteristics even in the midst of high civilization. The lamp of experience ought to be the safest guide but in order to be followed without question there would have to be a great wealth of examples of the same kind, or an ability to pick out logical conclusions from confusing examples.

In our army and in the question of armament these difficulties seem to be marked.

The Cavalry Journal
January 1914

IMPORTANCE OF CAVALRY

It is easy to demonstrate the need for a strong cavalry, but no one will exert himself greatly to demonstrate what does not intimately interest him. We cannot expect an infantryman to do more than admire the cavalry as a possible auxiliary, more given to romance than the bitter business of battle; we cannot expect the artilleryman to regard the cavalry as anything more than a possible difficult target; the airman will merely agree that the cavalry must co-operate in "his" reconnaissance. The cavalryman must state his own case if it is to be stated at all.

The Cavalry Journal
October 1923

Chihuahua Cavalry

by Lieutenant Colonel R. Gordon Pynes, Jr.

A little known episode in American military history is the Punitive Expedition into Mexico headed by General John J. Pershing in 1916. Although the event has gained only minimal space in history books, it served as a fortunate opportunity for this nation's small army, which was soon to expand drastically and enter World War I in the trenches of France.

This article will deal primarily with new equipment and concepts that were first utilized and tested during the Punitive Expedition. Those interested in more detailed accounts of military operations and political problems of the period should read Clarence Clendenen's "Blood on the Border" or "The Great Pursuit" by Herbert M. Mason, Jr.

The Punitive Expedition seemed only a long dusty ride to many troopers who engaged in the last major horse cavalry operation; however, the experience gained by all concerned was to have numerous benefits for the United States Army just over a year later.

Chasing Pancho Villa let the U.S. Army ride off into the sunset and into the modern warfare of the 20th century. While the horse cavalry was actually in for a last roundup, a multitude of new innovations were battle-tested during the operation in northern Mexico. In addition, numerous commanders of all ranks gained valuable experience in their futile pursuit of the famed Mexican guerrilla chieftain. Just months later, many of the same officers would command major units against the Germans. Pershing's own performance in directing the chase would earn him command of America's Expeditionary Forces in Europe, while many of the officers who rode through Chihuahua would later serve as the principal commanders in World War II.

This major cavalry operation began from a small but unique incident in U.S. military annals. It was small because only a good two company-size Mexican guerrilla unit was involved, but unique in that the Mexicans actually invaded United States soil with a night attack on Columbus, N. Mex.

Villa's reasons for an attack upon U.S. territory are still unclear, but theories abound. One is that Villa wanted the military supplies and arms of the 13th U.S. Cavalry stationed at Columbus. Another claims that he sought revenge against two brothers who had failed to deliver guns for which he had already paid.[1] There is even the possibility that Germany influenced Villa to make the raid through a German national who served as his physician and principal adviser.[2] Villa's motivation probably stemmed from a combination of the above theories in addition to frustration with his deteriorating military situation within the ongoing Mexican Revolution and lack of U.S. support.

The guerrilla band of 485 well-mounted Mexican cavalry charged into Columbus shortly after 0400 on 9 March 1916. Confusion immediately reigned in the early morning darkness. Officers of the 13th Cavalry were away for the night at a dance in

[1]Haldeen Braddy, "Pancho Villa at Columbus" (El Paso: Texas Western College Press, 1965), p. 10 Hereinafter cited as "Villa."

[2]James A. Sandos, "German Involvement in Northern Mexico, 1915-1916: A New Look at the Columbus Raid." *Hispanic American Historical Review* (February 1972), p. 71

Deming and the unit's arms and ammunition were locked inside the guardhouse per regulations.[3] Strength of the 13th was seven officers and 341 enlisted men.

The ensuing defense was characterized by individual bravery on the part of the 13th Cavalry troopers. Total losses amounted to 18 Americans killed including ten civilians and eight soldiers. Ninety Villistas were killed in the raid. A large quantity of

military equipment and 80 horses were taken by Villa.[4]

Villa and his force quickly retreated into the Mexican state of Chihuahua ahead of a brief chase led by Major Frank Tompkins. The wild rumors of future guerrilla attacks left Columbus in panic while the nation reacted in anger. President Wilson conferred through the day with his cabinet on 10 March. By early evening a warning order was telegraphed to General Funston at San Antonio: "President has directed that an armed force be sent into Mexico with the sole object of capturing Villa and preventing further raids by his band, with scrupulous regard to sovereignty of Mexico."[5] The United States Army's last major horse cavalry operation was underway as the Punitive Expedition.

Men and supplies began converging on Columbus rapidly, and within a week Pershing had 4,800 men to form his pursuit force.[6] Later, a provisional division used against Villa would number 10,000 men.[7] Cavalry-heavy, the 4,800 man force was comprised of four cavalry regiments, two infantry regiments supported by two batteries of field artillery, an airplane squadron, and various combat service support units.

Chihuahua presented itself as a foreboding area of operations with its rugged mountains and desert terrain comprising a sparsely populated region of 94,000 square miles. The terrain and weather of northern Mexico were to severely test Pershing's logistical and communication systems in addition to his troopers and their mounts.

Transportation quickly became a problem as the cavalry rode deeper into Chihuahua after the fleeing Villa. Although pack mules and wagon trains were used as in past military campaigns, a new innovation appeared, the truck and touring car. Pershing immediately recognized the value of motorized transport as well as the problems associated with its operation over the almost nonexistent roads of Chihuahua. He used a Dodge touring car extensively to provide the mobility needed in coordinating the widespread pursuit.

On 19 March Pershing wired the Department Commander, General Funston, that only four trucks were operational because of poor road conditions and that more of the four-wheel drive type were needed. A telegram on 26 March pointed to the superior capacity of trucks over wagon transport: "Total capacity for motor truck companies over present roads 65,000 pounds daily. Total capacity of all available wagon transportation 27,000 pounds daily . . ."[8] At least 270 one-and-one-half ton trucks eventually supported Pershing's supply lines.

A report of operations submitted on 30 June 1916 included an evaluation of motorized transport and its contribution to logistics. The report concluded that truck trains had been put to the most severe test, having operated as far as 400 miles into Chihuahua. It cited the deplorable road conditions and difficult terrain faced by the motorized supply columns and stated: "Contemplation of the supply of an army under such adverse conditions might dishearten the most courageous, hence actual accomplishments under the circumstances is all the more creditable to the officers concerned." The report summed up the concept of motor transport and its first real field testing by stating that "the successful handling of supplies by truck trains for an expedition operating over a long line of communications has been steadily and gradually developed to a degree never before attained in our service." The report's author was most prophetic in concluding that these experiences would be the basis of "energetic efforts in anticipation of possibly greater emergencies."[9]

A young lieutenant destined to be America's greatest armored leader was among the first to grasp the significance of motorized warfare. George S. Patton Jr. saw from his experience in Mexico that the motorized vehicle had appropriated and assumed the characteristic mobility of the horse. In his opinion, the cavalryman could make use of this new asset better than anyone else. Patton began building his military reputation by using a touring car to reach a ranch where he surprised and killed a colonel of Villa's forces. Serving as an aide to Pershing, Patton had this incident gain press coverage in a *New*

[3]Braddy, "Villa," 17.
[4]*Ibid.*, 32.
[5]Clarence C. Clendenen, "Blood on the Border" (Toronto: The McMillan Company, 1969), p. 213.
[6]Herbert M. Mason, Jr. "The Great Pursuit" (New York: Random House, 1970), p. 84.
[7]Robert S. Thomas and Inez V. Allen, "The Mexican Punitive Expedition" (Washington: Department of the Army, 1954), p. II-11.
[8]*Ibid.*, II-24
[9]*Ibid.*, A-9.

York Times story on 23 May 1916.[10]

The weapon to have the most effect on 20th century warfare was first tested by U.S. forces during the Punitive Expedition. Airplanes had already entered warfare over Europe, but the chase in Chihuahua allowed the first U.S. application of the airplane to combat.

On 11 March, the 1st Aero Squadron stationed in San Antonio, Tex., was attached to Pershing's command. Eight airplanes were disassembled and shipped 520 miles by rail to Columbus. A day later, 10 pilots, 82 men, one civilian mechanic, and two hospital corpsmen boarded a train for the "front." One of the pilots recalled that the squadron was in horrible shape as the airplanes were not fit for military service. The squadron had no ordnance, and it was 2 months before 16 machineguns were obtained. Supposedly that total represented one-half of the army's machinegun inventory.

Primary concern in employing the squadron centered on the performance of Curtiss engines at the higher altitudes in Chihuahua. On the afternoon of 19 March Pershing called his air squadron forward, ordering it to proceed at once to his location 90 miles south of Columbus. Taking this order literally, the squadron took off late in the evening with only one pilot experienced in night flying. This first effort did not establish the value of aircraft. The planes had no reliable compasses and each was equipped with a different type. There were no lights on the aircraft and after dark the pilots could not see their instruments. None of the planes reached Pershing that night, but the next morning six reported safely.[11]

Pershing gave the squadron its first mission by ordering a reconnaissance flight to locate American cavalry on the move. After several unsuccessful attempts to fly through high mountain passes, the insufficient strength of the 90-horsepower Jenny aircraft became apparent. In two messages on 20 and 31 March Pershing urged that "...highest powered, highest climbing, and best weighted aeroplanes that can be purchased in the United States be purchased for this service..." He was advised that four 160-horsepower Curtiss models had been purchased and were undergoing tests.[12] The eight planes of the 1st Squadron were able to offer little help as the eyes of Pershing, yet they did perform well in several reconnaissance missions and were used in flying courier runs to link the extending pursuit.

The airplane's potential if not real value was evident. Lieutenant Patton mentioned the use of three airplanes to scout an area of 700 square miles.[13] A record of sorts was set when a plane with an observer and pilot covered 315 miles in less than 5 hours establishing an American airplane record for nonstop flight.

Rough landings and maintenance problems soon forced the squadron out of action, but the lessons learned in flight over Mexico gave aviation a much needed boost during its fledgling days as an arm of the U.S. military. The 1st Squadron's Commander, Major Foulois, best summed it up in an after action report, "The experience gained by the personnel of this command, while on active duty with the Punitive Expedition, has been of the greatest value, and it is believed that the knowledge gained by all concerned should result in more rapid and efficient development of the aviation service in the United States Army."[14] A year later air squadrons were much

[10]Martin Blumenson, "The Patton Papers," (Boston: Houghton Mifflin Company, 1972), p. 337.

[11]Mason, "The Great Pursuit," p. 108.

[12]Thomas and Allen, "The Mexican Punitive Expedition," p. III-24. "The Patton Papers," p. 326.

[13]Blumenson, "The Patton Papers," p. 326

[14]Thomas and Allen, "The Mexican Punitive Expedition," A-20.

better prepared for employment in Europe.

Especially vital to the Punitive Expedition were communications. With numerous mounted columns spread over hundreds of miles south from Columbus, Pershing had extreme difficulty staying abreast of the pursuit's progress and directing the overall operation. Although the air courier service contributed significantly, other faster and more reliable means of communication were employed.

Several communication methods were first tested extensively over the rugged terrain and long distances. Ground telegraph wire was put down and eventually provided communication connecting Columbus with sites in Chihuahua over a distance of 325 miles.[15]

Wet weather forced construction of a line on iron poles. The line supported transmission of 10,000 words daily. Radio sets were utilized which enabled signal units to transmit up to 2,000 words. Early in the campaign Pershing reported that wireless communication had been unsuccessful and requested he be furnished two pack wireless sets and one wagon set. He mentioned that a large part of the signal equipment was unserviceable.[16] Spare parts were difficult to obtain as much of the communication gear was of foreign manufacture.

Later in the expedition, Lieutenant Patton noted the capability of the radio set by commenting on its use in establishing communication over a distance of 60 miles; however, the pack sets provided to the moving cavalry columns were of little value. A report by the signal staff recommended a larger pack set with a 50 to 75-mile range to accompany the cavalry. The same report pointed out the lack of U.S. made parts as a very serious defect. It also suggested that consideration be given to the shortage of wireless machines since they proved indispensable under modern war conditions.[17]

In addition to the field testing of military equipment and concepts by Pershing's regular army forces, the U.S. defense establishment reaped valuable experience from a national mobilization during the Punitive Expedition. In the summer of 1916, the National Guard was ordered to active duty from every state except Nevada, which had no National Guard. Considering the lack of planning, the mobilization proceeded with amazing speed.

On 1 July, 12 days following the mobilization order, 122 troop trains were bound for the Mexican border; 4 days later 101 trains were enroute. By the end of July 112,000 men were stationed along the border from Douglas, Ariz., to Brownsville, Tex.[18] Eventually some 250,000 men were involved in the callup.

Though no one could forsee its effect in the summer of 1916, the mobilization of the Guard prepared American forces for World War I. Large numbers of men were trained and conditioned while officers and noncommissioned officers gained priceless experience in handling troops and planning for them. Numerous weaknesses and deficiencies were revealed. Though begun in 1917, the demoblization after the Punitive Expedition was not completed prior to entry into World War I. Remobilization of units already discharged went smoother because of the recent experience.

The Punitive Expedition basically accomplished its mission. Villa's forces were killed, captured, or scattered for the most part, and could no longer threaten U.S. soil with major raids. The legendary Pancho Villa was never captured, but would not regain his previous military strength and ceased to be a major political factor within Mexico or a threat to the United States.

The last major gathering of U.S. horse cavalry had a far greater significance to the U.S. military than the damage dealt to Pancho Villa. Its leadership had been tested in combat in varied and rugged terrain over great distances. Adverse circumstances had provided an opportunity to view the advantages of motorized vehicles, airplanes, radios, and other equipment and concepts in addition to the problems encountered in their adaptation to warfare. The lessons were well learned and soon effectively applied in the battles of World War I.

Young George Patton probably best expressed both the frustration and professional satisfaction provided by the difficult Mexican venture. In a letter to his father dated 15 June 1916, the young cavalry officer wrote, "I am very well and having a stupid time." Just over 6 months later in a letter to his wife he was grateful for the experience, writing, "I have learned more useful soldiering while in Mexico than all the rest of my service put together."[19]

A little known event in American military history, this campaign by cavalry through Chihuahua known as the Punitive Expedition, was destined to provide rich dividends for America's forces in the two world wars ahead.

[15] *Ibid.*, p. A-18.
[16] *Ibid.*, p. III-23.
[17] *Ibid.*, A-18,19.
[18] Clendenen, "Blood on the Border," p. 290.
[19] Blumenson, "The Patton Papers," pp. 341, 371

LTC R. GORDON PYNES, JR., was commissioned in Military Intelligence upon graduation from Texas Christian University in 1960. He has commanded the 502d MI Detachment, the Defense Investigative Service Field Office at Ft. Hood, and the 312th MI Bn. (Provisional). LTC Pynes has studied Spanish and Vietnamese at the Defense Language Institute and is a graduate of the MI Career Course. A C&GSC graduate, LTC Pynes also holds an MA from the University of Texas in Latin American studies. LTC Pynes is currently assigned to G2, III Corps, Ft. Hood, Tex.

Defense Against Chemical Attack

by First Lieutenant Austin Bay

With the most recent estimates maintaining that fully one-third of the Red Army's tactical missile warheads have a potential chemical fill, and with the deployment of thickened nerve agent GD (soman) and volatile blood agent SC (hydrogen cyanide), a very convincing picture emerges. NATO and U.S. commanders must prepare their units to survive NBC attack and continue their combat mission in a contaminated environment.

NATO's heightened awareness of the Soviet Union's capability to wage chemical warfare on a massive and deadly scale increases the need for effective chemical defense training. Though once in woeful condition, U.S. Army, Europe (USAREUR) has made great strides in preparing its troops for personal chemical defense and made the first positive steps toward improving unit-level chemical defense and decontamination methods. It is now incumbent upon CONUS units, especially those with REFORGER missions, to develop their nuclear, biological, and chemical (NBC) defense expertise.

Perhaps it is a moot point to discuss why NBC training once received little or no priority in the U.S. Army while our most formidable potential adversaries have stressed such training. An awesome historical imperative exists for the Soviet awareness of chemical weapons' devastating potential. In World War I their armies suffered over 475,000 casualties, 56,000 of which were fatal, as the result of chemical attack. In the 1950's, the lack of a Soviet tactical nuclear arsenal comparable to the U.S. capability certainly affected their decision to develop chemical weapons as an intermediate tactical response to the U.S. nuclear advantage. With the erosion of America's tactical nuclear edge the tables are somewhat reversed.

The Soviets are constantly improving their NBC training techniques and technology. Several Warsaw Pact decontamination items, such as the *TMS-65*, a jet engine mounted on a truck bed used for rapid decontamination of armored units, have no Western counterpart. Their NBC reconnaissance capabilities, built around trained and dedicated chemical troops using such sophisticated items as the *BRDM-rkh*, an armored car rigged for survival in an extremely contaminated environment and equipped with internal and external chemical and radiological monitoring and marking devices, have no counterparts in the U.S. Army.

Thus the Soviets are prepared both offensively and defensively. The noted Russian defector, Colonel Oleg

Penkovskiy, described Soviet intentions quite succinctly:

> Soviet artillery units are all regularly equipped with chemical warfare shells. They are at the gun sites and our artillery is routinely trained in their use. And let there be no doubt, if hostilities should erupt, the Soviet Army would use chemical weapons against its opponents. The political decision has been made and our strategic military planners have developed a doctrine which permits the commander in the field to decide whether to use chemical weapons and when and where.
>
> from "The Penkovskiy Papers," 1965
> Doubleday and Co., Inc.

How can we go about improving current programs? Commanders must develop individual defensive skills, and as the individual soldier gains expertise, develop the unit's ability to survive NBC attacks. A unit's survivability must be based upon all elements coordinating to survive, identify, contain, and decontaminate chemical, nuclear, or biological contamination. This includes all combat and support elements as well as specially trained radiation monitoring, chemical survey, and decontamination teams.

The following is illustrative of a program aimed at improving individual and unit NBC defensive skills. The thrust of the program is toward chemical defense, but many of its elements are applicable to all types of NBC attacks.

The key words are survive, identify, contain, and decontaminate. But first the individual soldier must be made aware of the potential Soviet chemical threat. Bring the G2/S2 intelligence personnel into the show and ask them for assistance. Unclassified documentation of the Threat is readily available. A short company-level class will go a long way toward improving the soldier's awareness of the Warsaw Pact's ability to kill him quickly and cheaply through the wonders of chemistry.

Without question, survival of chemical attack in order to continue the combat mission is the unit commander's NBC training goal. Survival is a function of the use of protective equipment and immediate action drill. The individual must be knowledgeable of the equipment available, well versed in its use, and know when and how to use it.

The primary means of chemical defense are the protective mask and hood. The *M-17* and *M-25* series masks are the Army's standard masks. They are complemented by the standard U.S. protective overgarment, or the Standard B chemically treated undergarment. *M-2* vesicant leather dressing is supplied to each company for chemically treating and protecting leather gloves and boots. The dressing is resistant to liquid agents.

In the past, garrison training utilizing the protective mask has consisted of mask fitting to obtain an effective seal, and mask confidence training, which usually consists of walking into the tear gas chamber and donning the mask.

This training was, at best, a yearly affair. To do it justice, some training is better than none. But the commander is doing himself and his troops a great disservice if he believes this to be adequate. A thorough program must include mask discipline training: the ability to perform normal missions for extended periods of time with minimal loss of job efficiency and without removing the mask. This should not be a bitter pill to swallow because it is exactly what will be required in combat. Mask discipline is an acquired skill very much like weight lifting; it takes a lot of work to be able to operate while masked for extended periods.

Fortunately, mask discipline training is easily integrated into the average duty day. For example, the 1st Infantry Division (Forward) in USAREUR and elements of the 4th Brigade, 2d Armored Division at Fort Hood, Texas have adopted the following program:

Weeks 1-3	*Units wear mask one continuous duty hour one day a week*
4-6	*two continuous duty hours one day a week*
7-8	*three continuous duty hours one day a week*
9-12	*four continuous duty hours one day a week*

Physical training should not be performed while masked due to the danger of a collapsed lung. Due to safety factors individuals driving military vehicles or POV's should not drive while masked, unless in a designated maneuver area. The problems of identifying soldiers with legitimate reasons for not being masked during the prescribed time period are solved by having the unit NBC sergeant issue a card stating the reason the individual does not have a mask. For example, the card would inform the inspector that the individual's mask is in for repair.

Mask discipline training will allow the individual soldier to grow accustomed to the loss of visual acuity inherent with wearing the mask and to the heat and fatigue stress associated with extended masking. It will also serve as an impetus to insure that individuals who need optical inserts get them. Normal telephone usage will familiarize radiotelephone operators with the intricacies of communication while masked.

As more of the overgarments enter the system, an increasing number will be designated for training purposes. These suits are available through normal supply channels. The issue rainsuit serves as a good simulator for the overgarment as long as the soldier is aware that it it a simulator. *There are troops who believe their rubber rainsuit is their protective overgarment. This confusion could prove to be fatal!*

Use of the *M-2* vesicant leather dressing constitutes a very simple tank crew or squad-level class. All it takes is a can of *M-2* ointment and an old boot. The result is a very, *very* waterproof boot, and troops who know how to protect their hands and feet from liquid agents.

Effective immediate-action drill incorporates the second requirement for NBC preparedness, identifying the agent. Here we do not mean exact agent identification (for example, pinpointing the precise kind of nerve agent) so much as being able to determine that a chemical attack is underway and to react before it is too late. Knowledge of Soviet chemical delivery systems and the effects of chemical agents is essential, but training in recognizing the physical effects of chemical agents is of primary importance because in most tactical situations where chemicals are used, recognition of the attack depends upon physiological recognition (smelling mustard agent for example) or recognition of physiological effects.

In most units it is mandatory to mask when the unit is struck with rocket or tube artillery. This requirement should not be ignored during training. Soldiers should know to mask any time a suspicious mist or smoke is identified, especially one emanating from aircraft.

The standard NATO warning for all NBC attacks is metal on metal. For example, one alarm might consist of a soldier striking a metal tent peg against a dangling iron bar. The soldier who is familiar with the unit alarm systems, who can recognize the danger, who knows how to use his protective equipment, and who can mask in 9 seconds or less, will survive the attack and continue the mission after he provides first aid to the soldier who left his mask in the bustle rack, or after he buries the soldier who left his mask in the bustle rack.

Army Subject Schedule 21-6, *Individual Protective Measures for CBR and Nuclear Attack,* as well as FM 21-40, *CBR and Nuclear Defense* and FM 21-41, *Soldiers Handbook on CBR Warfare* all provide strong background information on immediate action drill as well as most aspects of NBC training.

More complete identification of the chemical agent will

usually be carried out by specially trained unit teams. We will discuss these teams more thoroughly later. The exception is use of the *M-8* detector paper, an item issued with the mask. Soldiers should be taught how to use the paper. *M-8* paper in contact with a liquid chemical agent will indicate the general agent type of most chemical agents. Training is very simple. Antifreeze reacts with *M-8* paper to produce the yellow color indicating G-type nerve agent. DS-2 (Decontaminating Solution 2, an item in the unit's decontamination arsenal and issued to all companies) turns *M-8* paper green to indicate V-type nerve agent. The solution from the blue-topped bottle in the *M-15A2A* Chemical Detector Kit, also issued to all companies, reacts to produce the red H-type mustard indication.

At the individual level, containment of the effects of the chemical attack consists of two actions: informing the unit leaders and administering first aid. All personnel should know how to deliver an NBC-1 Observer's Report and understand that it has FLASH precedence. Flanking units should be warned immediately via the NBC attack warning signals.

First aid is the other individual means of containing the effects of the attack. First aid treatment for chemical casualties is generally agent-specific, so the soldier should know as a minimum, treatment for vesicant (blister) agents (use *M-258* and *M-13* decontamination kits,) G- and V-type nerve agents (*M-258* kit for effected skin areas, atropine injector for symptoms) and all blood agents (amyl nitrite ampules). Individual decontamination using the *M-258* and *M-13* kits must be stressed.

Ultimately, the key to individual survival is the soldier's own confidence in his NBC protective equipment and in his ability to use it successfully. In the larger picture, such confidence and ability is the key to the unit's preservation. I personally believe the greatest single effect of Soviet chemical attack will be panic, fear, and demoralization. Our greatest casualties will not be caused by direct exposure to chemical agents, but by the physical and mental disruption their use will cause in our tactical planning and deployment. Certainly, physical on-the-ground contamination and casualties will exist, but their most decisive effect will be their mental intimidation and our unwillingness to operate in the chemical environment.

This lack of confidence in our ability to operate in such conditions could be rapidly exploited by Soviet units having no such qualms.

But the present is not the time for pessimism. We can solve the problem. The situation suggested above is only intended to illustrate how chemical weapons could prove to be the key offensive element which unbalances our command structure in the same sense that bypassing strong-points allowed the Germans to unnerve the command effectiveness of the Polish and French armies. We are ready for similar blitz and accelerated assault tactics on a broad, fluid front and we train to deal with them both mentally and physically. But we do not train to deal with them while suffering the awesome shock of chemical or nuclear weapons. Our tactics, the active defense for example, key on coolly executed combined arms action, quick counterattack, and timely withdrawal. They demand clear and confident thinking and application. Sir Basil Liddel-Hart's "Strategy" chronicles and rechronicles wars between fairly evenly matched opponents that have been lost because command disruption and loss of confidence were the keystones to rapid and irretrievable defeat.

This is all the more reason to ensure our units are able to effectively deal with the shock of chemical assault. Unit training should be keyed to insure successful reaction to the shock of Soviet first-use because the time-frame immediately following first-use will be the period of greatest tactical vulnerability.

To recapitulate, initial unit survival will be a function of each individual's ability to protect himself. Unit immediate action drill will include NBC attack warning signals, dispatch of detection and decontaminating teams, followup NBC reporting to higher headquarters and aiding casualties.

But these are after-the-fact reactions. The unit can do something to limit the effects of chemical attack before it is initiated. This is through the application of *mission oriented protective posture* (MOPP) one of the most misunderstood terms in current military vocabulary. The chief reasons for the misunderstanding have been lack of a standard MOPP guideline, and lack of field training under MOPP conditions. What is MOPP? FM 21-40 defines it as:

> ...a flexible system of chemical protection for operations in a toxic chemical environment. This posture requires personnel to wear individual chemical protective clothing and equipment consistent with the chemical threat work rate imposed by the mission, temperature, and humidity without unacceptably degrading their efficiency from the effects of heat stress, psychological stress, and other factors affecting the senses. Personnel are directed to assume the mission oriented protective posture when intelligence indicates that the enemy may initiate the employment of chemical agents or once chemical agents have been employed. The extended wearing of chemical protective clothing and equipment is required by the continuing immediate threat of chemical attack or hazard resulting from the known capability of the enemy to produce an unacceptable casualty rate among unprotected personnel.

I authored the following simplified MOPP Level Designation System (MOPP-LDS). It is an attempt to develop a

standardized operational system which allows the commander to defend against enemy chemical attack based upon the estimated threat of the attack and the assigned mission. The MOPP-LDS is a very simple and easily implemented system utilizing the two matrices detailed below.

Summer (HOT) or Hotel Matrix

- MOPP 3. Standard condition, protective mask carried by personnel; company trains/APC's carry protective clothing.
- MOPP 2. Carry mask and gloves, wear part of protective clothing open, watch for heat illness; from time to time remove protective clothing.
- MOPP 1. Wear all protective clothing and equipment; attack is imminent or in progress; prepare for immediate action drill and decontamination.

Winter (COLD) or Charlie Matrix

- MOPP 3. Standard conditions, protective mask carried by personnel; company trains/APC's carry protective clothing.
- MOPP 2. Wear mask, hood, and gloves; open frequently; wear all protective clothing, open frequently; watch for heat illness.
- MOPP 1. Wear all protective clothing and equipment; attack is imminent or in progress; prepare for immediate action drill and decontamination.

The correct matrix is determined by time of year and

climatic conditions. A rough estimation of conditions is all that is required, but generally any temperature over 55° Fahrenheit should require the utilization of the summer matrix. The reason there are two matrices is simply to take advantage of the increased protection available during cold weather because protective clothing serves as winter clothing.

How is this system applied by the commander? When the MOPP level determined by the commander is disseminated through the command net, a number indicating the percentage of personnel to the nearest 10 percent, who are to assume the directed level, will immediately follow the prescribed MOPP level. This only applies to MOPP level 2, since MOPP 3 is standard condition and MOPP 1 represents a situation where 100 percent of the personnel would be required to assume full protection due to attack. By indicating a percentage figure the commander can have a mix of protected personnel and personnel unhindered by protective clothing. For example, *MOPP 2-50* indicates MOPP level 2 with 50 percent of personnel in MOPP 2 condition. *MOPP HOTEL 2-50* indicates the H or hot matrix. *MOPP CHARLIE 2-50* indicates the C or cold matrix. Units adopting and utilizing such a MOPP system will greatly increase their combat survivability, but the unit must do more than simply survive the initial attack. It must be prepared to continue operation in the contaminated environment. NBC-1 reports are forwarded, basic loads of filters are checked (this is especially important if a blood agent is encountered since it rapidly degrades current filter elements), and detection teams, utilizing the *M-15* or *M-18* series kits, are dispatched to determine the extent of the contamination and the exact agent type.

These unit detection teams, along with the radiation survey and monitoring teams, should consist of the unit's best available personnel since some of their required operations are intricate and complex. However, the training of detection teams can be very easy once a basic understanding of detection techniques is acquired. Besides making use of the expedient simulants discussed in conjunction with the *M-8* paper, the *M-72* chemical agent simulants kit is available on unit common tables of allowances. Dozens of homemade training agents can be constructed. A 3-pound coffee can with a hole in the plastic top is a simple and effective training aid. Spray an organophosphate pesticide into the can, cover it, and insert a blue band detector tube with aspirator into the hole. Take the aspirations. The result should indicate nerve agent.

Unit decontamination personnel will use the *M-11* sprayer with DS-2 Super Tropical Bleach (STB) and various field tools, such as shovels and hoes. *M-11* sprayers are authorized on all tactical vehicles. The operators should conduct the decontamination operation themselves, starting with the vehicle hatches and entry points.

Further decontamination using dry STB or STB mixed in a slurry may be conducted by the unit decontamination teams. The teams should be well trained and confident of their abilities. Ill-trained teams could easily make the mistake of mixing DS-2 and STB which causes an exothermic reaction that produces heat, and ultimately a fire with toxic fumes.

TM 3-220, *CBR Decontamination*, is the most thorough and authoritative text available on tactical decontamination. Army Subject Schedule 3-2, *NBC Decontamination*, is another excellent reference.

Commanders should realize that Army doctrine requires each unit to provide its own organic decontamination. Even if the current plan to include one chemical defense company in the division base is implemented, this vital asset will be spread to the point of invisibility should a chemical attack be initiated on a broad front.

One final comment must be made regarding medical assistance for chemical casualties. We must realize that until the casualty reaches an uncontaminated hospital, about the only effective first aid measures we have are those individual procedures previously discussed. The unit can further medical treatment by attempting to segregate, decontaminate, and isolate chemical casualties. Although chemical agents are tactical weapons with limited operational use, even a tactically unsuccessful strike will strain medical facilities to the breaking point. Contamination of nonchemical casualties and key medical personnel will be minimized if proper care is exercised at the unit and the unit's clearing station.

I tend to believe the preparedness of our medical support dealing with chemical casualties is at best inadequate. All of the Medical Corps personnel with whom I have discussed this subject concur. Inspections I have participated in reveal a lack of training expertise and a shortage of even the most basic drugs and equipment. We must improve our performance in this area or be prepared to suffer the consequences.

The program presented is just an example of one possible NBC training program. It is representative of a well rounded, but by no means complete program. Units should design their own program based upon their particular requirements, and they should complete the training cycle with an NBC performance-oriented evaluation. This may be conducted in conjunction with the unit's appropriate Army Training and Evaluation Program.

If a motto exists for NBC defense it should be "Train to Survive and Continue the Mission." Implementation of the program outlined or one of similar ilk will enhance individual and unit survivability on the modern battlefield and be another step toward winning the first battle of the next war.

1LT AUSTIN BAY was commissioned through ROTC as a Chemical officer from Rice University in 1974, where he earned BA and MA degrees. An AOB graduate, Lieutenant Bay served as a platoon leader in the 11th ACR, and as the Division Forward Chemical Officer in the 1st Infantry Division. Lieutenant Bay is currently assigned to the 4th Bde, 2d Armored Division.

Combat Training Theaters

by Ms. Ann Mulligan

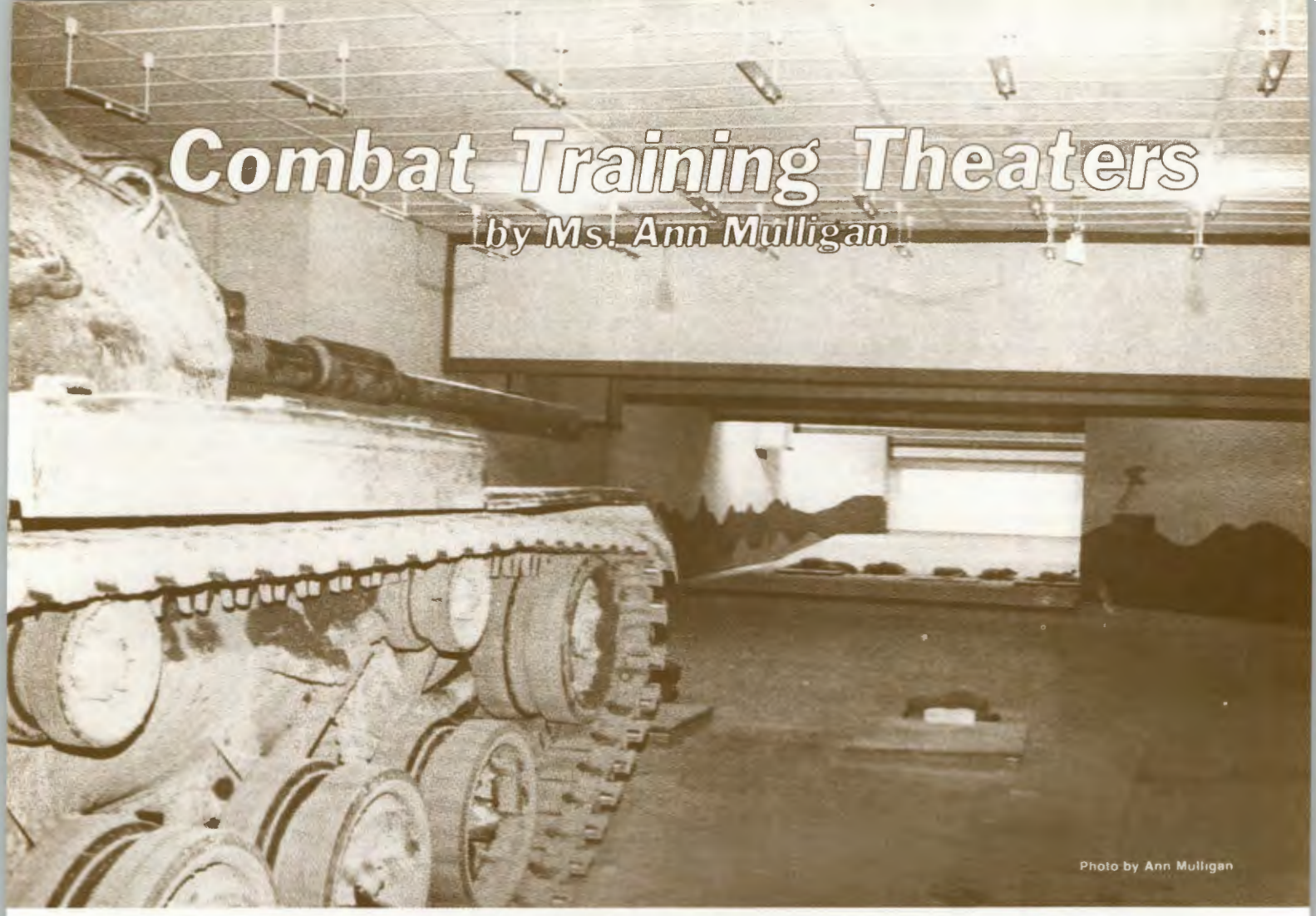


Photo by Ann Mulligan

The pinch in defense funds continues. Ammunition, transportation to ranges, and range operation costs are on the rise. The trend in tank gunnery is toward more subcaliber firing and target simulation.

Eleven USAREUR locations are now using a British-developed Combat Training Theater (CTT) that not only saves money, but increases armor training capabilities.

The latest CTT combines an indoor firing range having controlled lighting conditions with a computerized 16-mm. color film "target." Special movies and slides cater to the requirements of either infantry or armor units. Trainers say initial and maintenance costs are reasonable and the CTT's many advantages make them good investments.

The U.S. Army studied the British systems in the early 1970's. The first CTT went into operation in USAREUR in 1972. The systems are improving and the Army is currently using equipment manufactured by Detras Training Aids Ltd.

Typical operations may be found at 8th Infantry Division locations at Wiesbaden Air Base and Coleman Barracks. The 8th Infantry Division's 3d Brigade is one of eight locations still using the earlier, less versatile, models. Just under $20,000 was spent in 1975 to partition an existing indoor firing range to accomodate the $28,000 equipment package for the CTT. Hampered by lack of training facilities at Wiesbaden Air Base, the *Brigade 76* armor units stationed there spent $50,000 renovating a former warehouse and adding an estimated $30,000 worth of up-to-date equipment in early 1976.

How Does the CTT Work?

A single tank sits on a firing line 30 meters from a paper screen. An electrical switch panel controls lighting conditions. A projection stand or booth houses the computer and movie equipment. Using a hand-held remote control unit, the instructor programs the computer for the type of target, range, weapon, and ammunition. The projector beams a color film, for example, showing a crossroads at 1,200 meters and an enemy tank approaching the intersection.

The tank crew on the theater firing line sights and tracks the target, then squeezes off a subcaliber round. At the same instant, a sensitive microphone or audio detector receives the report of the shock wave and generates an electrical impulse in the control console. At the theoretical instant the projectile would hit the target, the movie projector freezes the film image. Trajectory simulation is immediately applied. The projector elevates the target image on the screen to show where the full caliber round would have impacted in a real situation. The system is accurate to plus or minus .05 millimeter in trajectory, and to milliseconds in time of flight.

Flood lamps switch on behind the screen providing a point of light through the bullet hole. The instructor and the tank crew can then assess the hit or miss. Before the film continues,

the screen's drive mechanism rolls the paper and eliminates the hole. The instructor can program the equipment so the tank crew can get off several rounds before the movie stops.

The advantages of CTT's are:

- **Realism.** Popup target ranges limit practice in identifying the enemy. An ever-growing supply of films can simulate almost any combat situation. Lighting controls let operators dial in bright sunshine, moonlight, darkness, or infrared lighting for training with night devices.
- **Convenience.** Limited space at Wiesbaden Air Base once meant gunnery practice was limited to infrequent and costly trips to major training areas. Now the crews practice at home. Manpower attrition can change the makeup of a tank crew since the last range practice. The CTT is an easy way to let newly-assembled crews fire together and become proficient before annual gunnery. Training takes place indoors so round-the-clock, round-the-calendar firing is possible. Equipment is protected from the elements. Instructors can assess and advise in a clean, sheltered environment.
- **Cost Savings.** The Army hasn't released full financial statistics, but the primary equipment supplier claims the CTT "will pay for itself" with the use of subcaliber rounds. For instance, Detras claims the average target screen cost per round for over 100,000 rounds is less than three cents per round. So far, commanders are using the CTT only as a supplement to outdoor range activity, but increased use has been recommended by training support activity personnel. Most theaters operate 4 to 5 days a week, but a platoon can be scheduled on 24-hour notice to fill a free period. A run through a film averages 15 to 20 minutes.

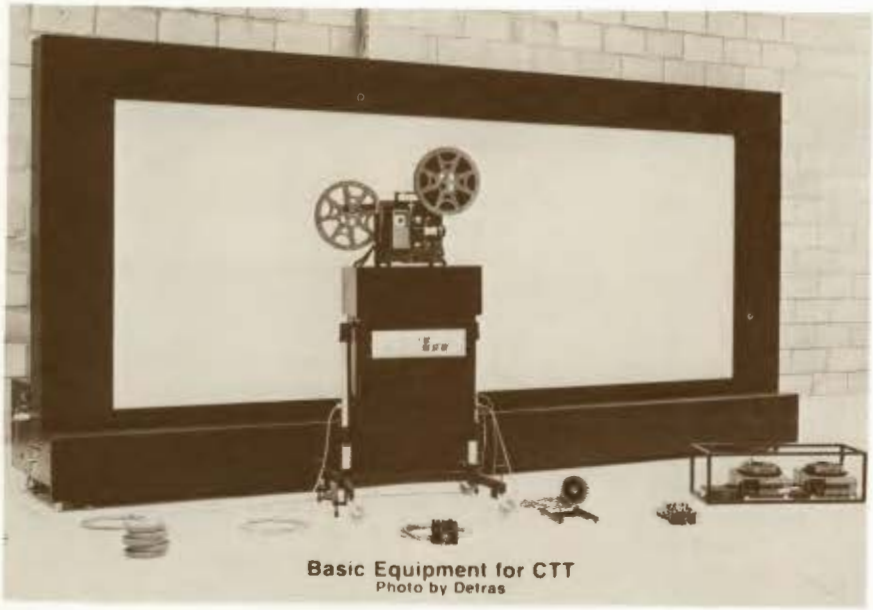
An early question was whether more than one tank could fire at the same film target at the same time. With present equipment, training support personnel say they found the sound of two rounds often didn't register accurately and scoring was easier with a single crew.

Tankers report they like the fast-paced, realistic film targets. The gunner and tank commander benefit the most from training in a CTT. The facility is not particularly useful in training drivers, but loaders do get practice recognizing fire commands.

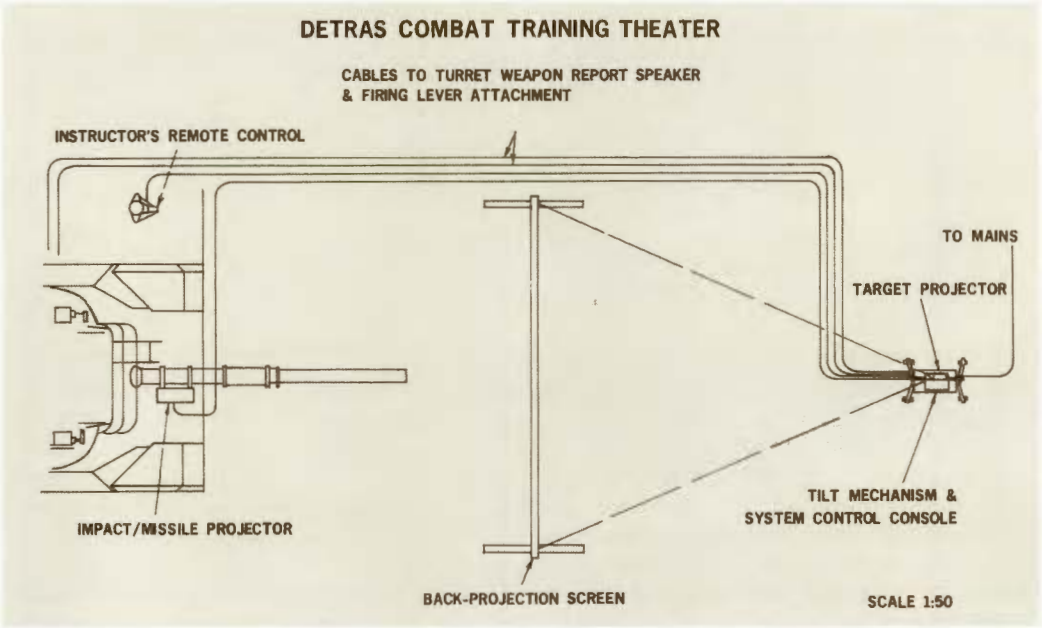
The most up-to-date combat training theaters employ a combination of Detras equipment and other facilities supplied by the units themselves.

The Detras package includes a:

- **Projector.** A 16-mm. sound projector modified for heavy-duty use and two modified slide projectors.
- **Projector Console.** An integral part of the movie projector stand, the console contains a tilt mechanism to simulate trajectory.
- **Control Console.** The computer-like heart of the system contains plug-in modules which control such factors as power, timers, trajectory, flight-time and target range. The series of modules is programmed for any of eight free-flying projectiles, but the program can be changed in minutes by inserting new memory banks.
- **Remote Control Unit.** This hand-held box with a wandering cord lets the instructor control the projector from the firing line. Used in manual or automatic modes, the operator tells the control console what type of weapon, ammunition, and range will be in use. Training support activity personnel say the remote unit is one of the advantages of the system. It was also an early problem. The brittle connecting cord is now "G.I. proof." (Early 1970's equipment in use at Coleman Barracks does not include a remote control unit with all of the capabilities and functions of the new type.)
- **Screen.** A free-standing framework holds and guides two rolls



Basic Equipment for CTT
Photo by Detras



of special white paper. The projection area itself measures 4,500-mm by 1,600-mm. An electric motor drives the paper rolls. Each roll costs $250 and lasts about 6 months. Screen area bullet hole illumination is by florescent lamps.

Individual Army units say they're spending from $20,000 to $50,000 to complete their combat training theaters. A building, fortified backstop, controlled lighting system, dust blower, ceiling baffles, infantry foxholes, tank firing lines, and a foreground sandpit fall into the local cost category.

The rear impact wall determines the type of ammunition that will be used. Existing conditions at Wiesbaden Air Base and two other locations limit tank crews to .22-caliber projectiles. Other CTT facilities can fire up to .45 caliber.

Installation of the equipment and training of the operator takes about 1 week. Continuous refresher courses are handled by training support teams, and operators report upkeep of the equipment is minimal.

USAREUR has four more combat training theaters on the drawing board. In the near future, plans may be approved to standardize the design of the theaters, and not limit it to one firm's equipment.

Standardization will include changes in arrangement of ceiling baffles (bullet deflectors), and an improved back stop (minimum 5.3 meters of sand at the base, and steel reinforced plates against an 8-inch reinforced concrete back wall so a maximum of .45-caliber ammunition can be used). Lighting systems will also be made uniform.

But the combat training theater hasn't stopped evolving. A new system that eliminates the need for a large building, an impact area, rolls of screen paper, and ammunition has been developed.

Called the "Tank Gunnery and Missile Target System," the equipment uses laser light to simulate HEP and HEAT rounds and *Shillelagh* missiles. Later equipment will also simulate TOW and *Dragon*.

According to the manufacturer, the system consists of a self-standing screen, and a projection and computer unit that beams the film from 5.6 meters to the rear of the screen. The tank lines up 5.6 meters on the opposite side of the screen.

The tank gunnery concept operates like the existing Military Film Target System except that instead of a bullet hole, the position of the round "fired" shows up on the screen as a point of laser light. The light is projected by a device clamped on the gun barrel (impact/missile projector).

If the instructor selects the missile mode on the remote control unit, the laser light will simulate the inflight motions of the *Shillelagh* missile. A "sight obscuration device" lets the gunner "see" smoke in his field of view after launch. A "gun muzzle movement sensor" on the gun tube and the projector simulate the characteristic missile drop after launch, the "lock-on" to the Infrared Command Guidance System, tracking "lag" due to rapid sight movement, and other performance aspects.

The U.S. Army Armor Center is investigating the USAREUR success with the combat training theaters. Increased use of existing film target systems, plus the prospect of adopting laser light and missile simulators may show up as lower costs and greater competency in armor gunnery.

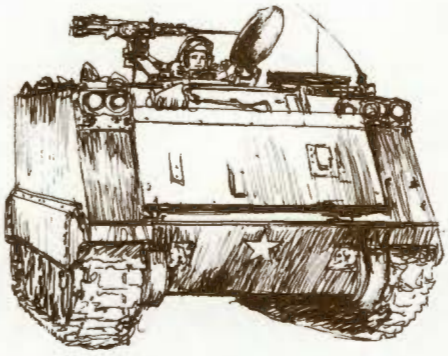
ANN MULLIGAN is a freelance photojournalist living in Heidelberg, Germany. She has a journalism degree from Ohio University and is a former daily newspaper staff writer, radio news director, and television news reporter. Ms. Mulligan has had several years experience with military publications. She is now employed as a writer and editor with the American Forces Network.

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)

THE GUT ISSUE



The fundamental difference which separates the Armor and Infantry Officers concept of combined arms operations lies principally in their divergent views of the roles to be played by the infantry fighting vehicle (IFV). Those differences far exceed whatever conceptual differences may exist between the two in the employment of the tank.

The Armor leader looks to the tank as the primary weapons system on the battlefield. In the tank he sees the protection, mobility, and firepower to destroy the enemy in either offensive or defensive operations. He sees also the inherent weakness of a pure tank force and recognizes a need to divert enemy pressure from the tank through the use of supplemental, destructive, and suppressive fires beyond that which are available from the tank itself. However, he sees the battle as an Armor battle—a battle of highly-mobile mechanized forces—where the role of the dismounted man is held to the absolute minimum necessary to maintain the mobility of the tanks and IFV's or to regain that capability when lost in defiles, built-up areas, etc. In other words, the Armor leader sees the personnel carrying capability of the IFV as secondary to its mobile fighting power. The Armor commander envisions tac air, artillery, air cavalry, and attack helicopters playing an important role in any Armor battle. However, these supplementary forces are in such limited supply that they must be conserved for employment at critical periods during the course of the battle. These forces are also often transient in their general support role. Therefore, in the face of probable contact or sustained combat, a combined arms force with some dismounted capability is required.

To the Armor leader, the principal purpose of the IFV in the combined arms team is to:

- Use their TOW missiles to destroy enemy tank-killing weapons systems which are at greater kill ranges than are achieveable by our own tanks.
- Participate in the destruction of tank-killing weapons systems with their TOW's and 25-mm. guns at ranges compatible to both the tank and IFV.
- Contribute to the destruction and suppression of close-in, mounted and dismounted tank-killer weapons systems.

In those roles, the IFV relieves stress on the tank and permits the tank to concentrate on rapid servicing of the most critical targets on the battlefield.

In an Armor leader's order of priority, we now come to the role of the dismounted crewmen of the IFV. That role has only lightly been addressed heretofore because, whether in the offense or defense, the Armor leader must first focus his attention on engagement ranges which are incompatible with the dismounted infantryman's weapons systems. Is there a role for the dismounted infantryman? Absolutely! In the offense there are many situations in rough, broken terrain; in defiles; in built-up areas; etc, where tanks and IFV's must bypass or overrun resistance. They cannot leave the remnants of that enemy force to pick off or attrite the follow-on elements. Locally bypassed enemy forces cannot be left to regroup. They must be suppressed or destroyed by dismounted infantry, often supported by IFV's and/or tanks.

In the defense, the dismounted man's role is critical in manning OP's, and covering defiles, and dismounted enemy avenues of approach. His rifle, machinegun, LAW, and *Dragon* cover the close-in avenues of approach and compensate for much of the intervisibility problem inherent in the tank weapons system. His TOW provides a long-range, overwatching capability for the tank and IFV, adds depth to the battle position, and facilitates the tank and IFV capability to maneuver on the battlefield.

The issue between the Infantry and Armor leaders is clearly one of where the emphasis is placed—mounted or dismounted combat. The infantryman opts for dismounted action, while the Armor leader devotes every asset to the progress and protection of the armored weapons system, while committing the dismounted infantryman only when absolutely necessary. In other words, it is not a case of a full partnership of the components, only the success of the operation is fully shared. The infantryman in an IFV must remain mobile and protected. He is dismounted only to aid the IFV and the tank to retain or regain their mobile fighting capability.

With the emphasis on mobile protection and the increase in destructive firepower, it becomes obvious that the size of the infantry squad can and should be reduced—and therein lies another issue! The answer to that problem is not purely an Infantry or Armor Branch matter, but one which should be dictated by the minimum needs of the combined arms force.

What then is the GUT ISSUE—the fundamental difference between Armor and Infantry leaders? Simply stated, it's a case of primacy and emphasis! The present Infantry concept concentrates its emphasis on supporting the unprotected dismounted soldier on the ground and Armor leaders concentrate on supporting the mounted man servicing a mobile, protected, destructive weapons system.

If we seek victory, we must organize a force that offers the best chance to achieve that goal. People no longer come cheap! They must be protected from the traditional and archaic roles they played in past wars.

SIDNEY S. HASZARD
Colonel, Armor, Retired

Ft. Knox, Ky. 40121

TOW SHORTCOMINGS

While examining the advantages and disadvantages of various numbers of TOW's in the mechanized infantry rifle company (MIRC), one thing becomes abundantly clear—the limitations of the weapon itself *do not allow it to be effectively employed in many combat situations*. A glance at a map of Europe, West Germany in particular, reveals that the requirement to fight dismounted infantry, or to fight in built-up areas including the "urban sprawl" and forests will equal, if not exceed, the requirement to fight armor in open, rolling, "good tank terrain." To say that the enemy outnumbers us in tanks, and we therefore must concentrate on killing tanks, is to ignore the vast numbers of infantry in the Threat force structure. To say that Threat infantry will fight mounted and we can destroy him by destroying his vehicle with antitank weapons is *unrealistic*. To rely on indirect fire to destroy dismounted infantry is absurd considering the myriad of other requirements placed on our relatively small number of indirect-fire weapons.

The ability to employ TOW in overwatch, simply because TOW is the only infantry weapon that can engage at 3,000 meters, is frequently used as an argument for retaining the TOW as organic in the MIRC. The argument is faulty for several reasons. First, although it may be necessary at times to protect a bounding element from a potential weapon site 3,000 meters distant, the type of terrain that exposes the bounding element to that enemy position during its bound, long enough for an enemy weapon to lay, track, and fire (or fire and fly for antitank guided missiles) with a significant hit probability, probably only exists in the desert. Second, the Tactical Effectiveness Testing Antitank Missiles study conducted by the Combat Developments Experimentation Command indicated that a single moving vehicle with 360 degrees of observation can locate a stationary enemy weapon and engage it only 30 percent of the time. How much smaller then is the probability that an overwatch element will be able to pinpoint an enemy weapon, firing from a covered and concealed position, at any range, when the overwatch has a much larger field of view and numerous potential firing sites to observe? Rather than pinpoint an enemy weapon with the accuracy required for TOW destruction, the overwatch will more often identify a general target area that is more suitable for suppression. The TOW is a poor suppression weapon. Additionally, acquisition time and time-of-flight would probably not be short enough to destroy a target before it moves, even if it could be pinpointed. The TOW is not the only infantry-type weapon that can shoot 3,000 meters. It may be the only weapon capable of accuracy at 3,000 meters, but if suppressive fire is what is normally called for, TOW accuracy is wasted.

The caliber .50 machinegun mounted on every infantry squad APC is capable of suppressing at 3,000 meters and beyond. A common misconception about the caliber .50 is that its effective range is 1,825 meters. However, 1,825 meters is only the range of tracer burnout; a caliber .50 can shoot 6,800 meters. A machinegunner firing armor piercing incendiary (API) ammunition, a basic load item for the armor battlefield, can engage any target using BOT adjustment as long as he can see the strike of the round. This method may sacrifice pinpoint accuracy, but for area-type suppressive fire, pinpoint accuracy is unnecessary. With these considerations in mind, it seems illogical to argue retention of a weapon in the MIRC for a role it is unsuitable for.

JAMES P. TOTTEN
Captain, Infantry

Ft. Richardson, Alas. 99505

ADVANCED HELICOPTER TECHNOLOGY

Future combat will require greater use of technology to assist the air cavalry combat commander in controlling combat assets, and improving his capability to seek and destroy enemy forces.

The simplistic wagon wheel reconnaissance tactic with the overwatch protection of the scouts by the gunships will long have been replaced by the tactical space controller (TASAC) and scout/attack helicopter mix concept. This concept greatly increases the responsibility of the scouts so that scouts will become the keystone of aerial employment for the combined arms team. The TASAC's will be responsible for conducting and orchestrating the battle in their respective areas of operations.

The TASAC's will not only employ the air cavalry and attack helicopter teams in antiarmor roles, they will support the ground commander by applying destructive/suppressive artillery fires and tactical air support. The scouts will have responsibility for employing the elements of the destruction/killer teams by selecting the kill zone for their teams and establishing and maintaining contact with enemy forces. This will be accomplished by acquiring and handing off targets to the attack helicopters and distributing fire within each team.

As the TASAC's and scouts employ their tactical assets they will be flying in highly maneuverable helicopters constructed primarily of composite materials and high strength metals.

The composite material construction not only will allow a lighter, stronger aircraft, but also will provide protection for crewmembers and key flight and engine components.

Powered by a light weight, high lift-to-weight-ratio engine, the aircraft will be designed to permit maneuvers restricted only by human limitations. It will be an adverse weather aircraft with instrumentation visually displayed on the windshield or canopy for night and instrument navigation.

The future scout aircraft will have a visual capability that will give crewmembers the ability to detect the enemy at night as well as day.

This improved system can operate in total darkness. Since it detects differences in temperature, it identifies both camouflaged personnel and equipment in daylight. It also will be an integral part of the pilot's visor, but of greater importance to the pilots will be the capability to see through light haze or fog.

Although the scouts may have improved detection capability, an enemy may still take them under fire without being seen. But future scouts will be equipped with detector-sensor equipment that will determine from which direction the fire is coming and also its caliber.

This sensor equipment will be incorporated with advanced development of the target acquisition and designation system. Using a laser ranging and tracking system, the scout will detect the enemy location and illuminate the position with laser. This will afford inbound attack helicopters increased capability for first-round hits.

The attack helicopter will have a much improved forward looking infrared system (FLIR) as an integral part of the weapon systems. It will be miniaturized and much more effective than today's prototypes.

The viewing screens of both the pilot and copilot will be clearer and sharper than current television and will enable them to observe their strikes accurately and adjust accordingly.

Coupled with the attack helicopter FLIR system will be a receiver for the Persistent Laser Painters that the scouts will use to "mark and forget" targets. The reflected laser energy will be picked up by both special trackers in the aircraft and laser seekers mounted in the ordnance which employ a "fire-and-forget" missile with a warhead mix of high explosives, antitank, and antipersonnel flechettes.

The detector sensor on the scout identifies the type of fire being received, transmits it to the selective effects armament subsystem, which in turn automatically selects the warheads to counter the enemy fire. The attack helicopters will have greater standoff capability because they will only have to turn inbound to the target, stabilize, fire, and break.

If the need arises to insert troops, the TASAC will direct the scouts to reconnoiter a landing zone. After making their clearing sweeps, they will drop a recoverable portable transmitter that incorporates an omnidirectional and distance measuring device that simultaneously transmits azimuth and distance to the receiver in the troop lift helicopter.

Before the lift helicopters receive signals from the

LZ, the TASAC will have alerted them that their services are required by simply pushing a transmitter switch which illuminates a light on the lift helicopter console. The TASAC will have selected various precoded bits of information such as inbound heading to the LZ, wind direction and velocity, whether the lift helicopters will be permitted to fire their protective weapons during the insertion, and the direction of egress from the LZ.

A lighted interpreter on the lead lift helicopter's console will indicate the coded information, permitting the troop insertion to be made without extensive radio traffic. Should the miniature transmitter be damaged when dropped into the LZ, the scouts can identify the LZ with a hand-held laser designator. The laser-detector sensor mounted on the scout also may be used to indicate the scout's position to the TASAC during periods of inactivity and possibly for ship-to-ship communications.

All in all, once the scout receives fire or identifies targets, there will be no requirement for radio transmissions during subsequent fire support, LZ reconnaissance, or troop insertions. Command and control will be more responsive with fewer transmissions, and coordination with artillery support or tactical air will be simplified.

The portable transmitter dropped to mark the LZ and guide the troop lift helicopters also will assist tactical air support by eliminating the need for the TASAC to identify the target and distinguish between friendly and enemy forces.

The TAC air support will be advised of the frequency on which the transmitter is operating and will be given the radial bearing and range of the enemy from the transmitter. Tactical air support pilots then may expend their ordnance without additional target information.

The advancing blade concept (ABC), using rigid rotor principles, could become common to all types of air cavalry aircraft. The construction of future helicopters from high strength composite material will permit the use of this concept without sacrificing any of the pure helicopter capabilities and yet permit high speeds when required.

The rigid rotor will provide improved maneuverability required for the scouts, allow greater gun platform stability for the attack helicopters, and give lift helicopters the rapid reaction speed necessary for troop reinforcements or insertions.

Another possible rotor concept is the hingeless, bearingless, rigid rotor. This advanced system permits the same maneuver capability as the ABC. However, the smaller rotor hub reduces radar reflectivity and the lack of hinges and bearings cuts maintenance requirements tenfold.

Advanced integrally designed infrared suppression capability, ballistic tolerance, and radar reflectivity reduction will also be common in the future.

Condensed from an article by Colonel George W. Shallcross in the December 1977 issue of Aviation Digest.

AN ENDANGERED SPECIES

Since the 16th century, the mortar has rained death and destruction on its owners' enemies. In all that time it has changed little, either in its design or in its ability to demoralize and confuse its victims. Its continued success is due to its simplicity and "cost effectiveness."

Of late, though, the heavy mortar has fallen onto hard times, particularly in the U.S. Army. The 4.2-in. (four-deuce) mortar is fast becoming a victim of planned obsolescence, rumor, libel, and abuse.

The 4.2-in. mortar has always been a bit of an enigma. And it has belonged to the Artillery, the Infantry, and the Chemical Corps in its career. The "four-deuce" has never found a real home primarily because of its size and design. At various times, the Infantry has accused it of being artillery. The Artillery, on the other hand, has noted that it is clearly not like one of their sleek, sensual cannons.

What is the 4.2-in. mortar, then? And why is it inferior—or is it inferior? The answer to the first question is obvious, and depending on your viewpoint, perhaps the answers to the second and third questions are equally obvious. Nonetheless, all merit some thought.

The 4.2-in. mortar is a heavy mortar, and as such is different from its smaller cousins. Its fire control is much like that used by the Artillery. Its size, in fact, at 107-mm., places it in a class of its own. Further, it delivers nearly as much bang at a range of 5,650 meters at less cost than the 105-mm. howitzer.

Why then do some people consider it an inferior weapon? These are the two arguments usually presented:

- It is not as accurate as artillery.
- It is slower than artillery.

I submit that the chief causes of the weapon's inaccuracy and slowness are poorly trained mortarmen and planned obsolescence. It is easy enough for the Infantry to point with pride at the 81-mm. mortar's record and say there is no excuse for 4.2-in. mortar crews to be poorly trained. Since soldiers with the 11C military occupational specialty (MOS) are assigned to

crew both weapons, infantrymen say the training of both should be equal, and equal results should be obtained. To them, therefore, the weapon is at fault.

Not so. First of all, there are fewer 4.2-in. than there are 81-mm. mortars; therefore, fewer officers and NCO's ever become familiar enough with it to properly train platoons. In our armor battalions, few armor lieutenants welcome an assignment to the heavy mortar platoon.

Why? Because few of them know the correct fire direction center (FDC) procedures, and in order to deliver accurate and timely fire, the 4.2-in. mortar FDC has to reach the level of expertise that was required of an artillery battery before the advent of the field artillery digital automatic computer. With some cooperation from a nearby artillery battalion fire direction officer (FDO), or a kindly battery executive officer, he may train his platoon to reach a reasonably high state of proficiency.

"I submit the chief causes of the weapon's inaccuracy and slowness are poorly trained mortarmen and planned obsolescence."

Wouldn't it be a lot simpler to provide him with a school-trained FDC manned by soldiers with the 13E MOS? Soldiers with the 13E MOS are trained horizontal chart operators and they arrive with a basic knowledge of FDC procedure.

Even if our lieutenant works very hard, he will still have accuracy problems as a result of planned obsolescence. Why? Find a 4.2-in. mortar and take a good look at it. You will probably find the standard loose and the cross-level mechanism worn and cranky; you may even find that the tube was condemned 18 months before and no replacement is in sight. There are, you see, no parts.

Why bother to bring the 4.2-in. mortar platoon to greater accuracy and faster delivery? After all, the 81-mm. mortar does yeoman service, and artillery is so sophisticated that its projectiles do everything but drive you to work.

There are several good reasons. First of all, to use a cliche, the heavy mortar is the battalion commander's hip-pocket artillery. While this may sound trite, it is valid. The 4.2-in. mortar's range fills the gap between the 81-mm. mortar's range and the howitzer's, and it is responsive to the battalion commander.

This factor is more important in Europe than it was in Vietnam. In Europe, there will be no prepared fire bases with instant fire delivered on call.

"Its current failings are due to our ignorance rather than to any weakness in its design. Let's learn how to use it."

Secondly, the 4.2-in. mortar delivers superb illumination out to 5,650 meters (better than the 81-mm. mortar's and nearly as good as the 155-mm. howitzer's). The 4.2-in. mortar can also deliver a 300-meter-wide final protective fire (FPF), as well as chemical ordnance. Further, with the smoke round, it can quickly lay a dense smoke screen. An increased emphasis on this capability would give the battalion an added measure of concealment.

Merely assigning the MOS-trained soldiers is not the complete solution. Gearing up the Infantry and Artillery Schools to provide an appropriate curriculum is imperative. Further, it is of no use to train soldiers to shoot the 81-mm. mortar and then assign them to 4.2-in. mortar units. The two weapons are different, and specialized training is a must. The training program for a 13E MOS with adjustments, seems a suitable starting point.

Once we have trained soldiers to use the 4.2-in. mortar and have identified them, we must use them on that weapon and not move them back and forth between it and the 81-mm. mortar with no consideration for the unique qualities of either weapon. Let's go one step farther—assign to the Infantry the responsibility for arriving at doctrine and technological improvements for the 4.2-in. mortar, and then develop an appropriate level of pride in it.

The 4.2-in. mortar is still a valuable weapon. If we upgrade the equipment on hand, insure an adequate supply of repair parts, and raise our training standards (especially in the FDC) we can improve its contribution immeasurably. Its current failings are due to our ignorance rather than to any weakness in its design. Instead of abusing the 4.2-in. mortar, let's learn how to use it.

Condensed from an article by Captain Gregory Fontenot in the January-Febuary 1978 issue of Infantry.

MODERN INFANTRY'S ROLE

The pendulum of military thinking has become unbalanced on the question of the employment of the armored combat team on the high-intensity battlefield of Central Europe. While many of us question the relative merits of competing antitank weapons systems, there is little doubt that the tank will be the principal target on the next battlefield of Europe. The tank can no longer dominate the battlefield. [Strictly

the author's opinion-Ed.] The apparent doctrinal preoccupation with the problem of extending the life span of the tank's role has resulted in a doctrinal vacuum concerning the role of armored infantry forces armed with the incredibly lethal series of light, medium, and heavy antitank missiles.

It seems clear that infantry-heavy task forces possess a special capability to create fortified complexes in urban areas. It is almost conventional wisdom that these infantry forces will possess enormous survivability even when faced with superior armored formations as long as the infantry is entrenched in the concrete safety of street-fighting positions. It would seem probable that these battalion task force defensive positions in cities, towns, or extended builtup areas would be eliminated by the Soviet Army only after the commitment of sizable forces and the expenditure of vast amounts of munitions.

The mission to seize and hold urban areas with infantry forces rarely has been central to our field training. A central argument against training for this mission foresees rapid Soviet movement which rigidly adheres to their announced doctrine of by-passing urban complexes.

Given the new family of ATGM's (antitank guided missiles) (TOW and *Dragon*), it is equally evident that infantry-heavy task forces can interdict armored movement over large frontages by operating offensively from the margins of builtup areas. Thus, it would seem useful to hinge divisional combat positions upon villages, towns, and cities as we fight in sector. These positions should be, at a minimum, carefully reconnoitered by all combat leaders and crew-served weapons team chiefs during every field training exercise.

"It has become tempting to dismiss infantry as an irrelevance . . ."

Armor is best protected by its own speed, detailed camouflage, and by iron-clad observance of the rules of combined arms warfare. There is little disagreement with the maxims of combined arms warfare. The theory is sound; however, the practice and employment of these procedures leave much to be desired. Specifically, the role of infantry in this team has always been a matter of confusion.

- Infantry can best participate in tank battles by engaging enemy armor with TOW's and *Dragons* fired at near maximum possible ranges (given the terrain intervisibility). These infantry forces may well be separated physically from the U.S. tanks they are joining in battle by distances of 1 to 3 kilometers. Antitank guided missiles should not be employed individually. Volleys of four to eight missiles should be fired in conjunction with the use of indirect artillery and mortar fire to force Soviet armor to button up. Smoke shells should be included in the fires on advancing armor. The enemy tanks will suffer significant visibility loss while U.S. TOW and *Dragon* gunners will retain acceptable vision.
- Infantry can assist in protecting U.S. tanks from Soviet ATGM's (*Swatter* and *Sagger*) only when engaging probable enemy firing positions with small arms, indirect fires, and crew-served weapons. Infantry squads riding buttoned up in an *M-113* pose little deterrence to a determined Soviet ATGM gunner.
- Infantry units do not work as well in very small groups as they do in bigger formations. This lesson is a fundamental truth that tends to be forgotten very quickly in peacetime. Thus, we should predict that an infantry-heavy company team will handle itself fairly well in resolutely continuing a mission. A platoon will be much less effective. An isolated squad will fall subject to its own internal fears. The conclusion is inescapable. While tanks and infantry must be cross attached, the flexibility to employ physically isolated squads or platoons of infantry as the "eyes and ears" of the battallion task force will be severely restricted on the high-intensity battlefield.
- Infantry units fight well only when with friends. The cohesion and teamwork demanded in the face of the violence and destruction of the first battle of the next war will only exist among tank-infantry teams that train together in peacetime. Thus, the habitual association of the same tank, infantry, and artillery elements in peacetime training is essential. These teams should be garrisoned on the same post in combined arms battalions.

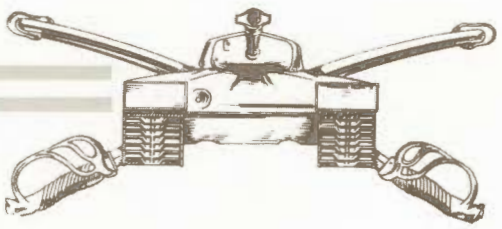
It has become tempting to dismiss infantry as an irrelevance which continues to remind us of the last war. Our enthusiasm with exciting new weapons systems such as the TOW *Cobra* is understandable. However, our continued preoccupation with the survivability of U.S. tanks is less clear. We will win the next war only by focusing on the question of killing Soviet armored vehicles, not by orienting on the defense of our tanks. The difference in perspective is crucial

"We will win the next war only by focusing on the question of killing Soviet armored vehicles, not by orienting on the defense of our tanks."

The tank is not yet dead although the deployment of the cannon-launched guided projectile may end its current preeminence. The real challenge to military tacticians, however, remains the continued conceptual development of combined arms employment of all weapons systems. Better use of infantry forces is an essential first step to creating the combat team that can fight and win the first battle in Central Europe.

Condensed from an article by Major Barry R. McCaffrey in the January 1978 issue of Military Review.▲

OPMD - EPMD ARMOR



OPMD

JOINT DOMICILE POLICY

Department of Defense Directive 1315.7, *Military Personnel Assignments,* was signed on 7 Dec 77 climaxing 2 years of negotiating by the military services. The Directive established policy for Joint Domicile which significantly varies from the previous policy.

Old Policy

- Service member could join spouse overseas and DROS could be adjusted to coincide with arriving member's DROS.
- Service member must serve 12 months at old duty station prior to submitting Joint Domicile application.

New Policy

- Service member can join spouse overseas and DROS can be adjusted to coincide with first arriving member's DROS provided the last to arrive serves at least the "all others tour."
- Service member must still serve at least 12 months at old duty station prior to submitting a Joint Domicile application.

It is Army policy to permit the assignment of married Army couples to the same general locality whenever possible. A deciding factor in granting these requests is assignment of both parties against valid requisitions. If you are married to, or planning to marry another service member, be sure to keep your career management division informed so this information can be considered during the assignment process.

TRAINING BASE REDUCTIONS

The Army has been directed to accomplish significant training base reductions during FY's 78 and 79. The first reduction was in the area of the Army War and Command and General Staff Colleges. For each course the Army was directed to reduce student input by 15 percent, reducing the number of quotas for C&GSC from 1035 to 915 and Senior Service College from 318 to 291.

For FY 79 the Army was further directed to reduce all formal training by 10 percent and to eliminate all non-essential courses. In following this guidance the Chief of Staff has approved approximately 50 courses from the various service schools for elimination effective FY 79.

The Armor courses approved for elimination are:

- *M-48A1* Transition — Enlisted
- Realtrain, Train the Trainer — Enlisted
- *M-48A1* Transition — Officer
- Company Grade Officer Preventive Maint.(to be conducted as a part of the Branch Week Phase)
- Command Designee Maint. (CRC courses)

The Army also experienced Army Audit Agency and General Accounting Office inquiries into schooling policies and practices. In the case of the Motor Officer Course at Fort Knox, the AAA has recommended the course be discontinued because of "malutilization." In an attempt to maintain the course, its use is restricted to only those first lieutenants and captains being assigned to battalion/squadron motor officer positions.

It is anticipated that the Army's Education Programs will continue to be scrutinized for reduction in the future. In light of this OPMD will strive to equate training to requirements, review courses for possible elimination, and eliminate redundancy in training. At the same time OPMD will continue the effort to train all officers within both their primary and alternate specialties.

INVOLUNTARY FOREIGN SERVICE TOUR EXTENSION

One of the goals of Armor Branch is to program all eligible overseas returnee officers into the first available advanced course class if they have not yet attended. In conjuction with this there has been a concerted effort during recent months to reduce the Transient, Holding, and Student account.This personnel account includes all students as well as "snowbirds" awaiting the start of a course. Many officers in Germany will be involuntarily extended to preclude "snowbird" time. The authority for this is Table 7-1, Rule 2, AR 614-30 which states that "if an individual serving in a long tour area is reassigned to a CONUS school in a PCS or TDY status.....with a specific reporting date and whose return would give a period in CONUS.....in excess of desired leave and travel time the overseas tour will be extended for a period not to exceed 6 months which will allow only sufficient time for desired leave and necessary travel."

All assignment instructions have been published for AOAC 78-3 and 78-4 starting 7 July and 22 August respectively. Screening for attendees at AOAC 79-1 starting 11 Jan 79 is well underway and Branch will soon start the screen for AOAC 79-2 which reports 22 March 79. Other dates for 1979 are AOAC 79-3 reporting 5 July 79 and AOAC 79-4 reporting 21 Aug 79.

If you are serving in Germany, your DEROS is within the next year, and you expect to attend the Advanced Course upon return to CONUS, you can figure out generally whether you will be extended or not. No tours will be curtailed to attend the course.

STABILITY BREAKS

Much has been said and written about stability policies in recent months. The DOD policy is that CONUS tour lengths are normally for 3 years. In many cases officers are at a given installation for even longer than that. This is especially true of officers in CONUS who have not yet attended the Advanced Course. There are, however, a number of times when OPMD had to "break stability" on an officer in order to meet the Army's requirements. This is particularly true of the captain who is an Advanced Course graduate, has commanded a company or troop successfully, and who has a strong overall manner of performance. These types of officers are in great demand. Many times the demand is greater than the supply. There are many jobs in the Army that call for this type officer. Some of them are Recruiting duty, Army Readiness Region duty, and ROTC duty, as well as the requirement to send officers to Advanced Civil Schooling with subsequent assignment to a utilization tour. The stabilization goal will remain 3 years on station; however, all officers must be aware of the continuing need for exceptions to this policy.

SERVICE OBLIGATIONS

All officers should be aware of the obligations incurred as a result of PCS moves and Advanced Course attendance. AR 635-120, paragraph 3-1c(1), which deals with Unqualified Resignation, states that "Officers who have departed the continental United States will normally be required to complete the current prescribed tour for the area of assignment as specified in AR 614-30. All other officers who receive a permanent change of station will be required to serve 1 year at their new duty station." AR 635-100 reinforces this.

Attendance at the Advanced Course obligates an officer for 1 year from the date of course completion or termination of attendance, whichever is earlier. Further information on school obligation can be found in AR 350-100.

EPMD

APPEAL PROCEDURES MUST BE USED

Because of improper submission or insufficient documentation many appeals of enlisted efficiency or evaluation reports (EER) and academic reports must be returned by the U.S. Army Enlisted Records and Evaluation Center (EREC), Fort Benjamin Harrison, Ind.

An appeal—a written request by a rated soldier which seeks alteration, replacement, or withdrawal of an EER or academic report from official military records—may be made if a rated soldier can provide substantial evidence to support an assertion that an injustice or administrative error has occurred. However, the burden of proof rests with the rated soldier.

All appeals must originate with the rated soldier and should be sent directly to EREC, ATTN: PCRE-OP-A. If a soldier desires, an appeal may be sent through command channels. In either case, soldiers should request assistance from the military personnel office (MILPO) to ensure administrative correctness in the preparation of appeals.

An appeal should contain the following documents:

- A copy of the report being appealed.
- A verified true copy of the soldiers' DA Form 2-1.
- A verified copy of the unit, activity, or section rating scheme or verification that one cannot be obtained.
- Statements from responsible individuals having knowledge of the rated soldier's performance during the rated period or of the specific incidents upon which the appeal is based—statements from subordinates normally should be avoided.
- Any additional documented information which may have a bearing on the case.

Limitations in the time in which an appeal may be made are as follows:

- Enlisted Efficiency Reports (DA Form 2166-4) rendered on soldiers prior to 1 October 1975 may be appealed up to 5 years after the ending month of the report.
- Enlisted Evaluation or Senior Enlisted Evaluation Reports (DA Forms 2166-5 and 2166-5A) rendered 1 October 1975 or later may be appealed up to 2 years from the soldier's authentication in Part V or, if not authenticated by the soldier, 2 years from MILPO certification in Part VII.

Academic Evaluation Reports (DA Forms 1059 and 1059-1) may be appealed up to 5 years after the ending period of the report if the beginning date of the appeal was earlier than 1 July 1973. If the beginning date was after 1 July 1973, the report may be appealed up to 2 years after the ending date of the report.

Appeals receive detailed attention and soldiers are notified of the decision made with respect to their appeals. If an appeal is approved, corrections will be made to the records and a copy of the letter approving the appeal will be placed in the Official Military Personnel File (OMPF). If an appeal is disapproved, all paperwork involved becomes part of the OMPF. Details on evaluation reports and appeals are found in AR 600-200, Chapter 8. ▲

NOTES

1977 *ARMOR* AWARD WINNERS

The U.S. Armor Association's annual award of a $50 Savings Bond for the most innovative and stimulating articles published in *ARMOR* in 1977 goes to Captain Michael Tesdahl, author of "Probing for a Solution," and Sergeant First Class Fred E. Kirtchen, author of "Why Isn't the Basic Trainee Better Trained?"

Captain Tesdahl's discussion of techniques for breaching minefields appeared in the May-June issue. Sergeant Kirtchen's proposal for improved utilization of Drill Sergeants ran in the September-October issue.

The selections were made by the Chief of the Office of Tank Forces Management and his staff. Articles considered for the award are limited to those written by company grade officers and noncommissioned officers.

Captain Tesdahl was commissioned from the United States Military Academy in 1969. He is also an Infantry Officer Advanced Course graduate and is currently assigned to the Directorate of Combat Developments, USAARMC.

Sergeant Kirtchen is a graduate of the Drill Sergeant School. He has also completed Special Forces training and is now serving as a Special Forces adviser to the Niagara University ROTC unit, Niagara Falls, N.Y.

120-MM. GUN

The cost of adapting the German smoothbore gun for production and use which was reported as $142 million in our March-April issue is now $159 million. The gun and breech will be adapted for manufacture in the U.S. pending Congressional approval. Specific manufacturers have not been selected.

XM-1

The testing locations for the first *XM-1* pilot vehicles have been expanded to include Yuma Proving Ground, Ariz., and the Cold Region Test Center, Alaska during 1978 and 1979. These are in addition to Ft. Bliss, Tex., Aberdeen Proving Grounds, Md., and Ft. Knox, Ky.

PROPER CREDIT

ARMOR does not normally acknowledge authorship of Forging the Thunderbolt articles. The 90th Anniversary T-Bolt was authored by Captain Charles W. Farnham, III, the author of "OJT Programs" in the same issue.

DRAPER TROPHY AWARDED

Company A, 1st Battalion, 63d Armor recently won the Draper Award as the armor unit with the best record in the 1st Infantry Division. The Draper Trophy is an annual award. For additional information on the competition, see the January-February 1978 issue of *ARMOR*, page 25.

GUIDELINES

General Bruce C. Clarke's booklet, *Guidelines for the Leader and Commander,* has been translated into German and is being published in Germany.

The booklet is based on General Clarke's experiences as Commanding General, U.S. 7th Army; Commander-in Chief, U.S. Army-Europe; and Commander, Central Army Group, NATO. It was written in 1962 and is now in its fourth English edition.

General Alexander M. Haig, Jr., Supreme Allied Commander, in a letter to General Clarke, stated, "I am very pleased to know that your outstanding *"Guidelines for the Leader and Commander"* is to be published in German. It will make a contribution to the interoperability of our forces."

BOOKS

PANZERTAKTIK IM SPIEGEL DEUTSCHER KRIEGSTAGEBÜCHER 1939-1941 by Rudolf Steiger. Freiburg i.B.: Rombach, 3. Aufl., 1975. 204 pages. DM. 9.00

This is our first review of a book written in other than English. Let us know what you think.-Ed.

Students of *Blitzkrieg* should take particular note of a most valuable study by a Swiss tank officer with a Doctorate in History and Pedagogy from Zurich. In two years this little gem is already in its third printing, as well it might be. Steiger has done very well what had been crying out to be done for decades, namely the practical or tactical examination of the war diaries of the German armored forces in Poland, France, and Russia from 1939 through 1941. A practical examination of German experience had, it is true, come to light in the fifties in the form of declassified U.S. Army pamphlets offered for public sale, but Steiger's work makes a distinctive and important contribution even so, for he gives us a picture of *Blitzkrieg* triumphant and *Blitzkrieg* stalled which is unmatched, we believe, for vivid and telling detail. Note that this advantage is not at the expense of scholarship. Steiger's bibliography of published sources alone runs to eight full pages. The special foundation and strength of Steiger's work is paraded in his eleven pages of bibliography of unpublished documents from OKW and OKH down to Panzer corps and divisions. Steiger's purpose is to bring to light *as many aspects of Panzer tactics as possible.* In this he seems to have succeeded with distinction.

The opening chapter surveys the evolution of German armor, briefly discusses experiences gathered in Poland, France, and identifies tactical causes contributing to the failure of Barbarossa. There follows a chapter on armored offensives, including surprise and night attacks.

Chapter III deals with envelopment, and the next with the relations between armor and infantry. This is a crucial chapter because infantry, far from fully motorized, served unintentionally as ball and chain on the tanks. Steiger notes the revealing and neglected detail that in this century of mechanization it took the Germans almost exactly as many days to get from the Bug River to the gates of Moscow as it took Napolean 129 years earlier.

After a chapter on the *Panzerpioniere* or engineers, important not least because of the strong Russian use of land mines, Steiger turns briefly to air-ground cooperation. The concluding four chapters deal with armor as such, starting with design characteristics, the surprising *T-34, Panzer* modes of coping with built-up areas, forests, and rivers, the devastating consequences of mud and snow, and German logistical failure. A brief conclusion denies to the Russian campaign the title of *Blitzkrieg,* evaluating it rather as a protracted war of attrition. One of the appendices gives specifications and production statistics of French, British, German, and Russian armor in use from 1939 to 1941.

Dr. John E. Tashjean

THE SECRET WAR IN THE SUDAN by Edgar O'Ballance. Archon books, 1977. 174 pages. $10.00.

As the attention of the American political system increasingly focuses on Africa, one of the continent's least known conflicts is tersely described and evaluated in this book by Major O'Ballance. The Sudan conflict was fought from 1952 to a cease fire in 1972 between the northern Sudanese (Arabs) and their southern black opponents. This unresolved conflict may yet reappear as the events in neighboring nations, such as Uganda, Egypt, and Ethiopia, exert influence on internal Sudanese poilitcs.

"The Secret War" recounts Sudan's history under various occupying powers and the early attempts at democratic government with a common thread of the continuing struggle of the Southern blacks for equal representation in the national power structure. The continued disfranchisement of the southern Sudan led to a classic guerrilla confrontation. The initial southern efforts, which were little more than banditry, matured into a true guerrilla conflict which displaced over one million civilians and caused an unknown number of casualties. One source with a vested interest in the conflict estimated more than half a million dead. Yet surprisingly, the conflict received scant attention in the world press and in regional and world organizations.

The author, a military historian, has written extensively on warfare in the Middle East. His detailed account of this conflict is based on research and his personal contact with key individuals in the struggle. This preparation enabled the author to document his main points; the conflict as a classical guerrilla operation; the unusual event of a black force standing up to an Arab nation; and the effect of media coverage or lack thereof on the conflict.

The book is of more than passing interest to the general military reader, primarily due to the increased interest on the African continent. For those readers more deeply involved in insurgencies, this work might well be worth the effort.

Captain Albert F. Leister Jr.
Department of Behavioral Sciences & Leadership,USMA

BIRTHPLACE OF AN ARMY: A STUDY OF THE VALLEY FORGE ENCAMPMENT by John B.B. Trussell, Jr. Pennsylvania Historical and Museum Commission, Harrisburg. 1976. 145 pages. $3.50.

This precise, authoritative work describes the formation of the American Army at Valley Forge. Colonel (Ret) John Trussel has packed in this short book a wealth of detail, obviously researched with meticulous attention to historical fact. The weather, the leaders, the problems with provisioning, Steuben's drill, the ill and miserable, the officer intrigue, the perseverance, and the other great and small aspects of the winter in Pennsylvania are all there. The tone and spirit of the times comes through. For the leader, the manager, the commander, or the historian, the book is worthwhile. It will be appreciated most by students of leadership or American history. And nobody could read it without thinking "Thank God for George Washington."

One fascinating aspect of COL Trussel's book is the way in which a host of detail is orchestrated so that something coherent and larger than the trivia always emerges. Discussions of the essentiality of the bayonet, the tactical need for close-order drill that would provide some option other than marching Indian-file, the significance of arming the officers, and the need for a reputable promotion system—all these and others give interesting background to many of the issues that our Army still faces.

The book deserves to be on the counters in the service school bookstores.

Brigadier General W.F. Ulmer, Jr.
Assistant Division Commander,
2d Armored Division

RECOGNITION QUIZ ANSWERS

1) U.S. F-5E *Tiger*
2) JAPAN *Type 60 Antitank Vehicle* (Photo by 1LT Donald B. Kaag, Jr.)
3) FRG *Leopard I 2* (Photo by SGT Dale T. Ewing)
4) FRG *Léopard I armored recovery vehicle.*
5) SOVIET *ZSU-57-2*
6) SOVIET *MI-4 Hound*

SOVIET OFFICERS by I. Babenko. Moscow: Progress Publishers. 133 pages, Illustrated. $3.10.

"Soviet Officers" is one in a series of books being published by Progress Publishers whose purpose is to explain the basis for past Soviet military victories, analyze the structure of the various branches of the Soviet military forces, and expound Soviet views on the nature of modern war.

Chapter 1, in typical Soviet fashion, establishes the political-historical foundation of the officer corps in Leninist theory and practice. Of greatest interest is the explanation of the system of one-man command. In view of the fact that over 90 percent of Soviet officers are members of either the Communist Party or Young Communist League, the reduced role of the political officer, who once shared command, is not surprising.

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

In Chapter 2, the author acquaints the reader with the ideological as well as technical educational background of Soviet officers, and how "ideological conviction" gives each Soviet officer that additional inspiration necessary to surmount difficulties. The author notes that every serviceman must be "flawlessly trained" in handling his weapon. One of their tools in fulfilling their training objective is called "technical propaganda."

Later in the chapter the author states that training and educational philosophy is based on methods of persuasion, but should persuasion fail, coercion can be legitimately applied. Coercion is defined as warnings, reminders, prohibitions, condemnation, reprimands, and punishment.

In discussing discipline, the author stresses its importance by relating combat actions of the Great Patriotic War. The Soviets believe, as do we, that taking care of one's men does not imply a lessening of the demands made upon them in times of stress.

The last section of chapter 2 gives many insights into the Soviet style of small-unit leadership. It would appear that there is more concern shown for troop morale and welfare than we have historically believed. The Soviet commander's main concern is for keener fighting ability and better training.

The two most interesting portions of the book pertain to the decision making process and those character traits we are so often told all Soviet soldiers and commanders lack—initiative and imagination. The orthodoxy of the decision making processes described, when stripped of their ideological subtleties, are not unlike our own. There is emphasis on prior planning, on decisiveness, on use of the surprise element, and on skillful execution of plans.

What do imagination and initiative mean to the Soviet officer? Simply stated, "it is to bring victory by boldness and resolve in the shortest possible time and with the least losses." In spite of everything the author says about the importance of initiative in combat actions, it becomes quite obvious that he is writing about initiative of a limited nature.

Chapter 4, titled "New Weapons and the Moral and Psychological Factor," addresses the problems brought about by the complexity of modern weaponry. The reader will learn that Soviet military training doctrine stresses the psychological aspects of combat readiness far more than our own. Call it psychological training, combat hardening, brainwashing, or whatever you like, it still equates to a deeply entrenched belief that the psychological training and preparation of a soldier must be undertaken with the same intensity as weapons training or other skill mastery.

The book is replete with illustrations and full of "lessons learned" from the Great Patriotic War. Whether one is a Sovietologist or just a military book collector, this book is certainly worth the effort to obtain and read.

First Lieutenant James F. Gebhardt
Co. B, 2-69th Armor

LIDDELL HART, A STUDY OF HIS MILITARY THOUGHT by Brian Bond. Rutgers University Press. 289 pages. 1977. $14.95.
'BONEY' FULLER: SOLDIER, STRATEGIST AND WRITER, 1878-1966 by Anthony John Trythall. Rutgers University Press. 314 pages. 1977. $13.95.

Major General J.F.C. Fuller and Sir Basil Liddell Hart became friends and continued a close relationship until their deaths. This friendship was founded upon a pursuit of truth through study of military history and a search to avoid the blood bath they had experienced during World War I. Fuller is the acknowledged innovator in the use of tanks, to avoid the carnage of trench warfare, but Hart quickly understood their potential and developed tactical doctrine which unfortunately was widely read and more closely followed by the Axis nations than by the West.

The book on Fuller covers his personal life through four wars and his contributions in two of them. It covers the development of his philosophy of mechanization and the thought processes which enabled him to produce 45 books and hundreds of articles. It is unfortunate that Fuller, who was a successful soldier, journalist, and historian, was so marked by the Nazi movement during the 1930's. This portion of his life adversely affected his influence during World War II when his ideas and concepts were put to the crucial test.

The book on Liddell Hart is limited to a treatment of his theories. Brian Bond has drawn from the voluminous Hart papers to trace the events and people who influenced Sir Basil. In this regard, when Hart was wrong or changed his mind through the years he retained these papers which preserved mistakes along with brilliant insights for history. Brian Bond has done a marvelous job in sorting his key thoughts from more than a half century of writings. The final two chapters examine the impact Hart's teachings have had on the two most successful employers of mobile warfare—the German and Israeli Armies.

These books are companion pieces. As the two men's ideas were so closely linked, so were their lives. Their views on mechanized warfare were close. Liddell Hart was better with people and could compromise with political realities. As a result, his name will long survive. The true student of armored warfare will want both of these books for his library.

Colonel C.A. Mitchell
C&S Department, USAARMS

Views Through the Visor

In past years this space announced the agenda for the Armor Conference. This year timing, deadlines, production schedules, mailing, and other considerations beyond our control, preclude getting this issue of ARMOR to you prior to the Conference. We have, however, requested and have been granted approval for the funding of additional pages to report on the Conference in our next issue.

We hope you come to the Armor Conference. It brings representatives from all over the world, truly a gathering of the combined arms clan. Everyone has the opportunity to share his ideas, to listen to presentations from the field in addition to updates from the Home of Armor, to decide which discussions fit his unit, and then return to further spread the gospel of armor and combined arms.

One of the many advantages of attending Armor's conference is sharing comradeship. Many friendships and acquaintances will be renewed. Social gatherings enable the academic daylight hours to be debated during the social evening hours.

The Army's oldest professional organization, the United States Armor Association, will also be present. Their annual general membership meeting will be conducted in conjunction with the Conference. The presence of the so-called oldtimers offers the youngsters the privilege of hearing how it used to be, perhaps to decide that how it used to be is, in many ways, exactly how it still is. Listen carefully for the names and equipment may be different, but the enchantment of our profession, and of our branch, remains the same.

If you come to the Conference, or came to it, depending on when you read this, reflect on all you have seen and heard, both old and new. Those of you who didn't come – oldtimers and youngtimers alike – reflect on it too.

One thing is certain, the spirit deserves to be, and must be, preserved and fostered. Our traditions and solidarity can be renewed here at the Home of Armor, for it is here where the ghosts of past members of our Association, and the traditions they bequeathed to us, blend with the spirited vigor and youth of modern Armor's leadership.

For many, we'll see you soon, and for many others, see you next year.

MAV

ARMOR

july-august 1978

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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

The cover art for this issue represents another visualization of the Combined Arms Team: air vehicle, ground vehicle, and the soldier actually on the ground.

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

LETTERS

What Is It?

Dear Sir:

Having just finished *ARMOR's* informative article on Soviet Armor (January-February 1978), I am still puzzled on a point that has produced some concern and embarrassment here in Europe. That is, what is the "official" designation of the tank:

- Recently fielded in CSFG?
- That appeared in November, 1977 Moscow parade?

Since neither vehicle appears to have advanced armor or significant design differences from the standpoint of engagement methods, the question is somewhat academic, however, we would appreciate clarification on this point.

J. H. SPENCER
1LT, MI

APO New York 09221

See the article on T-72 in this issue - MAV.

Remembering Cant

Dear Sir:

I wish to thank you for publishing Captain James D. Brown's article, "You Can't Forget Cant" in the January-February 1978 issue of *ARMOR.*

As an infantryman, I was amazed to learn how the inclination of a tank gun's trunnion axis can so markedly affect main gun accuracy. Grunts everywhere should be better able to effectively employ their armor assets, now, on a variety of positions thanks to this excellent piece.

CPT Brown has graphically demonstrated that "cant-free firing positions," as he calls them, are of critical importance in ensuring battlefield success. Additionally, his discussion of the effect of cant upon different types of ammunition (APDS, HEAT, HEP, WP) was particularly interesting.

Articles such as CPT Brown's call attention to considerations crucial to winning the "first battle of the next war."

C. B. Timmers
Captain, Infantry

APO NY 09031

We Need Them Now!

Dear Sir:

While I have enjoyed your fine magazine for the past 6 years, there is one thing that seems to be overlooked by the many staff-type officers that write for you. We wait with bated breath each month to read of all the magnificent equipment that has been under development since 1962, which we won't see until 1990. It is salt in an open wound to the men that will have to fight and die in obsolete and defective equipment. We don't need it in 1990, we need it now. We test and test a piece of equipment until by the time it comes out it is nearly obsolete. Our ethnocentrism toward only AMERICAN MADE equipment is beyond belief. Instead of outdated *M-42's, Vulcans,* and *Chaparrals* we can have the West German *Roland* and *Gepard* system *NOW!* Instead of 1981, why isn't the *MAG-58* the coax on every vehicle that needs one NOW!? We need a tankers uniform badly. Our R&D people say not to expect one 'til the 1980's or later. The West Germans have had an excellent tankers uniform for years. What is going on?

Enough testing; the best test any vehicle can get is by the men who will have to fight and die in it. Problems could be found sooner and taken care of through modification work orders or field modifications as needed. The American soldier doesn't expect a free ride or an easy meal ticket—the ONE THING he does expect is adequate equipment. So enough testing, enough gadgetry, enough of the ultra-sophistication. ENOUGH!

LEE MICHAELS
Sergeant

Ft. Bliss, Tex. 79916

Recognition Quiz

Dear Sir:

Regret to inform you that picture number 6 of the Recognition Quiz on page 52 of the January-February 78 issue is not a British *Centurion MK 13.*

The tank shown is a Canadian *Centurion MK 11.* The identifiers are:

- The armored gas tank just visible at the rear of the tank.
- The antenna mount which is clearly that of the American made *524* set.
- The sleeping bag containers strapped to the turret bins.

The limited number of countries manufacturing tanks and the wide distribution of similar types to many nations makes it imperative to recognize not only the country of manufacture, but also the nationality which it serves. Particular attention to small details such as kit layout are invaluable to proper identification, friend or foe. More quiz pictures of armor vehicles in battle order would be appreciated rather than those of machines fresh from the factory assembly line.

As a final note, the *Centurion* is no longer in service with Canadian Armor units. It has been replaced by the *Leopard A3.*

P.A. PHILCOX
Captain
8th Canadian Hussars
(Princess Louise's)
St. Hubert, Qubec J3Y 5T5

ARMOR continues to invite all soldiers in all armies to submit photos for the picture quiz.
MAV

Justified Fears

Dear Sir:

I read with great interest the January-February issue of *ARMOR,* the first copy I have had the pleasure to examine. As is usual in AFV publications, the letters to the editor section was especially stimulating. As a new subscriber, perhaps I may be allowed to make a small contribution to this section.

In regard to Mr. Milton Sherman's letter, I have a press clipping which says his fears about the secrets of chobham armor falling into Soviet hands became justified, probably early in 1977.

The Daily Express of London reported last summer that samples of chobham armor were smuggled from West Germany into East Germany. The story quotes British officials as saying that they expect the Soviets to be capable of producing chobham type armor in production quantities within 2 or 3 years. They expect that it will take them longer to produce ammunition capable of defeating such armor though.

This latter point seems academic, however, as no NATO nation seems willing to bear the expense of equipping its armored units with chobham-armored tanks.

Let's hope the situation does not arise where West German *Leopard II's* fill the role of *Fireflies*, and *M-60A3's, Leopard I's* etc. serve as *Ronsons* to the Soviet's *T-72/Panthers*.

DOUGLAS DEVIN

Edmonton, Alberta, Canada T6A 2R7

Why?

Dear Sir:

Talk to anyone in my maintenance field about testing, measuring, and diagnostic equipment and the laughter immediately centers around the low voltage circuit tester (LVCT). Amazingly enough, the Armor Center and *ARMOR* Magazine (January-February 1978) published an article about this relic. Why does this piece of equipment

stay on the shelf—who needs it? It is unbelievably cumbersome, time consuming, breakdown prone, and serves no useful purpose.

Contrary to Armor School doctrine, the best mechanic is not the one who needs an LVCT to tell me what is wrong with a 28-volt charging circuit. I, and everyone else I've met, desire a mechanic who can diagnose and repair a vehicle electrical system with a mallet, screwdriver, voltohmeter (VOM) and feeler gage.

U.S. Army Armor School Special Text 17-158 lists 33 checks that the LVCT can do if you've got all week, a trained LVCT expert, and an extension cable for every line on the LVCT. With the four tools mentioned above, an Army mechanic can perform all but four, and those four are not worth checking anyway.

Come on Armor School, you can Forge the Thunderbolt with something better than this. It's 1978, you are the folks who are supposed to be pounding FORSCOM over the head to get us a cheap, plastic Taiwanese voltohmeter in every general mechanic's tool kit. A controlled-expendable VOM could be purchased for $4 apiece if the Army bought a hundred gross of them. No, don't make it waterproof, cast-iron, olive drab or pay some yo-yo $40,000 a year to break every tenth one for quality control. KISS.

In summation the LVCT is like the *M-114*. It's expensive, immobile, inefficient for the time spent to keep it running, and easily replaced by something that does the job better.

RANDOLPH J. ROBINETTE
Captain, Armor

APO New York 09165

Dear Captain Robinette:

Modern electrical systems consisting of printed circuits and solid-state configuration require the best of test equipment and know-how on the mechanic's part. Failing to keep this in mind will result in continuing the process that we are in today—replacement of parts that are not defective.

If you want to use the voltmeter method of troubleshooting, the voltmeter of the LVCT will fill the bill. It is time our supervisors familiarized themselves with the capabilities and simplicity of equipment provided for their use. A short training exercise in the motor pool some rainy day would be a good start in getting this equipment off the shelf. You may even start to appreciate it.

AUTOMOTIVE DEPARTMENT
USAARMS

Ft. Knox, Ky. 40121

A-10 Controversy

Dear Sir:

We have noted the *A-10* aircraft controversy in *ARMOR*. The issues involved are not new to modern warfare. The Soviet Union has recognized the value of combined ground and air armored attack and has pursued this policy since 1936. This was highlighted by the tactical usage of the *IL-2 Sturmovik* of which 36,163 were produced (almost as many as the *T-34* tank).

Given this history lesson, armor commanders must ask themselves at least the following:

- How is the *HIND* helicopter to be used?
- Will the *A-10* (or even the AAH) alone be effective against the Soviet combined arms team?

JOSEPH E. BACKOFEN, JR.
LARRY W. WILLIAMS

Columbus, Ohio 43201

I Want My Own!

Dear Sir:

Would you please enroll me as a subscriber to *ARMOR* magazine for a period of 3 years.

I am sick of borrowing, stealing, and leaning over people's shoulders trying to read *ARMOR*, and want my own copy so that I can hide and read it!

REED W. JARVIS
Sergeant First Class

Port Angeles, Wash. 98362

An Opinion

Dear Sir:

* * * * *

I believe the platoon size [of the restructured division] is right, but company and battalion size is too small. As for the recon problem the divisional cavalry unit can provide a platoon when it is needed. Antiaircraft equipment is going to have to be more numerous and more localized than at present. Maybe one to a platoon, as Mr. Icks suggests, is best, or gun vehicle at platoon and missile vehicles at battalion to cover the whole front. The TOW, actually antitank, problem has existed in all armies, and will until present equipment allows an answer. The infantry needs to have their own long-range antitank firepower for their own protection. The independent antitank company can be used as overwatch and flank guards in the attack overwatching the ground and air. In the defense they form the main line of defense along with a mechanized infantry company. This allows the battalion to keep a strong reserve for counterattacks and gaining the initiative. How many times have advantages been lost because your forces won the defensive battle, but did not have enough strength left to attack? These forces should move forward as soon as possible to relieve the line companies in defensive situations. The antitank unit must be quite large as it covers the entire battalion front. Since antitank forces require kinetic and chemical energy rounds to keep the enemy from easily defeating a single type of attack, tanks should be included in their organization. What mix to use I don't know.

* * * * *

CHRISTOPHER F. SCHNEIDER
Sergeant

APO 09076

Convinced

Dear Sir:

I would like to express my opinion on the Dual-Tex camouflage pattern.

When I was in the 1-8 Cavalry at Fort Hood the platoon I was in was selected for testing the pattern. The "checker-board" platoon received many comments. I myself did not like it [the pattern]. After many field testings it proved its usefulness. The division commander viewed my tank in a training area from about 1,000 meters. The tank could not be sighted unless viewed for a few minutes and then it was still hard to make out. I used no attached camouflage, and used only a position with very little natural cover! I pulled out of the position, parked next to it, and still the tank was difficult to see.

I can only say that the *XM-1* and this new pattern along with the tank's lower height will be an ideal combination! The Dual-Tex pattern made a believer out of me.

MATTHEW R. LINNEMAN
Sergeant

APO 09074

Admirer

Dear Sir:

I continue to admire and enjoy *ARMOR* magazine, and must admit the other branch magazines do not even come close in content, audience appeal, format, and quality. Keep up the good work!!

GERALD T. CECIL
Major, Infantry

Hazel Green, Ky. 41332

Credit Where Credit Is Due

Dear Sir:

I'm sitting here on SDNCO in Germany and I pick up the *ARMOR* Magazine of March-April 1978. Reading the article "Improving Turret Maintenance," I feel that you are giving too much credit to the Master Gunner and 45K30 people on the *M-60A2* tank, and not enough to the 45R Missile Tank Turret Mechanic at company level. The only time the Master Gunner or 45K help is when we have a problem we can't solve and that's very seldom with me.

Master Gunners receive no more training than the 45R's do going through the course at Fort Knox. If they do, I want to know where. Now I'm waiting for the *XM-1*.

GENE R. HOAK
Sergeant

APO 09702

THE COMMANDER'S HATCH

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

In my first "Commander's Hatch," I shared with you my initial impressions of the "Home of Armor." I also outlined what I saw as my primary goals and missions. Those goals and missions optimize the Combined Arms Team through the development of armor doctrine, training materials, weapon systems, and trained armor personnel. The need to establish an effective communication link between the field and the Armor Center is critical to fulfilling those missions. Now I'll describe my ideas on how Armor Center interface and interaction with the field can provide a more dynamic and effective Armor community.

Since their inception, our Office of Armor Force Management (formerly Tank Force Management Group—Knox) and the Directorate of Evaluation have been involved in getting the revised resident courses established, Fort Knox training facilities updated, and several new weapons systems on the road as recommended by the Tank Forces Management Study. Quality control and Armor management have been their full time job with little time for in-depth contact with the Armor force in the field. This will now change. The two agencies have been combined, retaining the title of Office of Armor Force Management (OAFM). In addition to keeping the train on the track at Fort Knox, they will be my coordinating staff section for visiting the field.

This external assessment and assistance function of the new OAFM will be performed by "Armor Forces Management Teams" tailored to accomplish specific, predetermined objectives. These teams will be able to recognize established standards. Composition will be determined by the type of unit visited, its location, and its current status. Generally, teams will consist of people with expertise in training, personnel, and logistics. Before visiting a unit, available data from current reporting systems will be reviewed to determine the composition of the teams and the area of emphasis during the visit. Particular situations such as technical maintenance problems, training certification, fleet modernization, target systems, etc., will require subject matter experts. I hope to provide these experts to OAFM from other Armor Center agencies such as the Directorate of Combat Developments or an Armor Training Activity. Active Army air and ground Armor units, as well as National Guard and Reserve Component Armor units, are included in this program.

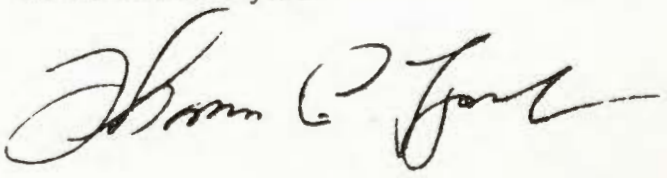
The primary thrust of the teams will be to inform you of what is going on at the Home of Armor, to solicit your suggestions, to help with your problems, and to see how standardization is working. The teams will provide me with data to use to provide you with trained personnel and developed products that better meet your needs.

On-site procedures will find team members providing subject matter expertise to units. Training members will be able to discuss training management, programs, and facilities; and certify and validate training areas as requested. Personnel team members may devote part of their time at the unit level discussing personnel utilization, the secondary MOS program implementation, and career development plans. Then they could devote a portion of their time to higher headquarters personnel offices tracking back through the personnel subsystem to ascertain the effectiveness of the support given those units being visited. The logistics team members would devote their time to problems the user has in operating and supporting organic equipment, organizational readiness, providing information on new materiel being fielded, and soliciting user comments for training and materiel developers. All members of the team will take particular care to listen to suggestions and requests for assistance. The Armor Center will make every effort to provide that assistance within its capabilities.

To do all of this correctly it must be well planned and coordinated. My intent is to be a helper. Although this effort is low key, I will coordinate the visits through the major headquarters involved. My effort is directed toward making the Armor force better by communication and identification of problems, not by identifying units. I have been adamant in my staff guidance that specific units are not my concern; universal problems are.

The recent Tank Gunnery Standardization Conference is an example of how we are beginning our program. In March my experts met with representatives from 7th Army Training Command, and CONUS major commands, including Active Army, Reserve Component, and National Guard units. In conjunction with the Army Training Study, we have teams visiting units to administer tests to recent Track Vehicle Mechanic and Basic Armor Training graduates so that we can better modify and develop those programs. Likewise, we are working with the 84th, 85th, and 100th USAR Divisions (Training); and the 5th Brigade, 89th ARCOM, as well as beginning preliminary work with other National Guard and Reserve tank units. The 49th Armored Division in Texas will participate in one of our training development programs during the next year.

As you can see, we are beginning to spread our wings. In doing so we are working to refine and organize our procedures so that we can serve the Armor community, and still operate within our funding and personnel constraints. I solicit your cooperation and assistance as we work together to make Armor and the Combined Arms Team the best fighting force ever, and to challenge and build confidence in our most precious resource—the Soldier. *Take care of him.*



ARMOR FORCE MANAGEMENT

The major Tank Forces Management Group (TFMG) findings in the area of maintenance personnel and training were:

- Training is too general.
- Experience is too broad.
- Technically competent mechanics, clerks, technicians, and supervisors were not being produced or developed.

The TFMG recommendations which addressed these findings generally proposed that maintenance training be focused by major system. This would accomplish two things. First, the scope of instruction of the mechanic coming into the Army would be so narrowed that the individual could build up proficiency on his system in the training base and be competent enough to perform his mission when he joined his unit. Second, the experience gained by the senior mechanic on his system could be "captured" and used to develop his expertise as a technician, supervisor, and trainer on that system.

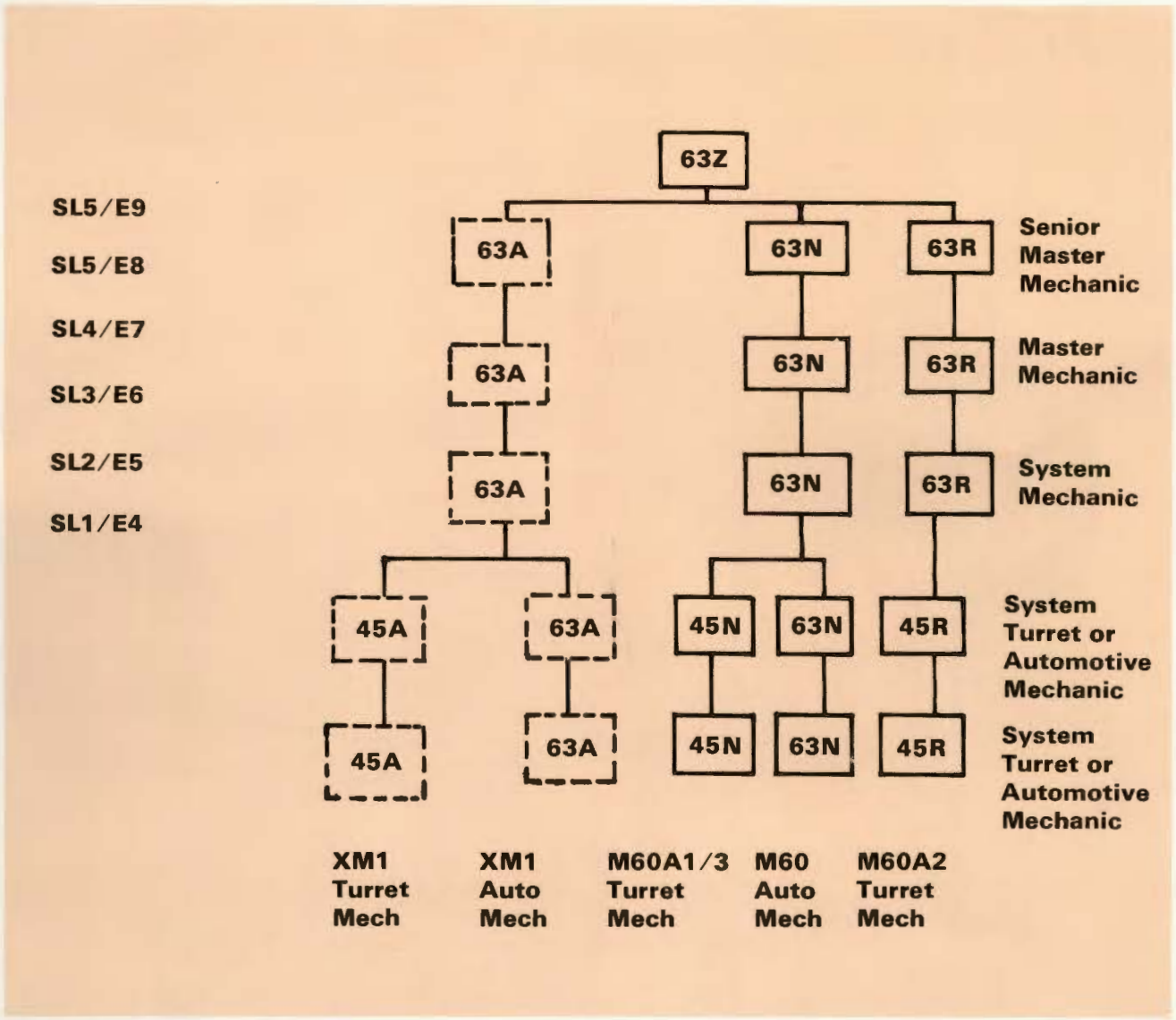
Although the TFMG recommendations only addressed the tank forces, it was obvious that the entire Career Management Field (CMF) 63 (Mechanical Maintenance) would have to be reviewed. It was also determined that although the individual's training and experience would be focused on one major system, he would have to be given training on how to operate and maintain the recovery vehicle associated with his major system, the *M-113* armored personnel carrier, and a few high-density wheeled vehicles. A spinoff of this is that the recovery MOS (63F) is eliminated and systems-oriented automotive mechanics will be assigned to operate the unit's recovery vehicles.

The major systems that were identified are the *M-60A2, M-48A5, M-60, M-60A1, and M-60A3* tanks; the *M-551 Sheridan;* the *M-109* and *M-110* self-propelled field artillery pieces, and the *M-113* improved TOW vehicle (ITV). Since the *M-551 Sheridan* is being phased out of most units, it will probably be dropped as a major system. The *XM-1* tank and infantry fighting vehicle/cavalry fighting vehicle (IFV/CFV), however, were identified as major systems to be included when they are fielded in units.

The application of this systems orientation to both support and organizational maintenance personnel was examined closely. It was determined, however, that the support maintenance repairmen would retain their commodity orientation.

A true "system" mechanic approach required that the turret and automotive skills be brought together at some point. For the tank-system mechanics, this crossover point was identified as somewhere between skill level 2 (E5) and skill level 3 (E6). It was assumed that complementary institutional training would be required at this time.

Figure 1 reflects how the tank-systems-oriented organizational mechanics will look.



Note that the individual is a turret or automotive-system-specific mechanic at skill levels 1 and 2. At skill level 3 he becomes a system mechanic, at skill level 4 a Master Mechanic, and at skill level 5 he becomes a Senior Master Mechanic.

What this means to our company and battalion Tables of Organization and Equipment (TO&E) is:

- Automotive and turret mechanics from grades E1 through E5 will continue as they now are except that the automotive mechanics will be system-specific.
- The company maintenance section will be authorized an E6 system mechanic who will be the senior technician, technical supervisor, and technical trainer. Each battalion maintenance platoon will be authorized two E6 system mechanics who will have similar responsibilities at battalion level.
- The company will be authorized an E7 Master Mechanic as the company maintenance supervisor.
- The battalion will be authorized an E8 Senior Master Mechanic as the battalion maintenance supervisor.

In parallel action, the area of maintenance administration is also under study. The company PLL and TAMMS clerks, as they are known today, may be transferred from CMF 76, Supply and Services, to CMF 63, Mechanical Maintenance. This would give CMF 63 its own nonsystems-oriented administrators who would serve both organizational and support maintenance. In the tank company, they would be found in authorized E4 and/or E5 PLL and TAMMS clerk's positions. At the battalion level, an E6 maintenance administrator position would be authorized in the maintenance platoon. These individuals would assume most of the maintenance administrative responsibilities that now fall on the shoulders of the maintenance supervisor. This would free the unit maintenance supervisors, who will be master and senior master mechanics, to do more technical supervision, managing, and training.

The proposals to systems-orient organizational maintenance personnel and introduce unit maintenance administrators are currently undergoing staffing. They promise to greatly improve the quality of mechanical maintenance of the entire Army, not just the tank forces. They represent giant steps forward in modernizing maintenance personnel management and training to keep pace with the modernization of our equipment.

My Turret Mechanic Can't...

by Major William T. McLarty

How good are your turret mechanics? Different units in the field express widely varying opinions when asked this question. While some of this variance may be due to differences in individual capabilities and motivation, some is undoubtedly due to differences in unit expectation. The same commander who receives a new armor crewman with the realization that he possesses only basic skills, often expects the new turret mechanic to immediately perform as a fully-qualified mechanic. The purpose of this article is to describe the training turret mechanics receive at the Armor School, and suggest some ways in which units can more rapidly make new turret mechanics fully functioning members of the team.

Turret mechanic courses of instruction are vehicle-specific for the *M-60A1* (MOS 45N), *M-551A1* (MOS 45P), and *M-60A2* (MOS 45R). The three courses are similar, although the *M-60A2* course, due to the complexity of its turret, is approximately 4-weeks longer than the other two. For purposes of illustration, the *M-60A1* course of instruction will be described.

The 45N course is approximately 8-weeks long. During this 8 weeks the turret mechanic student receives instruction on the following topics:

LESSON	HOURS
Orientation	4
DA Publications	12
Fundamentals of Electricity and Electrical Repairs	12
Auxiliary Fire Control Instruments	12
Disassembly, Assembly, and Trouble-shooting 105-mm. Gun and Combination Gun Mount	16
Firing Circuits	20
Searchlight	4
Gun Elevation and Turret Traversing System	32
Stabilization System	32
Fire Control System	52
Cannon, 165-mm., *M-135* CEV, *M-728*	4
Gas Particulate Filter Unit	4
Commander's Cupola	6
Quarterly Services	24
Examinations	56
TOTAL HOURS	290

During this 290 hours of instruction, the student spends approximately 87 percent of his time in an instructional group with three other students and an instructor. The majority of this time is spent in hands-on, performance-oriented instruction, using either a turret trainer which duplicates the *M-60A1* turret or an actual tank. During these periods of instruction he performs those tasks that will be required of him on the job. Troubleshooting, use of the technical manual, and use of diagnostic test equipment—areas often reported as the most serious deficiencies exhibited by new turret mechanics—are integrated into each block of instruction. Periodic examinations test his ability to perform these tasks, and are administered on a GO/NO GO basis. Students who are unable to perform a task on the first attempt receive additional training, and are tested again on a different problem, but one which tests his ability to perform the basic task. Any student who is unable to perform a task after three attempts is eliminated from the course. Students who successfully complete the course must have demonstrated their ability to perform the majority of those basic skills that will be required of them as turret mechanics.

It would seem that the new turret mechanic, having just completed the course of instruction, acquired his basic skills, and demonstrated these skills in proficiency testing, would be able to go into any tank turret in his new unit and demonstrate those same skills. Why doesn't he? Lets examine some of the possible causes.

Environment. With the exception of quarterly service and synchronization training, the student learns his skill within a classroom and laboratory environment. Turret malfunctions are studied in an isolated context. All manuals, tools, and test equipment required to diagnose and repair faults are readily available. A skilled instructor, along with a group of peers, is available to render advice and assistance, except when the student is being tested. Compare this environment with that of an actual unit. In the field, the turret mechanic finds that maintenance, instead of being the primary focus of each day's activities, is now ancillary to a multitude of missions. He is no longer a student. He now must perform all those other tasks required of soldiers. Turret trainers and reasonably comfortable laboratories have been replaced by functioning combat vehicles with myriads of faults and shortcomings; and a motor pool or trains area that most likely is exposed to whatever Mother Nature has to offer. If his unit is fully manned with turret mechanics, there are two other individuals (with luck an E4 and an E5) who are primarily responsible for the organizational maintenance of 17 turrets. More frequently the unit is not fully manned and the experience level of other turret maintenance personnel is less than 1 year on the job. He may often be required to work alone, or with only tank crewmembers to detect and correct malfunctions. He may well find that his unit is short tools and test equipment that were readily available in school. Instead of an instructor and peers to critique and assist him in performing his duties, he may find no one with enough turret maintenance knowledge to help him through problem areas. Altogether, this provides an environment that might stifle even the most ambitious and qualified new turret mechanic.

Motivation. Questionnaires completed by new turret mechanic students reveal a wide range of entry qualifications, perceptions, and motivation. While some students fully understand what their schooling and future duties will entail, equal numbers have broad misconceptions about these areas. Some students are previous advanced individual training (AIT) failures who, to their way of thinking, have been arbitrarily assigned to an MOS that they neither desire nor feel qualified to perform. Despite this wide range of entry qualifications, most students do complete the course successfully. Continuing motivation then becomes the responsibility of the unit to which they are assigned. One of the more important factors in continuing this motivation is the manner in which the new man is initially received and assimilated into the unit. Hints on what some units have done to make the new turret mechanic a successful member of the team will be discuss-

ed later.

Supervision. A key factor in job performance is effective supervision. Who supervises the new turret mechanic?

- The Motor Sergeant? Perhaps, but he is most likely a product of the 63C career field with no formal training in the turret.
- The Senior Turret Mechanic? Perhaps, but he may lack experience himself.
- The Turret Maintenance Supervisor? Perhaps. The Army has provided this man in the table(s) of organization and equipment (TO&E) of *M-60A2* and *M-551* units for this purpose. Unfortunately, we have found that he is often a direct support technician who may not possess the knowledge to effectively supervise the organizational turret mechanic.
- The Unit Motor Officer? The Unit Commander? Again the answer is perhaps. These officers are seldom able to devote the time required to actively supervise turret maintenance.

The fact is that we haven't really had a qualified turret mechanic supervisor in most units. This has been largely due to the fact that the organizational turret mechanic could only progress through grade E5 in his primary MOS. After reaching E5, he had to seek promotion to E6 as a 45K, an MOS associated with direct support maintenance. The new Master Mechanic concept, which is designed to allow both turret and track mechanics to progress on through the ranks while improving their skills, and remaining with combat units, will eventually remove the present career progression "roadblock," and concurrently provide an effective supervisor for novice turret mechanics.

A potential supervisor who is now available in most units is the Master Gunner. The "gunner" title partially obscures the fact that this sergeant has received 160 to 284 hours of instruction extracted directly from the turret mechanic's program of instruction (POI). This equates to approximately 65 percent of the instruction presented to the turret mechanic. This source of expertise might wisely be tapped for turret maintenance as well as gunnery instruction and supervision.

Promised earlier were some hints on what certain units have done to make their new turret mechanics more effective members of the team. These have been gleaned from various trip reports rendered by personnel from the Armor School after visiting numerous units in the field.

- *Let Him Know He's Part of the Team.* Mechanics often feel left out, especially during gunnery training and qualification. The turret mechanic usually spends long hours preparing and maintaining his unit's turrets for service firing. Most of the recognition for a successful gunnery season, however, is directed toward the tank crews. Formal recognition of the mechanic's efforts may partially compensate for the fact that he's basically a maintainer, not a direct competitor. In any event, his performance will have a direct and important impact on the unit's gunnery performance.
- *Accept the Newcomer as an Apprentice.* Regardless of how serious your turret problems may be, a few weeks spent in unit orientation and closely-supervised training will pay dividends in the long run. Some units, usually those who indicate the most satisfaction with their turret mechanics, keep newly assigned turret mechanics at battalion level for a period of 2 to 3 weeks prior to assigning them to a line company. During this period they conduct formal on-the-job training (OJT) which acquaints the men with unit standard operating procedures (SOP's), battalion supervisory personnel, provides additional training in those areas currently comprising unit problem areas, reviews skills learned as much as 2 to 3 months earlier, and teaches those tasks not formally taught at the Armor School. This period of time also provides an important transition period during which the new turret mechanic adjusts to the differences between school and unit environments. It may also serve as an evaluation period during which the supervisor can decide which unit can most profitably utilize the man. The battalion turret mechanic supervisor, Master Gunner, or senior turret mechanic is normally charged with supervising this training, and all can assist.
- *Establish Goals and Provide Recognition for Their Attainment.* Goals may be expressed as an increased operational readiness rate; a percentage reduction in currently deadlined vehicles; reduced time required for preventive or repair maintenance; or any other quantifiable standard. Reward attainment of goals with oral and written recognition. Provide similar incentives for outstanding turret maintenance that may be provided for tank crewmen.

The development of outstanding turret mechanics is a joint venture for both the Armor School and field units. The Armor School will continue to strive for turret mechanic courses that provide the best training possible. Once graduated from the School, further development of turret mechanics is primarily the responsibility of the unit to which he is assigned. The Armor School is prepared to assist in this development whenever possible.

For additional information on turret mechanic training or assistance in turret related problem areas, call or write:

Chief, Maintenance Division
Weapons Department
U.S. Army Armor School
Fort Knox, KY 40121
Tel: (AUTOVON) 464-6155

MAJ WILLIAM T. MCLARTY was commissioned in Armor upor graduation from Auburn University in 1965. A graduate of the Air Command and Staff College, he has commanded tank companies in Germany and CONUS, and a Mobile Advisory Team in Vietnam. Other assignments include ROTC duty, and various staff assignments in the 1st and 3d Armored Divisions and V Corps Headquarters. He is currently assigned as Chief, Maintenance Division, Weapons Department, USAARMS.

MASTER GUNNER'S CORNER

On numerous occasions the Master Gunner Branch has received requests for help from units in the field. Usually these appeals can be fulfilled and the unit helped with a little guidance from one of our instructors by telephone or by correspondence.

At times, though, there have been requests which require one of our instructors to gather up his books, reference materials, expertise, mount his noble steed and charge off into the sunset or sunrise (depending on the direction), to come to the aid of a concerned unit commander. All joking aside, there are problems in the field that at times have required us to visit several units and help them with a variety of problem areas. Some of the areas we discovered are common in most units. They are:

- The lack of a complete LOI at division level.
- The lack of a good gunnery program at battalion/squadron level.
- The lack of trained and/or experienced vehicle commanders.
- The lack of repair parts for vehicles and crew-served weapons.
- Units not using or not having the proper manuals, i.e., FM 17-12 with appropriate supplements.
- Units not understanding the proper use of training devices where available.
- Range facilities not being utilized to their utmost, or substandard range facilities.

Through our experiences and travels to different units throughout the United States and Europe, we have found possible solutions to the above mentioned problems which we believe have increased the units' proficiency.

Logistical support must be established before any gunnery program can get off the ground. This is accomplished and controlled at division level. Major areas that should be addressed are:

- Forecasting ammunition within a sufficient time frame.
- Insuring sufficient transportation is available to support the maneuver battalions with POL, PLL, ammunition, and any other necessary items required for the unit to have a successful gunnery program. If it is a policy for the division to schedule ranges, sufficient time should be allocated for units to complete required firing with a buffer time for make-up firing as needed. Ammunition supply points (ASP) should be looked at also. When tank or tank-like vehicles are used, the storage areas have to increase in order to facilitate additional space required by the types of ammunition common to these vehicles.

A logical training sequence should be developed to insure that the vehicle crewmembers have a full working knowledge of their vehicle and associated equipment, before they can be taught the fundamentals and advanced techniques of tank gunnery. The program generated at battalion/squadron level should be developed according to the unit's level of training, based on their last year's gunnery program results and personnel turnover. In many

instances it has been found that an intensified individual crewmember training program has been successful. The unit may find that because of a large turnover of personnel or equipment, they may have to start with basic classes and progress to higher levels of training. In essence, "Don't put the cart before the horse."

Before the crewmember can be trained, the trainer must be trained. If the unit's NCO's are not familiar with the vehicle or training techniques, the crewmembers are not going to be able to operate and function effectively. By identifying selected NCO's who have demonstrated their abilities with the vehicle and its associated equipment through past gunnery programs, they can be used to establish a TGAT or assist in presenting a training program. The unit should establish a "checkout" program for these selected NCO's to insure that the training information is presented logically and in a standard format.

An effective training program will only be as good as the trainers and the operational status of the unit's vehicles and equipment. Too often crewmembers are not able to adequately maintain their vehicles and crew-served weapons due to a lack of parts. A close look at PLL and TAMMS personnel is essential to insure that the correct repair items have been requested and that proper entries have been made in equipment logbooks. If these personnel are not familiar with the type of equipment used in the unit, problems can arise. In turn, the vehicle operators must also be familiar with proper procedures in requesting repair items. The operators must also understand proper entries that are made on appropriate logbook forms. This, of course, should also be covered in detail in the unit's training program.

Appropriate manuals are a big problem in the field. Units are not receiving manuals in the quantities they require. A good example of this is the new FM 17-12 with the appropriate supplements. Problems exist with reproduction of this manual due to the very large list of requests for it. A unit that has requested FM 17-12 should insure that DA Form 17 is up to date. If the request is over 90 days old, a followup request should be checked to insure that the proper amount of manuals have been requested. If you have the manuals, use them. Most soldiers in the field don't use or read the manual. They have a tendency to use old short cuts and ways that in some cases work and in other cases can confuse and make things harder in the long run.

To overcome current training limitations due to the rising cost of main gun ammunition, fuel, spare parts, and units not being able to get to major tank ranges to fire as often as they should, more gunnery training must be done at home station using simulators, subcaliber training devices, and innovative training techniques.

Some of the devices have been issued to tactical units while others should be available through local Training and Audiovisual Support Centers (TASC) on a loan basis. Devices not available through TASC could be, depending on the unit's capabilities, fabricated locally using drawings available for issue by the local TASC. Units should use devices currently available to them and should not make plans based on devices they hope to receive.

Problems in the operation of devices have come up in the field which can be rectified if the operator will consult with the unit Master Gunner if available, and FM17-12-7, which explains proper mounting, boresighting and zeroing procedures along with techniques used with each device.

Range facilities are probably the biggest problem in CONUS. The majority of ranges being used now are poorly set up. Many ranges can be modified with minor adjustments in range boundaries and on-site facilities. Combining two ranges close together at times can greatly improve crew and platoon maneuver, and gunner skills and techniques. Units wanting to set up or modify ranges for scaled down firing can get helpful information from chapter 1 of FM 17-12-7. This chapter covers scaled ranges for both stationary and moving firing vehicles.

The majority of the problems that arise in the field can be overcome by key personnel (the Master Gunner if the unit has one) sitting down and taking a hard look at the existing gunnery program. Problem areas that are identified can usually be corrected by the unit's Master Gunner with minor adjustments to existing SOP's and gunnery programs. Master Gunners receive 28 hours devoted to "How to Train" during their course at Fort Knox. Coupled with this training, the Master Gunner's experience, and other training received during the Master Gunner Course, these personnel are the most logical and qualified to take an in-depth look at existing gunnery programs, identify problem areas, and suggest ways to improve the tank gunnery proficiency of the unit.

JEFFREY L. HAMILTON
Sergeant First Class, Master Gunner

FROM THE FIELD

As the 1980's draw upon us, it seems that instead of becoming more proficient in Armor training technology, we are losing ground in one of the most important areas.

During the late 1960's and early 1970's, when Range 80 at Grafenwöhr, Germany was the ultimate in qualification courses steel targets were fired at by tank crews engaging with individual fire commands. Our crews were receiving the best simulated combat training possible.

I was very disappointed at Range 42 this year, concerning multiple targets and techniques employed. The SAAB devices supplied were very poor, as the panels fell down upon being hit with TPT ammunition only 30 percent of the time.

Also, crews had to rely on external sensing from the controller upon announcing "LOST" over the radio. When engagement time is the deciding factor in survival on the battlefield, our crews must be able to sense a "hit" and adjust fire on their own. We must bring back the hard target on stationary engagements in order to give our crews the factor that is needed for realism.

Furthermore, the reinstatement of good simulated combat courses should be our greatest desire and receive our total commitment.

JEFFREY C. HARPER
Staff Sergeant, Master Gunner
3/2 Armored Cavalry Regiment

Send A Message

by Captain William R. Soneira
and Captain James R. MacSwords

The cool morning mist blowing across the turret sends a shiver down to your toes, as the distant rumble of artillery increases in the grey nothingness. The silence in the headset adds to your nervousness. "Radio silence" said the CO, and here you are, lead element, and no contact with the rest of the battalion.

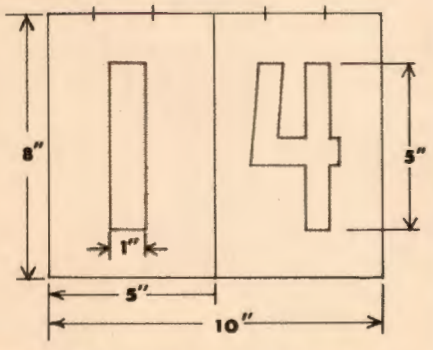
Above the trees and to the right, a sudden movement—a lone *OH-58* materializes in the approaching dawn. The unidentified helicopter, unable to land on the narrow woods trail, hovers above the lead tank, the pilot waving wildly. Staff Sergeant Smith looks back at you queryingly. It appears urgent, but you can't break radio silence, even if you knew what frequency to use. "What do you do now, lieutenant?" is recalled from your AOB days, but this is not Fort Knox. The *58* is still hovering above the column and the pilot is pointing to the treeline, now barely visible 800 meters to the west in the morning mist. The words stick in your mind, "Lieutenant, you will hold that bridge until the rest of the unit arrives, and remember—RADIO SILENCE!" You signal the lead tank to move out as your track lumbers forward, the gunner scanning the woodline for any signs of trouble. As your last tank clears the safety of the trees, a sudden flash erupts—then another. *AMBUSH!*

Figure 1 Matrix

	1	2	3	4	5	6
1	A	B	C	D	E	F
2	G	H	I	J	K	L
3	M	N	O	P	Q	R
4	S	T	U	V	W	X
5	Y	Z	AA	BB	CC	DD
6	EE	FF	GG	HH	II	JJ

Note: The first number in the sequence can be represented by a series of dots on a light gun during periods of limited light conditions or with night vision devices. The second number in the series would be represented by dashes. Example: "J" would be "2-4" or "./---".

CARD/Number COLORS
1--BLUE/White
2--GREEN/White
3--YELLOW/Black
4--RED/White
5--WHITE/Black
6--BLACK/White



Each flip card is 5-in. wide by 8-in. high. The numbers are as indicated above and are 1-in. x 5-in.. The backboard is a single 8-in. x 10-in. sheet. The cards are connected by four binder rings or by a spiral-type binder. The cards can be 1/16-in. plastic or sheet metal, or can be plastic coated paper.

Figure 2

Yellow smoke billows from the lead tank. As your driver pulls sharply off the trail, a flash erupts and you also become engulfed in a cloud of yellow. It's too late now, you think, watching your platoon smashed before your very eyes. Minutes later, the controllers chalk-up the score—good guys "zip," bad guys, five kills.

What went wrong? How could you have known about that ambush? And what about that *58*. Why didn't he warn you about the enemy tanks? How could he, you say to yourself, you didn't know what frequency he was on either! If only there was a way.....(enter stage right..SAM)!

"What is SAM?" you say. SAM, short for Send A Message, is a communication method that uses a set of six flip cards to provide a simple, flexible, one handed method of communication during radio silence and periods of extensive electronic warfare. Originally designed by the authors as a method of air-to-air communications for aeroscout teams, SAM has developed into a system with unlimited potential and can easily be employed air-to-ground, ground-to-air, and even ground-to-ground. (See Figure 1.)

The SAM system is a set of five colored flip cards mounted on a solid backboard. By using four basic day-glow colors in conjunction with black and white, the problem of color shades is eliminated. To reinforce the colors during reduced lighting conditions, and to lessen the problem of differentiation at increased distances, the cards have been numbered one through five, with the backboard numbered six. Therefore, SAM is now capable of sending thirty-six combinations of signals or messages, by using a series of two-digit color codes.

While the colors are basic and the numbers are large enough to be legible, neither will "wash-out" the other, even at distances up to 200 meters (See figure 2.) The flip cards themselves were designed to be large enough to be visible at sufficient distances, but small enough to be manageable, even in the confines of a crowded cockpit.

During a limited field test period, members of the aeroscout platoon of A Troop, 2d Squadron, 17th Cavalry used SAM under different lighting conditions and distances from 25 to 250 meters. The numbers and colors were easily distinguishable in all cases, and with minimal training, messages were sent and decoded by crew members with little inconvenience and virtually no errors.

Once past the initial familiarization phase, the crew members became confident with the system and messages were decoded as fast as they could be sent—including distances to the nearest 100 meters and azimuths to the nearest 10 degrees. A full spot report can be sent in 40 seconds.

The system is simple and requires no authentication or security measures because if the bad guys are close enough to see the cards, they'll be shooting, not reading!

Although primarily designed for aeroscout teams and scout-to-gunship communications, the system is flexible enough for just about any message. During the test period, the code breakdown or definition sheet was

Figure 3: CODE SYSTEM

CODE	LETTER	D/DD	MESSAGE(SPARE 1)--Armor	(SPARE 2)--Aviation
1-1	A	01	aircraft	aircraft
1-2	B	02	bridge	BMP/APC
1-3	C	03	camouflaged	camouflaged
1-4	D	04	DIRECTION	DIRECTION
1-5	E	05		break right
1-6	F	06	fuel	follow me
2-1	G	07	rearm	
2-2	H	08	troops	troops
2-3	I	09	traveling	east
2-4	J	10	move, -ing	
2-5	K	11	check point	check point
2-6	L	12		
3-1	M	13	attack helicopters	move, -ing
3-2	N	14	BMP/APCs	
3-3	O	15	tanks	tanks
3-4	P	16	traveling overwatch	POL
3-5	Q	17	HQ/CP	HQ/CP
3-6	R	18	recon	south
4-1	S	19	ATGM	stationary
4-2	T	20	antitank gun	
4-3	U	21	bounding overwatch	artillery
4-4	V	22	ambush	ADA
4-5	W	23	on the road	on the road
4-6	X	24	mines, -ed	helicopters
5-1	Y	25		break left
5-2	Z	26	SPARE	SPARE
5-3	AA	27	assembly area	west
5-4	BB	28	attack position	attack position
5-5	CC	29	ALL CLEAR	ALL CLEAR
5-6	DD	30	DISTANCE	DISTANCE
6-1	EE	31	obstacles	
6-2	FF	32	return	return
6-3	GG	33	I SPELL	I SPELL
6-4	HH	34	secondary position	holding position
6-5	II	35	FRIENDLY	FRIENDLY
6-6	JJ	36		north

NOTE: Underlined words/codes are common to all languages.

D: DIRECTION to the nearest 10 degrees. DD: DISTANCE to the nearest 100 meters.

chosen for simplicity and can easily be tailored to fit the mission. (See figure 3.)

The basic combinations we chose for the air cavalry mission were simply color associations. Blue-blue (1-1) for the sky, became aircraft, while green-green (2-2) indicates troops. The armor branch color was translated to indicate yellow-yellow (3-3) which designates tanks under our code system. The aviator's biggest threat is the enemy anti-aircraft gun systems, therefore, a red-red (4-4) indicating danger, represents ADA. The double white (5-5) is a good way of indicating 'All Clear.'

The limiting factor of our system is that of sending grid coordinates. By limiting the codes to the six basic ones, we've limited ourselves to one through six on the number scale. Therefore, numbers seven through nine and zero are not part of the flip cards. However, by indicating "6-3" or the black and yellow combination, "I Spell" is designated and then the grid coordinates are given by a combination of codes "1-1" through "1-6" for one through six, "2-1" for seven, "2-2" for eight, "2-3" for nine, and "2-4" for zero. It takes a little longer, but at least there is still the option of sending grid coordinates.

Targets can be designated by giving direction and distances from predesignated check points using the polar coordinate method. This shortens the required sequence and still gives the desired results. Grid coordinates can be sent to either four or six digits, but the check point method works just as well in most cases.

The use of "I Spell" followed by the code for a particular letter of the alphabet can be used to spell out any word not designated in the premission briefing, therefore, you can say "meet me at MacDonald's for lunch" if you want to take the time to spell it out. For example, if you wanted to say "Return to Fort Knox," all you'd have to do is send 62/63/25/32/33/46, where "6-2" stands for return, "6-3" designates "I Spell," and the rest spells K-N-O-X.

It may sound complicated, but anybody who can read can learn how to send and decode messages within 5 minutes.

The code system is self-explanatory where "1-1" through "6-6" represent the flip card numbers, and "A" through "J" are used when spelling words or designating check points. The D/DD stands for Direction and Distance, and is used when sending azimuths and ranges to targets. As mentioned, the azimuths are to the nearest 10 degrees and the distances are to the nearest 100 meters. This reduces the exposure time for the attack helicopter when engaging targets—exposure time being critical to the life expectancy of the pilot in a midintensity-type battlefield.

The system is not just limited to the codes used during the test. By designating a system of spares, each type unit can have their own language. Therefore, a helicopter pilot could talk to an unidentified tank unit in their own language by using a standard code system set up for their particular needs. The code for "Spare" would be universal, "5-2" followed by the code for the number of the spare desired. The system becomes unlimited. For example, if armor was designated as Spare 1 and aviation as Spare 2, the unidentified *OH-58* pilot in the opening scene could have warned the tank platoon of the ambush by designating Spare 1 (5-2/1-1), and then by sending the warning in the tankers own language—the 36 symbol matrix set up for armor—where "4-4" might indicate AMBUSH! This also might save the pilot if a tanker were to send him a message of warning in the aviation spare such as "4-4," indicating enemy ADA.

SAM works for air-to-air messages. It was tested during a recent field training exercise, and plans have been made to implement it fully as soon as the flip card devices can be produced in sufficent numbers for each aircraft to have a set.

SAM is a simple, flexible and workable method of communicating when we are denied the use of our radios under various tactical situations. It's not the final answer, but it's the best developed so far. Besides, the system wasn't designed to replace the radio—only to supplement it!

CPT WILLIAM R. SONEIRA was comissined in Armor upon graduation from the University of Vermont in 1973. He is a former enlisted man in the U.S. Marines. An AOB graduate, Captain Soneira has also attended the Infantry Mortar Platoon School and is an honor graduate of the Flight School. His assignmens include tank platoon leader, assistant S2, and Aero-Scout Section Leader. Captain Soneira is currently assigned as assistant S3 2-17 Cavalry.

CPT JAMES R. MACSWORDS III was commissioned in Armor upon graduation from Ohio University in 1973. He has completed Airborne and Ranger training, AOB, and Flight School. His assignments include tank platoon leader and assistant S3. Captain MacSwords is currently assigned as Aero-Scout platoon leader with A Troop, 2-17th Cavalry.

by First Lieutenant Charles E. White

It was 13 June 1944. That gray Tuesday morning marked the Allies' first disasterous contact with the *Tiger*, and one of the most spectacular but obscure episodes of the Normandy Campaign. By 0630 hours, a British armor column had flanked the German line south of Bayeux and was advancing through Villers-Bocage northeast towards Hill 213, which commanded the main highway to Caen. Should the English seize Hill 213, thus penetrating their enemy's rear, the German position would collapse.

Unknown to the British, 2d Company, 501st Heavy SS Tank Battalion occupied their objective. Led by *Obersturmführer*[1] Michael Wittmann, an experienced tanker who had knocked out 119 Russian tanks, 2d Company had just reached the invasion front following a strenuous forced march from Beauvais via Paris. Near Versailles on 8 June, Allied fighter-bombers had caught Wittmann's 16 *Tigers*, leaving him with just five operational tanks when he arrived in the neighborhood of Villers-Bocage on the morning of the 13th. While the remains of his battered force paused to reorganize and service their tanks, Wittmann reconnoitered his position.

Emerging from a small patch of woodland that broke the mood of solitude generated by the gentle, grassy landscape, Wittmann noticed enemy tanks traveling in column along the road toward his location. Cautiously, the veteran of the Russian front withdrew to the edge of the woods, observed, and counted. Here was no reconnaissance detachment, but an entire assault force, and it was moving into the rear of the Panzer Lehr Division. Though Wittmann was ignorant of his enemy's identity, this was the spearhead of the 7th Armored Division, Montgomery's famous "Desert Rats." Through his binoculars Wittmann noticed that the British were encountering scant resistance in Villers-Bocage, allowing the bulk of Montgomery's force to continue unmolested along the road toward Caen. It was a hazy morning with no Allied aircraft in the sky. To Wittmann's amazement, the British were displaying an astonishing degree of audacity, acting as if they had already won the war. From his prior experience Wittmann knew that there was no time for additional calculation, only for action. But what could a single *Tiger* do? Detecting quarry, Wittmann instinctively attacked, setting the stage for one of the most sensational incidents of the war.

The still of that damp June morning was abruptly rent by the blast of the *Tiger's* "88." Seconds later, the leading British tank, only 80 meters away, erupted in a volcano of searing flames, impeding the

[1]Rank in the SS equivalent to First Lieutenant.

ONE TIGER

line of advance. Wittman's *Tiger* then raced at top speed past its first victim, fired again, and the last vehicle in the British column became a blazing holocaust, effectively blocking any movement within the closed formation. Reaching the road, Wittmann maneuvered his *Tiger* down the length of the enemy line, presenting only his frontal armor as he systematically blasted the entrapped British force.

Suddenly, a *Cromwell* materialized from the dense smoke that billowed from the blazing hulks which littered the battlefield, firing its gun point-blank at the *Tiger*. Seconds after its shell slammed against Wittmann's armor plating with no effect, the *Tiger* destroyed it.

Down the road rolled Wittmann. Every halftrack, as well as a dozen tanks, quickly became scrap. Another *Cromwell* now attempted to stalk the beast from behind, aiming at the *Tiger's* relatively soft rear. A veteran of nearly 200 engagements, Wittmann was not to be caught so easily. Anticipating his adversary's intensions, Wittmann denied the *Cromwell* his posterior and had another glowing tank to his credit.

By now, the rest of 2d Company had marched to the sound of the guns, and supported by tanks and infantry of the Panzer Lehr, drove the dazed British from Villers-Bocage. Stunned by Wittmann's daring action, Montgomery abandoned his flanking movement, withdrawing his battered units to Livry. British historians credit Wittmann with destroying 19 tanks, 14 halftracks, and 14 Bren gun carriers in less than 5 minutes. British chroniclers also claimed seven *Tigers* destroyed, but since defeats and retreats inevitably lead to inaccurate counting and reporting, this is a pardonable mistake.

Obersturmführer Michael Wittmann's sudden and determined action at Villers-Bocage on 13 June 1944 remains one of the most impressive feats of the war. Destroying the first and last vehicles in a column, a single tank was able to rake the immobilized tanks and halftracks, crippling the spearhead of an armored division within 5 minutes. Faced by seemingly hopeless odds, a resolute tank commander, using bold, decisive action, brought a serious enemy threat to an abrupt halt.

Obersturmführer Michael Wittmann never lived to see Germany surrender. On 7 August, Wittmann's company wrought havoc among 600 Canadian tanks attempting to seal the encirclement of the Germans in the Falaise pocket. The next day, 8 August 1944, death and destruction was showered upon Wittmann's company by an estimated 1,900 bombers and 1,800 fighter-bombers of the 8th U.S. Air Force—the largest Allied carpet-bombing attack of the Normandy Campaign. When the 501st Heavy SS Tank Battalion was withdrawn that evening, *Obersturmführer* Michael Wittmann was no longer with them.

NOTE: During an interview with a former member of the 4th Company, 501st Heavy SS Tank Battalion, the author learned some interesting revelations. In training, Wittmann's crew could load and fire within 4 seconds. Additionally, the crew of a *Tiger* consisted of five men, the fifth being a signal operator who also fired the machinegun mounted on the right front of the tank. These observations help explain Wittmann's amazing performance on 13 June 1944, since his gunner could concentrate on tank-like targets while the signalman simultaneously machinegunned the thin-skinned vehicles. The author also learned from a British veteran of Villers-Bocage, that he witnessed a *Cromwell's* turret being blown nearly 20 feet from its chassis after being hit by a shell from Wittmann's "88."

1LT CHARLES E. WHITE was commissioned in Armor upon graduation from the USMA in 1974. Lieutenant White has attended AOB and the Motor Officer Course. Currently assigned to 2d Squadron, 11th Armored Cavalry Regiment, Lieutenant White has served as armor and cavalry platoon leaders, intelligence officer, assistant adjutant, and border officer.

Armor Training Vehicles

by Mr. Richard M. Ogorkiewicz

The growing power and cost of tanks are posing increasingly serious training problems. Acquisition cost alone has risen dramatically in recent years and places severe restrictions on the use of tanks for training. The power of tank armament has increased to such an extent that the number of areas where it can be fired for training purposes has been greatly reduced. Even driving tanks is becoming a problem, due to fuel cost constraints and because of the damage they cause.

All this has directed increasing attention to the use of various types of driving and gunnery simulators for training tank crews. An entirely different solution to many training problems is embodied in the concept of an armored training vehicle (ATV).

In principle, an ATV would correspond to the training aircraft the world's air forces have been using for many years because of problems similar to those that now face Armor.

Basic Requirements

To be useful, an ATV must meet three basic requirements. First, it must simulate battle tanks as closely as possible, making training with it sufficiently realistic. Second, its characteristics must be such that there are considerably fewer restrictions on its use in peacetime than there are presently on battle tanks. Third, it must cost considerably less to acquire and operate than battle tanks.

As long as battle tanks have the traditional configuration with a driver's station at the front, a central manned turret with the main armament, and an engine at the rear of the hull, the first of the three basic requirements implies that an ATV must have a similar general configuration. It should also have much the same power-to-weight ratio and agility and, taking a leaf from the aircraft designer's book, the layout of its controls and instruments should be similar to that of battle tanks. However, it should be sufficient for the ATV to have a turret only for a commander and a gunner, instead of three men, which would help to keep down its overall size and weight.

The second basic requirement indicates that the ATV should be as light as possible. In fact, its weight could be as low as 12,000 pounds. This is equivalent to only 10 percent of the weight of the latest types of battle tanks and is no more than the weight of a medium-sized truck.

Such a low weight would in itself do much to facilitate the use of the ATV compared with that of battle tanks. But to overcome several of the restrictions on the use of tanks in peacetime, particularly in heavily-populated areas such as Western Europe, the ATV would also have to be wheeled. The reason for this is that only a light and wheeled ATV would obviate the damage to roads and other facilities caused by tanks. At the same time, a light, wheeled ATV could have a soft ground performance comparable to that of battle tanks, which is essential if it is to be used for realistic tactical training.

The feasibility of a light-weight wheeled ATV having a soft ground performance comparable to that of battle tanks is indicated by the well-known fact that the minimum ground pressure of wheeled vehicles is higher, and that it rises more rapidly with vehicle weight than that of tracked vehicles. However, light wheeled vehicles can be designed to have ground pressures as low, or even lower than

those of battle tanks. This has been demonstrated by the Lockheed *XM-808 Twister* and *XM-800* armored reconnaissance scout vehicle which, whatever their other merits or demerits, exerted a ground pressure of only 6 to 7 p.s.i., thanks to being fitted with specially developed large-diameter, low-pressure tires.

Consequently, a well-designed light ATV with six large-diameter, low-pressure tires could have a soft ground performance comparable to that of battle tanks. This would make it very different from the wheeled armored vehicles built thus far, which in general have not been fitted with adequately large tires. Because of this no conventional armored car can simulate tanks as satisfactorily as an ATV.

In addition to having ground pressure comparable to that of battle tanks, the ATV should also handle like a tank. This implies that it should be skid-steered like many tracked vehicles are. A skid-steered vehicle would also be more compact and simple than more conventional multiwheeled vehicles.

The idea of a skid-steered, wheeled armored vehicle is not new. In fact, the prototype of such a vehicle was built in Britain in the late fifties. It was a relatively heavy, 45,000-pound, six-wheeled vehicle called *TV-1000*. It was not entirely successful, largely because of its high rate of tire wear. However, a lighter skid-steered, wheeled armored vehicle developed more recently in France, the *AMX-10 RC*, has been much more successful. In fact, the *AMX-10 RC* has been accepted by the French Army as an armored reconnaissance vehicle and has already been ordered by at least one other army. [See *ARMOR*, January-February, 1978.]

Given light weight and the ability to use standard commercial components such as engines, a designed-to-cost ATV should be able to meet the third of the three basic requirements, namely that of low cost. A historical survey of vehicle costs indicates that an ATV could cost only 15 percent, or less, of what a battle tank does.

In other words, it should be possible to procure a company of ATV's for the price of two battle tanks. Moreover, since operating costs are generally proportional to acquisition costs, battalion-scale exercises with ATV's should cost considerably less than company-size exercises with battle tanks. In many areas, maneuvers carried out with ATV's would also raise far fewer problems and claims for damage from civilian authorities, farmers, and others.

Primary and Secondary Roles of ATV's

With modifications to its basic configuration, an ATV could be used in several different training roles. For instance, its weapon turret could be replaced by a cabin for an instructor and a second trainee, as on the German *Leopard* tanks. In this case it could be effectively used to train drivers in operating over different types of terrain at a fraction of the cost of doing this in battle tanks.

The most appropriate type of main armament for the ATV would be a cannon of 20- to 30-mm. This would make it suitable for small range gunnery training of the kind practiced at present with 20-mm. cannons mounted on the tubes of tank main guns. Alternatively, the ATV could be used almost anywhere for two-sided gunnery or tactical training after being fitted with eye-safe laser weapon simulators, such as the widely used SIMFIRE.

Whatever their real or simulated armament, ATV's could also be used for training unit and individual tank commanders in command and control and communications. This could be carried out over much larger and much more varied areas—including urban areas—and at a much lower cost than is possible with tanks. At the same time, such training in ATV's would be more realistic and meaningful than with unarmored recreational vehicles which are presently used as command and control training vehicles.

The ATV's could also be used for several purposes other than training, just as training aircraft have been widely developed and used in a variety of roles, ranging from observation to ground attack, in addition to their basic training roles. This provides a strong additional reason for developing ATV's and makes them an even better value.

The list of the additional, nontraining roles which ATV's could perform ranges from border patrols to destroying hostile MICV's, armored carriers, and other light armored vehicles in major conflicts, particularly if they were armed with an effective, high-velocity cannon such as the 30-mm. RARDEN. The list also includes internal security and protection of important installations, which would make ATV's highly suitable for National Guard and Reserve Components, as well as police forces. Being wheeled, ATV's would be particularly suitable for these types of units located in urban areas where it is normally difficult to operate tracked armored vehicles in peacetime.

Another potential user of ATV's would be the Air Force, which could well do with such vehicles for protecting its installations and, in particular, for patrolling the perimeters of airfields.

There are, therefore, several potential applications for a suitably designed ATV. Its principal role would clearly be that of a training device; however, it would also be highly suitable for several other nontraining roles. This dual capability would make the ATV a sound investment and give it the unique advantage of being the only major item of armored training equipment that could also be used for real.

RICHARD M. OGORKIEWICZ, widely recognized as a leading authority on armored fighting vehicles, is a consulting engineer and author of two books and more than 200 articles, including 66 in *ARMOR*, on various aspects of armor. He has also lectured extensively on the subject not only in the United States and England, but also in Sweden, Israel, Brazil, and South America.

Soviet Long-Range Planning

by Mr. Andrew W. Hull

Despite frequent technical analyses of Soviet armor developments, few Western observers have appreciated, or taken into account, the Soviet organizational processes such as planning which shape the contours of that technological evolution. The development of military equipment, just as the development of civilian goods, proceeds in directions outlined in forecasts and long-range plans. These long-range plans or forecasts in effect constitute programs which set the parameters for future tank designs.

Forecasting and Long-range Planning

Although Soviet sources seldom discuss defense planning, a 1969 Soviet monograph did admit that weapons development forecasts usually run 7-10 years.[1] A more extensive explanation of military forecasting was provided by Major General M. Cherednichenko in a 1970 article in *Kommunist Vooruzhennykh Sil* in which he defined the purpose of military forecasting as helping to "go into the entire complexity of the process of development, evaluate various possible variations of a situation, work out optimum plans and decisions and raise the effectiveness of command."[2] Cherednichenko's article is remarkable in that he not only defines the role of military forecasts, but reveals the major aspects of their content as well. Specifically, military forecasts consider the anticipated world politcal situation, the likelihood of wars, their intensity, duration, and probable geographic locations.

Forecasts are not ends in themselves, but rather, they make it possible for "making decisions in military development, and for scientifically establishing the development of the armed forces and their technical equipping."[3] These decisions take the form of 10-year long-range plans, or programs, wherein political leaders, military men, designers and/or production personnel elaborate the general tactical-technical requirements which serve as the parameters for future tank designs. Examination of Soviet history reveals several clear-cut examples of such programs in the area of armor development.

Programs

The 1931-1932 program, as described by John Milsom, the noted Western historian of Soviet tank development, probably is illustrative of the aims and operations of all the programs.[4] While attempting to formulate the defense aspects of the second 5-year plan, Defense Minister Marshal Voroshilov gathered the most experienced tank designers and armor commanders and assigned them the task of defining the operational and technological requirements for new armored vehicles. The result of this exercise was a program that categorized existing types of Soviet armored vehicles, defined the tactical roles of future vehicles, and established five classes of future armored vehicles. Significantly, this classification scheme also shaped the functional specialization among tank design bureaus for the next 30 years. Once the general parameters of the program were fixed, designers were expected to create new tanks in keeping with these general tactical-technical specifications. The resultant tanks first appeared in 1939 when a state commission tested five prototypes, three heavy tanks and two medium tanks.

Another round of major decision-making in 1940-1941 constitutes the second Soviet armor program.[5] Just as in 1931-1932, high-ranking military and political leaders gathered to examine weapons production, military organization, and troop utilization. Presumably these discussions, held in the context of the unsuccessful Finnish war and the impending conflict with Germany, shaped tank design and development just as the previous program had. This program, however, did not have as definitive an impact on subsequent tank development as its predecessor, since immediate post-1941 tank design was strongly influenced by battlefield lessons and by the enemy's accelerated introduction of new equipment. Nevertheless, the decisions of 1940 and 1941 were a concious attempt to direct the course of armor development and its utilization.

Although there is no direct evidence of a program around 1950, there is considerable information suggesting another program was formulated between 1960 and 1962. During this period an intense debate raged within the Soviet military regarding the necessity for continuing the development of tanks and their place on the battlefields of the future. Staunch defenders of the tank's traditional role as the spearhead of the offensive, such as Chief Marshal of the Armored Troops P. Rotmistrov, claimed that tanks would rule the battlefields of the future just as they had done in the past.[6] On the other hand, critics like Chief Marshal of Artillery S. Varentsov charged that tactical missiles could perform most battlefield tasks previously accomplished by tanks:

> The combat capabilities of rocket-nuclear weapons enable ground troops to conduct operations on wide fronts. . . There is now scarcely a need to concentrate on breakthroughs in narrow strips by massed tanks, infantry, and (conventional) artillery.[7]

[1]G.M. Dobrov, "Forecasting Science and Technology," Izd-vo 'Nauka,' Moscow, 1969.

[2]M. Cherednichenko, "Military-Political Forecasting as a Type of Scientific Prediction," *Kommunist Vooruzhennykh Sil*, No. 20, October, 1970.

[3]*Ibid.*

[4]John Milsom, "Russian Tanks 1900-1970," Galahad Books, New York, 1970.

[5]*Ibid.*

[6]Pavel Rotmistrov, "Modern Tanks and Nuclear Weapons," *Izvestiia*, October 20, 1962.

[7]S. Varentsov, *Izvestiia*, December 2, 1962.

Armor Programs and New Generations of Medium Tanks

PROGRAMS	*NEW GENERATIONS OF TANKS*
1931-1932	*T-34* (1939)
1940-1941	*T-54* (1949)
circa 1950 (?)	*T-62* (1961)
1960-1962	*T-64* (1970)
1970	*T-72* (1974)
	?

The *T-44* was excluded from this list since, by the account of Soviet sources, it was an interim vehicle which never went into large scale production.

The *T-64* is also known as the *M-1970* or "Dvina" tank since it was first identified from photographs of the Soviet Dvina maneuvers in 1970.

Table 1.

Questions regarding the overall organization of the ground forces, and the place of tanks within that structure, were debated just as strongly as issues regarding the future technical directions of armor's development. These debates involved more than just professional soldiers; for instance, Khrushchev came out against the future development of tanks.

The 1960 to 1962 disagreements over the technical and operational merits of tanks had a profound impact on subsequent tank development. No new heavy or light tank models were designed after the doctrinal-technical debates. In addition, production of existing *PT-76* light tanks and *T-10M* heavy tanks ceased shortly after the close of these discussions. The old Soviet formula of a mix of light, medium, and heavy tanks, each with well-defined battlefield functions, was replaced by the elevation of the medium tank to the status of a main battle tank.

The Soviets may have formulated another armor program around 1970. The best indicator of such a program is a comprehensive study entitled "Tanks and Armored Troops," by Chief Marshal of the Armored Troops A. Kh. Babadzhanyan with contributions from senior technical-engineering officers and staff members of the armor branch.[8] Part I of the book deals with all aspects of tank design abroad while Part II concentrates on operational employment of tanks. Babadzhanyan's comprehensive treatment of the structure of armored forces, desirable technical characteristics for new tanks, and their operational deployment are in keeping with the elements of previous programs. "Tanks and Armored Troops" is not a long-term plan itself, but rather an indication of Soviet concern for the subjects covered in programs. Consequently, the content and the timing of its publication are significant clues that point to an armor program's formulation around 1970.

So far four armor programs have been identified (1931-1932, 1940-1941, 1960-1962, and 1970) and as can be demonstrated by the progression of dates, these programs have come approximately every 10 years with the exception of 1950-1952. While no direct evidence exists to confirm a circa 1950 program, table 1 does make a circumstantial case for one having been formulated. The table demonstrates that new generations of medium tanks have appeared at roughly 10-year intervals. A comparison of the timing of known armor programs with the appearances of new generations of tanks suggests that each program resulted in the fielding of a new generation of tanks just about the time the next program was due for formulation (e.g., the 1931-1932 program ultimately led to the procurement of the *T-34* in 1939). If this pattern of cause (articulation of a program) and effect (appearance of a new generation of medium tanks 10-years later) is indeed accurate, then the production of the *T-62* in 1961 was probably sparked by an armor program elaborated around 1950.

Conclusions

Analysis of known programs reveals that they had three common features. First, each attempted to establish the general technical specifications which could serve as a guide for tank designers in creating tank prototypes. Also, the programs devoted considerable attention to the question of the role of tanks in future combat engagements. Finally, based on conclusions regarding the technical characteristics and future roles of tanks, the programs addressed how tank units should fit within the organizational structure of the ground forces.

ANDREW W. HULL is a researcher for the International Studies Center, Columbus Laboratories of Battelle Memorial Institute. His research centers on Soviet R&D policy and management in the USSR. Mr. Hull deals with Soviet armored vehicle design philosophy, R&D practices, and organizations. In 1968 he received a BA from Adrian College. In 1973, Mr. Hull was awarded an MA from the William Andrew Patterson School of Diplomacy and International Commerce, University of Kentucky.

[8]A. Kh. Babadzhanyan, "Tanks and Armored Troops," Red Banner of Labor Military Press of the Ministry of Defense, Moscow, 1970, translated by the National Technical Information Service, AD-762,558, 1970.

MILITIA CAVALRY

by Lieutenant Colonel Raymond E. Bell, Jr.

In the years preceding and during the birth of our nation, cavalry was a scarce commodity. There were some small troops of horse, but they contributed little to the security of the colonies. The reasons for this situation centered around economics, terrain, and style of combat.

First, it was very expensive to equip and maintain cavalry. Although many citizens had horses, it appears little effort was made to form them into combat units. Obviously animals were required for use on the farms and in commercial enterprises. They were also expensive. The thought of losing a costly horse to an unnecessary gunshot wound was unacceptable to those striving to carve a new life out of the wilderness.

But there were horse formations, which were generally formed from well-to-do members of the larger towns and communities. A formation from Connecticut, however, was refused service to the cause by Washington because it agreed to serve only if it was exempted from guard and fatigue duty. Even among those mounted troops accepted for service, the performance of all the common tasks as well as taking care of one's horse was not popular.

Washington sent the Connecticut horse, picked from men "of reputation and property," home for another reason besides their dislike for menial tasks. He really did not know how to employ his cavalry and badly underestimated their potential. Many opportunities for reconnaissance and early warning were lost by Washington. The outflanking of his forces on Long Island in 1776 could have been foretold if even a small force of cavalry had been deployed. It was not until late in the war, and especially in the South, that cavalry under commanders like Light Horse Harry Lee began to come into its own.

After the Revolutionary War, cavalry units were still slow in being formed. In the regular establishment the 1st and 2d Dragoons were organized, the 1st in 1833 to fight the Indians and the 2d in 1836 during the Florida War. Then in 1846 a 10-company regiment of mounted riflemen was created to establish military stations on the route to Oregon. Later designated the 3d Cavalry it was originally called the Regiment of Mounted Riflemen and won fame under Scott in the Mexican War prior to Chapultepec. As settlers pushed west, more horse regiments were organized until at the beginning of the Civil War there were six, increasing to 10 prior to the Spanish-American War.

In the late eighteen hundreds, militia cavalry units which are part of today's active establishment began forming. The 1st New York Cavalry, now designated the 101st, fought in the Spanish-American War and in World War I. Today it is the armored cavalry squadron of the 42d Infantry Division, New York Army National Guard.

There are presently four National Guard armored cavalry regiments: the 107th in Ohio and West Virginia; the 116th in Oregon, Idaho, and Mississippi; the 163d in Nevada and Montana; and the 278th (minus) in Tennessee.

In addition to divisional armored cavalry squadrons and armored cavalry regiments, there are separate squadrons and separate troops. The 1-150th Armored Cavalry of West Virginia was formerly a regiment and was activated during the 1962 Berlin crisis.

The 101st Cavalry is a good example of what today's "militia cavalry" is all about. The squadron is quartered throughout the state of New York. Its Headquarters, A, and B Troops are located on Staten Island in the home of the pre-World War II 51st Cavalry Brigade. Troop C is split between two small towns in the western part of the state, Hornell and Geneseo, both of which have old cavalry traditions. Troop D, the air cavalry troop, is located at the state capital in Albany where its aircraft fly

from the local airport. This stationing has, in large part, been dictated by the availability of adequate facilities for units with large numbers of aircraft, vehicles, and weapons.

Each troop has a few full-time Guardsmen who provide administrative, logistical, and maintenance support. Hornell, for instance, has only two platoons and as a result has but one "technician," who is a Department of the Army civilian, Guardsman, and a member of the unit. The detachment, as it is called, is authorized two officers and 48 enlisted men.

The squadron headquarters has two commissioned officer technicians. One is in charge of all administration while the other devotes his attention to training. The officers are assisted by the supply and maintenance personnel assigned to squadron headquarters. Maintenance required to keep the vehicles running is performed in the Organizational Maintenance Shop, where highly-skilled mechanics keep the generally overage fleet in operating condition.

The air cavalry troop is in sharp contrast to the ground troops. It is equipped with the *OH-6A, UH-1B, UH-1H* and *UH-1M* helicopters. These aircraft are maintained at an Army Aviation Support Facility by mechanics, most of whom are members of the troop, but all of whom are National Guard technicians. If you should visit such a facility you will note that a large number of the mechanics wear organizational patches on their right shoulders, since many are veterans who served in Vietnam.

Here is the National Guard at its best. Aviation units benefit from the stability the technician program brings to it. The tendency is for the mechanics, supervisors, and administrators to stay with the organization on a long-term basis. There is no question that they know their business since they have all been trained in the Army school system. The aviation safety record of Army National Guard aviation units is currently the best of all the Armed Forces, and it is due in large part to the expertise of its full-time support organization.

The pilots are another factor in the equation. Today, the Army National Guard is soliciting ex-military aviators to fly for the Guard although a limited number of Guardsmen receive initial-entry flight training at Fort Rucker, Alabama. The overwhelming majority of those on flight status flew combat missions in Vietnam and all are highly qualified. To maintain flight proficiency additional time known as additional flight training periods (AFTP's) are authorized to all aircrew members currently on ARNG flight status.

Although combat readiness is now the watchword of all units of the Guard, the aviation elements of this squadron are perhaps the best able to be quickly mobilized and rapidly deployed. Unfortunately, the ground elements of the squadron would have to be reequipped and retrained to survive on the modern battlefield.

In addition to the problem of overage equipment, there is the problem of training space. The National Guard Bureau has tried to remedy the situation by placing most of the mechanized units in the south, southwest, and west where large training tracts are available. To units in the northeast, however, Fort Drum and Fort A.P. Hill offer the only place to maneuver extensively, and even they lack room to exercise all the capabilities of cavalry. But the mounted tradition is exceptionally strong in the northeast and it would be unfortunate to see it lose all of its historic cavalry and armored units to other states.

How then does one compensate for lack of maneuver room? It is not easy, but innovation and imagination are the key. The surface has just been scratched.

Recently, a division CPX wrestled with the problems associated with an armored division withdrawing across the Rhine River. The division's armored cavalry squadron was assigned an appropriate mission and during the CPX functioned as planned. A simple enough assignment.

Unfortunately, few if any of the key personnel had ever been stationed in Germany, much less in the area where the CPX was staged. So here was a great opportunity to have sent the squadron and troop commanders plus key staff members, numbering about 12 Guardsmen, to ride over the actual terrain. Four days, 12 places on a MAC jet, and some help from units in Germany were all the extras that were required.

Any armor or cavalry soldier in the world can tell that there just will not be any administrative or commander's time in Europe the next time adversaries take up arms. It is absolutely essential that those who might fight in Europe be as familiar with the prospective battleground as possible.

So there is a great deal of potential to be realized. In an armored cavalry unit it is a spectacular challenge. In the Guard, as in the Active Army, the cavalry can rightly set itself apart as a special type of outfit.

Today's "militia cavalry" is still strong in tradition. Although relatively young when compared to Guard infantry and artillery formations, it is none-the-less very conscious of its contribution to the country's military effort both past and present. Despite its equipment and other deficiencies, National Guard mounted formations eagerly look to the opportunity to serve.

One has only to look to Israel and its experience in 1973, and to the Soviet Union with its potent threat in East Germany, to realize the importance of U.S. armored formations. It is obvious that rather than reduce our dependence on mechanized, armor-protected elements, we must increase it. But it is also obvious that the Active Army cannot be expected to carry the entire burden by itself. The National Guard must, therefore, be ready to place its armored cavalry—the"militia cavalry"—into the vanguard on a moment's notice.

LTC (P) RAYMOND E. BELL, JR., U.S. Army Reserve, is a graduate of the nonresident course of the Army War College. He has recently been an instructor at the C&GSC (USAR School). An instructor with the 1163d USAR School, LTC Bell is currently a civilian consultant to the Historical Evaluation Research Organization.

PATTON MUSEUM UPDATE

by Lieutenant Colonel (Ret.) John A. Campbell

The May-June 1975 issue of *ARMOR* reported the status of the Patton Museum. Since that time The Armor Center and the Patton Museum Development Fund, Cavalry-Armor Foundation, Inc., have not been idle in their efforts to complete Phases III and IV of the museum.

The Museum Development Fund, an all-volunteer unsalaried group, is currently raising more than $300,000 to complete Phase III, and is presently at the $175,000 mark. The primary fund-raising activity is the offering of Commemorative Eagle prints by nationally-known wildlife artists. The initial print, the General George S. Patton Commemorative American Bald Eagle, was in part the source of funds for Phase II. The General Creighton W. Abrams Commemorative Golden Eagle, still available, will be followed by The General Adna R. Chaffee Commemorative Golden Eagle. The funds from these two prints, combined with contributions from the State of Kentucky and other sources, should provide for beginning the construction of Phase III within one year. Efforts to collect funds for Phase IV will follow without hesitation because the group responsible for the operation of the Fund, and The Armor Center, feel it is in the best interest of the Armor Community to push ahead with this very worthwhile program. An adequate amount of protected space is vital to the long-term preservation of the tanks and other valuable items in the museum collection.

The program for collecting funds will be sustained through the offering of additional prints commemorating leaders of Armor and Cavalry, and historic places and events.

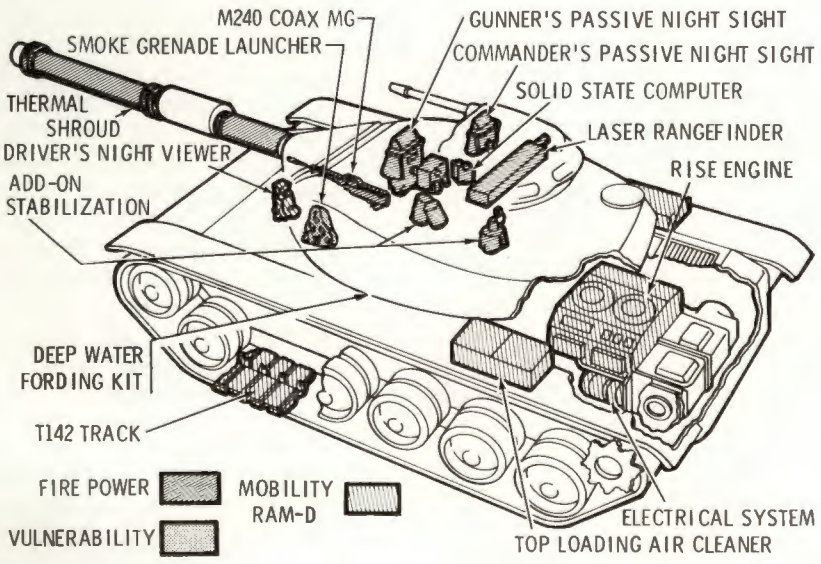
The museum's success requires the support of each member of Armor, past and present. The museum staff is doing an outstanding job and was recently notified by the Accreditation Commission of the American Association of Museums that the Patton Museum of Cavalry and Armor had met the standards of operation established by that Association. This means the Patton Museum is professionally equal to the best museums in the United States. The West Point Museum is the only other facility in the U.S. Army Museum System to have earned this accreditation. Everyone associated with Armor can be justly proud of his museum, a museum that is certainly worthy of support from Armor and Cavalry soldiers in all organizations of the U.S. Army.

M-60A3 Plus

by Major Donald W. Derrah

First conceived in 1969, currently being produced for final testing in 1978, and planned for release to the field in 1979, the *M-60A3* tank (figure 1) brings the Army a vast improvement in firepower and reliability.

Many of the components for the *M-60A3* (figure 2), such as the add on stabilization system (AOS), reliability improved engine (RISE), and the smoke grenade launcher (SGL), have been installed in fielded *M-60A1* tanks. However, the major improvement in firepower (figure 3) will be derived from the laser rangefinder (LRF), and the solid state computer (SSC) when they are combined with the current passive night sights and AOS to synergistically provide improved long-range hitting performance, firing on the move, and operational capability during periods of reduced visibility.



Already scheduled for 1979 is the *M-60A3* second generation passive night sight (tank thermal sight (TTS) (figure 4)) with double the effectiveness of the first generation *M-60A3* passive sight.

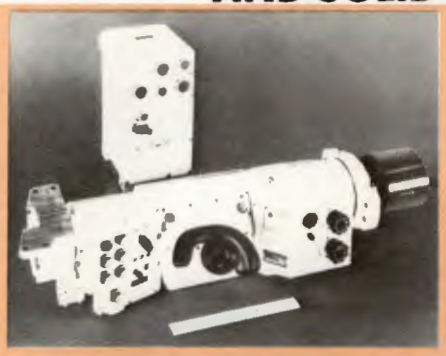
The *M-240* coaxial machinegun is yet another significant advancement in reliability for the *M-60A3* tank. [*M-240* is the U.S. designation for the Belgian *MAG-58*. See *ARMOR*, September-October 1976.—ED.]

Since the *M-60A3* might be considered by some as being only a stopgap weapon system until the *XM-1* eventually provides the much-needed improvements in tank protection and mobility, two questions concerning its future could be asked.

Why should the Army further improve the M-60A3?

If the tank must be improved,

LASER RANGE FINDER AND SOLID STATE COMPUTER



CHARACTERISTICS

- CONSTANT RANGING ACCURACY ± 10 METERS
- RANGING BY COMMANDER OR GUNNER
- COMPUTATION FOR 6 AMMUNITION TYPES
- LEAD ANGLE FOR MOVING TARGETS
- CORRECTS EFFECTS OF:
  ALTITUDE PARALLAX
  TUBE WEAR CROSSWIND
  GUN TRUNNION CANT
- BUILT-IN SELF-TEST CIRCUITRY

Figure 3

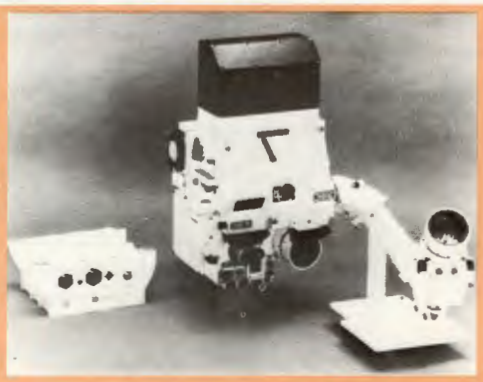
toward what areas should these improvements be directed?

The answer to the first question becomes evident when we examine future contingencies in light of past experiences. The *M-48A3* tanks served well in Vietnam while the more advanced *M-60A1* supported our NATO commitment. And even now, 25 years after its introduction, the *M-48* is being upgraded once more as the *M-48A5* to serve with the Reserve Components. The *M-60A3* could very well have a similar life history. Furthermore, foreign military sales (FMS) have an impact on the *M-60A3* because the more technologically advanced a tank may be, the more attractive it becomes for FMS. In turn, FMS not only have a favorable impact on our nation's economy, but also strengthen our allies and enhance the deterrent capability of the Free World. Improvements to the *M-60A3* are further justified because better built, more durable components reduce operational expenses and lower the tank's life cycle cost—a highly desirable feature when budgetary constraints are considered.

Having established the rationale for improving the *M-60A3*, let's turn to the question concerning areas and components of the tank that should be improved.

The area of reliability, availability, and maintainability (RAM) best supports reduced life cycle cost, especially since this economic impact is felt even during peacetime operations.

In the area of operational capabilities, however, little has been done concerning reduced vulnerability with the exception of the SGL.



CHARACTERISTICS

- COMMANDER'S AND GUNNER'S DAY/NIGHT SIGHT
- EFFECTIVE IN ALL WEATHER
- TOTALLY PASSIVE
- DRIVEN RETICLE COMPATIBLE WITH LRF/SSC
- BIOCULAR DISPLAY REDUCES EYE FATIGUE
- MORE THAN DOUBLE PERFORMANCE

Figure 4

Improvements here can also be interpreted as reductions in tank fleet life cycle costs if fewer tanks are destroyed as a result of the improvement.

Another consideration is commonality with the *XM-1*. Any components common to *XM-1* and *M-60A3* reduce the logistical and training burdens during the period that both systems are in the tank fleet. Therefore, improvements in the area of increased RAM and reduced vulnerability, which are also common to the *XM-1*, represent the most justifiable development areas for the *M-60A3*.

An Army decision in July 1977 approved the developments for the *M-60A3* shown in figure 5.

The muzzle position sensor (figure 6) does not fall into the prime area of improvement previously discussed. The sensor provides a correction for gun tube distortion caused by thermal energy. This correction, along with those already provided by the other sensors of the solid state computer, (cant, wind,and automatic lead) provides a more complete package for making the adjustments for those major nonstandard errors that are necessary to significantly increase the long-range hit capabilty for which the *M-60A3* was designed. The accuracy obtained during zeroing will remain effective for longer periods and reduce the cost associated with ammunition required to rezero.

The adaption hardware consists of components designed by the Army for use with numerous systems and is applicable to the *M-60A3*. The addition of these items will greatly reduce the tank's vulnerability. Most of the reductions are self explanatory. For example, the commander's seat has a quick release capability that enables him to drop rapidly from an exposed position in the cupola.

An improvement in safety as well as reduction of secondary explosions results from incorporating the *XM-1* automatic halon fire extinguisher into the *M-60A3* tank to provide instantaneous suppression of fires in the crew and engine compartment. A total of seven automatic and false-alarm free sensors are distributed throughout the two compartments.

Both the *XM-1* and *M-60A3* will test the *T-142* aluminum track. Not only does this effort provide a track

IMPROVEMENT	COMMON XM-1	SIMILAR XM-1	RAM	VULNER-ABILITY
Muzzle Pos Sensor		•		
Adaption Hardware				
Engine Smoke Generator		•		•
Heading Ref Unit	•			•
Comm Security	•			•
Radiac Alarm	•			•
Chemical Alarm	•			•
Internal Water Stowage		•		
Foliage Brackets	•			•
Cmdr/Gnr Seats				•
Auto Fire Extinguishers	•			•
T-142 Alum Track	•		•	
Planetary Final Drive	•		•	
Improved *M-140* Gun Mount		•	•	
Aux. Power Unit	•		•	•
Advanced Air Cleaner				•

Figure 5

common to both tanks, but will enhance the operational performance of both systems through a 1-ton reduction in weight over the *T-142* steel track.

In the area of maintainability, high failure rates are being experienced on the current *M-60* final drive because it was initially designed for the 50-ton *M-48* tank. The weight of the *M-60A3* is in excess of 56 tons, therefore, the incorporation of the *XM-1* planetary final drive into the *M-60A3* will more than triple the mean-miles-between-failure rate being experienced with the present transmission.

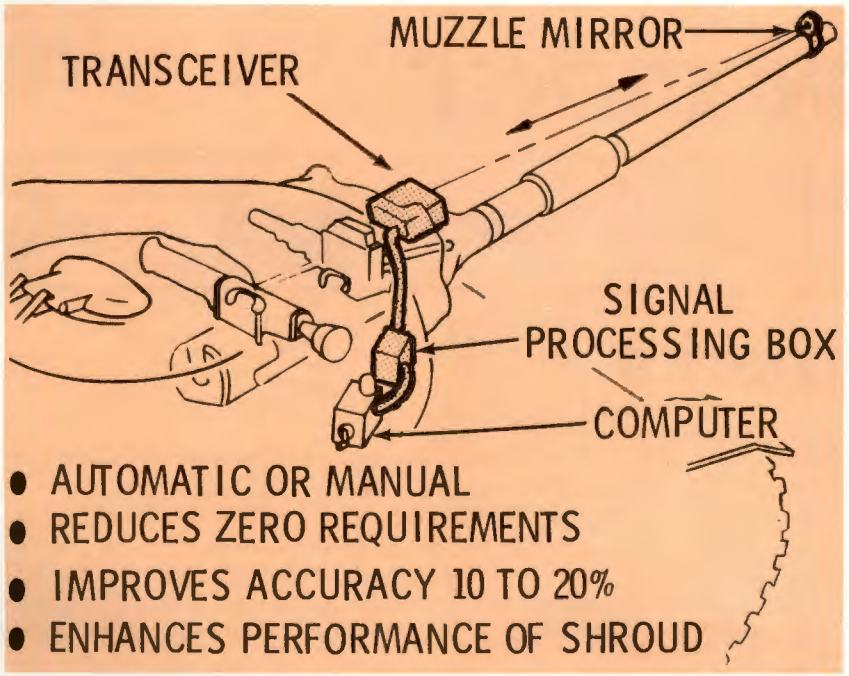
Another high failure component on the *M-60A3* tank is the *M-140* gun mount recoil spring. A common *XM-1* mount with a stronger recoil spring is being considered and is predicted to increase the mean-rounds-between-failure rate by at least 15 percent. Also being considered for the *XM-1* and *M-60* is a compressible (silicone) fluid substitute for the recoil spring. This design will have three basic internal components compared to the nine parts that now exist.

A joint *XM-1/M-60* development program has been initiated to design an auxiliary power unit to provide up to 10 kw. of electrical power to meet all the tank's operational requirements during silent watch. Additionally, the system will be designed to provide battery and engine warming for cold weather starting. This will reduce the operating hours on the main engine, thus improving RAM, reduce noise levels during silent watch, and provide a potential fuel savings.

The advanced air cleaner designed as an integral part of the RISE engine will reduce air cleaner vulnerability and enhance system reliability by eliminating the blower motors, and preventing dust ingestion during ground-hop operations for the engine.

Development programs for most of these items are currently planned for completion in sufficient time to meet the last year of *M-60A3* tank production. Retrofit programs for application of these improvements to previously produced *M-60A3's* are also being studied.

The reduction in training and logistics burdens, the economic aspects of improved life cycle cost, and the availability of a tank that is technologically attuned to the "state of the art" for contingencies provide sound rationale to continue development of these improvements for the *M-60A3* tank, even in light of the imminent fielding of the more desirable *XM-1* tank.



MAJ DONALD W. DERRAH was commissioned in Armor as a distinguished military graduate from the University of Maine in 1964. A graduate of AOB and Airborne School, he has served as assistant regimental S3, and troop commander. Major Derrah has attended the Infantry Officer Advanced Course, Maintenance Officer Course, and the C&GSC. He has been assigned as an Assistant Project Manager to the Project Manager, *M-60* Tank Development. Major Derrah also graduated from the Defense Systems Management College.

ARMOR CONFERENCE

This section of the magazine is devoted to the Armor Conference. There are not enough pages to print everything that was said, classified or unclassified.

We have taken some of the highlights and edited them to fit the space we have. Some of those not reported in this issue may appear in future issues.

The complete program by subject area follows:

SUBJECT	PRESENTER
Opening Remarks	MG Thomas P. Lynch CG, USAARMC
Keynote Address	GEN Donn A. Starry CG, TRADOC
How We Train the Combined Arms Team	LTC Dennis P. Malcor USAARMC

TRAINING UP THE COMBINED ARMS TEAM FOR THE CENTRAL BATTLE

Tank	MAJ Curtis W. Seiler and MAJ James C. Sutton, USAARMC
Air Cavalry	LTC Donald R. Martin USAARMC
Mechanized Infantry and Antitank Weapons	MG William J. Livsey, Jr. CG, USAIC

SUPPORT FOR THE COMBINED ARMS TEAM IN THE CENTRAL BATTLE

Artillery	COL John E. Donohue USAFAS
Engineer	COL Gene B. Welch USAEC
Air Defense (S)	COL Robert P. Woods USAADS

TRAINING TODAY

Training for the European Contingency	MG Charles P. Graham CG, 2nd AD
Training for Reforger	COL Joseph C. Lutz Cmdr, 3d ACR
USAREUR	COL William F. Coad Cmdr, 7th Army CAS
Reserve Component Training	MG Herman Tenken CG, 50th AD

LOOKING TO THE FUTURE

Tank Force Management Update	BG Richard D. Lawrence Ch, TFM
Infantry Fighting Vehicle/ Cavalry Fighting Vehicle	BG Stan R. Sheridan PM, DARCOM
XM-1 Update	MG Donald M. Babers PM, DARCOM
Advanced Attack Helicopter (C)	MAJ (P) Stanley E. Grett USAAVRADCOM
Advanced Scout Helicopter (C)	COL George W. Shallcross USAAVNC
Training Devices	MAJ Douglas J. Richardson USAARMC
Restructured Division	COL Richard W. Diller TACATA

ARMOR CONFERENCE

Opening Remarks

by Major General Thomas P. Lynch, CG, USAARMC

Good morning, gentlemen, and welcome to Fort Knox for our annual Armor Conference and the 88th meeting of the United States Armor Association.

The theme of this year's Conference is "Training up for the Central Battle." Actually, to be fully meaningful, that should be expanded to "Training the Combined Arms Team for the Central Battle Against a Changing Threat." Proud as we are that the Home of Armor has forged our nation's thunderbolt for the last three wars, and that those thunderbolts have not been found wanting, the total job

has always been beyond the capacity of the Armor Center alone. We can and do develop doctrine, equipment, and programs of instruction for tank and armored cavalry units and their aerial counterparts, attack helicopters and air cavalry which are, after all, only tanks and cavalry which need not worry about swamps, mud, and blown bridges. But this is not, and has never been, enough.

The term "Armor" in its true meaning has always connoted the Combined Arms Team which, to be effective, must include mechanized infantry, field and air defense artillery, engineers and communicators, tac air fighter and recce birds, and the whole spectrum of combat service support in addition to ground and air tankers and cavalrymen. Thus our efforts here at Knox must always be compatible with and mutually supportive of parallel efforts at Benning, Sill, Bliss, Belvoir, Gordon, Nellis, Leavenworth, and elsewhere. This is nothing new, but the increasing stature of the Threat in recent years adds new emphasis and urgency to the need for perfect orchestration of the elements of our Combined Arms Team if our nation is to celebrate a tricentennial.

Let me describe that changing Threat. You will understand, of course, that I cannot go into definitive detail in an unclassified presentation. My remarks have been drawn exclusively from unclassified sources, a bibliography of which is available for those who may wish to delve further on their own.

The Soviets appear to believe Lenin's ominous words: "A reasonable strategy is to stick to the operation so long that the moral dissolution of the enemy makes a deadly strike possible."

For in spite of detente, SALT, and negotiations for mutual and balanced force reduction they continue relentlessly to expand and strengthen their military capabilities. At least since the Western Allies disbanded their World War II armies, the Soviets and their Warsaw Pact cohorts have enjoyed numerical superiority, but we used to take comfort in our technological superiority. That appears no longer to be a valid source of comfort. In the summer of 1977, the CIA assessed the Soviet Union to be technologically *superior* to the United States in 20 military areas, behind in 19 technologies with military application, and nine areas were too close to call. Thus, visions of Cossacks charging on horseback must be struck from our thinking.

The Soviets learned their lessons well in the First and Second World Wars. Their drastic losses to World War I German chemicals have led to establishment of the finest chemical defense of any army in the world today. They have also spent literally billions of dollars in creating a compatible offensive nuclear and chemical base. The Soviet Army has dedicated chemical defense units down to and including regimental level. They have developed specific decontamination apparatuses for every piece of equipment they have. Where do we stand in this field?

The Luftwaffe also taught them a lesson in "The Great Patriotic War." Today the Soviets have a vast array of complementary gun and missile antiaircraft systems integrated at all levels. The latest addition is the *SA-8 (Gecko)*. The unit is amphibious, can receive radar early warning, and can track aircraft with on-board radar, thus making it a fire unit unto itself. What does this mean to our Army and Air Force aviation?

Soviet artillery has been, and apparently will continue to be, the mainstay of their ground forces. The introduction of the *M-1973* 152-mm and *M-1974* 122-mm self-propelled pieces has upgraded crew protection and mobility. People who study Soviet order of battle are changing the motorized rifle regiment's towed artillery battery to a battalion of *M-1974's*. Also, variants of the *BMP* armored infantry combat vehicle, some credited with a radar target acquisition capability, have been seen with self-propelled artillery units, and allegedly nuclear-capable 203-mm guns have been seen at Soviet Army bases. What is the challenge to our counterfire?

All infantry units, less airborne, are now motorized. The *BMP* continues to be introduced into Warsaw Pact forces to replace the aging *BTR* family. The *BMP* is an excellent infantry fighting vehicle, utilizing complementary gun and missile systems to kill armored vehicles.

"The term 'Armor' in its true meaning has always connoted the Combined Arms Team . . ."

Some *BMP's* in Germany have had their *Saggers* replaced by the *AT-4 (Fagot)*, a second generation antitank missile. The remaining *Saggers* may have been upgraded to semi-automatic command-to-line-of-sight guidance, similar to our TOW. Another new missile has been spotted on *BRDM* launch vehicles and will probably replace *Sagger*-equipped antitank batteries within motorized rifle regiments. Logical progressions for the Soviets would be a laser beam-rider or semi-active laser guidance system similar to *Hellfire*. What does this mean to our tanks?

Indications are the Soviets have field tested *Hellfire*-type missiles from the *Hind-D*, a relatively new attack helicopter. It carries an impressive complement of weapons, including antitank missiles, 57-mm rockets, and a 12.7-mm Gatling gun in the nose. It has been seen in antiarmor, air assault, and close air support roles. The entire Soviet philosophy of helicopter employment has grown from the strictly resupply concept of the sixties to full-blown air assault and antitank roles of today. What is the task for our forward air defense?

The Soviets have not ignored combat support but have fielded a series of new mine-clearing equipments, and tactical bridging. Also, new tactical radios and communication vehicles have been spotted.

The Soviet Air Force has been modernized, and they have a complete family of air defense, bomber, and close-air-support aircraft. Strategic mobility has been enhanced by the addition of long range jet transports which give their eight airborne divisions the capability to interfere in local conflicts virtually anywhere in the world. Who will secure our rear areas?

Organizationally, the Soviets have not stood still. The size of tank platoons in motorized rifle regiments has increased from three to four, thus providing a total of 266 tanks in a motorized rifle division and 325 in a tank division. The Soviets have included an independent tank battalion in the motorized rifle divison. Tank regiments in Germany now have an organic motorized rifle company, and they practice, preach, and train the combined arms

concept. Where is the U.S. Army's combined arms battalion?

Now the subject closest to our hearts—Soviet tank developments. Late in 1976, the Soviets introduced into Germany numbers of tanks we thought were *T-72's*. Subsequent analysis has revealed them to have been *T-64's*. [See *T-72*, pg. 61.] Both feature improved suspension systems, track, and engines. Fire control has been improved by a better stabilization system and either a laser or electro-optic rangefinder. The automatically loaded gun on both models is a 125-mm smoothbore which can fire fin-stabilized SABOT, HEAT, and HE-fragmentation rounds. The SABOT will probably have an effective range in excess of 2,000 meters. Reports have also been made public that the Soviets are field testing a follow-on called the *T-80* which may have special armor either of the chobham type or a unique Soviet design of three layers. It may also have a laser rangefinder. The gun caliber cannot be determined at this time.

In summary, the Red Bear has devoted considerable time, money, and effort to grow both in quantity and quality in the last 10 years, and we can no longer presume qualitative superiority. To put this in perspective, let us now address how to kill modern, well-equipped bears.

Following General Starry's keynote address, we will hear how the Armor Center and our sister schools of the Combined Arms Team are training to meet the requirements of the modern battlefield. In the end, I hope you will agree that the situation is cause for concern, but not panic. While our equipment may no longer always be better, it is still very good indeed, and crews who know how to use it, led by commanders who understand the dynamics of modern battle and can make the required rapid-fire decisions, can still kill bears.

ARMOR CONFERENCE

Keynote Address

by General Donn A. Starry, CG, TRADOC

I would like to talk about The Central Battle again. No new wisdom—but let's talk about some aspects of it in a different way perhaps than before. In TRADOC, we are trying very hard to develop operational concepts from which we might derive tactics, weapons systems, organization, and force structure. We try, then, to put all that together with a training system for the Army.

First the concepts, and a few words about their interdependence. On the one hand there are the overriding Soviet concepts: mass, momentum, continuous land combat, and the notion that defense is but a temporary measure. On the other hand there are counterconcepts—those we have adopted in our attack and defense doctrine. We speak of seeing deep into the battlefield, moving fast to concentrate forces, suppressing enemy fires—especially artillery—with counterfire systems, striking quickly to kill many systems, then finishing the fight rapidly before the second echelon can close.

On both sides, the concepts are interdependent; one is not sufficient to a military system without the others, for they all relate to one another. Let's look at that interdependence as a capability, a systems capability—interdependence of concept, interdependence of weapons systems, of tactics, or organization and structure.

Let's look first at force interdependence (figure 1). This picture indicates forces that operate against one another in

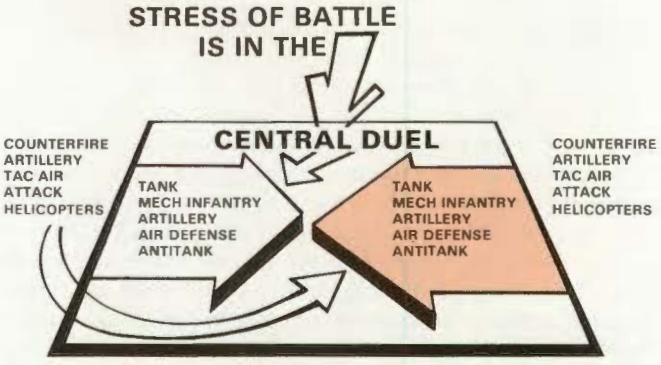


Figure 1

The Central Battle. Orange direct fire systems—BMP's, tanks, antitank guided missiles, and short-range infantry are arrayed against Friendly APC's, tanks, antitank guided missiles, and short-range infantry. Contributing on both sides to the battle are Orange tac air, artillery, and helicopters operating against Friendly, and Friendly tac air, artillery, and helicopters operating against Orange. Now, if we put on these systems numbers which represent the contribution of each system to killing systems on the other side, we would get a relationship that goes somewhat as follows.

Friendly tanks kill about 48 percent of enemy systems destroyed in The Central Battle. Friendly antitank guided missiles kill about 20 percent of enemy systems that perish in the battle. So 68 percent of enemy systems killed by friendly systems in the duel are killed by those two weapons alone, tanks and antitank guided missiles

(ATGM). For the enemy, Orange tanks account for but 31 percent of the total Friendly systems kills, and ATGM's only 7 percent of the total Friendly systems kills, for a 38 percent contribution by Orange tanks and antitank guided missiles.

Why the difference? The reason is simple. Our tanks and antitank guided missiles must kill more enemy systems because we do not have an Infantry Fighting Vehicle (IFV), and we do not have enough artillery. On the Orange side, the BMP kills about 34 percent of all Friendly systems destroyed in battle, most of those being APC's, dismounted infantry, weapons crews, and antitank guided weapons crews.

This clearly says our Combined Arms Team is out of balance. To redress that imbalance we need many things—but foremost among the many is an IFV—one that with tanks, antitank guided missiles, short-range infantry, and artillery, kills its share of enemy systems in those unique tasks for which it is designed. So the problem is more than one of balance—it's interdependence; it's the need to restore effective interdependence in the Combined Arms Team.

Because of imbalances in the interdependence equation, Friendly artillery is overstressed. We have required artillery to make up for our gross shortage in firepower by adding to it new shells capable of doing many new things. There are cannon-launched guided projectiles, smoke rounds, mines delivered by artillery, and nuclear artillery munitions. Someone showed me a scheme recently for a cannon projectile with a television camera in the nose of it.

We did not have enough artillery tubes to begin with. Now we tie up a lot of our tube capability with these special weapons. In addition, we tie up our forward observer system—the FO's are guiding guided weapons onto targets, instead of adjusting HE and smoke. So we have overloaded the total artillery system with all these new weapons trying to make up for the shortage of firepower. Part of that shortage in firepower can be measured in terms of the absence of an IFV; many of the systems it kills now must be killed by artillery.

Looking at counterfire systems, The Central Battle tells us that Orange artillery is 30 percent more effective than Friendly artillery. This is so because there is more Orange artillery to begin with. And Orange artillery can deliver more throw weight—more ammunition delivered—than can our own artillery. Orange is not encumbered by lots of special mission artillery. So it isn't just that some magic balance has to be maintained in the Combined Arms Team, it is that we must create a satisfactorily interdependent Combined Arms Team in order to take advantage of the synergism that that team offers in battle.

Now, why is interdependence important. Let's talk about the calculus of battle (figure 2). Many of you have seen this picture before. On the ordinate is probability of victory, on the "X" axis, attacker versus defender ratios, ranging from one attacking five on the left to five attacking one on the right. Using the traditional calculus of battle derived from Lanchester's Law, we get the black curve; it says that if you're one attacking five you haven't a chance, but if you're five attacking one you nearly always win. That's bad news for the fellow who believes he may have to fight outnumbered—it says he is foredoomed to defeat!

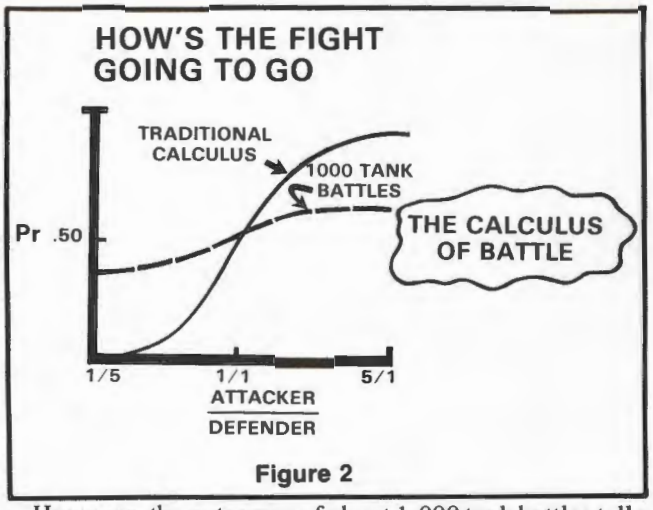


Figure 2

However, the outcomes of about 1,000 tank battles tell a different story—the curve looks like the orange line. Empirical data tells us that there is apparently more to battle than the traditional calculus would admit. Winning in battle seems to require something more than the calculus tells us. What is that?

Let's look at a battalion battle again as an example. Time is zero. A tank battalion task force is defending in a conveniently U-shaped piece of terrain (figure 3). The task force is being attacked by elements of a motorized rifle division—the commander doesn't know how many. He has three companies, two *M-60A1* tank companies—Team A and Team B, an *M-60A2* tank company—Team C, and in support, a mortar platoon, and a direct support artillery battalion. The terrain is such that the enemy can deploy at about six to one—six attackers to one defender.

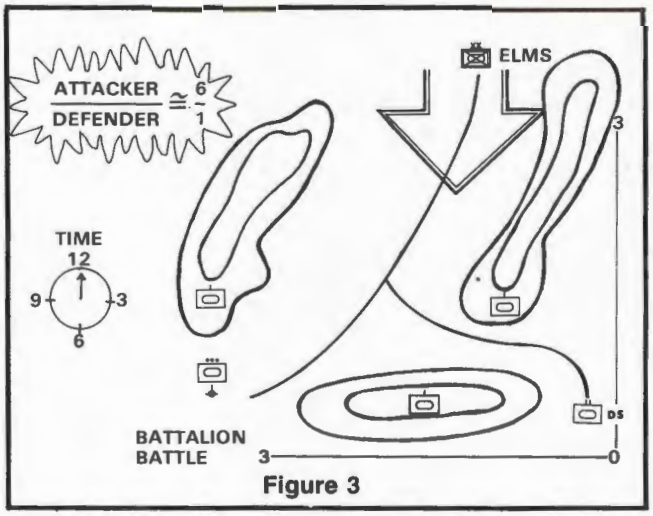


Figure 3

Using the traditional calculus, this battalion is foredoomed to defeat. But let's see if there isn't something we can do to get closer to the orange line that history tells us is possible.

The enemy attacks with about three reduced strength regiments—about 250 systems (figure 4). Ten minutes into the battle, the team commanders have made the numbers of decisions shown. Commander, Team A, has put three platoons into position on Hill 1 and positioned his TOW's as shown. The Team B commander has put his platoons into position on Hill 2 with his TOW's as shown. The Team C commander has taken up good firing positions

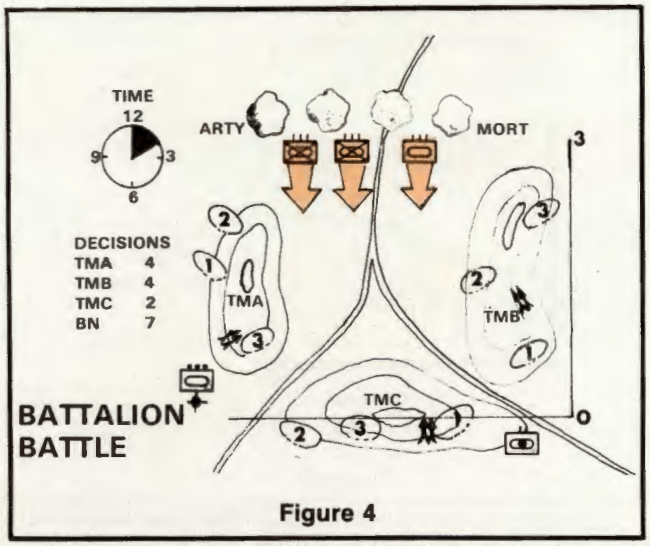


Figure 4

on the reverse slope of Hill 3 with TOW's firing from the military crest.

The enemy was within range of supporting artillery; so we opened fire with artillery on the two motorized rifle regiments. The artillery was firing madly when out of the smoke came some tanks. We quickly shifted some artillery over on them, and began to fire mortars.

So at 10 minutes into the battle, decisions have been made and acted on concerning positioning platoons, positioning TOW's, identifying the enemy, calling for fire, and reporting what's been done. The battalion commander has responded, asked his direct support artillery battalion commander to get some more fire, and called for attack helicopters and tac air.

Fifteen minutes into the battle, the fight is brisk. The battalion commander has distributed the fires of his teams in such a way that each battalion in the enemy formation is being fired on by two platoons of the defenders (figure 5). He did this by outlining a terrain mosaic in the center of the U-shaped area, so that he and the team commanders might accurately direct fire or maneuver into those areas.

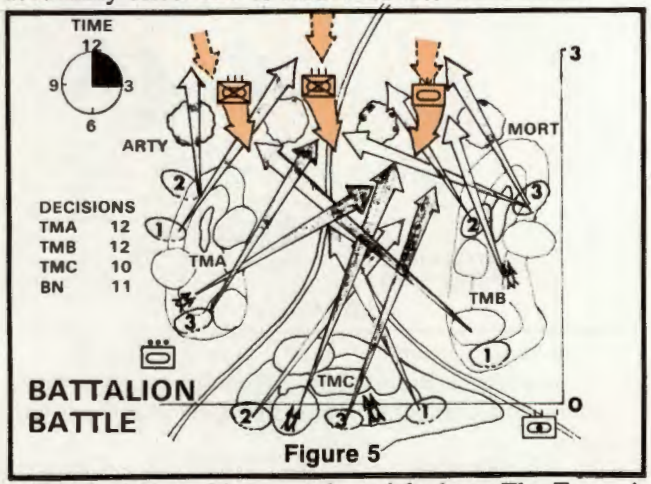


Figure 5

The decisionmaking pace has picked up. The Team A commander is directing the fires of his two northernmost platoons on the motorized rifle regiment on the enemy's right flank. At the same time, he has directed the fires of the TOW's and the 3d Platoon on parts of the regiment which seem to be turning in the general direction of Team B. He's firing into the flanks of that outfit. Later, he shifts the fires of the 3d Platoon into the flanks of the middle motorized rifle regiment. The TOW's have been shifted to fire on the tank regiment which is moving more rapidly than the other two—having just moved into the battle.

Team B is firing all its TOW fires into the flanks and rear of the attacking tank regiment. The 2d and 3d Platoons are firing into the flanks of that regiment, and the 1st Platoon is delivering crossfire into other elements of the motorized rifle regiments which, because of the lay of the ground, cannot be reached by Team A. Initially, most of the fires of Team C were directed against elements of the tank regiment. All TOW's, and 2d and 3d Platoons are also firing against the tank outfit. 1st Platoon is firing on lead elements of the center motorized rifle regiment.

Twenty minutes into the battle, it is essentially over (figure 6). The attack helicopters have arrived. In order to clean up this battle area in the center before the 2d echelon comes along, the battalion commander has the artillery fire a mixture of HE and smoke behind the fight in progress. The 2nd Platoon of Team A is still firing at some trail elements of the motorized rifle regiment in the middle. TOW's and the 3d Platoon of Team A are working over remnants of the motorized rifle regiments in the center and on the left.

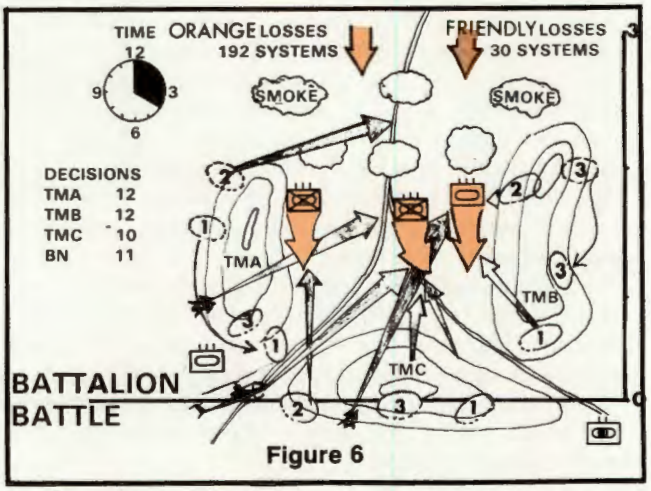


Figure 6

The 1st Platoon, since its fires are masked in the engagement area, has moved down in the throat to fire against enemy air defense systems, permitting the attack helicopters to come in. They are on station with some aircraft firing, some in the forward area rearm and refuel point about 30 kilometers away, and some are in transit at low level, dropping to nap-of-the-earth as they come into the forward air defense envelope. They recycle about every 10 minutes, so we can keep missile firing helicopters on station for some time. The close air support aircraft have not arrived yet, and are not expected before we have to have this battle tidied up. Team B is attacking the regiment's remnants with its 1st and 2d Platoons. Its TOW's were destroyed by hostile fire. The 3d Platoon is moving to join the counterattack, overwatching the two attacking platoons.

Now let's talk battle outcome, the killer-victim scoreboard, a battle analysis. You all know that tank crews perform better some times of the year than others—usually when they have just finished annual gunnery qualification. "Forgetting" takes place as time passes and proficiency drops off until it's time to qualify again. So we have a

standard sawtooth curve with which analysts are so familiar. That curve represents a lot of things, but in this case it represents learning and forgetting, learning and forgetting, learning and forgetting. What I'm going to do now is show you some battle analyses of our battalion battle which were conducted with low performance crews, high performance crews, and then high performance crews which were members of fully trained outfits, in which all of the interdependent factors in the battle worked together and worked well.

First, here is a low performance killer-victim scoreboard (figure 7). The systems are shown in the left column—two companies of *A1's* with 15 tanks each, a company of *A2's* with 12 tanks, 6 TOW's, artillery, and the attack helicopters. The second column is the time the enemy was within range of the systems in the defensive position. The third column shows the kill rate based on hit/kill probabilities of those systems against enemy systems, using low band performance figures. The fourth column shows Orange losses as a result of those kill rates. Friendly losses from Orange counterfires, direct and indirect, are in the last column. There were 250 Orange systems in the attacking array. About 150 of them were killed and 100 of them were left. It is quite likely that most of those 100 were tanks. Out of 71 systems of our own, we lost 37.

TARGET SERVICING

BATTLE ANALYSIS
LOW PERFORMANCE CREWS

SYSTEM	TIME AVAILABLE	KILL RATE	ORANGE LOSSES	FRIENDLY LOSSES
TANK A1—15	5 MIN	12.2/MIN	61	9
TANK A1—15	5 MIN	9/MIN	45	9
TANK A2—12	8 MIN	3.8/MIN	30	7
TOW—6	4 MIN	1.5/MIN	6	5
ARTY—18	20 MIN	.2/MIN	3	5
ATK HEL—5	5 MIN	2.7/MIN	14	2*
		TOTALS	159	37

*DATA NOT AVAILABLE

Figure 7

On balance, this fight has not been very successful. In fact, this commander is probably going to have to get out of the conflict. He can't fight successfully against the remaining 100 tanks, certainly not with 34 systems left.

Figure 8 shows another battle analysis, with the same columns, different kill rates, and different kill ratios resulting from the work of high performance crews as opposed to low performance crews. This outfit killed at the rate of about 6½ to 1 while the low performance crews killed at the rate of about 4¼ to 1—a rather dramatic improvement in performance just based on crew performance.

Figure 9 displays data representing well-trained crews in fully trained units, where the interdependence of all systems working together is brought to bear. The outcome is dramatic. This outfit killed at the rate of 8¾ to 1.

What made the difference in that battle? Let me see if I can summarize it for you. The Friendly force was out of

TARGET SERVICING

BATTLE ANALYSIS
HIGH PERFORMANCE CREWS

SYSTEM	TIME AVAILABLE	KILL RATE	ORANGE LOSSES	FRIENDLY LOSSES
TANK A1—15	5 MIN	16/MIN	80	8
TANK A1—15	5 MIN	12/MIN	60	8
TANK A2—12	8 MIN	5/MIN	40	6
TOW—6	4 MIN	2/MIN	8	4
ARTY—18	20 MIN	.2/MIN	4	4
ATK HEL—5	5 MIN	3.8/MIN	19	2*
		TOTALS	211	32

*DATA NOT AVAILABLE

Figure 8

balance with no infantry fighting vehicles. His tanks and attack helicopters had to kill more than the enemy killed. Orange did not employ antitank helicopters. He used a lot of artillery, but Friendlies were mostly tanks and survived fairly well.

So all things considered, the real scoreboard probably showed the advantage provided by technology may have gained us something like 3 to 5 percent, taking full credit for the sophistication of guided missile guidance systems, tank fire control systems, and so on. Crew performance, the difference between the performance of the low crews and the high crews, added about 15 percent to the battle's outcome. The difference between the organizational performance—the high performance crews—in the fully trained unit, added about 25 percent to the battle's outcome.

Organizational performance, using interdependence is what made the difference. That's leadership. Leadership is a function of training—training the crews, training the organization. Leadership is what puts it all together. I hesitate to use the word leadership to describe organizational performance because leadership in our Army has long been looked upon as an individual thing. An individual is a leader. He has charisma or he doesn't have charisma. He makes good decisions or he makes bad deci-

TARGET SERVICING

BATTLE ANALYSIS
HIGH PERFORMANCE CREWS/FULLY TRAINED UNIT

SYSTEM	TIME AVAILABLE	KILL RATE	ORANGE LOSSES	FRIENDLY LOSSES
TANK A1—15	5 MIN	20/MIN	100	7
TANK A1—15	5 MIN	15/MIN	75	7
TANK A2—12	8 MIN	6.3/MIN	50	6
TOW—6	4 MIN	2.5/MIN	10	4
ARTY—18	20 MIN	.3/MIN	5	4
ATK HEL—5	5 MIN	4.7/MIN	24	2*
		TOTALS	264	30

*DATA NOT AVAILABLE

Figure 9

sions. We tend always to focus on the individual aspects of leadership—what made General So and So or Colonel So and So a great leader. What caused Private Whatshisname to dash from his squad and suddenly become the *defacto* leader when the squad leader was killed or wounded, and lead the squad to victory? Personal, individual leadership therefore has traditionally been our bag.

Admirable as that may be, it is truly the exception. Individual leadership has its place but what is more important is that leaders must also lead platoons, companies, and battalions, and these are organizations. The kind of leadership that will get the synergism—the plus—from the interdependent effects of a well-trained organization is a leadership that comes from the organization itself. It can give each individual the strength he draws on as a result of being part of a well-trained, highly-motivated outfit which is doing good things. That kind of an outfit can take high performance crews, squads, and platoons; put them together, and capitalize on their interdependence to achieve phenomenal things in battle.

Organizational leadership comes from training. It's much more than flags, guidons, and esprit. It's the simple, sure knowledge that each man and every crew is highly trained, and that they all belong to a solid, firm, confident, well-trained organization that knows where it's going and what it has to do.

That's the kind of leadership we have to strive for at every level, from E-nothing on up, if we are really to make the combined arms team work. If we train and lead our units in that manner, we'll go a long way toward capitalizing on the interdependence potential of the combined arms team. There is no other course, for we can and must win the battles of the next war. Our soldiers, our Army, and our Country, depend on it.

ARMOR CONFERENCE

Air Cavalry

by Lieutenant Colonel Donald R. Martin, USAARMC

I will address a very important part of Armor's contribution to the Combined Arms Team—Armor Aviation—what will be demanded of it during The Central Battle, and how we plan to help insure that these units are trained and prepared.

Armor Aviation consists of all the air cavalry and attack helicopter units in our army. During the 1980's, Armor Aviation will compose more than 51 percent of our total Army Aviation force structure.

The air cavalry troop consists of aeroscouts, reconnaissance, and aeroweapons platoons. The focal point of the troop is the aeroscout platoon, consisting of 10 *OH-58* scout helicopters. This platoon has the major responsibility for performing the troop's mission of reconnaissance and security for the ground force commander. To complement the reconnaissance capability of the aeroscout platoon, the troop uses its recon platoon consisting of a headquarters and four 10-man scout squads to perform detailed, on-the-ground reconnaissance when required, and to provide an all-weather 24-hour screening force. The nine *AH-1S Cobra* helicopters in the aeroweapons platoon provide the integrated firepower required to assist the scout platoon in accomplishing this mission.

The attack helicopter company is Armor Aviation's contribution to the fight and finish part of the battle. The focal point of this unit is the attack helicopter platoon. Each of the three attack platoons of this company has seven missile-firing *AH-1S Cobra* helicopters for a total of 21 which can be armed with eight antitank missiles each. The eyes of an attack helicopter company are in the scout platoon which is organized with 12 *OH-58* scout helicopters broken down into three sections with four aircraft each. The company is employed using scout/attack helicopter teams or platoons depending upon the situation, with the scouts providing security for and handing off target arrays to their attack helicopter counterparts. Both air cavalry troops and attack helicopter companies are highly mobile and flexible units which possess the speed and firepower necessary to extend by aerial means the ground commander's capability to find, fight, and finish the enemy over the expanded width and depth of the modern battlefield.

Armor Aviation Training

Let's discuss what we are doing to assist the unit commanders in training their units to be prepared for The Central Battle. As with all other fighting units, the first thing that must be established is doctrine. We have done this by publishing how-to-fight manuals, FM 17-95, *Cavalry;* FM 17-50, *Attack Helicopter Operations,* and FM 17-49, *Air Cavalry Combat* and distributing them to the field. These manuals were written with The Central Battle in mind and depict the doctrine and tactics necessary to win that battle. These doctrinal manuals, however, have pointed out the need to improve our training in several areas.

First, our individual pilot training at Fort Rucker. Heretofore our flight training at the Aviation School has produced outstanding pilots, but pilots who were only

qualified in the *UH-1* utility helicopter. Any specialized training, such as scout or attack, had to be done in the unit or the aviator had to return to the Aviation School at a later date for transition. This system proved very costly and infringed upon the already overtaxed unit training time and money.

Dual Track

Recently the Aviation School initiated a dual track system in which all students in initial entry rotary wing qualification training are given 115 hours of flight training in the *TH-55* and *UH-1* helicopters. During this time a certain number of the class, based upon the Army's needs at the time, are selected to attend the aeroscout qualification track. At this 115-hour level of training, these selectees are separated and enter a 60-hour flight program in which they are trained as aeroscout pilots and qualified in the *OH-58* scout aircraft. The remainder of the flight class continues on to receive 60 more flight hours of training in the *UH-1* or later, the *UH-60A Blackhawk* when it becomes available.

In addition, with TRADOC and Department of the Army approval, the Aviation Center plans to initiate an attack helicopter track early next year which will parallel the aeroscout and utility tracks that are now available. This new institutional training approach will result in a more specialized man-to-machine interface, and will provide the commander in the field with a graduate aviator who is individually trained and prepared to enter unit training.

Aerial Reconnaissance Specialist

The next area of training that has needed improvement is that of the enlisted aerial reconnaissance specialist. Although these specialists are authorized in both air cavalry and attack helicopter units, there is presently no institutional training available to teach those additional tasks that the cavalry scout must learn to become an aerial reconnaissance specialist or aerial observer. The Armor Center has recently developed a complete exportable training package to assist the units in training these specialists and has dispatched this package to the field in draft form for comment. However, this is considered to be a short term or interim fix. For the long-term, the Armor Center and the Aviation Center are working on a joint training effort which would allow for a certain number of graduates, again, depending upon Army needs, from each 19D Cavalry Scout Course at Fort Knox, to be sent directly to Fort Rucker for additional aerial reconnaissance specialist training. This training would be conducted in concert with the aeroscout pilot track at Fort Rucker and would result in a fully qualified enlisted specialist graduate for the unit.

Institutional Training for Aviators

Additionally, there is a need to improve the institutional training for those commissioned Armor aviators who will be filling the leadership positions in air cavalry and attack helicopter units. Currently the Armor Center is developing additional aviation training for Armor aviators who attend the Armor Officer Advanced Course. This instruction will cover those unique management tasks which apply only to air cavalry or attack helicopter leadership positions. In addition, instruction will be expanded to all members of the advanced classes on Armor Aviation employment techniques to better acquaint all officers with the best methods of integrating these units into their scheme of maneuver.

Air Crew Training Manuals

For many years the annual training programs for our aviators and aircrews has lacked definitive guidance. We have concentrated more on basic machine manipulation tasks rather than combat maneuver tasks. To alleviate this problem, we have developed Aircrew Training Manuals (ATM) for each type of aircraft in our organizations and implemented these training programs Army-wide in 1977. These programs are designed to give unit commanders an effective interface between individual and crew maneuver training, gunnery programs, and Army Training and Evaluation Program (ARTEP) training. They remove all conjecture concerning the proficiency of aviators and their ability to perform the specific mission of the unit. ATM's standardize combat maneuver training so that aviators transferred from one theater or major command to another are able to perform their mission immediately upon reassignment. These manuals have incorporated "how to" information from several training circulars and flight standardization guides to give the aviator a ready reference for tasks, conditions, standards, descriptions, and references. Formulas have been determined which tie the number of authorized aviators to specific task completion levels to equate directly to unit readiness. This entire program addresses training which is also applicable to both Reserve and National Guard units.

To better understand the philosophy of the ATM's, let's take the example of an aviator who is just being assigned to an attack company after 2 years in a staff assignment at Fort Knox. He is already qualified in the attack helicopter, but his skills may have deteriorated. So he begins with refresher training. After a proficiency check to determine his weak areas in airframe manipulation, he works on only those tasks in which he is not proficient. After 7-10 hours of refresher training he is judged proficient and moves on to mission training. The commander selects the tactical tasks which are essential for accomplishment of his mission, based on the unit's TOE and geographical location. The aviator must train on each of these tasks until he can meet the required standards under the specified conditions. Another evaluation is necessary to move on to continuation training where he performs the necessary number of iterations of the tasks on a year round basis to maintain his readiness proficiency. Each aviator is also required to successfully complete an annual aviator proficiency and readiness test which approximates the soldiers qualification test. The aircrew training manuals are in fact complete maneuver training programs which tie in directly with the unit ARTEP's and give the commander the tool with which to better judge his unit's ability to perform its mission.

Gunnery

The second new training program is attack helicopter gunnery. We have just culminated many months of work by publishing FM 17-40 (draft) and distributing this man-

ual to the field. This new aerial gunnery program not only replaces the two older gunnery manuals, TC 1-4 and TC 17-17, but incorporates those maneuver tasks from the aircrew training manuals, with weapons tasks, and most importantly, emphasizes combined arms gunnery exercises. The manual is organized around performance objectives with tasks, conditions, and standards for each level of training. The tables are graduated from individual pilot and copilot/gunner day and night qualification, through crew to team, and finally unit day and night qualification. An example of the final performance objective-tasks, conditions, and standards for Table IX unit gunnery follows:

TASK:

Each unit will conduct a combined arms attack against a multiple threat target array.

CONDITIONS:

Given a unit consisting of two or more teams/sections under day or night conditions with or without night vision goggles, a combined arms attack mission, designated holding areas, firing positions, and a multiple Threat target array.

STANDARDS:

Acknowledge receipt of mission (operation order).

Plan mission using METT factors.

Coordinate division of responsibility with ground commander (sectors of fire).

Conduct coordinated attack by:

Controlling key terrain.

Blocking likely avenues of approach or escape.

Containing enemy armor forces.

Destroying targets in priority of danger to unit.

For the unit to meet the performance objective of a combined arms attack against a multiple threat array, they must successfully meet the standards set for all phases of the operations. These include mission receipt, planning, coordination, maneuver, and engagement. These standards must be achieved under the conditions of day, night, and adverse weather. Table IX is designed to be fired with other members of the Combined Arms Team in a live-fire unit exercise. Table IX also ties directly into the final requirements of the unit ARTEP and is intended to be fired during the live-fire part of that program.

The new gunnery manual provides the air cavalry and attack helicopter unit commanders with a complete, integrated, and realistic aerial gunnery program that will insure the unit's ability to move and shoot on The Central Battle battlefield.

In summary, we are confident that the doctrinal "How-to-Fight Manuals," which have driven the improvement in our individual and collective training programs, such as aircrew training and attack helicopter gunnery, all closely tied to and integrated with our unit ARTEPS, will provide our unit commanders with the overall game plan needed to prepare Armor Aviation units to execute their part of the Combined Arms operations in The Central Battle.

A part of Colonel Martin's briefing, which includes a scenario for the tactical employment of Armor Aviation, has been omitted due to space constraints. It may be printed as an article in a later edition of the magazine. ED.

ARMOR CONFERENCE

Mechanized Infantry and Antitank Weapons

by Major General William J. Livsey, Jr. CG, USAIC

At Fort Benning we train leaders of men, skillful tacticians, and able technicians. Our role is to train young soldiers to be effective soldiers, NCO's, lieutenants, and captains, and active and credible members of the Combined Arms Team. Although these soldiers may not be able to describe The Central Battle in overall terms, they will understand and fulfill their part of the battle calculus. As the title of this presentation indicates, we are taking great efforts and interest in moving mechanized infantry to the forefront. The interdependent doctrine, concepts, tactics, organization, and systems to support infantry as an active partner of the Combined Arms Team are also priority. Infantry *must* be able to fulfill its role under any and all conditions of terrain, weather, or Threat activity, but always within the framework of the Combined Arms Team.

The Central Battle can only be won by a well-balanced Combined Arms Team. Mechanized infantry with its mobility, firepower, and armor protection is the vital partner of Armor within the team. The Infantry must be highly trained, well equipped, and superbly led. One of the greatest challenges to our Combined Arms Team is to be prepared for warfare against a highly mobile combined arms foe.

Mechanized warfare in the recent past has provided certain lessons for our evaluation.

The Threat forces are equipped with a highly sophisticated array of combat vehicles which out-number us in every category except helicopters. The Threat is capable of mounting combined arms operations under a significant

air defense umbrella. To defeat this potential foe, we must optimize the effectiveness of our own combined arms elements.

Results from the Yom Kippur War indicate that victory is not wholly dependent on the most tanks, or most infantry, or most artillery, but is won by the combatant with the best trained and best led Combined Arms Team. In preparation for The Central Battle, we can and must gain a quantum differential on our potential foes. Training and organizational leadership will make the difference in how well the Combined Arms Team operates and fights as an entity, rather than as constituent parts. I will present an overview of what is being done at Fort Benning to provide the Combined Arms Team with capable infantrymen and leaders.

The emphasis on combined arms and mechanized operations not only occurs at the captain level, but encompasses all training throughout the instructional spectrum. The infantryman recently completing advanced individual training must be aware of the basics of how he fits into the Combined Arms Team. He also must be taught what tasks his comrades are trained and better equipped to perform. For individuals and teams to be trained realistically in their role, they must participate and learn as Combined Arms Team members.

Training Up

The training up to Army Training and Evaluation Program standards requires emphasis to be placed on hands-on training. Performance is the key. Those essential training elements the modern infantryman must accomplish are based on a systematic analysis of what he must do; what equipment is available for him to perform the task; and the environment in which he must accomplish the tasks.

As the battle is projected, the most likely area of confrontation is Central Europe. The Threat force deployed within the area, coupled with our force configuration, indicate the criticality of this area to our interests. Therefore, much training of the soldiers at Fort Benning is aimed toward the potential battle in a European environment.

We emphasize how all types of infantry fit into the Combined Arms Team. Importance is placed on integrating airmobile forces so that their particular mobility differential may be exploited to aggressively destroy enemy forces. Infantry provides the force to be applied in those types of terrain unsuited to mounted warfare. Looking to the close-in fight visualized in forested areas, mountains, or in particular, military operations in urban terrain, Infantry can exploit its capabilities while minimizing its vulnerabilities to Threat armor.

Infantry must think and believe Combined Arms under all conditions of weather and terrain. Students are taught the capabilities and advantages of each type of force and how to employ the force effectively. The soldier and leader must appreciate how his particular type of infantry can best be utilized within the Combined Arms Team.

Antiarmor Training

Observing and understanding the Threat noted earlier, we are concerned about the sheer numbers of armored vehicles. To effectively service all available targets requires antiarmor trained infantry. The leaders at squad through task force level must be able to exploit the training and weapons advantages of this expert antiarmor soldier. Today's infantryman has gained a capability never before possessed. He can now destroy armored vehicles before they are within main gun effective range. This advantage has made the modern infantryman a credible tank buster.

At Fort Benning, soldiers are instructed on seven principles of antiarmor weapons employment. These fundamentals, if correctly applied in the field, will assist the soldiers and leaders in utilizing to best advantage the available weapons and terrain. The antiarmor capability of infantry must complement the tank, rather than compete with the tank. Instruction at Fort Benning teaches the soldier how to exploit the best points of each arm to maximize the capabilities of the Combined Arms Team.

Tactical Training

The emphasis is on field tactical training. The Central Battle must be trained up to under conditions simulating the realities of modern warfare. To have performance-oriented tactical training, the student must relate his weapons to terrain under conditions representing a realistic battle environment. Student training has progressed to performance-oriented training based on actual tasks required under field conditions. The tactical exercise whereby the leader plans the utilization of forces on actual terrain has been a very useful technique in instruction. The engagement simulation techniques have been of particular value in courses of individual and collective training to emphasize critical teaching points.

REALTRAIN is tactical training of excellent advantage in stimulating correct tactics and techniques. This training requires more equipment and troop support, but provides mission fulfillment for the trainee. REALTRAIN also provides soldiers opportunities to master their terrain and environment and demonstrate proficiency in training for combat tasks.

Maintenance of the soldier's equipment is being stressed at The Infantry School. In this era of limited assets, the maintenance of equipment for The Central Battle is critical to our mission. The maintenance training is geared to hands-on, practical skills, and testing based on practical maintenance applications. One example of testing is the requirement for advanced course NCO's to apply an Equipment Serviceability Criteria to vehicles during a field training exercise.

As previously noted, the European battlefield has occupied much of our attention and stress is placed on training our soldiers and leaders for battle requirements there. However, offensive actions and the requirement to seize initiatives at some subsequent time, must also be emphasized.

Supporting Elements

The elements of combat power other than infantry and armor must be trained into the equation. If in training, the soldier and leader are not required to use supporting artillery or close air support, they are unlikely to do so, initially in The Central Battle. The means whereby combat

power can be multiplied by using terrain and weather conditions must be exploited. As the Combined Arms Team capabilities improve for limited visibility and night operations, we teach being able to take full advantage of these situations. Only if the Combined Arms Team is trained to fight in all situations will the advantages be seized. The engineer, air defense artillery, and helicopter assets must all be part of the team.

Training the Individual

Advanced individual training at Fort Benning is still fast and tough. It produces a highly-motivated, physically tough, rough, and lean infantryman. This soldier has been taught the required basic entry-level skills, but any finishing must be done at the unit. He has qualified with the LAW. He has received 12 hours of mechanized tactics as part of a squad, and he is familiar with the basic functioning of the *M-113* armored personnel carrier as a squad member.

Selected soldiers are trained in a follow-on program of 1 week to be TOW or *Dragon* gunners. Thus, these troops can be assigned duties in the TOW squad or designated as a *Dragon* gunner. They have been trained to skill level 1 and have sufficient training to perform assigned tasks as infantrymen or indirect fire crewmen. As Fort Benning moves to test One Station Unit Training (OSUT) later this summer, the result should be a better trained infantryman.

Noncommissioned Officer Courses

The Basic NCO Course trains the soldier in skill level 3 tasks in three phases in 4-weeks. In phase 1, the soldiers are tested to determine their entry-level proficiency. During phase II, the soldiers train on those tasks they could not initially perform adequately. Then in phase III, they participate in a tactical exercise based on proficiency in required ARTEP events. Upon completion of the course the NCO's are prepared to lead and train their squads.

The 10-week Advanced NCO Course is designed to produce proficient platoon sergeants. The course has a common phase and separate phases for the 11B and 11C sergeants. These sergeants receive 112 hours of indoor and field classes in mechanized operations. Instruction in combined arms tactics includes offensive, defensive, retrograde, airborne, and air assault operations, and the use of combat support elements.

Infantry Officer Basic Course

The redesign of the Infantry Officer Basic Course (IOBC) has resulted in the best possible course of instruction for providing a qualified, motivated lieutenant for the infantry platoon. These officers attend a 14-week tracked course of demanding training. They are trained to be weapon systems and equipment experts who will direct and supervise subordinates in operating, maintaining, and employing those assets. These officers learn firsthand to work as members of the Combined Arms Team. They are taught the roles of tanks and infantry and apply them during a tactical problem to accomplish an assigned mission. The lieutenant also learns how to employ his platoon in an antiarmor role. He is trained to ask for assets available to the team commander in order to multiply the combat power of his platoon. Integration of indirect fires and use of engineer assistance also are stressed. The IOBC students participate in an FTX and ARTEP to prepare them for their first assignment and they spend most of their training time in the field being trained to make decisions and doing those tasks they will later perform as platoon leaders.

Infantry Officer Advanced Course

The captain is a leader of men and a technician who must apply weapons and materiel to the terrain successfully. He applies doctrine at team level and makes the many quick decisions as to where the critical juncture of battle will occur. Students of the Infantry Officer Advanced Course (IOAC) are trained in the employment of the Combined Arms Team. More than half of their tactical training is mechanized, using problem scenarios that are European oriented. Offensive and defensive tactics are treated almost equally in the IOAC, but now we will discuss only the active defense which is stressed for 79 hours of the defensive instruction block.

Classroom instruction includes practical exercises to provide students with an opportunity to apply forces and weapons to the terrain. Map exercises which are an extension of this instruction allow more independence and variations and rag models or cloth terrain models provide added flexibility. The students observe a terrain and enemy situation that may be analyzed in detail and from every direction. The enemy situation may be changed as a battle progresses so that little effort is required to keep abreast of a teaching model.

After the students have mastered the techniques and tactics, they are placed on local terrain to emplace forces and analyze enemy and friendly capabilities. The ever-changing nature of terrain and its impact on tactical operations is stressed. The students also participate in gaming simulation.

The instructional approach in teaching the active defense is a building block format. The students are introduced to a mechanized team tactical exercise without troops (TEWT). Prior to the TEWT the students receive the task force (TF) mission, the enemy situation, an analysis of the terrain, and the commander's concept. The student completes a terrain and enemy analysis as homework prior to reconnoitering the TF sector.

The student must visualize the enemy force and the terrain that that force will require for maneuver. They also determine what the enemy is most likely to do, alternate courses of action, and what objectives the enemy seeks.

The battlefield must be seen from the enemy's point of view for avenues of approach, choke points, weapons locations, and locations for artillery fires. Moving to the friendly side the defense is examined as to observation, fields of fire, cover and concealment, key terrain, routes of movement, and engagement areas where the enemy can best be killed.

The IOAC students are now prepared to use the advantages accruing to the defender by preparing positions in advance of the battle. Weapons systems are emplaced to take full advantage of their capabilities. The positioning of

weapons and troop elements allows for mutual support between elements and depth of positioning through planning and rehearsal of action. Each battle position is allocated the force required to service the expected number and type of targets with sufficient combat power.

The students are required to defend their solutions by having the instructor inject changes in the enemy action. Each student must go through a battlefield calculus so that he can envision the battle at each instant and defeat the foe with the necessary measures or countermeasures. The captain task organizes his available assets to meet the enemy threat. Combat support through indirect fires, obstacles, mines, and close air support is also stressed.

During this instruction the students demonstrate their understanding of knowing the enemy, seeing the battlefield, using terrain and weapons advantages, in-depth execution, and employing the assets of the Combined Arms Team. The fact that the most significant discriminators will be the differentials of training and leadership is pointed out.

A revised advanced course will soon be developed. An analysis of the tasks, conditions, and standards that should apply to a captain's job is underway and should be completed by late summer. This advanced course will be designed and developed based on the job analysis. As the revised course is designed, however, maximum effort will be made to improve mechanized infantry training. Maintenance training is to be stressed and tactical instruction will be expanded with an increase in staff and commander interactive training.

The Future

Now that we have completed observations on selected courses, we move to those items in development that will have a significant impact on training for The Central Battle.

The *Viper,* which replaces the current LAW, will provide the infantry a better light antiarmor weapon with an improved antiarmor warhead. The *Viper* will also have an increase in range and accuracy, and is due for the field in late 1980.

The viscous-damped mount for mounting the *Dragon* on the *M-113* should become available late this summer. This mount will provide the capability for improving the accuracy of *Dragon* and give the squad a mounted antiarmor capability out to 1,000 meters.

The thermal night sight for TOW and the night observation device—long range (NOD-LR) are both slated for the field in the 2d quarter of next year. The TOW sight will provide an acquisition and tracking capability compatible with the range of the weapon. An improvement in night and limited visibility operations will provide a significant advantage over the current TOW sight. NOD-LR is similar in capability to the TOW sight and will provide the detection capability for mechanized teams. The only TOW missiles coming from the manufacturer now are the extended range version. These missiles have been fired by the ground launcher beyond 3,700 meters.

The improved TOW vehicle (ITV) is currently slated for availability in the 2d quarter of next year. This weapon system will provide the armor protection for the crew and weapon which is currently limited. It will replace the *M-113* TOW vehicles and provide the Combined Arms Team with a considerably improved antiarmor weapon system.

As an equal partner in the Combined Arms Team, the greatest need of the Infantry is a fighting vehicle to complement the tank. The mobility and firepower advantages of having complementary vehicles within a team are great. The Infantry Fighting Vehicle (IFV) is a third generation vehicle that surpasses anything in the field today. The 25-mm cannon and the TOW launcher will provide a significant firepower advantage and the two-man turret provides superior command and control, making the IFV a worthy partner to the *XM-1*. The IFV will enable mechanized infantry to accomplish its primary task of killing infantry and destroying antiarmor positions more effectively, thereby allowing the *XM-1* greater maneuverability and survivability on the battlefield.

The Infantry is dedicated to the synergism that accrues to a functioning Combined Arms Team. Through improved training, doctrine, tactics, and systems, the Infantry is striving to increase our contribution. Mindful of our vital role, the Infantry will continue to improve the effectiveness of the Combined Arms Team by strengthening our interrelationship with our partners.

ARMOR CONFERENCE

Engineer

by Colonel Gene B. Welch, USAEC

"The greater the increase in mechanization of the Army, the greater are the troops dependent on passability of terrain and good roads and tracks for success: the greater the power of modern weapons, the more difficult it is to protect troops from them. Engineer tasks have become more complex, are nowadays on a greater scale, and must be completed in a much shorter time. Indeed, it is the time factor which has perhaps had the most significant effect on engineer tasking."

These words appeared in an international publication on Soviet military doctrine and reflect the major role that the

Soviet engineer must assume if the force is to achieve its objectives.

The quote above is used to show the relative importance that both the U.S. and the Threat place on doctrine which fully integrates terrain as a key element of the battle.

Where we are? Where are we going? What is driving us? Our current assessment indicates that the Engineers bring to the battlefield a combat system which provides commanders with knowledge of and capabilities to reinforce the terrain. The objective simply stated is to enhance the capabilities of U.S. combat and combat support forces, while decreasing the effectiveness of enemy personnel, weapons, and support systems.

Organic engineer battalions are the focal point for all combat engineer effort within the division, and the engineer battalion commander is the single point of contact for all engineer activities in the division area.

". . . the constraint of time on Engineer roles is seen as critical."

The Engineer capstone manual FM 5-100, *Engineer Combat Operations,* and FM 90-7, *Obstacles,* have been distributed to the field in advance print. The major thrust of these doctrinal manuals is to place emphasis on combat engineer tasks in support of brigade maneuver elements and the concentration of Engineer power forward. This doctrine results in an increased combat role for Corps Engineer Battalions and a reduction in general engineer support capability. Though FM 5-100 is an important first step, detailed doctrine in several key areas is still vague. Primary areas of concern include the breaching of obstacles and obstacle systems such as the Soviet defense belts and strongpoints, and the integration of field fortifications and protective positions into current operational concepts.

Terrain

The initial question to be answered is, "Is this the best terrain to defend?" It is an Engineer responsibility to insure that data describing the strengths and weakness of the terrain are available. Looking at specific Engineer tasks relating to terrain, the initial task is to insure that the maneuver forces have access and egress routes to primary and alternate battle positions and available combat routes to concentrate combat power. Another requirement is to provide the force with more target servicing time. This is accomplished by employing and siting obstacles to hold targets in the window of weapon systems longer, thus maximizing weapon characteristics. The last requirement is to reduce the vulnerability of our defending forces by preparing battle and protected positions.

Assuming that relative force ratios cannot be influenced by increasing friendly combat power by introducing more weapon systems, the relative importance of reinforcing the terrain becomes paramount in influencing loss exchange ratios and the ultimate battle outcome.

Changes in Support

Not only have the density, lethality, and range of Soviet weapon systems greatly influenced changes in Engineer support of The Central Battle, the capabilities of Soviet Engineers and special purpose forces to overcome our obstacles have made quantum gains and we must insure that our time and resources invested in obstacle emplacement provide a positive return.

Perhaps the greatest single change in the relative force effectiveness equation is *time*. Every element of the Combined Arms Team is impacted to some degree. However, the constraint of time on Engineer roles and missions is seen as critical.

Currently, about 70 percent of the total engineer force is found in the National Guard or Reserve Components. What this might imply in a capability sense, is that our active forces must be structured and equipped to go a short war alone, and a very rigid system of task identification and priorities must be invoked. As a result, we must insure that we have identified the high payoff tasks and are equipped and trained to execute them.

We have conducted several studies which have made significant contributions to our development efforts. Specifically, the Engineer-Family of Systems Study (E-FOSS) is intended to analyze alternative engineer organizations to determine a structure which is the most effective in a European scenario.

Our efforts to date look very good, and we are confident that the study results will produce a unit structure with a meaningful increase in total force effectiveness. A second study effort was TEMAWS—Tactical Effectiveness of Minefields in the Antiarmor Weapons System. This was a fully instrumented force-on-force field test which was designed to determine how effective scatterable mines are in a countermobility role. The results showed that when scatterable mines were employed Threat losses increased by 20-35 percent with no increase in friendly losses.

In a third study entitled, Revised Engineer Active Force (REAF), we reviewed all TOE's of Engineer units of company size and larger in light of new FM 100-5 doctrine. We determined what engineer organizations and hardware we seek by 1985, and have established TOE road maps to transition to the 1985 goal.

Currently, we are not satisfied with how we have described Engineer roles, missions, and capabilities in other combat arms manuals, and we are placing emphasis on improving the Engineer input to those manuals.

As portrayed in FM 5-100, the current thrust of placing more engineers forward provides five engineer battalions in support of committed divisions. Three engineer battalions provide support in the division area—one with each of the two forward brigades and one in the division rear or with the reserve brigade. The Corps Engineer Batallion locates forward in the Corps area and the Corps Heavy Engineer Battalion moves much closer to the division rear. Within the Covering Force Area, we see the Corps Combat Engineer Battalion playing a much greater role either directly as part of the Covering Force or filling gaps left by the Divisional Engineers who go forward to support the Covering Force.

Priority Tasks

Increased Engineer effectiveness is reflected by placing priority on and doing the high payoff tasks in mobility, countermobility, and survivability. We are attempting to

achieve this increase through better techniques and materiel to do these priority tasks. As an example, it might take 100 units of engineer effort to put in a conventional minefield. With the introduction of scatterable mines, we can do the same task with perhaps 10 resource units. Similar examples exist in tactical bridging and explosive obstacles. Our goal is to be more effective with no increase in people.

Positive *command and control* has three primary parts: First, with the large area that the engineers must cover, better communications are essential. Second, we must insure that we have provided an adequate engineer planning capability at least to brigade level. Currently, the Divisional Engineer Company Commander wears two hats—one as the commander of his engineer platoons and one as the maneuver brigade engineer. When you introduce Corps Engineers into the brigade area, you quickly exceed his capabilities to be a staff planner and commander. Our new concept places an Engineer Support Team at each maneuver brigade. Third, we have spelled out in great detail the various command and support relationships between maneuver units and engineer units.

The placement of more Engineer equipment at user level is intended to give the user the advantage of owning and training on his equipment, and to reduce the requirement for task organizing equipment for every new mission.

Mobility, Countermobility and Survivability

In the mobility area, the objective is to develop systems and techniques to allow our forces freedom of movement in all areas of the battlefield by doing counterobstacle-type tasks. In order to satisfy this requirement, we seek systems which can move with and survive with the maneuver forces. Currently, our combat engineer vehicle is the only true capability we have in this area. In mine detection, we want something that tells us where the mine areas are before we have an encounter. We seek something with a standoff capability which can be used by any member of the Combined Arms Team. The only items in the current inventory are two hand-held mine detectors. Obviously, they do not give us the needed capability. The only items forecast in the next 3 to 5 years are the on-route mine detection and the mine roller. The on-route system has good on-road characteristics for sweeping lines of communication and main supply routes, but has little capability for use in the forward areas.

Although the primary concept of employment for the mine roller is as a mine neutralizer, we see an equally important role in mine detection. (Threat doctrine appears to use the roller exclusively in a detection role).

In mine neutralization, we are looking for a capability that:

- Is highly effective against all type mines/fuzes.
- Can be employed in less than 5 minutes.
- Has stand-off for greater survivability.
- Will provide a high density of systems on the battlefield.
- Can be employed by other elements of the Combined Arms Team even though designed primarily for use by the Engineers.
- Will provide a family of items instead of a single dedicated countermine system that employs several devices.

Today we have developed two countermine systems. One system is labor intensive, slow in employment, highly vulnerable, and not available in Europe. The other has poor cross-country mobility in that it must be hauled to the battle area and then dragged into firing position.

Countermine systems for the future include a mine roller and a fuel-air explosive. The mine roller has been type classified and will be carried by either Engineer or Armor units. It will be employed by tanks and is designed to be immediately responsive to the maneuver commander to create an assault breach.

The other system employs a fuel-air explosive warhead on 30 rockets and has a standoff of 1,000 meters. Although the system is designed primarily for destruction of pressure-fused mines, it has demonstrated a good capability for neutralizing all types of fuses. As a supplement to the fuel-air explosive we are looking at an improved line charge. Recent evaluations of the UK *Giant Viper* look very good. Basically, it is trailer mounted with good cross-country mobility, has a rocket-propelled charge, and is fired remotely from inside a combat vehicle. It clears a 200-meter path about 10-meters wide.

"Our goal is to be more effective with no increase in people."

Tactical Bridging

The assault, vehicle-launched bridge (AVLB) is a good bridge and will be around until at least 1990. But we need to answer this question, "Is 60 feet long enough and are there enough AVLB's on the battlefield to support our new doctrine?" Looking ahead, we are seeking bridging that can be emplaced quickly with reduced hardware and personnel resources.

The Mobile Assault Bridge (MAB) is currently the primary bridge found in Armored and Mechanized Divisions. It is a good, responsive bridge. However, it has the disadvantages of being expensive, has restricted cross-country mobility, and high maintainability requirements. The other float bridges currently found in Europe are the *M-4T6* and *CL-60*. Both have the major disadvantage of being labor intensive. The replacement for the MAB, *M-4T6*, and *CL 60* will be the ribbon bridge. However, it will not replace the MAB until the mideighties. The ribbon bridge is being fielded in Europe and should be in all Army units by 1982/83. The ribbon bridge can be employed faster than either the *M-4T6* or *CL-60* and as fast as the MAB. It is constructed by the hauling unit or bridge company and no additional heavy equipment is required for construction. In the area of dry support bridging, we have the old panel or Bailey bridge, which is labor intensive and slow to erect. To replace and supplement the Bailey, the medium girder bridge (MGB) has been developed. The MGB offers these improvements:

- Construction time is greatly reduced.

• It can be constructed by the Engineer bridge company without any additional engineer resources.
• No additional equipment is required for construction.
• Normal span is 100 feet, expandable to 160 feet with a cable reinforcing kit.
• The MGB should be in Europe within this calendar year.

New Vehicles

We see the M-9 universal engineer tractor (UET), as the most needed and most significant advance in Engineer mobility in the past 25 years. With the introduction of the UET in FY79/80, the Engineers will finally have an organic capability to move with and do their mobility and survivability mission in support of any type unit—in any location on the battlefield. The UET is a multi-purpose combat vehicle which can dig, push, haul, swim, and travel cross-country with the speed of, and armor protection equal to, an APC. The UET will replace all dozer-tractor-trailer systems in the division area.

"With the introduction of scatterable mines, the Army's ability to delay, stop, and kill the enemy in areas of our choice is greatly enhanced."

Another development, which significantly enhances our capabilities to accomplish our mobility and survivability missions is the Family of Engineer Contruction Equipment (FAMECE). The equipment is made up of a common power module and several work modules. Advantages of the FAMECE are:
• Good on-road and cross-country mobility.
• No prime mover required.
• Good productivity.
• Commonality and standardization of a total equipment system.

Mines

With the introduction of scatterable mines, the Army's ability to delay, stop, and kill the enemy in areas of our choice is greatly enhanced. For the first time, we can place mine obstacles in response to what the enemy is doing as opposed to his capabilities or what we might expect him to do.

All scatterable mines, except the helicopter *M-56* system, employ a magnetic fuze and have self-destruct times which range from a few hours to several days. The *M-56* system is currently in Europe in Cavalry and Army Aviation units. All other systems are in development and have an IOC of from this calendar year to 1985.

Obstacles

The *M-180* Rapid Cratering Device augments our current capability for emplacing cratering charges by digging a hole by hand and positioning the charge. The new system digs its own pilot hole and emplaces the charge automatically. Its major advantage is speed of emplacement.

A new explosive slurry gives the Army an added demolition capability. Two inert packages, which when mixed, produce a slurry explosive with a relative effectiveness of 1.5 to TNT. It can be mixed in any container from a steel pot to a cement mixer and there are no major storage problems while the two ingredients are separated.

One of the major things we are evaluating in the nonexplosive obstacle arena is the tank ditch. Analysis to date supports the tank ditch as an effective obstacle and our current efforts are devoted to determining the general size and shape parameters and the best procedures and equipment for use in its construction.

Battle Positions and Protected Positions

The UET is planned to be the primary Engineer system for preparing battle positions on or near the FEBA. The Korea/Vietnam approach to protected positions is not workable on the modern battlefield because it requires time for construction, large volumes of materials, and is labor intensive. The basic concept for the future is a frame which is covered with fabric and then covered with dirt. The design has applicability for mounted and dismounted TOW as well as other small weapon systems or command and control complexes. The structure is lightweight, erectable without bolts or tools, and can be recovered. A major consideration involves how maneuver units are to carry it. We recognize this problem and we are evaluating concepts which have the engineer either hauling it as a mission load item or responsible for drawing it from stocks as the need is identified by the tactical commander.

Terrain Development

In the *doctrine* area, we have just completed writing FM 21-32 which is the capstone manual for topographic support. It spells out in great detail, the *what* and *how* of terrain support. *Organizationally* we have developed a new topographic battalion with the primary thrust to insure that the mission, structure, and resources are geared to producing user-needed battle products for the corps and division. A major feature of this organization places terrain analysis teams at corps and division. In *hardware,* there are two major developments underway. The first is the Topographic Support System (TSS) which replaces WWII type equipment and gives the unit greater mobility. The second is the need to develop a digital data base and automate some of the basic terrain analysis functions.

Summary

We feel confident that we have identified those critical tasks that the Engineers must do to increase the combat effectiveness of the maneuver forces. With this identification of *what* we must do, and must do in a severely time- and resource-constrained environment, the *how* becomes the Engineer's critical path. We are not at that point in time which allows us to do all those things that we must do. However, as indicated by our trends in doctrine and developments, we do have a game plan, which should allow us to meet our primary objectives by the 1982-83 time frame.

ARMOR CONFERENCE

Reserve Component Training

by Major General Herman Tenken, CG, 50th AD

The 50th Armored Division of the New Jersey Army National Guard is a standard armored division organized into three brigades, Division Artillery (DIVARTY), Division Support Command (DISCOM), and Division Troops. It has six tank and five infantry battalions, four artillery battalions, a cavalry squadron with its organic air cavalry troop, and the normal engineer, signal and support units. We have a brigade slice in Vermont consisting of a brigade headquarters and two of the tank battalions, one of the cavalry troops, one engineer company, one medical company, the division aviation company, and a maintenance company. The divisional air defense battalion is stationed in New Mexico, and a target acquisition battery will be formed soon in New Hampshire.

Our people come from the whole spectrum of the population, and many of the best ones we have are hard-working private businessmen as well as good soldiers and commanders. For example, the DIVARTY Commander is a supervisor with a local gas company. The CO, 1st Brigade, is the comptroller of the Army hospital at Fort Dix. The postal NCO in the division AG company is a supervisor with a large construction firm. One of the personnel records clerks works in a dairy. A brigade operations sergeant is a full-time police officer in his home town and runs the athletic league there too. The first cook in one of the tank companies owns his own restaurant (and never gets the ration requests mixed up). A tank platoon sergeant owns his own poultry farm.

My point here is simple. We are part-timers and proud of it. We aren't able to devote the time to soldiering that the regulars have available, and this affects the way we organize and train.

The division is organized at Authorized Level of Organization (ALO) 3 and my goal is to reach and maintain a C3 Readiness Condition (REDCON). We have 39 paid 8-hour days a year available to do the job of maintaining our readiness. We usually meet to train for 2 consecutive days each month on a weekend, and we go to summer camp for 15 days annual training. Our officers and NCO's are required to devote additional time in the form of evening meetings, at least twice a month, to keep the administrative work moving.

Given this amount of time, what does the average battalion have to accomplish? Several activities are constants: individual weapons qualification, annual general inspections, battalion CPX or STAFFEX, annual physical fitness test, and civil disturbance training are all required.

A tank battalion must plan to conduct range firing at home station and Fort Dix to complete Tables I through V. Tables VI and VIIC will be fired and tactical training conducted at summer camp. The scouts and mortars have their own programs as prescribed by the appropriate ARTEP. An infantry battalion has to qualify soldiers on crew-served weapons and train to squad and platoon level ARTEP tasks.

Progress is measured in 3-year increments instead of the 1-year cycle used by most regular units, but in some units the strength turnover is so high that a commander is forced to go to an annual cycle. This can become a vicious annual cycle if the soldiers in a unit do not sense that they are making progress each year.

This is the challenge faced by every commander in the division—to make the most of every minute he has available to improve his unit so that people will want to be a part of it. Once he can get that cycle going he can, in my estimation, take great pride in himself for he has truly "put it all together."

How can he be helped? There are five programs for which I would like to suggest improvements.

Recruiting and Retention

The retention of individuals in a unit is a direct responsibility of the commander. It is his ability as a leader and trainer that will cause the people in a unit to respond and reenlist. A part-time soldier can be a tough man to convince if he isn't satisfied with what his outfit is doing. Our retention program starts the day the man or woman is enlisted. It works for us, for during the last quarter we achieved a 66.5% reenlistment rate.

The Readiness Report System

AR 220-1 is being changed to require a more objective evaluation of a unit's state of training. The change will be effective this summer, and will require a unit commander to assess the impact of several different areas of training readiness. The commander is asked for an assessment of the impact of availability of leaders, equipment, fuel, ammunition, funds, training areas, and time, as well as a judgment on the number of weeks he will need to complete training. While this will undoubtedly provide a more definitive report and will certainly assist in pinpointing problem areas, it will still be true that if a unit is rated C4 or C3 it will be seen as being at or near the bottom of the list in effectiveness.

According to a recent message from General Kroesen, a

unit commander who achieves a readiness rating equivalent to his ALO is doing his job and his unit has accomplished its training mission, but some of my units will not be able to climb out of the cellar of C4 because of low strength or other problems. While I do not seek to excuse or wish away the problem, I do want to suggest that the C4 rating itself could be made more useful in gauging a unit's capability if several factors about a unit were analyzed to determine whether a unit, even though rated C4, could still accomplish a limited mission. How many fully trained people does it have? What shape is the equipment in? How many leadership positions are filled? I think the answers to questions such as these should be used to form a picture of what a unit *can* do rather than assume that a C4 rating means that it can't do anything.

SQT

The SQT system is here to stay, and the impact was felt for the first time by the 50th Armored Division this year. We have followed the advice of the Active Army and have trained to the test, but the time available to do this has again been restrictive. While we support the philosophy of conducting training on the basis of the SQT, the Guard has yet to decide on how best to apply the results to our particular set of circumstances. Right now we feel that it is a very valuable training tool, but we aren't sure yet whether we can meet all of the high standards, in every case. Here again, the SQT may have to be analyzed in the premobilization versus postmobilization context. If modification were needed it could be done by limiting the number of tasks to be tested in a premobilization environment. Tasks not tested would have to be included in the unit postmobilization training plan.

Tank Gunnery

Much is being written on the subject of tank gunnery. The ability of a tank to survive and to carry the fight to the enemy depends upon the accuracy of its firepower. We are all well aware of the importance of well-trained tank crews, especially since the 1973 Arab-Israeli War. Because of the advanced state of the art, there was little room for mistakes and not many chances for a second round during that war.

The tankers in the 50th Armored are all well aware of this, and are working hard to find ways to increase their proficiency within the constraints I have mentioned earlier. The main problem for them is being able to measure their progress in terms that will provide them with a sense of accomplishment.

Qualification is the ultimate goal of every tank crew. For us, this is accomplished by firing Table VIIC, a subcaliber tank crew proficiency course. This type of course is the best way to train a crew because it requires them to work as a team, and this they must do if they are to win in combat. The crew must be drilled constantly in order to maintain proficiency and it is here that I have to state that, for us in the reserve components, proficiency means something different than it does in the Active Army. Proficiency to me means a thorough knowledge of the weapons system, and an ability to operate it correctly and safely. If this is done, the weapon will shoot accurately, but it may not shoot quickly. I submit that the ability to shoot accurately *and* quickly can only be achieved by an Active Army tank crew after many hours of drill, and that for us in the Reserve Components this can only be a very distant goal—distinct—but distant. This is where we need to rethink the problem. A crew that can't hope to reach a goal will not bother, but a crew that can will keep trying. Some means must be found to provide an interim goal for Reserve Component tank crews to strive for during their premobilization tank gunnery training.

I do not advocate a separate standard for Reserve Components when I speak of an interim goal. I want the same standard for them, but *after* mobilization. I support the efforts underway here at The Armor School to achieve a single standardized course of fire for tank gunnery. But, we think the standards ought to take into account the limitations on our ability to reach them. Tables I-V are good subcaliber tables. Table VI is a good service exercise for us. Table VIIC is a good exercise for the crew, but the qualification score is too high for premobilization training because it presupposes that the crew has been thoroughly drilled. We think this is where an adjustment needs to be made to allow a reserve component tank crew to achieve a realistic goal and be rewarded. We need to consider a premobilization qualification course in the context that we would be able to train on Tables VII and VIII after mobilization. In summary, it should be possible to declare a tank crew as qualified if they can take their tank down range on Table VIIC and hit their targets. The table itself is good and it saves ammunition, but we need to change the way it is scored to permit a new crew to get a feeling of accomplishment.

Subcaliber Gunnery

We in the New Jersey Guard are particularly interested in subcaliber gunnery training devices. The laser, the Brewster, Telfare, and inbore devices all have useful roles for us because of the diversity of training areas available to us. Some of our armories have outdoor subcaliber ranges where the Brewster with the *M-16* 22-caliber adapter can be used, but others are located in areas that preclude this and must rely on the laser device to accomplish their home-station gunnery training. Because of this, we would not like to see either of these devices phased out. The same can be said of the Telfare and Riley devices. We believe that each complements the other and provides needed flexibility.

I would very briefly like to report on an *M-114* remote control target that New Jersey has been developing along with Army Readiness Region (ARR) II. For some background, there is only one moving target range at Fort Dix for tank and antitank subcaliber firing. Meetings with Fort Dix, ARR II, and Readiness Region Dix have addressed this deficiency and the requirements for realistic moving target facilities have been programmed for future consideration. The cost of a new moving target facility and track bed has been estimated at $160,000. Funding for this requirement has not as yet been provided. Within the last 2 years, New Jersey has picked up 25 *M-114* armored reconnaissance vehicles to be used as hard targets at Fort Dix. Initial inspection indicated that some of these were in good condition and with some research and development could be modified for remote control. The cost of equipping each vehicle for remote operations was estimated at $3,000 plus. Fortunately, we attended a

range and target conference conducted by TRADOC in January 1977. During the conference an Operational Test and Evaluation Agency (OTEA) team outlined available vehicles currently being used to test weapons effects. Further coordination with this team revealed that a few complete systems for *M-114* vehicles were available for a long-term loan.

As a direct result of a great deal of effort, a remote control facility was completed and tested by December 1977. Major activities and support were as follows:

- OTEA provided two complete systems.
- ARR II provided funds to pay civilian technicians.
- Army Maintenance Office-New Jersey provided project officer, shops, tools, and technical assistance.
- ARR II provided additional funds for a track bed.
- New Jersey National Guard maintenance battalions upgraded two obsolete *M-114's* for the remote control project.
- Fort Dix aided in the design of the track bed and provided clearances for construction.

Does the One Army Concept work? *You better believe it.*

Premobilization versus Postmobilization Training Standards

What I have said so far about tank gunnery, SQT, and the readiness reporting system would seem to fly in the face of the One Army Concept. I want to say that the Army as a whole is made up of many diverse elements, and that I believe there is room for flexibility in setting training standards within the context of that concept. I do not advocate lowering standards, but I do believe they should be established in degrees of proficiency as a function of the time and resources available for their accomplishment.

The desire to be recognized, that is inherent in any unit, too often translates itself into a quest to be combat-ready even though that unit is in a premobilization environment. I think there is wasted energy when this occurs if all that a unit really needs to do is remain ready for mobilization and *further training*. The skills they should be perfecting in this situation are far different from those that would be required in combat. I believe we need to devise a two-stage standard that can be applied for all. The first stage would be for units in a premobilization status or in the newly activated status. The second should be additive to the first and should be the Active Army combat-ready standard, to be applied to Reserve Component units upon mobilization, depending upon their assigned authorized level of organization before mobilization. I think this is being accomplished now to some degree, using current systems of assigning priorities, but I think it needs to be developed further along the lines of General Kroesen's message, which was referred to earlier.

I would like to thank the Armor Center for inviting me to talk with you today. It has provided a forum for discussion as well as conjecture at a location guaranteed to provide a feeling of warmth to the armored community. Thank you very much!

ARMOR CONFERENCE

Tank Force Management

by Brigadier General Richard D. Lawrence, Ch, TFM

The mission of the TFMO is to optimize the combat potential of the Army's tank forces. Key words in describing how we accomplish that mission are: *identify, energize, organize, integrate,* and *coordinate*. With a great deal of input from the field, we try to identify tank-related problems and energize the right people to find timely solutions.

The bulk of the TFMO workload is concerned with pursuing new initiatives to improve the tank force and with implementing two major activities; tank management, including coordination of tank modernization, and the Army tank program.

On 1 March 1978 the new Career Management Field (CMF) 19 was implemented for Armor soldiers worldwide. Under this new CMF, each tanker and trooper is classified according to the tank model and specific crew position in which he is qualified.

Training Improvements

Training improvements parallel those described in the personnel area in that they all are designed to improve technical proficiency on specific armored vehicles. The old generalized approach has been replaced by a system that trains, and classifies, a crewman against requirements in a specific crew position on a specific model of tank.

To improve the proficiency of the key battlefield Armor leader—the tank commander—the Armor Center has initiated an improved 6-week tank commander's course—4 weeks of which is tied to the Basic NCO Courses and is packaged for export to the field. To date, no other MACOM's have initiated this program. All commands are being urged to do so by DA ODCSPER.

Finally, in keeping with system specific training for crewmen, similar discrete training is being planned for maintenance personnel.

We are a long way from completing our upgrade of the Armor training system. Fixing entry level training is a

solid first step. In the future, we must focus on our ability to conduct meaningful unit training. Initiatives like the national training center—and the implementation of realistic unit readiness standards—are examples of the issues we must deal with in the future.

Probably more in training than in any other tank subsystem we depend upon field input and feedback for guidance in initiating actions at DA level to improve armor readiness. I urge you to keep us pointed in the right direction.

Logistics

In the logistics area, the main thrust is toward establishment of an efficient peacetime system that is also a viable support structure in combat.

To make the Cavalry regiments more self-sustaining, a TOE for an organic support squadron is being developed. The support squadron concept has been approved by the Logistics Center and TOE's should be available for staffing at DA later this year. The support squadron will provide direct support supply, maintenance, transportation, medical, and administrative services to the regiment.

"We are a long way from completing our upgrade of the Armor training system."

The efficient combat replacement of tank and crew losses is a matter of deep concern to the entire Armor community. General Starry has directed that the Logistics and Administrative Centers conduct a coordinated review of weapon system replacement in wartime.

Significant progress has been made in two ammunition related issues—serviceability of existing stocks, and up-loading for combat. In the past there have been problems with the serviceability of the M-392 APDS and M-456 HEAT rounds. Engineering and testing of fixes has been completed and the renovation program will be finished next year for the M-392, and in FY81 for the M-456. Significant progress is being made in relocating and reconfiguring the stockpile of tank ammunition in Europe, and the tank up-loading program is currently ahead of schedule. In addition, the development of quickload facilities, wherein ammunition is stored by vehicle set instead of by round type, is progressing well.

Before leaving the logistics arena, I would like to elaborate on an issue that concerns me. All of the personnel, training, and new hardware initiatives in the world will not do us one bit of good unless we have a positive, supportive logistics sustaining capability. For too long, we have left these issues to the exclusive purview of the logistician. In Class III, V, and IX areas particularly, we have seen our wartime support capability cut back in the name of peacetime efficiencies, streamlined procedures, and leaner tail-to-teeth ratios.

This will continue until leaders from the field, who represent the teeth of our forces, become more vocal, present objective facts which support inadequate logistics support where it exists, and demand that the logistics system be responsive to your needs. I can tell you that key logisticians have not heard enough from you with specific facts to believe there is a critical problem. If you are not satisfied, and I do not think you are, you had better stand up and be counted.

Tank Training devices have long posed a serious problem to the Armor Community. Our efforts in the past have been fragmented, under funded, and without an overall strategy. In the past year, steps have been taken to make the Armor Center's training devices strategy a reality in terms of fielded, effective devices. We now have a fully chartered product manager for armor training devices who has established a development program for devices which we believe is responsive to user needs, and has been accepted and funded at DA level.

Now I would like to cover the new Army Tank Program in more detail. In April 1976, at the direction of the Chief of Staff, we undertook a comprehensive review of the Army Tank Program in order to create an integrated R&D and procurement plan for tanks which would adhere to affordable fiscal levels, yet remain responsive to the major threat.

XM-1—M-60A3 Tradeoff

For a number of reasons, we look upon Fiscal Year 1979 as a watershed year in the tank program. We do so because it is the first year in which direct trade-offs can be made in the number of XM-1's and M-60A3's to be built. The issue, then, of properly balancing the XM-1 and M-60A3 programs was the foremost consideration in our tank program review. That review focused on a single crucial objective: to provide XM-1's to our NATO dedicated units, in the largest number we can afford, at a much faster rate than previously planned. The objective thus presumes the imperative to modernize.

In past decades, America's first line of defense has been the United States Navy.

Today, and for the foreseeable future, our first line of defense rests on the United States Army in the central region of NATO.

And I think for our European allies the issue is even greater because those same positions represent not only their first, but their final line of defense.

The Army will execute its strategy of forward defense by employing the combat power of its corps. Having evaluated, by generic system category, the components of that combat capability, we have found that the tank provides the bulk of the Army's firepower—about 36 percent. Moreover, the cost of our tank forces amounts only to about 20 percent of the Army budget and all of our tank crews total only 2 percent of Army manpower. Thus, as a weapon system, the tank applies considerable combat leverage in the central battle. From this, we may properly infer that against an armor-heavy Warsaw Pact threat, the tank is in fact the Army's most important system.

We began our analysis by examining the status of our current production tank, the M-60A1, on the modern battlefield. Its status was not reassuring. We must assert that the threat to our tank force is increasing rapidly as the Soviets modernize their tank inventory. Moreover, the one advantage that we have traditionally held over the Soviets, that of tank-for-tank quality, is rapidly disappearing.

The threat to our tank force in the near- and midterm

centers on the current Soviet production tank, the T-72. After fielding the T-62 in 1961, the Soviets produced a number of prototypes prior to fielding the T-72 which is much more sophisticated than the T-62, and is very much a quality vehicle.

The T-72 mounts a 125-mm smoothbore gun which should provide added killing power over that of the 115-mm armament of the T-62. Intelligence indicates that the fire control of the T-72 is significantly more sophisticated than the T-62 sight. The T-72 has the first, full production engine change since the T-34 and probably also includes improvements in frontal armor protection. If the design is reliable, the addition of the automatic loader on the T-72 could increase its rate of fire. Probably the only area in which our M-60A1 enjoys a distinct advantage over the T-72 is in night fighting capability.

We have spent considerable time and money developing the M-60A3 and XM-1 tanks to assure we have the capability to counter a threat like the T-72.

Since an update of the XM-1 was featured in the May-June issue of ARMOR and an article on the M-60A3 appears in this issue, several paragraphs of General Lawrences's description of the vehicles have been deleted at this point. ED.

The M-60A3 represents what we can do in the near term to extend the useful life of our M-60A1 tank assets; and,the XM-1, for the next generation, is the best that technology has to offer for the long-term within a design-to-unit-cost goal.

We analytically evaluated the T-72, M-60A1, M-60A3 and XM-1 in force-on-force posture for several tactical scenarios. The analytic approach is based on computer combat simulations. Results show that, in terms of relative losses the operational characteristics of the T-72 make it a better tank than the M-60A1, which should be replaced as soon as possible, either by phaseout, or by upgrading to A3 configuration. The fielding of the T-72 temporarily ends our historical qualitative advantage in tanks.

The results of the analysis also indicate that we can expect a big payoff from our research, development, and procurement investment with both the M-60A3 and XM-1. By fielding the M-60A3 immediately, we can regain the quality edge we have lost to the T-72 on a tank-for-tank basis. A3 production began in February at a low initial rate and will be fielded soon in NATO. The M-60A3 is the near-term solution to give our tankers an interim edge until we provide them with the XM-1. We plan to procure 3,676 M-60A3's by FY82 to fill that near-term gap.

The XM-1 data clearly justify our expectations that it will be the best tank in the world. It will give us the dramatic increase in quality which we need to counter the numerical superiority of Warsaw Pact Forces. The XM-1 is on schedule, within costs, and is meeting its performance milestones. We plan to field 7,058 XM-1's in FY87 to support our high priority NATO oriented force package. That schedule achieves the New Tank Program's primary objective to field the XM-1 as rapidly as possible in numbers constrained only by force structure and affordability.

The XM-1 gun issue is a critical recent development in our program. I will relate to it here because it impacts on the overall tank program.

The primary findings in the XM-1 main armament decision process are twofold. First, the 105-mm gun with improved ammunition is adequate against any currently postulated threat. The gun evaluation reaffirmed our belief that the XM-1, as currently configured, will be the best tank in the world.

The second finding in the decision process was that it is prudent to complete U.S. development and testing of the German 120-mm gun. That development effort will allow us to make an intelligent production decision on the 120-mm gun. The XM-1 project manager has structured a development program which will lead to a production decision in FY81. Given a go-ahead decision, the first XM-1/120-mm tank could be fielded in '84.

We feel the FY81/84 milestones represent, from a risk standpoint, a prudent program and I want to make it clear that the Army is behind the 120-mm gun decision, and will move as rapidly as prudence, in risk and cost, will allow to implement the new program.

To summarize, let me compare our new program to what we had planned in the past. Under old planning, we combined a large M-60A3 program with a relatively small buy of XM-1's which included converting the entire M-60A1 fleet to the A3 configuration. This was expensive and provided only marginal gains over current threat systems. The buy of 3,312 XM-1's over a 10-year period was totally inadequate to support future force structure needs.

"The XM-1 data clearly justify our expectations that it will be the best tank in the world."

The new program gives top priority to fielding the XM-1 as rapidly as possible in the largest numbers affordable.

The Secretary of the Army approved the new Army Tank Program on 10 August last year and cited it as the Army's top priority readiness initiative. Since then, OSD has also approved the program and we have actively presented the program to the Congress in our defense of the FY79 budget request. To date, key committees have indicated support for the new tank program.

The Modernization Effort

The tank program and the surge of equipment modernization during the next 5 to 10 years, is going to have a profound impact on the way the Army does its business. It affects all of us.

On an Army-wide basis, we are about to embark on a modernization effort of unparalleled magnitude. In the next 5 years, virtually every major system the Army has in development will hit the field. The dimensions are staggering. Between now and 1986, over 8,000 M-60A3's and XM-1's will be sent to Europe. We will be eliminating the M-551 from the inventory and redistributing the M-60A1. This will cause every battalion and squadron in Germany to change out equipment at least twice: first from M-60A1 to M-60A3, then A3 to XM-1. And tanks represent only two of 44 new systems to be introduced between now and 1990.

The impact of this modernization can give us a tremendous increase in capability or it can become a readiness disaster through the lack of adequate planning and forceful, coordinated action. The result will, in some way,

depend upon everyone in Armor because modernization is everyone's business; not just DARCOM's or the PM's.

Reliance on time honored answers to questions on introduction, training, employment, organization. and support may very well not work.

First, we must plan the time-phased distribution schedule of new tanks down to battalion level. This involves balancing production schedules and priorities with the capability of FORSCOM, TRADOC, and USAREUR to absorb the new tanks. The full impact of the new equipment on the training and support systems of the receiving units must be forecast and planned for; an exercise that involves both field and staff activities.

To do these things, we cannot just rely on business as usual staffing procedures. To cope with the action, my office convened the first worldwide conference on tank modernization planning earlier this month. It brought together representative and appropriate expertise from all staffs and major commands who will be concerned with force modernization. We will meet periodically to assure that the critical issues of distribution and new equipment training and support are effectively coordinated.

However, after we successfully complete the planning phase, we are less than half-way home. Without Armor's violent execution, we are in trouble. The condition of our old tanks during equipment turn-in is critical. If they are in poor shape, we will quickly generate another maintenance backlog problem in Europe that could bog down the entire modernization effort. If our PLL and ASL stocks are not in order during changeover of support, it will create chaos in the supply system and significantly reduce our readiness posture. Finally, train-up on the new equipment must be effectively conducted within current training facilities and funding constraints.

To accomplish this modernization and reap the full benefit to be gained from our new tanks, each of you, where called upon, must involve himself in the process. Moreover, I believe each MACOM must form and dedicate an element to the tasks. I see a need to establish force modernization offices to serve each MACOM as energizers and coordinators for this critical program. These offices would be responsible for ensuring that adequate modernization plans are developed and executed, and not just for tanks, but for every new major weapon system to be introduced in the next several years. They would serve as the focal point for both internal command and external modernization actions. Force modernization offices would accomplish, on a full-time basis, the day-to-day burden of planning for the introduction of new equipment leaving the regular staff free to concentrate on routine functions that will continue undiminished.

The magnitude of the modernization challenge dictates that we intensively manage this problem. We cannot afford to come up short.

In summary, tank forces management, which really embraces each of us, must focus on the common goal of fielding a modern tank force capable of meeting an ever increasing threat. That force must be efficiently managed in an environment of constrained resources and effectively led from top to bottom. As managers, our work is cut out for us. And in typical Armor style, together we will accomplish the mission.

ARMOR CONFERENCE

Advanced Scout Helicopters

by Colonel George W. Shallcross, USAAVNC

A review of the Army's prospective aviation fleet for the 1980's reveals an impressive modern helicopter fleet that will be available to support our tactical forces. This briefing will focus on one part of that fleet—the Advanced Scout Helicopter (ASH).

In early 1970, recognition of changing tactics and doctrine required to support conflicts within a mid- to high-intensity battlefield environment spurred awareness that our helicopter fleet needed updating, especially the observation helicopter. Subsequent studies in the early 1970's produced a Required Operational Capability (ROC) for a new scout helicopter. This ROC was approved and the need verified by the Department of the Army in January 1974. The Defense System Acquisition Review Council (DSARC) reviewed the Army's requirement for an ASH in September 1975, approved the need, and authorized initiation of a development program. The DSARC stipulated another review must be conducted to rule on recommendations for hardware development. The new DSARC convened in March 1976 and ruled in favor of an ASH development calling for:

- A competitive new airframe development which would employ a single T-700 engine.
- Selection of a competitive Target Acquisition and Designation System (TADS) and Pilots Night Vision System (PNVS) which would have common application to ASH and the *AH-64*.
- Optional provisions for Light Attack Helicopter and Light Utility Helicopter prototypes.

Congressional action of the House Armed Services Committee and Senate Armed Services Committee

(HASC/SASC) Joint Committee in September 1976 deleted Fiscal Year 77 funds that were required to get the ASH program underway. Loss of these funds delayed the ASH program for 2 years and closed the DARCOM ASH Project Manager's Office. The major areas of concern during the HASC/SASC deliberation were the survivability of the ASH in the combat environment in which it must operate. In July 1977, the TRADOC System Manager (TSM) for ASH was established at Fort Rucker, Ala. This office was chartered with the responsibility to represent the user in all scout matters.

Equipment For All Missions

The next subject is mission equipment for worldwide day and night operations. The ASH will consistently use the terrain for cover and operate within the range of the *ZSU-23-4*. This means the scout must have sufficient power to maneuver at low level, hover, and acquire targets using the mast-mounted (MMS) sight. It must also have sufficient agility to evade the *ZSU-23-4* when caught in the open in the effective range of the gun. The need for power and agility is determined by the above maneuvers and by altitude and temperature conditions.

The basic tactical maneuver of the scout is hovering out of ground effect just behind the trees or ridge lines. This maneuver is required for reconnaissance, surveillance, target acquisition, and designation missions. The scout must be able to operate worldwide where the Army may be required to conduct operations.

The requirement for a target acquisition and designation system, pilot night vision system, and the mast-mounted sight have top priority for the scout. Many of the scout missions will be accomplished at night and in adverse weather, and the aircraft must be equipped to satisfy all missions including employment of Precision Guided Munitions (PGM). The TADS/PNVS/MMS represent about one-half the weight and cost of the total equipment package.

Other equipment required is for day and night navigation, secure communication, and survivability. The PNVS is required to fly the scout at night nap-of-the-earth (NOE). It is independent of the night target acquisition and mast-mounted sight systems. The navigation equipment includes a self-contained low-level navigation system, a projected map display, instrumentation, and a radar altimeter. The communication equipment includes three tactical radios:

State-of-the-art countermeasure protection against visual, aural, infrared, and electronic systems will be integrally incorporated into the basic design of the ASH.

The Requirement

To be successful, Army Aviation must be able to quickly deploy state-of-the-art aircraft designed to meet mission requirements in high technology battles. The following scenario will define the requirement for the advanced scout helicopter. The scout helicopter is the common denominator throughout the battle—from identification of the enemy's major thrust through his final destruction.

We can envision enemy forces massing across a political border. Friendly forces have been alerted and are hurriedly preparing to move to their general deployment positions.

Covering force units have arrived at their specific location and are awaiting signs of the enemy. The scouts are conducting a detailed area reconnaissance.

The Users

Massive enemy artillery firing begins, followed shortly by smoke. The scout observes and reports every lead element rolling through the smoke and crossing the border. At this point in the scenario we will begin discussion of the four users of the ASH. Let's first consider air cavalry operations. The ground commander deploys his air cavalry units in a covering force operation to determine location of the enemy's major thrust. The cavalry is engaging the enemy and forcing him to reveal his intentions. The enemy is concentrating his force to breach what he believes to be the forward edge of the battle area.

Having accomplished a major task of forcing the enemy to deploy, the air cavalry scouts begin screening the exposed flanks, covering large amounts of real estate, and making sure the enemy does not use the lightly defended flank area for another attack route. Scouts are providing an important human link to the ground commander in the screening and covering force operations. Aerial FO's also fly in the ASH and have access to the sophisticated target location equipment and laser designators for cannon-launched guided projectiles. This fast, initial firepower response to the enemy attack is the first step in building added coverage and sustained firepower required to stop the enemy.

The third user of the scout is the attack helicopter (AH) company which is composed of 3 attack teams. We will focus on the scouts of the team. The scouts are the eyes on the battlefield, locating prime targets for destruction, enabling the AH company commander to concentrate his *AH-64's* for maximum killing power and control their use for maximum effectiveness. The leader of the attack helicopter team is located in the scout aircraft and is responsible for coordinating the battle with the ground commander. He must insure positive intervisibility while managing supporting fires delivered from or controlled by aircraft.

Air Force forward air controllers are the fourth of the major users that have a vital requirement of the ASH. Their unique responsibilities require responsive mobility independent of another scout. Collocation with the ground controller would not be complementary and would degrade the mission of both. The ground controller is the close air support (CAS) pilot's link to the battlefield. Through him, the CAS pilot is able to form a mental picture of the battlefield before he actually arrives. After the ground commander requests close air support, the ground controller informs the team leader of his CAS team's location and intentions. He remains in close contact with his CAS team and provides support by designating targets for destruction.

The conflict has now extended into total darkness with no loss of killing effectiveness, an action impossible before the availability of sophisticated night vision equipment. The scenario ends with the enemy being driven back

and with our forces suffering minimum losses. Advanced technology equipment, aircraft, and new night fighting tactical concepts make this result possible.

We have explored requirements for the ASH, identified four users of the aircraft, and showed the scout as the common denominator throughout the battle.

In summary, no other aircraft presently available can effectively perform these missions and survive.

ARMOR CONFERENCE

Training Devices

by Major Douglas J. Richardson, USAARMC

In our attempt to solve the total training problem, we are developing a class of devices which are interoperable with any and all of the tank systems. These are the nonsystems devices, and they complement the systems-specific devices to produce a comprehensive, responsive, quality training system designed to train up to higher standards and to sustain the proficiency demanded by those standards. The total development effort strives for complete integration of devices into training, and for maximum interoperability and interdependence among the devices themselves.

The nonsystems devices, listed in order of relative priority, are: the Armor Research Facility, the Armor Remoted Target System, the Tank Weapon Gunnery Simulation System, and the Eye-Safe Simulated Laser Rangefinder.

ARETS

The Armor Remoted Target System (ARETS) is our goal for tomorrow. ARETS is an advanced target technology which will go far beyond the realism available today. It will be capable of providing challenging training under simulated battle conditions in tactical gunnery including target acquisition, engagement, and movement against massed enemy formations portraying Threat scenarios.

A fundamental component of ARETS will be reliable, full- and half-scale, stationary target mechanisms which will display a realistic target complete with thermal signature. An array of these programable mechanisms can be sequenced to create the illusion of enemy tactical movement or evasive techniques. A tank crew or platoon encountering this array will be faced with an "enemy" which can initiate an attack by direct fire or can return fire through the use of a hostile fire simulator. This "enemy" will also explode and burn, through the use of a visual hit simulator, if killed. The "enemy" however, can be programmed to simulate receiving disabling but nonlethal hits, in which case it remains in the up position until hit again.

A formation of these targets will present the gunnery challenges that we lack today, such as the engagement of evasive, "intelligent" targets which use terrain for cover and concealment. These targets will present the difficult angles of tank-to-tank engagement and will require total crew proficiency to detect and destroy the simulated enemy closing upon them.

The moving target will be controlled by an RF grid system and will be programable. The production model will require no berms for protection, but will require the use of frangible main gain ammunition, which is also under development.

The control unit of the target system will be capable of automatic scoring and recording so that accurate and complete evaluation can be accomplished at the conclusion of a simulated battle. ARETS will be in the inventory in late 1982, when it will become the standard range system to support both tank and antitank weapons training and qualification.

TWGSS

Tank Weapons Gunnery Simulation System (TWGSS) is a tank gunnery proficiency trainer that uses a tank, mounting TWGSS hardware, as well as cooperative targets, to realistically simulate the total gunnery problem. The system will permit gunnery training with or without range supervision and with or without other tank crews. The system will be interoperable with the ARETS or another tank equipped with a TWGSS device.

The TWGSS will operate by electro/optical technology combined with computers which will integrate the tank main gun weapon system with accurate, real-time simulation to provide on-vehicle training in the full range of battle engagments. It will be used for basic gunnery, including acquisition and engagement, and for adjustment of fire upon stationary and moving targets from a stationary or moving tank.

TWGSS will calculate the exterior ballistics and impact points of simulated main gun rounds from stored trajectory data, the range determined by the crew, the relative vehicle/target velocities, cant angle, and the accuracy of the weapon lay, including lead. A simulated tracer burn and shell burst will be displayed in real-time in both the gunner's and tank commander's primary and secondary day, night and, ultimately, thermal sight. Obscuration at firing, sight displacement, and target effects will also be displayed. In order for the system to display a target hit, all crew inputs must be correct.

TWGSS is ideal for platoon, company, and battalion

sustainment gunnery training and for adding accurate gunnery to force-on-force exercises.

MILES

The Multiple Integrated Laser Engagement System (MILES), being of laser technology, uses line of sight gunnery, and does not require inputs such as lead, angle, or range. Thus, it does not require the accuracy or completeness of real gunnery. Using TWGSS to simulate accurate main gun tactical gunnery and MILES to simulate the other battlefield weapons, a very effective and complete engagement simulation system is realized. TWGSS will also have an audio and visual record and playback capability, to record all exchanges, as well as the gunner's sight picture.

ESSLR

The Eye-Safe Simulated Laser Rangefinder (ESSLR), system will provide the crew the capability to train in the use of the operational rangefinder without laser eye hazard and will allow the crew to conduct standardized, repetitive training in lasing and coping with the problem of multiple returns.

There are several techniques being considered to simulate the use of the laser rangefinder. One such technique is to attenuate the power of the operational laser rangefinder and enhance targets and terrain features using retroreflective materials to cause multiple returns. This system will be interoperable with TWGSS and MILES and will be available in 1984.

The annual gunnery program during the period 1982 to 1985 will be in a period of transition—new devices, new tanks — new programs, and will reach the field during this period.

U-COFT

Collective sustainment will be accomplished primarily by using the scaled range system that is currently being developed, but we will be transitioning during this time into broader reliance on full simulation devices such as the Unit Conduct of Fire Trainer (U-COFT) to provide training up to crew level. By 1985 the U-COFT should be in full use throughout the force. There will be annual qualification and off-season main gun firing. The ARTEP evaluation will be conducted using MILES. The contribution of the nonsystem devices in this time frame is made solely by the ARETS. It will be used for qualification and/or during sustainment training using subcaliber or dry firing on scaled ranges.

During the period 1986-1990, the remainder of the nonsystems devices will be in full use and will cause significant changes in our training. The ESSLR will be used for individual training in lasing and, when teamed up with the TWGSS and the U-COFT, will replace platoon scaled-range firing. Additionally, TWGSS and ESSLR will be used in combined arms training and ARTEP evaluations. ARETS will continue to be used as before.

Research

At Fort Knox, we are developing a one-of-a-kind research facility due in 1980—the Armor Research Facility. It will be a full-mission, high-fidelity research simulator for a complete tank crew. It will have the interior configuration of the *XM-1* tank, will provide proper functioning of all controls, and the crew station will be mounted on a fully interactive motion platform. All crew stations will have the same visual equipment capability that is present in the tank. Views of exterior scenes through various tank vision and sighting devices, as well as out-of-the-hatch viewing capability will be provided and will present a wide variety of tactical, engagement, and maneuver challenges to the tank crew. The visual system will allow full freedom of speed and direction within the simulated gaming area. The visual presentation of the simulated battlefield will be as realistic as possible. The visual system will have multiple target arrays, hostile targets which can fire back, and battlefield obscuration. Monitoring systems will provide printout and playback for detailed analysis of soldier performance on an individual and crew member basis. This system will be able to fully simulate the dynamics of tank crewmen performing any and all tasks under realistic conditions.

A significant feature of the laboratory will be the ability to turn on and off various cues and functions of the simulation system. This will assist in evaluating which cues, in terms of the environmental fidelities of the visual, target engagement, motion, and communication and auditory systems, and which functions, in terms of gunnery controls and driver controls, are necessary, and to what degree, to train crew members in either the individual or full crew training environments. For control and evaluation purposes, the researcher will have the capability of selecting the engagement parameters and target scenes, and of injecting malfunctions. This feature is designed to test the utility of the various functions.

Interface

In addition to providing the means for conducting studies which will result in better tank training devices, the facility should also yield data which will suggest some required features or modifications to operational equipment—the man-to-machine interface. These modifications would be those to the crew station which would optimize the functioning of the man-to-machine system. Positioning of controls and equipment will be varied to determine the most efficient configuration.

The research facility will contribute to more effective crew training for years to come, by arriving at defensible and quantifiable parameters which characterize crew training and training device requirements. This facility will permit the Armor Center to become the fountainhead of Armor and training research, technology, and development.

Crew qualification using the tank will be replaced by the combat mission simulator, further reducing the number of main gun rounds required for annual qualification. If these simulators are issued in sufficient numbers, then crew exercises/qualification in the full crew environment can be accomplished several times a year. Such a simulator could replace all individual and crew training.

The devices just discussed form a responsive, complete, quality, and valuable training system. It should be apparent that they are designed to provide us the capability to improve readiness while conserving resources and standardizing training. The movement toward the use of simulation may be the only answer to the problem of sustaining proficiency in an environment of shrinking resources. ▲

Pages from the Past

SHORT ENLISTMENTS

On inspection of the troops which constitute our army today and the records pertaining to them, the most noticeable feature which impresses one is the youthfulness of the men and the general absence of the old soldier. The short term of enlistment makes it necessary that from honorable discharges alone, nearly one-third of the Army shall always consist of recruits of less than one year's service, and when death and desertion are taken into consideration this proportion is very materially increased. The factor of desertion is a very serious one in the problem of keeping our personnel up to its proper strength, and I think it is a fact that more than one-third of our deserters are men of less than three month's service. The cost to the government of these men who have never rendered it a single day's trained service is correspondingly great, and by providing the material for desertion is worse than an absolute waste of money.

The Cavalry Journal
July 1905

A NATIONAL MENACE

When a nation situated as is ours, beyond the danger of immediate attack, adopts a military policy to maintain but a small regular establishment, and to depend upon its citizen soldiery, either as militia or volunteers, such policy is not open to criticism. But when a nation with such a policy fails to adequately provide for organizing, arming, and disciplining its citizen soldiery in a manner making it available in times of national crisis, such a policy becomes a national menace and invites the destruction of the very liberties it is supposed to maintain.

The Cavalry Journal
July 1904

AN UNNECESSARY EXPENSE

A hundred years of experience has been necessary to dispel the fallacies that have attended the popular conception of what constitutes a free state, and to teach the nation that armies cannot be instantly created by calling together men from their plows and workshops, and putting into their hands weapons they may have never seen before.

In the early history of our government it appears to have been the intention of Congress to entirely dispense with regularly trained troops, and to depend wholly upon militia called out as the emergency arose. At the same time it failed to provide measures for making the militia an efficient force capable of taking the field when called upon. The result has been disaster, disgrace, and an unnecessary expense of blood and treasure.

The Cavalry Journal
July 1904

OUR CAVALRY

It is a very expensive experiment in men . . . and money, to use volunteers for cavalry duty in time of war. Volunteer cavalry may be of great assistance. At the best it is only mounted infantry, and can not take the place of well organized cavalry. In order to have good cavalry when a war breaks out, it is necessary to keep it up in time of peace. It is not possible to organize it on the outbreak of war. Hence its proportion in time of peace should be large. When war breaks out, well trained infantry is a necessity, but raw recruits can be much sooner drilled into shape for infantry than they can for cavalry.

The Cavalry Journal
October 1904

Be Seen—Hit—Killed

by Captain Arthur B. Alphin

Recently the professional soldier has been beset by the loud and insistant calling of those who maintain that technology is radically and irrevocably changing the nature of war itself. The "be seen, be hit, be killed" formula for battles is treated as a revolution in war and is burned upon the brains of officers and noncommissioned officers alike. Using "comparative data" from World War II and the October War, most manuals and instructors emphasize the be-seen-hit-killed statement as something leading to revolutionary tactics for future conflicts. Perhaps we have mistakenly become entranced by the absolutes of an unsupported tactical cliche.

Reams of copy have been written about the October War. I'll not belabor the point, but I think that it is now accepted by all that the Egyptians organized a defense in depth, employed a number of different types of weapons systems, and wreaked havoc upon a force of tanks advancing across open terrain. The world was stunned, time stood still, the Israelis recovered, and the assesor-revisionists swooped in to make their analyses. Revolutionary? No, quite the contrary, fairly ordinary. Perhaps a walk back through history will help us put the "be seen, be hit, be killed" cliche in perspective.

Immediately prior to the Operation Crusader battle in North Africa in 1941, Major General W. "Strafer" Gott told his troops, "No commander can go far wrong if he places his tank within range of the enemy." The British then sallied forth in tanks armed with 37-mm, 2-pounder, and short-tube 75-mm guns; all of which had effective ranges of 500 to 1,000 meters. Facing them, the Germans had tanks of roughly similar capabilities and a number of 88-mm antiaircraft guns. When employed in the ground role, the "88" had an effective range in the neighborhood of 1,500 to 2,000 meters, and each crew was issued a hand-held rangefinder with a 4-foot base chord to assist them in firing against ground targets. Although the battle was decided by a multitude of other factors, the opening phases saw a British 22d Armored Division lose 128 of 158 tanks while the 7th Armored Division lost 129 of 129.

Earlier in history, in 1781, the Americans in South Carolina, under General Daniel Morgan, prepared to fight the British under Colonel Banastre Tarleton. Although Morgan had the numerical edge (1,400 to 1,100) his force was at a disadvantage in training and experience. Additionally, he had a hodgepodge of weapons including some 300 rifles and 1,000 muskets with only approximately half of the latter fitted with bayonets. Selecting his ground near Cowpens, Morgan organized his forces in three ranks with a skirmish line of riflemen up front, unsteady militia in the middle, and the Continental Line in the rear. His reserve consisted of 115 mounted men plus the two front ranks *after* they fired and withdrew on predesignated routes behind the Continental Line. Battle was joined; the British broke on the Line assisted by flank pressure from Morgan's reserves and lost 100 dead, 229 wounded, and 600 missing. Not a bad performance considering Morgan's loss of 12 dead and 60 wounded.

In another look at history, the battle of Crecy, fought between the English and French during the Hundred Years War of the 14th and 15th centuries, stands out as an example of an outnumbered defender repelling an attacker by employing sound tactics. When the forces of Edward III of England began ravaging northern France in 1346, the French, with 14,000 men under Philip VI, moved to meet them. The armies collided at Crecy where Edward placed his 10,000 men in a defensive posture. Tying his defense to natural obstacles, Edward organized in depth with units of archers interspersed with dismounted men-at-arms. Sharpened stakes and other barriers were placed in front while a mounted reserve backed the entire line. Generally unknown today, Philip had a force of some 4,000 Genoese cross-bowmen which he advanced to

within range of the English. Coming away a decided second best in an exchange of fire, the cross-bowmen fell back. The French mailed horsemen, anxious to get in the fray, rode over their own cross-bowmen and charged the English. By nightfall Philip had lost 4,000 dead to the English longbow and withdrew.

Nor is the combined arms concept a tactical innovation. Upon formation of the First Triumvirate in Rome in 53 B.C., Crassus sailed for his area of influence with his Army. Arriving in Mesopotamia, he met Surenas and the Parthian army at Carrhae. Skillfully blending his horse archers, who could out-range the Roman javelin, with other troops, Surenas slew 10,000 Romans. When the Roman retreat collapsed, Surenas captured and executed Crassus and all but a few thousand of the Roman Army.

And when we examine the Roman Legion which existed for some 700 years, we find that although it went through a number of evolutionary changes, certain tactical precepts were timeless. As organized during the period 300 to 200 B.C., it was called the Consular Legion and consisted of 4,500 men. Soldiers were segregated by age as *Velites* (young, light infantry), *Hastati* (young, heavy infantry), *Principes* (veterans), and *Triari* (older veterans). The Legion was formed in three ranks with 10 *maniples* per rank. *Hastati* and *Principes* formed the first and second ranks respectively in *maniples* of 120 men each. The *Triari* made up the third rank in *maniples* of 60. *Velites* totaling 1,200 formed in the front, rear, or gaps between *maniples*, while cavalry numbering 300 formed as required. It is obvious that this formation provides defense and offense in depth. *Velites* were armed with javelins and slings which provided missile power. Other Legionaires carried javelins, but depended on the 5-foot spear *(pilum)* and 18-inch sword *(gladius)* as thrusting weapons. As the Legion evolved, missile power was increased (especially by Caesar, who added catapults) and *maniples* changed in size and number, but the basic ideas of depth and flexibility remained.

What then can be concluded from this brief study of historical battles? For one thing, sweeping pronouncements cannot be justified by the results of a single engagement. Crecy is billed as the end of the armored knight, but that is as falacious as saying Carrhae was the end of infantry. The concept of body armor not only survived Crecy but is enjoying a resurgence. Horses and mounted units lived until the advent of the internal combustion engine. Crecy did illustrate, as had been done before and was done after, that dogmatic up-the-middle employment of the armored horseman did not guarantee victory.

Another conclusion is that claims that the antitank guided missile (ATGM) will revolutionize warfare are as overdone as similar claims for the longbow. As one looks at the continual evolutionary cycle between armor and armor penetrators, only one truly revolutionary weapon emerges. For thousands of years, man's armor (skull cap, leather, etc.) was basically proof against the weapons of the day. Fighters had to be careful that they did not break their weapons on enemy armor. Then, about 1500 B.C., the socketed axe appeared. With the haft inserted and wedged into the head instead of lashed to it, a soldier could use all his might, penetrate armor, kill his enemy, and withdraw his weapon in one piece to continue the fight. This was indeed revolutionary and started the first of many succeeding armor versus armor-penetrator cycles.

Since then, nothing much has really changed. Modern man may be a few inches taller, Schick may love his face and Tums may sooth his stomach when he leaves the mess hall, but he is essentially the same warrior he was 10,000 years ago. By the same token, weapons don't really change. They always have and always will be designed to penetrate armor, clothing, and skin to destroy what is inside. The ranges may change, but the purpose, and the relation of man to weapon never changes.

What is the difference between the October War where the ATGM outranged the tank and Operation Crusader where the German "88" did the same? What is the difference between these battles and those of Crecy and Carrhae where the bow outranged the javelin, lance, and sword? One could always *be seen, hit, and killed;* the ranges change, but the 3,000 meters of the ATGM should certainly be less of a shock to us than the 250 meters of the longbow was to Philip VI.

Perhaps there are some common factors in all this. Is there much difference between the organization of the Legion, Morgan at Cowpens, or the current threat? There hardly seems to be—it could be that organization is a common factor or thread found in warfare through the ages.

It is also apparent that one other thread entwines its way through all of the historical examples above, and that is leadership. The leaders in all of the battles we have discussed analyzed the mission, enemy, terrain, and troops available; blended men and weapons into their organization; multiplied its effectiveness by the use of terrain, where appropriate, and won. That is our job today. We must realize that we are not unique. Our questions on what to do with tanks and ATGM's are little different from the questions of Caesar's *centurions* concerning *gladius*, *pilum*, javelins, and catapults.

These questions are best answered now, as they were then, through the discussion and testing of ideas by the men who will have to execute future war plans. As we do so, we must also remember that somewhere, sometime before, a leader was presented with similar problems of terrain and man-weapon relationships. It is up to us as leaders to drop the sweeping pronouncements of "revolution" and get about the basics of the job—analysis, organization, and execution.

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.

Reliability Centered Armor Maintenance

by Captain
Donald B. Skipper

The expected force ratios on the midintensity battlefield demand maximum availability of critical weapons systems. Current maintenance policies and procedures will, in some cases, preclude us from optimizing our combat potential in Armor units. Major emphasis is now being placed on ways to get more reliability and availability from our current and future

Maintenance Processes for RCM Strategy

Hard-Time Limits
- Maximum interval for performing scheduled maintenance programs, including component change.
- Based upon quantified control parameters.

On-condition Inspections
- Scheduled inspections on a regular basis to determine the condition of an item.

Condition Monitoring
- Items have neither hard-time nor on-condition maintenance requirements.
- They are monitored for operation and are replaced only upon failures.

Table 1

armored vehicles. One program that will go a long way in assisting us in improving reliability and availability is Reliability Centered Maintenance (RCM).

RCM is a disciplined procedure of determining and conducting equipment maintenance tasks. When consistently applied during development and after deployment of the equipment, RCM will retain equipment in its originally designed safe and reliable condition with minimum maintenance burden. RCM concepts were developed by the commercial airline industry to provide for more efficient and cost effective maintenance programs. The success of RCM in the airline industry and elements of our space program led to a Department of the Army decision in 1976 to apply RCM concepts to all Army equipment.

The overall objectives of the Army's RCM program are to reduce the steadily rising costs of maintenance, increase the reliability of equipment, increase the availability of critical weapons systems, and insure the continued safe performance of these weapons systems.

RCM is based on the concept that maintenance cannot improve upon the safety or reliability that is already built into the hardware's design. A good maintenance program can only preserve those characteristics. RCM will eliminate many time-honored Armor maintenance practices and procedures that have done nothing more than increase costs without increasing the safety or reliability of our tanks. RCM is a logical and valid response to time-consuming and wasteful maintenance practices being conducted in a time of ever-increasing maintenance costs. Reliability Centered Maintenance in Armor and Cavalry units will be accomplished through the logical selection of appropriate maintenance processes such as:

- Monitoring condition during operation
- Scheduling periodic inspection
- Using hard-time or fixed-frequency replacement.

Table 1 describes these maintenance processes for RCM strategy.

Many aspects of RCM have already been implemented in existing Army weapons systems. The Missile Readiness Command has developed certified rounds such as the improved *Hawk, Dragon* , and TOW which are not tested or maintained by operating personnel, are not overhauled, and still maintain high reliability. The Troop Support and Aviation Material Readiness Command has also adopted RCM, and as a result, aviation system maintenance costs have been reduced without any decrease in aviation system reliability or safety. On-condition maintenance, phased maintenance, and three-level maintenance are examples of RCM aviation maintenance programs that are being put into practice with currently fielded aircraft and aviation units.

Decision Logic

RCM concepts will have a great impact on the way we conduct maintenance of our Armor and Cavalry vehicles. The decision logic for RCM strategy is as shown in table 2. This decision logic will lead to a more logical and cost-effective selection of the appropriate maintenance option and represents a good approach to the reduction of scheduled maintenance inspections.

The use of an RCM-type computer modeling technique will be a screening device for component evaluation which will lead to one of the three maintenance processes:

- Replace at a hard-time limit
- Replace at a fixed frequency
- Perform on-condition scheduled inspections.

On-condition scheduled inspections are used to determine when a component should be removed prior to failure, or to monitor the condition of a component for replacement only after it has failed.

The use of this new RCM decision logic should also indicate when a redesign of a component for better reliability or diagnostic capability is indicated. An example of hard-time replacement is a tank gun tube which is replaced at a time determined by the number of equivalent full-charge rounds. The Army oil analysis program provides an example of on-condition maintenance. Results of oil analysis indicate the condition of vehicle engines and critical components and dictate necessary maintenance. In the last RCM category, condition monitoring, most Army electronic

materiel is designated for repair or overhaul only after failure of the component or end item.

Overhaul Criteria

How does RCM affect Armor and Cavalry weapons systems maintenance programs? The initial impact of RCM on the Armor community will be in the area of selection of tank candidates for depot overhaul. On 1 October 1977, a pilot interim on-condition maintenance policy for CONUS based *M-60A1* tanks began. Under the interim policy, mileage criteria currently specified in AR 750-1 will no longer be used for selection of depot overhaul candidates. All *M-60A1* tanks not meeting other criteria specified in AR 750-1 must be evaluated in accordance with an Estimated Cost of Repair Technical Inspection (ECR-TI). This ECR-TI will eventually be replaced by vehicle condition evaluation guides (VCE) to determine tank eligibility for overhaul. Normally, *M-60A1* tanks will be evaluated after 5,000 miles of operation since manufacture or last overhaul. For selected tanks, this evaluation may be performed prior to reaching the 5,000 mile interval when requested by using units. Initial evaluation of the *M-60A1* family of tanks at the 5,000 mile threshold should identify all of the vehicles requiring overhaul. As more data becomes available from VCE's, adjustments to the inspection mileage threshold may be made. As a goal, for both technical and management reasons, it is desirable to first evaluate a vehicle at least 2 years before it should require overhaul. With 2 or 3 years of experience gained with the on-condition maintenance system, it should be possible to predict, after the first evaluation, in which budget year an individual tank will require overhaul. Also, if experience indicates that conditions of usage vary markedly in certain locations, due to unique terrain, soil composition, or mission, a selectively different initial inspection criterion could be applied to each location.

Using the VCE as a guide, an evaluation team will inspect and rate those vehicles meeting the mileage requirements. The results of the evaluation for each vehicle will then be recorded and forwarded to the Tank-Automotive Materiel Readiness Command (TARCOM) for scoring, analysis, and final selection of depot overhaul candidates. Upon the determination as to whether a tank qualifies for overhaul, the owning unit will be notified by the National Maintenance Point (NMP). The NMP will also advise the National Inventory Control Point (NICP) of overhaul candidate selections. If a tank qualifies for overhaul, the owning unit will submit a request to the NICP for disposition and a requisition for a replacement vehicle using the NMP overhaul selection notice as justification for the action. The NICP will then issue a movement release order containing shipping instructions to move the vehicle to the overhaul depot and then take appropriate action to fill the requisition. The owning unit will be advised accordingly and, upon receipt of instructions from the NICP, will prepare and ship the vehicle to the depot. Vehicles which are rejected from overhaul by TARCOM review, due to fund constraints or ineligibility, will be reevaluated in the following year.

The evaluation procedures are divided into four sections. Section I covers vehicle identification, usage, and historical maintenance data. Sections II and III provide instructions for evaluation of the current condition of the turret and hull. The last section contains evaluation instructions for the overall vehicle condition. There is also an annex that covers product improvements that may be incorporated on the vehicle undergoing the evaluation, such as top loading air cleaners, RISE engines, etc.

VCE Field Tested

The VCE's contain inspection points, procedures, and parameters which were field tested at Fort Hood to determine their applicability and worth. A total of 12 vehicles (3 each-*M-113A1, M-551, M-60A1,* and *M-109*) from different units were evaluated and the results recorded for later scoring at TARCOM.

Reports indicate that with minor modification, the VCE's appear to be satisfactory. They allow an inspection of critical points which will indicate a requirement for depot overhaul, but are much less time-consuming than a full technical inspection which addresses many points of no significance to depot overhaul, such as presence and completeness of basic issue items. These VCE guides will be revised as experience is gained and more data becomes available from the new system and other sources such as readiness reports, depots, reports, and extended mileage testing.

On-condition overhaul of Armor weapons systems will eliminate much of the unnecessary cost of depot overhaul when a mileage limit is reached on a smooth-running, trouble-free tank. It clearly offers the means to get the most use out of our tank fleet for the least amount of money expended.

The first few years of operation will be a learning period and adjustments to timing and content will probably be necessary. The ultimate goal is to be able to predict, at least 2 years in advance, the time frame in which a vehicle will require and/or receive an overhaul. This will also permit selection—on a worldwide basis—of those vehicles needing overhaul the most, and insure their timely arrival at the appropriate depot for scheduled overhaul programs.

The interim on-condition maintenance procedures should be phased out on an installation-by-installation basis beginning about the 1st Quarter, Fiscal Year 79. Regulation changes must be completed and final decisions made on extending on-condition maintenance policies and procedures to other types of combat vehicles worldwide.

Reliability centered maintenance is a viable alternative to increasing maintenance costs and it is here now. Additional RCM strategy will be seen in the new style of technical manual formats, changes in daily maintenance inspections, and modified deadline criteria. RCM will have an ever increasing impact on the Armor community in the form of decreased maintenance costs and increased weapon system availability and reliability.

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 Office of Armor Force Management, Ft. Knox, Ky.

NOTES

ANNIVERSARY COVER

The United States Armor Association, Fort Knox, Kentucky, is offering for sale prints of Karen Randall's oil painting, "*Armor's* Ninetieth Anniversary," which appeared as the cover of the March-April 1978 issue of *ARMOR* magazine. The print measures 12¼ in. × 17¼ in. on 14¼ in. × 18½ in. Saxony paper stock. The first limited number of prints may be ordered for $3.50 until January 1, 1979.

88TH MEETING

The U.S. Armor Association, in conjunction with the Armor Conference, conducted its 88th meeting since its formation in 1885. Business this year included the election of the Association's officers and executive council for 1978-1979.

OFFICERS

President	Gen. Michael S. Davison, USA. Ret.
1st Vice Pres.	LTG Donald H. Cowles, USA, Ret.
2d Vice Pres.	MG George S. Patton (USAREUR)
3d Vice Pres.	MG Thomas P. Lynch (Ft. Knox)

EXECUTIVE COUNCIL

Gen. Officer	BG David K. Doyle (Ft. Knox)
1 Fld. Grade	COL Robert F. Molinelli (6th ACCB-Ft. Hood)
2 Fld. Grade	COL James G. Hattersley (USAREUR)
3 Fld. Grade	COL John L. Waldrip (49th AD, Tex. ANG)
4 Fld. Grade	COL James L. Dozier (2d AD, Ft. Hood)
5 Fld. Grade	LTC W. Judson Walton (Ch. Armor Br.)
6 Fld. Grade	LTC Peter E. Genovese (50th AD, N.J. ANG)
7 Fld. Grade	MAJ Geoffrey S. Moakley (USMA)
1 Co. Grade	CPT James Z. Farmer (2d AD, Ft. Hood)
2 Co. Grade	CPT Robert E. Mitchell (Ft. Knox)
3 Co. Grade	CPT Ronald L. Rold (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	CSM Douglas B. Hayes (1st Cav Div, Ft. Hood)
Member-at-Large	LTC Clarence W. Pratt, USA, Ret.

RATE INCREASE

The rates for 2 and 3 year subscriptions to *ARMOR* will increase on 1 January 1979. Two year subscriptions will increase to $15.00. Three year subscriptions will increase to $22.00. The price of a 1 year subscription remains at $8.00.

DRAWING WINNERS

Armor Association members who were winners at the drawing held as part of the Armor Conference banquet in May were:

Grand Prize (Hawkins Rifle)	MAJ Donald H. Davoli (1-127 Armor, N.Y. ANG)
2d Prize (36 Cal., 1885 Revolver)	CSM Donald L. Bearden (Ft. Knox)
3d Prize (Bowie Knife)	LTC William A. Bobo, USA, Ret.
4th Prize (Old Bill Plaque)	LTC Rafael G. Garcia (ARR1, Ft. Knox)
5th Prize (Old Bill Plaque)	CPT Robert S. Shaffer (Ft. Knox)

FINAL DRIVES

Some units experiencing final drive failure suspect that 50-weight oil is the culprit. Not so. According to engineers, *M-60* PMO, and most everyone else, the 50-weight oil is the correct lube and should not be changed except when required by climatic conditions as shown in the lube order.

MOTHBALLING

A method for storing battle tanks in the open for extended periods was demonstrated recently at USAREUR Headquarters. By sealing the tank within a plastic cover, the tank can be left anywhere in the open and years later, after adequate technical treatment, can be put back into service immediately. This "mothballing" technique has been in use by the Bundeswehr and the British Army for about 9 years. ▲

T-72

by Sergeant Donald L. Teater

The latest in Soviet tank technology, the *T-72*, was revealed in last 7 November's Red Square parade. This tank appears very similar, but not identical to the tank observed with Soviet Forces in East Germany since 1976. That tank was incorrectly identified by western intelligence agencies as the *T-72* due to the similarity in major characteristics. That tank, a possible prototype of the *T-72*, is now identified as the *T-64*. (For photographs and other details of the *T-64*, see *"T-72," ARMOR*, January-February 1978, pages 34-36.)

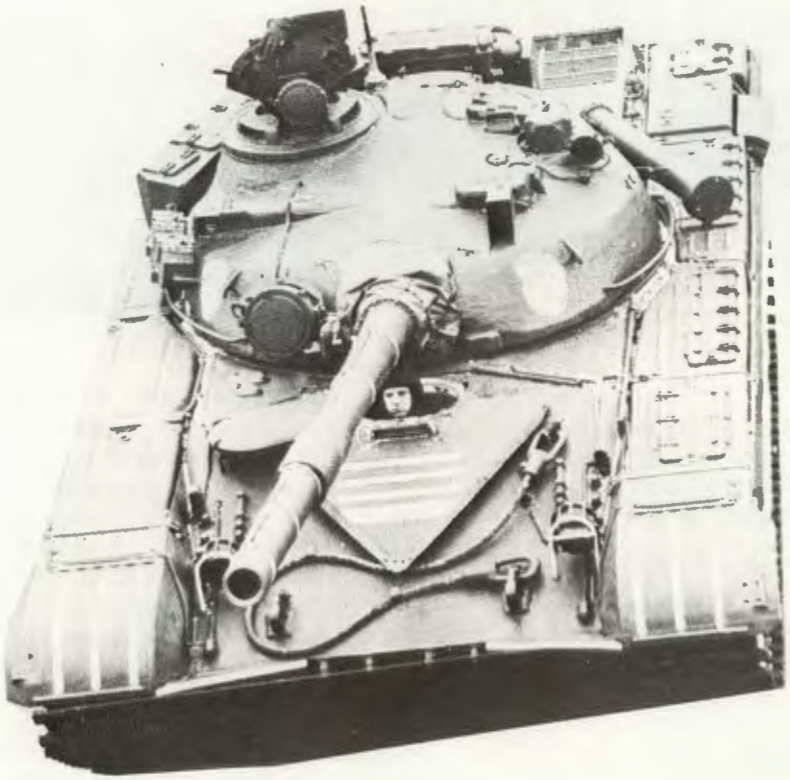
A detailed comparison of the accompanying photos and those previously published in *ARMOR* reveals that both tanks share an identical transversely-ribbed long sloping glacis. The driver's station is located at the top center of the glacis, directly under the main gun in both tanks. In fact, the gun tube must be elevated to enable the driver to occupy a "head out" position.

The overall dimensions and hull design of the *T-72* are probably identical to those published in the drawings in the January-February issue. The dimensions are 6.35-meters long, 3.1375-meters wide, and 1.4-meters high.

The Soviets are able to design such small combat tanks by limiting crew comfort and by using only crew members who are from 5 ft. to 5 ft. 4 in. tall.

EXTERNAL FEATURES

Not clearly seen in the accompany-



ing photos is a toothed shovel blade mounted under the front glacis. The blade is stowed in a raised position aligned with the hull front.

The right fender appears to be covered in its entire length by fuel cells, while the fender has sponson boxes over the front fender and fuel cells located aft.

Like all recent Soviet medium tanks, the *T-72* is fitted with brackets for external fuel storage pods on the rear deck. Two pods of 200 liters each may be carried.

The white lines on the tank fenders are painted on rubber mud flaps.

An interesting feature of the *T-72* is its incorporation of armor skirting plates. Four of these plates can be fitted to quick attach points on each side of the vehicle. When not in use they can be easily removed, chained back, or swiveled upwards. They are spring-loaded, possibly to allow the tank to brush past obstacles, and they are no more than 6-mm thick. Angled at about 60 degrees from the tank side when in use, the plates are probably only effective against high explosive, antitank (HEAT) rounds.

The turret of the tank is well-rounded and appears to be made of cast steel. There is no indication of special armor or spaced plates anywhere on the vehicle.

One of the most noticeable changes between the *T-64* and *T-72* is the shift

of the infrared searchlight from the left to the right of the main gun. It has been speculated that the change was made to prevent interference with the gunner's low-angle line of sight, or because the searchlight's mechanical linkage is more easily accomodated on the right.[1]

ARMAMENT

The *T-72* features a 125-mm automatic loading smoothbore gun, necessitating only a three-man crew. It carries a basic ammunition load of 40 main gun rounds, comprised of 12 armor-piercing, fin-stabilized, discarding-sabot (APFSDS) rounds, six HEAT rounds, and 22 high explosive (HE) rounds.

A new 12.7-mm gas-operated machinegun is located at the vehicle commander's station.

MOBILITY

Several innovations have been added to the suspension of the *T-72*. A totally new drive sprocket with 14 teeth can be seen engaging a new single-pinned track. The six roadwheels are much larger than those on the *T-64*. The *T-72* utilizes the same type small track support rollers inboard of the center guides found on the *T-64*, however, only three such supports (between roadwheels 1 and 2, 3 and 4, 5 and 6) can be seen. The *T-64* suspension has four such supports.

The Soviets have claimed a maximum road speed of 100-km per hour for the *T-72*.[2] Considering the tank weighs 41 tons and has a 700-horsepower engine, this figure seems high.

The *T-64* and *T-72* are assumed roughly equal in combat capabilities. Further information and photographs will be published on both vehicles as they become available.

[1] "Details of the Soviet T-72 Battle Tank," *International Defense Review*, Vol. 10, No. 6 (December 1977), p. 1023.

[2] Ibid., p. 1033.

Beans and Bullets

by Lieutenant Colonel Richard P. Diehl

Ammunition availability, as never before, has become so critical it spells disaster unless we tailor our resupply system.

You can easily carry enough *beans* on a tank to last the crew for days. You can also carry enough diesel fuel and packaged POL to keep a tank moving for a couple of days. However, without *bullets*, even the most experienced and proficient tank crew is at the enemy's mercy.

Therefore, we must fashion a workable solution for ammunition resupply that will make adequate amounts available and enable us to get it to the troops. Then, we must practice ammunition resupply in training just as we practice tank gunnery and collective tactical training.

Ammunition resupply is a task that is difficult for any unit, but at the company team or battalion task force level it becomes even more so. When the combined arms team is truly combined, the question arises as to what kind of bullets are to go where, in what quantity, and on which of the limited numbers of carriers available. This requires the establishment of command priorities because tank ammunition must compete with all other ammunition for pallet space on a particular ammunition carrier. It also means the battalion logistician responsible for loading the ammunition carriers must constantly be familiar with team tactical compositions to preclude the wrong ammunition being delivered to a particular unit; for example, TOW missiles to a tank platoon.

Our traditional ammunition resupply doctrine does not support our recently up-

dated tactical doctrine. We now need to tailor the resupply methodology to that tactical doctrine.

The Dilemma

FM 71-2 suggests one solution, *prestocking*. Indeed, we could offload certain pre-specified pallets of ammunition in designated defensive positions. But how can we predict with surety that the tactical situation will unfold as we envision it before the battle? Further, if a tank crew or platoon is facing destruction because of a lack of communication, where will they go when ordered to displace, to the tactical position or to the one where the ammunition is stocked, if the two locations differ? Should we subject our tank commander to such a dilemma? Obviously, the attraction of the ammunition is very strong. We could wholesale prestock *every* defensive position, but how can we predict what unit will occupy the position, and what weapons systems will be in the unit? Probably the strongest argument against wholesale prestocking is stated in FM 100-5.

> Throughout the support structure, resources must be *austerely* supplied, *properly* applied, and *efficiently* used.

In other words, the ammunition resupply system requires that same selectivity, flexibility, and mobility that is the key to the tactical success we pursue in the active defense.

So what is the answer? We could opt for more trucks and more people to drive them. That would solve the problem, but it is a brute-force solution that is infeasible in light of past force development efforts to keep such support assets to a minimum at the battalion level. Fundamentally, our problem is time, time required to travel back and forth to distant ASP's, to cross-load to support tactical configurations of the moment, and to physically reload the weapon systems involved. We must determine how we can solve this problem with the truck assets currently available.

A Possible Solution

A logicial solution is to expand the brigade ASP forward support idea of FM 71-2 one step further to create a battalion ASP. Under this system a battalion representative picks up certain trucks coming forward to the brigade ASP and moves them further forward to positions near the battalion task force rear boundary for unloading. The task force would operate there from a ready distribution point to supply *mobile* prestocks—the trucks of the support platoon. This cuts down the distance factor substantially and allows the task force to tailor the load to the tactical configuration of the supported team.

Does this violate the doctrine stated in FM 71-1? NO! The task force sector has been assigned by the brigade commander based upon the factors of mission, enemy, terrain, time, and troops available. As it did in the area defense, the established task force rear boundary remains as the line past which the task force cannot move unless changed during the battle. Positioning ammunition at a task force logistical distribution center (LDC) near the rear boundary complements rather than impedes the tactical mission.

Does this system violate the intent of logistical doctrine? NO! The commander establishes controlled supply rates (CSR) for subordinates"...to control consumption based on available supply...." The brigade S4, Forward Area Support Coordinator, or representative of the Division Ammunition Officer, can control the release of available ammunition based upon the established CSR. The task force could move forward only the CSR maximum. Additional allocations would require command-directed tactical emergency resupply.

The combat trains are the key to the proposed ammunition resupply system because it is from this location, 2 to 4 kilometers behind the forward teams, that the mobile prestocks are dispatched. Trucks preloaded to support a tactical configuration are turned over to the team executive officer or first sergeant when one of them returns an empty truck for a full one and guides that full truck back to the LOGPAC position. The empty truck is then guided by the support platoon leader or the truck master to a release point on a main supply route from which the driver can find his way back to the LDC. The driver is given specific *written* instructions about what his next load should be, and to what point and at what time he should return.

Obviously, a forward LDC reduces the time the trucks must travel to reload, a savings of about 1 hour for each trip. But what about the time involved with tactically cross-loading the trucks and loading from the truck to the tank? Proposed here is a system which features offloading of the ammunition received from COSCOM in the LDC and reconfiguring the pallets to command-designated mixes designed to be easily and quickly moved manually from the truck to the tank or other weapon system.

Palletizing Ammunition for Combat

Figures 1 and 2 illustrate how ammunition is typically palletized. Ammunition is contained in packing boxes stacked on pallets. Boxes are not normally opened until a tank is being resupplied. This creates a refuse problem, a time-loss in unboxing, and more importantly, loss of valuable space on the pallet due to protective packaging. Figures 3 and 4 show an example of the suggested type of pallet loading system.

Ammunition is taken out of boxes in the LDC and restacked on pallets using combat dunnage layers and adjustable webbing instead of steel straps (figure 3).

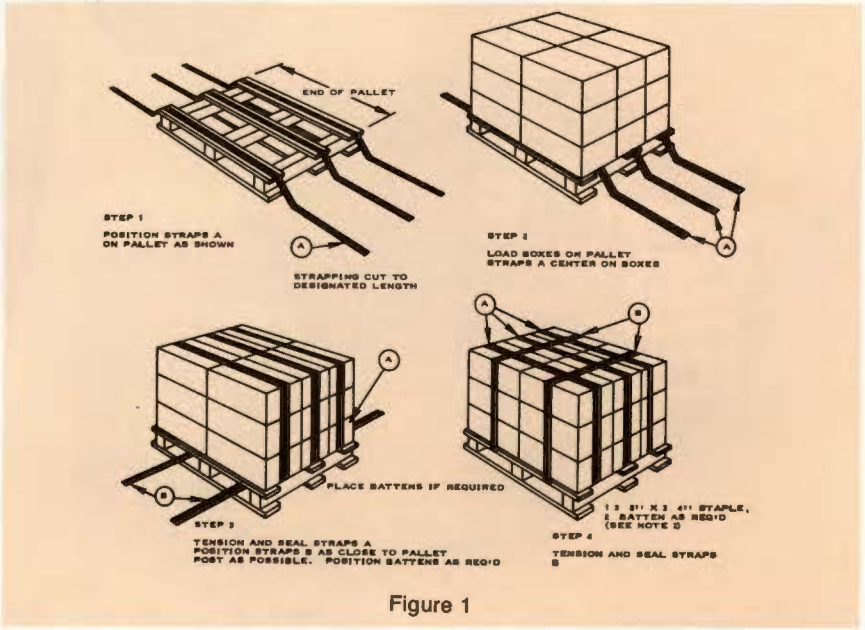


Figure 1

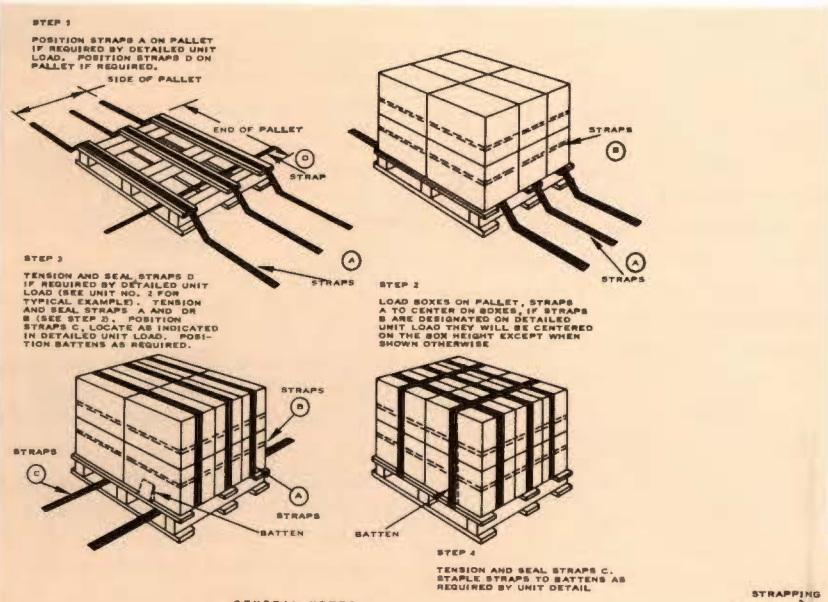


Figure 2

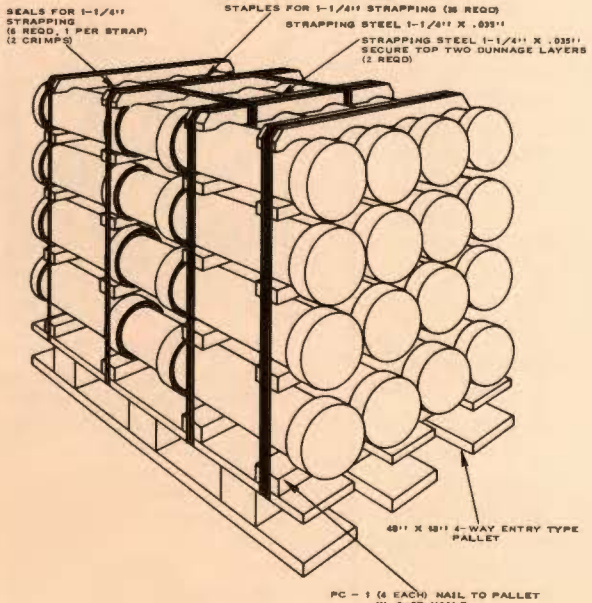


Figure 3

With this system, as a tank is being resupplied, the webbing is loosened and the rounds are cross-loaded from truck to tank. Since the webbing can be retightened, this palletizing system eliminates the problem of loose boxes when pallet bands are broken.

The same system applies to boxed machinegun ammunition. The metal boxes are loaded on the pallet in layers by type and separated by cardboard dunnage. Missiles, LAW's and 81-mm. mortar ammunition can be loaded similarly using appropriately designed combat dunnage. For the 4.2-in. mortar ammunition, an adaption of the artillery configuration (figure 4) is needed. This suggested packaging change will save time and simplify

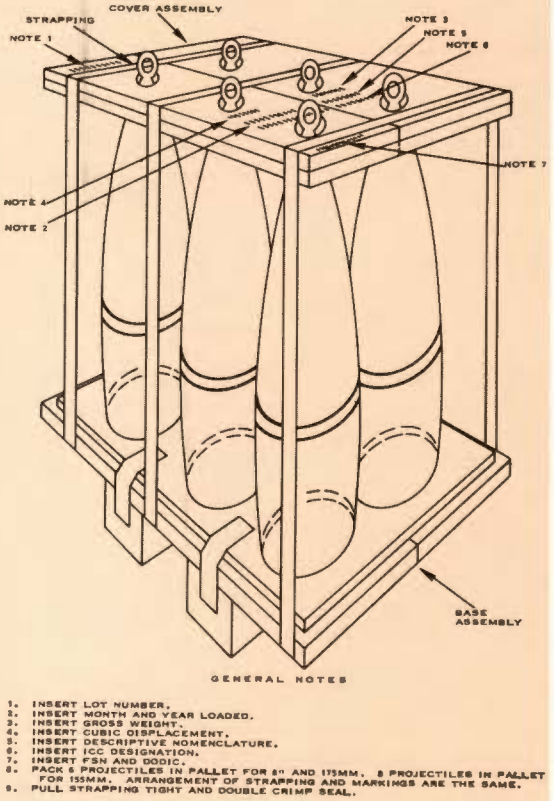


Figure 4

ammunition resupply procedures. There is always a danger, however, that weather could affect the uncased ammunition. This means appropriate protection such as tarps must be available in the LDC. It also means ammunition should be moved from the LDC on a "first in, first out" basis. Also, to make this system work each pallet must arrive with a combat dunnage package for combat breakdown. It appears a system like this is far better than what we have now, or one expedient sometimes used in the field today, stack-

ing unboxed ammunition loose in the GOER vehicles.

Cross-loading of pallets on trucks will vary with the desires of commanders. One type of loading is shown in table 1:

LOGPAC TRUCKS

Unit	No. Trks	No. Pallets	Type Ammo
Team A (2 Tank/ 1 Mech)	One 5-ton	2	HEAT
		2	APDS
		1	Comb. cal. .50 and 7.62-mm.
		1	Comb. *Dragon* and LAW
Team B (2 Mech./ 1 Tank)	One 5-ton	1	HEAT
		1	APDS
		1	TOW
		1	Comb. cal. .50, 7.62-mm., LAW and *Dragon* (in layers)
		2	81-mm. mortar
Co. C (Tank Pure)	One GOER	2	HEAT
		2	APDS
		1	Comb. cal. .50 and 7.62-mm.
Hv Mort Platoon	One GOER	2	HE
		2	WP
		1	ILLUM

Combat Trains

No. Vehicles	Type Vehicle	Vehicle Used By
2	5 - ton	Tank-heavy team
2	5 - ton	Mech Inf-heavy team
2	GOER	Tank-pure element
1	GOER	Heavy Mortar Platoon or for mines or engineer demolitions

Table 1.

Pallets should be arranged on the ground in the LDC as "pickup islands" in the type truck configurations the commander desires. Loading operations are supported by the 5-ton wrecker or, if needed, the *M-578* recovery vehicle. Bulk breakdown is a problem for the limited number of ammunition handlers available in the battalion. However, the ammunition handlers can be augmented by mess personnel who will not be needed to prepare meals because C-rations will be the primary food in the early stages of the battle. Additionally, the four 2½-ton trucks of the mess sections, unless they are built into mobile kitchens, provide an unplanned for source of transport to bring ammunition forward from Corps ASP's, or as a stopgap supplement to satisfy the immediate ammunition needs at the team level.

Training Implications

How do we practice this system? Army Training and Evaluation Program 71-2 provides the critical tasks and tactical criteria standards related to tactics, but does little to describe supportive ammunition resupply requirements. Ammunition resupply is difficult, and cannot be done effectively unless it is practiced. Today we give lipservice to it. One possibility for improving resupply training would be to have each post, garrison, or kaserne stock a battalion task force worth of expended or dummy ammunition. This ammunition should be weighted appropriately to simulate actual weights, packaged as it would come from the ASP, and accompanied by appropriate combat dunnage to practice the bulk-breakdown repacking process. The team should practice the resupply of their share of the ammunition from their LOGPAC every 2 to 2½ hours. During one period the ammunition might be loaded on the tank. Next it could be offloaded back onto the truck to be returned to the LDC for repacking. The trucks would exchange from the combat trains to the LOGPAC every 4 to 5 hours.

If the appropriate amount of expended or dummy ammunition cannot be devoted to training support, an alternative would be to use the ammunition request form (DA Form 581) to simulate an amount of ammunition to be resupplied to a particular weapons system—for example, one for a tank might include six rounds each of HEAT and APDS, 200 rounds of caliber .50, and 500 rounds of 7.62-mm. The total ammunition on the individual request forms should equal the total amount of ammunition to be found on the LOGPAC vehicle. This would not necessarily exercise the physical loading from the truck to the tank, but it would force the team or task force to consider the crucial ammunition resupply problem while conducting tactical training.

Summary

Mobility, flexibility, and the effective use of time will be the keys to winning the next war. Our tactics are sound. If they are practically, judiciously, and intelligently applied, they will counter the threat. We train our crews to put steel on target and to maneuver as they must in combat. Now we must train them to do these things while considering from whence their next *bullets* are coming, and what must be done to get those *bullets* in the tank, ready to kill the next enemy vehicle that presents itself.

It is maxim that the logistical tail should not wag the tactical dog. However, the logistical tail's limitations cannot be ignored as we are so prone to do. We must plan for and practice alternatives that will overcome these limitations. The system proposed herein is one alternative. It will work!

LTC RICHARD P. DIEHL was commissioned in Infantry as an ROTC Distinguished Military Graduate from the University of Michigan in 1963. An IOAC graduate, LTC Diehl has also attended the U.S. Army C&GSC. He holds a BS in Mechanical Engineering and a Masters in Business Administration. He has held all the normal troop assignments commensurate with rank in the 3d Inf (M), 25th Inf., 9th Inf., and 2d Armored Divisions. LTC Diehl is currently assigned as CO, 1st Bn (M) 50th Inf., 2d Armored Div., Ft. Hood, Tex.

PROFESSIONAL THOUGHTS

The Indispensable Scout

As a former armor soldier, I have long been a keen supporter of your admirable journal. One of the privileges of editing the British Army Review is that I now receive a personal copy!

I was very struck by Brigadier General David K. Doyle's article "The Indispensable Scout" in your September-October 1977 issue.

While the organization of armored reconnaissance in the British Army is rather different from your own, the basic reconnaissance needs of the ground force commander in any army remains the same. So much of what Brigadier General Doyle had to say is music in the ears of anyone who has had battle experience in an armored unit and yet reconnaissance, and reconnaissance troops in particular, seem to be very much in the doldrums these days.

In our own peculiarly British way, our units tend to tailor their establishments in war to meet the particular quirks of current commanding officers. I remember very well how in the 1st Royal Tank Regiment in 1944-45, our CO placed so much reliance upon the reconnaissance troop that of the eight patrols (each of two vehicles—two *Stuart* tanks or two *Daimler* scout cars), four were commanded by officers and the remainder by sergeants. Thanks to the efforts of these picked men we were seldom unaware of the position on our front or to our flanks, every major movement of the regiment was carefully recced and every regimental axis clearly marked—a situation which not only contributed substantially to the regiment's combat effectiveness but must also have saved many lives.

From World War II onwards the tradition of the elite character of unit recce troops was perpetuated but, thanks to the stringencies of peace, far greater reliance had to be placed upon junior NCO's and troopers as establishments began to be cut and the numbers of patrols available fell.

We learned in war how quickly the recce troop can burn up its reserves of energy, so that in a matter of days, if not used economically and for essential tasks only, its effectiveness falls off very sharply. Nothing that has happened since then has changed this inescapable fact. However, the changing nature of the battlefield, with its greatly increased frontages, far greater use of obstacles and the inevitable devastation which will play such havoc with normal roads and with such obstacle crossing points as bridges and culverts, has created an insatiable demand for topographical reconnaissance and the need for what I like to call "shepherding" by the recce elements. Thus the burden is now greater than ever.

Let me explain what I mean by "shepherding." There has always been a need for route recce and marking if time was not to be lost during tactical movement, particularly at

night. Within the armored regiment (or tank battalion) this is a prime task for the recce troop and calls for the highest standards of training and initiative, as Brigadier General Doyle has pointed out. Now that units must expect not only to fight "closed down," or "buttoned up" as you would call it, but also to make tactical movement in this state (because of the chemical threat) and because virtually all such movement will be at night. Whether with or across the grain of the battlefield, the inescapable demand exists for a closely coordinated system of control within the unit which not only recces and marks the routes, but also ensures that the battle group is "shepherded" along them as the CO requires. Such a system can only be operated efficiently by the CO's own recce troop or subunit in which he must be able to feel implicit trust as must their comrades in the squadrons.

The training of a first class recce troop is not done overnight. Because, as Brigadier General Doyle points out, it may often be necessary for a CO to rely absolutely upon the accuracy of the report and soundness of the judgment of a junior NCO, or even of an experienced trooper, the officers, NCO's and soldiers of these recce troops must be handpicked. Of course it is possible to command an armored regiment in battle using recce support from an outside source, but the task of the CO is thereby made immeasurably more difficult and the operational effectiveness of his unit must surely be severely degraded.

I write this from a purely personal standpoint as one who has fought and trained in tanks and armored cars all his military life. There may be those who think that I am overcalling my hand but, if it were left to me, I would gladly surrender main battle tanks from my establishment if to do so was the only way in which I could ensure the provision of a strong and effective recce element within my unit.

I have no doubt whatever that an armored regiment, in attack or defense, which has a first class recce capability will "see off" a force which is stronger in tanks but lacks organic reconnaissance.

Information is one of the primary weapons of war. As war becomes more sophisticated, so does the importance of timely and accurate information increase. No matter what sensors and other information gathering and processing systems may be introduced, the human eye and brain will always be prime agents in the business of information gathering and transmission. That means highly trained, organic scouts for every armored regiment or tank battalion if it is to be fully effective in war. Sadly, evidence shows that it is only too easy, in the face of limited training facilities in peace and the consequent inevitable lack of realism in so many field exercises, for this truth to become obscured.

BRYAN WATKINS
Brigadier
British Army (Retd.)
Editor
The British Army Review

NCO Professionalism

Even more than in past years, the Noncommissioned Officer (NCO) Corps is faced with the challenge and responsibility of training the new soldier. Not only are we responsible to see that he is trained to perform in his MOS, we are just as responsible for giving him the counsel and guidance necessary to insure he can properly handle his private life and affairs. In short, our mission is one of total involvement with our soldiers at every level from basic professional skills through helping them and their families meet the unique demands of a military career.

Our approach to training the junior NCO must be one that will prepare him to handle the problems and training of his personnel while, at the same time, sharpening his professionalism and preparing him to accept the greater challenges he will face as he rises in the ranks. We can do that by insuring that his career needs are met through the Enlisted Personnel Management System, by giving him sincere and timely counseling, by allowing him to develop through giving him responsibility and, very importantly, by setting the proper example as senior NCO's. I feel that our job is well expressed in a quote from *The NCO: Backbone of the Army*. "Many varied and important duties have elevated the NCO's calling to a unique status among the hundreds of careers from which an individual citizen of this country can choose: a technician, a supervisor of function, a manager of activities, an expert in artifacts of war, a leader, and a soldier in the service of the country. The NCO is also the strong right arm of the commander." I feel, therefore, that it is necessary for our Noncommissioned Officers to develop a strong professional program designed to educate and train ourselves and our soldiers. Such a program requires that all NCO's set and maintain the highest standards of professionalism, conduct, and bearing. I might add that establishment of a wholesome social environment is very important to the unit in performing its mission in a top manner.

To properly carry out our responsibilities, we must first make all enlisted personnel aware that the NCO is dedicated to doing his part in helping younger soldiers adapt to military life and prepare for a productive career in the Army. We must be attuned to the needs of our men and prepare ourselves to meet their needs through self-education.

The requirement is for us to look within our units for NCO Professionalism Programs. We all need one, but the approach to implementing it is going to vary based on grade structure, mission, and type organization. Your ideas and assistance in getting an effective program off the ground are needed by, and desired by, commanders.

D. L. BEARDEN
Command Sergent Major
USAARMC

Let's Make the XM-1 Even Better

The *XM-1* is being lauded as fast, maneuverable, hard hitting, maintainable, and survivable. It has been named the best tank in the world, and a great tank for the 1980's. Because of wide pronouncement of these views, it seems almost a sacrilege to raise a couple of questions.

The power plant of the *XM-1* is a gas turbine, a wonderfully smooth source of power, but it uses much more fuel than a conventional engine. Therefore, for military purposes, there will be an even greater military need for oil.

The armed forces may be guilty of accepting a belief seemingly held by the general public: that there is no energy shortage; that it's all a plot by the oil companies to make more money. The military also may believe that there will always be enough for them because, if necessary, they could take it away from the civilian population. However, the civilian population turns out the munitions of war and must have transportation to get to and from the factories. It may not be possible some day to fill both needs if present views persist.

Is there an alternative source of power? At the risk of being accused of beating a dead horse, let me suggest something in which I have been interested for many years—steam power. Before you laugh, keep in mind the present problems. The normal internal combustion engine is not the answer to any of them. A steam-powered *XM-1* not only would use far less fuel than either, but what it could carry would permit a radius of action five times the distance presently possible, and it would do so in almost complete motive-power silence.

What is there about steam power that turns people off? Mostly myths, not the least of which rises from the alliterative words "Stanley Steamer." There were other steam cars, the most important of which was not the Stanley, but the Doble. The Doble was a luxury car in the Rolls Royce class. But the shortcomings of the Stanley, for some reason or other, have always overshadowed the virtues of the Doble. The World War I steam wheeled tank and the Corps of Engineers steam tank did little to enhance the image of steam power for tanks.

Old myths are hard to kill. They include such beliefs as that steam power is bulky, that water freezes too easily, that there is great risk of explosion and fire, and that a long wait is required to fire up. Contrary to these beliefs, modern steam installations can be very small and require no transmissions. Small electric heaters can prevent freezing of water and in a closed circuit system, a coolant, such as Freon, can be substituted with the added advantage that it also acts as a lubricant. Such a closed circuit Doble monotube boiler (or heat exchanger) has existed since 1917 and has proved itself no more hazardous than the conventional internal combustion power package. Finally, the same heat exchanger permits starts to be made in from five to 30 seconds even in the coldest weather.

So, instead of being disadvantages, there are advantages, not to mention far fewer working parts, reduced maintenance, freedom from vibration, constant torque even at zero degree starts, no noise and freedom from noise during acceleration and a great radius of operation. Certainly there is much more reason to consider steam power for the *XM-1* than there was in the mid-1950's to seriously consider atomic power to the point of actually making a mockup. Steam power is not that far out. As a matter of fact, some of the 50-year old Doble cars are still in operation. Steam cars and buses are still being made and used. There is an interesting nine double-ended cylinder engine made by Gibbs-Hosick, one of 1,000 h.p. which is so small it can be picked up by one man.

During World War II, following news of the inability of Montgomery's *Sherman* tanks to catch up with the Germans retreating from Alamein due to limited fuel capacity and radius of operation, a discussion with an officer who was a highly successful steam power consultant in peacetime, resulted in an effort to do some experimenting. The Navy, at the time, was working on a possible steam power plant for aircraft so it was not a completely stupid idea. We also know now that Henschel in Germany was working at that time on a steam power layout for the *Tiger* tank, although the project was later dropped.

After pulling a Doble engine out of the World War I steam tank in the Ordnance Museum and finding it in perfect condition by testing it with compressed air, this officer and I made some layouts. The drawings went to Washington with a request for a modest $40,000 for a test installation in an *M-4A4* medium tank, chosen mainly because it had a sufficiently large engine compartment. I still have the buckslips bearing comments made by various young Ordnance officers in the Pentagon, most of them peacetime automotive and petroleum engineers. Their collective sarcasm helped to kill the project.

In 1954 the Ordnance-Industry Combat Vehicle Committee proposed the exploration of steam power, but received no support. Ten years later Convair Division of General Dynamics built a working scale model of a 45-ton tank powered by a steam turbine, but it attracted little attention. Although the automotive and petroleum companies did not actively oppose the project, their small research staffs have concentrated on such engines as the Wankel, the Sterling Thermal, and gas turbines.

I attempted to stir up interest in the subject in 1973 during the development period of the *XM-1*. It now seems desirable to try again. The energy shortage and the whining gas guzzler of the *XM-1* ask for it. I ended an earlier article with the statement: "If you haven't tried it, don't knock it." That opinion is unchanged.

ROBERT J. ICKS
Colonel, AUS-Retired

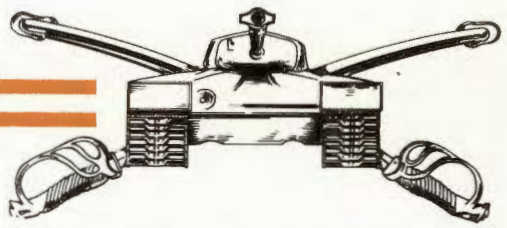
Elmhurst, IL 60126

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 76)

OPMD - EPMD ARMOR



DEFENSE OFFICER PERSONNEL MANAGEMENT ACT (DOPMA)

There are currently two DOPMA proposals before the 95th Congress. On 23 March 1977, Representative Bill Nichols, Chairman of the House Armed Services Committee's Subcommittee on Military Compensation, introduced DOPMA, the Bill approved by the House in the 94th Congress, into the House of Representatives, 95th Congress, as HR 5503. The House Armed Services Committee reported out the DOPMA proposal on 2 August 1977, with no proposed amendments to the legislative wording. The House Appropriations Committee reported out the DOPMA proposal on 23 September 1977, with a recommended amendment to provide a maximum separation pay of $15,000, the current maximum. On 14 February 1978, the House of Representatives passed DOPMA (HR 5503) by a margin of 351 to 7. Prior to voting the DOPMA proposal, the House overruled by voice vote the amendment which would have provided a maximum severance pay of $15,000; thus the Act retains the $30,000 capper.

The DOPMA bill approved by the House during the 94th Congress was revised only slightly by the Office of the Secretary of Defense (OSD) to make several technical amendments. This proposal, DOD Proposal 95-5, in accordance with standard procedures for submitting legislation into a new Congress, was forwarded to the Office of Management and Budget (OMB) during January 1977 to obtain an administration approval. On 4 August 1977, OMB provided an administration approval of the DOD version of DOPMA which, at OMB recommendation, provides for a maximum severance pay provision of $15,000. OSD sent this proposal, DOD 95-5, to the Congress on 31 August 1977.

There are indications from both House and Senate staff personnel that the House and Senate will continue to work with the House-introduced version of DOPMA. The technical amendments included as part of the OSD proposal will most likely be addressed during Senate staffing of the House bill.

DOPMA is designed to:

- Establish a common management system for all Services.
- Provide career opportunities to attract and retain high caliber officers.

Major provisions of DOPMA are:

- Field grade authorizations reduce the number of officers in the grades COL and LTC with a slight increase in the grade of MAJ.
- Single promotion system eliminates separate systems (RA and AUS).
- All-regular force after 11th year of service (RA ceiling removed).
- Changes mandatory release dates for MAJ from 21 to 20 years, LTC from 28 to 26, and COL remains at 30.
- Absolute guarantees of tenure are removed. Boards may consider those officers for continuation in the grade of MAJ and LTC who are twice non-selected for promotion. Colonels may be considered after 4 years in grade. At least 70 percent of COL's and LTC's must be continued.
- Provides greater equity for women in the Army.
- The House introduced version of DOPMA, HR, 5503, increases maximum severance pay from $15,000 to $30,000.

Transition period of 2 years provides that:

- Reservists who complete 18 years of service during the transition period, may remain on active duty in the Reserve until retirement.
- Qualified Reserve Officers will be integrated into the Regular Army.
- Officers with tenure under current law will retain that tenure.
- Officers selected or promoted to a higher grade after enactment will acquire tenure as provided by the new law.

EPMD ASSIGNMENT SYSTEM

The primary objective of the enlisted assignment system is to fill the Army's worldwide need for enlisted soldiers. To achieve this objective, the system is tempered by a corresponding need to equalize assignments—CONUS or overseas, accompanied or unaccompanied—by reassigning the most eligible soldiers from among those qualified. At the same time, the system attempts to provide each soldier with an assignment pattern that will maximize opportunity for professional development and promotion, while also considering the soldier's personal desires and situation.

The equity, efficiency and responsiveness of the system depends upon the accuracy of the information that describes the requirement and the soldier. The importance of accurate data in the effective management of the enlisted assignment system continues to be emphasized. In the link between the individual soldier and MILPERCEN, many are responsible for data accuracy, including the soldier, the chain-of-command, and the personnel management structure from the local level to HQDA. An understanding of how the enlisted assignment system operates will help ensure its objectives are met and the soldier's needs considered

Requisitions State Requirements.

Enlisted personnel requirements are sent to MILPERCEN via requisitions. Each requisition represents a requirement for a soldier of a particular grade and possessing a specific MOS code for assignment to a particular unit. Requisitions are derived from an evaluation of a unit's current status—a comparison of its authorized strength versus assigned strength, plus a tally of the known and projected gains and losses.

A "cross-leveling" of personnel assets by installations and major commands ensures that where possible local shortages or overages are balanced from soldiers already assigned. The remaining vacancies by grade and MOS then form the basis for requisitions.

CONUS units submit their requisitions 5 months before

the soldier is needed, while 9 months lead-time is required for units stationed outside CONUS, including Alaska, Hawaii, and Panama.

After the requisitions arrive at MILPERCEN, they are edited and validated by comparing them with the HQDA data base. Validation is done to ensure that the unit did not over- or under-requisition; discrepancies are resolved and the validated requisitions move on for assignment processing.

Availability Factors

Soldiers become eligible and available for reassignment for a number of reasons. Enlistees are available for assignment upon completion of training and award of an MOS. Other soldiers may be considered available for assignment upon:

- Volunteering for reassignment.
- Completion of an oversea tour.
- Completion of school/training.
- Termination of stabilization at a unit/organization.
- Time stationed in CONUS (turnaround times will vary by MOS/grade depending on oversea requirements).

Matching Soldier to Requirements

Two automated systems are used to match soldiers who are available and eligible for assignment with the requirements. These two systems are the Centralized Assignment Procedures III System (Cap III) and the Automated Control of Trainees System.

Every assignment issued by MILPERCEN is made by an assignment manager, although CAP III is used to obtain a match between the soldier and the requisition, except those soldiers graduating from basic training and advanced individual training. The system is an automated nomination/assignment procedure that compares the qualitative requirements recorded on requisitions against selected qualifications/factors for each soldier. These include:

- Grade.
- Sex.
- MOS skill level.
- Area of preference.
- Volunteer application.
- Special qualification identifier (SQI), additional skill identifier, language identification code.
- Expiration term of service.
- Months since last permanent change of station.

The Nomination Process

Soldiers are awarded points in the nomination process according to these qualifications/factors. The soldier will be nominated to the first requisition for which a point score establishes qualification and will remain nominated until another soldier with a higher point total, or more qualified, is nominated against the requisition. The replaced soldier will be checked against remaining requisitions until he or she is nominated or placed in an unnominated category. This procedure continues until all soldiers have been matched with a requisition or declared unnominated, and guarantees that the most qualified and available soldier will be nominated against the highest priority and requisition.

Career Managers Have Final Say

Assignment managers review and make the actual assignment on any nomination generated by CAP III. Before nominations are accepted for soldiers on whom a career management individual file (CMIF) is maintained, the file is reviewed to ensure that the assignment is in line with the professional development plans for the soldier. CMIF's are maintained at MILPERCEN for all soldiers in grade E6 and above, plus some soldiers in grades E5 and below as per table 1-1, AR 614-200. Unless there are strong reasons for rejection, the manager accepts nominations made for soldiers on whom career files have not yet been established.

Once the selection is made to fill a requisition and the Enlisted Master File (EMF) is annotated to show the soldier is slated to move, the system sends assignment instructions to the losing and gaining commands. Assignment orders are issued by the MILPO servicing the soldier's losing unit.

Managers' Role Reemphasized

A key point regarding the enlisted assignment system needs reemphasis. Although automated systems are used to assist in matching soldiers with requirements, an assignment manager personally approves each assignment issued by MILPERCEN. A computer does not make assignments, people assign soldiers.

The effectiveness of the enlisted assignment system depends on several other factors. The system relies principally on the EMF to obtain data for soldiers being considered for assignment. If the EMF data is inaccurate, the assignment transaction may be invalid. For example, an erroneous primary MOS code or SQI could result in a soldier's being incorrectly alerted for overseas movement. Although the error may be found and the soldier deleted from orders, another soldier probably will have to move on shorter notice to fill the requisition. If a soldier is not assigned in time, unfilled positions may affect unit readiness.

Thus, the effect of erroneous EMF data is compounded. The ripples affect the responsiveness of the assignment system and unnecessarily create hardships for soldiers and possibly downgrade unit readiness.

Individual Review Important

Through periodic review of their DA Form 2 (Personnel Qualification Record), completion of preference statements, and other communication with career managers at MILPERCEN as to their personal situation, soldiers can help provide the critical information needed to operate an efficient and equitable assignment system.

The communication transmission link between HQDA and the field also must be maintained. Any break in transmission from MILPERCEN through SIDPERS to the MILPO—and vice versa—can cut into the notification leadtime given the soldier, and also may affect the oversea replacement flow. Clearly, the military personnel information reporting system accomplished through SIDPERS is critical to an effective assignment system.

Summary

While fulfillment of Army requirements must be the paramount objective of the enlisted assignment system, the soldier's personal desires, circumstances, and professional development needs also are weighed. MILPERCEN's goal is to make assignments with maximum fairness to the soldier, balanced with the Army's needs.

BOOKS

ABOVE THE BATTLE: WAR-MAKING IN AMERICA FROM APPOMATTOX TO VERSAILLES by Thomas C. Leonard. Oxford University Press, New York. 1978. 260 pages. $12.95.

This book, obviously the product of considerable research and containing an excellent summary of sources and notes, provides an interesting compendium of the understandably diverse personal views of battle. However, there appear to be two major flaws. First, while each chapter presents a generally cohesive approach, the book as a whole suffers from a diffused thesis and an unsteady gait. Second, the author appears to be searching for a justification for war—or lack of it—based on the virtues of soldiering. In the first instance, his lack of focus within such a broad subject as "War-Making in America" places a heavy burden on the reader. In the second, Mr. Leonard seems to be addressing topics which do not have the cause-effect relationship which he apparently asumes: war in broad context cannot be examined exclusively through the motivation, exhilaration, and disillusionment of the participants.

In discussing the Civil War, and noting the difficulty in describing—or even remembering—the realities of battle, the author notes, "The frank admission of panic and pain by realists did not overturn the popular faith in the efficacy of the war." Is it logical, one might ask, to expect the acknowledgment of the confusion and brutality of warfare to be the basis for its rejection as an option for resolving crises of governments? Lincoln gave us his rationale for resorting to warfare: "I consider that the central idea pervading this struggle is the necessity that is upon us of proving that popular government is not an absurdity.... If we fail it will go far to prove the inability of the people to govern themselves."

With the possible exception of some of the Crusades as viewed with the combined necessity for expelling the infidel and gaining a spiritual cleansing through participation in holy battle; and possibly the Spanish-American War as seen by some of Teddy Roosevelt's colleagues, there is little evidence that wars within Western civilization have been launched with the primary goal of ennobling the individual combatants. If there is, in fact, a hidden flow of societal impetus that independently drives a nation toward warfare—a compulsion for combat as both end and means—such a phenomenon has yet to be confirmed.

In the introduction, Mr. Leonard indicates that if Americans were better informed on the reactions and predilections of the participants, "more choices may be imaginable." In discussing the benefits of World War I, the author compares the later disillusionment of many soldiers with their initial expectations of heroic adventure. Yet Samuel Eliot Morison in his "History of the American People" makes the point that while the early reactions of Americans to the beginnings of war in Europe were generally of "horror, disgust, and determination to keep out of it," the people "of the South who alone in America remembered the devastation of war warmheartedly supported the Allied cause from the beginning." In recent years, the trauma, ambivalence toward opposing soldiers, elation, and frustration of warriors was clearly articulated by such publications as "The Seventh Day: Soldiers' Talk About the Six-Day War." Yet these widely disseminated views of Kibbutz members, who found much horror and little residual exhilaration in their service, did not deter their nation from taking up arms 5 years later.

Viewing Teddy Roosevelt's disappointment that he was not permitted to field a volunteer regiment in France, Mr. Leonard states that "spirited volunteers did not fit into the Administration's picture of an efficiently organized campaign." This conclusion seems disputable. In fact, volunteerism was rampant in World War I with more "volunteer" than "draft" divisions in the American Expeditionary Force. The World War I discussion includes an excursion into the motives of the inventors of advanced weaponry. Did they truly believe that better weapons would shorten wars? Did Maxim really believe his gun would save lives? Was Harry S. Truman convinced that atomic weapons would be ultimately less costly in human terms during the final months of World War II? The questions are unanswered and perhaps moot. The case for war being primarily a byproduct of either weapons technology or arms transfers has yet to be made.

Mr. Leonard also finds the machinery-dependent modern soldier "not a shining example of heroism." Most observers of soldiers would agree that all are rarely shining examples, but that neither valor nor altruism is inherently incompatible with industrialized society. And an argument that war is fundamentally horrible as seen by the participants is not cause for abandoning the pride that soldiers should feel for belonging to a profession which finds concepts of duty and honor as essential tools as well as hallowed mottos.

Discussion of the frustrations of the Indian Wars, with the situation of soldiers who understood the aspirations and respected certain traits of their enemy and were obliged to execute the often confused and short-sighted orders from higher authorities is perhaps the best section of the book.

All of warfare deserves study. None of the assumptions should be immune from scrutiny. But any serious theses which lead to generalizations must probe the whole spectrum for valid cause-effect relationships. "Above the Battle" explores interesting facets of warfare, but the excursion is not deep enough to give us helpful answers.

Brigadier General Walter F. Ulmer, Jr.
Assistant Division Commander,
2d Armored Division

THE TOTALITARIAN TEMPTATION by Jean-Francois Revel. New York: Doubleday & Co., Inc. 1977. 311 pages. $8.95.

Western observers lately have noted the "sudden discovery of the Gulag" by French intellectuals. A controversial new book by French writer Jean-Francois Revel is one reason why. It is a book about the psychology of the political Left in the Western world—a mentality that indulges itself, Revel says, in a "totalitarian temptation." The indictment of the Left commands all the more attention for Revel's own socialist credentials.

A fundamental democratic misunderstanding exists about communism, Revel says. A belief is pervasive that Stalinism was an aberration and that a reformist tide is flowing. But "no Communist state has ever been other than Stalinist," and Krushchev's de-Stalinization address of 1956 is today officially buried. Eurocommunism is only a tactic; Stalinism and democracy are mutually exclusive. Do they allow dissent even within their own organizations? Revel asks. The Portuguese example of 1975 revealed the true nature of "democratic communism."

The socialist misunderstanding complements the democratic one. Socialists persist in the belief that communism is a form of socialism. The goal of communism is indeed to destroy capitalism, Revel writes, but not to install socialism. The goal is to make both the economy and the people serve what Milovan Djilas called "the New Class."

The two varieties of self-deception result in a narcosis of the Left that causes suspension of its critical faculty when confronted with Communist rhetoric and action. The liberal and socialist press repeatedly villify multinational corporations, for example, but pass over the Gulags in vast silence. "Thus

Stalinism is strengthened under the attentive and benevolent gaze of those it wants to destroy."

Revel's is a devastating analysis of that sector of the Left that sees *pas d'ennemis a gauche*, replete with analyses of recent Chilean, Portuguese and other examples. Revel has a combative style and knows how to highlight the absurd. His book is also a strong unexpected apology for capitalism. But he ends a good book on an inconsistent note—a plea for a global socialism—democratic, to be sure—that will "outgrow" capitalism. After his forceful critique, can Revel really mean this? How will socialism, notoriously short on incentive, produce the means to fund social welfare? And, as Revel himself notes, a look about the world today reveals not one instance of a democracy that does not also have a capitalist economy.

John Romjue
HQ, TRADOC

THE GERMAN WARS, 1914-1945 by Donald J. Goodspeed. Houghton Mifflin, Boston, 1977. 561 pages. $17.50.

Historians of the two world wars have a difficult subject. On the one hand, the sheer volume of events and records defies systematic analysis, while on the other hand emotions and classified documents such as the Allied code-breaking effort leave the student with a false and limited view of this period in history.

Although Lieutenant Colonel Goodspeed has by no means surmounted all of these obstacles, his history of the world wars is remarkably thorough and readable. He skillfully leads the reader through the tangle of diplomatic alliances, war plans, and political crises which produced World War I, and the equally complex and deadly events of the 20 year truce between wars. In his account of the wars themselves, Goodspeed manages to make each year and each campaign stand out from the vast struggles. Although his account is pitched at the level of national policy and grand strategy, he includes enough detail to identify the major tactical developments of the era. To cite but one example, the author correctly traces the origins of *Blitzkrieg* to a combination of the armored vehicle with the German infiltration tactics of 1917-1918.

Apart from a brutally candid and pessimistic account of events, the only unusual aspect of Goodspeed's book is its thesis that France was the nation most responsible for World War I and all its consequences. The author insists that only France had national goals, such as the recovery of territory ceded to Germany in 1871, which could be satisfied only by a major conflict. Goodspeed therefore portrays French President Raymond Poincaré as the one leader who deliberately encouraged the diplomatic crisis of 1914. However, by the same logic, Prussia and especially Otto von Bismarck, were responsible for fomenting the Franco-Prussian War of 1870, the war which dismembered France in the first place. The author overlooks this flaw in his determination to disprove the idea of German responsibility for 1914. Yet few historians today would blame any one nation for World War I, preferring to look at the entire system of alliance and diplomacy which led Europe to the brink.

Some such simplifications are inevitable in a single volume which attempts to cover such a broad topic. In general, "The German Wars" is an excellent summary, a textbook of political and military strategy worthy of considerable attention by the soldier and the general reader.

First Lieutenant Jonathan M. House
USAARMC

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

YUGOSLAVIA AFTER TITO by Gavriel D. Ra'anan. Westview Press. 1977. 206 pages. $14.50.

> . . . it would appear that, while rash Soviet action in Yugoslavia (and perhaps subsequently in Albania) might present some pitfalls for the U.S.S.R., the potential harm to Soviet interests is unlikely to offset the tangible strategic gains to be made.

The thesis of this well researched contemporary international relations volume is that the chances for "tension" during the post-Tito succession period are far better than even. The author's recommendation is that the U.S. government must play a role—at least diplomatically—in assuaging and tempering that outcome, to prevent the Soviet Union from gaining considerable headway in the worldwide battle for hearts and minds. In the realpolitik of the late 1970's, this may have some credence, although the dichotomy of political influence seems a bit simplistic to this reviewer.

Ra'anan has assembled an engaging treatise on the implications of Yugoslav state chaos on her neighbors, both friendly and inimical. The numerous scenarios he posits are sound, expository, and thought provoking. The military and economic advantages which would accrue to the U.S.S.R. are explicitly defined. Even the ramifications of a post-Tito, Soviet grab for power on Albania are presented. It is difficult to believe that wooing this political pariah could be an inducement for a Soviet power play in the Balkans, but the author's arguments augur convincingly for just such an eventuality.

While the graphics included in the book do not measure up to the written text, *Yugoslavia After Tito* is recommended to the professional international affairs reader and political-military analyst.

A. W. McMaster, III
HQ, TRADOC

RECOGNITION QUIZ ANSWERS

The answers for this issue's quiz are:

1) **SOVIET** *SU 7-B Fitter A*
2) **U.S.** *M-60A1*
3) **BRITIAN** *Scorpion*
4) **SOVIET** *BTR-152*
5) **BRITIAN** *FV 433 Abbot* 105-mm. self-propelled gun
6) **SOVIET** *Mi-6 Hook*

Views Through the Visor

From registration through the final renditions of "You're a Grand Old Flag," the 1978 Armor Conference was an outstanding success. Combined Arms was the theme, a theme that prevailed throughout. Other service schools made presentations and were represented by their commandants—truly a meeting of the Combined Arms Clan.

Compliments for an outstanding conference go to the Armor Center. The Armor Association is proud to have been a part of it. The results of the general membership meeting are reported on page 60. General Michael S. Davison is our 28th president.

ARMOR *supports the Combined Arms theme and concept. Our branch was the innovator at the outset. Our Association has always been in accord and has always paid "special attention to mobility in ground warfare."*

ARMOR *is "the Magazine of Mobile Warfare" and is in consonance with the Armor Center and the Association.*

There is a place for both the Association and the journal. They go hand-in-hand. They posit the same ideals. Although the two are separated, they are no more separated than the Home of Armor and the Infantry Center. Armor and Infantry go together. So do **ARMOR** *and the Association. In each pair there is a separation, but also a joining.*

The Armor Conference was enlightening. The branches that make up the Combined Arms demonstrated support for each other for the mutual benefit of all.

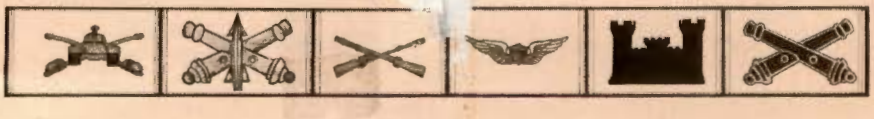
The Association and this journal are no different. Our ideals are the same. We can, do, and will work together in mutual support of Combined Arms and Mobile Warfare.

MAV

ARMOR CONFERENCE

ARMOR CONFERENCE

ARMOR CONFERENCE



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september-october 1978

US Army Armor School

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

COVER

The cover art for this issue represents another visualization of the Combined Arms Team: air vehicles and ground vehicles combining to fulfill the total cavalry mission.

ARMOR

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LETTERS

Gut Issue

Dear Sir:

The article by Colonel Haszard in the May-June issue has hit on one of the key issues in the development of the Infantry Fighting Vehicle. Colonel Haszard is quite correct to assert that preconceived notions of doctrine are a significant factor in determining what guidance is sent to the material developer. In the case of the IFV, infantrymen envision the need for an armed carrier with significant troop space—that is a squad-sized vehicle. On the other hand, the Armor thinkers see a vehicle which primarily brandishes tank-killing weapons. These features are considered more important than carrying a 10-man rifle squad. In fact, if the Infantry persists in demanding a squad-carrying capability, Colonel Haszard suggests the Infantry should reduce the size of the squad to fit the space available. While this seems like a logical, if not easy, solution to simplifying the combat development criteria, Colonel Haszard's suggestion is based on an improper perspective of the battlefield requirements.

In reality, there are two roles for infantry troops and Colonel Haszard has identified them both. First, the infantry must be capable of fighting mounted in the manner suggested by Colonel Haszard. In this mode the vehicle-mounted weapons are most important to the combined arms force, for these weapons allow the mounted column to engage greater and more diverse targets while remaining mounted. Survivability, based on speed, decreased target size, and powerful weapons systems, is the key design criterion.

The second role for infantry troops is to fight dismounted. Colonel Haszard tends to see this role as achieveable with smaller squads, but here he is wrong. The present size of the infantry squad is based on many factors — among them, psychological needs of fighting men as well as the demand for firepower and flexibility. The dismounted infantry squad should be larger than that envisioned by those seeking a tank-accompanying IFV. The mission of dismounted infantry requires the large squad. The growing importance of dismounted infantry in European combat is clearly suggested by Ferdinand Otto Miksche's article in the July 1978 issue of *Military Review*. Images of future combat dictate that the dismounted infantry squad should not be decreased in size.

Where Colonel Haszard and others go astray is that they accept the IFV design question as a case of "either-or". In actuality, another solution is available. Two vehicles are needed to meet the specialized tasks of infantry on the battlefield. One vehicle would be the IFV suggested by Colonel Haszard. It must be an integral member of the fast-moving, armored combined arms team. For this vehicle, the infantry must create smaller squads. The second vehicle should be similar to the present *M-113*. It should provide mobility, protection, and firepower to troops who will basically fight dismounted, but need the mobility and protection arising from their membership in armored and mechanized divisions. Their greater manpower will be necessary for the destruction of enemy positions bypassed by the rapidly moving tank—IFV columns. While in favorable terrain (e.g., forests, built-up areas) the larger squad will continue to be the effective formation in the offense and defense.

The present conflict over the IFV has become mired through the belief that one vehicle must be developed to handle two distinctly separate and specialized missions. The Army has put enough money into the prototypes for each type of IFV that we should be able to produce both with little extra cost to the program. The two specialized cases (mounted combat and dismounted combat) require two different vehicles. Let us recognize that and get on to the more difficult question of how much of each type (mounted and dismounted infantry) unit (with appropriate vehicles) do we need in the mechanized and armored divisions.

ROBERT FRANK
Major, Infantry
USACGSC Faculty

Logistics Guidance

Dear Sir:

I read Captain John Drebus' article, "A Neglected Responsibility", in the May-June issue with great interest. His perceptive article hits home for all combat arms officers who ignore combat service support. The "warlords" cannot expect the logistic system to support them unless they understand it and give it clear requirements.

TRADOC has already taken steps to answer Drebus' plea for a "How to Support" field manual. The Logistics Center and Administration Center have been charged with the job of preparing exactly such a series consisting of:

FM 100-10, *Combat Service Support in Battle*
FM 63-1, *Combat Service Support Operations: Separate Brigade*
FM 63-2, *Combat Service Support Operations: Division*
FM 63-3, *Combat Service Support Operations: Corps*
FM XXX, *Division Maintenance Operations*
FM XXX, *Division Supply and Services Operations*
FM XXX, *Division Transportation Operations*
FM XXX, *Division Medical Support Operations*
FM XXX, *Division Personnel Operations*

XXX—Publication numbers not yet assigned.

Hopefully the discussion of logistics will become less distasteful for tactical leaders. It is high time that we in Armor give the need for effective support the attention it rightfully deserves.

WILLIAM R. GRIFFITHS
Lieutenant Colonel, Armor
Tactical Doctrine Office
HQ TRADOC

One Tanker's Opinion

Dear Sir:

Regarding the comments of Robert E. Stone and his applause (May-June 1978) for "Soviet Armor: A Study in Efficiency", I can only say, "Bravo to you, sir". You have voiced the opinion of practically every tanker I know.

We are all sick to death of reading about what wonderful weapons we will field in the 1980's, while our "Threat Briefings" bombard us with information on the T-64, the BMP, and ZSU. We are sick of test reports on the *XM-1* and MICV, when next week we have a field exercise alongside German Leopards and well-armored Marders. It seems that while we talk about it, everyone else has it.

I don't think any of us blame the Army. We fully realize that if it were left to Congress, in its typical post-war penny-pinching attitude, we would be armed with nothing more than a high-grade bow and arrow set. Then, when we finally do decide to spend some cash, the new product has just absolutely, no two-ways-about-it, got to be 100% American.

Just between us tankers, when the *XM-1* Leopard 2AV evaluation was in progress, most of us were rooting for the Leopard. If we'd bought it, maybe the Germans would

have thrown in a few sets of those great tanker coveralls of theirs as a bonus. Ah, but why dream? The coveralls aren't made in America either.

T. J. SPERRY
Staff Sergeant (P)

APO NY 09330

Congratulations

Dear Sir:

As a regular reader of your magazine, I wish to extend my congratulations on the occasion of its 90th Anniversary.

I should also like to take this opportunity to offer my regards to you and your staff.

KAMOL KHAKSAR
Lieutenant, Armour

11GF., Shiraz, Iran

Electronic Smog

Dear Sir:

Warfare seems to be getting so involved with electronics that the battlefield of the future is likely to be filled with electronic smog. Semi-conductors and transistors can malfunction by responding like the crystal detectors of early radio days. Such solid-state components are to be found in projectiles and missile guidance systems, direction finders, weapon and communication locators, rangefinders, recognition devices, sensors; normal, spread and shifting band radio, IR, black light, low illumination TV, and wire communications systems; jamming, decoy and some false echo systems, and even in automotive ignition systems.

These varied devices will function under good conditions, but will they be able to do so in battle when hundreds of such devices are likely to be in use? Before being adopted, are they being tested in the presence of maximum electronic cross stimuli? If not, we may find that future combat will be conducted as blindly as it was in the days of black powder.

ROBERT J. ICKS
Colonel AUS-Ret.

Elmhurst, Ill. 60126

Scout Vehicles

Dear Sir:

I picked up the March-April issue and saw an interesting article on scout vehicles. It seems that the Cavalry just can't make up its mind about what vehicle fills its needs. Being a Cavalryman myself, I thought I would add a few comments. Wasn't there a vehicle *(XM-230)* that was a lot like the Gamma Goat? This was a 6-wheeled vehicle and hinged in the middle to make two parts—engine and fighting compartment. It also mounted a 20-mm cannon in a cupola similar to the *M-114*.

Also, what about the *M-100* combat car? This vehicle was used by the MP's in Vietnam as an armored car. But the nice thing about this vehicle was that it was rugged, mobile, fairly fast, and could be easily adapted to other versions—mortar carrier, APC, gun vehicle, and command and control vehicle. I think that these two vehicles would make adequate scout vehicles.

CRAIG C. MOSHER
Specialist Four
K/3/2 Armd Cav

APO NY 09452

Flash Cards

Dear Sir:

I would like to say that I enjoy the Armor Recognition Quiz very much. Because it shows vehicles in the field and in the bushes, it is more challenging than the flash cards the Army has out now. Also please try to make all of your pictures the same size because I cut them out and put them on 3 x 5 cards to make my own flash cards. You can pass this idea on to fellow readers if you like. I hope you can use one or all of the pictures I have sent.

WADE R. BARTTELS
Staff Sergeant

Two of the pictures submitted by Sergeant Barttels appear in this issue. ED.

OUCH!

Dear Sir:

On page 49 of the March-April issue of *ARMOR*, in the article, "Origins of Soviet Tank Guns," you mention increasing the tube length of the 76-mm tank gun from 30 to 40 inches. This increase was from 30 to 40 caliber lengths, something quite different.

Dr. Arthur G. Volz
Moosrain 11
811o Murnau
Germany

A Matter of Spelling

Dear Sir:

Like Major Terry A. Girdon (Letters, March/April 1978—"Of Misspelled Names"), *Armour* (sic) Magazine is also on my list of top professional journals. I am encouraged to see that at least one officer in the U.S. Army knows and uses the correct spelling for Armour (even if he is a Gunner).

I tried for an entire year, as an Allied Student in AOAC-73, to convince my classmates of the correct spelling for our chosen profession, but no such luck!

Seriously, I look forward to the arrival of each edition of the magazine and wish you every success in your next 90 years.

John H. Heymans
Major, Armour
Canadian Forces

Mobile Command Headquarters
St. Hubert, Quebec J3Y 5T5

120-mm Ammo Worked

The information given in "Poop Deck" of the February 78 issue of *Armed Forces Journal* pertaining to the results of the tropical testing of the German 120 mm tank ammunition gives us, as prime FMOD contractor of this development, reason to comment the following: "After relatively brief time in the jungle environment, both foreign rounds we experienced very high incidence of misfire, compared with . . ."

This general statement is misleading and incorrect.

Correct is, that after having been subjected to the extremely severe tropic environment of the Canal Zone for a maximum period of 90 days, the German 120 mm tank gun ammo met all criteria and

- did not show any dimensional deviations
- did completely perform without any malfunction or misfire
- did not in a single case show incomplete combustion
- had normal ballistic performance.

These results are due to new technologies developed and applied for the first time in ammunition.

Dr. Raimund Germershausen
Rheinmetall GMBH
Dusseldorf, Germany

Armed Forces Journal April 1978, pg. 4

Help!

Dear Sir:

The staff of the 1st Battalion, 70th Armor is compiling information for the unit's history. Former members of the 70th Armor who have knowledge, data, or pictures of past activities of the unit are encouraged to contact the undersigned. Any written material or photographs loaned for use in compiling the history will be returned to the owner.

ROBERT E. NICHOLSON
Sergeant First Class

APO NY 09358

Needs Slides

Dear Sir:

A few fellow officers and myself are working on a Battle Simulation project. I would like to make contact with someone near the area of Budingen-Gelnhausen, Germany, who could take some slides for me. I will pay for the slides. Please write,

MAJ Dave Daubert
13662 W. Dakota Ave.
Lakewood, Colorado 80228

DAVID B. DAUBERT
Major, Armor, USAR

THE COMMANDER'S HATCH

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

In my first Commander's Hatch I stated that Air Cavalry and Attack Helicopter units are an integral part of mobile warfare. I want to expand on this comment and discuss the progress we are making in bringing this to fruition as well as some of the obstacles that confront us.

The Armor Center recently established the Armor Aviation Directorate (AAD) as the central action agency for Armor Aviation. AAD integrates the effort for weapons development, training development, tactics, and doctrine. I have tasked them to take the initiative and set the standard in this long-neglected extension of Armor's historic role in mounted, mobile warfare.

Due to many misunderstandings both within and outside the Combined Arms Team, the Armor Center's task in developing this extension of its mobile warfare mission has not been easy. Some commanders have been reluctant to fully integrate Armor Aviation into their training. On the other hand, many aviators harbor the attitude that aviation is totally different and unique. They isolate their training, neglecting their role as members of the Combined Arms Team. I challenge today's combined arms leaders, from platoon to division, to insure that the capabilities Armor Aviation offers the force commander are not unused, or worse, misused. Just as too many cooks spoil the stew, the multiple, redundant, independent efforts by numerous agencies working alone outside the Armor Center have done little to insure that Armor Aviation will fight as an integral member of the Combined Arms Team.

Actions are more meaningful than words. The Armor Aviation Directorate recently published a major long-overdue effort, FM 17-40, a comprehensive attack helicopter gunnery training manual. This manual includes the reserve aviation components and outlines the first combined arms gunnery training program for aviation units. To demonstrate the potential of the concept, we will conduct the combined arms gunnery table at Fort Knox in the near future.

The Army has renewed its effort to field a true scout helicopter, the ASH. The Armor Center has consistently supported the urgent battlefield requirement for an ASH. It will insure that our mobile tank killing weapons are in the right place at the right time and on the right target. We envision a small, quick, and agile helicopter with a sighting ability equal to our Advanced Attack Helicopter (AAH). You cannot scout in a battleship. The scout will, as in the past, rely on stealth, cunning, and mobility to perform his mission and survive. The ASH is already late! We must get together and assist this program forward as quickly as possible.

In a related field, the Armor Center is responsible for defining the mission for two of the Army's most promising antiarmor weapons for the 1980's, the XM-1 tank and the AH-64 attack helicopter. Their battlefield functions are similar to provide the maneuver commander with mobile, flexible, armor-killing fires. Thus, I see a requirement to insure that the lessons learned in one development program are available to the other. To assist in getting these programs coordinated, I will host a working conference in late January or early February 1979 of all major activities involved in both programs.

You may have participated in the Air Cavalry/Attack Helicopter Symposium last year at Fort Knox. That symposium produced a valuable interchange of problems, concepts, and solutions among all attendees. The symposium brought together the real "user," the hardware developer, and the training/tactics developer in a common forum. It proved to be an investment producing near- and long-term benefits to the Armor Center. I intend to make this interchange a recurring event. Plans are already underway to host another symposium in the near future.

Another meeting of Armor which produced valuable results occurred with the recent Tank Gunnery Conference held during May. However, all of Armor's gunnery program was not addressed. In the next conference, both attack helicopter and tank gunnery training, ranges, problems, and solutions will be discussed and acted on. As the two development programs are related, so are the gunnery training problems. I see a conference where the exchange among Armor's gunners will be beneficial in increasing our target servicing on the battlefield.

Needless to say, I place much value on the tremendous potential offered by the knowledge, initiative, and problem solving capabilities of all members of Armor. To tap this potential and coordinate its direction is one of my primary tasks. Frank communication among the units, developers, and trainers of Armor is imperative. For example, if you have a problem with our ARTEP and have a solution for it, let us know!

To solicit comment and tap the potential I see, we will publish an article in ARMOR proposing a single unit to perform both air cavalry and attack helicopter missions. This may not be the ultimate solution. We want your views on how to use the helicopter's potential to find, fix, fight, and destroy threat targets.

In our position of leadership for mounted warfare, we cannot concentrate all our efforts on the glamour items, such as weapons. It is also our responsibility to insure that the vital components of the total Army system are coordinated in order that the glamour weapons can and will function. I am talking about ensuring that TO&E's fit the unit's combat mission, that the correct MOS is in the correct job, that the mechanic is trained and has the right tools, and that the critical support areas function rapidly and efficiently.

In Armor Aviation, how we refuel and rearm our combat vehicles remains one of our most serious problems. This critical supply function has been given only cursory attention for too long. It is time for a workable solution to be found and fielded. The solution to this problem will involve several TRADOC centers, and I have tasked my Armor Aviation Directorate to take the lead in correcting this serious flaw in the combat potential of Armor Aviation.

In closing, I would like to repeat what I said in my first Commander's Hatch: "Air Cavalry and Attack Helicopter units are an integral part of mobile warfare. These Armor units are an aerial extension of the urgent requirement to provide the ground commander the means to see the battlefield, fix the enemy, and destroy him." I believe this and ask that you assist us in achieving optimization of your Armor weapons systems.

Think Mobile Warfare!

ARMOR FORCE MANAGEMENT

TANK DISTRIBUTION

During the next 10 to 15 years, the Army will undergo what is probably the greatest modernization it has ever seen. In the forefront of this change will be the tank. Our active and reserve components will see numerous model and type tank changes, from the *M-60* and *M-48A5* through the 120-mm *XM-1*. The TFMO has been assigned the responsibility of monitoring all aspects of tank forces modernization and hosting periodic coordination conferences to review progress. The first meeting was held in May and the second is tentatively scheduled for November and every 6 months thereafter. The current subject areas are the cavalry conversion, *M-60A2* redistribution, and *M-60A3* and *XM-1* introduction.

Modernization Distribution Methodology

When a tank model or system is changed in a unit, the tanks in the unit's maintenance float, war reserve, and prepositioned equipment, if appropriate, are also changed simultaneously (figure 1). The tank systems are the *M-551 Sheridan, M-48A5/M-60A1/M-60A3* series, *M-60A2*, and *XM-1* (105- and 120-mm guns). New systems will usually be introduced concurrently to Europe and CONUS in such proportion so as to keep the personnel rotational base balanced. Upgrading within a system will usually result in a new version being distributed in a forward-weighted manner — to the highest priority units first (e. g., usually Europe based). All changes may require some transition training and adjustments in the logistics support, but they are far more significant in a system change.

Cavalry Conversion

The Army is currently replacing the *M-551 Sheridan* with *M-60*-series main battle tanks in all its cavalry units. When completed, only the airborne tank battalion of the 82d Airborne Division and the "Roundout" cavalry troop of the 101st Airborne Division will have the *M-551 Sheridan*. Other uses for the *M-551* are being explored, but no definite plans have been made. Concurrent with the phase-out of the *M-551* is the reorganization of the cavalry platoon from their many different forms today to a stan-

	UNIT SET
TO&E	— Required by the Unit's Table of Organization & Equipment. — Issued to unit wherever located.
ORF	— Operational readiness (maintenance) float. — To replace maintenance losses. — Retained at maintenance support units.
PWRS	— Prepositioned War Reserve Stocks. — To replace combat losses. — Stored in anticipated theater of combat operations.
POMCUS	— Prepositioned Material Configured to Unit Sets. — To equip high priority CONUS based units which are flown, less equipment, to the anticipated combat area of operations. — Stored in unit sets in the anticipated combat area of operations.

Example: (1) Europe based tank unit would receive *XM-1* tanks in its TO&E, ORF, and PWRS simultaneously.
(2) High priority CONUS based tank unit would receive XM-1 tanks in its TO&E, ORF, PWRS and POMCUS simultaneously.

Figure 1.

dard four main battle tank tank section, four tracked scout vehicle scout section, and a platoon headquarters mounted in a scout vehicle. The scout vehicles will be the *M-113* and improved TOW vehicles (ITV) initially but will eventually be replaced by the cavalry fighting vehicle (CFV). The mortar squads will become part of the troop headquarters.

M-60A2 Tank Distribution

The Army made the decision last year to improve the effectiveness of its *M-60A2* force by making a more balanced distribution of its *M-60A2* tank assets. There will be a decrease in the number of *M-60A2* battalions stationed in USAREUR, an increase in the number stationed in CONUS, and an increase in the number in CONUS that have prepositioned equipment ready to fight in Europe. The *M-60A2* tank's unique long range killing capability will be retained in the tank force.

M-60A3 Distribution

The fielding of the *M-60A3* tank will begin in 1979. They will come from two sources — new production and conversions of *M-60A1's*. Since the *M-60A3* is an upgrade within the *M-60*-series tank family and not a systems change, the distribution will generally be forward-weighted or to USAREUR units first. The greater effectiveness of the *M-60A3* over the *M-60A1* models will give our tank forces increased capability in the face of an ever-increasing threat.

XM-1 Distribution

Before the *M-60A3* is fully fielded, the *XM-1* will be in the field, because the *XM-1* is a systems change in that it requires discrete crewman and organizational mechanic MOS's, has an almost completely different PLL/ASL, has significant operational differences and greatly increased capability, it will be distributed concurrently. This method of distribution will put the *XM-1* in Europe- and CONUS-based high-priority units simultaneously. When the 120-mm gun equipped *XM-1* reaches the field in the mid 1980's, it will be distributed forward-weighted or sent to USAREUR units first because it represents a system upgrading within the *XM-1* tank family. It is anticipated that crewmen and mechanics on the 105-mm gun *XM-1* will be able to perform their jobs on the 120-mm gun *XM-1* equally as well as they did on the 105-mm gun *XM-1* with minimal training.

Summary

As the preceeding paragraphs indicate, the total tank force will be continuously modernizing. It will be a major concern for all commands, but it represents only one system change out of a total of over 40 systems that are anticipated for introduction into the force during this period. Planners, programmers, and commanders must anticipate these changes as far in the future as possible so that their added capability can be an advantage and not a burden. The old way of "sorting things out on the ground" is no longer appropriate. ▲

T-142 TRACK

Units are experiencing problems with the *T-142* track ranging from rapid pad wear to end connector or track pin failure. The latter two are rarer extremes and can be prevented by proper inspection to detect unusual wear.

The wear on end connectors can be reduced by ensuring that the track tension is correct. A track that is too tight increases wear on the connectors as well as the sprocket teeth. It also puts a heavier load on the final drive and idler wheel which cuts into their useful life.

The track pins that fail have, in the majority of cases, been those in dead track blocks. If these dead blocks are detected and the affected component replaced, this type failure will not be so much of a problem. The procedures for setting correct tension and detecting dead track blocks are found in Figures 3-7 and 3-8, TM 9-2350-215-10.

The problem of rapid track pad wear is also one that can be reduced. Pivot or other very sharp turns on hard surfaces tend to pinch the rubber between the track grouser and the surface, then tear it away as the turning motion of the tank continues. This is especially true of new pads that have not been worn down through normal use. Once the pads have worn down, they are not as susceptible to this type damage, but they can still cause severe wear. Pivot or other very sharp turns on paved or other very hard surfaces *should be avoided* unless absolutely required.

All movement on paved surfaces causes more wear than cross-country travel, so let's not aggravate the situation. None of this is to say that there is no problem or that it can all be solved by the suggestions just given. It does say that much of the problem with the *T-142* track can be cut down. We have a problem and we know it, including the *M-60* Project Manager. That office is testing new material which they hope will eliminate the deficiencies.

We can make our jobs easier by strictly adhering to maintenance and inspection procedures. As a contrast to the low mileage figures many units have reported, while undergoing tests, one *M-60A1E3* accumulated over 2,000 miles on the original track and pads. This vehicle *was not* operated on hard surfaced roads, and professional factory engineers and highly experienced crewmen made sure that the vehicle was thoroughly inspected each day and that all components were adjusted correctly. They were professional testers; we are professional tankers and can do as well.

Automotive Department, USAARMS

MASTER GUNNER'S CORNER

SYNCHRONIZATION

For years the quarterly maintenance services and equipment serviceability criteria (ESC) for the *M-60*-series tanks has included a synchronization and alignment check of the direct fire sighting system. How many times has this important requirement been neglected because of the nonavailability of the old familiar "synch ramps," most of which are located at range complexes far from the unit's home station?

The solution to this problem is the testing target method of synchronization which has long been tucked away in the back of the technical manual and is not as familiar to tankers and mechanics as is backing up the synchronization ramp. The testing target when properly constructed and positioned is as accurate as the ramp method and requires only a small corner of the motor pool area.

Before performing the synchronization and alignment check you must first understand what these checks are all about. The main gun of the *M-60A1* tank has a maximum elevation of +20 degrees and a minimum depression of −10 degrees. The gunner's *M-32* periscope and the rangefinder are attached through ballistic drive linkage (commonly called the 5- and 11-inch arms) to the gun trunnions

and follow the gun as it is elevated. Synchronization measures the ability of the gunner's periscope and rangefinder to follow gun movement within .5 mil of elevation deviation throughout the full range of elevation and depression. Alignment measures the ability of the gunner's periscope and rangefinder to follow gun movement within .5 mil of deflection deviation throughout the full range of elevation and depression.

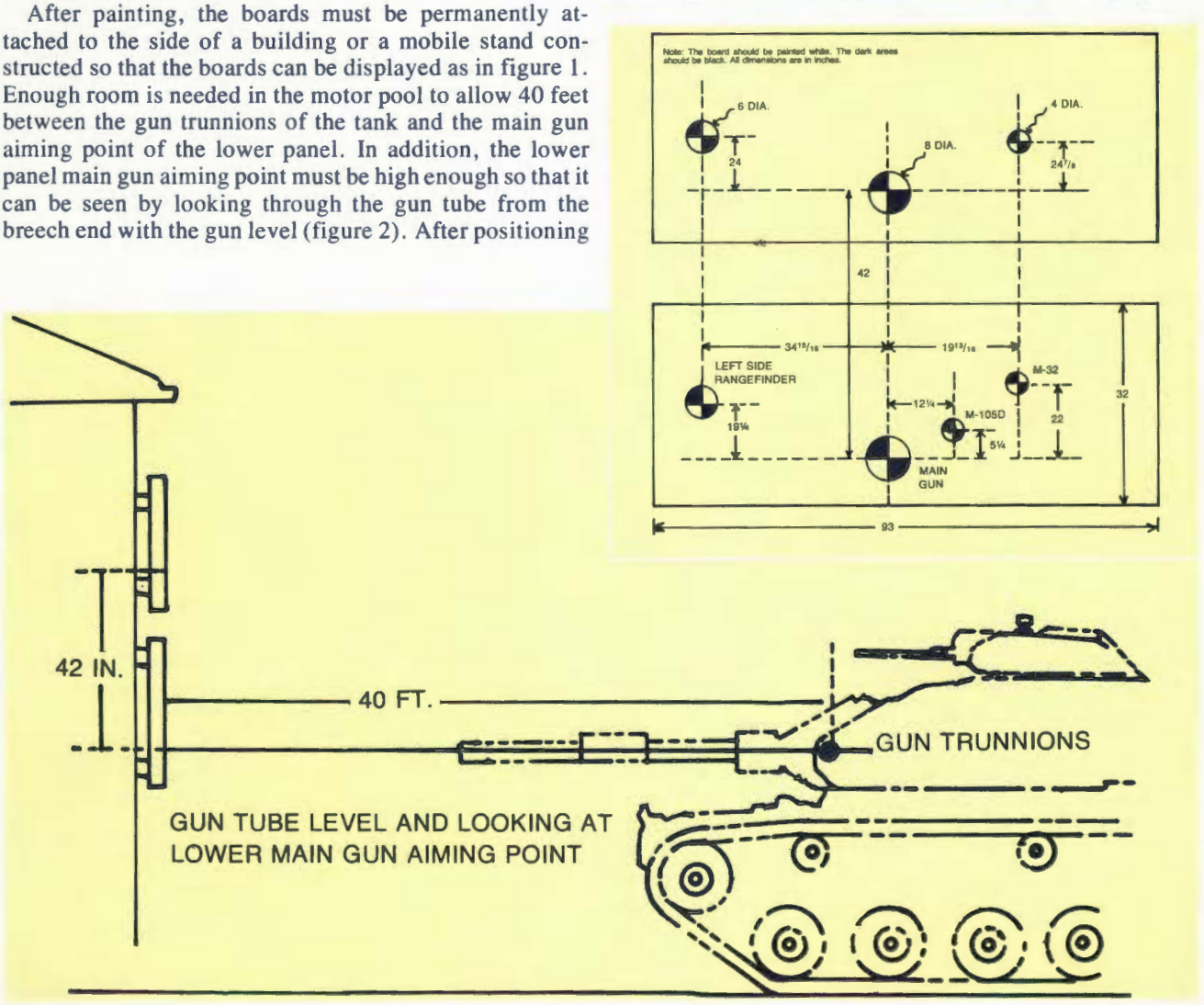
Boresighting the tank brings the gun and sights together at only one elevation angle. If the elevation and/or the deflection error exceeds .5 mil and you are firing at a target that is at a different elevation angle than your boresight elevation, there is a high probability that you will not obtain a first round hit. Therefore a quarterly synchronization and alignment check is necessary to insure the combat readiness of the unit's tanks.

A testing target can be constructed from two pieces of plywood with target aiming points drawn on them using the dimensions shown in figure 1. This testing target will allow the tank to be synchronized from 0 to plus 5 degrees, indicating that the fire control system is within tolerance at 15 degrees. More boards may be added to provide synchronization up to 20 degrees or a minus 5 degrees (the dimensions can be obtained from TM 9-2350-215-20 w/C, Feb 1965).

After painting, the boards must be permanently attached to the side of a building or a mobile stand constructed so that the boards can be displayed as in figure 1. Enough room is needed in the motor pool to allow 40 feet between the gun trunnions of the tank and the main gun aiming point of the lower panel. In addition, the lower panel main gun aiming point must be high enough so that it can be seen by looking through the gun tube from the breech end with the gun level (figure 2). After positioning the lower panel, the upper panel must be positioned above and parallel to it at a distance of 42 inches between main gun aiming points.

Before checking the synchronization and alignment one more small item must be made. These are the aperture disks which fit over the *M-32* periscope body, left rangefinder end housing, and 105D telescope port. These disks are 1¾ inches in diameter and have a ⅛ inch diameter hole in the center. They can easily be cut from cardboard or permanently made from wood or plastic. The aperture disks greatly decrease the parallax that will be present at the short distance of 40 feet.

With the tank positioned 40 feet from the board with the gun level, and the aperture disks in place, you are now ready to begin the synchronization and alignment check. Using TM 9-2350-215-20 w/C as a guide you must first handcrank all superelevation to zero and boresight the main gun on its lower aiming point. After the main gun is laid on the large circle align the rangefinder, periscope, and telescope on their own respective aiming points using the boresight knobs. The target aiming points are positioned to reflect convergence of lines of sight with the main gun at 1,200 meters and are corrected for sight location parallax. After the sights are positioned, lock the boresight knobs and slip the scales to their appropriate



readings.

Elevate the gun to the 5-degree aiming point (upper panel) without overtravel. Insure that the gun is on its upper aiming point, then sight through the periscope. If the boresight reticle is not on its 5-degree aiming point, disengage and rotate the boresight knobs to bring the reticle to its aiming point. Check the amount of movement required to bring it to its aiming point by reading the slip scales. If the synchronization error exceeds .5 mil, adjustment of the 11-inch arm is required. If alignment error exceeds .5 mil the head assembly is improperly seated or may need repinning by supporting maintenance personnel. Perform the same check with the rangefinder. If synchronization error exceeds .5 mil an adjustment of the 5-inch arm is necessary, and if alignment error exceeds .5 mil supporting maintenance should be notified. Adjustment of the 5-inch and 11-inch arms are covered in the TM.

The testing target method allows your crews and mechanics to check the synchronization of their vehicles without leaving the motor pool. If additional information is needed for constructing a testing target, contact the Career Development Branch, Weapons Department, U.S. Armor Center, Ft. Knox, Ky. (AUTOVON 464-5826).

A synchronization and alignment check should be performed quarterly or whenever a sighting system component is replaced. Although many times an adjustment is not necessary, the vehicles should still be checked to insure their combat readiness.

WILBURN D. HORTON
Staff Sergeant
Master Gunner Branch

ZEROING THE SHERIDAN

The key to first round hits in *Sheridan* gunnery, both on the range and in combat, is a precise boresight and a controlled zero. To this end, the following tips for efficient and accurate boresighting and zeroing are presented.

The accuracy of a zero will depend entirely on the accuracy of the boresight. It is imperative that each *Sheridan* crewmember, while performing the boresight exercise check, double check, and check one more time each step along the way—and then another crewmember should check it! In particular, the gunner must insure that all parallax is removed from the *M-127A1* telescope. If this is not done, all other steps will be invalid. Before he can do this, he must understand what parallax is—this is a job for the Master Gunner. Another item which must be thoroughly checked are all mounting bolts, especially on the *M-149* mount and the manual traverse control handle bracket. If any of these bolts are loose, the boresight and zero will be correspondingly inaccurate.

Just as the accuracy of the zero depends on the boresight, the accuracy against the target depends on the zero. To some, this has meant that you must shoot more rounds to "confirm" the zero. This, however, is confusing quantity with quality. Two rounds are all that are needed, and here's how we in the 1st Squadron, Blackhorse Regiment have done it.

As is appropriate, the initial emergency zero elevation and deflection settings are the starting place. TM 9-2350-230-10 says that "5" elevation and "2" deflection are appropriate. But that's for a 12-ft by 12-ft panel. Here in USAREUR, we usually get an 8-ft by 8-ft panel. If you shoot at this panel using the 5 and 2 settings, you'll probably be off the panel. Therefore, we start with "6" elevation and "2" deflection and put in the first round on the panel.

The next step in accurate zeroing is control. Each crew must understand the principle behind the boresight knobs on the *M-127A1* telescope. In review, an increase in the elevation knob will lower the strike of the round on the target, and vice versa. In deflection a decrease will cause the round to go to the right, an increase to the left. We have found that this formula is confusing and easy to forget. For that reason, the Master Gunner should control zeroing from the tower on the range. His first step should be to draw the corrections on the tower window—then he can't forget either! Next, the designated vehicle tank commander (TC) should announce his initial elevation and deflection readings, which should be recorded in the tower. After announcing "on the way" to the tower, the remainder of the firing line (preferably all from the same platoon, including scouts) sense the strike of the round. The firing gunner should use the electrical firing trigger in his palm control handle with the turret power turned off. This will reduce the error imparted by the gunner flinching when the recoil of the 152-mm first hits him.

The gunner must then re-lay on the target center-of-mass by the "G" method, using manual controls. After assuming the same sight picture, the gunner unlocks his boresight knobs and references the 1,200-meter cross from center-of-mass to the strike of the round.

We have found that it is best if the gunner and TC talk each other through this procedure to avoid error. Prior to reengaging, the TC must announce his new elevation and deflection settings to the tower for verification by the expert—the Master Gunner. Often if this is not done, the gunner will re-lay on the strike of the round and then use his boresight knobs to reference the center-of-mass, thus compounding rather than solving the problem. By announcing the changes, the Master Gunner can tell if the gunner increased when he should have decreased.

Using these procedures, *M-551* crews can achieve a two-round zero regularly. This not only translates into a substantial ammunition savings, but gives crews confidence in their equipment and puts steel on target—on the first round!

PETER ROSIE
Staff Sergeant
Master Gunner

B/1/11 Armd Cav Regt

A Bigger Foot Print

by CAPTAIN
PAUL A. LEONARD

Since ancient times combat commanders have understood the cardinal principle of success: *mass combat power at the point and time of decision*. The interpretation and implementation of this principle, however, has been evolving constantly due to technical advances. The advent of the tank in the "Great War" and the development of armor doctrine in the years intervening before World War II are prime examples. Guderian's tactics of massed armor were extremely successful in the blitzkrieg of Poland in 1939 and in Germany's assault in the West in 1940. Rommel extended the concept using combined arms tactics to maximize the effectiveness of his weapons in the African desert.

The desert war shaped the tactics Patton took back to Europe in 1944. The desert wars in the Middle East in 1967 and 1973, similarly, have demonstrated the lethality of the modern battlefield and have caused further evolution of tactical doctrine. FM 100-5, *Operations*, outlines the concepts that were distilled and made more obvious by the desert, to be used

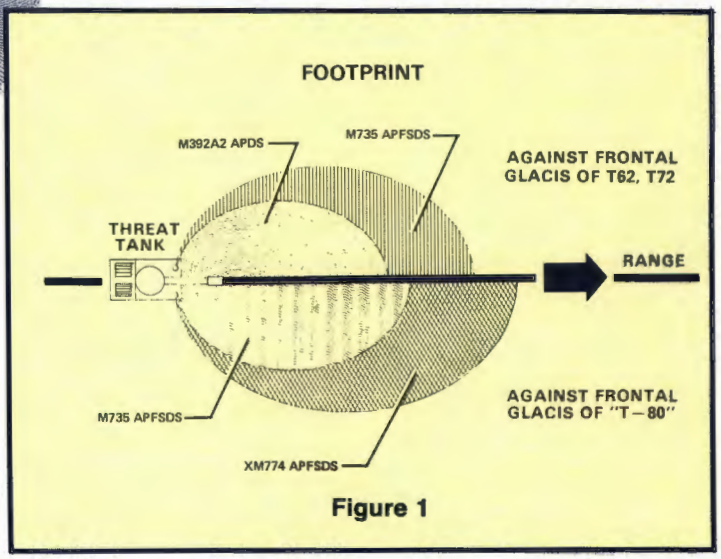


Figure 1

A better effectiveness measure is the footprint against armored components like the glacis. M-735 provides a bigger footprint against the T-72. The XM-774 will maintain it against "T-80."

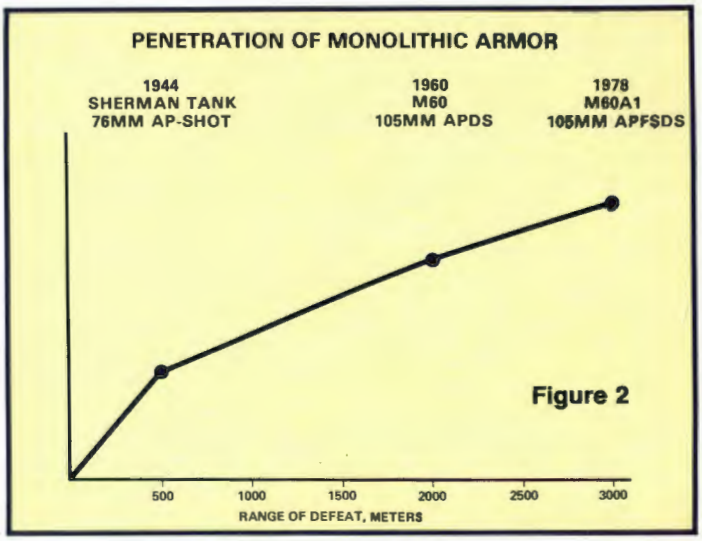


Figure 2

The *M-735* provides increased performance against the current threat through increased accuracy, and through better penetration on monolithic frontal armor.

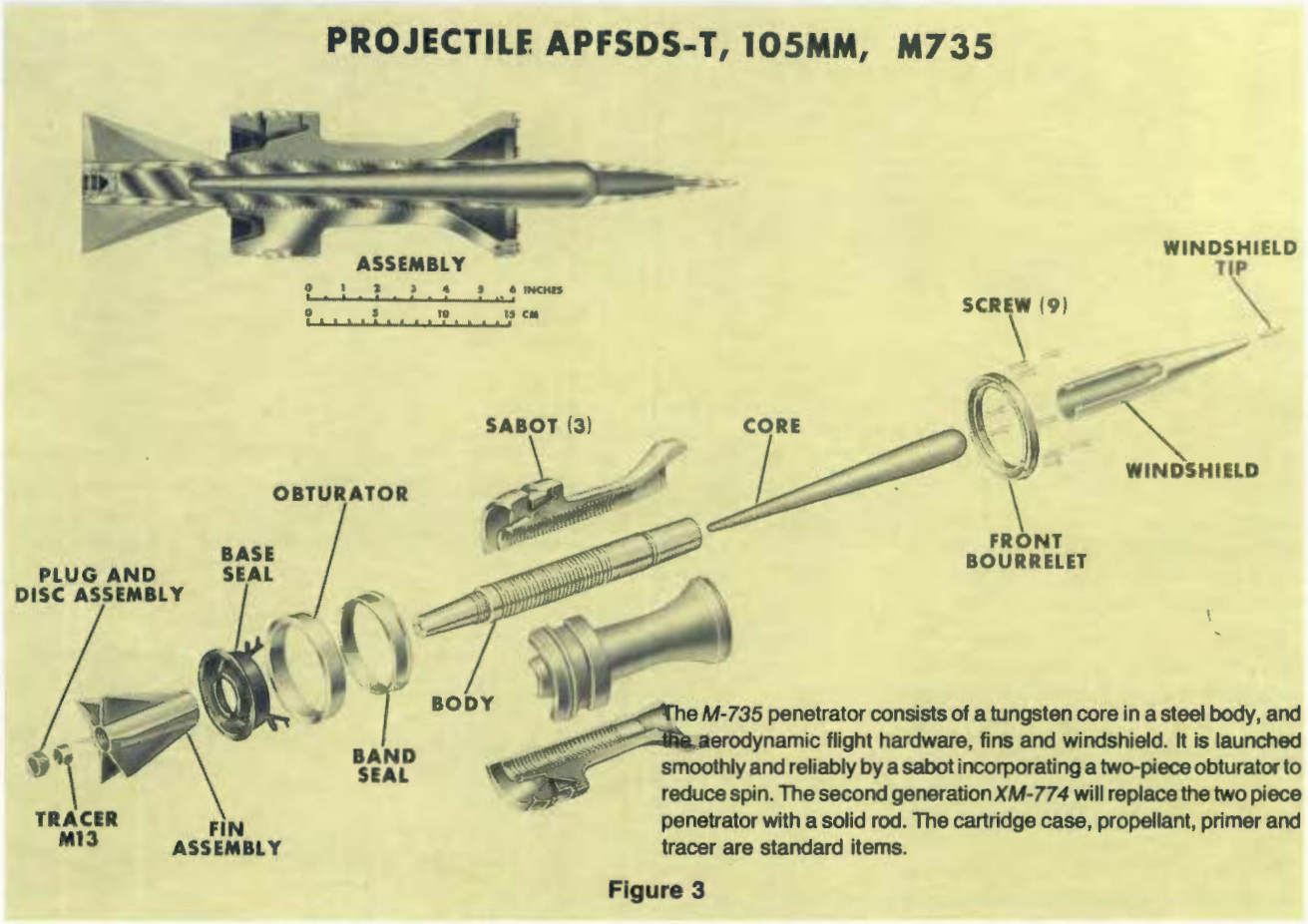
in Europe in the 1970's and 80's. Effective combat must be long-range combat.

The effectiveness of U.S. and NATO tank forces mounting 105-mm cannon is now being dramatically increased to suit the long-range need by the introduction of a new kinetic-energy, armor-defeating cartridge, the *M-735*. This ammunition has already profoundly influenced ongoing U.S. technical developments, especially the *XM-1* tank. It can also be expected to influence Soviet technical and tactical doctrine for tanks in the 1980's. Armored unit commanders should examine the impact of the *M-735* on tactical implementation of the FM 100-5 concept.

The *M-735* is the first generation of a new approach to the design of kinetic energy ammunition. Technology base programs in the late 1950's had shown the desirability of concentrating the kinetic energy of a projectile into a long, thin, very dense penetrator as a means to increase penetrating power over shot-type munitions such as the *M-392*-series armor-piercing, discarding-sabot (APDS) rounds. The development and fielding of such a projectile awaited development of dense materials of high strength, toughness, and hardness which could withstand the environments of both launch and impact. The *M-735* development was not begun until late 1972, when the technology of tungsten alloys several times as dense as steel became sufficient to permit their use. Even so the penetrator of the *M-735* consists of a tungsten core in a steel body to achieve both a safe launch and good penetration.

The *M-735* increases the amount of monolithic armor the 105-mm gun is capable of defeating. However, a better measure is the range from which a round can defeat the turret or a hull section, for example the glacis, with a specified probability. This range is a function of attack angle, as well as armor composition and geometry, and therefore describes a characteristic "footprint" (figure 1). As well as giving a bigger footprint against the turret and glacis, the *M-735* provides increased capability to defeat the side of armor hulls on grazing shots despite the exterior components such as road wheels, idler arms, and side-skirts. Given a hit, the *M-735* can achieve catastrophic kills at angles and ranges where the *M-392A2* might only inflict a minor functional impairment (figure 2).

The rod geometry required for this penetration performance also requires the fin stabilization of the penetrator while in flight, as contrasted to the spin stabilization of the *M-392*. In fact, the *M-735* sabot is designed to avoid the spin imparted by the gun tube rifling. This is accomplished by a two-piece, concentric obturator, the outer band sealing the lands and grooves while rotating around the inner, sabot-sealing band (figure 3). Compared to the *M-392* projectile, which is spinning at about 780 revolutions per second as it leaves the muzzle, the *M-735* projectile has very little spin. Given the exigencies of military nomenclature, we think it quite logical that the *M-735* is designated APFSDS (armor-piercing, fin-stabilized, discarding-sabot). It follows that it is almost facetious to say that fire commands will continue to be



The *M-735* penetrator consists of a tungsten core in a steel body, and the aerodynamic flight hardware, fins and windshield. It is launched smoothly and reliably by a sabot incorporating a two-piece obturator to reduce spin. The second generation *XM-774* will replace the two piece penetrator with a solid rod. The cartridge case, propellant, primer and tracer are standard items.

Figure 3

given as SABOT.

The *M-735* sabot also separates from the penetrator subprojectile very precisely and reliably upon leaving the muzzle. The combination of clean sabot separation and fin stabilization yield a dramatic improvement in round-to-round dispersion. The total result is that the *M-60A1* firing *M-735* has a much improved probability of a first round hit and kill of a standing target at ranges greater than the capability of the *M-392* projectile. This range is limited by fire control and will be greater for *M-60A3* and *XM-1*.

The sabot technology developed for the M-735 is being exploited fully in the development of the *XM-774*, the second generation of 105-mm APFSDS which will be fielded in the near future. The *XM-774* is being designed to overmatch the projected next generation of Warsaw Pact tanks, *"T-80,"* in terms of range of a first round kill probability. It will do so by giving dispersion as good as that of the *M-735* with much greater penetrating capability. The increased penetration can be obtained by changing the *M-735's* two-piece, tungsten alloy and steel penetrator to a solid rod of depleted uranium (DU) having mechanical properties superior to those of tungsten alloys.

Because depleted uranium has so often been misunderstood, especially by the press, it is appropriate to digress. We are not fielding "nuclear bullets." DU is the byproduct of the uranium enrichment process and is depleted of the radioactive isotope U_{235}. Only several tenths of a percent U_{235} remain in DU which is very effectively shielded by the stable isotope U_{238}. Because only low-energy alpha particles are emitted, raw DU can be safely handled with gloves. In the *XM-774* cartridge, the DU penetrator is completely shielded by other components, including the sabot, cartridge case, and aluminum aerodynamic windshield. In-tank testing of a basic load of *XM-774* cartridges has demonstrated the levels of all types of radiation to be comparable to that of normal, everyday background radiation, and orders of magnitude less than levels which are considered physiologically harmful.

In addition to the mechanical properties which make DU a superior antiarmor penetrator, it is pyrophoric. The heat generated at target impact causes DU to ignite and burn in the air. This causes a veritable fireworks display and increased effectiveness by igniting flammables. The Air Force's *A-10* close-support aircraft uses a mix of HEIT and APIT (high-explosive and armor-piercing, incendiary tracer). The latter incorporates DU as the penetrator.

M-735 sabot technology will also be the basis of a new 105-mm training round — the target-practice, discarding-sabot (TPDS) *XM-797*. TRADOC and DARCOM have recently defined requirements for *XM-797* which include not only the capability of gunnery training to 3,000 meters with *M-60A3*- and *XM-1*- type fire control, but also the capability to do so in existing tank training areas which often have range fans limited to 8,000 meters. The *XM-797* also will be fielded in 1981.

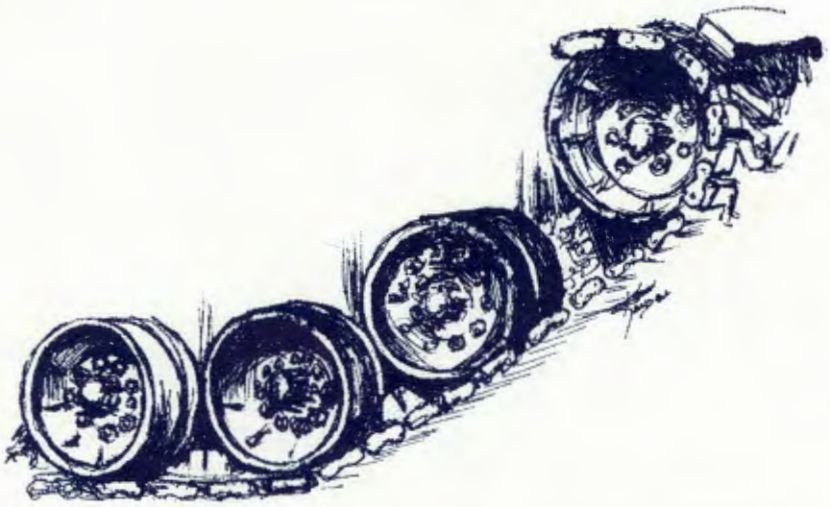
The *M-735* and its technology will have a wide range of benefits for U.S. and NATO forces. The most obvious is the immediately increased effectiveness and confidence of our tank forces equipped with the *M-48A5* and *M-60A1*. Because many other tanks in the NATO inventory such as the *Leopard I* mount either the *M-68* cannon or its British twin, the *L-7*, the *M-735* is interoperable. Interoperability has also been demonstrated with the French 105-mm *F.1* gun. Whereas the *M-392* has limited interoperability with the *F.1*, because its rifling has less twist than the *M-68*, the *M-735's* performance is actually better from the *F.1*. As reported in a recent issue of *International Defense Review* the French will now probably not up-gun the *AMX-30* to 120-mm *(AMX-32)* but rather product-improve the fire control only, with technology similar to that of the *M-60A3*, in order to take advantage of the *M-735's* excellent dispersion and penetration. The *M-735* is being studied for production in Europe under license by a NATO consortium for these reasons.

The *XM-774* will also be interoperable. It is intended to provide 105-mm NATO tank forces standoff against the projected Warsaw Pact *"T-80"* similar to that provided by *M-735* against *T-72*, despite projected improvements in armor technology. It also will present Soviet tank designers a significant dilemma for the far distant *"T-90."* Either the Soviets will continue to accept a large standoff range and high kill ratio inside the 105-mm effectiveness fan, or they will adopt a radically different philosophy and provide increased armor protection to reduce this standoff. The latter alternative carries significant penalties in terms of vehicle size, weight, and cost, all of which carry strategic as well as tactical benefits for NATO.

Much has been written in the last several years concerning adopting the 120-mm caliber to counter the projected threats of the 1980's and 1990's. Germany has announced her intention to equip the *Leopard 2*, a contemporary of *XM-1*, with the 120-mm smoothbore cannon currently in development (and which uses ammunition designed with *M-735*-type technology). At this writing the U.S. Army has recommended to the Congress a program leading to future application of the German 120-mm smoothbore gun to the *XM-1*. In the interim, the new family of 105-mm APFSDS ammunition will provide the U.S. and NATO 105-mm gun tank fleets with outstanding combat effectiveness against current and future Threat tanks at least through the remainder of this century.

CPT PAUL A. LEONARD was commissioned in the Ordnance Corps upon graduation as a Distinguished Military Graduate from Purdue University in 1973. He attended AOB and served in the USATCA in various capacities including company commander. Captain Leonard holds an MS in Mechanical Engineering. He is currently Coordinator of 105-mm Ammunition Development, Office of the Project Manager, *XM-1* Tank System.

FORGING THE THUNDERBOLT



Recently, the Ground Mobility Division, Maintenance Department, USAARMS developed a driving program that gives the Armor Officer Basic Course (AOB) student expanded exposure to typical terrain situations encountered by a combat vehicle driver.

Though the amount of miles driven by each student may seem small, the realistic situations thrown at him present a challenge.

Why a basic driving class for a student who, upon graduation, will be a leader? Why not? How can one adequately train, supervise, and evaluate his subordinates if he is unfamiliar with those individual requirements peculiar to each crew position?

The driving course runs the student platoon leader through the full cycle from the driver's test to actual driving over a prescribed course.

Actual driving takes place over a course consisting of steps, ditches, slalom, vehicle roll and pitch, steep grades, maneuvering through rubble, and crossing over an obstacle on the armored vehicle launched bridge (AVLB).

The student repeats this course while buttoned up and wearing his protective mask.

At night the process is repeated with infrared (IR), and a convoy operation under blackout conditions (BO) is added. The student is confronted with all this in a distance of approximately 8-10 miles each driving period.

A breakdown of this instruction follows:

Day Operations

Operating fundamentals.	3 hours
Driver test (Battery II and written test).	2 hours
Escape and evacuation *M-60A1/M-551*.	1 hour
Driving over varied terrain and road conditions without protective mask and unbuttoned.	20 min per student minimum
Driving over varied terrain and road conditions while wearing the protective mask and buttoned up.	20 min per student minimum

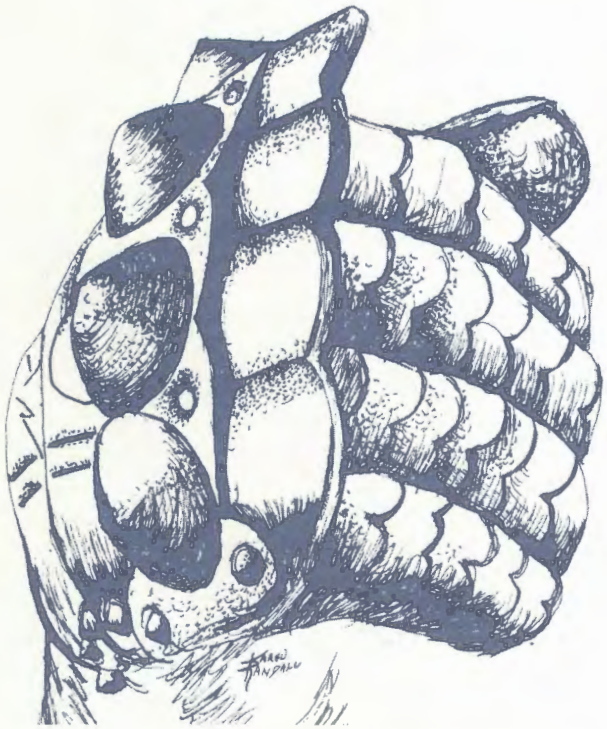
Night Operations

Driving over varied terrain and road conditions using IR device and wearing the protective mask.	20 min per student minimum
Driving over varied terrain and road conditions under BO conditions.	20 min per student minimum

What does the AOB student gain? First, he is made to realize, under actual field conditions, the necessity for proficient operator maintenance. Secondly, he has driven a vehicle under the same conditions his drivers must operate under, and is made to better identify with and appreciate their responsibilities. Thirdly, he is made to appreciate the importance of proper route selection when going from point A to point B to prevent damage to equipment and injury to personnel.

Upon completion of this training, the AOB student becomes a greater asset to his commander. He has been exposed to a phase of training that the commander cannot afford to present as on-the-job training because of limited training time in the unit.

It is now up to the new platoon leader to expand and broaden what he has learned.



FIST

by Captain Barry J. Robella

For some time now, service schools have recognized the need for a closer partnership between combat maneuver units and supporting artillery elements. To accomplish this, the fire support team (FIST) concept was implemented on 27 June 1977, including the establishment of MOS 13 F (Fire Support Specialist).

The FIST provides maximum artillery forward observer assets, centralized control of artillery and mortar personnel, and frees the company commander of fire support coordination details. The latter is accomplished by making the FIST chief the fire support coordinator (FSCOORD) at company level.

Implementation of FIST involves the acquisition of new hardware and additional personnel for the traditional three-man forward observer (FO) team. The following chart lists projected new equipment and its application.

Ground/Vehicle laser locator designator (G/VLLD)	Designates moving and stationary targets for laser guided munitions.
Digital message device (DMD)	Links platoon FO's and FIST headquarters at company level with the TACFIRE set for requesting fire.
Laser target designator (LTD)	Used in dismounted operations to designate targets.
Laser rangefinder (GVS-5)	Provides improved accuracy in range determination out to 10 kilometers, resulting in more accurate fires.
Variable format message entry device (VFMED)	Establishes a two-way computer interface with TACFIRE; and vehicle position determining equipment to provide precise information for use in conjunction with the laser rangefinder for accurate targeting.

Note: Most of this equipment is in the testing and development stage and will not be available for training until the 1980's.

The personnel changes involved in the implementation of FIST vary according to the type of maneuver organization to be supported. Under FIST, no longer will field artillery have to field *ad hoc* observer teams to provide observed fire support for the armored cavalry squadron and additional maneuver battalions of a tailored combat division. FIST's and fire support sections to support these elements will be assigned to general support battalions in all but the airborne and air assault divisions.

RANK POSITION / TYPE UNIT			MECH INF	ARMOR /CAV
LT FIST CHIEF			1	1
SSG FS SERGEANT			1	1
SGT FORWARD OBSERVER			3	0
SP4 FS SPECIALIST DRIVER			1	1
PFC RTO (ASS'T FO)			3	2
TOTAL			9	5
EQUIPMENT TYPE			MECH INF	ARMOR /CAV
VEHICLE	M113A1, M151A2 W/ TRL, AND M561		0**, 2, 0	0** 2, 0
NAVIGATION	VEHICLE POSITION DETERMINING SYSTEM*		1	1
COMMUNICATIONS	VRC 47	GRC 160	1 2	1 2
	PRC 77	KY 38	3 1	1 1
	GRA 39	SB 993	2 1	2 1
	MK456A/GRC RC292		1	1
		DMD*	1 2	1 2
OBSERVATION	G/VLLD*		1	1
	GVS-5*		2	1
	LTD*		2	1
	PVS-5		1	1
	TVS-5		1	1

* PROJECTED NEW EQUIPMENT

** PREFERRED VEHICLE THROUGH LOCAL REASSIGNMENT OF ASSETS

FIGURE 1 FIST EQUIPMENT/PERSONNEL SUMMARY

To better understand how the FIST is a more efficient means of providing fire support, let us look at the two most common configurations, the mechanized infantry and the armor/cavalry FIST's. These new teams provide all the benefits of the old FO system and more by making the FIST chief, an artillery lieutenant, the FSCOORD (figure 1).

The mechanized infantry FIST is comprised of nine

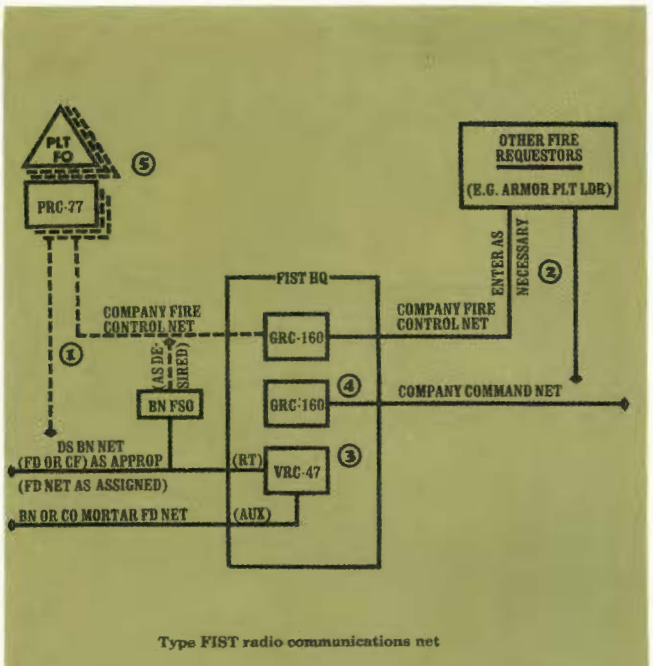
members. The FIST chief (LT), fire support sergeant (E6), and fire support specialist (E4), man the FIST headquarters. The FIST headquarters is the net control station for the company fire control net. Additional nets which the FIST may have access to are the Air Force FM frequency, the company command net, the fire direction net of the appropriate field artillery unit, and either the 81-mm or 107-mm mortar fire direction nets. New equipment will also include the ability to operate in a secure net which will substantially increase the ease of passing targeting intelligence to higher headquarters.

The three, two-man, platoon FO parties equipped with AN/PRC-77's found in FIST are a radical departure from the traditional Redleg support structure. Even a fourth FO party could be formed from the assets found in the FIST headquarters, however, a reduction in the radio capability within FIST headquarters would be incurred. These FO's, under the supervision of the FIST chief, will permit better battlefield observation and timelier fire support down to platoon level. These men will be depended upon to be the eyes of our mortars and field artillery, as well as the Air Force and Navy. Work has already begun to standardize mortar and field artillery observer procedures. As a result, TC-6-40-4, *Fire For Effect,* has been revised to reflect the new standardized procedures.

The armor/cavalry FIST organization differs from the mechanized infantry in that platoon forward observer parties are not provided. A few reasons for this decision are that platoon leaders in armor have immediate close-in firepower available until direct fires can be brought to bear; second, there is no place for an FO to ride in an armor platoon and a separate tracked vehicle for FO's is not considered cost-effective; finally, the communications system already present in armor/cavalry organizations provides a method for indirect fire support if required. In light of these conditions, the armor/cavalry FIST consists of a FIST chief (LT), fire support sergeant (E6), fire support specialist (E4), and two RTO's/assistant FO's (E3) (figure 1).

One of the key elements leading to increased fire support responsiveness at company level and higher is the acquisition of additional communication equipment for the FIST. An AN/VRC-47 and two AN/GRC-160's allow the FIST headquarters to operate on three radio nets. The FIST headquarters will be the net control station for the company fire control net (CFC). This net can be used for the bulk of fire support planning at company level between platoon leaders, platoon FO's, mortar platoon leaders, and FIST headquarters. It can also be utilized by non-field artillery observers to request fires.

The second net that the FIST headquarters will be able to monitor is the company command net. This allows direct communication between platoon leaders and the FIST chief, as well as the company commander when he is physically separated from his FIST chief. If the FIST is not separated from the commander, the FIST headquarters may operate in the 81-mm and 107-mm mortar nets simultaneously. Finally, the authorized communications equipment provides FIST with an extended range capability to operate in the designated command net or fire net of the appropriate field artillery unit. A type of radio communication net for a FIST is illustrated in figure 2.



Type FIST radio communications net

1. FIST HQ may:
   Predesignate FD net to be used by each FO, or
   Assign FD net and FDC *after* coordination on company fire control net.
2. Non-FA observers may request fire on either the company fire control net or the company command net. FIST HQ may act as a relay between requester and FDC or may direct requester onto selected FD net.
3. Airborne FISTs are not authorized an AN/VRC-47. Therefore, an AN/GRC-160 would be used without the capability to monitor a fourth net.
4. Air assault FISTs are only authorized one AN/GRC-160. Therefore, a PRC-77 would be used in its place.

Figure 2

A primary area of concern in all FIST organizations that has not yet been resolved is the transportation for the FIST's. Platoon FO's will of necessity be provided transport by the supported platoon in the mechanized infantry configuration. Armor configurations do not have this problem. Ideally, transportation for FIST headquarters would be a modified *M-113*. However, a quick-fix solution, and the one that will be reflected in MTOE changes in July 78, is the use of two ¼-ton vehicles with trailers.

The ultimate success of the FIST concept will depend on the close rapport established between maneuver elements and field artillery units. The FIST must train when maneuver units train. More than ever before, field artillery units must be prepared to respond to the observer needs of maneuver elements. This means that FIST members must be well trained in both individual and team functions. The responsibility placed upon the traditional FO is now extended to all members of the FIST and once again the habitual association between artillery and maneuver units must be reaffirmed to insure responsiveness.

A move toward this goal was made earlier this year by the 1-20th Field Artillery, 4th Infantry Division (Mech), when it conducted an 80-hour course of 2-weeks duration for FIST volunteers. It included 48 hours of classroom work and 32 hours of practical exercises. The subjects taught and the time devoted to each are shown below.

SUBJECT	HOURS
Introduction to FIST	1.5
Map Reading	9.5
Communications	5.0
Selection, Occupation of Positions	8.0
Artillery/Mortar Ammo and Equip.	2.0
Aircraft Ordinance/Capabilities	1.0
Call for Fire/Adjustment Procedures	21.0
Observed Fire Procedures (M-31 Trainer)	8.0
Fire Support Coordination	8.0
Close Air Support Planning	2.0
Close Air Support FTX	4.0
Observed Fire FTX	8.0
FIST Exam	2.0
TOTAL	80.0

Most of the instructors were FIST chiefs from the 1-20 Artillery with some classes taught by personnel from the division fire support element, a brigade fire support officer, a brigade air liaison officer, and mortar platoon leaders.

In addition to the MOS 13F volunteers all mortar platoon leaders, FAC's, ALO's and mortar fire direction chiefs in the division were invited to attend training. The open discussion of the different techniques involved in calling for mortar, artillery, and close air support generated a more cohesive fire team and made the FIST students continually conscious of the different fire support means available.

In order to move, shoot, and communicate the students first needed to be proficient in mapreading skills. Then they had to know how to adjust both artillery and mortar fire. Inherent in the latter task is the need to be able to transmit the call for fire under various tactical situations. Therefore, added emphasis was placed on developing mapreading skills and transmitting the call for fire for the different shell/fuze type combinations.

To facilitate teaching basic mapreading, Fort Sill nonresident instruction provided student packets for home study. The 9.5 hours of mapreading instruction need to be supplemented by additional field work. With the benefit of hindsight, it can be said that a minimum of 16 hours is needed on mapreading exercises in addition to classroom instruction.

The majority of the second day of training was spent learning about the operation and installation of the various radios associated with FIST (AN/VRC-47, AN/GRC-160, AN/PRC-77). Proper radio telephone procedures, use of the CEOI, and authentication procedures were also stressed.

During the remainder of the week, training concentrated on the integration of artillery, mortar, and close air support considerations. Students received classes on artillery/mortar shell and fuze combinations and were taught to optimize effects on the target. The Brigade ALO gave a class on aircraft and ordnance capabilities. It was imperative that our students think about all the fire support resources available. Since the course was taught primarily by field artillerymen, it was easy to forget the Combined Arms Concept to integrate all fire support assets into fire planning. The inclusion of classes taught by maneuver and Air Force personnel in addition to their presence in the classroom helped prevent this occurrence.

We were now ready to get down to the art of requesting fire and adjustment procedures. Classes were given on how to conduct registrations and both the deliberate and hasty methods of adjustment, which led into the second week's instruction.

This training proved invaluable to student comprehension of previous instruction. Two days on the subcaliber range would have been twice as effective as one day. FIST chiefs were evenly distributed over three OP's while maintaining team integrity. Two fire direction centers handled all calls for fire and two gun platoons simulated an entire battery of artillery. The spillover was challenging and effective concurrent training for the FDC and guns. All in all, 250 rounds of 14.5-mm ammunition were expended in the 1-day exercise. A more realistic training estimate would have been 2 days and 600 rounds.

The practical work also included a demonstration of close air support by three A-7 aircraft during which the students selected targets and guided the planes onto them.

The final day of the field training was supported by the battalion's three firing batteries, FDC, a platoon of 8-inch howitzers, and a platoon each of 81-mm and 107-mm mortars. The day's firing consumed more than 350 rounds of ammunition. On the average each student conducted two missions. They initiated the calls for fire and made all subsequent adjustments.

Lessons learned from the presentation of the course included the fact that more emphasis on mapreading is needed and an additional day of subcaliber firing should be considered. It was also noted that an overnight FTX would have enhanced the program.

Future training for MOS 13F will entail continuing close contact with the U.S. Army Field Artillery School and close observation of FIST operations during combined arms exercises. A 13F track has been introduced in the Field Artillery Basic Noncommissioned Officers Course at selected installations and more will follow.

It is recognized that implementation of the FIST concept will be a learning process for Redleg and maneuver units alike. There may also be equipment short-falls in some units, but this should not deter the innovative commander from making the FIST concept work.

FIST's can insure that the destructive force of all available fire support is brought to bear at the right time in the right place.

CPT BARRY J. ROBELLA was commissioned in Field Artillery upon graduation from the U.S.M.A. in 1969. He served with D Troop, 229th AHB and the 50th CAC in Vietnam. A 1975 graduate of the FAOAC, Captain Robella has commanded in both aviation and field artillery units. He is currently assigned as fire support officer, 3d Bde., 4th Inf. Div. (M), Ft. Carson, Colo.

SOVIET SELF-PROPELLED ARTILLERY

by Larry W. Williams

The recent introduction of advanced self-propelled artillery by the Soviet Union signifies a major departure from their previous post-World War II practices. While hastily designed self-propelled guns are credited with a significant role in defeating German armor,[1] since the war Soviet Ground Forces have relied primarily on tanks, antitank guided missiles (ATGM's), conventional towed artillery, and more recently, armed helicopters, to counter Western armor. Even though several self-propelled guns were developed, only the *ASU-85* and the *ASU-57* were widely deployed, and these went only to airborne units.[2, 3] The *M-1973* and the *M-1974* self-propelled guns were developed because evolving battlefield conditions and the Soviet battle plan require more sophisticated artillery than was previously available to the Soviet Ground Forces.

Soviet Artillery Requirements

Writing in 1975, a group of Soviet authors cited nine requirements which must be met in developing new artillery. These requirements include:

- Increased accuracy.
- Increased rate of fire.
- Increased terminal effectiveness.
- Improved mobility.
- Transportability by air.
- Improved effectiveness in combat against armored vehicles.
- A high degree of protection against bullets, fragments, and radiation.
- Improved reliability.[4]

These requirements were published after the *M-1973* and the *M-1974* were fielded. However, these guns were obviously developed in response to these requirements, of which three in particular are worthy of discussion.

Improved Combat Effectiveness Against Armor. The Soviets have traditionally emphasized two modes of artillery fire: massed indirect fire and point-blank direct fire. The indirect fire mission continues to be important in the Soviet battle plan, and in many combat situations this fire could be delivered with older towed weapons. However, on a highly mobile battlefield, both indirect and direct fire missions might be impeded by reliance on towed artillery. Especially in the attack, advancing Soviet armor would soon outrun both indirect and direct fire from supporting artillery, or else lose its momentum while waiting for the artillery to keep up.

Direct fire in particular is required if Soviet forces are to maintain the advance in the face of resistance by enemy armor and ATGM's. All Soviet guns up through 152-mm are capable of effectively engaging tanks in direct fire, and all gun crews are trained in this tactic. Soviet writers claim that direct fire is advantageous for several reasons.

- Fire missions are fulfilled in a shorter time.
- Less ammunition is expended.
- The reliability of target destruction is considerably higher than with indirect fire.[5]

Given their increased muzzle velocities, newer Soviet weapons have greater effective ranges and greater engagement ranges than older systems. However, the Soviets seek to maximize the effectiveness of direct fire, and one writer maintains that

> The range of artillery pieces in direct fire must not exceed 800 m . . . Positions for direct fire are usually chosen as close as possible to the target.[5]

[1] P. A. Rotmistrov, "Time and the Tank," *Voyenizdat* (Military Publishing House), Moscow, 1972.

[2] John Milsom, "Russian Tanks, 1900-1970," Galahad Books, New York, 1970.

[3] Christopher F. Foss, "Jane's World Armoured Fighting Vehicles," St. Martin's Press, New York, 1976.

[4] I.I. Zhukov, *et. al.*, "Artillery Weapons, Fundamentals and Design," *Mashinostroyeniye*, Moscow, 1975.

[5] D. Kolpakov, "Artillery in the Offensive," *Soviet Military Review*, Number 13, 1968, pp. 20-21.

Therefore, even though the available towed artillery can effectively engage targets in direct as well as indirect fire, even the specialized antitank guns leave much to be desired on a modern battlefield.

Mobility. The mobility requirement for artillery has greatly increased as the Soviets have stressed the massive offensive in a possible European war. In order to move across Western Europe with large combat formations in a rapidly advancing offensive, Soviet front-line artillery units will have to march at an unprecedented rate. It has been stated by one Soviet author that

> Maneuvers of artillery units in the offensive are executed in such a way as to provide uninterrupted fire support to the attacking infantry and tanks in the whole depth of a set combat mission.[5]

In view of the time required for emplacement and displacement, and the physical exertion required to handle each move, it would be physically and logistically difficult for towed artillery to provide uninterrupted fire support for advancing Soviet forces. The speed and efficiency of the new self-propelled guns overcome these deficiencies. However, it is not known to what extent reliability had to be sacrificed in order to achieve the desired mobility in the *M-1973* and the *M-1974*.

Protection. The protection of artillery crewmen from both chemical, biological, and radiological (CBR) and conventional threats is very important on the modern battlefield. Previously, Soviet gun crews were completely exposed to CBR, small-arms, and fragmentation threats. By fielding large numbers of weapons and crews the effects of such threats could be partially offset. However, the preference for more invulnerable artillery systems has evidently prevailed, at least for those providing critical fire support in the most intense combat environment near the forward edge of the battle area (FEBA). The provision of all-around armor on the new self-propelled guns, along

with probable radiation liners and air filtration, give the crews of these guns much-needed protection on the modern battlefield.

Armor and Self-Propelled Artillery

The close fire support role of artillery against personnel and light vehicles has assumed increased significance in

view of the West's emphasis on ATGM's.[6] NATO's ground-launched ATGM's and the target designators used for guiding remotely-launched munitions are operated by personnel who are unprotected or are in lightly armored vehicles. Up-front artillery fire can effectively suppress the crews who are guiding or launching ATGM's near the FEBA.[7] The new self-propelled guns, therefore, can provide critical fire support to Soviet armor and motorized infantry. Indeed, it was the armor branch which pressed for the reintroduction of self-propelled guns.

Marshall P. A. Rotmistrov put forth the following argument in 1972:

> . . . the tanks in the offensive need artillery accompaniment . . . the best type of artillery capable of the direct accompaniment of the tanks is self-propelled artillery.
>
> . . . in combating enemy armored vehicles the self-propelled artillery possesses considerable advantages over field artillery.
>
> . . . self-propelled artillery is that means which can accompany tanks in combat without interruption and together with them can successfully combat the enemy's armored vehicles.[1]

Pointing to the World War II experience, Rotmistrov noted that

> . . . The self-propelled gun mounts were often employed as tanks, and the latter went into combat without the support of self-propelled artillery. As a result both suffered excessive losses.[1]

To prevent such losses, Rotmistrov called for an "organizational solution" which by implication might have subordinated the new artillery to the armored branch. This would have repeated the pattern of World War II, when Stalin ordered self-propelled (SP) guns subordinated to tank commanders instead of to artillery units. However, if the new self-propelled guns had been subordinated to armor commanders, the artillery branch would have been relegated to a secondary role in the attack. That the new self-propelled guns are assigned to the artillery branch under combined arms commanders is indicative of the continued prestige of the artillery branch within the Soviet Ground Forces.

Soviet SP Guns Not In Response To Western Artillery

It is clear that the Soviets did not find it necessary to field self-propelled artillery merely because Western armies had such systems. United States weapons planners, for example, put great stress on self-propelled artillery throughout the 1950's and the 1960's. Of the 10 basic systems fielded by the United States from 1955 through 1966, not counting product improvements, seven were self-propelled. Of the exploratory systems in this period which were *not* ultimately fielded, the United States had five self-propelled weapons, three towed weapons, and one auxiliary-propelled weapon. The United States and West European nations fielded large numbers of self-propelled artillery. If the Soviets had believed it necessary to do so merely in response to similar Western systems, they had ample time prior to 1973. They certainly were not restrained by their own technological capabilities, nor by the lack of example in the West.

Conclusion

The Soviets fielded the *M-1973* and *M-1974* self-propelled artillery because of evolving battlefield conditions and their own battle plans, and not because the Western nations relied so heavily on self-propelled weapons. Much of the push for self-propelled artillery came from the armor branch, which recognized the value of having an organic highly mobile artillery capability to protect both tanks and motorized infantry. That the new self-propelled guns are subordinate to artillery commanders reaffirms the role of the artillery branch on a par with armor and infantry.

[6]N. Shibayev, "Tank Attack and Artillery Fire," *Voyenyy Vestnik (Military Herald)*, Number 3, 1971, pp. 29-35.

[7]P. A. Karber, "The Soviet Antitank Debate," *ARMOR*, November-December 1976, pp. 10-14.

LARRY W. WILLIAMS is a Ph.D. candidate at Ohio State University and a political scientist in the International Studies Center, Battelle Columbus Laboratories, Columbus, Ohio. In the past 10 years, he has engaged in a variety of studies requiring an interface between the social sciences and the engineering and physical disciplines. Mr. Williams was recently involved in a study of technology transfer in tactical weapons.

COMBINED ARMS

by GENERAL DONN A. STARRY

The Combined Arms Team and Armor—frequently they're thought of as synonymous. In some ways they should be—the concept was introduced into our Army at Fort Knox, not by anyone now on active duty to be sure, but by a small group of our distinguished predecessors. The concept has been developed, protected, husbanded, expanded, and even criticized at Fort Knox. In fact, everyone who has served there has participated in at least some of those activities.

So we might say all is well with Armor and the Combined Arms Team; we could mutually congratulate ourselves, smug in the knowledge that Armor has the inside track on all that's necessary to win the critical battles of the next war. That's a tempting security blanket, but not a real one.

The Army is not that homogeneous in its outlook nor is the world in which it lives. In the Army today, there is a parochialism that challenges and sometimes even denies many things about the combined arms idea. That parochialism sometimes may concern leadership, or tactics, or administration or any of a hundred other things. It is easy to get confused, even discouraged on finding that

everyone doesn't understand the message as do those in Armor. It is also all too easy to join the throng that is quick to point out problems, but offer no solutions.

Not all the question asking is bad. It is a necessary part of Army dialogue—in progress for 200 years—and we probably shouldn't want it any other way. For, despite Field Manuals, How-To-Fight Books, and the other written paraphernalia with which we surround ourselves, approved doctrine on any matter is often the opinion of the senior officer present. Now while that may give me no small measure of satisfaction, it doesn't help anyone else—nor did it satisfy me when I was younger.

It does, however, point out a strong feature of our system—we can and should argue the merits of operational concepts with which we intend to fight. Operational concepts are important—they set the framework for tactics, organization, equipment development, and for training. They are the guts of our Army; therefore, a consensus about them is important. However, a word of caution. A common starting point is necessary for any intelligent dialogue to proceed. Each discussant must recognize that everything for which the other stands is not inherently wrong. To believe that is folly, a folly that rejects the value of dialogue.

It is this failure to recognize the merits of a dialogue, and its bounds as well, that troubles Armor and the Combined Arms Team. Instead of listening intelligently to one another, we are divided into two or three strident camps. In one, the tank is supreme. In another, it is the armed helicopter. In still another, it is the antitank guided missile (ATGM). There is no room for compromise; rationality is not a virtue in any camp; all draw their best examples from the same source, the Yom Kippur War. Listening carefully, one wonders if in October of 1973 there were several wars or just one.

So while we chorus our huzzahs for the Combined Arms Team, in a quite parochial aside we add "fine but *helicopters/tanks/ATGM's*—insert one of your choice—are the real answer." So at this point a summing up seems appropriate, followed by suggestions for a perspective that might help cope with the dilemma in which we find ourselves.

The Armor Combined Arms Team in our Army was created by a few farsighted men—Chaffee, Van Voorhis and others—who persisted against a lot of entrenched tribal wisdom. Their victory was short-lived, but it lasted long enough to win World War II. Then, in a rush to get back to "real soldiering," we disbanded our large Armor formations—all we really needed was a few tanks to support Infantry. Many still believe that. Today, this group would have us believe antitank guided missiles have taken over, and the tank is dead.

The antitank helicopter is a new and attractive dimension in battle. It is so new, that those who understand it the least have made it the center of too much attention. Its singular advantage—the ability to move rapidly from one part of the battle to another—has given rise to mistaken notions about what it really can do. Ignoring the limitations of weather, terrain, air defenses, and the inability to occupy ground, enthusiasts raise up the helicopter as the answer to the warrior's prayer. Some would even trade battalions of tanks for squadrons of attack helicopters.

Then, there are the tank purists; after cursory study of the Yom Kippur War, they redecided in favor of more tanks to the exclusion, or at least neglect, of other Combined Arms Team members. All we need is an elite, sophisticated, highly proficient tank force.

Versions of these arguments have passed by us all at one time or another. All contain some tempting arguments. Their failing is that they defy everything the Combined Arms Team was designed to be. Most alarming is that they interact most violently in the ranks of Armor. The Armor soldiers of our Army seem unable to speak with one voice. 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.

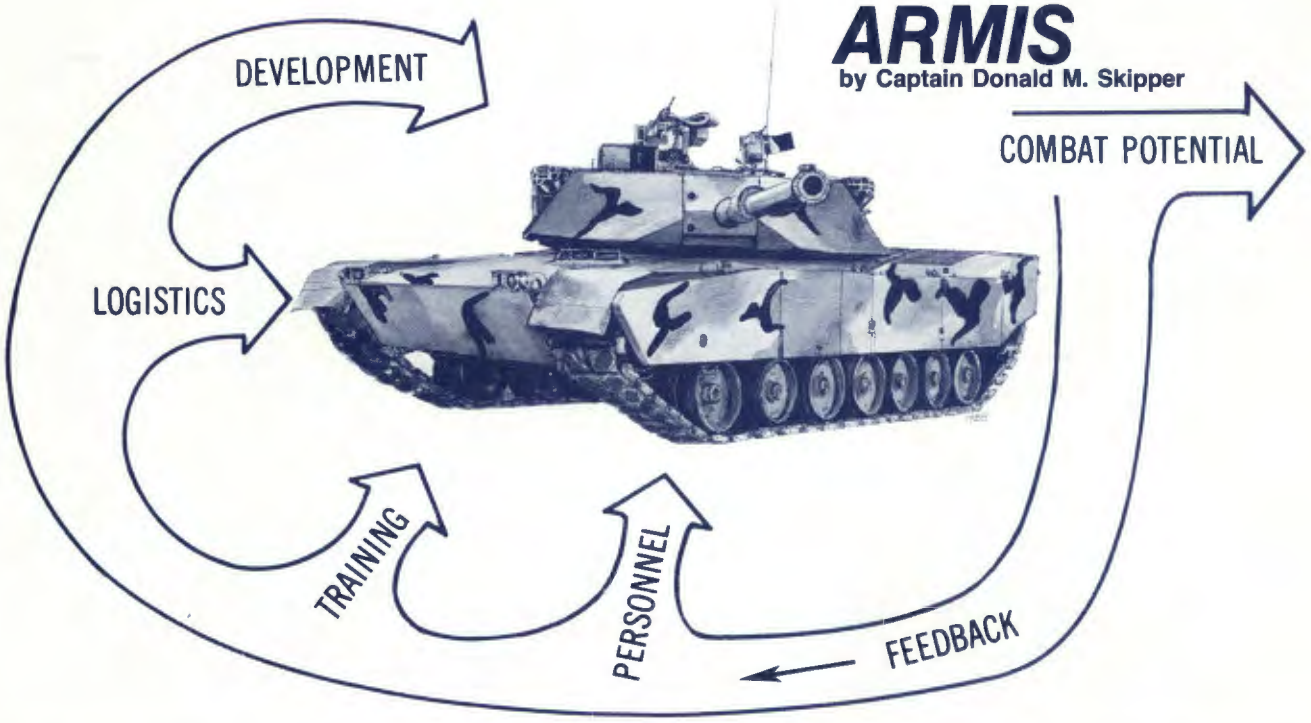
Unable to put aside the nearsightedness of personal experience and embrace a broader Combined Arms Team perspective, we debate endlessly. We continue to talk long after saluting would be a more appropriate gesture.

So my appeal is for perspective not parochialism, for rationality not rashness, for teamwork not lip service.

If the Yom Kippur War demonstrated anything, it strongly affirmed the utility of the Combined Arms Team with strong emphasis on the operative word, *team*, a team which embraces a balanced force of artillery, mechanized infantry, tanks, air defense, engineers, and supporting arms and branches; and a team which draws its effectiveness from balancing the capabilities of these systems and from the synergism of their combined efforts. True, the balance is constantly changing, but it is always interrelated. Armor is part of this interrelationship. As legatees of the Combined Arms Team idea, it seems to me Armor soldiers have a special duty to insure that imbalances are redressed. We all must be willing to understand and logically examine each proponent's advocacy in terms of what's best for the Combined Arms Team. If we don't, I predict our detractors, aided by some well-meaning voices in Armor itself, will destroy or imbalance the team and ultimately jeopardize our chances for victory. The team—the Combined Arms Team—deserves a better fate.

ARMIS

by Captain Donald M. Skipper



The Tank Forces Management Group under the direction of Lieutenant General (Retired) James G. Kalergis identified the major subsystems of the Armor force as personnel, training, logistics, and developments. These subsystems, or components, are the parts of the overall Armor management system that act in coordination to accomplish a set of goals or objectives. One primary objective of all Armor force managers is the efficiency of operations; or in other words, the objective of reducing costs. An alert commander monitors the operation of his assets and is able to discern where wastes are occurring. He then does his best to eliminate these wastes in order to reduce the total cost of operation of his assets.

Before we go any further, let's define cost. Cost means the expenditure of resources. It's usually measured in terms of dollars, but very often the real costs can be thought of in terms of time, physical resources, or personnel. Each time a dollar is spent, or a soldier is used to perform a task, or a physical resource is used in some way, there is a lost opportunity for doing other kinds of jobs.

Consequently, the commander is concerned with keeping the efficiency of his assets at the highest peak so that every dollar spent is spent efficiently and contributes to the real, overall objectives of the system. However, our commanders and staffs have a great deal of difficulty, due to the size and complexity of the Armor system, in making decisions on manning, training, and equipping a *combat-effective, cost-efficient* Armor force.

The need for an accurate Armor Management Information System (ARMIS) is clear. There is no single, accurate management information system in existence today that addresses the entire Armor system with all its subsystems. The size and complexity of the system can be demonstrated by the fact that we will soon have more than 13,000 tanks in the total Army force in as many as 10 very different configurations. Besides size and complexity, we are faced with sharply increasing procurement costs. When fielded, a fully-equipped *XM-1* will cost approximately 1.5 million current year dollars and will demand optimal utilization in order to be cost effective. Current trends in systems management also highlight the need to identify total costs of fielded systems by individual weapons systems, thereby making an ARMIS mandatory.

Conceptually, the ARMIS would be a capstone system providing data from existing reports and sources. No new reports should be required from units at any level; however, the accuracy of current reports must be improved. To be timely and accurate it must be automated and provide only that management data deemed necessary to effectively manage Armor assets. It must provide a complete interface between the subsystems of personnel, training, logistics, and materiel acquisition, plus highlight problem areas in all subsystems.

Because of the magnitude of the components of the ARMIS, related activities, proposed plans and changes in policies and procedures relating to various ongoing programs in the Armor subsystems, the ARMIS should be established in stages. The logical place to start in establishing the system is with the logistics module of the ARMIS because of myriad existing maintenance and readiness reports, escalating maintenance costs, and ongoing modernization of the tank fleet. We will refer to this portion of the information system as ARMIS-Log.

The initial objectives in designing ARMIS-Log are to provide an array of data that accurately describes the fleet inventory by serial number, its configuration by major product improvement (RISE engine, thermal sights, etc.), its age and condition (usage and operational readiness (OR) data), and the planned eventual replacement vehicles for any given unit. A logical array of this data will provide Armor force managers a single readable document that will, at a glance, give a snapshot look at the fleet and also provide trend data upon which logical decisions may be made. ARMIS-Log quarterly data rollups could be by division, armored cavalry regiment, separate brigade, state (for the National Guard), and theater, and would

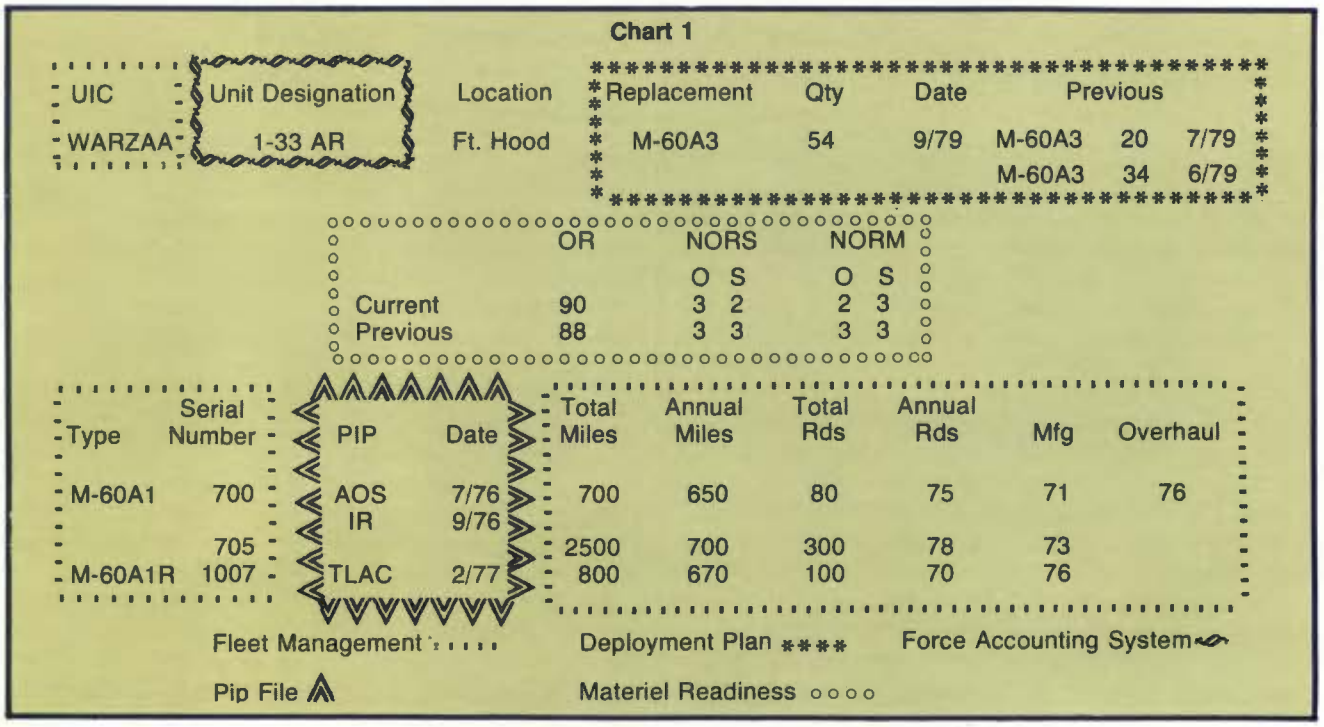
summarize data from existing reports. Data on float and war reserve vehicles should also be available. The following computer programs should be produced on an as-required basis:

- Serial Number...location, product improvements (PIP) applied, and usage data on an individual serial number.
- PIP.....all serial numbers (with above data) with a selected PIP applied.
- PIP Combination.....all serial numbers with selected multiple PIP's applied (example: add on stabilization, passive vision sights).

now—in bits and pieces—in various reports. The problem is that this information is so fragmented due to its myriad sources and eventual uses that decision makers are hard pressed to see the complete picture. The accuracy of this information will be more critical than ever before. Information sources include The Army Maintenance Management System, the Continuing Balance System, the Total Army Equipment Distribution Program (TAEDP), Unit Status Reports, the Fleet Management Report, the Structure and Composition System (SACS), and the Force Accounting System. Useful information extracted from these myriad sources and arrayed in a meaningful display might look like the sample ARMIS-Log extract in chart 1.

ARMIS-Log must be able to account for all main battle tanks by serial number in order to keep track of our fleet configuration and account for all existing tank assets. No existing system is doing this. As an adjunct to and supportive of the efforts to establish the ARMIS-Log, the Tank Automotive Readiness Command (TARCOM) is evaluat-

Chart 1



- Expanded Division.....a division summary of an Active Army division with selected National Guard units added (example: 7th Div with 1st Bde, 36th Div).
- Expanded Theater.....a theater summary with selected division added (example: USAREUR with the 2d Armored Division added).

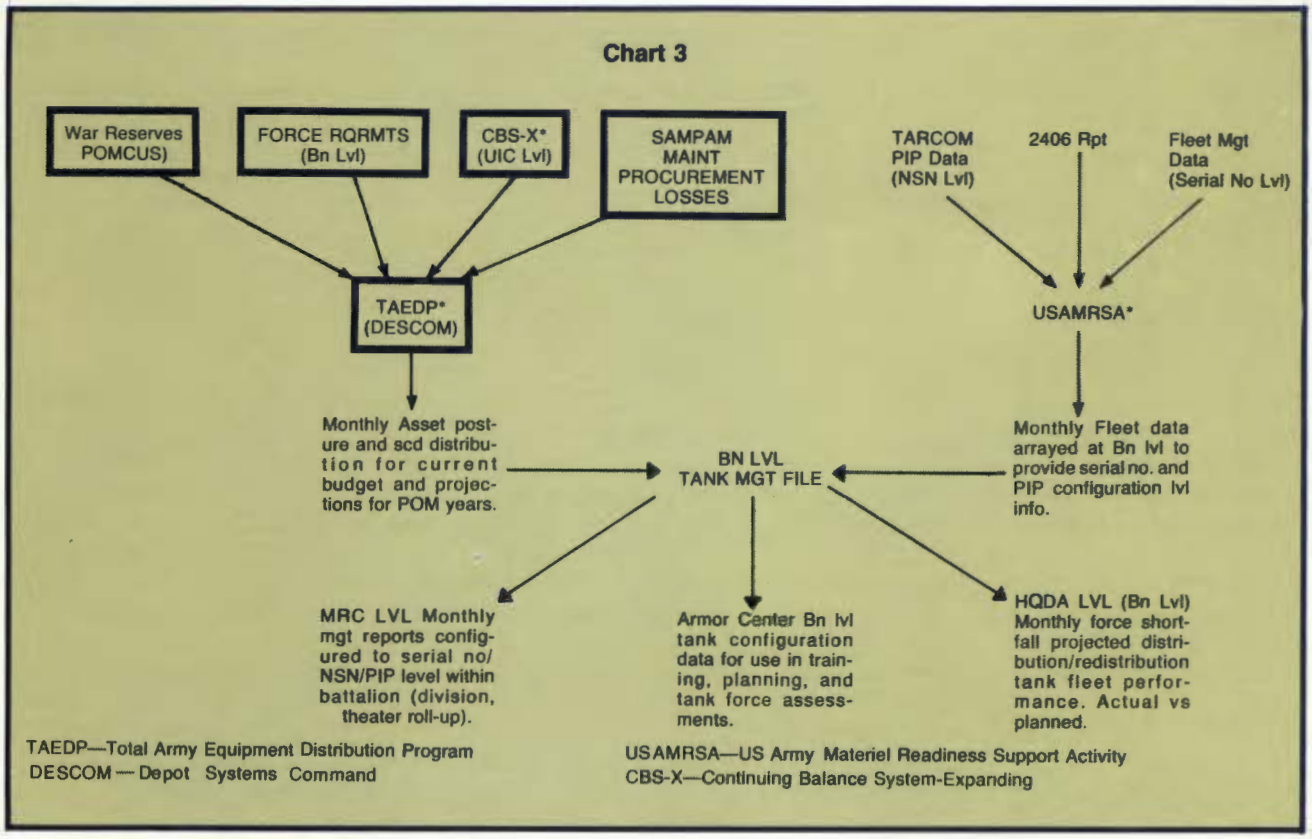
All of the information discussed above is available

ing a proposal to assign a separate national stock number (NSN) to each major configuration of tank.

Chart 2 provides a list of these configurations and highlights the need for visibility of assets by configuration. Separate NSN's will assist in limiting the proliferation of

Chart 2

M-60A2	M-60A3
M-48A5	M-60A3 (TTS)
M-60	XM-1
M-60A1	Dozer Tanks
M-60A1 (AOS)	Smoke Generator Tanks
M-60A1 (RISE)	Mine Roller Tanks
M-60A1 (RISE-Passive)	AVLB



diverse configurations at unit level, substantiating operational differences, reducing the spare parts stock requirements worldwide, and planning training base and depot overhaul requirements.

Main battle tank assets should be accounted for at battalion and separate company level because this is the lowest level of total resource management, the common level for unit status reporting, and the level of Department of the Army interest.

ARMIS-Log must eventually incorporate an analysis capability to highlight the total fleet effect of alternative production and distribution plans, associated transportation and changeout costs, and through interface with the training portion of the ARMIS, a total training cost associated with the various production and distribution plans. Trend data and component prediction analysis might also be incorporated into the program to highlight significant component forecasted vs. actual performance and costs. Chart 3 diagrams the sources, input/outputs, and some uses of the ARMIS-Log.

ARMIS-Log is more than just an idea—it is about to become a fact. DA-ODCSLOG, in coordination with the Tank Forces Management Office, Office of Armor Force Management, and the U.S. Army Materiel Readiness and Development Command (DARCOM), has taken the initial steps to establish ARMIS-Log as a functional management tool to optimize the combat potential of the Armor force. One of the first steps in establishing the ARMIS-Log is to accurately define the composition of the present fleet. To accomplish this, a worldwide tank muster, by serial number and PIP configuration, will be conducted sometime in the near future. Once accomplished, tank asset figures will be reconciled with various source documents, DARCOM agencies, and major commands. Questions on initial system composition, data arrays, and funding and manning considerations in support of running the system are now being addressed. The goal of these combined efforts is to produce the first ARMIS-Log output by the end of the 4th quarter, FY 78. Current efforts do not include asset visibility of secondary components such as engines, transmissions, or laser rangefinders. Before these components are incorporated in the ARMIS-Log, hopefully in FY 79, these efforts must be costed and studied as to the best approach to achieve incorporation with minimal impact on existing reporting systems.

ARMIS-Log is the first small step toward building a total system evaluation tool for Armor force managers. The conceptual efforts associated with establishment of personnel, training, and materiel acquisition portions of the ARMIS are now being accomplished. ARMIS will solve many of the problems associated with the efficient management of a complex Armor force, enabling us to better understand our system.

CPT DONALD B. SKIPPER was commissioned in Infantry upon graduation from OCS in 1969. He has commanded Infantry and Armor units. A former staff officer in 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 System Management and is now serving with the Office of Armor Force Management, Ft. Knox, Ky.

Smoke

by LIEUTENANT COLONEL JAMES C. FARGO

It is a cool, crisp day, with small billowy clouds moving lazily overhead. Occasionally a small wisp of dust rises from the numerous tank trails that crisscross the surrounding terrain. From a concealed hull-defilade position, a tank company commander scans the ridge line 2,000 meters to his front. Suddenly a brief gleam of reflected sunlight catches the corner of his field of vision. He swings his binoculars back and forth, searching the area where he thought the gleam of light came from. Was the light reflected from a gun barrel being swung in his direction, or from a pair of binoculars now observing his position? These questions race through the company commander's mind as he continues to scan the next ridge line. That portion of the ridge is heavily vegetated with several clumps of cedar trees that could effectively conceal a tracked vehicle with little effort at camouflage. Could this area be hiding an observation post (OP) of the enemy force that the tank company, as part of a battalion task force, has been trying to locate the past several hours? To assume otherwise might lead to disaster when the company commander moves his unit across the low, open ground between his present position and the next ridge line. The opposing enemy force had previously employed long-range antitank weapons to inflict as many tank kills as possible before falling back to subsequent positions.

The company commander advises his battalion commander of his suspicion that the next ridge line is being occupied by an enemy OP and requests a smoke screen between the portion of the ridge line thought to be occupied by the enemy and his planned route of march. The battalion commander concurs and passes the request for a smoke mission to his fire support officer (FSO). Based on the general location of the suspected enemy OP and the planned route of advance, the FSO quickly determines the length and orientation of a smoke line that will provide the necessary screening. The smoke mission is passed by radio to the appropriate delivery unit and within a few minutes smoke is on the way. The tank company commander watches as several smoke clouds begin to rise and merge to form a smoke curtain that is carried with the wind. As soon as the smoke becomes dense enough to preclude observation from the suspected OP, he moves his unit across the vulnerable area to the far high ground without losing a single tank to enemy fire.

The above tactical scenario was typical of many that were experienced at Fort Hood, Tex. during the Division Restructuring Study (DRS) Phase I testing (battalion test) conducted by the TRADOC Combined Arms Test Activity (TCATA). While participating in this testing as either the tested unit or as part of the opposing force (OPFOR) unit, each battalion's tanks and TOW's were equipped with instrumentation comprising the Weapons Engagement Scoring System (WESS), which is part of the TCATA Automated Field Instrumentation System. The WESS consists of laser weapon simulators, signal processing and control logic units, laser energy detector array subsystems, and other peripheral devices capable of simulating the firing of a weapon, applying appropriate discrete kill probabilities to determine if the target weapon system being engaged is killed and, if so, activating an onboard kill simulator. The kill simulation is attained by the ignition of a violet smoke grenade and the flashing of a strobe light on the target vehicle, providing ample evidence that the vehicle has been effectively engaged by an opposing weapon system. Because of the WESS, the results of a battle between opposing forces equipped with it is clearly determined; the force that has most of its weapon systems killed loses the battle. This tactical reality experienced by the units from the 1st Cavalry Division and 2d Armored Division participating in the DRS Phase I testing led to a high degree of comprehension by all those involved of the truth in the military axiom: "Any target that can be seen can be hit, and any target that can be hit can be killed."

It became obvious to unit commanders at all levels that the tactical situations they were facing during the testing required the full application of their experience, good judgment, and leadership. Therefore, it was not surprising when, during the early DRS Phase I testing, commanders began to request the smoke assets available to support the testing be used to support their particular tactical operations. The commanders knew that smoke being produced by *M-3A3* mechanical smoke generators and numerous smoke pots for the creation of "battlefield haze" in the test area could also be used more discretely, both in timing and location, to reduce the opposing unit's ability to detect, engage, and kill their armored vehicles.

The decision was made to integrate the employment of smoke into the tactical operations to provide added realism to the test conditions. To preclude confusion as to which opposing force was employing smoke at any given time, only one force was provided smoke support during a given event. This arrangement during the 3-day DRS battalion test allowed the tested unit to employ smoke during a movement to contact on the first day and a deliberate attack on the last day. Smoke was employed in support of the OPFOR when the tested unit was

conducting an active defense during the second day of the test.

The mechanism for integrating smoke into tactical operations was simple. Planning and coordination for employment of smoke was, as it should be, handled through fire support channels. In preplanned missions for smoke curtains, grid coordinates for the two locations delineating the end points of the linear smoke target (curtain) are either passed from company level to the battalion FSO where they are incorporated into the battalion fire support plan, or the battalion FSO determines the target locations for smoke missions after receiving guidance on desired support from the battalion commander or battalion S3.

The FSO then assigns each smoke target a target number. The target locations and numbers were passed, along with other pertinent information on the battalion's operation, to the officer-in-charge (OIC) of the smoke support element, normally during face-to-face coordination conducted 2 to 3 hours prior to the test event. Similar planning and coordination can, of course, be done at a higher organization level, as it was during the DRS testing when the OPFOR brigade was provided smoke support.

The smoke support element consisted of six *M-3A3* mechanical smoke generators mounted on ¼-ton trailers and pulled by ¼-ton trucks, and one ¼-ton truck carrying 30 to 36 smoke pots (HC, *M-1*, 10-lb). The six smoke generators were employed together in support of a single smoke mission, or divided three and three, or four and two, to service two separate targets, often simultaneously. Because of the limited mobility of a ¼-ton truck pulling a trailer carrying a smoke generator and a barrel of fog oil, which weighs about 450 pounds when full, smoke missions on terrain which was difficult to reach were executed using smoke pots carried by the other ¼-ton truck in the smoke element. This ¼-ton truck was also the smoke OIC's command and control vehicle, and was equipped with an AN/VRC-47 radio, or AN/VRC-46 and PRC-77. This radio configuration enabled the OIC to control the smoke generators, which had at least two radios with them, and remain in continuous contact with the FSO responsible for passing the command to execute preplanned smoke missions or passing target locations for the execution of immediate smoke missions.

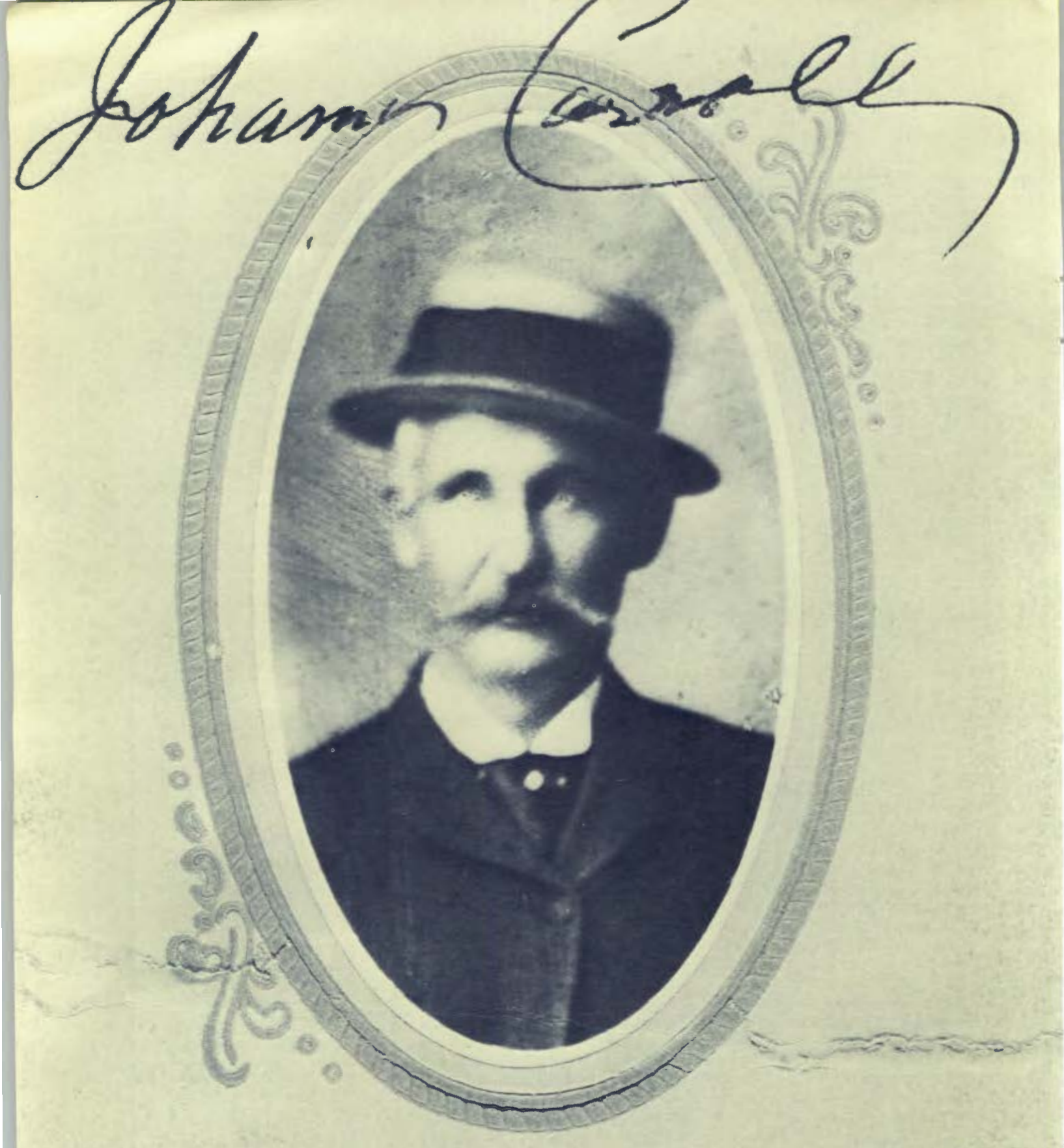
Executing immediate smoke missions presented the biggest challenge to attaining a high degree of realism. Immediate missions were usually called for after enemy contact was made, and the tempo of the battle increased rapidly thereafter. This usually required the smoke generator subelements and the ¼-ton truck carrying smoke pots to leapfrog forward of the advancing supported unit to be in the best positions to execute either preplanned missions or anticipated immediate missions. In several instances, three smoke missions would be in progress simultaneously in support of a battalion making an attack on two axes of advance. In such a situation, the original intent of employing smoke in support of the DRS testing, the creation of a realistic "battlefield haze" over the battlefield, was more than fulfilled.

More important, however, were the training benefits derived by having maneuver units plan for the use of smoke in support of their operations, requesting the smoke at the appropriate time, and employing organic weapon systems under the reduced visibility conditions created by either friendly or enemy use of smoke. These training benefits can easily be attained by other units during field training by using methods similar to those described for the DRS testing, and can significantly contribute to improving the units' proficiency in employing smoke and operating in a smoke environment. The need to correct training deficiencies in this area has been highlighted by Colonel Henry R. Shelton in his article "Smoke as a Weapon," which appeared in the August 1977 edition of *ARMY* Magazine.

While smoke generators are capable of producing large quantities of smoke and are more cost effective than smoke pots, they are not essential in providing smoke support for training. For example, a smoke support element consisting of three ¼-ton trucks, equipped with radios and carrying thirty 10-lb. smoke pots each, could be employed to execute three smoke missions simultaneously, providing smoke curtains totaling up to 3 kilometers in length under favorable weather conditions for approximately 6 minutes duration. Shorter, more realistic smoke curtain lengths of up to 300 meters, produced over several hours (for different periods of duration), would enable many more smoke missions to be executed by a three-vehicle smoke support element.

It should be clear at this point that there are numerous possibilities for organizing, equipping, and controlling a smoke support element. It should also be obvious that such an element can make a significant contribution to a unit's effort to inject realism into its training program by creating smoke and haze conditions that can be expected to be present on any future battlefield shared by an enemy possessing not only great numbers of modern, lethal weapons, but a credible smoke capability as well. Only if training is conducted under realistic battlefield environmental conditions can we be expected, when called upon, to fight, survive, and win on that battlefield.

LTC JAMES C. FARGO was commissioned in the Chemical Corps upon graduation from the University of South Dakota in 1964. He holds a BA and an MA in chemistry. A graduate of the Infantry Officer Basic Course, Lieutenant Colonel Fargo has also attended the Chemical Officer Advanced Course and the C&GSC. He has served as a rifle platoon leader, company XO, and as chemical officer of SETAF and at brigade level. A former Deputy Commander of the Rocky Mountain Arsenal, Lieutenant Colonel Fargo has served as Strategic Intelligence Staff Officer for HQ USAREUR. He is attached to TCATA from the U.S. Army Ordinance and Chemical Center.



OLD BILL

by WILLIAM K. EMERSON

The names of "Light Horse Harry" Lee, Phillip Sheridan, George Custer, George Patton, and many others create mental images of Cavalry leaders. But who represents the individual Cavalry trooper? Perhaps Frederick Remington's sketch of "Old Bill" is, more than any other, the symbol of the Cavalry trooper.

Who was "Old Bill"? Was he a real person? If so, where did he serve and what was he like in real life? Many men have studied and written of Cavalry leaders, but information about "Old Bill" does not abound. Members of the 3d Cavalry, however, knew "Old Bill" well when the famous sketch was made in 1898, for he had served 18 years in that regiment alone. They knew him not as Bill but as Jack; Sergeant Jack Lannen.

A Canadian, Jack Lannen enlisted in the 4th U.S. Cavalry in 1870 at New York City, and served 5 years with I Troop. He took his next enlistment with the 3d Cavalry, and except for some later recruiting duty, Sgt. Lannen remained with the 3d Cavalry the remainder of his career. He served with B, F, and G Troops during various enlistments, with most of his duty in Texas being at Forts Davis and Brown, and various temporary camps.

All cavalry recruits assigned to units in the West were sent to Jefferson Barracks, Missouri. Sergeant Lannen was well acquainted with this post, as well as those in Texas, for he made at least four reenlistment trips to Jefferson Barracks, all from 2 to 6 months duration. This was done by many soldiers who at the end of an enlistment were entitled to be discharged at Jefferson Barracks. Many men like Sgt. Lannen, reenlisted at Jefferson Barracks and returned to duty after this Army expense-paid trip.

From 1891 through 1896 Sgt. Lannen was on recruiting duty in New York City and Boston. After this eastern tour, he rejoined G Troop, 3d Cavalry, which had recently moved to Fort Ethan Allen, Vermont. The regiment went to Georgia and Florida 2 years later, enroute to Cuba during the Spanish-American War.

Frederick Remington visited the 3d Cavalry in Tampa when it was ready to embark for Cuba. He made a series of rough sketches of Sgt. Lannen in the troop area. The initial "Old Bill" drawing was sketched in front of the G Troop Commander's tent. Evidently, Remington later added some details from memory. Captain Hedekin, the troop commander at that time, stated that Sgt. Lannen did not wear the sling belt or boots shown in the sketch. But with the white hair and moustache, blue eyes, and dark complexion, he looked like the great trooper he was. Remington's sketch was used for many years by *The Cavalry Journal*, and was copyrighted in 1910 by the Cavalry Association. For several years the sketch was simply called "The Remington Cut."

Shortly after G Troop landed in Cuba, Sgt. Lannen contracted yellow fever, and died in Siboney, Cuba, on 24 July 1898. Several letters written a few years after Sgt. Lannen's death by men who knew him characterized him as an "old fashioned NCO (a tough disciplinarian)" and a superb horseman. One officer described him this way:

> He was a superb horseman . . . His horse was his friend and comrade. Aside from his horsemanship, Sgt. Lannen's most marked characteristics were his loyalty to his organization and his unfailing good humor under trying conditions. Ordinarily a stern disciplinarian, he was always ready with a smile and jest when roads were muddy, skins damp and cold, and rations low. He accepted hardships as part of his day's work. There were too few of his kind.

An officer asked Sgt. Lannen during his tour at Fort Ethan Allen if he was close to retirement. The reply was, "Yes, but one of my enlistments was in the Infantry (evidently the recruiting duty), and I wouldn't want to retire on Infantry Service." Later the officer reflected, "Didn't that have the true Cavalry ring?" "Wasn't that *esprit de corps?*"

Frederick Remington stated Jack Lannen was the most perfect American horseman he had ever seen. This was no mean compliment, considering Remington's time spent with the Cavalry.

How is it that Jack Lannen is called "Old Bill"? Perhaps it is because he was named William Carroll when he was born on Prince Edward Island, Canada, in January 1845, the son of Michael and Johanna Carroll. He grew up on Prince Edward Island and worked as a carpenter before enlisting at the age of 25. When he enlisted, he used an alias derived from his mother's maiden name, Johanna Lannon, and became known to his Army friends as John or Jack Lannen. The use of an alias when enlisting was commonplace during the late 19th century when many people considered Army service undesirable. Immigrants filled the ranks, many barely speaking English.

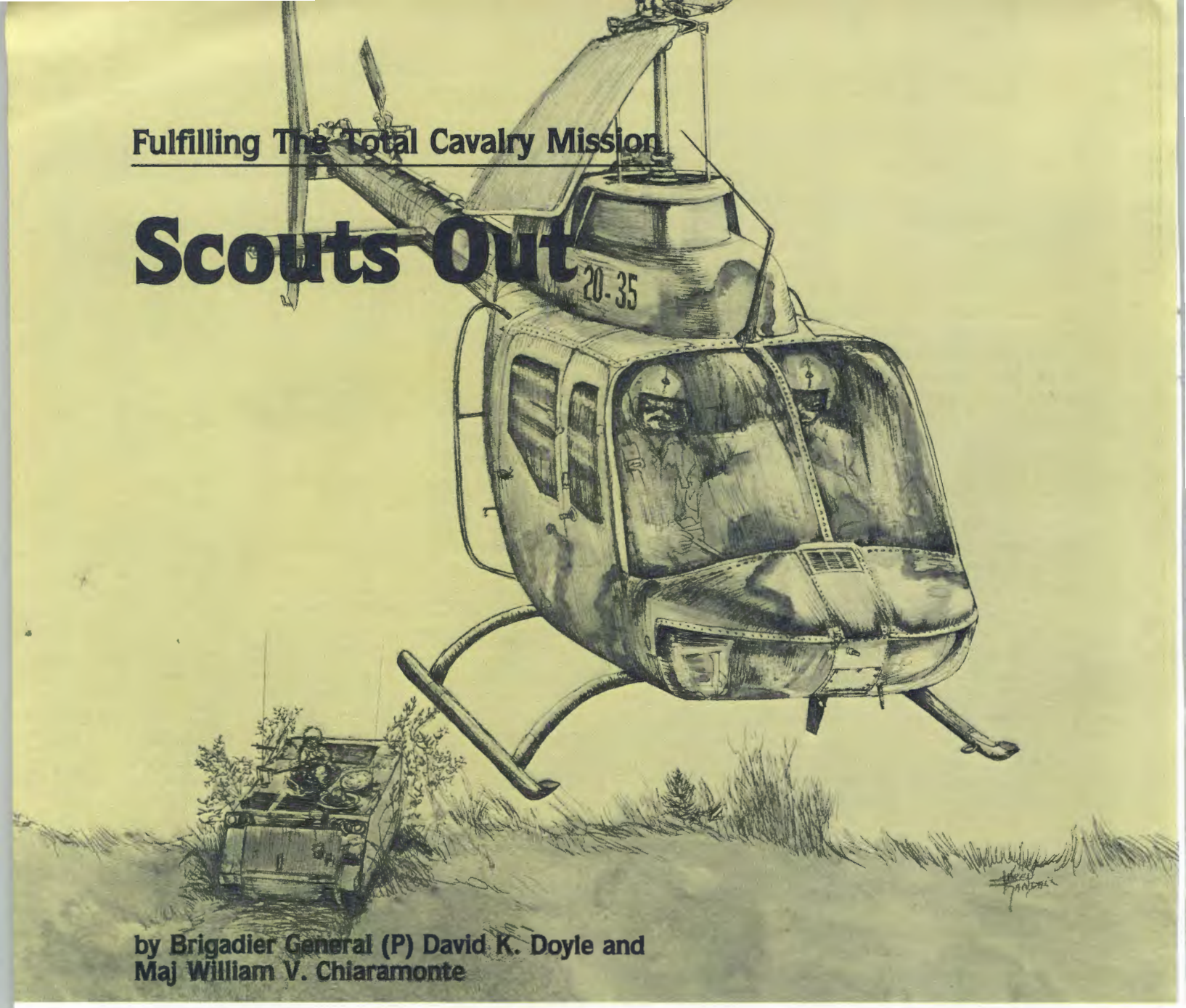
During Sgt. Lannen's first enlistment, his father died. Throughout "Old Bill's" remaining time in the service, he sent his mother money and visited her during each leave. His last visit home was 1 year before his death. In 1901 his mother began to receive an Army pension of $12 a month after old age forced her to quit her job as a serving woman. Johanna Carroll lived on Prince Edward Island from before her marriage in 1843 until her death in March 1909.

While the above may alter or reinforce our preconceived ideas of what "Old Bill" was really like, a photograph of the man may absolutely shatter our illusions. The accompanying picture is the only photograph of "Old Bill" that the author has been able to locate, and it is, as far as is known, being published for the first time.

MAJ WILLIAM K. EMERSON was commissioned in Armor upon graduation from Oklahoma State University in 1965. He has been assigned as tank battalion S4, Cavalry Squadron S3, commander of tank, cavalry, and infantry companies, USAARMS instructor in the Weapons Department, and R&D Coordinator at the Mobility Equipment R&D Command, Ft. Belvoir. Major Emerson received his M.S. in Mechanical Engineering in 1972. A Fellow in the Company of Military Historians, he is currently assigned as X0, 3d Squadron, 11th Armored Cavalry Regiment.

Fulfilling The Total Cavalry Mission

Scouts Out



by Brigadier General (P) David K. Doyle and
Maj William V. Chiaramonte

In the September-October 1977 issue of *ARMOR*, we cited the training, equipment, aggressiveness, elan, initiative, and esprit that are the essential qualities of the "Indispensable Scout." Later, in the November-December 1977 issue, we elaborated on the unique abilities of the aeroscout and discussed the flexibility of the light helicopter as a mount for that wide-ranging member of the Cavalry team.

In this article we will look at the air and ground scouts and how they work together to accomplish the primary missions of cavalry—reconnaissance, security, and economy of force. And, in so doing, we will address the important matters of command, control, communications, and the application of firepower that cavalrymen from squad to regiment must master and employ—boldly and skillfully.

We would like to emphasize and restate that throughout military history there has remained a requirement for responsive accurate battlefield information. Commanders must know where the enemy is, where he is not, and about the terrain on which they will fight. The mounted cavalry scout provides a capability to give the commander useful and vital combat information before, during, and after a battle.

To insure the information received was accurate, the men of this mounted force were trained and required to have a broad understanding of the battlefield and its dynamics. The wide-ranging, independent battlefield missions assigned to the mounted force demanded aggressiveness, flexibility, and initiative to capitalize on and react to unexpected events and unknown situations.

In the past 70 years, technology has made significant improvements in the cavalry scout's ability to provide information. Mechanization was the first major technological advance in the capability of the scout. In the United States, it was the traditional horse cavalry arm which adopted and developed mobility on the battlefield through mechanization.

Today, opposing land armies are fully mechanized and again roughly equal in force mobility. To achieve a mobility advantage, the helicopter emerged as a cavalry mount. This new mount was adopted to complement and increase

the mobility of the mechanized armored mount. The mission statement of all air cavalry units begins "to extend by aerial means."

No matter what is superimposed, a track or a propeller, the basic symbol, cavalry, remains the foundation. The separate employment characteristics of the armored and aerial mount have enabled todays cavalry scout to regain his required mobility advantage. These characteristics also, when the ground and aero capabilities are integrated, produce a cavalry mission profile that can surpass any one separate scout's quality.

The combination of strengths and limitations of separate combat elements into a single fighting unit is not new to Cavalry. Cavalry units historically have been organized as combined arms units from platoon to regiment. This organization of Cavalry is a necessity dictated by the requirements for mobility, flexibility, and independent operations of a unit trained to operate as a team under one commander to share, execute, and accomplish the Cavalry mission.

A common mission, training, and command and control structure acts as a binding force for these seemingly diverse elements. An efficient, effective modern cavalry scout force emerges, a force that is capable of fulfilling the total Cavalry mission.

Total Cavalry Scout for the Total Cavalry Mission

A major portion of this cavalry mission is reconnaissance, its purpose is to find everything possible about the enemy and the battlefield. The quality of the result depends on both speed and accuracy. These criteria are met in different ways, in different situations by the modern scout using both the armored and aerial mounts. The speed of obtaining reconnaissance information is directly related to the condition of the terrain. The aerial mount is independent of ground conditions. Impassable terrain for ground vehicles may be a rapid, protected route for the aeroscout. The armored mount can obtain all important ground analysis and eliminate enemy forces which may occupy, block, or control the terrain. In reconnaissance missions the combined qualities provide detailed accuracy with the speed required by the commander. To visualize this, let's look at a hypothetical situation.

The viscious fighting between the Warsaw Pact and NATO has triggered a time bomb. The armies of several Warsaw Pact nations have gone into open rebellion against their "protector." A wide frontage near Nurnberg has been exposed to NATO's forces. Two US divisions and an Armored Cavalry Regiment (ACR) are ordered to advance through the gap and seek out and destroy the second echelon armies still fighting to the north.

The ACR organizes to perform an advance covering force for the two divisions. It is leading the operation with the air cavalry troop (ACT). The ACT is conducting a zone reconnaissance in the regimental sector well ahead of the armored cavalry elements (figure 1).

In this extremely fluid and unsettled situation, the ACT provides the rapid accurate information the cavalry commander requires to maneuver his forces and position his combat support assets in a timely manner.

The ACT commander is assigned an air cavalry team of two aeroscouts and attached helicopter from the aeroweapon platoon to conduct a zone reconnaissance in each squadron sector. This will help insure close cooperation between the broad far-ranging troop with the powerful armored cavalry squadrons moving behind. The ACT is operating under the same control measures as are the squadrons. With identical reference points, phase lines, and boundaries, coordination of effort is proceeding without difficulty.

Information the air cavalry teams acquire about the terrain and the enemy is transmitted to the ACT commander who is operating between the teams and the forward armored cavalry elements. All routine information, positive or negative, is then transmitted to regiment on the designated net. In this case the regimental intelligence net is used. Information on trafficability, road conditions, bridge capabilities, absence of enemy forces, or the status of built up areas, are vitally important. The aerial extension of the command's "eyes and ears" provides this information 30 minutes to an hour before it could be gained by ground forces. With this time, the flexibility of cavalry is enhanced. The commander can change his unit's maneuver, shift supporting engineer elements to the right area in time to ensure uninterrupted movement, and the divisions the ACR is leading will also benefit from the additional time to react.

This continued flow of valuable routine information is also given to the armored cavalry squadrons, but not directly. The armored cavalry squadron's command group monitors the regimental intelligence net and will receive the applicable reports at the same time as regiment. If, at times, the squadrons are not able to monitor the ACT commander's transmissions, vital information will be retransmitted to them from regiment.

With this wealth of advance knowledge about the battlefield, the regiment's rate of advance is quite rapid. The armored cavalry scouts are able to move directly to where they are required. They insure there are no enemy forces in the thick forests, small towns, and other areas the aeroscouts were not able to closely reconnoiter. The armored scouts also immediately begin reconnoitering bypass routes and fording sites around reported obstacles. Additionally, with enemy contact not likely, the armored cavalry platoons are able to use the faster traveling overwatch movement technique.

The situation just described shows the normal method of transmitting routine information about the battlefield (figure 2). Contact with the enemy, however, is not treated

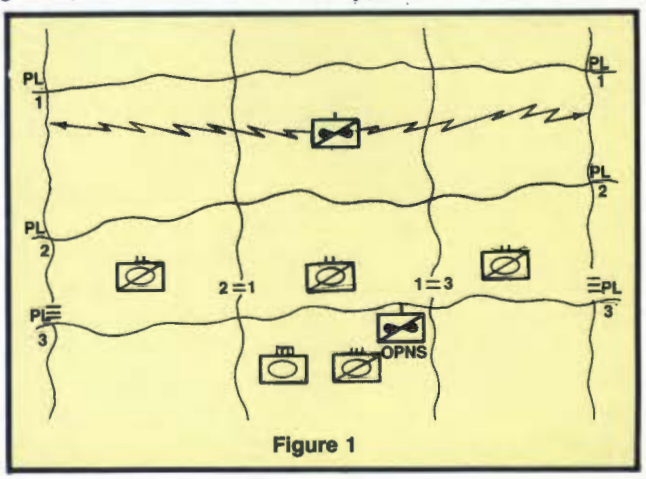


Figure 1

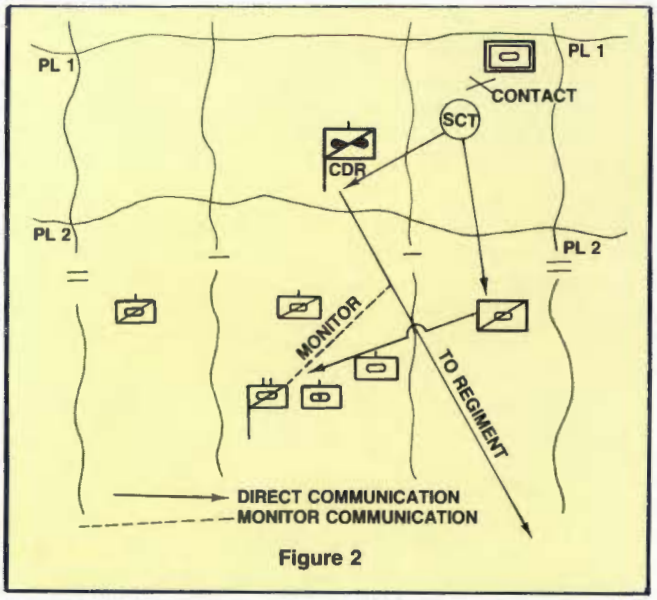


Figure 2

as routine. This information is extremely perishable and must be transmitted directly to the troop or troops who will be affected by the enemy force. The air cavalry team leader reports the contact to the affected armored cavalry troops, while another member of the team reports to the ACT commander. The armored cavalry squadron is notified as described before and, in addition, receives the retransmitted information from their troop. In this manner, vital information is in the hands of all command echelons in almost the same time for immediate planning and action.

With the air cavalry teams using their UHF or VHF nets for internal control and passing reports to their commander over the troop's UHF, VHF, or FM frequency, the command nets are kept clear. Only critical information is broadcast on command nets. Because of this, and extensive training by all, when the extended cavalry speaks the commander will listen and act. On the other hand, the information will be relevant, immediate, and critical and commanders are not immersed in trivia and meaningless transmissions.

What happens when enemy contact is made? The cavalry organization reacts with the full capabilities of each level of its combined arms combat power in an ever increasing intensity.

The air cavalry teams discover what appears to be a reinforced motorized rifle platoon preparing positions to overwatch a minefield being emplaced by engineers. This contact is immediately reported to the ACT commander and to the troop in whose sector the enemy force is located. In the order for the operation, all squadrons were told to give the air cavalry teams to their front priority on their artillery fires. The ACT commander directs the team to contact the squadron FSO and request artillery fires.

An aeroscout adjusts the artillery initially on the unit emplacing the minefield to halt its progress. The scout team leader and his aeroweapon reconnoiter the extent of the position as would a ground scout and locates weak points. The ACT commander moves to a position on the battlefield where communications are insured, both from his team and to regiment.

The aeroscout shifts the artillery to the motorized rifle unit while the team leader reports on a concealed approach route into the enemy's position. This information is transmitted to the ACT commander who orders the team leader to deliver it to the squadron to assist in their attack planning. With this advance knowledge the squadron commander maneuvers his forces to execute a quick flanking attack on the enemy unit to neutralize it.

For the attack, the squadron tank company is maneuvered to the combat area. At the same time the armored cavalry troop moves to develop the situation. As the troop comes into the battle area, its commander is provided an update on the situation, shown the recommended approach to the enemy position, and is given control of the artillery fires. During the attack, the aeroscouts and the aeroweapon operate to the flanks of the friendly force and observe the enemy position for possible evacuation or reinforcement. While conducting this operation, the aeroscouts detect a command vehicle and a tank platoon moving toward the enemy position. This information is reported to the armored cavalry troop commander and the ACT commander. The command track is handed off to the aeroweapons attack helicopter who destroys it with missile fire, a tank is also destroyed before the others find masked positions.

The foregoing describes the speed, flexibility, and tactical value of the air-ground reconnaissance team. However, the smoothness and effectiveness of the operation is only possible if:

- Air Cavalry is used as *Cavalry*, not as something else.
- Unity of command is maintained at all levels.
- Aero and ground scouts habitually train as a team.
- The scout mounts are used for what they do best.
- Air and ground elements are equipped to—and do—talk with each other. (See figure 3 for a diagram of the communication net that is used in either the offense or defense.)

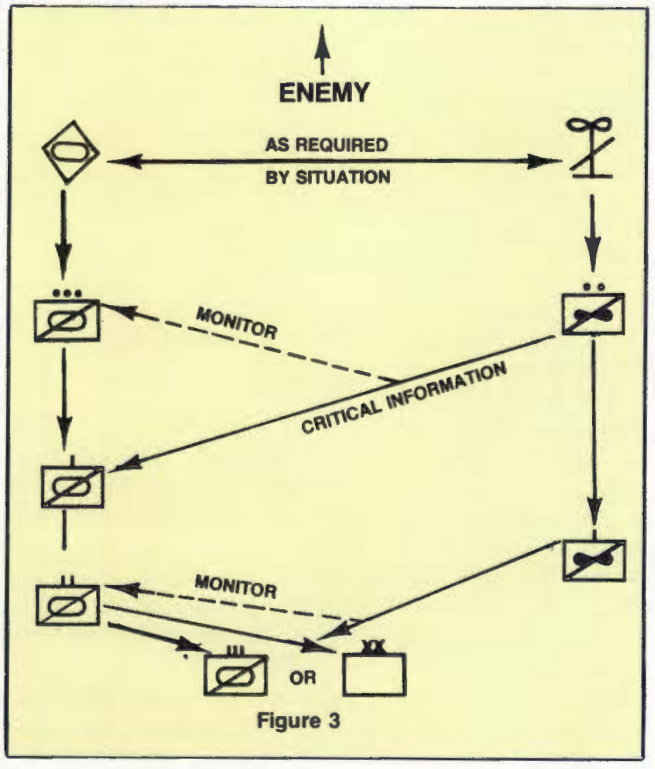


Figure 3

Turning to the other half of the broad Cavalry mission—security—we find that many different missions are covered academically by this label. The success of the varying missions, however, is dependent on an interrelationship of *time, distance, combat power,* and *enemy force.*

The cavalry scout's role in the matter of time revolves around his ability to gain information as rapidly as possible to lengthen maneuver time. Further, by reporting a threat at the earliest time, the cavalry scout increases the reaction time available to the maneuver commander.

The distance between the cavalry scout and force being secured is another important variable—the farther the scout operates from the main force, the more terrain there is available for its commander to select the area of combat. This distance also provides more time for the application of cavalry's killing fires, thus reducing the enemy formation which may be fought by the main force.

The factor of modern cavalry combat power interacts with time and distance. Early application of cavalry combat power delays the enemy's advance and forces him to reveal his capabilities and intentions. The success of cavalry combat power depends on accurate information provided by the aero and ground scout.

In the security role, as in reconnaissance, the capabilities of the aerial and ground scout mounts will dictate his actions in developing the situation. The aeroscout can rapidly acquire a contact, report it, and apply limited combat power, such as aerial TOW fires or artillery. This limited combat action will be followed by ground maneuver forces as required. The armored scout will also report a contact in real-time. However, with greater armored staying power, the ground scouts' actions may also include the immediate fire and maneuver of ground forces.

By properly combining the different capabilities of the aero and armored scout to fit each combat mission, the modern cavalry commander can obtain maximum results from a very economical mix of forces. A common mission, training, communication, and chain of command will insure the rapid execution of complex security missions.

Cavalry will use the mount and scout to fit the mission. In any situation, however, it should never be viewed as an "either/or" proposition. The question should be one of the proper mix, insuring the two scouts are performing complementary roles. We can envision destructive fires being brought to bear on the enemy's ADA by the armored scout to free the maneuver of the aero scout. We can also see the aeroscout assisting the ground scout by identifying obstacles to movement, securing his flank as he advances, and providing early warning so that the armored scout's deployment and weapons will be ready at the right time and place.

We have discussed the offense and the value of combined aerial reconnaissance and armored combat power, but it is the defense which must first succeed. We will now look at the combat potential of seeing the battlefield through the air and ground cavalry scout.

In order to more clearly illustrate this interaction we will assume that a divisional armored cavalry squadron and its ACT is assigned to the corps covering force. Because of the wide frontage assigned, the squadron retains control over the ACT giving it a mission of screening forward of the squadron along phase line 1 (figure 4). The air cavalry troop is also given a mission of screening a portion of the squadron's left flank which borders another covering force area.

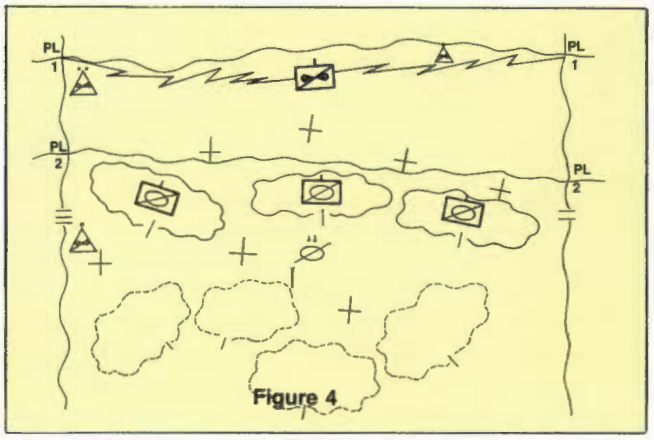


Figure 4

The ACT commander deploys his reconnaissance squads as shown in figure 5 to continuously cover dangerous avenues of approach. The remaining area is covered by the aeroscout and aeroweapons platoons, each task-organized to conduct a continuous screen operation. Each platoon organizes into two teams of scout and attack helicopters so that one team can relieve the other when fuel runs low, or, one can reinforce the other as the situation demands.

The ACT has been given priority of artillery and close air support requests to assist them in the early and continuous attrition of the advancing enemy forces. The squadron commander has directed that the ACT hand over the enemy force when it reaches predesignated target reference points (figure 5). The target reference points are a handoff control measure that insures the ground force can in fact see and engage the enemy.

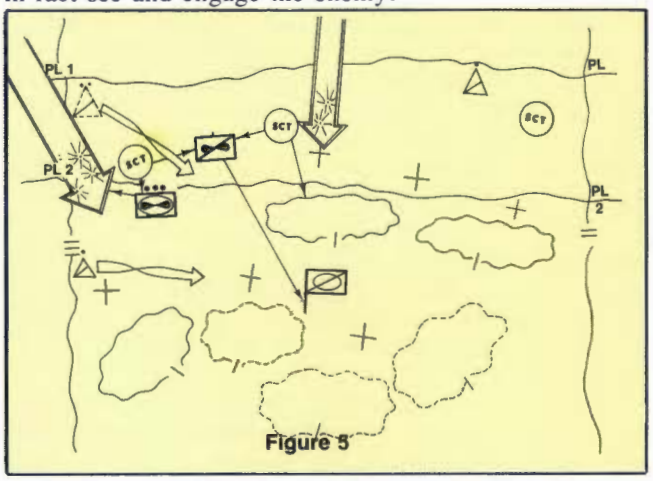


Figure 5

As before, the ACT commander operates forward where he can best communicate and control his elements. Enemy avenues of approach identified by the squadron commander have been divided between the two platoons. All sightings are reported direct to the ACT commander for retransmission to squadron. The armored cavalry troops are aware of critical information by monitoring the squadron command net. Other information than enemy sightings is passed on the OP/INTEL net, then disseminated as re-

quired by squadron.

An observation post of the reconnaissance platoon reports movement of an enemy advance guard along an avenue of approach coming from the other CFA. This information is reported to squadron which directs both be engaged by artillery fires. Almost simultaneously, an air cavalry team sights enemy reconnaissance elements approaching the center of the squadron's sector. The squadron FSCOORD weights the artillery to the reconnaissance squads, but provides support to the air cavalry team.

The reconnaissance squads, in visual contact with the approaching enemy, report the advance guard is for a tank unit and that a battalion-size element is coming into view. Knowing the size and nature of the enemy force, as well as its orientation, the squadron commander orders his left flank troop to reposition to a new battle position.

The ACT commander is ordered to engage the enemy force with his aeroweapons. He orders the aeroscout platoon leader to release half of his attached aeroweapons back to the aeroweapons platoon. He further orders the aeroweapons platoon leader to use his attack helicopters against the enemy advance guard. The aeroweapons platoon leader receives a target update and handoff from the reconnaissance squads. The reconnaissance squads report that one ZSU has been knocked out, but that another is still with the second company of the lead battalion.

With this information, the aeroweapons platoon leader plans his attack to destroy the ZSU with one section as another section attacks the lead tank element. With the ZSU soon out of the way, his primary mission of destroying enemy armor will be much simplified.

The enemy reconnaissance elements in the center have been continually harassed by the air cavalry team's missile fire and accurately adjusted artillery fires. The fleeting nature and high mobility of the team has yet to present a target the reconnaissance company commander can come to grips with. The enemy element approaches the predesignated target reference point for handoff to the ground troop. The situation is reported to the ACT commander who relays it to squadron. Squadron directs the ACT to hand over the target direct to the armored cavalry troop.

The aeroscout platoon leader contacts the armored cavalry troop commander and gives him a complete situation report. When it is confirmed that the armored cavalry scouts do have the enemy reconnaissance elements in contact, control of the artillery and of the target is handed over to the armored cavalry troop commander. Once the handoff is complete, the aeroscout platoon returns to its screen in the portion of the squadron sector which the ACT is still responsible for.

In response to the squadron's situation, the covering force commander places an attack helicopter company under operational control of the squadron. The company commander receives a briefing from the squadron commander. He is ordered to receive the target handoff from the ACT elements presently engaging. An attack helicopter team departs for the area and soon makes contact with the aeroweapons elements. The attack helicopter team is provided a current situation and given a target array handoff along with the control of artillery fires.

Even with this additional antiarmor firepower, the squadron is in a dangerous situation due to the gap created by the repositioned armored cavalry troop. The squadron commander orders the ACT commander to assume control of this sector, and, in essence, to form an aerial battle position (figure 5). Due to the change in mission, the squadron commander relieves the ACT of the responsibility for the left portion of the sector, but not for the right. The ACT commander consolidates all aeroweapons under the platoon leader for use as a mobile reserve. He withdraws three reconnaissance squads and emplaces them in observation positions in the new area. He had initially planned to use two of the squads as stay behind reconnaissance elements, but the new mission requires their capabilities.

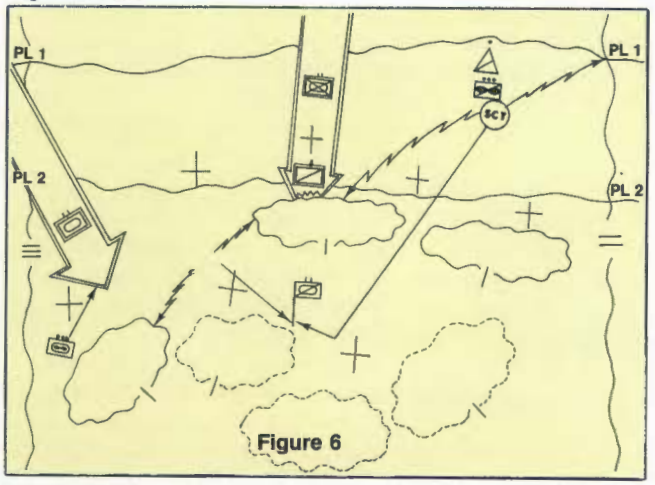


Figure 6

To ease the division of command and communications between the screen on the right and the aerial battle position, the aeroscout platoon leader, in charge of the screen, will report directly to squadron on the OP/INTEL net.

Again, in the preceding envisioned cavalry security mission the total interaction of the complementary scout mounts is described. These actions are again dependent on several assumptions. These assumptions are:

- Air and Armored Cavalry scouts habitually train together as a team.
- Air Cavalry is employed as Cavalry.
- Air and Armored Cavalry leaders are *fully* knowledgeable in the capabilities of the air-ground team.
- Aeroscouts and armored scouts are used separately or in unison to maximize capabilities and minimize limitations.
- Unity of Cavalry command is maintained.

The Modern Scout's Contribution to the Central Battle

Commanders must maximize the effect of their forces. Without accurate real-time knowledge of the terrain and enemy, the finest-trained, best-equipped force can be defeated. The modern cavalry scout will enable the force commander to accomplish a primary task of war — to *see the battlefield*. This task is the major prerequisite for concentrating combat power on the battlefield at the *right time* and at the *right place*.

To paraphrase the excellent words of Brigadier Watkins in the July-August issue, "the scout will contribute substantially to the unit's effectiveness but, will also save many lives." Measures of effectiveness cannot be only the numbers of tanks killed, but also the nonquantifiable number of men who survive the central battle to fight again and may never know to whom they owe their existence.

The Battalion Scout Platoon Is

ALIVE AND WELL

by Captain (P) Marc A. King

> "Success in battle depends to a large extent on which side has more information. It is obviously easier to concentrate forces against weak points in the attack or to counter the enemy's main effort in the defense if a commander knows where the enemy is located, how many forces the enemy has, and what the enemy's potential might be. The commander seeks his combat information and intelligence through every possible source. On the other hand, he protects his unit from surprise and denies to the enemy information about the task force."[1]

The principal tool the Task Force commander has at his disposal to accomplish the two broad tasks of reconnaissance and security is the battalion scout platoon.

The current battalion scout platoon has been with us in one configuration or another since the early days of World War II. Equipped from time to time with no vehicles, jeeps, light tanks, or APC's, the platoon has historically provided the TF commander with vital battlefield information upon which to base tactical decisions. Discussions with experienced officers and noncommissioned officers quickly leads to the conclusion that battalion scouts provide a valuable service and are an important part of the task force. What is not so easily decided in such a discussion are the roles and missions that should be carried out by the platoon. As a result of this air of inconsistency in the tactical employment of the platoon, the platoon was in danger of being eliminated as a result of a proposal made in the Division Restructuring Study.[2] Under the study proposal, the battalion scout platoon was to be replaced by a scout organization, smaller and lighter, at brigade level: its primary mission—traffic control. While this proposed restructured battalion scout platoon was preparing to undergo field test scrutiny at Fort Hood in late 1977, the Department of the Army (DA) was expressing concern as to how the Cavalry Fighting Vehicle (CFV) would be issued and employed in the battalion scout role.

To answer the questions posed by DA and to support the TRADOC Cost and Operational Effectiveness Analysis for the CFV, the US Army Armor Center's Directorate of Combat Developments, Studies Division, organized a study group to relook at the role of the battalion scout platoon in the 1980's time frame and evaluated the CFV as part of that organization. In conjunction with the study a literature search was conducted to gather all the historical documents available on battalion scout platoons. It became clear that while a significant amount of work had been done on the armored cavalry platoon, not since the Stilwell Board of the post World War II era had anything definitive been written concerning battalion scout platoon organization and employment.

In defining the organizations that would be evaluated, the study group selected the current USAREUR MTOE organization of 10 vehicles: six M-113A1's with cal .50 machineguns, four pedestal mounted TOW vehicles, and 34 crewmen[3] as the base case organization against which all other alternative organizations would be judged (figure 1). The study group incorporated the findings and recommendations of the Armor Center's 1974 Cavalry/Scout *Ad Hoc* Committee (CSAC) Study which concluded that the five-man scout crew

[1] FM 71-2

[2] TRADOC Restructuring Study of May 1976

[3] Four-man Augmentation. TOE calls for 30 men.

FIGURE 1

optimized overall accomplishment of scout missions. The study group further assumed that based on current manpower and strength limitations, there would be no increase in the foreseeable future in the number of personnel authorized in the platoon. With these as constraints, several alternative organizations were configured with six vehicles and 30 men. The alternatives included a platoon of six CFV's (figure 2), one consisting of four M-113A1's with cal .50 and two Improved TOW Vehicles (ITV) (figure 3); a third organization of three armored cavalry cannon vehicles (ACCV) with 25-mm cannon (conceptual) and three ITV's (figure 4); and a final alternative consisting of six ACCV's with 25-mm cannon (figure 5).

The methodology used for the study included the selection of eight scout platoon missions as outlined in FM 71-2. The missions were selected to stress the base case and alternatives in all aspects of reconnaissance and security including mounted and dismounted operations as part of a armored task force. The eight missions selected were:

- Frontal Screen—Covering Force Area.
- Flank Screen—Covering Force Area.
- Defend[4]—Covering Force Area.
- Route Reconnaissance—Covering Force Area.
- Maintain Contact—Covering Force/Main Battle Area.
- Area Reconnaissance—Main Battle Area.
- Reconnaissance of a Built-up Area—Main Battle Area.
- Zone Reconnaissance—Main Battle Area.

[4]This mission is normally given to the platoon when part of a larger force. In the scenario, the platoon was integrated on the flank of a team position, however, to stress the organizations. For analytical purposes no additional reinforcement was prov

Previous war gaming done at Forts Leavenworth and Knox in evaluating task force and brigade level forces using the Scenario Oriented Recurring Evaluation System (SCORES) were reviewed. Based on this review the study group identified combat situations where armored task forces would have realistically used their scout platoons on these eight missions. Once these situations were identified, the study group wargamed the scenarios, using the Armor Center's computer assisted manual war game methodology to generate as near realistic combat data as possible for use in the post gaming analysis. In addition to the data derived from the gaming, the study included a detailed subjective analysis of qualitative areas associated with scouting. Such things as mobility, employment of onboard smoke, thermal sights, ability to conduct sustained operations, and effective dismounted operations were addressed.

Analysis of both the quantitative and qualitative data resulted in several significant findings. First, the study substantiated the CSAC's finding that the five-man scout crew is the best crew structure for the accomplishment of both mounted and dismounted scout missions. Secondly, findings indicated that a platoon equipped with six vehicles, three ACCV's and three ITV's, could replace the current 10 M-113A1's without degrading mission accomplishment. Finally, results of the analysis showed that six CFV's together with their onboard array of cannons, TOWs and coax machineguns, with their increased speed, tactical mobility, and acquisition/surveillance devices provided the most significant increase in mission accomplishment when compared to any of the other alternatives.

The task, however, was not quite complete. While the study group was concluding its work and preparing to present its findings to the Infantry School, data was being received from the ITV operational test site at Yakima, Washington. This data indicated that, due to the amount of scout related equipment required to be carried in the vehicle, operating space for the five-man crew was limited. The crew and equipment stowage problem was further compounded when USAREUR identified the need to carry the components for dismounted operation of the TOW launcher onboard the scout ITV, a requirement previously identified only with the Infantry's ITV role as a dedicated antitank system.

To solve the problem, a joint working group was conducted with combat developers from Forts Knox and Benning. The Fort Knox proposal supported the findings that three ACCV's and three

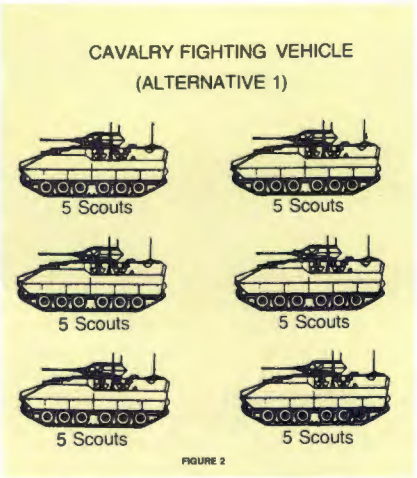


FIGURE 2

ITV's were second in performance only to the six CFV's. The Fort Benning proposal was for an eight-vehicle platoon, four ACCV's and four ITV's to relieve the overcrowding problem with the ITV. The Fort Knox proposal retained the five-man scout crew, but did not solve the stowage problem. The Fort

FIGURE 3

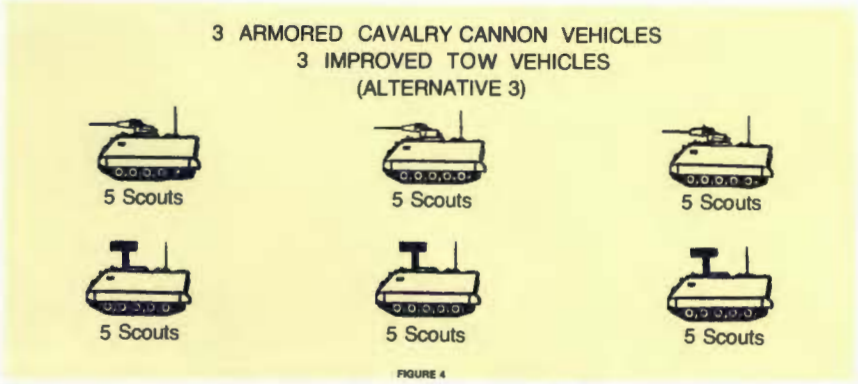


FIGURE 4

Benning proposal reduced the number of scouts to four on six of the vehicles and only three scouts on two of the vehicles. The study group went back to the drawing board in an attempt to reach a compromise which would resolve both of the above operational shortcomings.

The solution was a seven-vehicle transitional organization that would be composed of four ACCV's and three ITV's (figure 6). Each of the ITV's would be crewed by four scouts (relief for the storage problem), while three of the four ACCV's would retain a five-man scout crew (maintaining good dismounted capability) while the platoon leader in the fourth ACCV would have a driver and one additional scout. The eight-vehicle and seven-vehicle configurations were war gamed in the same settings as were the original alternatives. The results showed degradation in mission performance for dismounted operations in the eight-vehicle alternative, when compared to the six-vehicle proposal. However, the seven-vehicle alternative suffered only a slight degradation in that category due to the redistribution of crew members on the ITV. The result of adding one additional ACCV to the platoon did not impact significantly on the platoon's overall mission accomplishment while providing a solution to the ITV stowage problem.

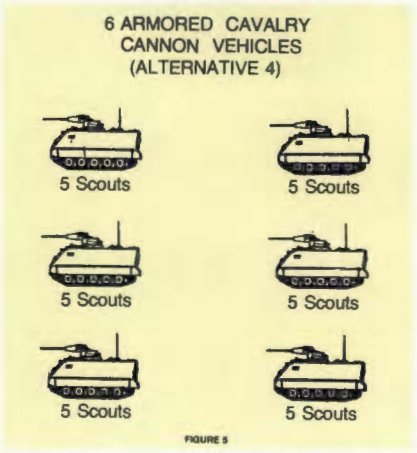


FIGURE 5

As a result of the study and the findings of the joint working group, it was recommended and approved by the Commanding Generals, US Army Armor Center and Infantry School, that a platoon organization of seven vehicles and 30 men be implemented by TO&E modification to serve as a transitional organization.

The transition of the platoon from 10 vehicles to seven will be carried out in two phases. Initially, the platoon will be reorganized with four M-113A1's with cal .50 machineguns and three ITV's. Pending approval of the ACCV, phase 2 would replace the M-113A1's on a one for one exchange. The transitional organization will be retained until the fielding of the CFV, at which time it will replace the seven-vehicle organization with six CFV's and 30 men.

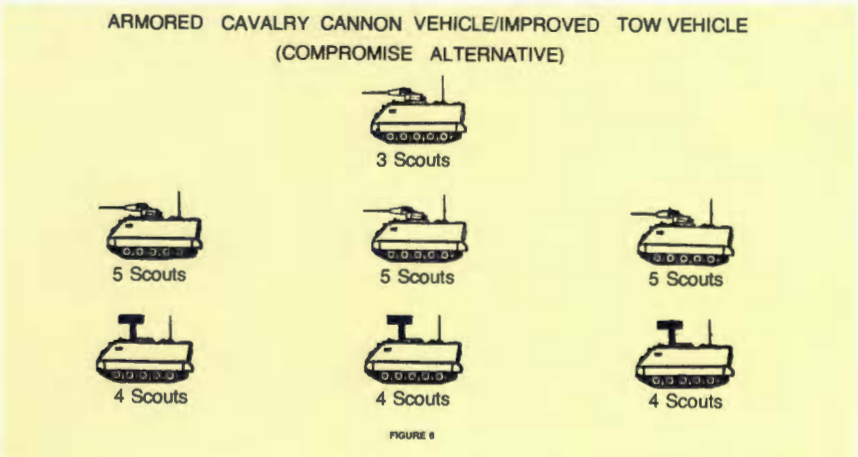


FIGURE 6

The Battalion Scout Study satisfactorily addressed the questions of employing the CFV in the 1980's Maneuver Battalion Scout Platoon. In addition, the study produced significant results which should not be lost in the morass of numbers and analytical jargon. The fact that regardless of organization and equipment, the battalion scout platoon is a vital element in the combined arms task force was clearly demonstrated.

This same conclusion was subsequently reached independently as a result of the Phase I Division Restructuring Test mentioned earlier. While the results of the testing are still incomplete and analysis of the field test data continues, there was one point that received unanimous support; *the task force commander needs a scout platoon*. It is this force providing the eyes and ears of the commander that is absolutely essential for conducting effective offensive and defensive operations. The commander must know where the enemy is if our doctrine is to be successful. The battalion scouts are an important key to that success.

CPT (P) Marc A. King was commissioned in Armor in 1967 upon graduation from Armor OCS at Fort Knox. He served as a training officer, combat arms advisor to the 6th Republic of Korea Corps, Asst G-2 and company commander, 25th Infantry Division in Vietnam. Since graduation from the AOAC, CPT (P) King has served as Asst S-3 and troop commander, 1st Squadron, 11th ACR in Fulda and is currently assigned to the Directorate of Combat Developments, USAARMC.

GONE HQ

by Reinhold Wilhelm (Bill) Herman

In bumper-sticker language we would have said "Tankers do it better—But Recon Does It Best"—even in the early 1940's. And at least one reconnaissance troop was as "outa-sight" then as it appears today, even from the cushion of many years.

The place was Camp (now Fort) Campbell, Ky. in 1942, and the mission was "Find it." Not that Campbell was lost; it had just been built, a freshly painted ghost town scaled for two new armored divisions, but at the moment holding only a tiny cadre sent in from Ft. Knox. Plus this giddy-gaggle of motorized soldiers called The Reconners—and con they did.

Why try to "find" this brand new camp? Because the 103,000-acre post astride the Kentucky-Tennessee border had been only hastily mapped (assisted by real estate charts and low obliques) and some borders were thought to be still "vague." Also, the boundaries of training and impact areas had still to be superimposed before the first armored division would be activated. So the troop's task, paraphrased, was to "Go out and get lost—but remember *where* you got lost and correct the maps."

We became the most-lost troop in the Army that summer of '42.

For openers we lost most of our scout platoon and squad sergeants the night before we started the mapping mission. Thinking we'd be the only soldiers in sight, we made a break for the nearby town only to find it already occupied by (who else?) Military Police. During an exchange of views on their ancestry and resemblance to parts of a horse's anatomy, some fists and clubs were swung. Not only were we the first soldiers in town but also the first in the new guardhouse. This episode also put us on the road to our unit submotto—"The Black-eyes of the Division."

But the mission did get underway, in the mad-cap way of Reconners equally at ease in the field as in the stockade. We roamed the endless roads, trails, and fence-lines of the huge post in half-tracks, scout cars, and motorcycles (there were still some 28 Harleys in the "bike platoon" TOE). The "bikers" were the real mixed-bag of Recon with two common traits—suicidal tendencies and the ingenuity of starving foxes. These traits were extremely useful, especially when it came to smuggling booze and fermenti into the post at night. ("This will be a dry post!" the new post commander had intoned. "All vehicles will be examined at the gates.")

The Recon solution was simplicity itself: they had stumbled on a small road at the post boundary that was not on any map. Not only did they fail to record it, they camouflaged it a bit more.

And badgered the gate MP's almost out of their minds. Like this.

Most of the Recon bikers also owned their own cycles (they were *24-hour* maniacs). Thus the evening's selected "booze bike" would check out of an MP gate, head for a highway liquor store but return via the secret "Recon Gate." Sometimes the same bike and rider would check out *twice* through the same gate— but never return. The MP's would call the other gates to ask, "Did that wild Recon guy come back in your gate?" The answer was always negative, or "He just went *out* again!" Part of a warm summer evening's sport was to "flood" the gates with out-going bikes, *but none would return*. Or—the variation—all would show up *going out again*. Or perhaps all but one—the one with saddlebags full of booze who came in via Gate X. But the Reconners always patiently submitted to saddlebag searches by the MP's who referred to them simply as "The Rumrunners."

In desperation the MP's started following the bikers who went off post, but they were no match for a "hard pants" on a country road with his headlamp switched off. Also, when *six* bikes go out for "character-builder," which one do you follow?

The private gate—and the bedevilment—lasted several months until a farmer near the edge of the post complained of heavy motorcycle traffic. The missing road was found and barricaded by the engineers.

During the resulting dry-spell, the Reconners probed the MP security with some short-lived success. One biker became adept at smuggling pints hidden inside the legs of his tanker's suit until, he claimed, someone tipped off the gate MP's. That was the night the Recons gave up the struggle. After the MP had checked the saddlebags, he started a casual conversation with the biker who became increasingly nervous. Not only was he afraid to move for fear of rattling the bottles in his pantsleg, the cold bottles were heating up from his hot cylinders.

The MP chatted on...and on.

Then it happened—"POCK! Clink-clink! POCK! POCK! Clink!—clink—clink!

Result: Booze-soaked boots, pants full of broken glass, and an MP convulsing with laughter.

Still, the main daylight activity was prowling the

backroads of the new post, recording terrain features, fords, bridges—and playing occasional games of "bust-'em-up." This is part of the Armor-man's strange compulsion to *smash things*. For this Reconners used the scout vehicle's "front-roller," the heavy steel cylinder that serves as a front bumper, designed to "walk-up" obstacles. And "obstacles" to Campbell's pioneer Reconners were small abandoned farmhouses. Drivers liked to gleefully push in the front door, attack the sides and thus tip the house over in a grotesque heap. They especially liked houses with long overhanging porches not too high off ground level. From a good running start the scout-car would run down the line of porch poles, clipping them off and getting away before the roof came down (usually). It was generally assumed that farmhouses in that area had no basements—until a half-track charged the back door of a house and disappeared in a deep root-cellar.

They also learned that many rickety-looking old sheds had a stout log-and-clay flue or inner chamber for curing dark burley tobacco. It was, in effect, a small fortress that could demolish the front end of a tank, and did. The Reconners watched helplessly many times as tanks charged merrily through old sheds, exploding them in a shower of warped old hickory boards, until they would rush the wrong one and fail to come out the other side.

It must be reported that the "Easy Raiders" did do some admirable work in verifying the limits to artillery impact areas—even though they may have "stayed-too-long-at-the-fair." A Recon detail got caught down-range for the first artillery registration while shortcutting through the impact area. Actually they had slipped into an old barn for lunch when they realized they were in a slow-forming bracket on their barn and beat it out.

During the map-checking, one post boundary continually fascinated them. While most were generally straight, this edge of the post was a series of jumbled steps chopped into an otherwise straight edge. One day during a cola break in an off-post country store they got the story. With much gleeful smirking, some natives told them that some big-city land dealers had got wind of the Army's intent to build a huge military post in the area and promptly bought up large parcels of land. When the Army in turn heard this, it simply refused to buy the speculation land and put the post boundary *around* it, explaining the jagged-edged border.

For living long periods in the field, the Reconner's lifestyle was uniquely functional. On nice nights they would simply "hammock-it," using an abandoned square-mesh fence. With their ever-present wirecutters they would simply cut the fencing outside two posts, knock down the two posts and hang them between two stout trees to form a gigantic hammock. All it needed was some straw and a bedroll for a deep, innocent sleep. One scout platoon sergeant had an equally effective way of waking the morning sleep-addict—by simply setting fire to the straw near the sleeper's head.

During colder stays in the field, the "Gypsy Cavalry" moved indoors—into a convenient abandoned house which they would "flue-cure," as they put it. This meant keeping a fire going in the fireplace using first any left-behind furniture, pantry shelves, doors, and frames. Then they'd burn the window casements, walls, ceilings, the roof and rafters. Then the main floor. The end result was they would end up outdoors again because the whole house would literally *go up its own chimney!*

Later many company commanders would have their chow trucks rendezvous at an abandoned house with a fireplace—until the house would be consumed by its own chimney. Many such chimneys would stand stark and defiant until some passing tank would finally and irreverently nudge it down.

Among my most memorable experiences with the early "Campbell Commandos" was my first contact with the arcane world of Research and Development. One day while firing on a towed 37-mm. gun range, a strange vehicle drove up near the firing line—a ¾-ton weapons carrier with a 37-mm. pedestal-mounted gun in the truck's bed.

Two gentlemen in white smocks got out and talked awhile to the troop commander who called me over and said, "Sergeant, these chaps want to test-fire this weapon. Pick a crew and give 'em full cooperation." After a gunner and loader were selected, the smock-clad lads nosed the truck and gun up on the firing-line, folded down the windshield and turned the rig over to me. My objections came promptly: "Sir—we don't fire over the hood in Recon."

"Why not?" one smock asked.

"Well, we always park a vehicle for get-away, facing *away* from the enemy, also because if..."

"Okay-okay," snapped the other smock, "But there's no enemy here—go ahead and fire, sergeant."

"It'll only take a minute to turn it around and fire over the tailgate."

My plea got nowhere. "Listen here, sergeant! Stop the theory and fire the gun the way she sits, okay?"

The gun was fired.

The muzzle-blast shattered the windshield and sucked all the dials and gauges out of the dashboard. Nor would the engine even start again.

Wonder what ever happened to that ¾-ton weapons system?

Maybe one day I'll run into one of those wonderful, crazy Reconners.

He'll know.

REINHOLD WILHELM (BILL) HERMAN is a former heavy tank and reconnaissance troop commander, and civilian information officer with Headquarters, Combat Development's Command at Ft. Belvoir. He retired from his last assignment in the Secretary of the Army's Office for the Freedom of Information in June 1974.

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)

LEADERSHIP IN THE

by Colonel Joseph C. Lutz

These thoughts represent my personal beliefs and perceptions concerning certain values that shape my philosophy of military leadership in a contemporary military organization. As such, they are offered for consideration by those who accept the challenge of leading men.

The values established for the development of the leadership philosophy within the 3d Armored Cavalry Regiment were selected as standards of conduct. Once established, standards became the basis for persuading others to develop a leadership style that would lead to attaining the goal of combat efficiency. Thus values and leadership are mutually supporting and reinforcing in attaining the optimum goal of leadership—*to get others to do what you want them to do because they want to do it.*

As a regimental commander, my leadership philosophy is based on the principal value that *recognition of each individual as a singularly unique, dignified human being is paramount*. This forms the basis for all other values and is the key to *people-oriented* leadership. Should this value be ignored, the validity of all other values becomes suspect. In that light, the following values were established for leadership standards within the command.

People

As the Army becomes more materiel intensive, the requirement to concentrate on the individual becomes increasingly important. The total direction of leadership must center on the individual. This may appear simplistic, but unfortunately there is, all too frequently, a tendency to ignore the individual trooper in striving to "get the job done." Ignoring the individual inevitably leads to a deterioration of communication and the ultimate erosion of discipline within a unit. The leader must always understand that he leads people, not machines or equipment. In stronger terms, without people leaders would have no purpose in military organizations.

Mission

Each trooper must learn and know those skills necessary to fight. In directing our collective leadership efforts toward accomplishing the mission, we must concentrate on reinforcing the concern of the leader for his men. The trooper is given a clearly defined goal and a sense of direction for his efforts. This adds meaning to his training and provides a recognizable and tangible goal that relates to his specific job. In turn, individual motivation is produced through the realization that increasing combat skills ultimately enhance the chance of survival in combat.

Integrity

The integrity of our senior leadership is perhaps the one sociological value that is most often challenged by young soldiers and junior officers. Their perception and thus their belief is that integrity is often sacrificed for *career interests*. Examples cited by many are the falsification of unit readiness and AWOL reports, and the inflation of officer and enlisted efficiency ratings. To remove or preclude this perception, the commander must assure all levels of leadership that the compromise of integrity will never be condoned, encouraged, or rewarded. Leaders must know that they will be supported even when a report *looks bad* for the organization. This may be demonstrated by accepting less than a C-1 readiness condition or an unfavorable AWOL report. Accepting such reports should never be construed as being satisfied with mediocrity but rather as receiving information that is factual and accurate. Moreover, leaders must understand that they will never lose their jobs for having soldiers AWOL, but they will be relieved for falsifying their AWOL rate. This doctrine will reinforce the credibility of integrity at all levels by ensuring leaders that they do not have to run scared.

Mental and Physical Toughness

The attainment of a high degree of physical fitness promotes a confident spirit of well-being within the individual. This confidence translates into an increase in mental alertness and eventually into a higher degree of mental discipline or toughness. While this correlation probably is unsubstantiated, ample evidence of mental toughness has been demonstrated by individuals and units maintaining high levels of physical conditioning. A demanding physi-

cal conditioning program for all ranks also promotes togetherness within a unit. For the trooper, the benefit of physical fitness is one of increased confidence and a better feeling of self-worth. Camaraderie is enhanced as soldiers share adversity, hardship, and challenge.

Attention to Detail

To achieve and maintain high standards of conduct, all levels of the chain of command must strive consciously and continually for attention to the smallest detail. Candidly, attention to detail adds direction toward specific requirements and responsibilities. If a vehicle is dispatched with deficiencies, several persons in the chain of command apparently failed to *pay attention to detail*. The first line supervisor, not necessarily the driver, should therefore be held responsible for that vehicle's condition. When supervisors are charged with the responsibilities of their roles, they must also be given the necessary authority to carry out their duties. Consistency is vital in developing a sense of urgency toward attention to detail. Inconsistency fosters confusion and subsequent frustration among troopers. The lesson here is that the individual soldier will do what needs to be done if he understands what is expected of him in terms of standards. Reinforcement is gained through knowing that appropriate authority is given to carry out the responsibilities of assigned positions.

Appearance

One of the most visible signs of discipline in a military organization is the appearance of its soldiers, equipment, facilities, and living areas. Again, a high standard must be established and aggressively pursued. Neat, orderly appearance is a positive and recognizable means for developing another essential value—pride. To this end each trooper in the regiment is inspected each day by his immediate supervisor. This requirement carries over into other areas requiring inspection. Reinforcement of pride is provided by peer acceptance, leadership concern, and personal recognition.

Chain of Command

In maintaining the values discussed above, an obvious reliance is both directed toward and expected of the chain of command. In fact, the leadership climate within an organization is the reflection of leadership displayed and practiced throughout each level of the chain of command. Emphasis is placed on a single chain of command. That is, officers and noncommissioned officers comprise the chain and work within that framework for optimum effectiveness. While the alternate noncommissioned officer channel of communication is encouraged, any concept of a dual chain of command is likewise discouraged. In other words, the first sergeant works for the troop commander, not the command sergeant major. There is, however, a viable communications link between the command sergeant major, the first sergeants, and all other noncommissioned officers in the leadership structure. Leadership throughout the chain of command is charged with people involvement. Each leader is challenged to know and understand his troopers thoroughly. This encourages a bond of mutual respect and confidence that stresses identification and teamwork. As individuals identify with their respective units, an increase in unit pride is inevitable. The chain of command reinforces the leadership philosophy of recognition of the individual that reinforces the trooper's awareness that someone really is *looking out for his welfare*.

Pride

As indicated in the discussion of appearance, leadership involvement should contribute, either directly or indirectly, to increased pride in the individual and the unit.

As other values are practiced, encouraged, and developed, the individual predictably will improve his self-image. This is often a very subtle transition, strengthened by individual accomplishment, peer acceptance, and recognition. As the individual's perception of his self-worth improves, he inevitably performs better. As performance improves he takes more pride in his job and his work environment. The individual who *feels good about himself* will feel good toward others, will have better morale, and invariably will perform more efficiently.

Aggressiveness

For the Cavalryman, aggressiveness is critical to the classic missions of Cavalry: *reconnaissance, security,* and *economy of force*. In each of these missions the Cavalryman must, by the very nature of his job, be the first combat soldier to come in contact with an enemy force. Some say, and most agree, this takes a certain type of individual to meet this challenge. A fine line must be drawn in maintaining a disciplined unit while encouraging aggressiveness. The danger in creating a unit of "tigers" without stressing other leveling behavioral values is obvious. The trooper must be trained to act independently but within a logical mission structure. One of the many attributes of a great Cavalryman is the ability to be aggressive, but not reckless.

The young trooper in today's Army wants to be recognized and treated as a human being, challenged in his job, gain a sense of achievement, and be recognized for his abilities and accomplishments. He wants, needs, and actively seeks guidance and direction in fulfilling his military role. He is quick to recognize capable leadership and seldom fails to identify poor leadership. In essence he expects, and more importantly deserves good, intelligent, and mature leadership.

Properly led and motivated, today's trooper will meet the challenges of military life, learn the skills required of him, and willingly contribute to maintaining a high degree of combat readiness.

COLONEL JOSEPH C. LUTZ was commissioned in Armor in 1955 upon graduation as a DMG from Army ROTC at St. Norbert College. He has attended the Basic and Advanced Armor Officer Courses, Command & General Staff College, and Naval War College. Colonel Lutz served as a Special Forces Adviser and "B" team commander in Vietnam. His cavalry assignments include troop command in 3-12 Cavalry, the 3d Armd Div, and 1-17 Cav, 82d Abn Div. He presently commands the 3d Armored Cavalry Regiment, Fort Bliss, Tex.

VEHICLE RECOVERY

by CPT. STEPHEN E. SIMMONS

Neither the current H-series modified table of organization and equipment, (MTOE), nor the T-series MTOE proposed in the Division Restructuring Study (DRS), provide adequate vehicle recovery support for retrieving salvageable casualties.

The H-series MTOE authorizes only six *M-578* light recovery vehicles for the mechanized infantry battalion and only five *M-88* medium recovery vehicles and two *M-578's* for the armor battalion.

Under the T-series MTOE, which is centered on reducing personnel and equipment authorizations, mechanized maneuver battalions receive two new companies, one of which is a maintenance company. This results in the consolidation of maintenance and recovery assets at the battalion level.

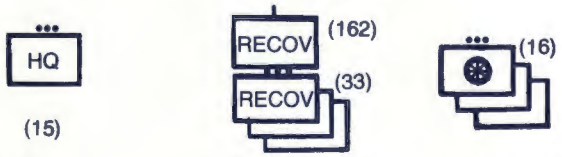
Using the armor battalion as an example, two 5-ton wreckers and two *M-88's* compose the recovery section, while three *M-88's* constitute the line company maintenance teams. In reality, the armor battalion gained two wreckers and lost two *M-578's*. Mathematically, the ratio of tracked recovery vehicles (VTR) to combat vehicles has been increased; however, neither the H-series nor the experimental T-series MTOE affords a recovery capability sufficient to meet the needs of a rapidly advancing attack or a deliberate and tenacious defense. These recovery elements could not readily assist the logistical network in increasing the availability of operational equipment.

To bolster the availability of operational combat vehicles, the Army needs to implement a system similar to that used by the Israeli Army in the October War to return combat vehicle casualties to battle in 1 to 2 days. Each mechanized maneuver brigade needs to be supported by a recovery unit over and above any TOE authorizations. To meet this requirement, a reinforced recovery company should become an integral segment of the Division Support Command (DISCOM). When a brigade engages in a training exercise or a combat operation, it would receive, in addition to its normal support slice, a recovery platoon consisting of 10 VTR's and seven heavy equipment transporters (HET). Each maneuver battalion would receive three VTR's and two HET's to augment its recovery capability. One VTR and one HET would remain in the brigade trains ready to assist a battalion when the situation dictated a greater need for recovery. Therefore, considering a mechanized or armored division with three maneuver brigades, the unit would consist of 30 VTR's and 21 HET's, with each VTR and HET manned by three- and two-man crews (see diagram of proposed TOE.) The availability of such an asset would help provide an increased return of combat vehicles to maneuver field commanders.

To effectively implement this concept, the recovery company would be composed of trained track mechanics and transport operators. Highly trained recovery teams would increase the capability of making on-the-spot repairs, isolating probable causes of malfunctions, and determining if a combat casualty is in fact repairable. Their expertise would also enable them to employ limited cannibalization of crippled and inoperable vehicles to expediently return the less disabled to battle. Those vehicles

that are damaged, but repairable at DS and GS level, would be evacuated to a predetermined collection point and then removed by HET's. The joint employment of VTR's and HET's would maximize the utilization of both assets and reduce the time of evacuation to a support facility.

PROPOSED TOE



(15)		
1 Co Cdr	1 Plat Ldr	1 Trans NCO
1 XO	1 Plat Sgt	15 Trans Dvrs
1 Trans Ldr	31 Trk/Recov Spec*	
1 1SG	(10 E5, 21 E4)	
1 Motor Sgt		
1 Commo Sgt		
1 Sup Sgt		
1 Wheel Mech		
1 TAMMS Clk		
4 Drivers		
1 Sup Clk/Armorer		
1 Unit Clk		
	Vehicles	
3 ¼-Ton Trucks	1 M-113	1¼-Ton Truck
3 ¼-Ton Trl	10 VTRs	7 HETS
1 5-Ton Wrecker		
1 2½-Ton Truck		
1 5/4-Ton Truck (M-880)		

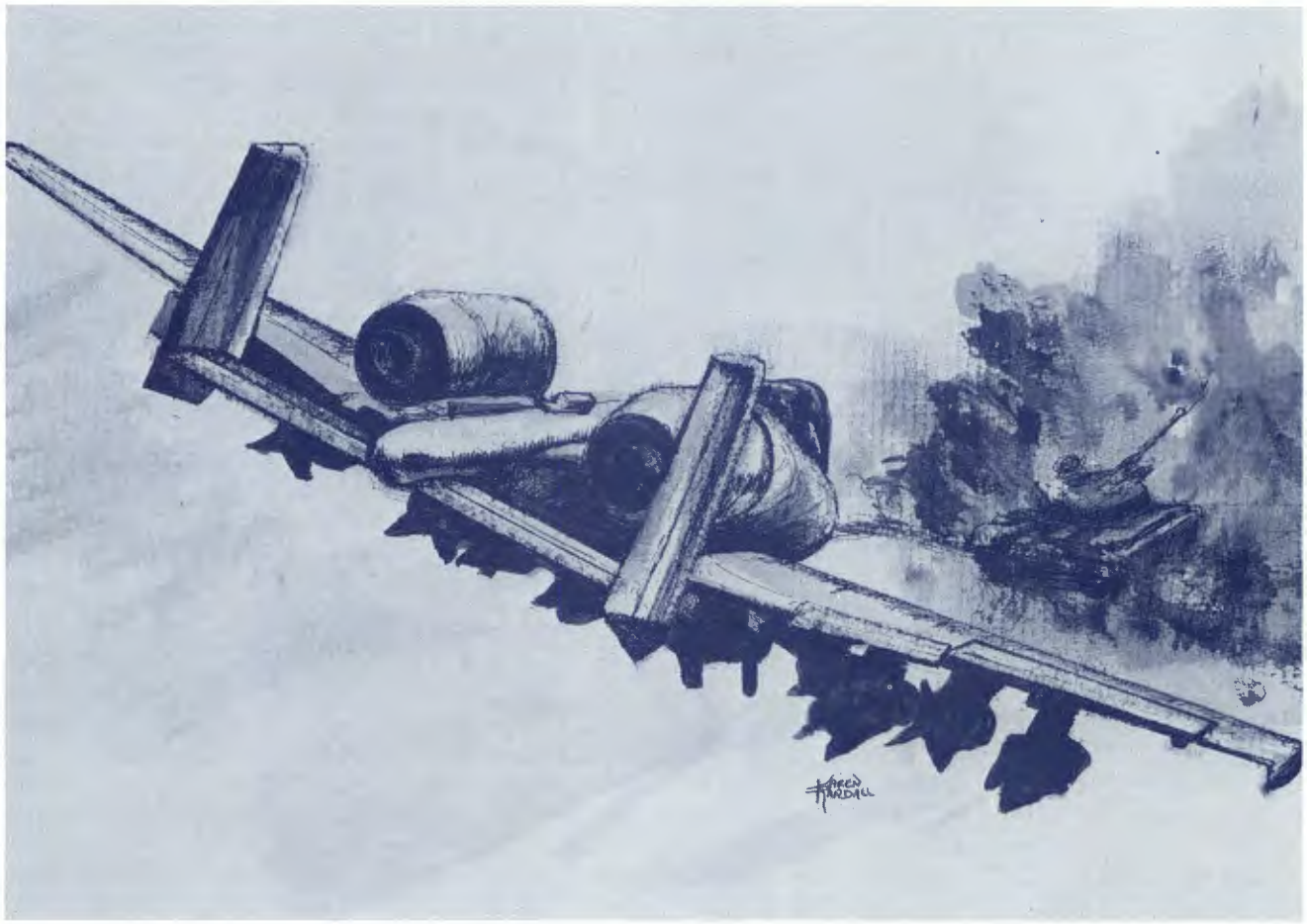
*Recommend that at least two-thirds of these be 63C and the other one-third be 63F, with one E4 per track.

This proposal is applicable to both training exercises and the battlefield, but what functions would such a unit perform in garrison? Being a segment of DISCOM and composed predominantly of well-trained mechanics, it could augment the division maintenance battalion in its unglamorous daily mission of vehicle and equipment repair. It could also assist the local GS facility which in most cases is primarily staffed with civilian expertise. Additionally, it could assist the maintenance battalion in initial displacement, utilizing both VTR's and HET's. This capability would help the maintenance facility and its customers by increasing its mobility. While the recovery unit is involved in either or both of the first two missions, companies or platoons could be readily rotated to support their respective maneuver units engaged in field training. The ability to train, refine, and perfect their recovery and evacuation techniques will yield greater returns in combat.

Based upon the current doctrine of combined arms teams, the majority of mechanized and armor battalions will cross-attach in field training or combat environments. Consequently, each would be composed of tanks to some degree. Therefore, a recovery vehicle would have to be capable of moving a tank, whether it be a modified *M-48A5* or one of the *M-60* series. Since the *M-88* is in the process of being replaced by the new *M-88A1*, it could become a logical candidate to equip the recovery company. Upon replacement, the *M-88* could undergo modification and overhaul, and then be equipped for its role in the recovery unit. Since the *M-88* provides the capability for making limited, expedient battlefield repairs, its basic issue items could be designed to meet this requirement; however, it should also be equipped with an additional set of APC and tank towbars, and devices to increase the recovery capability for "daisy-chaining." The employment of the *M-88-series* would also provide protection for the crew of the evacuated vehicle.

The obstacles confronting the requirements for greater and more efficient recovery capabilities are not insurmountable. Yet, a close scrutiny of the current test MTOE's of mechanized infantry and armor battalions dictates an immediate need for more recovery assets. We can improve the overall combat effectiveness training of our soldiers, but can we continue to fight effectively? With the institution of the reinforced recovery company in mechanized and armored divisions, we are helping to meet that need!

CPT STEPHEN E. SIMMONS was commissioned in Military Intelligence upon graduation from Engineer OCS in 1970. Captain Simmons received an RA commission in Armor after spending more than 4 years in MI, including a tour in Vietnam as a MACV-J2 order of battle analyst. Captain Simmons has commanded a tank company, and served as S4 at battalion and brigade levels. He began IOAC in April 1978.



Quantifying the Army's need for tactical air support is simple:

In a place like Europe, we need tons of it at the outset of hostilities; and the need will not let up until the numerical superiority of the opposing force is significantly reduced. Qualifying the Army's need for tac air, however, deserves some detailed discussion.

Folks tend to think of tac air only in terms of close air support (CAS), visualizing the fighters rolling in on a target that has been identified by the ground maneuver commander and very closely controlled through the classic tactical air control party mechanism. True, this is a large part of the tac air support package, but far from the total contribution that the Army expects tac air to provide. If we assume the standard scenario for Central Europe and focus on a single U.S. division in that sector, the requirement becomes obvious.

Let's look at the 1st Armored Division, Old Ironsides. We know that it has the mission of defending a wide sector, and we also know that it has 11 maneuver battalions, an armored cavalry squadron, and two attack helicopter companies with which to defend that extended sector. Soviet doctrine indicates that for their breakthrough they plan to mass up to 24 battalions within a 10-km front to achieve penetration and allow the second echelon forces to follow on in exploitation. Our analysis tells us that we can probably sustain a defense if we are capable of achieving a 1:3 force ratio. Without reinforcing the 1st Armored Division, the only way this can be done is to move eight maneuver battalions in the 10-km sector that Ivan has selected to conduct his breakthrough.

Instant Intelligence

First problem: How do we know precisely where this penetration will occur? Our classic response has been through the use of our signal intelligence and reconnaissance resources, and this is still true; however, we really need to think this one through very carefully. The Army has its family of collectors, as does the Air Force, plus national means. The trick is to properly fuse and deliver all of the information quickly to ensure the right decision in time. So the first thing the Army needs in the way of tactical air support is a sharing of all the relevant data that the Air Force is collecting in sufficient detail to sort out the main attack from the many diversionary attacks.

I am talking about providing the division with filtered

information in a near real-time fashion. Similarly, the Army needs to be sharing information with the Air Force.

For purposes of this discussion, assume that we were successful in determining the breakthrough sector, and that the division commander had done everything just right and was successful in repositioning his maneuver battalions. His next two immediate problems are hitting the targets so that he can maintain the defense and to ensure that the enemy's second echelon never arrives.

Coordinated Counterbattery Operations

No doubt the division commander's first scream will be to get the enemy artillery off his back. Our own artillery-locating radars and counterbattery fire will be swamped. Some of the enemy artillery will be out of range for our supporting fires. If tac air can pound their artillery, the immediate front line defense against Soviet tanks can probably be handled by our organic means. Again, information sharing is essential. We will be able to tell USAF the Red artillery's location with great accuracy. Similarly, USAF can give us radar locations of *ZSU-23-4* antiaircraft artillery systems that will be extremely helpful to friendly attack helicopter units.

Note that I said we will need help with artillery targets. Heretofore, we have generally discussed the requirement for close air support in terms of tank targets. That requirement remains, and all of our forward deployed forces, including the attack helicopters, will need Air Force close air support assistance. The priority targets will very quickly become the artillery and the second echelon staging area.

To get at these targets, a great deal of mutual effort will be required to clear a path for the CAS aircraft. Soviet air defenses must be suppressed or destroyed by every means that can be brought to bear. The idea is to provide the most benign air defense enviroment possible to give relatively free rein to the attacking aircraft. For the fighter pilot who is worrying about identifying artillery targets, active artillery units will provide plenty of signature, so he can go ahead and roll in. He will not be assisted by a nearby forward air controller (FAC), but he will be receiving coordinates from some element of the Tactical Air Control System or perhaps even directly from the division artillery target acquisition battery. It may sound a little far out, but it certainly can be made to work.

Integrating Firepower

There will be plenty of targets for all, and the coordination required between the services will be greater than ever before. World War II, Korea, and Vietnam doctrinal employment of tac air will not work, or at least our joint testing experience suggests that it won't work, until we have achieved a significant level of defense suppression. With the Army's attack helicopters operating at nap-of-the-earth altitudes, and the *A-10's* just above the trees, we should not have to be concerned about airspace management. However, target acquisition, identification, handoff, and navigation become more difficult from these operating altitudes.

One of the front-line ground commanders' most difficult tasks will be establishing the priority of targets to be destroyed by the various means available. We can't afford to kill the same target twice. Coordination and integration of available firepower has to happen quickly and simply. The TACP and, most importantly, the FAC must be as familiar with the battle plan as the battalion commander and operations officer—the battle manager. The FAC has got to be able to move to the right location at the right time and be in constant communication with the battle captain. There won't be time or resources for separate air and ground wars around the FEBA.

Merging Interdiction and CAS Targets

With respect to the second problem—the attacker's second echelon—close air support becomes vital. I realize that by definition the second echelon properly falls into the classic interdiction mission as opposed to CAS. Unfortunately, the numbers of combat aircraft available to the Warsaw Pact suggest that priorities will have to be established and interdiction may not be reviewed as vital as CAS or counterair, and for a period of time that view might be proper. The fluidity of the second echelon suggests that the time between this force being a staged interdiction target and a CAS target will be difficult to determine.

Let me wrap up the Army's view on tac air with a discussion on the FAC. I believe that he is going to be an increasingly important guy to have on the battlefield. The FAC's very survival and effectiveness are dependent upon how close to the FEBA he can operate. From our tactics development and evaluation experience we have pretty well documented that scout and attack helicopters are extremely survivable at nap-of-the earth altitude. These tactics protect against air defense and small-arms fire. Quite obviously the helicopter has to vacate the artillery barrage areas, as will all other thin-skinned vehicles.

The helicopter's advantage over ground vehicles is its agility and its ability to move out quickly. As has been demonstrated, the scout helicopter could provide the FAC with a capability he has never had. Similarly, a case can be made for putting the FAC in a tank or an infantry fighting vehicle. The latter option, although providing him with the protection required, decreases his flexibility and capability. This also suggests to me the obvious integration level of Army Air and Air Force tactical air support.

This is truly where the rubber meets the road. There will be targets that can be better killed by attack helicopters, and instances where clearly the *A-10's* or the *A-7's* are the right CAS weapons. The FAC, the scout, and the ground maneuver commander are going to be the best judges of the optimum weapon systems approach. No single weapon system is going to survive by itself.

Condensed from an article by Brigadier General Charles E. Canedy, USA, in the February 1978 Air Force Magazine.

Perspective and Patterns

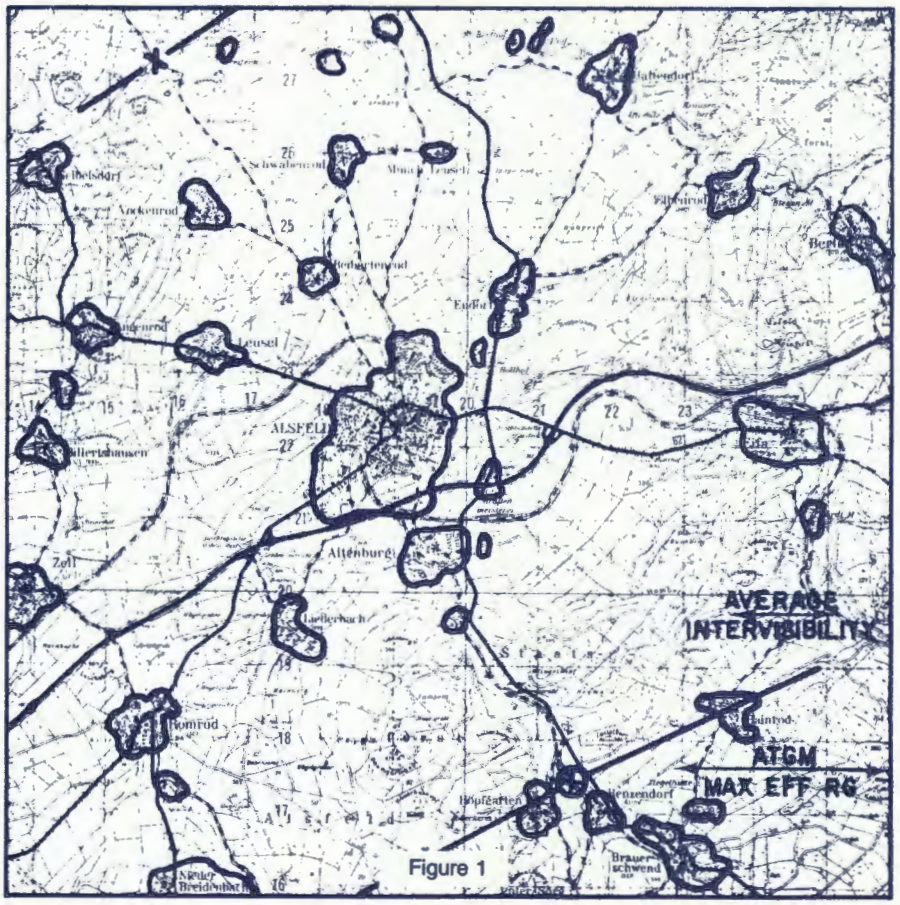


Figure 1

urbanized terrain

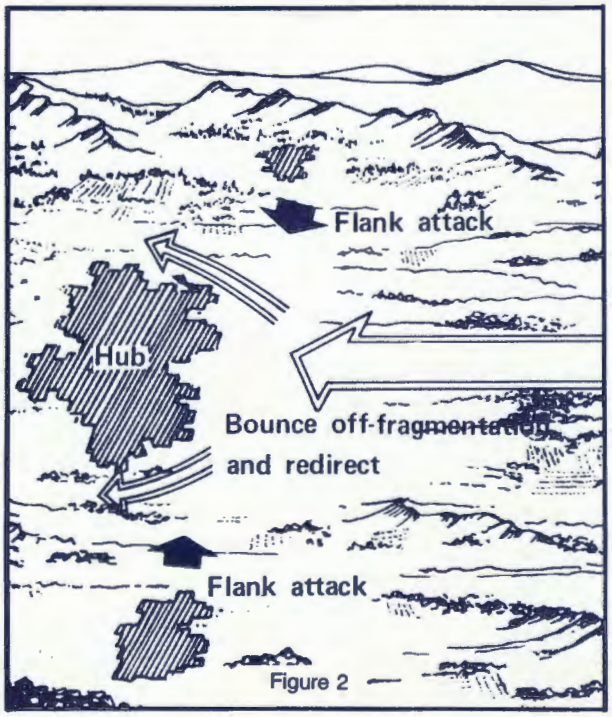


Figure 2

Increasing attention focuses on combat in cities (CIC) and the actions required therein by the company and the battalion. Here, lost doctrines and techniques are being revived, haltingly but surely. The Army is not, however, looking at the conduct of military operations on urbanized terrain from a brigade and division perspective.

When the urbanized terrain of Western Europe is analyzed from the brigade and division perspective, we find patterns of tactical significance. For example, if a line is drawn around each urban area, we observe that they occur in a hub pattern, a satellite pattern, a network pattern, and a segment or pie-slice pattern (figure 1). These patterns and their effects constitute the building blocks for a tactical analysis of urbanized terrain from the brigade and division perspective.

The hub pattern (figure 2) consists of an urban area with radiating transportation and communication links to other hubs. By itself, the hub requires CIC techniques. As part of an urbanized terrain pattern, however, it serves, with significant tactical impact, as an axle for the larger battle.

As shown in figure 2 the most important effect is that attacking forces will bounce off hubs, fragment,

and then move forward in a different direction. The fragmentation reduces an attacker's momentum, making him more vulnerable to flank attacks along the new line of advance.

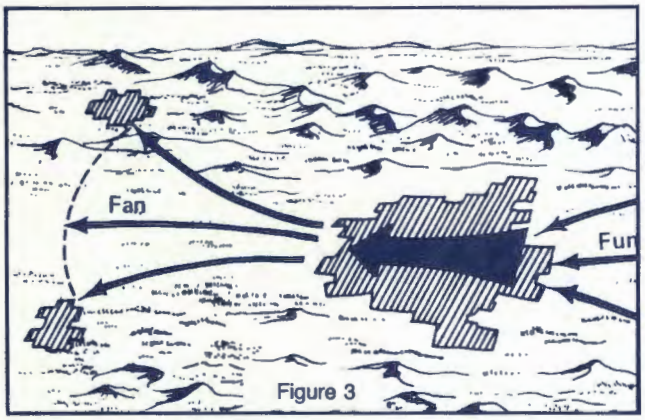


Figure 3

The funnel-and-fan effect (figure 3) occurs when a hub lies between natural terrain features that impede the maneuver of mechanized forces. As shown in figure 3, passage of units into the area results in canalization; traffic exiting the area tends to spread out or to fan. There is a sequence of tactical significance inherent in this effect in that it initially favors the defense and hinders the offense. If the hub is captured, however, it then facilitates offensive operations. An attacker, risking canalization in the funnel, gains the advantages of the fan if his operation succeeds. An unsuccessful defense, on the other hand, yields much more than a single urban area; because of the fan effect, the successful attacker gains access to a network of transportation and maneuver links to other hubs.

The satellite pattern (figure 4) occurs because of the smaller hubs present around a larger hub. The satellite towns normally serve as interdependent market towns and provide the terminals for communication and transportation links. They are the nodes in a network as shown in figure 5. It is this network, a

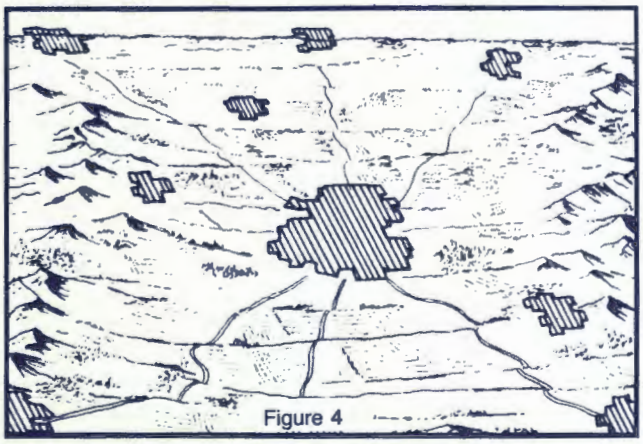


Figure 4

functional extension of the satellite pattern, that is of principal tactical interest.

The network pattern occurs because of the interlocking feature of the hub and satellite. This has been termed the "breakwater" pattern because forces attempting passage confront a pattern of obstacles that tends to disrupt their flow.

As seen in figure 5, the nodes or satellites give tactical support to the central urban area by providing bases for reinforcement and mutually supporting battle or blocking positions for the defender. For the attacker, they terminate avenues of approach and serve as springboards for entry into the fan effect.

This pattern tends to invalidate the doctrine of bypass. A glance at the urban areas in the brigade sector (figure 1) shows that no avenue of approach is masked from a potential gauntlet of antitank fires targeted on the ready-made kill zones between nodes. The adjacent natural terrain, impracticable for vehicular movement, contributes to the restricting and delaying effect.

Another consideration is the impact of task organization. The difficulties inherent in attempting to penetrate this antiarmor network require a task organization that is heavy in infantry and engineers but relatively light in armor.

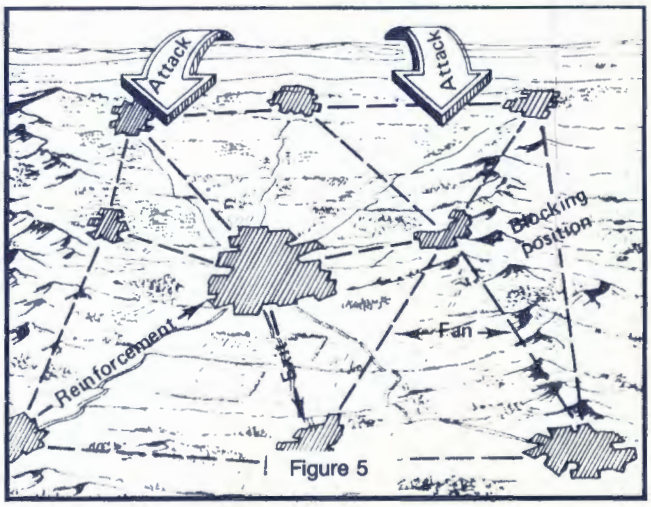


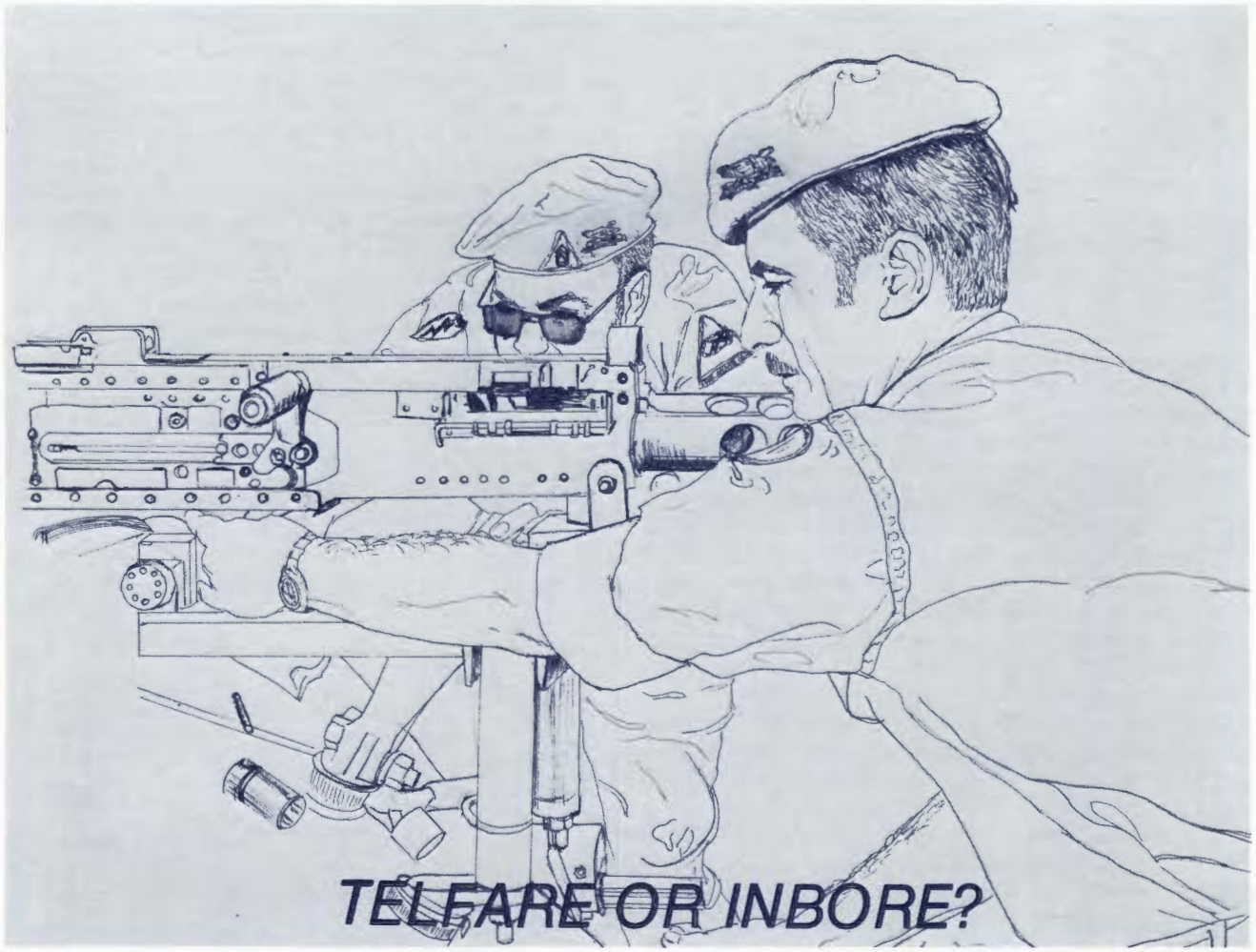
Figure 5

The segment or pie-slice pattern occurs as a result of the partition of the terrain by man-made features such as roads, dikes, and canals. This may be considered part of the hub-satellite-network patterns and effects. Its unique effect, however, is to influence the organization of the terrain and the task organization by providing readymade boundaries. Whereas streets and city blocks provide boundaries for CIC, these larger manmade segmenting features offer readymade boundaries for operations on urbanized terrain.

No longer can we entertain the fantasy that Western Europe is the terrain equivalent of Fort Hood, Texas. Doctrine, plans, brigades, and divisions must respond to the tactical implications of the patterns presented by urban areas and the urbanized terrain. Our doctrine cannot rest on terrain analysis learned on the rolling, open plains of Kansas. We must see terrain on which we may have to fight for what it is, not for what we would like it to be.

Condensed from an article by Lieutenant Colonel (Retired) John W. Burbery Jr. in the March 1978 Military Review.

PROFESSIONAL THOUGHTS



TELFARE OR INBORE?

Having been involved in the development and testing of tank gunnery subcaliber devices for the past few years, we of the New Jersey Army National Guard read Lieutenant Colonel Armand E. Racine's article in the January-February issue of *ARMOR* with more than a passing interest.

We agree completely with the conclusion of the TCATA test report that the subcaliber training device (SCTD) concept is valid and has definite training value. We do, however, have serious reservations concerning the conclusion that the *Telfare* device is superior to the inbore device, particularly when applied to reserve component Inactive Duty Training tank gunnery programs.

We in New Jersey have employed both devices extensively along with other aids such as the *Brewster* with the 5.56-mm rifle and the *Riley* 20-mm inbore assembly. Based on our experience, availability of training time, range impact area restrictions, range facilities, target arrays, simplicity, and required time to prepare devices for firing, the family of inbore devices better meets our requirements.

We have also studied the TCATA Test Report (FM 376) in detail and believe that the test did not fairly evaluate the two systems.

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:

- The test program, as designed, attempted to compare .50 caliber API-T ammunition to the .50 caliber spotter-tracer round used in the inbore device. This equates to a baseball manager testing two pitchers for the velocity of their fast ball, but forcing one of the two to throw a bowling ball. The vast difference in trajectory and velocity between the two rounds is well known and should not have been a factor in the test. A fair evaluation is only possible when controls are established to negate the differences, such as shortening the range for the inbore device, or increasing target size. The extra lead problem noted in the engagement of moving targets by the crews using the inbore assembly could have been easily solved by introducing false lead during boresighting. This was normal procedure in earlier model tanks, particularly when using frangible .30 caliber ammunition to fire the subcaliber tables with the coaxial machine gun.

• The difference in reloading times was also well known before the test and actions could have been taken to partially equalize this factor. For example, each crew could have been equipped with additional mini-breeches which could be preloaded, if time was really a factor. We do not, however, believe that there is a disadvantage in that the gunner is required to track the target for a longer period. We believe that the additional practice makes him more proficient at smooth tracking. The problem of spent casings sticking in the chamber has long since been solved by the manufacturer removing the superfluous "safeties" found on the earlier models.

• The fact that the loader gets no practice in his fighting compartment crew duties is true of both systems, but he has greater involvement in the firing exercise with the inbore device. The training value accrued from the loader loading dummy rounds while his crewmates are participating in a firing exercise is questionable.

• Knowing the traditional competition among the crews of different tanks, we can easily understand the disenchantment of those equipped with the inbore device. They were forced to compete head-to-head with crews firing the more accurate, faster-shooting .50 caliber *M2* machinegun. If comparative accuracy was a valid factor, the 20-mm inbore device should have been used, with the *M220* TP-T round. This round has a muzzle velocity of 1,100 meters per second and a maximum range of 7,200 meters. This is superior to the .50 caliber API-T round's muzzle velocity of 915 meters per second and 6,470 meters maximum range.

• The test also did not fairly evaluate the inbore device's two major advantages, ease of installation and the fact that its impact area requirement is about half that of the *Telfare* device. When a reserve component tank crew reports for weekend training it normally has 16-hours of training time available to it. If 3½ of these hours must be used just to modify the .50 caliber and assemble and mount the *Telfare* device, the convenience of the inbore device becomes overwhelmingly apparent. We have found it impractical to leave the *Telfare* installed because it tends to induce excessive use of those tanks and the neglect of others, with resulting maintenance problems. Conversely, we have found it convenient to install the .50 caliber spotter-tracer cams in place of the HEP cam in our computers semi-permanently, removing them only when the tanks are sent to support maintenance. We also feel that the reduced impact area requirement for the inbore device is a major advantage, particularly in highly populated areas with limited land space such as New Jersey.

• The test report also addressed the "safety problem" of fumes from the inbore device and breech flashing. The fumes are harmless and can easily be handled by the turret blower. The flashing is also insignificant and harmless. The crews should be advised to expect these conditions in advance and be told what to do about them. The test, in eliminating the machinegun exercises, also failed to address a serious safety problem with the *Telfare* device. When the *M-2* malfunctions on Table VIIC, three machineguns must be cleared before the problem can be addressed by the crew. Also, even when using the single shot device, the .50 caliber often fires twice making it difficult to sense the round and apply BOT. This is physically impossible for the inbore device.

• A problem with the *Telfare* device not addressed in the test report is that of high target mortality with the .50 caliber API-T round as compared to the .50 caliber spotter-tracer. Use of the *Telfare* requires much more frequent replacement of target frames and hardware because of the damage done by the armor-piercing ammunition.

In summary, we feel that the Army's decision to adopt the *Telfare* device as the "Standard" device for tank gunnery subcaliber Tables IVC, VIIC and IXC, based on the test results, should be reconsidered.

Both devices have their advantages and disadvantages and both should be evaluated in terms of their employment in varying situations where considerations of training time, safety, and land availability are the controlling factors. Based on our experience and needs, the .50 caliber and 20-mm inbore device should be made available to RC units and supported with ammunition.

James A. Broderick
Major, Transportation Corps.
West Keansburg, N.J. 07734 NJ ARNG

READING PROFICIENCY

In this day of increased automation, correspondence, research, and statistical fact-finding boards, a demand exists for the training of officers in the art of reading. Many officers comment on the fact that they are deluged with paper work. The present trend in the Army today is a reduction in manpower without any appreciable reduction in mission. If anything, the Army continues to become more demanding and more complex with fewer personnel to accomplish its requirements. A direct result of this situation is an increasing demand upon each officer for the maximum of efficiency. A high percentage of military assignments are in a category often described as being sedentary, an innocuous description for headquarters and staff assignments to which a great many officers are assigned. Any of these assignments places heavy demands upon the individual to read, understand, execute, and supervise an increasing volume of correspondence.

Since the volume cannot be controlled by the recipient, it then behooves him to better prepare himself to process the material received. One of the critical shortcomings found in today's officer is his lack of ability to prepare military correspondence, a part of which can be laid directly to his lack of training in the proper reading methods. This in turn places a heavy demand on the amount of time available to prepare the necessary correspondence which must first be read and understood before the necessary

action can be taken to execute the requirement.

As a major effort to solve this problem, a course in remedial reading, sometimes referred to as Speed Reading, has been designed to improve officers' reading efficiency. This is accomplished by developing his reading rate, increasing flexibility, and improving his reading habits. The ability to cover a printed page rapidly, to react quickly to the content, and to read in phrase or through units, is the indication of an efficient reader.

Speed without comprehension is of little value. A course in remedial reading should be designed to increase the reading speed while maintaining or improving understanding and retention. An efficient reader is a flexible reader and has a variety of reading rates and skills. He varies his rate and manner of reading with the purpose and the type of material being read. He uses a different rate and technique in reading newspapers, letters, directives, instructions, and technical materials and adjusts his speed according to the character of the material. Most individuals read everything at about the same rate and can slow down when they desire, but few can increase their speed when the occasion demands.

Many of us have fallen into poor reading habits, and to develop new and more efficient habits is never easy. Effective reading combines a complex set of skills and can only be developed by thorough training and extensive practice. The effort the student gives to the development of his reading ability will pay dividends in time saved, new ideas, and personal enjoyment.

Reading improvement has been taught in the Army school system for many years. However, in the majority of schools it has been taught on a voluntary basis, which has not been highly productive. A detailed study was made of the results of the training in the remedial reading received by an advanced class at a branch school which indicated effective progress on the part of students. Subsequent tests of various classes indicate that the average gain in reading rate was 85 percent with an accompanying increase in comprehension. The majority of the students completing the program were convinced of its value. Considerable long-term retention was indicated as a result of the retesting of students 4 years after the initial training. The average reading rate of the students before taking instruction was 310 words per minute. As members of a class 4 years later, the average rate of the same students was 436 words per minute with increased comprehension. This indicated that higher reading ability was retained years after completion of the initial instruction. The average percentage gain in reading rate as a result of instruction was 73 percent in two advanced classes, and the average comprehension rate had increased from 61 to 79 percent.

Appropriate facilities are required for a comprehensive reading program. They should incorporate the latest methods and most up-to-date equipment used in the field. Close liaison should be maintained with colleges and universities recognized as leaders in this field. Among the schools which have recognized the need for reading improvement and have had such programs for many years are: Harvard, Columbia, Iowa State, University of Chicago, Ohio State, University of Kansas, City College of New York, and Temple University.

It is considered important that all officers at some period in their career schooling receive training in remedial reading. The program would be most effective by including it in the earliest possible branch course of instruction and in successive courses on a refresher basis. With this in mind, the initial course should be 32 hours and successive refresher courses approximately 6 hours. In view of the course length of the basic courses in the branch schools, remedial reading should be programmed as a part of the curriculum. The importance of the subject should be emphasized in student briefings and the course made available to the student as an extracurricular activity. The course should be introduced in the curriculum of advanced classes of all branch schools, the Command and General Staff College, and the Army War College. Refresher training should be required on a successive basis where students have already completed the course. Time saved by improved reading habits is time gained. The importance of this training is obvious and should be a part of the career development of all officers of all the services.

HENRY C. NEWTON
Brigadier General, USA, Retired
Falls Church. VA 22044

SERGEANT MAJOR SELECTION

The selection criteria for promotion to sergeant major does not include a requirement for personnel to serve in both staff and first sergeant positions prior to selection for promotion.

At present, there are no incentives for personnel to seek the responsibility of unit first sergeant. Additionally, there are no incentives for "Professional First Sergeants" to seek staff assignments which would serve to better prepare them for promotion. The noncommissioned officer who has served in both positions has an excellent foundation for continued career progression. To better prepare personnel for promotion, a career assignment progression for master sergeants should be developed to insure that each master sergeant is required to serve a minimum of 1 year as a first sergeant and 1 year in a staff position prior to selection for promotion to sergeant major.

This would help insure that each master sergeant has a better understanding of the duties and responsibilities of a unit first sergeant. It would create competition for those positions and, through competition, help improve the Noncommissioned Officer Corps. It would cause the "Professional First Sergeant" to be placed in an environment to better understand and relate to staff functions both as a first sergeant, and later as a sergeant major.

A disadvantage of my proposal is that there are certain career management fields (CMF) that could suffer because of too few positions available to them as unit first

sergeants; however, they could be placed in positions in basic combat training units to gain first sergeant experience, if none other is available.

This would require that selection boards select only that master sergeant who performs his required assignment at staff level and as first sergeant for promotion to sergeant major. It is recognized that this will preclude some personnel from being considered for promotion, however, many that presently refuse the challenge of staff and first sergeant positions will have their career progression stopped as a result of their own actions.

I strongly recommend that career progression be implemented for career development of future sergeants major, and that each senior soldier selected for promotion must have served a minimum of 1 year as a unit first sergeant and 1 year in a staff assignment prior to promotion to sergeant major.

1st Bn, Lightning Brigade
USAARMS

GEORGE S. YANCEY
Command Sergeant Major

TRAINING INSPECTIONS

Recent TRADOC efforts have generated a hefty pile of training literature, and for the first time in years most of it is worth everybody's reading time. We appear to be zeroing-in on training that is designed for the soldier who needs it and not just for the staff officer who likes to plan it or inspect it. Still, whether we are centralized or decentralized, there need to be training visits or inspections. The difference is that the officer who is the looker is making a helpful training *visit,* while the officer in charge at the training site who is the lookee knows that what is happening is a training *inspection*.

What kind of questions we ask as visitors or inspectors obviously is a prime determinant of the useful information obtained. Prior to inspecting we need to refine the major purposes of the inspection. Are we interested in: efficiency, organization, resources, effectiveness, standards, spirit, discipline, techniques, honesty, attitude, knowledge, aptitude, relevance, doctrinal accuracy, or just all of the above?

One set of questions that seems appropriate across a wide range of training scenarios is shown below. If the OIC or NCOIC can discuss these with confidence, he is usually adequately knowledgeable about what is going on—and why. And of course the responses to questions 1 and 2 will give adequate clues to whether the training was designed for the soldiers who are participating, or was concocted in general terms for a nonspecific audience of mixed backgrounds who happened to be available for training at that time of the day!

W.F. ULMER, JR.
Brigadier General (P), U.S. Army
HQDA, Washington, DC 20301

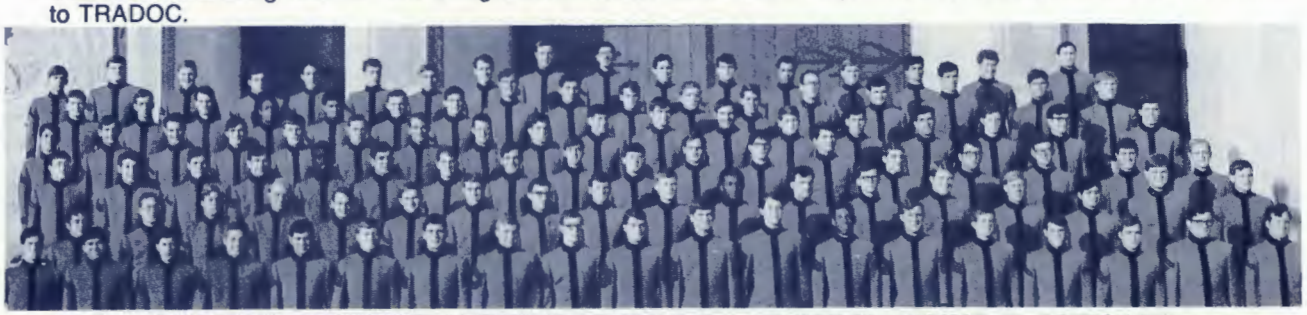
QUESTIONS FOR THE TRAINER

1. What did these soldiers know about the subject prior to this training?
2. How were soldiers selected to attend the instruction?
3. How were training objectives explained to the soldiers?
4. How is this training related to SQT and ARTEP tasks?
5. How are you using the chain of command to teach?
6. How are you reinforcing basic discipline and habits of respect for property in your instruction?
7. How are you developing concern for maintenance, unit SOP knowledge, enemy tactics, and safety in your instruction?
8. What plans for integrated and concurrent training?
9. What plans for finding and helping the slow learners?
10. What plans for identifying and rewarding the soldiers making the greatest *effort?* Greatest *progress?*
11. What feedback on progress and shortcomings does each soldier receive before departing from the training area?
12. What plan for gathering feedback from soldiers on their perceptions and suggestions about the training? (Too difficult, too simple, too long, unclear instructions, etc.)
13. How do you measure attainment of training objectives?
14. How will you critique the exercise?
15. How will you pass on lessons learned today for use in future training? (How to train and what to teach.)
16. How are you avoiding wasting soldiers' time?

NOTES

ARMOR GRADUATES CLASS OF 1977 UNITED STATES MILITARY ACADEMY

On 7 June 1978, 116 graduates of the USMA Class of 1978 were commissioned as Second Lieutenants, Armor. This impressive group included the number one and two graduates in the class and a total of six distinguished cadets (top 5%). Three of these cadets served as regimental executive officers, while two were battalion commanders, two were battalion executive officers, 13 were company commanders, and many others served as staff officers and platoon leaders. In addition to attending the expanded Armor Officer Basic Course, 111 have or will attend Airborne School and 74 have or will attend Ranger School. Fifty-five would like to attend Flight School after their initial assignments. Initial assignments include 45 to USAREUR, two to Korea, 53 to FORSCOM and 16 to TRADOC.



1st Row: CALDER JW, BENAVENTE JJ, FREUND BD, WALKER JJ, McCOY CL, THOMAS JD, COTTON RM, ZELLER PJ, LONDA JJ, BRAUNGART CP, DODD NC, FRAZIER MC, HAMILTON WW, GALLOWAY JJ, ANDERSON JR, FERRANDO AA, HORN CM, BRUNDAGE JH, EBY DH
2nd Row: EISELE AA, McGRUDER ML, JENNINGS DC, HARRIMAN AW, SEITZ KR, JOHNSON SL, POWELL CG, DAILY DM, MOORER DF, HEINZERLING KK, SCRIBER PH, NOWOWIEJSKI DA, HOFFMAN TK, McMICHAEL DE, CRANE RO, GONZALEZ JR, BRANDL JA, KNAPP RK
3rd Row: FAULCONBRIDGE JW, BECKER JP, O'CONNOR PJ, RICH DF, COLLINS TW, MARGVE DU, BOIN MH, CAWLEY MF, NALEPA JT, WITTIG DW, PULLIAM WN, RIESE DL, BARTO JC, ROMER JA, BLOWER JM, MULL DL, BAKER PN, EWING JW
4th Row: DONOVAN DP, McHALE SJ, PICKERELL DS, PIJOR TD, PETERMAN DR, VAN ORSDALE RD, MILLER MJ, NEUMANN JA, KELLEY GJ, GOERKE DF, SCOTT JF, LOUFEK JC, MOYER MK, LITTEL CJ, BARNUM RV, McCORKINDALE GL, MOODY GA, VINSON ME
5th Row: McINTYRE ME, DONNELLY EP, NAPIER WF, JOHNS OH, MINGILTON MD, SZYDLOSKI DJ, BUTLER JK, PLAYER RM, WELLS WB, BRAUNSTEIN MN, ANDERSON AA, HAYES TW, WINGROVE ER, LONG WD, GLENN TP, WILLIAMS RG, STEENBORG GR
6th Row: HENRY PA, ANDERSON WN, HANSEN MJ, VITAGLIANO JA, DONNELLY KR, JAMES JL, OLECKI JA, SLACK RC, POTTER WS, ANASTOS RP, GALINDO RG, NANCARROW ML, RAMOS BG, SANDERS SR, VYE PD, WILLIAMS KR, WHITE JA
Not Pictured: ALLEN CW, DAFFRON SC, HARKIN EG, LEWIS JM, LONG JW, MORRISON GA, RHINEHART RA, WALTERS RG, ZIMMERMAN DK

SABERS PRESENTED

Armor Association Sabers were presented to two distinguished cadets from the Class of 1978 during ceremonies at the United States Military Academy on 6 June 1978. Colonel Thomas F. Cole, Director of the Department of Military Instruction made the presentations on behalf of the Armor Association. The sabers were presented in recognition of the cadets' outstanding achievements in academic study, physical education and military leadership.

Second Lieutenant Earl R. Wingrove (left), a cadet company commander and battalion executive officer, graduated second in his class. He received the Eisenhower Award for excellence in military leadership and the Association of Graduates Award for his second highest academic standing. As a cadet, he trained with M Company, 3rd Squadron, 3rd Armored Cavalry Regiment and was a summer intern in Europe with SHAPE. Following Armor Officer Basic Course, Lieutenant Wingrove will join the Berlin Brigade.

Second Lieutenant Jeffrey W. Long (right), a cadet battalion commander and regimental executive officer, received the General Robert E. Wood Award for graduating first in his class with the highest academic standing. He also received five other recognitions, including the National Security and Public Affairs, International Affairs, and Social Sciences Awards for Academic excellence. As a cadet, he became airborne qualified; served with the 1st Battalion 26th Infantry, 1st Infantry Division Forward; and was a summer intern with the State Department. Following Armor Officer Basic Course and Ranger School, Lieutenant Long will join the 11th Armored Cavalry Regiment.

MILITARY REVIEW WRITING CONTEST

The *Military Review,* professional journal of the US Army, has initiated an annual Tactical Writing Award contest. The award, a $250 cash prize, will be made to the author of the best article on tactics which is published by the journal during the year.

A committee from the Combined Arms Center will review each tactical article printed and select the winner based upon the contribution it makes to tactical knowledge, the challenge it presents, its accuracy, style and presentation. Monthly winners will be picked for the yearly competition, and notified, if military, through their command.

An author may indicate his desires to have his article considered for the award, but all published articles in the tactical category will automatically be considered by the committee. Articles by general officers are not eligible.

The *Military Review* is published monthly by the United States Army Command and General Staff College at Fort Leavenworth, Kansas. A Spanish language version is printed monthly along with a quarterly edition in Portuguese.

PATTON SWORD

A sword that *The Army and Navy Journal* described as "the most perfect in existence" will be reproduced by the U.S. Historical Society.

It is an issue of 1,000 replicas of the sword that was designed by General George S. Patton, Jr., of World War II fame. The hilt is solid sterling silver, with genuine ivory grips. Original issue price of the sword will be $2,500.

General Patton designed the sword when he was a 27-year old army lieutenant. As a result of the design and numerous articles he wrote on the proper use of the sword, he was honored with the title, "Master of the Sword."

Patton designed the bowl guard to provide maximum protection for the hand, and he wanted the unusually long blade (42 inches) to make it more effective for cavalrymen from their mount. The young military leader agreed with Napoleon that the point of a sword was more important than the edge. (Napoleon exhorted his troops before a battle, "Don't cut! The point! The point!")

Each sword in the issue will be accompanied by a gold trimmed solid mahogany wall mount, decorated with the four silver stars of the General. The owners will also receive a certificate of registration. They can also receive the two-volume edition of *The Patton Papers,* signed by the author, Martin Blumenson.

IMPROVED APC

The Product Improved *M-113A1* Armored Personnel Carrier has successfully passed all tests and is slotted for production beginning in July 1979.

Addition of the Product Improvement Program (PIP) to all current diesel powered *M-113A1's* will be accomplished over the next 10 years.

The PIP includes a restructuring of the engine cooling system that will help reduce engine failures. Currently most *M-113A1* engines that fail do so as a result of damage done by over-heating. Also, additional shock absorbers and redesigned torsion bars will enhance crew comfort and increase mobility over the roughest terrain.

A future PIP utilizes a new outside-mounted, bolt-on pair of fuel cells that will reduce the possibility of burning fuel inside the carrier in the event of an enemy hit, and allow for 20 percent more payload space inside the carrier.

Another PIP, a turbocharged version of the same 6V53 Detroit Diesel that is used on most current *M-113A1s,* will result in a 38 percent increase in top speed.

Red River Army Depot, in Texas, and Mainz Army Depot, Mainz, Germany, will convert 18 thousand *M-113A1s* in the Army inventory.

The PIPs will be available to foreign allies who own an additional 40 thousand of the vehicles.

MINE-CLEARING ROLLER

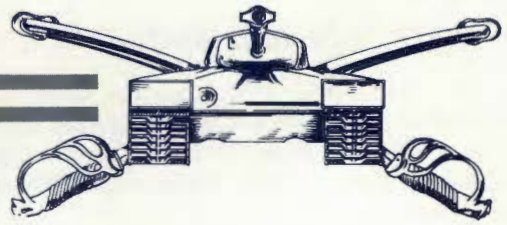
The track-width, tank-mounted, mine-clearing roller system developed by the U.S. Army Mobility Equipment Research and Development Command (MERADCOM), Fort Belvoir, Va., has been type classified and is scheduled to go into production in August.

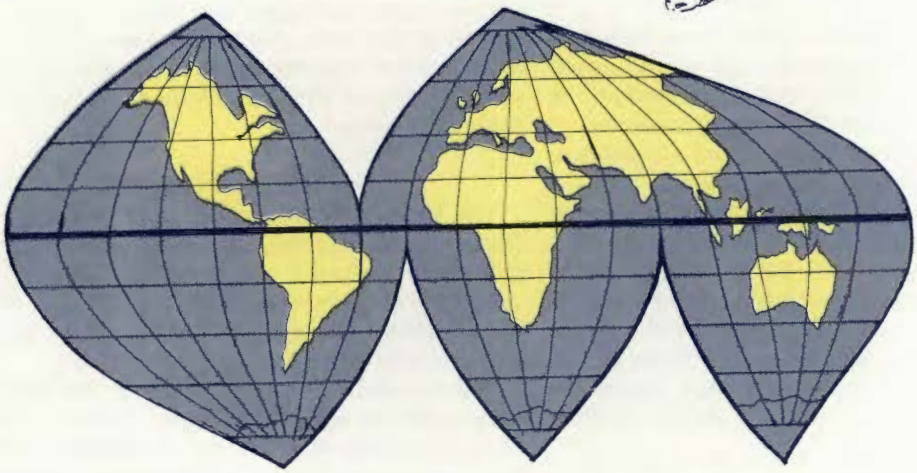
The mine clearing roller consists of a retrofit kit, a mounting kit, roller kit, and fixture kit. It weighs less than 10 tons and can be mounted in the field by the tank crew in less than 15 minutes for use day or night under all weather conditions.

This roller is about 90 percent effective against pressure fuzed mines buried up to 4 inches when traveling up to 10 mph. A weighted chain suspended between the roller assemblies clears tilt rod mines. It can survive blasts from two 22-pound high-explosive mines. Under battle conditions, the rollers can be released in less than 30 seconds using a hydraulic disconnect system.

Ninety rollers will be procured initially over the next 3 years for use by armored units in Europe. Pre-production tests will be conducted at Aberdeen Proving Ground, MD, from March-May 1979.

OPMD - EPMD ARMOR





OVERSEAS VS CONUS ASSIGNMENTS

Recent inquiries to Armor Branch at the Enlisted Personnel Management Directorate, MILPERCEN, have shown there is a misconception by soldiers in the field on the subject of oversea assignments versus CONUS assignments.

Time in CONUS

The period of time a soldier spends at a CONUS installation between overseas assignments is what the soldier in the field commonly refers to as *turnaround time*. At present, turnaround time in the Armor Career Management Field (CMF 19) is short, and with increased overseas requirements, it is decreasing. Turnaround time is governed by different factors.

- Authorized positions versus actual operating strength Army-wide in a given MOS and grade.
- The number of soldiers assigned and operating in stabilized positions as drill sergeants, NCO Academy cadre, and in Readiness Regions, etc.
- Overseas requirements versus CONUS requirements.

The chart below shows the *average* turnaround time for each grade, E5 thru E8, in CMF 19.

Grade	MOS	Months	Grade	MOS	Months
E-5	19D	12-15	E-6	19E	12-18
E-6	19D	12-18	E-7	19E	36
E-7	19D	24-30	E-5	19F	12-18
E-5	19G	18-24	E-5	19J	12-18
E-6	19G	18-24	E-6	19J	12-18
E-5	19H	18-24	E-7	19J	24-30
E-5	19E	12-15	E-8	19Z	24

Remember, these are only *average* turnaround times. There is no guarantee that each Armor soldier will spend that exact amount of time in CONUS between oversea assignments. Unless he is one of the soldiers on a stabilized assignment, chances are his turnaround time will be less. For the future these turnaround times appear to be declining. This is based on the number of soldiers who are terminating service (ETS/Retirements) versus the number reenlisting or being promoted. In accordance with AR 614-30, a soldier assigned to CONUS cannot be assigned overseas until he has served a minimum of 12 months in CONUS after completion of an overseas tour.

How Stabilization Affects Turnaround

If, for example, the Army-wide operating strength in MOS 19E3, grade E6, is 2,000, and the Army-wide authorization for that grade and MOS is 3,000, then to start with, we are operating at only 66 percent strength. Of the 2,000 Armor E6's, 1,000 (50 percent) of them are overseas, enroute overseas, or enroute to CONUS. The other 1,000 (50 percent) are assigned in CONUS. Of the 1,000 CONUS, 300 (30 percent) are assigned in stabilized positions; 100 (10 percent) are in school or in transit. That leaves 600 (60 percent) unstabilized. They are the ones whose turnaround time would be less than average. Most stabilized assignments are for 24 months, but in some cases, such as drill sergeants, can be extended based upon the needs of the Army.

LONG VS SHORT OVERSEA TOURS

"I have just completed a 3-year tour in Europe, so I will not have to return to Europe again until I have served in a short-tour area." This is the conception some service members seem to have of overseas tours, but it is not true. Although this would be ideal for service members in planning their future assignments, it is not often possible. Long-tour areas (basically Europe) have a greater requirement for Armor personnel than do short-tour areas (Korea). Therefore, Armor soldiers can expect more assignments in long-tour areas. This, of course, is not always the case. Assignments are made primarily on the Army's needs and priorities by grade and MOS and, in some cases, special skill qualifications such as drill sergeants and master gunners. One of the most important factors when an assignment is made is that the person nominated for the assignment be available for reassignment in accordance with AR 614-200. Also, if the assignment requires special qualification, the nominated service member must meet the qualification or be able to obtain the qualification in time to fill the requirement.

Pages from the Past

THE USER AND MAINTAINER

Equipment design must be correlated with the capability of the available manpower pool under mobilization conditions. We must realistically assess, by mental and physical capability, the expected intake into the Army of personnel under emergency conditions. Currently, for example, only about 10 percent of our total intake is in the upper mental bracket. Further, of that 10 percent many are not physically in the top bracket. The vying of the other services, as well as essential war industries, for the highly skilled becomes an added factor to be considered. Since the upper group is so limited we must then correlate our requirements for personnel with such high mental and physical ability with the weapons and equipment which demand their skills on a priority basis. Realizing that this limited group will be distributed pretty thin, it will be necessary in all equipment and weapon design to consider during the blueprint stage the expected capabilities of the user and the maintainer.

ARMOR
January-February 1955

DRS?

It is obvious that the primary considerations in the new reorganization of the U.S. divisions should include such essentials as increased strategic mobility, flexibility, agility, and tactical mobility; broader frontages; greater dispersion; greater depths; a more elastic defense and a more sustained offense. We must be able to disperse and mass quickly. However, if we are to take advantage of new weapons and equipment, a reorganization of the tactical units alone is insufficient. We must scrutinize our concepts of command and staff organization, procedures, and techniques; and adjust them to handle effectively the new tactical organization and to obtain maximum return from the manpower resources available to the Army.

ARMOR
May-June 1955

NO CHEAP SUBSTITUTE

There is an enormous amount of fiction written about how the advent of new and more powerful weapons, and types of equipment have rendered the retention of ground forces expensive anachronisms in future wars. This type of thought strikes responsive chords in the average American. We would all like a "cheap substitute" in war. But the war roads of history have been littered with millions of machines abandoned by men who no longer had the will to fight. When the will left men, men left the machines. There has yet to be invented, the machine that has courage or determination. Man is, and always will be, the final determinant in war. While machines are useful and essential, they can never substitute for the soldier—the soldier we must train.

ARMOR
May-June 1955

A LESSON LEARNED

Whenever possible it was found best to join up the same tank and infantry units together in training and in combat. Not only did staff sections function better but lower unit commanders, individual tank crews, and infantry squads became acquainted and gained confidence in each other. Units gained objectives as a team and not as individual arms. To round out this team, artillery forward observers were attached down to include tank and infantry companies from the field artillery battalion in direct support of the unit. This gave a well rounded team of tanks, infantry, and artillery. The artillery forward observer operated dismounted with the infantry and the observer with the tanks rode in a tank. Wherever possible the same artillery battalions were kept in support of the same units.

Armored Cavalry Journal
May-June 1947

BOOKS

THE FIGHTING 109 by Uwe Feist, Norman E. Harms, and Mike Derio. Doubleday Co., Inc. $10.50.

An excellent book! Three renowned authors have succeeded in creating a document of one of the world's most famous fighter aircraft, the *Messerschmidt BF-109*, or as the Germans called it, the *ME-109*. This fighter aircraft, which was so successful in all theaters of World War II, was the pride of the German Air Force. At the time, every child was familiar with this aircraft. The whole nation knew its successful pilots, admired their victories, respected the enemy's performance, and deplored the fates of many flyers.

Amply illustrated, this work bears witness not only to a notable technical accomplishment, audacity of the pilots, and chivalry, but also to a battle of materiel of enormous dimensions. The authors deserve to be thanked for an objective portrayal, their familiarity with the details, and their careful research of the records.

This book can be recommended for collectors and military historians alike.

Lieutenant Colonel Klaus Hederich
German Liaison Officer
USAARMS

MIT ROMMEL IN DER WUSTE by Volkmar KÜHN. Motorbuch Verlag. Stuttgart, Germany. Approximately $15.00.

"With Rommel in the Desert" is the latest book in the long series of publications on the North African Campaign in WW II. While many of the previous books deal only with certain periods or individual battle sequences, this new one considers the entire campaign from the first appearance of the Germans in this theater up to the end in Tunisia in May 1943. It is the history of the German Africa Corps and its Commander, Field Marshall Erwin Rommel.

One of the assets of this book is that it includes the parts the German Navy and the German Luftwaffe played, not to mention the Italian forces involved.

We learn many details about the Commanders. The 200 photos, many of them not previously published, and well-designed maps and charts, make the book easy to read, follow, and digest.

The author has, in years of long research and interviewing hundreds of participants, given credit to friend and foe alike. The book is written in the finest tradition of German military history. It includes a long list of sources and gives important data on Allied personalities and German units involved in the campaign.

I sincerely hope the author finds an English speaking publishing house, because the book should reach the large audience of interested military men and historians alike who do not speak German but take an active interest in the events of WW II.

Rendsburg, Germany

Wolfgang GERHARDT
Colonel G S, GERMAN ARMY

AMERICAN ESPIONAGE FROM SECRET SERVICE TO CIA by Rhodi Jeffreys-Jones. Free Press. 276 pages. 1978. $12.95.

"American Espionage From Secret Service to CIA" is a highly enlightening book on espionage activities of the U.S. Government. Mr. Jeffreys-Jones has written a fascinating history of United States involvement in domestic and international espionage since the founding of our country.

The author discusses in limited detail the preindependence involvement of Colonial agents in covert action against the British in 1775, and then traces the action and activities of U.S. agents up to the founding of the CIA in 1947. The author has woven a fascinating description of espionage activities initiated by different agencies within the Federal Government. These activities are sometimes covered in detail while other activities are covered in less detail. The author appropriately points out that American archivists have provided a wealth of information for his research up to 1947.

The author has dwelled on what he considers significantly neglected subjects; i.e., Russian reports of British and American spying in Russia by W. Somerset Maugham, and he has placed special emphasis on the period 1898 to 1947. The author also has noted that the involvement of military resources during the period of the Revolution and Civil War were extensive, but these activities were limited to domestic efforts.

During the period of the Spanish-American War, the Secret Service of the Treasury Department became very active in military counterintelligence. Mr. Jeffreys-Jones stresses, however, that in a civilian-dominated democracy like the United States the intelligence function in civilian hands has continually resulted in an upgrading of espionage activities. This process in the United States was further enhanced by the activities of the State Department which eventually became a permanent feature of this department of Government.

For the history buff the author discusses the use of military attaches and Naval attaches during the 1930's, especially in South America and the little talked about K project in 1943.

The author has woven a tale of known and little known facts about U.S. domestic and international espionage, and he ably points out the CIA can trace its roots back to the Revolutionary War.

This is a completely new look at a subject that in recent years has been highly controversial. I recommend this book for the individual that is interested in espionage activities as they relate to our government. The author is very convincing, and he has backed up his research with 46 pages of notes and a 14 page bibliography.

Major Ronnie W. Nall
USAARMS

A LEADING LADY by Silja Allen. P.O. Box 1251, Vienna, Va., 50 pages. $3.00

My first thought after reading *A Leading Lady* was, "Where was this when I needed it?"

Here, at last, is a manual that deals with a subject that too often is brushed aside with the sage advice of "just be yourself." Silja Allen, a former commander's wife, has written a "how to" guide specifically for the wives of men in leadership positions.

It is written in simple, clear cut language with ample sprinkling of good old-fashion common sense. It handles the question of who does what and lists the duties and responsibilities of the wives from the battalion commander's wife to the squad leader's wife.

The well organized material also deals with such important topics as the "trouble-makers", emergencies, lack of participation in ladies groups, and what to do when the men are in the field. There is also a section devoted to relations with wives of a host nation for those whose hus-

bands receive overseas command assignments.

Clearly, *A Leading Lady* demonstrates Silja Allen's great feel for people—and people is what it's all about. Her warm sense of humor and organized mind show throughout the book.

This guide is must reading for all wives, young and old alike, who some day will become or already are "A Leading Lady."

Mrs. Marian S. Streeter
Army Wife
Ft. Hood, Texas

WEBSTER'S AMERICAN MILITARY BIOGRAPHIES. Edited by Robert McHenry. G.&C. Merriam Co. 1978. 560 pages. $12.95.

"Webster's American Military Biographies" contains 1,033 detailed biographies and covers nearly 366 years of American military history from 1607 to the end of American involvement in Vietnam. Included are not only generals and popular military figures, but astronauts, frontier scouts, explorers, Indian warriors, nurses, military engineers, aircraft designers, foreign adventurers, and even one or two renegades.

In addition to the A to Z biographical section, which is the heart of the book, "Webster's American Military Biographies" also contains a chronological listing of every important military campaign in which the United States has been involved, and with each the places and names that are associated with it. Thus the book becomes a comprehensive chronicle of American military history as well as an important biographical work.

According to McHenry, the biographies of each of the 1,033 subjects are full and accurate treatments of their lives, written in narrative form, and not just a recitation of names and dates. The biographies range in length from a few paragraphs to a page or more.

The special reference section of the book is one of the most useful of its kind ever devised. The bulk of the section is the main chronological listing of wars and battles, with reference at each to people and places of importance.

Also listed in this section are the army group, army corps, fleet, or squadron commanders during the Civil War and the two World Wars. There are also lists of commanding generals and service chiefs through the present incumbents.

In addition to being just plain good reading, this book should prove a broad and effective reference work for military historians, students, teachers, researchers, librarians, even war game buffs. It will prove especially useful for all those who love American history.

Mr. Duncan G. Steck

CRISIS IN COMMAND by Richard A. Gabriel and Paul L. Savage. Hill and Wang, New York. 1978. 242 pages. $10.00.

Is the United States Army really fit to fight? "Crisis In Command" is a book every officer should read to reevaluate his or her mission and position in the U.S. Army. The authors go into great detail to illustrate the effects the Vietnam War had and still has on the officer corps as a whole, and how it has drastically reduced the effectiveness and professionalism of the entire Army. The authors portray a bleak picture of the leadership in Vietnam from the Commander of the U.S. Forces in Vietnam down to the squad leaders in the various units. The book illustrates the rampant disintegration of the system of values and the lack of cohesion among members of the units deployed to Vietnam.

The picture painted by the authors in the first two chapters makes one want to cry. The contention that today's Army is ill-prepared is a product of the comparison of the Vietnam era with today's Army—not the Army as a whole, but the officer corps. Data has been gathered by both authors to prove that assassinations of officers, combat refusals in large numbers, falsified reports, an inflated officer corps, the bestowal of unearned awards and decorations, racism, a discriminatory rotation system, and rampant drug trade and use went unnoticed or was ignored by all echelons of the officer corps. Today's commanders contend these faults have been corrected. "Not so," say the authors.

The documentation is excellent and the story is well written using extensive footnotes, statistical charts, and biographical essays. For a startling and caustic review of our military posture, I highly recommend "Crisis In Command." The truth hurts!

Captain Ronald E. Taylor
USAARMS

WAR, STRATEGY, AND MARITIME POWER. Edited by B. Mitchell Simpson III. Rutgers University Press. 1977. $19.50.

This book is a most interesting collection of 19 lectures and essays culled from the many presented or published at the Naval War College between the years 1952 and 1974. The editor has grouped his selections into four broad subject areas: the nature and purpose of war; theories of strategy and their underlying concepts; war and maritime power in the 20th century through the end of World War II; and politics and strategy in the nuclear era. The authors range from such luminaries as Sir Basil H. Liddell Hart and Martin Blumenson to a variety of budding stars from the academic and military ranks.

The collection as a whole is an excellent reference source of insightful and varied materials addressing some of the core elements of military science. Each article is interesting and well written, although few readers will be interested in all of them—quite frankly I skimmed the three or four on maritime power—but the editor has done extremely well in providing something for everyone. My favorite article addressed the role of the Joint Chiefs of Staff under Presidents Kennedy and Johnson and was most illuminating. All in all, an excellent volume that should be consulted by those interested in war, strategy, and maritime power for many years to come.

Major Terry A. Girdon
Princeton University

TRANSNATIONAL TERROR by J. Bowyer Bell. Washington, D.C.: American Enterprise Institute for Public Policy Research. September 1975. 91 pages. $3.00.

J. Bowyer Bell is a widely recognized authority on revolution and revolutionary violence. His books "The Myth of the Guerrilla" and "The Secret Army" have been widely read and respected. "Transnational Terror" will do nothing to hurt Bell's reputation. In a mere 90 pages he has presented a readable and competent introduction to the problem of terrorism.

"Transnational Terror" begins with a discussion of the widely variant types of terrorism, ranging from psychotic to revolutionary (with a number of stops inbetween). Bell recognizes what so many others avoid confronting, and that is that terrorism can be as much the product of a state — as in the case of "vigilante" or "authorized" terrorism — as of the common, garden-variety terrorist.

The bulk of "Transnational Terror" is taken up with a discussion of a number of "practitioners of revolution" who have resorted to terror. Case material from Palestine, Ireland, Africa, and Latin America is provided. Unfortunately, the anarchist-type groups (e.g. the Baader-Meinhof gang, or the Red Brigade of Italy) receive no attention at all.

Bell concludes with a short discussion dealing with the American response to terrorism, which has been to treat the symptoms rather than the disease. His closing warning bears careful reflection: "Most important, the threatened must accept that, however spectacular the deeds of terror, they are more easily tolerated than prevented."

Major Augustus R. Norton
U.S. Army Institute for Military Assistance

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

The author has concluded that the German soldier of World War II was about 20 percent more combat effective than his American and British counterparts! This conclusion is based on a quantified model of World War II battles. 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 no 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.

The Versailles Treaty eliminated the German General Staff.

But a covert General Staff studied World War 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 also could be used as mobile artillery.

With Hitler's rise to power Germany rearmed and reestablished the General Staff. Hitler assumed the position of commander-in-chief of the Armed Forces. Occupation of the Rhineland, Austria and Czechoslovakia enhanced his reputation.

Chapter 15, which deals with World War 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 under all conditions. As late as 1944 the German front line trooper inflicted 7.78 Russian casualties for each German lost. The percentage was higher at the war's start.

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

Dupuy considers Blitzkreig tactics as "the incorporation of armored and other track-laying vehicles into the fundamental concepts of the Hutier Tactics." Armored and armored infantry battle groups advanced using their own organic fires and supported by self-propelled artillery and air. After penetration of defenses the battle groups rapidly exploited success. A flexible cross-country logistics system kept them supplied.

As Hitler assumed more power, the General Staff's influence declined. At odds with the Chief of the General Staff, Gen. Franz Halder, Hitler dismissed him. Hitler established his own personal command staff. Dupuy believes Hitler's actions destroyed the General Staff concept as envisaged by Scharnhorst.

Dupuy further concludes the fatal flaw in the General Staff system was its failure to establish satisfactory relationships with the civilian government.

The author argues 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.

Dupuy explains he does not consider this book a definitive analysis. He believes the historical, economic, sociological, cultural and political aspects of German military performance require more study.

This book is thought provoking for the professional soldier.

Lieutenant Colonel Joseph P. Frankoski
APO San Francisco 96328

RECOGNITION QUIZ ANSWERS

1) **SWEDISH S-TANK** (no turret, low sloped glacis, Christie-type suspension)

2) **U.S. M-48A3** (bore evacuator at end of gun tube, blast deflector, slightly rounded bow armor) Photo provided by SSG Wade Barttells.

3) **U.S. M-728 COMBAT ENGINEER VEHICLE** (165-mm demolition gun, large-diameter bore evacuator, dozer blade) Photo provided by SSG Wade Barttells.

4) **FRENCH EBR** (main gun is mounted in top half of split turret, four center wheels of eight-wheeled vehicle are equipped with steel grousers, center wheels normally raised – or lowered only for cross-country)

5) **SOVIET BTR-50PK** (two forward hatches on top of blisters on front of hull, driver's hatch centered between blisters, top frontal armor is almost flat)

6) **U.S. C-130** (wing on top of fuselage, unusually tall stabilizer, landing gear remains close to fuselage when extended, four turbo-prop engines)

Views Through the Visor

Congratulations to those who were recent recipients of our little yellow cards. Your favorable response to our mailing survey has been overwhelming and beyond all expectations. Well done! You have enabled us to establish the most accurate, up-to-date mailing list we've ever had.

The survey card was only for those who receive your professional journal through our military distribution. If you received a card, you should receive **ARMOR,** *but that doesn't seem to be happening in every case. If you are not, please check your post office and your internal distribution. The magazines are being mailed.*

The military mailing is to specific units and offices, not to specifically named individuals. We are complying with the regulation and removing names from the mailing labels. Then, when the individual moves, the postal service won't mistakenly forward **ARMOR** *to him.*

Your professional journal is mailed to military addresses for dayrooms and staff sections. The magazine is for professionals and serves as a ready reference file at the mailing address. My next statement is not meant to be tactful, and if it offends, let the shoe fit. If you do not subscribe to **ARMOR;** *if you did not purchase this particular magazine; or if this is not a complementary copy; and if you are reading it at home with no intention of returning it to your place of employment; or if it is scheduled to become a part of your personal file, then you stole it.*

The staff appreciates the many laudatory comments that came with the cards. We wish we could increase the number of copies we mail. It isn't that we are slighting anyone. Our objective is to get **ARMOR** *to as many soldiers as possible, and the distribution is set accordingly. We estimate that* **ARMOR** *presently has an audience of one-quarter of a million people. We want an even greater distribution and are working at it.*

Changing the subject, you can help foster the spirit of Armor by joining a local chapter. The Abrams Chapter is in Washington, D.C. and the Lone Star Chapter is sponsored by the 49th Armored Division. If you're interested in establishing one, write to the Armor Association.

MAV

Coming in ARMOR

"THE COMPANY XO"

Captain Marshall L. Helena offers some guidelines on being an effective company executive officer and notes that the XO must be regarded as far more important than an administrative assistant.

"FUTURE INFANTRY ARMORED VEHICLES"

Richard M. Ogorkiewicz, widely known authority on combat vehicles, presents possible configurations for future infantry armored vehicles, including those with a chassis common to tanks. He also discusses armament options, troop carrying capabilities, and possible use of fighting vehicles in the fire support role.

"THE CHARGE OF THE HEAVY BRIGADE"

The charge of the Light Brigade on the Crimean Peninsula in 1854 failed miserably, yet became one of the most famous cavalry actions of all time. On the other hand, the charge of the Heavy Brigade on the same day forced an enemy eight times its size to retreat and saved the Allied base at Balaclava, but little has been written about it. Lieutenant Robert N. Stacy's article helps correct the oversight.

"TANK VERSUS HELICOPTER"

Lieutenant Colonel Charles W. Abbey notes that, "Many of us don't seem to be taking the opposing forces' antitank helicopter threat very seriously. Little to nothing is said in our current "How to Fight" material about the Soviet attack helicopter–yet it has been in the field since 1973." He then suggests tactics and techniques for detecting and defeating antitank helicopters on the conventional battlefield.

"THE RECOVERY VEHICLE"

Mr. E. F. Bashaw of the Maintenance Department, USAARMS traces the development of tank recovery vehicles from World War II to the product-improved M-88A1.

ARMOR

november-december 1978

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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

The M-88, workhorse of maintenance units from company to theater level, is essential to sustained operations of armored units.

ARMOR

the Magazine of Mobile Warfare

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LETTERS

Information Needed

Dear Sir:

In the May-June issue of ARMOR, there was an article on camouflaging tanks. This article mentioned a filter placed over the periscope to render the internal red lighting invisible to observers equipped with image intensification devices. We are most interested in this idea. Any information you could provide on the color of the filter, method of construction, procurement sources, etc. would be greatly appreciated.

I apologize for being vague in my description of the techniques employed. ARMOR Magazine is very popular among the personnel on the battalion's staff and someone "borrowed" my copy. Your magazine is by far the best of the branch publications. We find it quite informative and useful.

RONALD R. ARNAL
Captain, Infantry

APO 09091

Information Provided

Dear Sir:

This is in response to the letter from Captain Ronald R. Arnal which appears above.

For the *M-60A1* tank, a special glass developed by Corning Glass Company was placed over the inside vision blocks. The glass was held in place by metal strips around the edge, which was fastened to the vehicle by using existing bolts. The glass is light blue in color and allows all color to pass through except red light. Thus the crew members can see all light outside except red, but the red interior light cannot be seen from the outside because it is filtered by the glass filter.

It should be noted that this information is 1½ years old.

Either Mr. Otto Renius, ARADCOM (Autovon 243-1024) or Mr. Roland Murphy, MERADCOM, (Autovon 354-2654) can supply additional information and photos of the filters.

WILLIAM K. EMERSON
Major, Armor

APO 09141

An Error Noted

Dear Sir:

In your recent article, "Defense Against Chemical Attack," (May-June 1978), paragraph 1, sentence 1, page 40, hydrogen cyanide was referred to as SC. The question I have is, has the symbol been changed from A.C? I would like to know, as I am an NBC defense specialist and Tech Escort in the Marine Corps.

Thank you for any and all consideration you give to this letter.

CHARLES E. SANDERS

FPO San Francisco 96602

Your sharp eye caught us. Many thanks. MAV

In the Wings—The Guard

Dear Sir:

Much has been said for and against the Total Army concept. I believe the concept to be practical and realistic.

Waiting in the wings to support its active counterpart, is the Guard's Armor force. All year long during training, you'll find our Armor crewmen working with the *M-60's*, on the sandtable working on tactics, or in class with the Training Extension Course (TEC) trainer. At any rate, you'll find us doing what we love to do, and that's gearing up in tank gunnery.

I don't imply that we are where we should be in training, but give us a little time. We are making rapid progress in the right direction. The esprit in the tank sections is high and competition is the key.

We in the Guard are proud of our people, and in time we will be a crack outfit. We're going to be good because we want to be, because we thrive on first round hits, and because we want to be able to hold up our end in the event of war.

We are sending more and more people to school, and I was fortunate enough to be approved to attend the Master Gunner course at Ft. Knox. There are not enough words to express my apprehension about going. Along with the school training, we are directing our unit training almost totally in the direction of hands-on application. We are giving our NCO element the latitude to plan and conduct almost all of their own training and finding that it is super-effective.

So, I say to all of you Active Army tankers, "Don't think for one minute that there aren't good people behind you, and don't worry about the abilities of your counterparts in the Guard." Waiting in the wings is a group of anxious, perservering, and loyal National Guard tankers.

DOUG HARMON

Montana Army National Guard

Combat Service Support

Dear Sir:

At last someone has spoken out on an area that has either been lost or misplaced for such a long time. I refer to Captain John Drebus' article, "A Neglected Responsibility," in the May-June issue. It is about time that someone has accounted for and placed it in perspective.

Combat service support and its vital role in supporting armor operations is necessary to understanding the overall picture. All lieutenants should be familiar with how it functions and the part it plays in their roles as Armor leaders. It should be understood that a tank needs fuel and lubricants to move, ammunition to shoot, and food for its crew to survive on. This vital role in providing supply and services lies with the support platoon. Properly staffed and outstandingly lead, this element provides the logistical link between the rear and the forward elements. Without this important support, those who have trained in mounted combat will have to fight as infantry.

I believe that if we emphasize not only the logistical aspect but also the administrative functions of other staff elements within the battalion organization, we will see a better picture of how things are supposed to work. If we can prepare new Armor leaders to be capable tank or cavalry platoon leaders and to be familiar with the combat service support, we will have come a long way in preparing a more well rounded Armor officer for his next assignment.

MILES T. SAKAGUCHI
First Lieutenant, USAR

Pearl City, Hawaii

Appreciative

Dear Colonel Vargosko:

As an old tank man myself. I have always taken a great interest in your magazine and am so grateful that at least one country produces a magazine which deals with all those crucially important problems about which all too many people are woefully ignorant these days.

I have been lucky enough to get General Starry to write an article for my December issue. Needless to say, I first got to know of him through reading *ARMOR*!

H.B.C. Watkins
Brigadier (Retired)
Editor, *British Army Review*

London, England

Compliment

Dear Sir:

I also wish to compliment you and your staff on the continuing excellence of *ARMOR*.

GARY E. BINDER

Lincoln, Neb. 68516

Comments on XM-1

Dear Sir:

I would first like to compliment you on a fine publication. As a "house" magazine you have achieved a good mix of articles; those for persons who are in the "trade" and work with the various day-to-day technical aspects of their jobs, and articles which the interested amateur such as myself can understand and enjoy. Through *ARMOR,* and other publications, I have been following the development of the *XM-1* which brings me to the first reason for this letter.

"*XM-1* UPDATE II" by Lt. Col R.R. Taylor, Jr. covers many aspects of this new system.

A major item in this section concerned the storage of the main gun ammunition in the turret bustle. I recall a past article in *ARMOR* concerning a study of hits on tanks during the Yom Kippur War. If I remember correctly most of the hits were above the turret ring. There was also an accompanying pictorial article about a study or program to get the ammunition out of the turret of the *M-60* and into the hull. It appears to me that the system for the *XM-1* is a step backward in the face of known data and actual combat experience.

The drawing which accompanied the "update" shows the "blow-out" panels and "access doors" which I assume are armored. I wonder if naval "flash proof shutters" or a similiar spring or pressure operated closure wouldn't present a safer approach? No info was given if the doors are manually opened & closed or if there is an automatic system employed. I would also tend to think that each round should be in its own armored bin and have its own access opening with protective closure. Thus under the worst possible condition (i.e. a round half in and half out of storage) the access into the crew compartment would be limited to a single *small* opening in place of the large "door" as shown.

I especially enjoy the recognition quiz, however, there are two areas of identification which have received no attention in this feature, soft skin vehicles and artillery.

Keep up the good work. *ARMOR,* is very good reading and many articles are very thought provoking.

MICHAEL L. JONES

St. Charles, IL 60174

An Error Corrected

In the July-August issue, the staff inadvertently omitted two paragraphs of the conclusion to Mr. Andrew W. Hull's article, "Soviet Long-Range Planning." We apologize forthwith. The entire conclusion to the article is printed below. MAV

Conclusions

Analysis of known programs reveals that they (The Soviets) had three common features. First, each attempted to establish the general technical specifications which could serve as a guide for tank designers in creating tank prototypes. Also, the programs devoted considerable attention to the question of the role of tanks in future combat engagements. Finally, based on conclusions regarding the technical characteristics and future roles of tanks, the programs addressed how tank units should fit within the organizational structure of the ground forces.

The reasons for the articulation of armor programs approximately every 10 years since 1931-1932 are many fold. For one thing, general Soviet economic philosophy advocates the desirability of advancing science and technology development through forecasting and long range planning on a 10-15 year basis. Also, the permanent and on-going nature of Soviet tank and armored vehicle design organizations force decision-makers to elaborate general technical goals so that the armored vehicle industry can draw up the specific, detailed 5-year annual plans necessary for the completion of the overall state economic plans covering the same periods.

Lastly, it must be realized that these programs are general in nature and propose no direct action,but instead identify possible and desirable developmental trends. Such generality of goals permits the military, tank designers, and tank producers the flexibility necessary to take advantage of unforeseen technological opportunities or to adjust to unexpected foreign armor developments. Possibly the Soviet cancellation of *T-64* production in favor of the *T-72* is an example of such an adjustment, since this shift coincided with the U.S. decision not to develop the *MBT 70/XM-803,* but to develop a less sophisticated tank, the *XM-1.* Also because programs express only general requirements, it is not uncommon for Soviet tank designers to produce many prototypes before a series production model is selected.

Based on available evidence (e.g., formulation of a program and the appearance of the *T-64* in 1970). it would seem that the next new Soviet tank would appear in 1980 or 1981 at which time a new program would be developed. This normal Soviet schedule may have been distorted by the switch to the *T-72* in 1974 with the consequence that the next generation of Soviet tanks may be put off until 1984 or 1985. Only close analysis of Soviet developments in the coming 3 years will tell for sure the extent of the disruption caused by the 1974 change in series production models.

ARMOR CONFERENCE 1979 Will Be In May

THE COMMANDER'S HATCH

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

The environment we envision for the Central Battle will stress command and control at all echelons to an unprecedented degree. Weapons on both sides will be more lethal by an order of magnitude than heretofore. EW will render radio communications difficult. Improved smoke munitions, dust, and obscuration will make observation, control, and navigation more difficult. Improved night vision devices and the Threat doctrine of echeloning forces will require sustained operations around-the-clock, not for days but for weeks. And commanders will have to think—and think accurately—not at 2½ or even 15, but at 30 mph to fully utilize the capabilities of the XM-1 and XM-2 when they are fielded. This article is intended to surface problems and to propose approaches to solutions based on this visualization of the battlefield.

Central Battle

Trained task forces and teams cannot win the Central Battle unless their commanders have thought through

the process of effectively surviving and orchestrating their portions of the battle. The detailed planning for war must include considering which vehicle transports the commander during what phases of the battle, wno goes with him, which part of the burden is shouldered by the XO and S3, who are the principal operators of what radio nets, and how are detailed target servicing plans disseminated after moving to reinforce another division or brigade area.

While these problems do arise in training, their solutions too often do not fully reflect the "dirty battlefield" irritants of hostile artillery, aviation, smoke, EW, and the true tempo of the armored clash. We need now to begin optimizing our tactical command and control system for combat. We need specifically to rehearse under combat conditions. This will illuminate the requirements for standardizing SOPs, functionalizing command apparatus, and simplifying combat orders.

Standardizing SOPs

Standardizing SOPs is a clear prerequisite to effective task organization within a division. Some divisions already publish standardized brigade and maneuver battalion tactical SOPs to facilitate rapid changes in task organization. The force generation responsibilities of the corps, however, have displayed in several scenarios the attachment of units across division boundaries. Logically, then, the publisher of the battalion tactical SOP ought to be the corps, or even the theater army commander.

SOPs for battalion and company tactical control should reflect the commander's intent, his personality, and his assessment of the most efficient functional use of his key assistants. Appendix A of FM 71-2 describes the normal composition and function of the command group and the TOC, but it is not wholly applicable to each unit and situation, nor does it contain the specific detail required of an SOP. Placing the S3 in the command group, for example, is recommended in FM 71-2 and may sometimes be useful, but his role in the command group is not specified and could easily degenerate into that of radio operator. The tank that FM 71-2 proposes he share with the commander has but a single-net radio transmission capability with no speech security equipment. Perhaps he would be better employed at the TOC where there is much for him to do by way of planning and coordinating.

Efficient Use of Staff

Efficient use of staff also requires that a useful role be given the executive officer. As second in command, he cannot remain abreast of the tactical situation if he is relegated solely to supervision of the trains. His contribution to the battle, and that of the command sergeant major, will be limited unless the commander defines active roles to optimize use of their abilities.

The commander should analyze the contributions he expects from the command group and the TOC. In doing so he may conclude that the command group should provide "eyeball supervision" and control of direct fire, maneuver, and supporting fires at the critical point. If so, it evolves upon the TOC to:

- Monitor the entire battle, not solely the action at the critical point, and alert the commander to threats or opportunities at places he cannot see.
- Maintain communication with higher, adjacent, and all subordinate headquarters, thereby freeing the commander to go where the action is, even if that means losing some communication links temprarily.
- Plan ahead and anticipate additional resource requirements and potential redispositions.
- Direct combat service support operations.

These conclusions should enable the commander to prescribe the composition of the command group and the TOC. Both must be organized from available personnel and equipment for around-the-clock operations. Such key staff officers as the S1 and S4 may find themselves in the TOC, placing more reliance on the maintenance officer and support platoon leader to run the trains.

Whomever comprises the command group must train as a team, in armored vehicles, using terrain for cover. They must train under conditions of EW and smoke and become adept at responding to fragmentary orders that require radical changes in force disposition. Mental mobility must equal the tempo and dimension of the battle despite the most severe stress.

Physical Mobility

Physical mobility for the command group is provided by radio equipped armored vehicles which offer reasonable protection and survivability in the more lethal areas of the battlefield where the commander belongs. On an exceptional basis for specific reconnaissance and coordination purposes the commander may need a helicopter, jeep, or even a motorcycle. Once the battle is joined, however, he and his command group need the mobility and stamina that can only be provided by armored vehicles.

Key Subordinates

Company commanders must also consider how to get the most effective battlefield contribution from their key subordinates. The first sergeant and headquarters NCO's, cooperating with battalion trains personnel, may be able to control logistical operations during critical stages of the battle, thus freeing the executive officer to assist in tactical control. One technique (which has an obvious parallel at battalion/task force level) has the commander transmitting on the team net and monitoring the task force net, while his executive officer does the reverse, thereby relieving him of switching nets to report.

Although the initial phases of the central battle can be planned in intricate detail, later success will depend on the ability of commanders to issue simple oral orders which include the concept of operations and a minimum of graphic control measures. It is easy to imagine fast-moving situations wherein overlays cannot be passed down to the operating level. Thus there may be cases where map coordinates representing centers of mass for battle positions or target reference points must be transmitted by radio. Maneuver schemes and fire support and target servicing plans must be kept simple, enabling rapid transmission and clear understanding.

The optimum techniques for tactical command will vary among units and will depend on the personality of the commander and his assessment of the abilities of his staff. What is not variable is the need to make this assessment, think through the detailed mechanical process of around-the-clock tactical control, and conduct peacetime rehearsals accordingly under the most arduous and realistic conditions possible for commanders and staffs as well as for soldiers.

The challenge today and in the future is for combined arms leaders to command and lead—not manage from a remote site.

Take Charge!

ARMOR FORCE MANAGEMENT

The U.S. Army stands alone among the major armies of the world in that it does not provide a specifically designed functional uniform for its ground combat vehicle crewmen (CVC). These CVC uniforms are not just distinctive battle dress but serve the functional purpose of providing CVC four to six times greater levels of survivability than standard fatigue uniforms. Currently, CVC within USAREUR and 8th U.S. Army are authorized the aviator's NOMEX shirt and trousers.

This situation is receiving priority attention within TRADOC and DARCOM and a two-phased program has been developed. In phase 1, the basic uniform consisting of a coverall, cold weather jacket, hot weather gloves and cold weather gloves, should be fielded in 3d quarter, FY80. During phase 2, supplemental protective components to round out the CVC uniform would be fielded starting in 2nd quarter, FY82. These components include a coverall liner, lightweight ballistic protective vest, fire-resistant bib-overall, insulated balaclava, NOMEX/KEVLAR-type face mask, ballistic shell for the *OH-132* helmet, summer and winter leather CVC boots, and the standard vinyl overboot with modified closure system.

Significant performance characteristics of the CVC uniform system are:

- Environmental protection in climatic zones I (warm or hot all year) through VI (mild summers, cold winters).
- Free of design features which will snag on projections within or outside ground combat vehicles.
- Fire-resistant commensurate with the present state-of-the-art to allow maximum time for evacuation from the vehicle and maximum protection from flash fires.
- Washable not requiring special cleaning compounds or procedures.
- Provides a loop for extraction of injured vehicle crewmen.
- Provides ballistic protection consistent with the

state-of-the-art through the protective vest and helmet shell.

The CVC uniform will probably be provided using the same basis of issue as the current aviator's NOMEX. This will include crewmen of tanks, tracked recovery vehicles, mortar carriers, tracked command post carriers, self-propelled field and air defense artillery weapons, tracked cargo carriers, armored personnel carriers, armored vehicle launched bridges, and combat engineer vehicles.

The basic CVC uniform should make its first appearance at the 1979 Canadian Army Trophy (CAT) Competition to be held May-June of that year. CAT competition is a biannual NATO tank gunnery exercise involving several of the NATO countries. Hopefully the uniform will be a significant perk for US participants.

Neglected

One of the most unused fire control components in any tank unit today is one that is not even attached to the turret. It's something that is kept wrapped in the same paper it was shipped in, and locked in the company safe. It's called a *FIRING TABLE.*

The main reason it's never used is that very few understand it, and those who do are only concerned with the first two columns, Range and Superelevation—and then only to check the superelevation output of the computer.

But the firing tables contain enough information to engage targets at extended ranges, to determine why you missed that battlesight target, and the correct information to get the important second round hit.

How many of you have been lucky enough to at least look at a firing table and have been able to understand all of it except two columns—DX/DSE and DH/DX? These two columns allow you to make the proper corrections to the fire control to get a second round hit. And that's the key to these two columns; they pertain to the second round fired at that range.

The first of these two columns, DX/DSE, tells us that for each 1 mil change in gun elevation, the second round will go this much farther or shorter. To use DX/DSE, look down the Range column and find the range you fired your first round at; now go across to DX/DSE and you will see that if you add or drop 1 mil, the round will change its range the distance found in the column. If you change the gun angle any distance other than 1 mil, all you have to do is multiply the range change (DX/DSE) by the number of mils changed.

Now for the second of the two columns, DH/DX. This column tells that for each 100 meter change in range, the second round will go this number of meters higher or lower. To use DH/DX, again look down the Range column and find the range you fired your first round at; now go across to DH/DX and you will see that the second round will go this number of meters higher or lower for each 100 meters that the range was changed.

Now it's time to open that company safe, get the firing tables out, and start using them. If you still have problems, the Master Gunner uses his firing table all the way through the course and I am sure he can help you.

GARY M. HARRELL
Staff Sergeant
Master Gunner

Shillelagh Gunnery

The *Shillelagh* missile system is capable of achieving a high hit probability. Yet, analysis of the live missile firings conducted by our *M-60A2* tank battalions reveal that few have come close to achieving that system's capability. There are factors such as malfunctioning guidance and control systems, and malfunctioning missiles that contribute to the problem. Even when we disregard these factors in computing the percentage of hits, we fall short of its capability. If we disregard these factors, then what possibly is the cause? The obvious answer lies in the first place we must look—the gunner's ability.

Presently, the major part of the gunnery training conducted in *M-60A2* units is devoted to the employment of the conventional weapon system. Successful employment of the conventional system requires a great deal of training and knowledge in order to put the round on the target, and we naturally place our training emphasis on employment of that system. In comparison, employment of the missile system requires only that the gunner put the reticle on or near the target, pull the trigger, and then keep the reticle on the target until impact. It is in this comparison of the factors necessary to employ the conventional and the missile systems, that we tend to oversimplify the training necessary for effective employment of the *Shillelagh.*

Analysis of live missile firings reveals that employment of the *Shillelagh* is just not as easy as we have believed. And since each crew employs only one live missile during their qualification, one target miss can only be made up if they have been trained to effectively employ their conventional system.

Recently, during the qualification of an *M-60A2* tank crew on Table VIIIA, several observer's saw a missile leave the tube and streak straight for the moving target panel approximately 2,300 meters away. But, although the missile's flight appeared normal, it passed a few meters in front of the target. At the debriefing the gunner was questioned about the engagement. His reason for missing—"Well sir, I just led the target a little too much." Sounds funny now. Of course this was only Table VIII and the crew was still alive. Ironically, they did not miss any other target and achieved several first round hits. Is this an isolated incident? Ask your gunners how much lead is applied in order to hit a moving target at 2,300 meters when he is firing the missile. I hope you receive more correct answers than I did.

We agree we need to train in order to properly employ the missile system effectively. So just how do we conduct

this training?

The Conduct of Fire Trainer (COFT) is the primary aid furnished to *M-60A2* battalions for conducting this training. For most personnel who have had experience with the present issue of COFT, it has proved to be extremely bulky and unreliable. A new COFT has been developed which we are told is a great deal more reliable and less bulky. These units are still quite expensive and employment requires a training area with realistic employment ranges. Some of us are not lucky enough to have such a training area readily available.

What is the answer? The new fire control simulator which has been developed and is in the hands of some units is quite promising and should assist in accomplishing missile training. Actual experience with this unit has shown that it is easy to employ the missile against the targets which are displayed. That just about covers what we have available from our TASO's that has been developed specifically for missile training.

Innovations

There are, however, some very innovative ideas which have been developed and employed recently by an *M-60A2* tank battalion in Germany. The unit first analyzed the problem and determined that the major factor involved in training the gunner to hit the target with the missile was the gunner's ability to track the targets smoothly and accurately. Knowing that moving targets are not the only ones which might be engaged with the missile, there were several classes and practical exercises conducted to insure that the gunners knew how to engage stationary targets as well.In addition, emphasis was placed on maintenance and proper alignment of the guidance and control system.

During this training it was found that many of the gunners were under the impression that when engaging a stationary target, all they had to do was lay the crosshair on the target, pull the trigger, let go of the controls, sit back, and wait for the missile to hit the target. This misconception was immediately dispelled and the gunners were trained to maintain a proper sight picture throughout the missile's flight. After all, a stationary tank could begin moving during the flight of the missile. In fact, if the tank crew being engaged has detected the missile launch, they will seek cover immediately or take evasive action. The "Snake Board" was one of the original training aids employed to improve the gunner's tracking ability, and it did prove useful. The "Snake Board" exercise can be extremely challenging, but it takes some forethought to get the troops enthusiastic about it and willing to accept the challenge that is there. Competition among the participants can play an important part in making this training exciting and rewarding.

Some units may be as lucky as the unit that conducted tracking exercises while located in their own motorpool. The targets were their own ¼-ton and 2½-ton trucks that traveled along nearby roads at ranges from 1,800 to 2,900 meters.

The unique feature of this system was the way tank commanders and evaluators were able to evaluate a gunner's actual tracking ability and make corrections. This was accomplished by using the REALTRAIN telescopic sights mounted in modified missile aft caps. The REALTRAIN scope was then boresighted with the missile reticle and the tank commander or the evaluator was able to follow the gunner's exact sight picture throughout the engagement.

Most units have a mini tank range available at some time during their gunnery training. Additionally, most units have employed the *M-55* laser extensively on these ranges. But how many of us have tried to use the laser for conducting missile training concurrently with our other exercises on the mini tank range? Here's how it is done in one *M-60A2* battalion. The *M-55* laser is mounted in a device similar to the *Brewster* device to reduce parallax and then mounted on the tank. After the missile reticle is zeroed to the laser beam it is plugged into the dome light circuit with a simple ON/OFF switch wired into the electrical connector used for connecting the laser into the dome light circuit.

Targets

The targets consist of a laser-reflective panel secured to one of the moving targets on the mini tank range. A tank silhouette is cut from a piece of black nonreflective hard paper scaled to resemble a tank at 3,000 meters and affixed to the center of the panel. When the target appears in the crew's field of view the tank commander issues a fire command, the loader loads a dummy missile, and the gunner identifies and lays his reticle on the target. On the command FIRE, the gunner makes his final lay, announces ON THE WAY and pulls the trigger. Upon hearing the gunner announce ON THE WAY the loader turns on the laser which has been placed in the CONTINUOUS MODE. The gunner tracks the target for a period of 25 seconds and as long as he maintains the correct sight picture he sees only a close resemblance of the sight picture he should have on the battlefield. If his sight picture deviates from the target, however, the laser blip becomes visible on the panel surrounding the target. Each engagement is kept to a maximum of 25 seconds with 3-minutes between engagements to preclude overheating or burning out the laser.

Tracking the slow, straight-moving target is a real challenge. When the target is placed on a faster moving track which varies slightly in direction, keeping the laser blip from appearing on the reflective panel becomes impossible. The challenge then is to see who can track the moving target with the laser blip evident for the least amount of time.

Result

How did the unit which employed these training techniques make out on the range with live missiles? During its most recent firing, 99 missiles were fired. Of these, 52 were employed against a stationary target at approximately 2,600 meters. Disregarding the missles which were declared as malfunctions, a 90.3 percent overall hit percentage was achieved. This is a big step toward achieving the minimum employment of the system's capability. With continued training and application of additional training ideas from you other Master Gunners out there, we hope to achieve an even higher percentage of hits on our next trip to the range.

SSG RICHARD L. FOXWORTHY
Master Gunner
C/1-67 ARMOR
Fort Hood, Tex. 76541

This article was written while Sergeant Foxworthy was stationed with C/1-67 Armor, Fort Hood, Tex. Sergeant Foxworthy is now assigned as Division Master Gunner of the 3d Armored Division, APO New York, 09039. In his letter advising us of the change of address, Sergeant Foxworthy reported that the 3-12th Cavalry, 3d Armored Division, achieved 96 percent hits with the Shillelagh missile during Level I Tank Gunnery in June 1978.—MAV.

AIR CAVALRY ATTACK TROOP

by Capt. Gordon E. Sayre

The Army needs an Air Cavalry Attack Troop! In 1974, the Armor Center conducted a thorough analysis of the missions, roles, functions, doctrine, tactics, and organization of armored cavalry units. This effort, known as the Cavalry Scout Study (CSS) concluded that armored cavalry is required not only to find and fix the enemy but must have the capability to fight to gain intelligence and survive. The CSS resultant armored cavalry organization was given increased firepower to perform this mission. Air Cavalry is a maneuver unit which extends the traditional cavalry missions of reconnaissance and security by aerial means. This extension through a mobility advantage permits the unit to operate over greater areas and complements the ground armored cavalry capability to find and fix the enemy. However, air cavalry has only a limited antiarmor fighting capability. Therefore, it is time for the Army to examine the roles of air cavalry and give it an improved capability to fight.

Armor's aerial maneuver element, the attack helicopter company, is capable of fighting on the modern battlefield and is equipped, organized, and trained to kill tanks. However, it is *not* organized, equipped, or trained to perform the reconnaissance and security missions of air cavalry. Hence, the need for an organization which can do both missions---*find, fix,* and *destroy* the enemy. For traditional reasons, lineage, honors, and mission description, the unit will be known as the Air Cavalry Attack Troop (ACAT).

The ACAT organization *must* be able to perform the roles, missions, and functions of both the air cavalry and attack helicopter units. It is well known that an organization's capability to perform the roles, missions, and functions for which it was designed is based upon the synergistic interface of equipment, training, doctrine, tactics, personnel, and the environment in which the unit operates. Thus, all of these factors must be considered in designing the ACAT. A discussion of these factors follows and, for ease of interpretation, consists of a side-by-side comparison of the current air cavalry troop and attack helicopter company followed by those salient features needed in the ACAT. All of the information contained in the side-by-side comparison is taken from current TOE's, doctrine, and tactics for employment of air cavalry and attack helicopter units.

The TOE mission statements for the air cavalry troop, attack helicopter (AH) company, and ACAT are listed in chart 1.

The ACAT mission statement encompasses the reconnaissance (find), security (fix), and armor destruction (destroy) missions of the air cavalry troop and attack helicopter company. In the past, the focal point of the air cavalry troop has been its air and ground scouts with their mission of finding and fixing the enemy. The focal point of the attack helicopter company has been its attack helicopters with their mission of destroying enemy armor. The focal point for the ACAT must be on both the scout and attack helicopter integrated into an aerial maneuver Combined Arms Team with the mission to find, fix, and destroy the enemy.

Doctrinally and tactically, the organizational characteristics relating to the air cavalry troop, attack helicopter company, and ACAT are listed in chart 2.

AIR CAVALRY TROOP	ATTACK HELICOPTER COMPANY	AIR CAVALRY ATTACK TROOP
To extend by aerial means the reconnaissance and security capabilities of ground units. To engage in offensive, defensive, delaying, and economy of force operations as part of a larger force.	To destroy enemy armored, mechanized, or other forces by aerial combat power using fire and maneuver as an integrated part of the Combined Arms Team during offensive, defensive, and retrograde operations.	To find, fix, and destroy armored, mechanized, or other forces as an aerial maneuver unit using fire and maneuver as an integrated part of the Combined Arms Team during offensive, defensive, delaying, economy of force, and security operations.

Chart 1.

Once the generic characteristics of the ACAT have been established, it is necessary to identify the specific missions the ACAT must accomplish. For comparison purposes, the specific missions of the air cavalry troop and attack helicopter company are listed in chart 3.

The ability of the ACAT to perform the specific missions mentioned in Chart 3 is directly related to the flexibility of the organization in reacting to multiple missions at troop or higher level and the functional subelements of the ACAT itself. Since we have a good idea from our current organizations of what type functions have to be performed to accomplish the specific missions, it is necessary to identify those specific platoon functional capabilities the ACAT must possess. For comparison purposes the current air cavalry troop and attack helicopter company platoon functions are listed in Charts 4, 5, and 6.

The integration of the scout and attack functions of the air cavalry troop and attack helicopter company into the ACAT scout and attack functions is a relatively easy training procedure and is understood by people familiar with the units. The individual training for both air cavalry and attack helicopter scouts is the same. Similarly, the individual attack helicopter training is the same. The difference in the employment techniques (the focal point of the units) can be overcome by effective unit training. One area that is not well understood is the role of the ground recon scouts. The roles of the ground recon scout are critical to the air cavalry mission. They provide the only organic capability the air cavalry has to perform and gather detailed reconnaissance data. It is accomplished by a combination of mounted and dismounted actions. Dismounted actions are required when it is necessary to acquire more detail than is possible through aerial reconnaissance alone or to achieve greater stealth. Additional ground recon tasks are reconnoitering small built-up areas or thickly vegetated areas, checking a critical section of road or a bridge, locating a suitable ford or bypass to obstacles, checking defiles, and providing corroborating information concerning the enemy.

The ground recon scouts also provide the all-weather, 24-hour screen capability through establishment of a series of OP's. This ground recon capability will be required even after the eventual fielding of the advanced attack helicopter (AAH) and the advanced scout helicopter (ASH) for the reasons previously discussed. As a consequence, a ground recon scouting capability must be retained in the ACAT. While the question of whether this capability should be organic to the air cavalry attack platoon (ACAP) or whether it should be provided by a separate fifth platoon within the ACAT can be argued at length. The fact is the functional role must be performed. Due to the factors of timeliness, unique training (individual and unit), platoon integrity (organize and train as you will fight); the ground recon scout capability was retained as organic to the ACAP.

AIR CAVALRY TROOP	ATTACK HELICOPTER COMPANY	ACAT
Finds and fixes the enemy.	Fights and finishes the enemy.	Finds, fixes, fights, and finishes the enemy.
Mobility permits employment as a good economy of force unit to screen unoccupied areas of the battlefield.	Firepower and mobility permit fire and maneuver over a wide area to provide flexible employment.	Firepower and mobility that permits flexible employment as an armor aerial maneuver unit which can fire and maneuver or screen as an economy of force unit.
Employed in conjunction with the ground commander's scheme of maneuver to expand the commander's reconnaissance and security capabilities.	Employed as part of the ground commander's scheme of maneuver which in turn requires close coordination with the ground commander.	Employed as part of the ground commander's scheme of maneuver as a maneuver unit.
Employed over wide areas.	Employed from battle positions.	Normally, employed as platoon size entities permitting controlled and coordinated operations over either a wide or narrow area depending on the mission.
Organized for combat as a Combined Arms Team tailored to perform specific missions.	Organized for combat as a 3-scout, 5-attack helicopter team mix which can be committed as a team or in mass by committment of a company.	Organized for combat in four combined arms platoons consisting of aeroscouts, attack helicopters, and a ground reconnaissance element.
Provides the commander real time information.		Provides the commander real time information.
	Kills enemy tanks.	Kills enemy tanks.

Chart 2.

Battlefield Employment

Traditionally, air cavalry and attack helicopter units have usually operated in different parts of the battlefield. For purposes of comparison, chart 7 shows several characteristics of battlefield employment of the two units.

These employment concepts must also be included in the ACAT. The organization will require the flexibility to operate as a maneuver force in any portion of the battlefield. To maintain this operational flexibility, the ACAT will necessarily have to consist of more elements than either the current air cavalry troop or attack helicopter company have.

Organizational Structure of the ACAT

Since organizations are designed to accomplish specific missions and perform specific roles and functions, it is important to look at some of the

general employment principles which have evolved from lessons learned and been proven tactically sound over the years in air cavalry and attack helicopter units.

- Scouts operate in pairs.
- Air scouts require a pilot and a scout observer.
- Units should operate in all visibilities (day/night).
- Attack helicopters generally operate in no less than pairs.
- A detailed ground reconnaissance capability is required (ground recon scouts).
- A control element is required for all combat operations from squad through corps.
- To mass effective firepower in the antiarmor role. five to seven attack helicopters are required in a platoon maneuver unit.
- The organization should reflect an organization for combat with units organized the way they fight.

Using these rules, the organizational designer is faced with either structuring pure platoons of scouts, attack helicopters, and ground reconnaissance as air cavalry and attack helicopter units are currently organized, and organizing for combat at troop level or designing integrated platoons consisting of all of the needed elements. While there are advantages and disadvantages to both structural concepts, the overriding consideration must be for a structure which provides the most effective, best trained organization for combat. In the case of the ACAT, the best structure is an integrated platoon. Platoons are the basic combat elements of an organization. Men train, live, and fight as a platoon and as such are more effective as an integrated unit than as pooled assets which are occassionally associated as teams in combat.

PLATOON ORGANIZATION

The proposed air cavalry attack platoon is composed of an aeroscout section, an attack helicopter section, and an aerorecon section (figure 1).

The *Aeroscout Section* consists of the platoon headquarters and two aeroscout teams of two scout helicopters each.

Each scout aircraft, including the platoon leader's has a pilot and an aerial scout observer. The primary tasks of the aeroscout sections are those scout functions previously discussed. The scouts perform necessary ground coordination, gain and maintain contact with the enemy, report information on the enemy, do

AIR CAVALRY TROOP	ATTACK HELICOPTER COMPANY	ACAT
Reconnaissance:		**Reconnaissance:**
Area		Area
Zone		Zone
Route		Route
Security:		**Security:**
Screen		Screen
Guard		Guard
	Offense:	**Offense:**
	Base of fire.	Act as base of fire for the force.
	Attack by-passed enemy.	Attack by-passed enemy.
	Attack flanks.	Attack flanks.
	Attack enemy rear areas.	Attack enemy rear areas.
	Deny terrain to the enemy.	Use as part of exploitation and pursuit force.
	Reserve force.	Reserve force.
Defense:	**Defense:**	**Defense:**
Economy of force unit.	Employed as part of ground scheme of maneuver.	Employed as part of the ground commander's scheme of maneuver.
	Separate maneuver force.	Separate maneuver force.
	Reserve force.	Reserve force.
Special Mission:	**Special Mission:**	**Special Mission:**
Raids	Aerial escort.	Raids
Rapid Reaction.		Rapid reaction.
		Aerial escort.

Chart 3.

SCOUT FUNCTIONS

AIR CAVALRY TROOP	ATTACK HELICOPTER COMPANY	ACAT
	Ground coordination.	Coordination with the ground commander.
Gain and maintain enemy contact.		Gain and maintain enemy contact.
Report enemy information.		Report enemy information.
	Recon battle positions.	Recon battle positions.
	Recon routes to and from battle positions.	Recon routes to and from battle positions.
	Deploy the attack helicopters.	Deploy the attack helicopters.
	Perform target handoff.	Perform target handoff.
Adjust supporting fires and air.	Adjust supporting fires and air.	Adjust supporting fires and air.
Provide security for subelements:	Provide security for AH.	Provides security for the platoon.

Chart 4

all of the reconnaissance necessary to deploy and fight the attack helicopters, adjust supporting fires of artillery and TACAIR, and provide security to the platoon. The platoon leader provides command and control for the platoon, performs all troop leading functions, and can function as an additional scout, if needed. The aeroscout section provides the *find* and part of the *fix* portion of the *find, fix,* and *destroy* mission of the ACAT.

The Attack Helicopter Section consists of five attack helicopters divided into two teams of two attack helicopters each and a section leader's attack helicopter which can operate with either team. The primary tasks of the attack helicopter section are those tasks previously discussed, namely; to protect the scouts, to develop the situation, and to kill enemy armored and mechanized vehicles. The attack helicopter section provides part of the *fix* and all of the *destroy* portion of the ACAT mission.

The Aeroreconnaissance Section consists of a utility helicopter and a seven-man aerorecon squad which provides the platoon's ground reconnaissance capability. The members of the squad are trained reconnaissance specialists (19D's) and consist of one SSG squad leader, one SGT team leader, three SP4 scouts, and two PFC scouts. The platoon sergeant for the platoon is a trained 19D and has the option of working with the aero recon squad or in the aeroscout section as a scout observer, depending where he can make the maximum contribution to the mission.

ATTACK HELICOPTER FUNCTIONS

AIR CAVALRY TROOP	ATTACK HELICOPTER COMPANY	ACAT
Protect scouts. Develop the situation.		Protect scouts. Develop the situation.
Provide a limited antiarmor capability.		
	Kill enemy armor and mechanized vehicles.	Kill enemy armor and mechanized vehicles.

Chart 5.

GROUND RECONNAISSANCE SCOUT FUNCTIONS

AIR CAVALRY TROOP	ATTACK HELICOPTER COMPANY	ACAT
Provide detailed ground reconnaissance.	Not applicable since there are not ground reconnaissance scouts in the organization.	Provide detailed ground reconnaissance.
Provide all weather 24-hour screen capability. Provide limited ground holding capability.		Provide all weather 24-hour screen capability. Provide limited ground holding capability.

Chart 6.

AIR CAVALRY TROOP	ATTACK HELICOPTER COMPANY
Operates on the flanks.	Usually used initially as a reserve force.
Complements ground cavalry.	Committed against massed threat.
Economy of force. Gains information on the enemy.	Timeliness is critical. Required to have the capability of sustained and massed committment.
Has a continuing 24-hour mission. Conducts special missions.	Has an on-call, 24-hour mission. Conducts aerial escort.

Chart 7.

Platoon Organization for Combat. The ACAP platoon leader has the option of employing his platoon as an entity or tailoring his organization into two or more teams, dependent on mission, asset availability, and sustainability. The platoon will normally be organized into two teams for reconnaissance missions (figure 2). Team A will consist of two aeroscouts, two attack helicopters, the aeroreconnaissance section, and the platoon headquarters. The platoon leader controls the platoon and serves as the leader of Team A. Team B consists of two aeroscouts and three attack helicopters. The attack helicopter section leader controls his attack helicopter, serves as the leader of Team B, and assists the platoon leader in controlling the platoon. This two-team organization permits the platoon leader to operate the platoon independently in an area, and provides him the capability to rotate teams for sustained operations.

A three-team organization can also be used (figure 3) if the platoon must perform reconnaissance and security missions over a broad area, over an extended front, over multiple routes, or over open terrain. Teams A and B would consist of two aeroscouts and two attack helicopters, and Team C would consist of the platoon headquarters, one attack helicopter, and the aeroreconnaissance section.

For antiarmor missions the platoon may be organized into three teams with the attack helicopters consolidated in Team C (figure 4). Teams A and B consist of two aeroscouts each. The platoon leader is free to move with either team. The aeroreconnaissance section can operate with a team, be "on-call" or be utilized as the platoon leader or as the troop commander desires.

For special missions, the platoon can be organized into any number of teams to best accomplish the particular special mission depending on the factors of mission, enemy, terrain,

time, and troops available (METT). The specific techniques of movement and actions on contact for the ACAP platoon are the same as those outlined in FM 17-50, *Attack Helicopter Operations,* pages 4-7 through 4-15, and FM 17-95,*Cavalry,* pages 4-17 through 4-21. Terrain flying will be the key tactic used. Team and platoon movement will incorporate traveling, traveling overwatch, and bounding overwatch. Actions on contact will include fire and maneuver.

Air Cavalry Attack Troop Organization

The air cavalry attack troop organization is shown in figure 5.

The troop is organized into a troop headquarters, a service platoon, a flight operations section, and four air cavalry attack platoons. The troop headquarters provides the command and control administrative support for the troop. The service platoon is divided into a maintenance section, an aircraft component repair section (formerly a direct support maintenance section), and supply section. This platoon provides all of the combat service support necessary to support the ACAT. The flight operations section controls the combat operations of the troop, performs liaison and coordination for tactical requirements, and coordinates related logistical and administrative support. The four ACAP platoons permit sufficient flexibility and combat power to perform the diverse missions that will be assigned to the ACAT. Four platoons provide the troop commander the flexibility to conduct sustained or massed operations in an attack helicopter mission role while simultaneously maintaining an air cavalry mission capability. Thus, depending upon the priorities assigned to the troop, the ACAT has the flexibility to handle a variety of missions.

Personnel

While at first glance the 296 personnel in the ACAT may cause some concern due to the relative size of the troop, it must be evaluated in light of current organizations and the capabilities possessed by the ACAT. The current air cavalry troop with scout observer augmentation contains 218 personnel, and the current attack helicopter company with scout observer augmentation contains 252 personnel, for a total of 470. When the ACAT organization is looked at in light of its increased capabilities, the personnel decrease is significant. Furthermore, the troop is commanded by a major with captains leading all of the platoons. The increased experience, training, and judgment of this leadership should be able to cope with the size of the unit. The overall force structure impact of ACAT implementation will result in an overall personnel and aircraft savings to the Army.

Aircraft

For purposes of comparison figure 6 shows the number of aircraft in the air cavalry troop, attack helicopter company, and the ACAT.

Again the increased flexibility and capabilities of the ACAT reflect increased effectiveness for the ACAT organization with 16 fewer aircraft. With the advent of the AAH and ASH in the force structure, it is envisioned that the current scout and attack aircraft would be replaced on a one-for-one-basis.

Force Structure Implications

A rapid analysis of the force structure implications of the ACAT shows

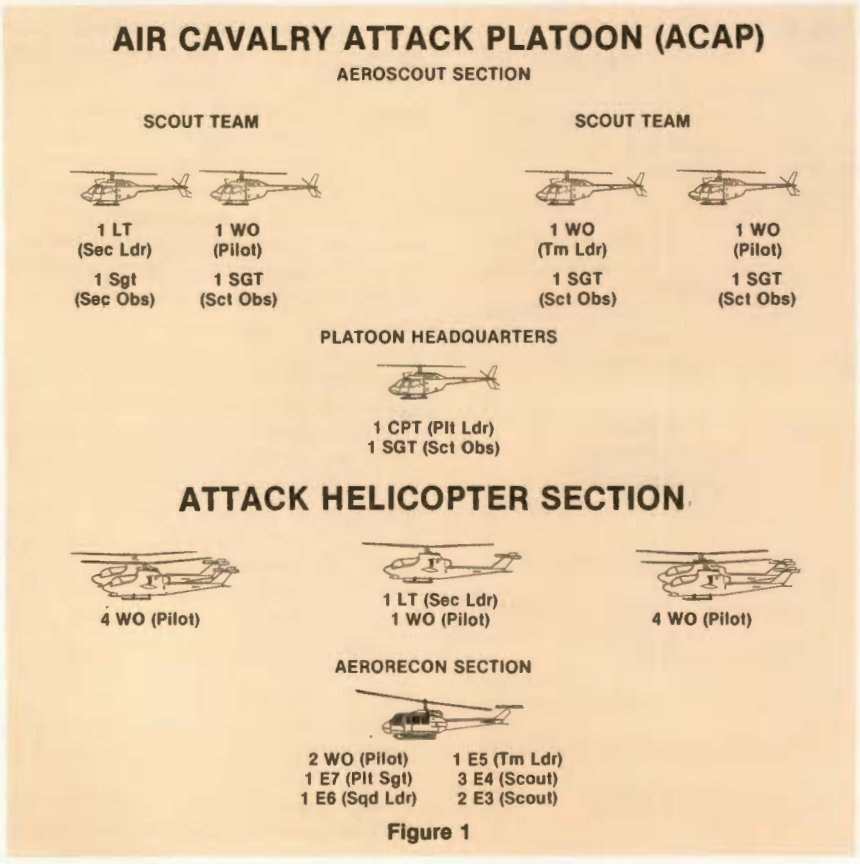


Figure 1

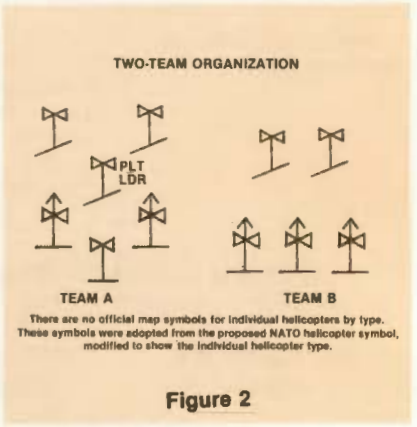


Figure 2

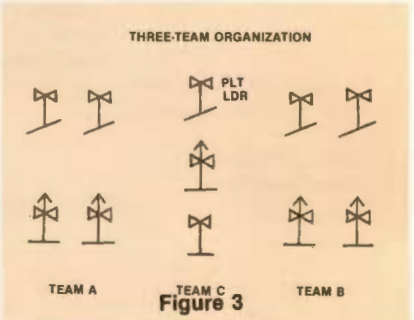


Figure 3

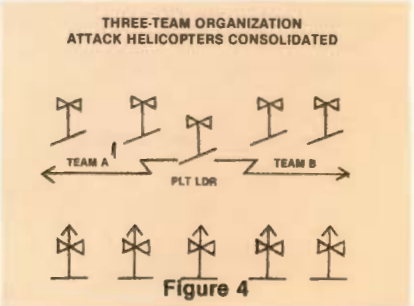


Figure 4

a substantial overall savings in personnel and aircraft. Figure 7 shows a comparison between the current approved force structure and a proposed ACAT structure. The savings of aircraft and personnel reflect only those personnel and aircraft found in a company or troop size unit and do not reflect personnel and aircraft savings which may result from squadron or battalion reorganizations or elimination. Figure 8 uses these personnel and aircraft savings and applies them to the proposed 16-division active duty force.

While this analysis has been purposely simplified for readability, an overall savings of more than 2,500 personnel and 70 aircraft is significant.

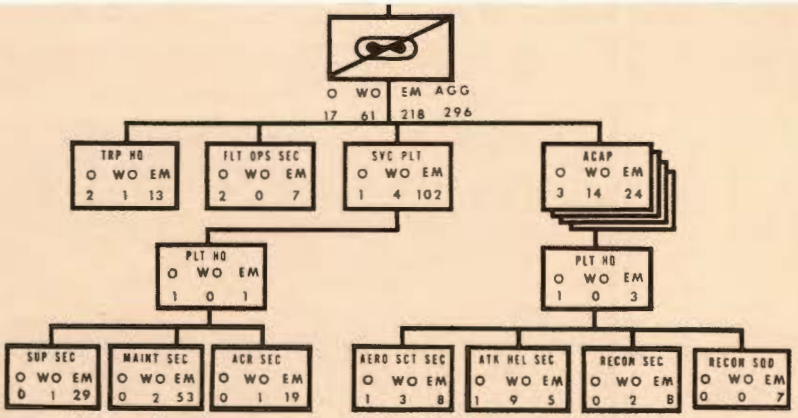


Figure 5

	Air CavalryTroop	Attack Helicopter Company	ACAT
Scouts	10	12	20
AH	9	21	20
UH	8	3	7
TOTAL	27	36	47

Figure 6

	AIR CAV TROOPS	ATK HEL CO	ACAT	PERSON-NEL	AIRCRAFT
Arm/Mech Div	1	2	2	-130	-5
ACR	1	1	1	-174	-16
Inf/Abn Div	3	1	3	-18	+24
Air Assault Div	3	3	3	-522	-48

Figure 7

	AIR CAV TROOPS	ATK HEL CO	ACAT	PERSON-NEL	AIRCRAFT
Arm/Mech Div	11	22	22	-1430	
ACR	3	3	3	-522	-48
ACCB	3	6	6	-390	-15
Inf/Abn Div	12	4	12	-72	+96
Air Assault Div	3	3	3	-522	-48
TOTALS	32	38 70	46	-2936	-70

Figure 8

Conclusion

The Air Cavalry Attack Troop shows great promise. A subjective analysis of the roles, missions, and functions for the ACAT logically leads to the proposed organization. There is still considerable analysis to be accomplished concerning personnel, equipment, training, costs, and effectiveness of the ACAT. The Armor Center is constantly looking for better organizations for the battlefield. The Air Cavalry Attack Troop (ACAT) may be Armor's aerial maneuver unit of the future designed to *find*, *fix*, and *destroy* the enemy. What do you think?

We're interested in the armor community's reaction to the proposed ACAT. Responses should be sent to:

U.S. Army Armor Center
ATTN: Director of Combat Developments (Studies Division)
Fort Knox, KY 40121

Captain Gordon E. Sayre, Jr. was commissioned in Armor upon graduation from the United States Military Academy. He has attended Ranger, Airborne, and Rotory Wing Flight Schools, the AH-1G Helicopter Transition Course, and is a 1975 graduate of the Armor Officer Advanced Course. He also earned an MS degree from USC. His assignments include duty as a platoon leader and company commander in a tank battalion, as a gunship section leader and operations officer of an Air Cavalry Troop, and as an assistant S-3 of an Air Cavalry Squadron. He is currently a project officer in the Studies Division, Directorate of Combat Developments, U.S. Army Armor Center.

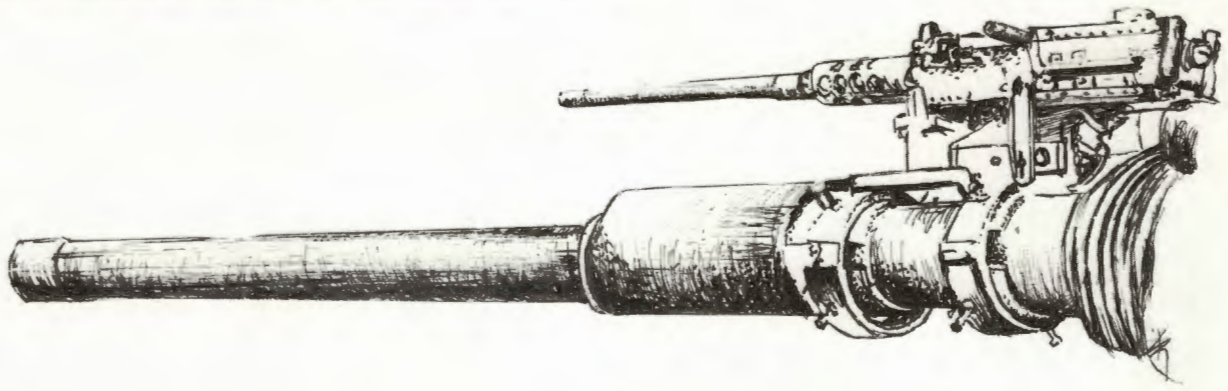
Recognition Quiz

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 57)

An Armored Cavalry Platoon

Subcaliber Table VP



by Maj. V. Paul Baerman

FM 17-12 provides tank platoons and sections with a unit sub-caliber exercise, Table VP. The table handles the requirements well for platoon engagements within armor units. However, the FM does not provide the armored cavalry platoon an exercise employing the full range of its firepower. I suggest that an armored cavalry platoon Table VP can encompass all the platoon's weaponry using existing sub-caliber devices. In fact, such a course has been designed and satisfactorily tested.

Let's set the scene as it unfolds within the divisional cavalry squadron at Fort Carson, Colo. The platoon leader is alerted, is given a troop operations order to occupy a blocking position, and is told to defend. He briefs his platoon, mounts his sub-caliber devices, and moves to and occupies the blocking position on the range. In the position the platoon zeros the *Brewster,* TOW, and *Dragon* sub-caliber devices and prepares the pneumatic mortar.

The range is generally built on a 1-35th scale, although that portion used for the pneumatic mortar is modified to meet its requirements. The sub-caliber range at Fort Carson is complete with towns, roads, and a river; and the platoon receives sufficient 1:50,000 maps of the range layout to meet its tactical needs.

The *Brewster* device is zeroed at 1,200-scale meters, the TOW device at 2,000-scale meters, and the *Dragon* device at 750-scale meters. (For more on the TOW and *Dragon* devices, see the May-June 78 issue of ARMOR.) Generally speaking the devices complement each other in range, just as the real weapons systems do. The TOW and *Dragon* devices, because of their small parallax error, will hit 1-35th-scale targets at scale ranges of from 1,200 to 2,800 meters and 500 to 1,000 meters respectively. The platoon leader thus must realistically plan for the employment of his direct fires, both laterally and in depth. He must employ those weapons whose ranges are compatible to the target distances and use his mortar to get those areas which are beyond direct fire range or in defilade.

A kicker is thrown in at this point. Once the devices are zeroed, the platoon receives only that amount of ammunition for its sub-caliber devices that corresponds to its basic load. The TOW receives only 10 rounds of *M-16* ammunition with 10 blast simulators, while the *Sheridan* is issued no more than 30. The platoon must carefully monitor its ammunition expenditure and pick its targets carefully or it will run out of ammunition. The platoon leader and his men quickly realize the importance of fire control, ammunition conservation, the usefulness of range cards, the logic behind stockpiling, and proper resupply requests.

How the exercise is actually conducted is up to the unit evaluating the platoon. One method that worked successfully was to hide both moving and stationary targets behind simulated woodlines cut out of E-type silouetts. Once the platoon leader had finished organizing his position the "woodlines" began to drop, exposing the targets. The battle was joined. At times as many targets as are in a full-strength reinforced motorized rifle or tank battalion were gradually presented as moving toward the blocking position. While crews were battling with *Sheridans,* TOW's, and *Dragons,* other scouts and infantry were calling in organic indirect mortar fire and sending reports to the platoon leader. Needless to say, the platoon leader was kept busy directing fires, assessing the situation, reporting, and arranging resupply.

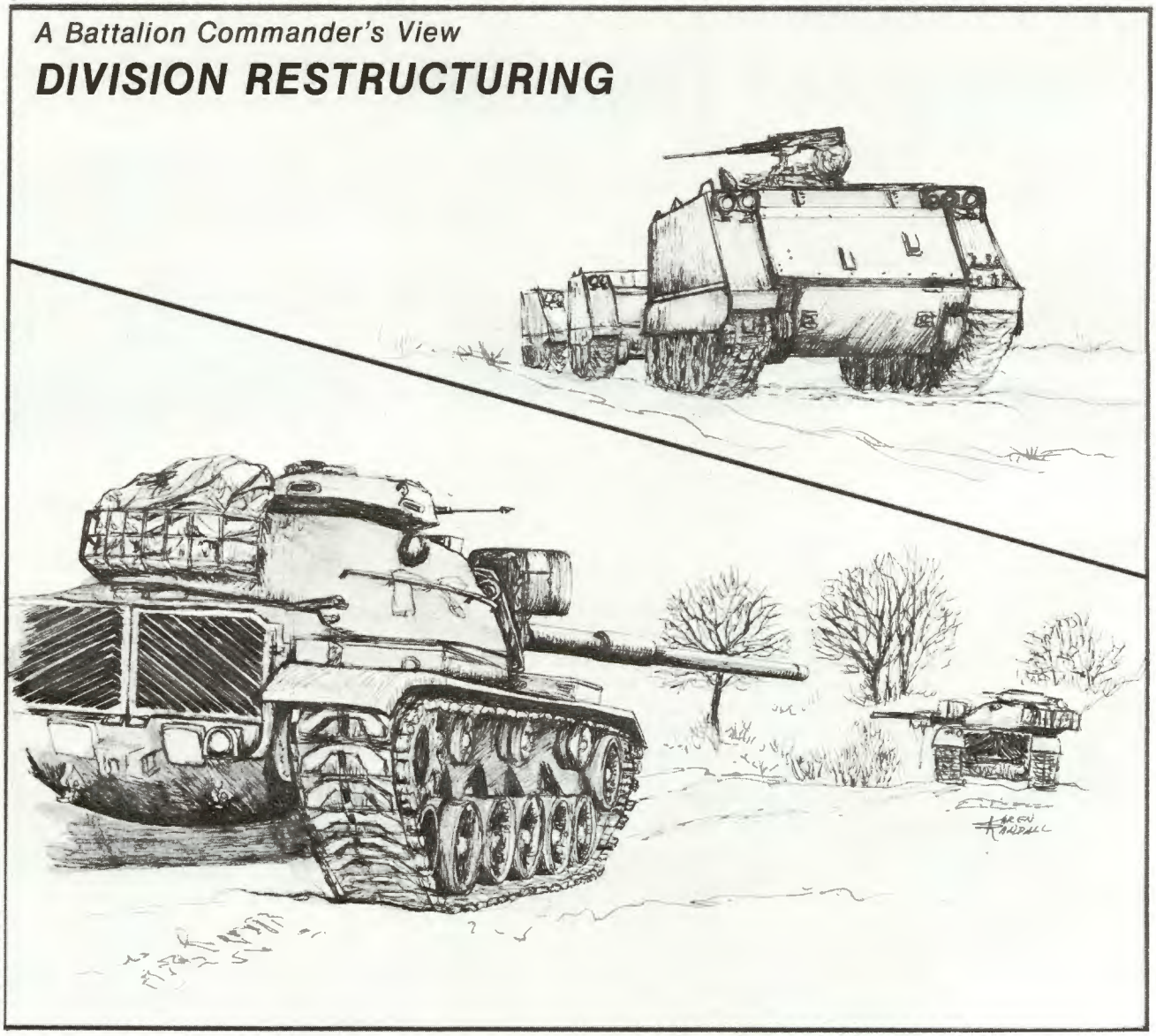
The comments from platoons that underwent the exercise have been uniformly positive. Especially noted by platoon members were the purposes of range cards, the importance of ammunition conservation, the knowledge gained of basic load and resupply, and the increase in confidence in their ability to fight outnumbered and win if they had done the proper preparation. Most platoons asked to have the exercise scheduled more frequently. Some crews were observed trying to scrounge more ammunition so they could fight their weapon longer.

Other variants of the exercise can include knocking out one or more friendly vehicles during the course of the battle, denying radio communications, causing the platoon to fire in a chemical environment or at night, and throwing simulators against the platoon to simulate incoming fire. Friendly scale models can also be added to the target array to check armored vehicle recognition.

What are the standards? Well, you can check the ARTEP manual for specifics, but we simplified the problem. If the unit ran out of bullets before all the enemy was destroyed, it lost. If the enemy was wiped out and the friendlies still had ammo, the platoon won! ▲

A Battalion Commander's View

DIVISION RESTRUCTURING



by Lt. Col. Richard F. Kolasheski

The Chief of Staff of the Army recently directed the conduct of a test to evaluate a new organization for our combat divisions. The experiment will test a variety of new concepts, primarily organizational, which are designed for better distribution and controls of combat power within the division. When viewed in their entirety, the concepts are quite revolutionary, touching almost every organizational element in the division. The concept features; a three-tank tank platoon; a redistribution of combat service support assets within the maneuver battalion; and a change in a fundamental tactical concept—cross attaching armor and mechanized elements no lower than battalion level, rather than at company level.

As revolutionary as these doctrinal changes appear, they are by no means original. The changes envisioned in the reorganized U.S. combat division are already a feature, either in whole or in part, of the tactical doctrine of a number of NATO and Soviet bloc armies. The French and Belgian armored forces for example, are organized into three-tank tank platoons. The German Army is in the process of reorganizing into the same platoon structure. The Soviets, on the other hand, are moving from the three-tank tank platoon to a bigger platoon. One can thus say, without fear of contradiction, that the concept of the optimal size of the tank platoon is dynamic.

What follows is a report of the experiences of one tank battalion, the 4th Battalion, 73d Armor, a part of the 1st Infantry Division Forward in Germany, of the organizational concepts that are being tested at Fort Hood, Texas. These experiences were gathered during two separate field training exercises that occurred in December 1976 and January 1977 in Germany.

This report is offered for two reasons. Foremost, it is a description of an innovative tactical exercise involving a combat tank battalion. Secondly, it is offered as a cautionary note to the planners and testers of the DRS. This

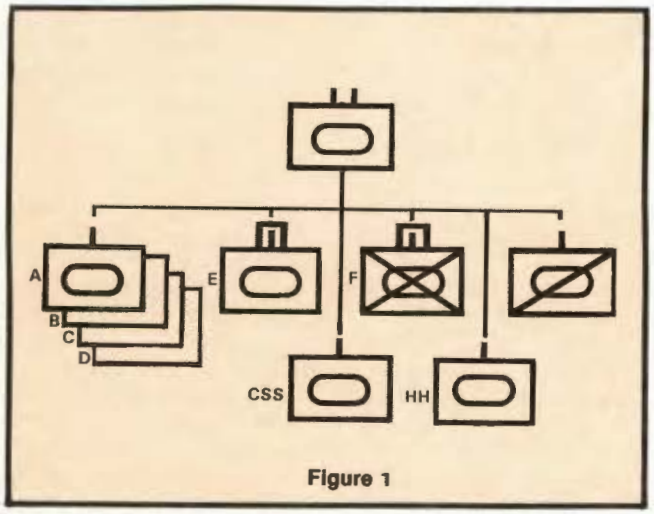


Figure 1

note is that the concept of a reorganized battalion is not without real-world problems that demand total objectivity in evaluation.

One mission supported two brigades of the 3d Infantry Division's task force (TF) level ARTEP's at Hohenfels Training Area during late November and December of 1976 as the opposing force, as well as providing tank companies for cross-attachment to the divisions mechanized battalions. In addition, the battalion was tasked to portray the opposing force during FTX POLAR GAUNTLET in central Bavaria from 17-23 January 1977.

In preparing for the mission, the battalion was faced with solving two primary requirements. First, it had to portray a Soviet bloc force against the tested TF's in strengths as high as 6 to 1. Secondly, it had to be prepared

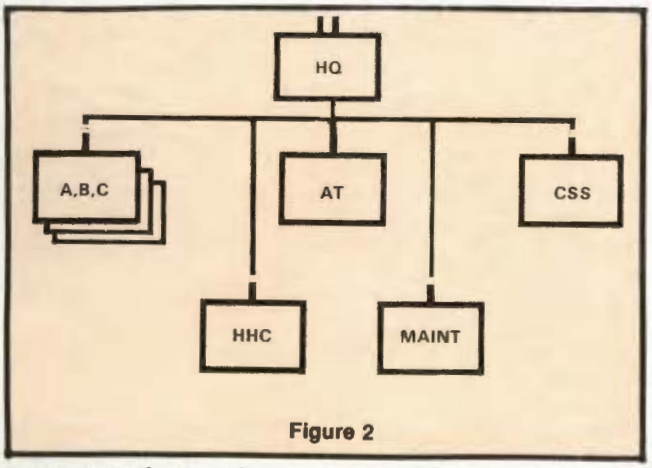


Figure 2

to react on short notice to a variety of unanticipated requirements involving tactical forces in a variety of sizes. In addition, there was the overriding requirement that the battalion maximize the training value it received from the 3-week Hohenfels period.

A series of planning meetings ensued to develop a method for bringing into harmony these sometime contradictory requirements. A decision to temporarily reorganize the battalion along the lines discussed in the Division Reorganization Study (DRS) emerged. It was felt that this would satisfy the requirements posed by the 3d Infantry Division relative to portraying a Soviet bloc force, and provide an increased number of tactical company level elements to provide the flexibility needed, and at the same time provide an excellent vehicle for "know your enemy" type training. The last bonus was that it would constitute a field evaluation, albeit a considerably limited and subjective one, of some of the key features of the DRS as it pertained to the tank battalion.

With the decision made to reorganize the battalion, we examined the DRS and developed a new battalion structure. At the same time, we developed a set of tactical guidelines to enable this reorganized battalion to operate in the fashion similar to that of an equivalent Soviet organization. The structure is shown in figure 1, showing several significant differences between this and the DRS battalion (figure 2). For one, it contains six as opposed to the traditional three maneuver companies. The organization of the tank companies is shown in figure 3 and the mechanized infantry company in figure 4. Significant in the company organization is the absence of any organic combat or combat service support. These are contained in the mortar company (figure 5), the combat service support company (figure 6), and the headquarters and headquarters (HHC) company. The HHC contained those elements of the battalion not assigned elsewhere (figure 7). Two other changes were the formation of a reconnaissance company (figure 8) that doubled as an antitank company and the formation of a mechanized-heavy team (figure 9)

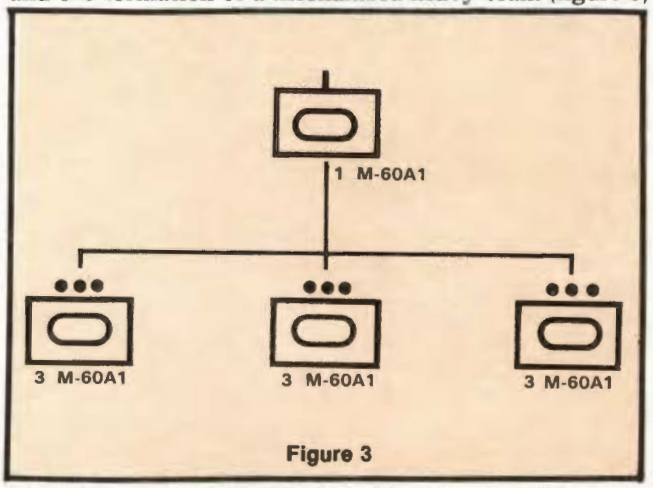


Figure 3

using the assets of an attached rifle company. The extra tank assets were made available by virtue of the attachment to the battalion of a three-tank tank platoon from the French 2d Cuirassier Regiment.

In the reorganization, major consideration was given to doing as little violence as possible to the normal organization. Thus, A, B, and C companies were formed from organic platoons. D and E companies were formed from the Headquarters Tank Section and excess line company platoons.

Because the major thrust of the experiment was to be on maneuver units, the A, B, and C company commanders

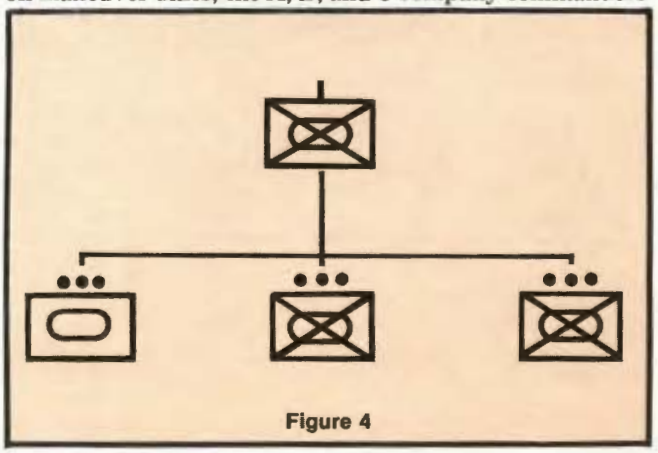


Figure 4

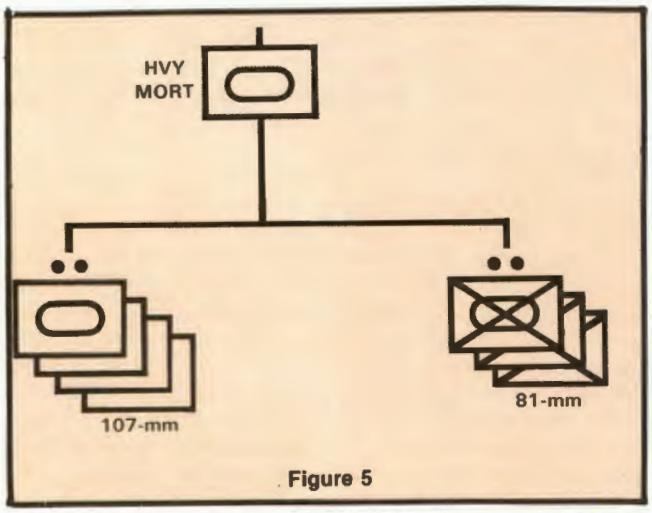


Figure 5

retained their executive officers and first sergeants. D and E company headquarters were staffed with the HHC and CSC commanders, executive officers, and first sergeants. The heavy mortar and reconnaissance companies were commanded by the mortar and scout platoon leaders, and the CSS company by the battalion S-4.

As the FTX developed, scenario events forced modification in the organization and mission of the combat support type companies; hence for all intents and purposes, they did not function as envisioned in the initial concept.

One thoroughly evaluated area of CSS was that of a consolidated maintenance organization. All maintenance assets of the battalion were placed in a maintenance platoon commanded by the battalion motor officer. To support the maneuver elements, this platoon (figure 10) was organized into six sections. An administrative section called the TAMPAC (TAMMS, PLL, and administrative center), was responsible for all administrative support, including spare parts control and resupply. The operating elements of the maintenance platoon were organized into three echelons and operated as shown in figure 11. The forward echelon, analogous to combat trains, was organized to perform the missions of recovery, evacuation, and quick-fix repair.

Evacuation was made from the combat zone to a covered location about 1 to 2 km behind the line of contact, where the problem could be diagnosed. If the vehicle could be repaired quickly without a great deal of effort, it was repaired. If a major effort was required, a recovery vehicle from the second echelon evacuated the vehicle to the second echelon work area, 4 to 8 km behind the line of contact where the field trains would normally be located.

Further analysis would be made at the second echelon to determine the exact problem. If the necessary work could be accomplished within 4 hours the work would be done and the vehicle returned to service. If extensive work was involved, a recovery vehicle from the third echelon would be brought forward to evacuate the vehicle to the base area.

The evacuation method used was selected because it insured a supply of recovery vehicles well forward, crewed by personnel who were familiar with the terrain and general location of the maneuver elements.

The first excercise this reorganized force took part in began on 1 December 1976. The Hohenfels terrain varies from wide, open valleys ideal for armor to heavily-wooded, steep hills that are virtually impassable to tanks. Initially the ground was covered with a 4-inch layer of mud, which with a weather change, froze and was covered with 4-inches of snow. Temperatures at night, toward the end of the exercise period, fell into the teens. Visibility throughout the period was limited because of snow, heavy fog, and the extensive use of jeep-mounted smoke generators.

The excercise scenario involved the execution of five tasks by the tested battalion:

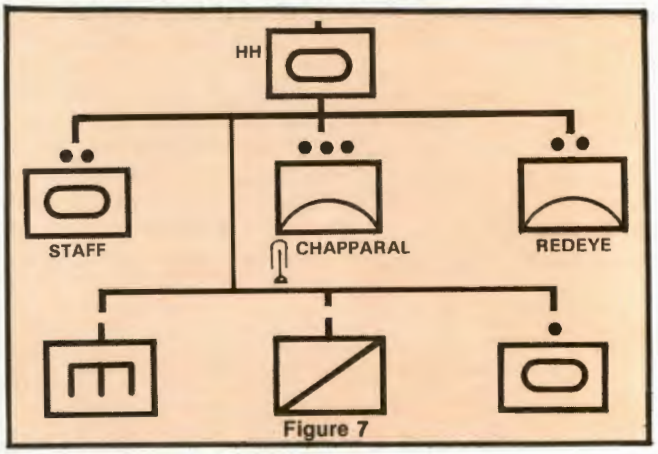


Figure 7

- A road march and occupation of an assembly area
- Execution of the active defense
- Conduct of a limited counterattack
- A delay
- Organization and conduct of a deliberate battle position (DBP)

As the opposing force, we were required to perform a series of offensive operations. These varied from large-scale massed attacks to initiate the active defense and cause execution of the DBP to small, company-sized probes to test the conduct of the active defense and the delay.

For FTX POLAR GAUNTLET, the scenario differed slightly and the distances were considerably greater, but the battalion was still primarily involved in offensive operations. Thus, any evaluation of the reorganized battalion considers objectively only its functioning in an offensive situation. Any thoughts on its viability in the defense are subjective.

How were these evaluations arrived at? The primary vehicle for the accumulation of opinions on the experiment was a series of seminars where the pros and cons of the reorganized battalion were discussed. The last of these was held at the conclusion of both exercises in mid-February with all the officers of the battalion submitting their thoughts in writing and orally during an officers class.

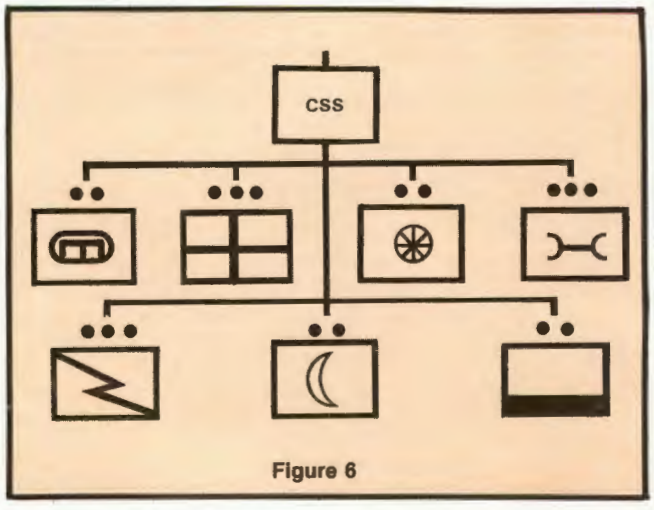


Figure 6

What observations emerged from the experiment regarding the three-tank platoons? First and foremost, was the obvious one that the smaller platoon is easier to control. Some commanders even felt initially that the smaller platoon could operate without radios, but this was found not to be the case. This became quite apparent during the periods of reduced visibility when the battalion conducted extensive offensive operations. One outstanding example of this was our supported, illuminated night attack conducted against two company-sized elements of one of the tested task forces. Control at the company level was such that the attacking elements almost overran the task forces before they were discovered and the illumination used. One innovative feature of the attack was the use of the battalion radar section to locate enemy positions and provide vectors for the illuminating tanks. This enabled the searchlight tanks to blind a number of task force tanks with the initial burst of light.

The second unanimous observation was that battle drill at the platoon level is less complex since the platoon is not split into sections, and the platoon leader can normally see all of his tanks. The platoon always must move as a unit and depend on the company commander to provide over-

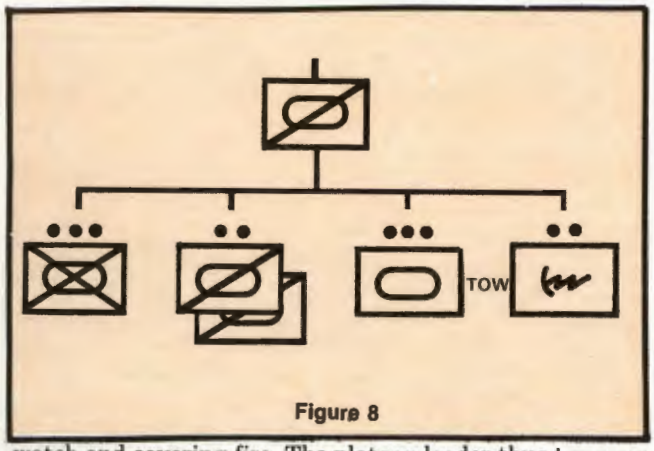


Figure 8

watch and covering fire. The platoon leader thus becomes a fire leader only, with all maneuver controlled by the company commander. The smaller platoon and company are easier to conceal and can move over smaller areas with great speed.

Countering these advantages is the presence of those factors lost when the tank company is cut by one-third. There is the obvious loss of firepower which in the event of a combat or maintenance loss becomes greatly magnified. The loss of one tank from a five-tank tank platoon represents a loss of only 20 percent of the firepower and still leaves the platoon leader two two-tank sections. In the three-tank platoon, the loss of one tank is a 33 percent loss in firepower—a considerably greater loss. This situation also exists at the company and battalion levels with the smaller number of combat vehicles reducing both the organization's capability as well as the flexibility with which it can be employed.

Another impact was that of the perception that commanders had of their role. Platoon leaders felt that the three-tank tank platoon did not need an officer platoon leader, and it could be led quite easily by a noncommissioned officer.

The same effect was observed at the company level, but to a greater degree. Here the company commander found himself commanding only 10 tanks—no maintenance section, no mess, and no administrative sections. He perceived his role degraded and questioned if his knowledge and experience were needed to command a company composed

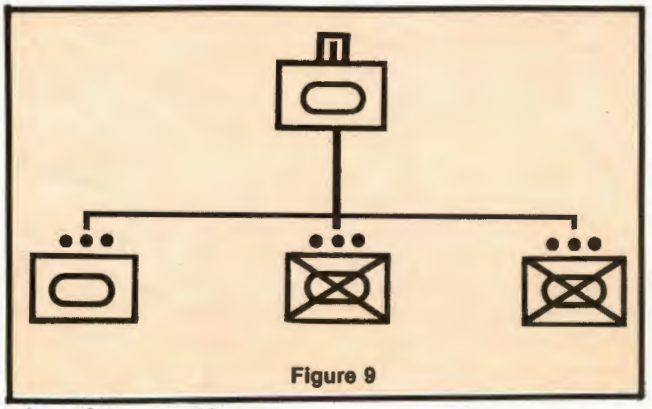


Figure 9

of, at the most, 50 men.

As indicated earlier, the 4-73 Armor also tested one of the logistical features of the DRS—that of a centralized concept of maintenance support. The maintenance assets of the entire battalion were organized into a maintenance platoon as indicated in figure 10, and were deployed in echelons.

Unlike the mixed reviews received for the tactical concepts, the consolidated maintenance operation met with unanimous approval. From the customer's point of view, it provided responsive service without the normal overhead cost of tying up a first sergeant or an executive officer in full time exclusive management of maintenance.

From the maintenance management point of view, its great advantage lies in the ability of the organization to cross-level work loads among all maintenance personnel. Company C was equipped with all new tanks several months prior to the exercise, and as a result, its maintenance workload was very low. Company B, on the other hand, had older tanks and a resultant bigger workload. Without consolidation, the Company B maintenance section would have been completely overloaded and the Company C section underworked. With the consolidated operation, both sections performed an equal share of the workload.

In spite of the use of the term *consolidation*, the maintenance platoon leader was careful in organizing his echelons to maintain, insofar as possible, a degree of section integrity. This was necessary from both a personnel management point of view—to insure that normal interpersonal relationships were not violated—as well as from an organizational point of view. The latter was necessitated by the requirement to give up, on two occasions, companies of the battalion for attachment to mechanized infantry battalions. Careful structuring of the maintenance platoon enabled accomplishment with

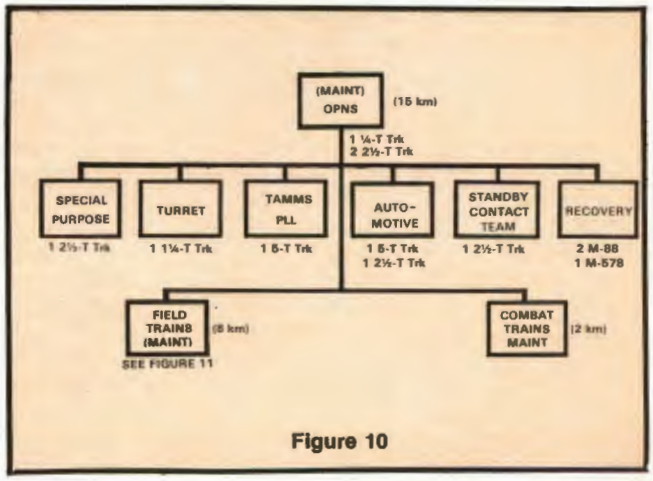


Figure 10

minimum disruption of the consolidated operation when a company maintenance team was spun off.

PLL management was greatly enhanced with the use of the TAMPAC. This centralized, under one motor sergeant's supervision, both the TAMMS and PLL functions. Demands for parts were first placed against the PLL for the parent unit of the tank requiring it. If the part was at zero balance in the parent unit, the other PLL's were checked. If available elsewhere, the requisition was filled and the demand adjusted accordingly. If the part was not stocked in the parent unit PLL, but was carried in another unit's PLL, the requisition was filled and an addition made to the parent unit PLL. This caused some problems intially with units which had well maintained and stocked PLL's. However, the problem disappeared when the parts clerks realized it was a two-way street. The system worked to their advantage as well as their seeming disadvantage.

Observations

As alluded to previously, the smaller platoons and companies lead to problems in role perception on the part of the leaders. A 12-man platoon and a 50-man company just don't offer the challenge larger units do. The answer to this is *yes,* but they will be busier on the modern battlefield and this will offset the decreased size. If that is accepted, how can the size of the cavalry troop now expanding to 192 personnel, and the platoon to 40 personnel, be commanded with no difficulty by those same captains and lieutenants? What of the role of the commander in garrison? What will his duties be when he has virtually no administration and logistics responsibilities? Can he find sufficient challenge in doing only training with his 10 and 50 men?

These questions are not posed lightly. They are based not only on the reactions of the 4-73 Armor, but also on observations and conversations with officers of foreign units, whose company and battalion commanders express a degree of dissatisfaction with the reduction in their duties and responsibilities.

In considering the smaller combat formation, recognition must be given to the question of the level at which the reorganization stops. This is an extremely critical question because on it turns the question of the role and mission of the smaller unit. Thus, will a DRS brigade still be composed of three to five battalions, and will it be expected to cover the same amount of terrain today's much larger brigade covers? It obviously cannot with a one-third reduction in combat power. If this is the case, how then do we assure the optimum amount of combat power in a given sector? Do we add battalions to the brigade or do we employ two brigades? In any event, the span of control of a commander for brigade and division commanders is extended. Accordingly, there is a concomitant increase in the problem of command and control in a tactical situation that, according to the new tactical doctrine, is to be extremely fluid. Thus, we do accomplish one of the major goals of the DRS, that of simplifying the jobs of lower echelon leaders, but have we in solving this problem, generated a new one for higher level commanders? This is a key issue in the DRS that must be examined thoroughly. The higher the level of command, the greater the reliance on electronic and other indirect means of communication. Will these means be available on a confused battlefield? Or would we be better off leaving the greater span of control at a low level where there are a greater variety of means of communication available to facilitate command and control—visual signals as well as electronic means.

Another major area of concern is the conceptual change in the creation of the combined arms team at company level. It will be eliminated in the new division to simplify the type weapon systems the captain will employ. This may be fine from a theoretical point of view, but the dictates of terrain and enemy capabilities point in the direction of continued mixing of infantry and armor at company level. The armed helicopters and the antitank guided missiles (ATGM) force tanks into wooded areas where they can obtain concealment. The enemy, realizing this (as did the 101st Airmobile Division on REFORGER 76) places tank-killer teams in those same woods. Without infantry in the woods, the tanks are doomed. One can say, "Well, the battalion has infantry assets available; why not use them?" They would, but assuming an advance over several routes, there is a requirement for several groups of infantry operating in close coordination with armor. Logic dictates that rather than being controlled by the battalion, their control must be given to the man with whom they are working—the tank company commander.

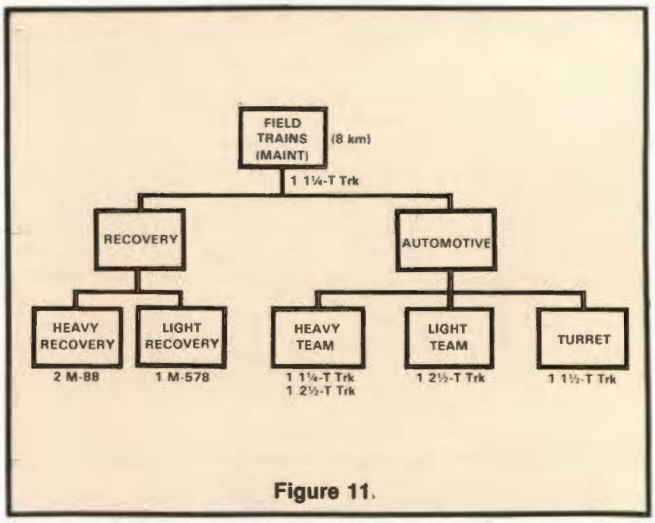


Figure 11.

One can again contrast this with the proposed new cavalry organization that will place tanks, TOW's, mortars, and motorcycle mounted scouts in the troop. How can the same captain employ that mixed bag of weapons systems?

One additional observation made by many of the officers concerned itself with the relationship between the unit's organization, the governing tactical concepts, and the most likely wartime mission for the unit. The U.S. Army in Europe has defense as its most likely mission. To this end, we have changed our tactical concepts to heavily emphasize defensive maneuver—*the active defense.* This envisions a highly decentralized battlefield where flexibility is one of the key characteristics of execution. One can, I think, very easily draw an analogy between the active defense battle and the naval and air battle. This would require, it appears, the placement of a broad spectrum of firepower systems at the disposal of as low a level commander as possible.

The truly integrated battle position would thus have ATGM's for long-range engagement of enemy tanks, tank guns for midrange engagement for covering fire and movement, short-range antitank weapons for periods of limited visibility that permit enemy closure on the position, and to cover movement of tanks through close wooded areas. With the DRS we appear to be going in the opposite direction. We are structuring our organization in a fashion that makes companies homogeneous in terms of

weapons systems; a pure tank company; a pure ATGM company; and a pure rifle company. While this may simplify the company commander's job, it does complicate the battalion commander's job, his staff resources notwithstanding, to an extreme degree.

In essence, it appears that our tactical and our organizational concepts are moving in opposite directions. The active defense requires decentralization of control and mixing of systems. The DRS is trying to centralize control and separate systems. The DRS is a good offensive organization as evidenced by the 4-73 Armor's success with it. It is not, however, a good defensive one, contradicting as it does many of the fundamental concepts of defensive warfare.

It might be added parenthetically that we may be looking at the Israeli experience in the 1973 war in too uncritical a fashion when we use their organization and tactics as a model for reorganizing our forces. One need only contrast the terrain in the Sinai with that of Western Europe to understand the fact that something which is a highly desirable tactical technique or formation in one is totally inappropriate for the other.

The final concept evaluated was that of the battalion centralized maintenance platoon. Our conclusion was that it is a feasible way of operating at battalion level. Two caveats are in order. The first is that it must be well managed and second, that it must be structured so that a certain degree of section integrity is maintained. The latter is necessary because of the requirement to detach companies. Under the DRS concept of no cross-attachment at company level this problem disappears, but as pointed out earlier, it is felt that cross-attachment must continue to be a fundamental concept of the way the U.S. Army organizes for combat.

How Will We Fare?

The last question that this field problem permitted us to answer was how will the current U.S. force structure, battalion task forces in this case, fare against a Soviet-type force? *Not as well as might have been expected.* This occurred not because of a problem with the units, but primarily because of organizational and tactical concepts that the units were operating under.

The active defense is a good concept; however, decision making must be decentralized for it to work. The platoon leader or company commander on the battle position must be able to control his movement. If he cannot, he can and will become decisively engaged and destroyed by a numerically superior force. If he is permitted to move when he has done the maximum damage to the enemy, he can save his unit and occupy another position and if the task force area is properly organized, another team is in position to take up the force of the enemy attack, continue attrition of the enemy, and cover the movement of the first element.

The key thing that the task force commander must know is the exact situation on the ground. Only in this way can he deploy and maneuver his unengaged forces to destroy the enemy. His principal concern should be the fight at the next battle position and not so much the one that is currently underway. One can carry this analogy up to brigade level where the same principle must hold true.

The second weakness observed had to do with the density and type of antitank weapons in the current inventory. The bulk of the ARTEP's were conducted under conditions of poor visibility. A great part of the time, the long range antitank weapons, *M-60A1, M-60A2,* and TOW's were limited to 200-300 meters of range. Situations occurred repeatedly where TOW and *M-60A2* tank sections were confronted with a Soviet-type tank company at ranges of less than 300 meters. The best that these crews could hope for was firing one missile before they were literally run over or destroyed. The *Dragon* crews faced essentially the same problems. The *M-60A1's* stood a slightly better chance because of their rate of fire.

What is needed, and quickly, is a rapid fire antitank capability for short and midranges, 100-1,000 meters. Targets do not generally present themselves, either because of terrain or visibility conditions, with any degree of frequency at ranges beyond 1,000 meters in Europe.

A *LAW*-type weapon is what is needed; however, one that meets the range criteria mentioned above, and it must be issued in much greater densities than the *LAW*—three per 5-men in the mechanized battalion.

If we are going to talk about fighting against 6 to 1 odds, then we must insure that regardless of conditions, we can fight at these odds. If the enemy attacks under visibility conditions of 300 meters, we must be able to service the particular density of targets in the time it takes to close on the defensive position from that distance. Our current and proposed antitank weapons do not appear to give us those capabilities.

Conclusions

These then are the results of a relatively unscientific test of several features of the DRS and the current organization and tactics conducted by one tank battalion in Europe. The conclusions are those arrived at by soldiers who tested the concepts in the course of accomplishing a real-world mission as opposed to the traditional method of a test unit attempting to validate a new concept. This is certainly a factor that must be considered in evaluating the 4-73 Armor's conclusions.

Simply stated, our conclusions are four in number.

- The small tank platoon is a good offensive formation, but it does not appear to adequately support the new defensive tavtics.
- The concept of the Combined Arms Team at company level must be retained.
- The concept of consolidating or collocating administrative and logistical functions at battalion level for management purposes is viable and leads to significant efficiencies.
- The current mix of antitank weapons does not provide an adequate defensive capability to counter a superior armor force in conditions of limited visibility.

LTC RICHARD F. KOLASHESKI is presently Chief, Program and Budget Office, ODCSOPS, HQ USAREUR. At the time the article was written, he was Commander of the 4-73d Armor. Previous assignments include duty in the R & D Directorate USACSC, and troop duty in the 4 Armored and 82d Airborne Divisions. He is a graduate of C&GSC and holds MBA and PhD degrees in Management from the University of Georgia.

FUTURE INFANTRY ARMORED VEHIC

by Richard M. Ogorkiewicz

In the early days of tanks some of their leading exponents imagined that tanks alone would be able to win battles and advocated the employment of "all-tank" armored formations. But World War II proved them wrong and since then, in spite of occasional lapses, it has been generally agreed that tanks need to be combined with infantry and other arms.

To put this combination into effect requires equipping the infantry with vehicles that can keep up with the tanks on the battlefield. Considerable effort has been devoted, therefore, to the development of suitable vehicles—much of it directed at making them as mobile as tanks in the automotive sense. This has been achieved to a degree, but

LES

Marder infantry combat vehicle of the Federal German Army. (Photo courtesy *MaK*)

TAM battle tank developed for the Argentinian Army by the Thyssen Henschel Co. from the basis of the *Marder* infantry combat vehicle.

in other respects infantry armored vehicles need to be further developed to enable them to operate alongside tanks.

The most obvious deficiency of all the armored vehicles produced for the infantry so far is that their battlefield mobility—as distinct from their automotive mobility—is inferior to that of tanks. This is particularly true in relation to the new generation of battle tanks, the *XM-1,* the German *Leopard 2,* and the *Shir* produced in Britain for Iran.

New armorplate makes tanks even less vulnerable to many weapons and they will, therefore, be able to maneuver much more freely on the battlefield than any of the existing infantry vehicles, which have much lighter armor of the traditional kind. In other words, the new tanks will have much greater battlefield mobility, because this is a function of armor protection as well as automotive performance. For the same reason the battlefield mobility of infantry vehicles is considerably lower even when they can move at the same speed as tanks over various types of terrain, since they cannot do it equally well in the face of heavy hostile fire.

To equal or even to approach the battlefield mobility of tanks, infantry vehicles need to be better armored. The need for this began to emerge some time ago, even before the advent of special armor, although the latter has greatly strengthened it. For example, 4 years ago this writer commented that mechanized infantry combat vehicles "should logically be provided with the same degree of armor protection as battle tanks" (*ARMOR,* September-October, 1974, page 19). More recently, Philip Karber brought out another facet of the same basic problem, namely the concern of the Soviet Army about the vulnerability of its lightly armored infantry vehicle, the *BMP* (*ARMOR,* November-December, 1976, pages 10-14).

Any significant improvement in the armor protection of infantry vehicles can only be achieved by major changes in their design. In particular, they need to be considerably heavier than they are at present—probably about as heavy as battle tanks.

As it is, one infantry armored vehicle, the German

VCTP (or *VCI*) infantry combat vehicle built by Thyssen Henschel for the Argentinian Army which has the same basic chassis as the *TAM* battle tank. Photo courtesy *Thyssen Henschel)*

Marder, is already within a few tons of contemporary battle tanks, weighing 28.2 metric tons (62,000 lb.). Because it is heavier than other infantry vehicles, the *Marder* is relatively well-protected. Nevertheless, its armor does not compare with that of battle tanks and any attempt to improve its protection would inevitably increase its weight to their level.

In view of this, it would be logical to base future heavy infantry armored vehicles on the same chassis as battle tanks. This would obviously allow their weight to be increased and, because they would then carry more armor, their survivability would improve considerably. In addition the development of heavy infantry vehicles (HIV) on the chassis of battle tanks would offer considerable advantages from the point of view of logistics.

These advantages are already being exploited by the Argentinian Army, which plans to procure a tank and an armored infantry vehicle based on a common chassis. The two vehicles are the *TAM,* or *Tanque Argentino Mediano,* and the *Vehiculo Combate Infanteria,* (VCI), both developed in Germany on the *Marder* chassis. Because the weight of both vehicles has been kept within 30 metric tons, neither can be very heavily armored. To this extent, therefore, they fall short of what can now be done to increase the survivability of tanks and armored infantry vehicles. But the *TAM* and the *VCI* clearly demonstrate the possibility of producing the two types of vehicles on a common chassis.

SAVIEM VAB six-wheeled armored carrier adopted recently by the French Army. (Photo courtesy *SAVIEM)*

Begleitpanzer, or accompanying tank, with dual-purpose 57-mm gun built by the Thyssen Henschel and Bofors Companies. Photo courtesy *(Thyssen Henschel)*

In addition to the logistics advantages, the development of tanks and HIV's with a common chassis also offers important operational advantages. In particular, it would lead to more effective combined arms units, since their principal vehicles would no longer differ in their battlefield mobility, as well as in other respects.

Armament Options

Although the ultimate justification for the development of any armored vehicle for the infantry must be its ability to deliver infantrymen for dismounted action, it must also possess some capability for mounted combat. This implies the mounting of armament which, at least, enables it to fight on the move against hostile infantrymen, particularly in ambushes.

The minimum requirement this represents can be met by a rifle-caliber machinegun mounted in a small, one man turret. Examples of this are provided by several armored personnel carriers (APC) currently in use, from the six-wheeled British *Saracen* to the much more recently developed tracked Soviet *MT-LB.*

However, there is now general agreement that infantry vehicles should carry more powerful armament, so that they can engage light armored vehicles and slow, low-flying aircraft. In most cases this has led to the installation of 20-mm cannons. Examples range from the *Marder* and the French *AMX-10 P* to the new Yugoslav *M-980.*

The installation of 20-mm automatic cannons has increased the capabilities of infantry vehicles and given them some offensive capability. But 20-mm cannons are no longer considered powerful enough for future vehicles. In fact, the Netherlands has already begun to field a derivative of the *M-113* developed under the designation of *Armored Infantry Fighting Vehicle* (AIFV) armed with a turret-mounted 25-mm cannon. A 25-mm has also been adopted by the U.S. Army for the latest development of the *XM-723* MICV—the Infantry Fighting Vehicle (IFV). However, an even bigger caliber is considered necessary by the German Army, which began to investigate the possibility of rearming the *Marder* with the 35-mm cannon.

An alternative approach to the armament of infantry vehicles is to arm them with low to medium-velocity, medium-caliber guns. The prime example of this is the Soviet *BMP,* which is armed with a low-velocity, smoothbore 73-mm gun. A more powerful, but generally similar, form of armament has also been proposed in Italy for the experimental O-F 24 *Tifone,* a 50,000-lb. infantry combat vehicle *(ICV)* originally developed in Switzerland to the same specifications as the German *Marder.* The Italians propose to fit it with the British *Scorpion's* two-man 76-mm gun turret.

The most recent addition to medium-caliber, low-velocity weapons suitable for infantry vehicles is the 81-mm "gun-mortar" developed in France. This breech-loaded mortar can fire all standard 81-mm mortar bombs as well as a special armor-piercing, fin-stabalized projectile. It has been mounted in the turret of the new French *EMC-81* six-wheeled, armored, fire-support vehicle (FSV).

Dual Purpose Guns

Medium-caliber weapons like the 81-mm gun-mortar can deliver effective high explosive (HE) fire and thus complement the fire of tanks, especially against hostile infantry. However, their rate of fire and relatively low muzzle velocity limit their effectiveness against mobile armored targets. What is more, they are incapable of engaging aerial targets, so they cannot support tanks against them. On the other hand, small-caliber automatic cannons are not considered effective enough against future vehicles, in spite of their high muzzle velocity and high rate of fire.

This leads to the question of whether future infantry vehicles should be armed with automatic dual-purpose guns of an intermediate caliber. These would fire much more effective HE and armor-piercing projectiles than 20-, 25- or even 35-mm cannons. At the same time their muzzle velocity would make them more effective against mobile ground targets and they could also engage helicopters.

A gun of this kind has, in fact, been mounted recently in the *Begleitpanzer 57-mm,* or 57-mm gun "Accompanying Tank," built by Germany in collaboration with Sweden. This very interesting 63,000-lb. test bed vehicle consists of a *Marder* chassis with a special, two-man turret mounting an adaptation of Bofors' 57-mm dual-purpose naval gun designed for use against both surface and air targets.

The 57-mm Bofors is fully automatic and can fire HE and high-velocity, armor-piercing projectiles against ground targets. It can also be elevated to +45 degrees to engage low-flying aircraft, with its proximity-fuzed ammunition.

The *Begleitpanzer 57-mm* is also fitted with a TOW antitank missile launcher which increases its antitank capability, but it is not considered to be unique, since antitank guided missiles can always be mounted on any ICV.

As an alternative to the intermediate-caliber gun and missile combination, HIV's could be armed with even larger caliber automatic weapons than the 57-mm Bofors. One such weapon is the new, experimental, high-performance 75-mm gun developed by the United States.

Questionable Hybrids

The possibility of arming ICV's with such powerful weapons opens the way to the development of a new type of multipurpose armored vehicle. In particular, such vehicles could combine high-performance guns of up to 75-mm with improved armor protection comparable to that of battle tanks.

In consequence, they could be used offensively, like tanks, and provide tanks with much needed supporting fire to relieve them of the task of destroying hostile light armored vehicles, so that they could concentrate on hostile battle tanks. At the same time, the ICV's could fulfill the traditional role of infantry vehicles—carrying infantrymen for dismounted action.

However, it is doubtful that such multipurpose vehicles would be as effective as they might appear at first sight. They certainly would not be efficient as infantry carriers because high-performance guns of 57-mm or more, inevitably take up considerable space within a vehicle, which can only be provided at the expense of the infantrymen. For example, the experimental conversion of the *Marder* into the *Begleitpanzer 57-mm* has reduced the number of riflemen it can carry from seven to only three.

Larger multipurpose vehicles, mounted on battle tank chassis, could possibly accommodate up to six riflemen in a cramped crew compartment. But this would result in their internal space requirements being about 50 percent greater than those of battle tanks, which would make

them larger and also heavier if they had a comparable amount of armor protection. Moreover, heavy multipurpose gun/infantry vehicles would not only present large targets but they would also place at risk two to three times as many men per mounted combat mission as battle tanks.

All this leads to the conclusion that an attempt to develop a multipurpose gun/infantry vehicle would only result in an unsatisfactory hybrid, a vehicle which was neither as good as a tank for mounted combat, nor effective at carrying infantrymen for dismounted action.

Heavy Infantry Vehicles

In consequence, the HIV should remain what any infantry vehicle worth calling the name must always be, a vehicle primarily to carry infantrymen for dismounted action. There is certainly a need for such a vehicle, since nothing can replace the capabilities of infantrymen on foot. At the same time, the infantrymen deserve the same degree of protection as tank crews if they are to ride close to tanks.

The development of HIV's to carry infantrymen for dismounted action does not preclude their having effective armament. Weapons for self-defense are essential; however, such weapons would not have to be larger than cannons of 35-mm, which could be accommodated with a moderate amount of ammunition without degrading the primary capabilities of the infantry vehicles.

Alternatively, the HIV's could mount gun-mortars, like the *Hotchkiss-Brandt 81-mm.* With these they could not only defend themselves but also support tanks with indirect fire. But they could not be expected to deliver direct fire or to assault like tanks, which would expose eight or nine men per vehicle to direct hostile fire when only three or four are involved in a tank.

Fire Support Vehicle

The direct fire support which might be given to tanks by the multipurpose gun/infantry vehicle could still be provided, and more effectively, by another type of vehicle.

Like the HIV, this direct FSV could also be built on the chassis of battle tanks and have a comparable degree of armor protection. But its crew would be no larger than that of a battle tank. The direct FSV could, in fact, be a tank mounting a different type of main armament. But, whether it was built by modifying a battle tank or not, it could only be justified if its armament could outperform the standard tank gun in some important roles.

There are three roles which standard tank guns cannot perform well, if at all. The first is to deliver a heavy volume of suppressive fire, particularly against hostile infantry antitank weapon teams. The second is to deal with large numbers of light armored vehicles, for which they are generally far more powerful than necessary. The third is to engage hostile attack helicopters.

The FSV could effectively fulfill all three of these roles if it were armed with a single dual-purpose automatic gun like the Bofors 57-mm or twin cannons of 30- or 35-mm. In the latter case it would resemble the division air defense vehicles currently under development and other antiaircraft tanks. It could even be a simplified, more heavily armored version of one of them.

However, whether the FSV is developed from a battle tank, a *flakpanzer,* or some other vehicle, it would be a well-armored, automatic-weapons vehicle, capable of engaging both ground and air targets. It is interesting to recall that the need for such an "antiaircraft/automatic-weapon tank" was already indicated on these pages, by the writer, 22 years ago (ARMOR, November-December, 1956, page 44).

Complementary Light Infantry Vehicle

Any HIV would inevitably be expensive and its number would be limited by budgetary constraints. However, it would not be required in the numbers in which some of the current armored carriers are used, because its employment would only make sense in close combination with tanks. In fact, it would only be fully justified when employed in combined-arms units. All other units would be better served by another type of armored infantry vehicle.

In particular, infantry units which are not closely combined with tanks, but which generally operate on foot by themselves, do not require an HIV. What they need, instead, is a fast armored carrier to move them to or from the scene of their operation. Such a vehicle still has to mount some armament for self-defense, but it does not need heavy armor and it can, therefore, be relatively light. The same applies to many other roles in which armored carriers are employed.

Conclusion

This leads to the conclusion that there is a need for a lighter, simpler, and less expensive armored vehicle to complement the HIV. Being less expensive, it could be procured in sufficiently large numbers and yet it should be entirely adequate for its proper roles, which exclude close battlefield cooperation with tanks, for which an HIV is necessary.

The actual configuration of the complementary light infantry vehicle could take the form of a modernized *M-113.* In other words, it could be a simple, tracked armored carrier based on a maximum of commercial automotive components. Alternatively, it could take the form of a wheeled armored carrier. Good examples of this are provided by the six-wheeled vehicle adopted recently by three different armies. They are the SAVIEM *VAB,* the *Transportpanzer* 1 and the Mowag *Grizzly* adopted, respectively, by the French, German and Canadian Armies.

RICHARD M. OGORKIEWICZ, widely recognized as a leading authority on armored fighting vehicles, is a consulting engineer and author of two books and more than 200 articles, including 67 in *ARMOR,* on various aspects of armor. He has also lectured extensively on the subject not only in the United States and England, but also in Sweden, Israel, Brazil, and South America.

EARLY INTEGRATION

BY GENERAL BRUCE C. CLARKE (RET.)

The Bakke case has aroused a great deal of interest in anti-discrimination measures in our country. It is well to recall that such measures were initiated in the Army nearly 30 years ago.

In 1949, I was commanding a Constabulary Brigade in Bavaria. The 15th Cavalry Squadron was patrolling the East German border on a full-time basis, which required the troopers to be on patrol up to 70 hours a week, day and night, in all kinds of weather.

I appealed for another troop to be added to the squadron. I was told to use a company from a colored infantry battalion of my brigade. I, at once, moved it to join the cavalry squadron at Weiden. Then the problem of how to employ it presented itself.

My solution was to integrate the personnel of the squadron and the company. This I did on this basis:

"All men in the organization should be given awards, promotions, and punishments based solely upon what they deserve without regard to race, creed, color, or national origin. No other policy is acceptable to all our personnel."

I explained the reasons for the action and this policy to all officers and noncommissioned officers, and had them pass it on to all of their men. The program was a success and the squadron's mission continued to be well carried out. Acceptance was of a very high order by all concerned.

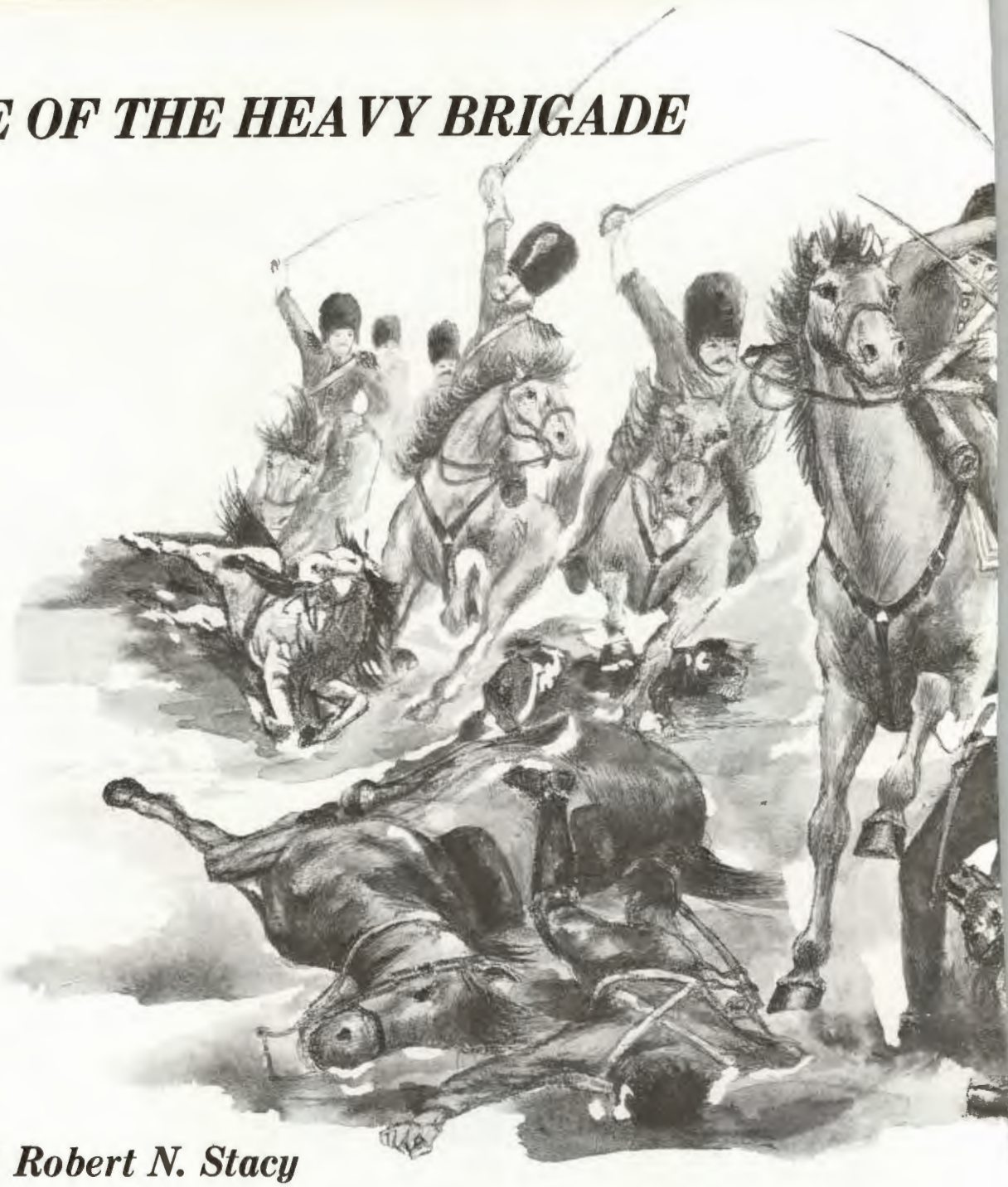
About a year later, in 1951, I reactivated the 1st Armored Division at Fort Hood, Tex. I had a colored armored infantry battalion that was way over its TO&E strength. My experience in Germany encouraged me to integrate the division on the same basis as at Weiden. It presented no difficulties and, I felt, made for a better combat division. Acceptance was no problem in the division or the community.

Those initial actions, put into effect on local initiative, soon led to the full integration of the Army and the rest of the armed forces.

It is well to recall that these actions took place well before the anti-discrimination measures of the 1960's in our country. These actions took place in two armor units and were initiated by an experienced armor combat officer. I am sure I would not have ordered them if I thought they would have been detrimental to the mission of the units.

Armor can be proud of this leadership in our Army and in our armed forces. ▲

CHARGE OF THE HEAVY BRIGADE



by 2d LT. Robert N. Stacy

October 25, 1854. In one day on the Crimean Peninsula, British cavalry would launch two assaults. Both attacks were spectacular, and both were ill-advised. The Light Brigade, led by Lord Cardigan, galloped down a valley covered on three sides by hostile fire. The charge failed miserably and became one of the most famous cavalry actions of all time. The other, conducted by the Heavy Brigade, forced an enemy eight times its size to retreat. Although that action saved the Allied base at Balaclava, it was soon relegated to a lesser place in history and pretty much forgotten. This is how the charge came about.

After a 5-week campaign in which a combined British, French, and Turkish force advanced through the Crimea, the situation was stalemated. The Allies forced the Russians to retreat at the River Alma and advanced until they came within sight of their objective—Sevastopol. The war of movement ended and the siege began. Army siege guns, augmented by naval batteries, laid fire on Russian positions in and near the city.

Even as the Allies strengthened their positions, their lines were not totally secure. Particularly vulnerable was Balaclava, the supply base. Spies and scouts frequently brought warnings to Lord Raglan, the Allied Commander, of a possible Russian counterattack. On October 24, Raglan received word that a Russian assault would definitely take place the next day. The objective of that attack would be the village of Kadikoi.

Kadikoi was unimportant except that it lay on the road connecting the Allied Army with its base of supply at Balaclava harbor. Raglan discounted the possibility of an attack in that area, but there were some troops in the area that could cover the approaches to Kadikoi. On the Causeway Heights that separated the north from the south valley, Turkish soldiers manned four redoubts. To the east of the Heights, a battalion of Turk infantry manned another redoubt on Canrobert Hill. Sir Colin Campbell commanded a mixed force of the 93d Highlanders with some Turks on a rise of ground a quarter-of-a-mile north of Kadikoi. The Light and Heavy Brigades of Lord Lucan's cavalry division remained in the area of their camp, not far from Campbell's position.

There were indeed men there to cover Balaclava and Kadikoi but, as it turned out, barely enough. Had Raglan taken the early warning and sent reinforcements, the battle would have gone more smoothly for the British.

Lucan always conducted stand-to at 0500, and the morning of the 25th was no exception. At the proper time and place, the regiments of the two brigades lined up and dressed their ranks. As the daily muster was called, a Russian force of 25,000 men sortied out of Sevastopol. The reports and rumors, earlier dismissed, were now coming true. Russian Prince Menshikov led 25 battalions of infantry, 34 squadrons of cavalry, and 78 field guns into action. Canrobert Hill was their first objective.

The Turkish battalion at Canrobert was badly outnumbered, yet held out for an hour before leaving the hill and 170 casualties behind. The Russian infantry took that position and remained in place. Throughout the action, other Turks in the redoubts on the Causeway viewed the situation on Canrobert with alarm. Their alarm changed to panic when the Russians took the hill and they promptly abandoned their positions. Most of them headed south for Balaclava in hope of finding immediate transportation from the Crimea. All that now stood between the Russians and Kadikoi was the infantry of Colin Campbell.

Lucan had been able to observe the action and commenced moving his cavalry closer to Campbell. As he started to move, he received a confusing order from Raglan. Lucan was to move his cavalry and "take the ground to the left of the second line of redoubts held by the Turks." Lucan did not know what to make of the message since there was no second line of redoubts. Also, the direction given was equally vague. Puzzled, Lucan moved his two brigades in an easterly direction, away from the Russian advance and out of sight of Campbell.

In coordination with the infantry assault on Canrobert, Russian cavalry advanced up the North Valley toward the British. Twenty-five hundred Russian horsemen in two massed formations drew closer to the now abandoned Turkish redoubts. When they reached the Heights, a detachment of approximately 400 troopers broke from the formation and bore down on Kadikoi.

On the hill, Campbell posted his men on the reverse slope. He could see the Russians approaching while his own soldiers escaped observation. Campbell spoke to his men. "Remember, there is no retreat from here. You must die where you stand." At his words, the Turkish contingent of nearly a thousand, broke and fled. Remaining were the 500 Highlanders and some 100 invalids from other units—the original "Thin Red Line." The Russians, seeing the fleeing Turks, were encouraged by the sight

and spurred their horses on. They had nearly reached the hill when the Highlanders advanced to the crest. Three quick volleys sufficed and the Russian cavalry turned away to rejoin the main body in the North Valley.

Where was Lucan and his cavalry through this action? He was still at the foot of the Heights, facing away from the enemy with no knowledge of the attack on Campbell. Raglan sent another message to Lucan to send eight squadrons of cavalry to support the Highlanders. Lucan relayed the message to Sir James Scarlett, commander of the Heavy Brigade. Scarlett selected the 2d Dragoons (Scots Greys), 4th Dragoon Guards, 5th Dragoons, and the 6th Dragoons (Inniskillings) as his vanguard. Since he did not expect immediate contact, Scarlett did not put his men in battle order. Some elements were in open column, others were drawn up in three's. Although Scarlett had never seen action before, his aide, Lieutenant Alexander Elliot, had. Elliot's experience led him to suspect that they could soon expect to see the Russians coming over the ridge to their left. He was not wrong.

On the other side of the Causeway Heights, Russian cavalry still advanced. Not seeing anything in their immediate path, the Russians turned south. From the North Valley, they trotted over the Heights, poised directly at Scarlett's left flank. Elliot was the first to see them as they came over the ridge; he galloped over to warn Scarlett.

It was to Scarlett's credit that his calm never abandoned him. Seeing the Russians, he turned his men about. Then, he arranged his force of 300 into two thin ranks. Squadrons from the Scots Greys and the Inniskillings constituted the front rank. Forty years before, at Waterloo, these two regiments had charged together, side by side. Now they prepared for their first combat together since 1815.

Without haste, or even apparent concern, Scarlett dressed the lines. Some of the Inniskillings on the right became impatient and advanced a few steps. Scarlett motioned them back with his sword and began the process over again. Finally satisfied, he turned for the first time in the direction of the enemy. The Russians were only 400 yards away. Scarlett was surprised but so, apparently, were the Russians. For reasons no one knows, the Russian cavalry suddenly halted. For a moment, the two opposing forces looked at each other, motionless. Three hundred British troopers stared up at the 2,500 Russians on the Heights above them. Then, omitting the usual preparatory commands, Scarlett ordered his bugler to sound the charge. He did so and Scarlett, Elliot, the general's orderly, and the bugler galloped headlong to meet the enemy.

The buglers in the formation, not used to such unorthodox procedures, signaled the charge in the normal sequence. *Advance at the walk. Advance at the trot. Advance at the gallop. Charge.* By the time the Scots Greys and the Inniskillings broke into a charge, they were a full 50 yards behind Scarlett and his small entourage. The enemy remained stationary.

Scarlett and his immediate group plunged into the Russians with swords drawn. Eight minutes later, they would emerge from the other side of the enemy formation. Scarlett was slightly scratched and Elliot severely cut, but all four were very much alive.

On their heels was the remainder of the formation. Like Scarlett's group, the Greys and Inniskillings were swallowed up by masses of Russian horsemen. Almost simultaneous with the first impact, the remainder of the Heavy Brigade arrived. Immediately, the commanders of the 4th Dragoons, 1st Dragoons (Royals), 5th Dragoon Guards, another squadron of the Inniskillings, launched four attacks in rapid succession. They assaulted the Russians twice on the left, once in the center, and once on the right.

With mounted troopers packed so tightly together, few could use their swords. The battle lost all semblance of organization and resembled a grand free-for-all. The shock of the four attacks, however, caused the mass to shift gradually up the hill. The Russians successfully disengaged, principally because the Heavy Brigade was too disorganized to pursue.

At the cost of 80 men, the British inflicted approximately 200 casualties and stopped the Russian advance on Balaclava. The base was saved. All of this occurred in a battle lasting just over 10 minutes. Yet, the battle of Balaclava was far from finished.

Five hundred yards from the battle, Cardigan and the Light Brigade stood in place. Due to another misunderstanding or orders, Cardigan refused to join in support of the Heavy Brigade. "The Heavies will have it on us this day," he was heard to exclaim. But Cardigan was wrong. Less than 2 hours after the charge of the Heavy Brigade, Cardigan's five regiments would be ordered into action. As the result of still another vaguely written order, the Light Brigade would ride down the North Valley in a vain attempt to seize the Russian artillery there.

Almost from the end of that day on the Crimea, the successful action of the Heavy Brigade would be overshadowed by the Light Brigade's defeat. Cardigan's men returned with losses of 178 men and 475 horses, but the attack that had saved Balaclava was forgotten almost immediately.

Both actions had had much in common. Both resulted either directly or indirectly from the circulation of vague and misleading orders. Both assaults were not the best course of action that could have been taken. Finally, each assault was a spectacular, full-blown cavalry charge which troopers often dreamed of but seldom saw. Yet Scarlett's attack had carried the field. His small force hit the Russians with a shock completely out of proportion to their size. A charge, uphill and over broken ground against a force outnumbering the attackers eight-to-one, should never have succeeded. Years before, someone had written that another campaign had succeeded as much by "guid luck as guid guiding." Scarlett and his Heavy Brigade had more than their share of good luck on that day.

LT. 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 is presently the Medical Platoon Leader in 5-33 Armor at Fort Knox, Ky.

Preventing Electrical Problems on the M-113A1

Field Maintenance Technicians have answered many calls for help on electrical problems over the years. They have found cases of self-inflicted wounds caused by a lack of knowledge or carelessness in following prescribed procedures. Listed below are the most common errors.

- Don't turn off the master switch when the engine is running. When you do, the batteries are taken out of the circuit and are not monitored by the regulator. A voltage surge can cause diode damage under these conditions.
- Do not use slave cables with the ends removed. If they are plugged in wrong, the reverse flow of current can allow damage to the regulator, rectifier, or alternator.
- Batteries can, and sometimes are, charged backwards. The positive (+) is then actually the negative. Battery polarity must always be checked with a voltmeter before installing them in a vehicle.
- Loose or dirty battery cable connections can cause the same problems described in paragraph 1 above. (The batteries are taken out of the circuit.) Connections in this condition are usually tied in with frequent slave starts.
- In some regulators, the internal components are shifted slightly and the adjusting screw does not line up with the adjusting screw plug hole. If you have to work with one like this, use extreme caution. Many regulators have been shorted out by screwdrivers being pushed to the side while trying to find the screw.

Keep your regulator covers tight and make sure the adjusting screw plug is in place. Otherwise, water can get into the regulator and short it out.

Some other problem areas that cause *serviceable* alternators, regulators, and rectifiers to be changed and turned in are:

- Cannon plugs that have a pin pushed back to the point where the circuit is open or pins being bent so that no contact is made. A pin or wire that touches ground at the back of the connector is also a problem area. Check these areas before you change components.
- Ensure that the ground connection in the master switch panel is both clean and tight. If not, the charging system won't work.
- Your batteries have to be serviceable before you troubleshoot the electrical system. Before you start, check to make sure they are charged. Dead or low batteries can give faulty indications in some components.

Some other areas are:

- Installing the pulley on an alternator without the proper key.
- Using the hammer to remove the pulley. This results in the shaft being knocked loose. Use the puller, *not* a hammer.
- Be sure the cannon plugs are properly aligned and tightened. If the alignment grooves are damaged, the connection can be misaligned.
- Double check all of the wiring harness prior to removing the pack. If you do rip a connection or wire, don't just twist them together and tape over the mistake; this causes more problems later. Solder the wires correctly before reinstallation.

The above cautions will not solve all problems; but if observed, they will save a lot of dollars and improve your unit ORT rate.

Armor School Changes

The Armor Center has recently completed a major reorganization resulting in significant changes to the Armor School. Listed below are changes of interest to field units.

- The Directorate of Training has been dissolved.
- The Resident Training Management Division has been transferred to the Directorate of Plans and Training, US Army Armor Center, and absorbed into the Training Division. Essentially, there are no changes in phone numbers or locations.
- The Extension Training Management Division was transferred to the Directorate of Training Developments. Location and phone numbers are unchanged. However, written requests for Armor Correspondence Course and instructional or reference material support should be addressed to:

Directorate of Training Developments
US Army Armor School
ATTN: ATSB-TD-EM
Fort Knox, Kentucky 40121

GUNNER—BATTLESIGHT—CHOPPER—FIRE!

TANK VERSUS HELICOPTER

by Lt. Col. Charles W. Abbey

Our current helicopters, indeed *anybody's* current helicopters, are quite heavily armed in comparison to those of just a few years ago. They can, and in many cases do, pose a significant danger to tanks. Helicopters are still thin-skinned and only lightly armored in critical areas, but they, like the infantryman, have learned many battlefield lessons that compensate for these shortcomings. Aeronautical design and engineering for the mission demands of today's and tomorrow's battlefields have allowed modern attack helicopters to overcome many of the characteristics that tended to make them fragile in the past. Today, armorplate is provided in critical areas; dynamic components are designed "big" to accept battle damage without failing; crews are protected from gunfire and fragments; and the whole machine has been designed for war, not for taxi service.

Modern opposing forces' attack helicopters are large (64 ft long and 14 ft tall) but agile and fully able to adopt the helicopter tactics of terrain flying, stealth, and target engagement at the maximum effective range of the weapon system.

The current Soviet attack helicopter is the *Mi24, Hind,* and it comes in several shapes and configurations. The most recent model, the *Hind D,* has been referred to as the "most heavily armed 'copter in the world." *It* mounts a variety of tank killer ordnance including *Sagger* or *Swatter* missiles, 23-mm cannon, and several types of unguided rockets. The antitank guided missile (ATGM), as has been demonstrated repeatedly in recent years, is a serious and important threat to armor operations in any theater. If we tend to be myopic about the role of the attack helicopter on the battlefield, we may be doomed to relive some of history's lessons in cognitive dissonance—witness the accepted importance of the tank today, or aerial bombardment.

Unfortunately, many of us don't seem to be taking the opposing forces' antitank helicopter threat very seriously yet. Little-to-nothing is said in our current "How to Fight" material about the Soviet attack helicopter, yet the Soviet attack helicopter has been in the field since 1973. It is simply not addressed as a weapon by the authors of our doctrine, by the authors of our training exercises, nor by our authors in our military journals.

The average tanker doesn't know a *Hound* (Soviet *Mi4*) from a *Sea Stallion* (U.S. *CH-53*). Few armor units have practiced identification friend or foe (IFF) techniques. Few U.S. armor units, with the sole exception known to the author of the 2d Armored Division during *GALLANT HAND* 72, have practiced large-scale counter-helicopter techniques. (NOTE: See "Hell on Wheels Defeats the Heliborne Threat" by LTC J. Hollis McCrea, Jr.; *ARMOR,* Sep-Oct 1972). Mostly, our commanders seem to say "Let the *Redeye* or the Air Force do it."

I am suggesting that expert knowledge of the attack helicopter's tactics and techniques is the *single most important asset* the armor leader needs to detect and defeat the antiarmor helicopter on the conventional battlefield. This article will develop these tactics and techniques. It will suggest some of the disadvantages faced by helicopters in the antiarmor role and suggest some tips for the tanker on how to detect them. It will discuss a few popular myths espoused by some people in the field and will recommend some counterhelicopter techniques.

TACTICS AND TECHNIQUES

Current U.S. Army aviation doctrine suggests several tactics and techniques for helicopters which will take full advantage of the capabilities of both the aircraft and its weapons. These tactics and techniques have stood the test of time, experimentation, and combat, and are considered to contribute greatly to helicopter battlefield survivability. Although all nations may not fully subscribe to all the techniques mentioned, it should be noted that they are fully capable of adopting these or similar techniques when necessary.

Terrain Flying

Terrain flying is a general term including three subterms (nap-of-the-earth; contour; and low-level) which suggest extremely low-altitude flying to avoid aural, visual, or electronic detection and engagement by hostile forces. Helicopters are fully able to operate over extended distances and for long periods of time at terrain flying altitudes. Testing and experience have shown that helicopters can effectively employ these flying techniques in all kinds of terrain, during any season of the year, and under most conditions of weather and ambient light. Properly trained and employed, helicopters operating in terrain flying modes will seek and find concealment or cover under or behind virtually any natural or manmade features available. Combined with other tactics and techniques, terrain flying provides an extremely effective means for an attack helicopter to achieve the element of surprise against conventional ground forces.

Standoff

This term suggests that a properly employed attack helicopter will come no closer to an enemy force than absolutely necessary to see and kill it. Typical ATGM

weapons available to helicopters are deadly in excess of 3,000 meters. A helicopter properly employing standoff is a small, difficult-to-detect object. Standoff, combined with terrain flight, can render the attack helicopter an extremely fleeting target. A sizable ground unit involved in a confused combat situation must be alert indeed to detect helicopters hiding in the terrain at 3,000 meters.

Stealth

Sneak and peek, a time-honored military technique readily adapted to helicopter operations, dictates that helicopters shall not make easy targets of themselves by prematurely disclosing their presence. Employment of this technique demands detailed prior planning, close coordination, battlefield savvy, and a myriad of other strategies well known to infantrymen and reconnaissance persons the world over.

Mass and Move

Mobility is a capability enjoyed in the extreme by helicopters. Mobility encourages attack helicopters to mass at will, throw a devastating punch, and move quickly away before fires can be effectively returned.

Nose-on Profile

Helicopters will present as small a target as possible by exposing only a head-on profile to observers, increasing the difficulty of detection by ground elements.

Taken together, these and other tactics allow helicopters to easily approach the battlefield from reasonably secure rear areas, undetected, and in reasonably large numbers, to engage their enemy from distant hidden positions, with a variety of lethal weapons, and to move quickly to other positions to repeat the process. Like the loaded shotgun, the attack helicopter is not a toy. It is a potent and dangerous combat tool when properly used and must not be taken lightly by other branches. The emphasis on proper use is meant to imply that an attack helicopter which is improperly employed, at least within the parameters of today's equipment, will not pose a significant threat to an armored force for very long.

HELICOPTER DISADVANTAGES

All is not peaches and cream for the rival helicopter commander. His armored foe is considered to also "have his act together." The helicopter has some features which degrade its capabilities in battle to a degree, and they should be known by the ground commander.

Some are obvious and apply to any unit in any Army. Examples include finite limits on the amount of equipment, problems of obtaining real-time and credible information and combat intelligence upon which to act, maintain, resupply, and train.

There are several universal, crucial disadvantages faced by helicopters trying to zap an armor force.

- Weapons signature—The smoke and blast of current guns, rockets, and missiles tend to give away the location of a firing helicopter to an alert foe.
- Front-firing weapons—Many attack helicopter weapons require that the helicopter be aimed in order to aim the weapon. This can be a distinct disadvantage to the attack helicopter element when faced with multiple and diverging targets.
- Night and Weather—Most attack helicopters are hampered by poor visibility. Devices which amplify light levels electronically are not currently found in all helicopters, although the technology to provide them is available.
- Defense—Helicopters attempting to attack a ground unit in the defense are at a disadvantage. A ground unit that is coiled, static, and quiet with its warning devices out should be able to detect the approach of an attack helicopter unit well before it poses a threat. On the other hand, helicopters waiting in ambush for the attacking ground unit enjoy considerable advantage aided by the confusion in movement of the ground force.

Detection Techniques

Spotting a concealed helicopter at a distance from which it is capable of destroying you is a difficult thing, akin to spotting a tank in hull defilade in a tree line. But there are several visual cues connected with a hovering helicopter that tend to give away its position to an alert ground force. Aural cues are specifically not addressed as an aid to detection. Current helicopters are quiet vis-a-vis helicopters designed only a few years ago and the muffling effect of terrain and vegetation effectively reduce the perception ability of a "listener" beyond a few hundred meters. It should be recognized, however, that a helicopter which blunders onto and over a ground unit's position will have a distinct aural signature.

- Rotor systems—These are aerodynamically frantic pieces of machinery and since they are at the top of modern helicopters they are the first portion of the airframe normally exposed to view. An observant ground commander may be able to detect a number of cues generated by the rotor system. Some helicopters are being fitted with a mast-mounted periscopic sight for testing to help overcome this problem.
- Atmospheric disturbance—The wind generated by the rotor system will frequently disturb the environment of its local area to a degree that facilitates detection. Examples include the blowing of snow, smoke, dust, or vegetative material into the air and the disturbance of heat waves rising above hot-climate terrain.
- Glint—On bright days and under certain lighting angles the rotating parts and glazed portions of the helicopter may, by reflecting the light, give its position away.
- Silhouette—Helicopters will devoutly attempt to avoid placing their airframe between you and the sky. Once silhouetted above the horizon, a helicopter is particularly easy to see. Helicopters will normally unmask with a backdrop of terrain and vegetation.
- Weapons Signature—The weapons mentioned before, may be a valuable, albeit late, cue to the presence of antiarmor helicopters. Coupled with the rotor signature, the evidence may be quite dramatic and may well assist in the detection and defeat of the helicopter—particularly in the meeting engagement.
- Scouts—Some military forces pair scout helicopters with attack helicopters to capitalize on the small size, agility, and speed of the scout to prevent the premature disclosure of the attack helicopter. The lesson here is the presence and detection of a small helicopter may signal danger from big helicopters.
- Heat—Another cue which may add to your ability to detect an enemy helicopter operating at extremely low altitudes is the presence of a heat plume from the exhaust or cooling devices which is detectable by some infra-red

and thermal sensing equipment.

• Combined Arms Employment—Many national forces who accept the attack helicopter as a useful weapon integrate the attack helicopter within the commander's concept of operation. When closing with enemy ground forces, expect enemy antiarmor helicopters to be present.

MYTHS

Helicopters are timid. Helicopters cannot be frightened away by artillery or other gunfire. They should be recognized as an enemy force just as determined as enemy infantry. Readers who saw combat in Vietnam can attest to the steadfastness of helicopter pilots under fire.

You can hear that 'whop-whop-whop' miles away. Helicopters cannot be "heard coming." True, if they are operating at altitudes of a thousand feet or so, they are noisy, but at 50 feet altitude, the sound is quickly muffled by terrain and vegetation.

Helicopters are easy targets while they make a firing run. Diving fire is not a current tactic. Helicopters will not appear and commence firing at 3,000 feet. Terrain flying operations and firing from a hover are almost universally accepted as necessary for helicopter battlefield survival.

ACTIVE COUNTERHELICOPTER TECHNIQUES

If it can be seen, it can be killed. Training and alertness of ground troops to the presence, tactics, and techniques of opposing forces' attack helicopters is a long step forward in the sequence of events leading to the defeat of that enemy weapon.

Although a dramatic and all encompassing "Easter egg" technique may not be apparent, there seem to be a number of plausible techniques useful to the ground commander in countering the antiarmor attack helicopter threat. Thorough preplanning and immediate reaction by all weapons within and available to the tank unit is essential. Artillery, when available, can be directed to fire along routes and into positions that attack helicopters will use at distances beyond ground observation and air defense artillery (ADA) ranges. Careful artillery fire planning and target listing can be a deterrent, as well as a counterweapon, to the attack helicopter.

ADA

ADA is a relatively obvious tool. If ADA weapons are available and the gunners can detect and lock on to enemy helicopter targets, they should be able to kill it.

Tank Weapons

The main gun using any ammunition and the caliber .50 are capable of engaging and destroying helicopters within range of the gun and ammunition used. No special firing procedures should be necessary since the effects of intervening vegetation and range are the same for any target. Target identification and handoff procedures between the crew and gunner should be thoroughly practiced however. It has also been suggested that at or near maximum range of the tank main gun, the gun can beat the missile to its target. A guided missile without a guide quickly aborts its guided path.

Additionally, because of the slow flight characteristics of most current ATGM weapons, an alert tank crew may defeat the missile in flight with a round of *Beehive.* HEAT and HEP fired into the trees near a hovering helicopter stand a fair chance of damaging the helicopter or at least convincing the air crew to seek other cover. TOW and *Shillelagh* are unquestionably useful against helicopters given their range limits, time of flight, and the effect of covering vegetation or other material.

Gunners need to be alert to the tactic, used by the helicopter, of "jinking" or changing-path lateral acceleration. Jinking tends to confuse a gunner or gunnery computer. Smooth tracking of the target and flight path prediction tends to overcome this evasive maneuver.

Air Cavalry

The aggressive employment of air cavalry assets may be expected to provide early warning of antiarmor helicopters. Air cavalry attack helicopters have the additional, but limited, capability of engaging and destroying enemy helicopters in air-to-air combat. In addition, while fighting alongside air cavalry, tank crews should be carefully briefed to insure that they are aware of the presence of the friendly aircraft.

Air Force

The *A-10* and other tactical aircraft have a limited capability to engage and destroy enemy helicopters, and they are somewhat limited in their ability to detect enemy helicopters.

Conclusion

The comments and suggestions in this article are not dramatic disclosures of new or regulated information. They simply represent the result of some thought, some extrapolation of air defense and armor doctrine, some notes from "hanger flying" sessions, and the drawing of some obvious conclusions. The author's helicopter flying colleagues feel somewhat aghast about shooting down helicopters, but they have few similar feelings about discussions relating to shooting down jets, which is fully discussed in our "How to Fight" manuals. A dialogue between *ARMOR's* readers and contributors about the "tank versus helicopter" is due, would be valuable to commanders in the field, and to the authors of our doctrine, and is earnestly invited.

LTC CHARLES W. ABBEY was commissioned in Armor from Penn State in 1959. He has served as an aeroscout in air cavalry units in CONUS and has commanded air cavalry troops in Germany and Vietnam. LTC Abbey has served as chief of the USAARMS's Aeroscout Observer Course, Officer/Warrant Officer Air Cavalry Course, and the Air Cavalry/Attack Helicopter Commanders Training Course. He is currently commander of Hanchey Division, Department of Flight Training, U.S. Army Aviation Center, Ft. Rucker, Ala.

Fidler's Green in Prose

* * * So when the cavalrymen die, their souls ride away with full pack and arms down the long dusty Road to the Next World. But two miles before the fork where the road turns north to Heaven and south to Hell, they ride off the road and dismount. They lead off to the right and past them march the infantry and the artillerymen drive their guns and caissons past, marching on to the fork of the Road to the Next World.

But the dead troopers lead away from the road to the green fields with trees and streams where by the river are pitched row on row of tents. Up on the hill is Headquarters and there are the marquees of the dead old cavalry officers —they too halted here, for they stayed with their own rather than swagger about Heaven or sweat through Hell. They ride with staff and orderlies, flags and escort, Murat and Seidlitz, Forrest, Ziethen and Stuart, and many more, or sit about the tables in the shade, over maps and glasses, as they did in the years when they fought and rode in this world.

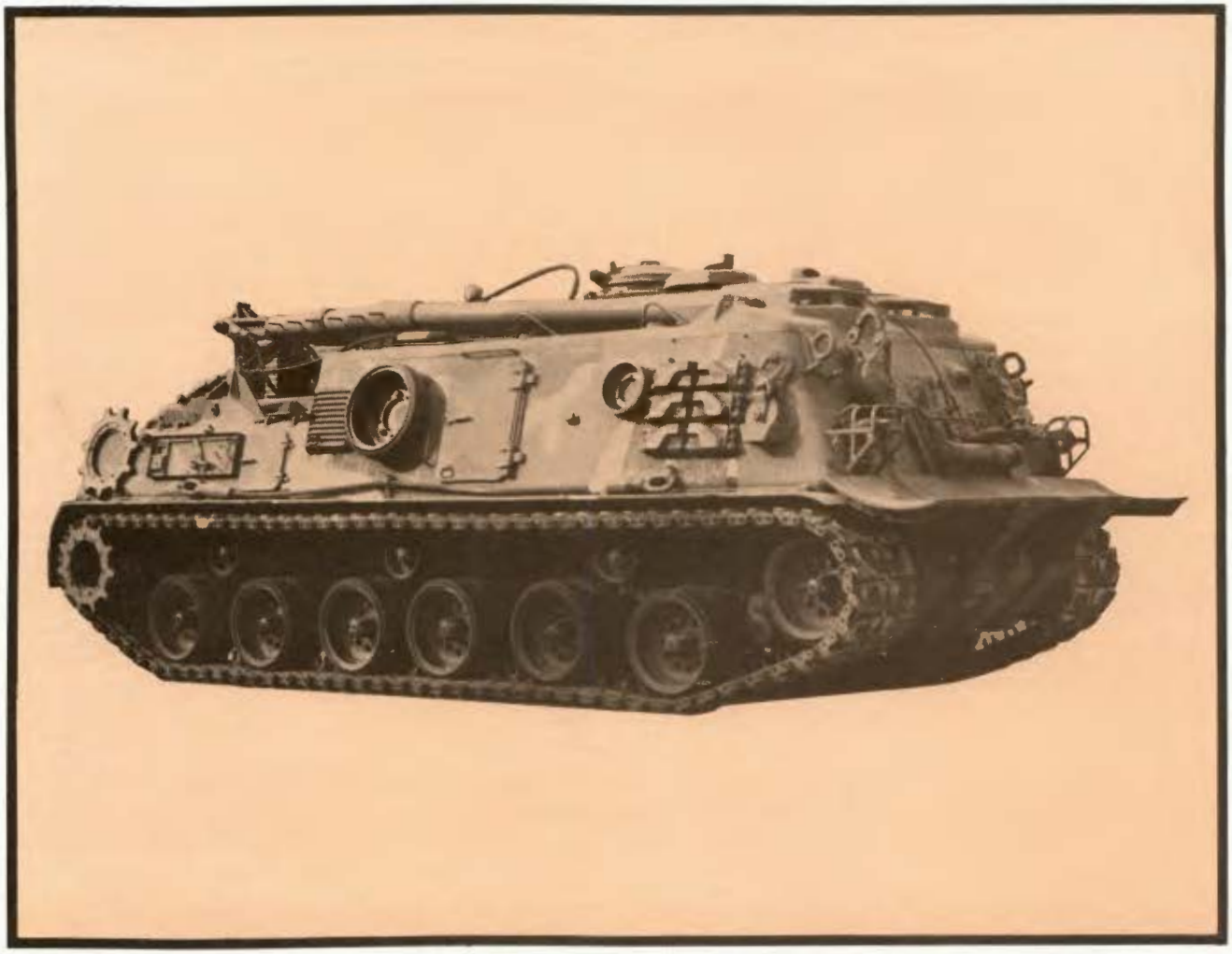
Along the picket lines under the trees, the dead troopers feed and groom, each man his own horse that he loved and rode in life. Now "Recall" blows, and "Mess Call": mess is served by celestial cooks and for K. P. and stable police the angels do miracles. The darkening sky shows its jewelry of stars and troopers rest about the fires, lying on the warm grass, with pipe and mug for every man. All together, man-at-arms and squire, cuirassier, lancer, hussar and dragoon; Briton and Frank, Cossack, Roman, Greek, Yank and Reb—all races and every uniform, at peace by the white and brown tents, the horses resting at the lines; the sergeants cease from troubling, the officers too are at rest; cavalrymen all, dreaming out eternity in the Last Camp.

And afar through the day and night, from the distant Road to the Next World, comes the muffled tramp of the infantry and the rumbling of the guns (and of late there has been the clangor of tanks and from overhead the hum of planes) marching on to the South Fork of the Road to the Next World.

C. S. C.

Pages from the Past

Cavalry Journal
January 1925



TANK RETRIEVERS

by Mr. Edward F. Bashaw

When considering or discussing a military operation. the first and foremost area of concern is the enemy. We normally consider the enemy as being personnel, fully trained, and having the mission to deprive us of success in our operations.

Now, let's consider another type of enemy that can turn a well-planned offensive into a disaster before the first shot is fired. That enemy is *terrain.* Commanders have found more than once that terrain can cause vehicle casualties as effectively as enemy gunfire.

Terrain disablements such as mired, nosed, or overturned vehicles impose a strain on the commander in the loss of vehicles and personnel. What starts as a well planned operation suddenly becomes slowed or results in failure.

The biggest fact concerning terrain caused disablements is that they aren't reserved for war-torn areas. Nor are they reserved for the other guy. Any motorized unit can get fouled up anywhere and anytime.

Scenes, whether in movie thrillers or in real life, depicting armored vehicles charging across terrain already prepared by artillery and supported by swarming, armed attack helicopters are attention getting. They are the breeding ground of the swashbuckling hero. They make effective recruiting commercials. However, even the most brilliant tacticians and planners cannot second guess terrain, nor can they state when disablements will occur. When a failure occurs, caused by terrain or mechanical problems, a new hero emerges, the recovery vehicle and its crew.

The recovery vehicle may spend hours, days, or weeks in the motor pool and never be needed in a recovery capacity. However, like the cop on the beat, it's a reassuring piece of equipment to have around when unit vehicles become mired, nosed, or overturned, and have to be recovered. It can now take its place in the sun.

Today's combat trooper has volumes of published data from which to draw and expand into successful tactical maneuvers commensurate with modern day demands. Military historians can quote battles, winners, losers, and the tactics involved dating back to Attila the Hun, Ghengis Kahn, and Hannibal.

The recovery trained person of today is using methods and equipment during vehicle recovery operations

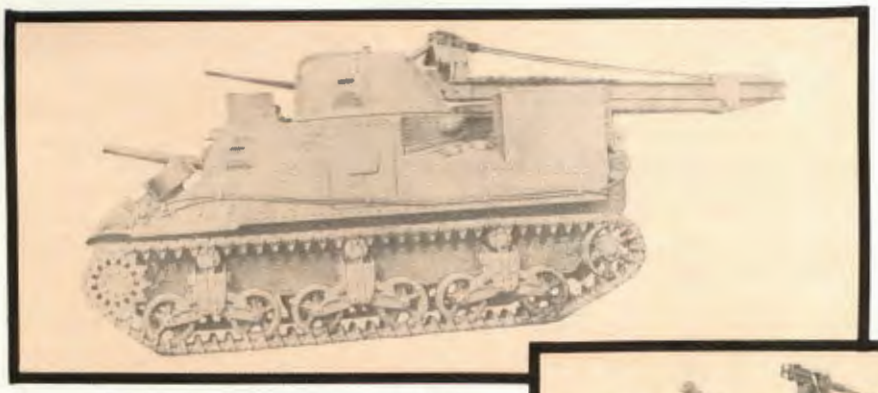


Figure 1. *M-31 (T-2)* Medium Recovery Vehicle.

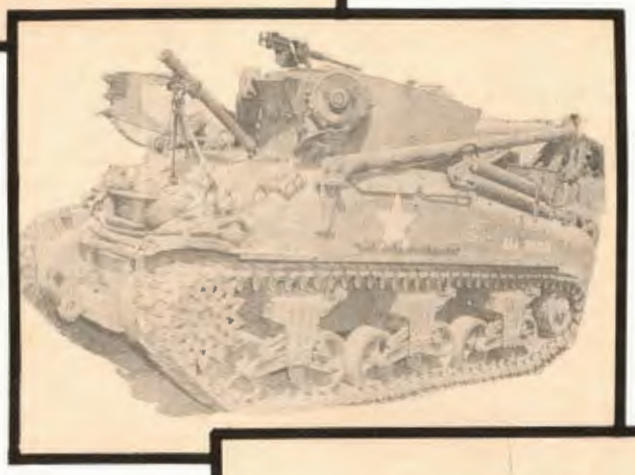


Figure 2. *M-32* Tracked Recovery Vehicle. *Note the 81-mm mortar mounted on the front slope.*

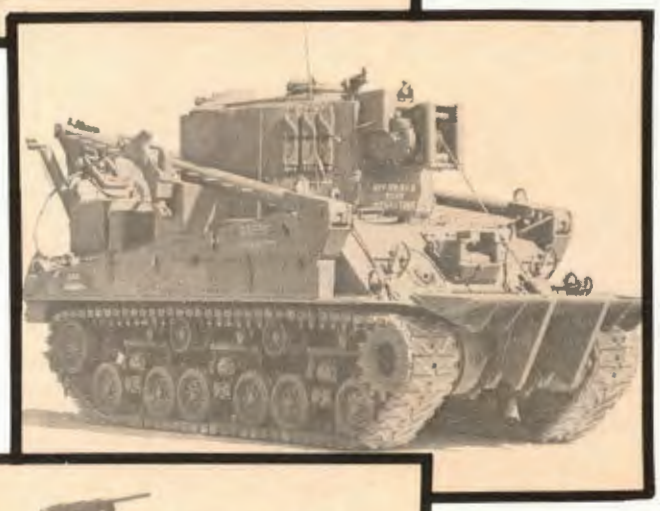


Figure 3. *M-74* Tracked Recovery Vehicle.

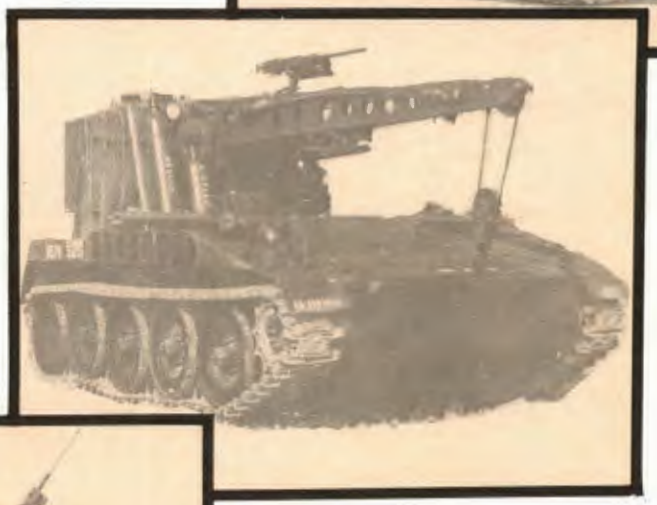
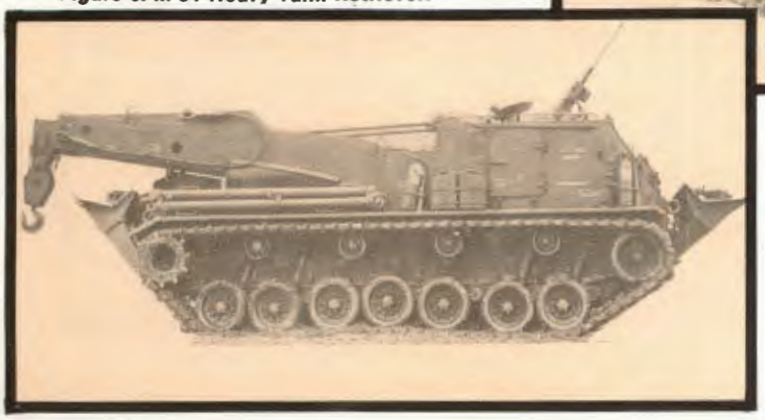


Figure 4. *M-578 Light Recovery Vehicle.*

Figure 5. M-51 Heavy Tank Retriever.



that have evolved from the farrier servicing ancient horse units up to and including the present day recovery vehicles. Looking at the history and development of recovery vehicles, from day one to the present, one might start at the basic recovery vehicle---manpower!

The hordes of invaders crisscrossing Europe, Africa, and Asia encountered the same terrain obstacles that today's armies face. The readily available source of effort was either the horse or man.

Each new conflict brings refinements of old methods and, because of necessity, the development of new ones. Students of military weaponry can track weapons development from the slingshot up to today's push button and computer controlled weapons.

The same can be said for vehicle development. The invention of the internal combustion engine opened a vast new area that modern thinkers could adapt to the military community. These thinkers surprised the world when, in World War I, the Mark IV tank and its various versions played havoc with enemy trenches, barbed wire, and machinegun nests.

This caused a new problem for the commander. Terrain-caused situations normally affected wheel vehicles, horse-drawn guns, or the Doughboy with his Springfield rifle. Now there was a huge track-laying machine, able to go anyplace or through anything—anything except a mudhole. Recovery vehicles, per se, were unheard of. In many cases, if similar vehicles or expedients didn't work, the next command was probably, "blow it in place."

The years between world wars saw many changes in military vehicles. Wheel vehicles were continually refined and upgraded. However, little was done in the area of tracked combat vehicle development. Recovery vehicles were usually the Diamond T or Mack wrecker trucks.

Tank development during the middle and late thirties went from the *M-1* and *M-2* combat cars to the *M-3* light and *M-3* medium tanks.

The start of World War II, and the publicity given the Panzer Forces of Germany, speeded up our tank development program until in the early forties the workhorse of the armor community, the *M-4 Sherman* tank, made its debut.

This time, in addition to tank development programs, the field of recovery operations was being considered. Pressed for time because of the worsening worldwide situation, standard combat vehicles were modified to become our first tracked recovery vehicles. Time and situation dictated that we use what was available, with some modification, to perform as recovery or support vehicles as an interim measure. Industry, already geared for wartime production, was then able to devote some limited time to the design, development, test, and the issue of a functional tracked recovery vehicle.

One of the first interim tracked recovery vehicles was the *T-2*, later called the *M-31* (figure 1), and issued to the troops in 1942. It was a modified *M-3 General Grant* medium tank. Weapons were removed and fake barrels were substituted as gun barrels, with most of the combat related equipment removed to make room for winches and controls.

Closely following were the different versions of the *M-4 Sherman* tank. These ranged from the basic *M-4* through the *M-4A3E8*.

Using the basic *M-4* chassis, the *M-32* (figure 2), and later the *M-74* (figure 3) came on the scene. Basic differences were in engine design and power train combinations with radial aircraft engines, diesel, Ford and Chrysler gasoline engines being used.

The *M-74* lasted until the appearance of the *M-51* Heavy Tank Retriever (figure 5), a totally new vehicle in hull and power train design. The vehicle was rarely seen in the Army because shortly after, in the mid-fifties, a new vehicle came on the scene, the *M-88* Medium Recovery Vehicle. The *M-51* is still in use by the U.S. Marine Corps.

The *M-88* (page 38), as was the *M-51*, was designed with one purpose in mind—the recovery of disabled tracked combat vehicles. It was not a modified combat vehicle, and is still in use today. It is making way for the diesel powered *M-88A1*, making it more logistically compatible to the present day armor unit.

Though they served their purpose, the *M-31, M-32, M-74* were basically modified combat vehicles, and as recovery vehicles, weren't really up to what was desired. Each vehicle was an interim measure until, by modification, design change, and requirements demanded of the modern armor unit, the *M-51* and later the *M-88* series came into being.

Armor wasn't the only unit with terrain-caused problems. Self-propelled artillery units were plagued with the same situations. The development of self-propelled artillery graduated from the 105-mm howitzer on the *M-4* tank chassis *(M-7 Priest)* up to the *M-107*, 175-mm gun. These SP vehicles were lighter, and a recovery vehicle more compatible with these vehicles was needed. It was economically unsound to send a 56-ton *M-88* to recover a 15-20-ton vehicle. With money equally as important as getting the job done the firing decks and weapons were removed from the *M-107* and *M-110* SP chassis, and a cab with winches and a boom was mounted. This became the *M-578* Light Recovery Vehicle (figure 4). It is ideally suited to the mechanized, armored cavalry, and artillery units. Taking its place beside the *M-88* as a recovery vehicle, the *M-578* provides the commander a recovery asset where the *M-88* would not be cost effective.

In closing, there is an element we have not discussed, but should never ignore—the human element. Any vehicle or equipment is just so much metal, fuel, and wire with a dormant potential until dedicated and proficient crewmen use their training and experience to arouse this potential to execute a successful mission.

Mr. Edward F. Bashaw entered military service in 1943 at Fort Devens, Mass. and was assigned to Armor, performing varied tank crew duties, including tours of duty as Armor Test Project NCOIC. He retired from military service in 1967, and is presently assigned to Ground Mobility Division, Maintenance Department, US Army Armor School.

The Army's newest and most effective antitank weapon system—the HELLFIRE—derives its name from "Helicopter-Launched, Fire and Forget."

The *AH-64* provides battlefield mobility and tactical agility, while the HELLFIRE missile delivers the devastating and deadly punch.

The versatile HELLFIRE Modular Missile System, as a part of the *AH-64,* will relentlessly seek out and destroy armored vehicles which are a major threat to ground forces.

The HELLFIRE missile is armed with a shaped-charge warhead and is designed to accept a variety of follow-on seeker modules.

It offers a variety of employment options for maximum effectiveness under diversified conditions.

Remote Ground or Scout Designator Mode: The remote mode provides the *AH-64* with a launch and leave capability. Targets are designated by a scout helicopter equipped with a laser designator or a forward observer using a ground laser locator designator (GLLD). Prior to unmasking, the *AH-64* communicates with the remote designator to coordinate target location, launch method, firing technique, lock-on option, and start of designation, thereby reducing both designator and *AH-64* exposure time. The *AH-64* immediately remasks after launch and the remote designator illuminates the target during terminal homing.

In the event a remote designator is not available, HELLFIRE can be fired in the autonomous mode. This mode provides for an airborne self-contained capability using the *AH-64* fire control system to acquire and designate the target. However, in this mode the *AH-64* must remain exposed throughout target acquisition, missile launch, target designation, and missile impact.

HELLFIRE includes both the direct and indirect launch methods. Direct fire launch can be employed using either a lock-on before (LOBL) or lock-on after (LOAL) seeker option. In the LOBL seeker option, the missile seeker locks onto the remotely designated target prior to launch.

In the LOAL seeker option, the HELLFIRE missile can be launched on a trajectory toward the target with seeker lock-on occurring in flight.

Using the indirect launch method, the *AH-64* can totally eliminate the possibility of being detected by enemy radar. In this method the missile is fired while the helicopter is concealed behind masking terrain features such as trees or hills. A select switch on the fire control panel activates a preprogrammed autopilot sequence to cause the missile to fly an elevated trajectory over the mask. The scanning seeker then locates and locks on the remotely designated target.

An increase in firepower is achieved in either the remote or autonomous designation mode by employing the rapid fire technique. In this firing technique, multiple missiles are fired at intervals against multiple targets designated in succession. As a missile impacts each target, the designator slews to the next target.

A further increase in firepower is available through the use of the ripple fire technique when multiple targets are to be serviced and multiple designations are available. Each designator operates on a separate code to illuminate its respective target. The *AH-64* then laun-

ches multiple HELLFIRE missiles, one on each designator code virtually one after the other.

HELLFIRE has been designated for use by the troops in the field. It will be manufactured and issued as a certified round and requires no assembly or maintenance prior to employment. Its simple ram home locking feature not only expedites rearming, but also eliminates rearming problems usually encountered at night and during periods of inclement weather. Built in test equipment of the *AH-64* isolates faults to a line replaceable unit and eliminates tedious manual effort and guesswork.

HELLFIRE can do the job for which it was designed and will contribute significantly to the effectiveness of the Combined Arms Team. Employed on the *AH-64*, it will destroy enemy armored vehicles and short-range air-defense weapons.

Its interchangeable follow-on guidance seeker modules on a common airframe make it equally effective around-the-clock and during periods of limited visibility. Its indirect fire capability makes it possible to hit targets while the helicopter is protected by masking terrain. Its first-round accuracy and superior exchange ratios help the Combined Arms Team beat the enemy to the punch.

Condensed from an article by Major Jeffrey H. Thomason in Aviation Digest, May 1978. Art by Fred Martin.

Soviet Mine Warfare

Soviet doctrinal writings have, in the past few years, emphasized the advantages of "preemptive maneuver" in overcoming NATO's potential to establish an antitank defense in depth. This tactic calls for multiple "daring thrusts" by BMP-equipped regiments supported by self-propelled artillery, deep into NATO's rear, before effective mobilization can occur. The motorized rifle(MR) regiment with its organic engineer company and the MR division with its engineer battalion are well prepared to employ mine warfare in support of these fast-moving offensive operations.

In the offense, the Soviets establish obstacles and emplace minefields across avenues of approach into the flanks that the enemy is likely to use to counterattack. Since there will be little advance warning of the exact time and direction of a counterattack, a highly mobile and specially organized and equipped combat engineer unit must always be at the disposal of the attacking Soviet commander. To meet this need, Soviet commanders form mobile obstacle detachments from organic engineer elements. The regiment probably employs an engineer platoon in that role, and the division a company. In either case, they deploy in tandem with the unit's antitank reserve in defense against counterattacking forces. While used in this role, engineer units are not used for any other functions.

The Soviet commander normally deploys his obstacle detachments on what he believes to be his more vulnerable flank. Although prior planning has determined the most likely counterattack approaches, emplacement of obstacles and minefields does not occur until the unit is threatened by imminent counterattack.

Normally 1,100 to 1,500 mines are required to cover a specific approach with a density of 550 to 600 pressure-activated antitank mines per kilometer of minefield. This density provides a greater than 50 percent probability that attacking tanks will strike a mine. The obstacle detachments emplace mines in depth within the range of fire of accompanying antitank elements beginning at the pointblank range of forward guns, out to maximum effective range of antitank weapons.

The PMR-3 is currently the standard mine planter employed by the Soviet Union. It is normally towed by a modified BTR-152 combat vehicle which is equipped with special movable racks with a capacity of 120 antitank mines. As the vehicle moves along a designated strip, mines are placed on the planter conveyor belt and plowed in at predetermined spacings of 4 to 5.5 meters. The plow continously opens a furrow and, when the preselected distance has been traveled, a regulator releases a mine into the furrow. The planter then pulls soil over the mine. When the BTR-152 is emptied, it is disconnected from the planter and another prime mover is brought forward.

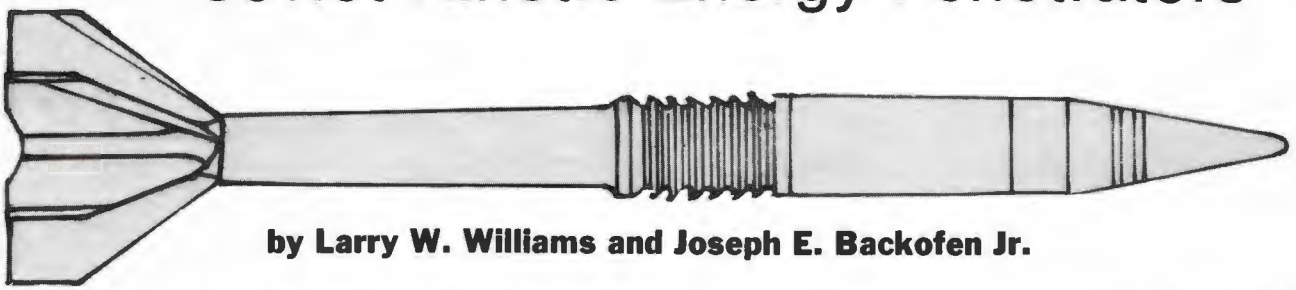
The Soviets latest and most sophisticated minelaying vehicle, the GMZ mechanical minelayer, is mounted on the rear of an SA-4 GANEF surface-to-air missile chassis. It carries a basic load of 208 antitank mines and is equipped with an infrared device that enables it to lay mines in the dark. The GMZ can lay a mine belt 1,100 meters long in about 8 minutes. Its functions are similar to the PMR-3.

The Soviets have reportedly been experimenting with Mi-4 helicopters as minelaying vehicles. In spite of the disadvantages of open mine laying, this technique gives the commander the capability of laying hasty antitank minefields in quick response to the threat of counterattack.

During World War II, the Soviets employed over 100 million mines in all kinds of combat operations. Today their doctrine continues to emphasize heavy use of mines, not only in the more usual defensive role but in the attack as well. Even though the Soviets have undoubtedly improved their mine warfare over the years, they are still vulnerable to our countermeasures. The best technique is to train our units in Soviet mine warfare doctrine so we can anticipate the locations and patterns they will use when laying offensive minefields. Other measures at our disposal are aggressive reconnaissance to locate minefields being installed with followup action to destroy minelaying equipment and disrupt minelaying operations.

Condensed from an article by SFC Larry A. Hicks in Red Thrust Star, July-September 1978.

Soviet Kinetic Energy Penetrators



by Larry W. Williams and Joseph E. Backofen Jr.

Modern antitank weapons tend toward the exotic. The publicity and glory frequently go to shaped-charge warheads and systems incorporating high-technology target acquisition and guidance components. TOW, *Dragon,* and *Hellfire* are examples of this emphasis. Considering the conditions of modern warfare and the characteristics of current armored targets, such systems are necessary and efficient tank killers. However, the gun fired solid penetrator still has significant advantages which assure its role on the battlefield of the future.[1]

The trend toward special armors designed to defeat shaped charges suggests that NATO and Soviet gunners will continue to exploit the destructive power and tactical advantages of kinetic energy (KE) projectiles. The KE penetrator (the core or main body of the projectile) relies on high velocity impact to defeat armor. The high velocity yields a flat trajectory, decreased time of flight, and increased hit probability. This ballistic performance gives gunners a time-to-kill advantage on a battlefield dense with enemy armor, mobile targets, and terrain obstacles from which targets are only briefly exposed.

Soviet weapons designers have always appreciated the value of the KE penetrator.[2] Historically this goes back to the days before shaped charges had been incorporated into munitions, and this appreciation has continued up to the *T-72.* Table 1 lists some Soviet KE projectiles and the guns from which they were fired.

The older, full-caliber Soviet penetrator designs, such as *BR-167, B-240,* and *BR-350,* were similar to

[1]Weller, J., "Middle East Tank Killers," *Journal of the Royal United Services Institute for Defense Studies,* pp. 28-35 (December 1974).

[2]Biryukov, G., and Melnikov, G., "Antitank Warfare," Progress Publishers, Moscow, 1973.

CALIBER	SOVIET DESIGNATION	YEAR INTRODUCED/ ADOPTED	GUN(S) USING
37-mm	BR-167	1939	M-1939 AA gun; SU-37 SP AA gun
37-mm	BZT	1950-51	Aircraft cannon model N
45-mm	B-240	Pre 1942	M-1942 AT gun
45-mm	BR-240	Pre 1942	"
45-mm	BR-243P	1942	"
45-mm	BZ-240	Pre 1942	"
57-mm	BR-271	1943	AT gun M-1943 (ZIS-2), APAT, and ASU-57
57-mm	BR-271K	1943	ASU-57
57-mm	BR-271P	1943	"
57-mm	BR-271SP	1943	"
57-mm	BR-281	1950	AA gun S-60 and ZSU-57-2
57-mm	BR-281U	1960	"
76-mm	BR-350	Pre 1940	M-1943 (ZIS-3)m D-56T tank gun, and the SU-76 (M-1942/43 SP)
76-mm	BR-350A	Pre 1950	"
76-mm	BR-350B	1943	"
76-mm	BZR-350B	1942	"
76-mm	BR-354P	1943	"
85-mm	BR-365K	1943	M-1939 85-mm antiaircraft gun KS-12 and KS-12A, tank gun M-1944 (ZIS-5-53), SP gun M-1943 (SU-85) D5-S85 or S85A), field gun D-44, and AT gun SD-44
85-mm	BR-365	1943	M-1939 85-mm antiaircraft gun KS-12 and KS-12A, tank gun M-1944 (ZIS-5-53), SP gun M-1943 (SU-85) (D5-S85 or S85A), field gun D-44, and AT gun SD-44
85-mm	BR-365P	1957	"
85-mm	BR-367	1957	"
85-mm	BR-367P	1957	85-mm tank guns (ZIS-5-53 and D-5T85)
100-mm	BR-412	1944	M-1944 field gun; M-1955 field gun; D-10T, D-10TG, and D10T2S tank guns; KS-19M2 AA gun; M-1944 SU-100 assault gun
100-mm	BR-412B	1955	"
100-mm	BR-412D	1955	"
100-mm	BM-8	1968	"
115-mm	BM-6	1961	U-5TS on T-62 tanks
122-mm	BR-471	1943	M-1931 field gun; A-19 field gun,(M-1931/37); D-25 (M-1943) tank gun, D-25S on the JSU-122 (M-1944) SP gun; A-19S (M-1931/44) SP gun
122-mm	BR-471B	1943	D-25 (M-1943) tank gun
122-mm	BR-472	1955	D-74 field gun

those used by all nations before and into World War II. These designs were originally derived from experience with naval armor penetrators and included the following styles for both solid projectiles and projectiles with a small explosive filled base cavity:

- Short ogive
- Blunt nose with a thin ballistic windshield (aerodynamic screen)
- Short ogive capped with a blunt armor piercing cap and a thin ballistic windshield.

The available information implies that this last design was not generally adopted for Soviet ground forces until about 1950 to 1955, which is surprising in that the invention of this penetrator is credited to Admiral S. O. Makarov in 1893 by both the Germans and Russians (Makarov Cap).[3,4,5,6] The particular usefulness of the capped ogive is that it aids in penetrating oblique and spaced armor (multiple plates).

These full-caliber styles of Soviet KE penetrators are noticeably different from those of other countries because they incorporate grooves either in front of or at the bourrelet. A Soviet text describes their purpose as follows: "(Localizers) are made on the projectile body to prevent failure of the projectile chamber [explosive filled base] upon target impact."[6] The purpose of the explosive filled base was to deliver an explosion behind the armor and thus within the confines of the fighting compartment.

The first Soviet adoption of subcaliber "spindle" armor-piercing ammunition occurred in 1942. This was prompted by the increasing thickness of German armor in 1941-1942. It took the Soviets only 2 months in 1942, from the beginning of February until April 1, to develop and win approval of a spool-shaped, subcaliber projectile for their 45-mm antitank guns (*BR-243P*). Of the two designs considered, the ballistically superior version (imparting less wear to the barrel) was not used because it was more difficult to manufacture and used more metal.[7] The adopted projectiles were most effective at ranges up to 500 meters. Between 500 and 1,000 meters they were about as effective as solid shot, and beyond 1,000 meters they were less effective. By May 1943 the Soviets adopted similar projectiles for their 57-mm and 76-mm weapons (*BR-271P* and *BR-354P*). These shells carried tungsten carbide cores.[7]

The Soviet "spindle" munitions were similar to the German Armor-Piercing Shell 40 "Arrowhead" designs which had been developed about 1939[8] and which were used in essentially every German gun that had a primary or secondary antitank role from 1942 onward.[9,10]

Copying of the German antitank ammunition probably occurred and could have been facilitated by the fact that an armor-piercing shell of the 40 type was manufactured for the Soviet 76.2-mm field gun which the Germans had captured in large numbers in 1941 and which they subsequently turned against Soviet armor formations.[10,11]

This German "Arrowhead" ammunition reportedly utilized solid aluminum and/or magnesium windscreens to achieve a behind-armor incendiary effect after the core perforated the armor plate.[9] Studies of shell carrier crush-up had been conducted by Polte,[3] but no actual data for the incendiary effectiveness are available in connection with this work. During the latter part of World War II the Germans substituted plastic and sometimes thin steel windshields on some of their smaller munitions. The Soviets used solid aluminum windshields on some of their KE penetrators. However, they do not mention a possible behind-the-armor effect from these windshields. Instead, they attribute the destructive effects to high temperature spall particles and shock-heated particles from the fractured penetrator core.[5]

After the fall of Germany, the main artillery and antitank ammunition proving grounds fell under Soviet control. There is good reason to believe that they exploited some of these sources of armor-piercing information in the same manner that they exploited other captured German technology. The exploitation of the Polte firm in Magdeburg (prime developers of tapered-bore guns, armor-piercing projectiles, and ballistic theory) was reflected in excellent indepth analyses of tapered-bore design and interior ballistics contained in the 1949 edition of M.E. Serebryakov's "Interior Ballistics."[12]

[3]Cranz, C., "Lehrbuch Der Ballistik, Erster Band, Aussere Ballistik," Verlag Von Julius Springer (1925).

[4]Latukhin, A. N., "Modern Artillery," *Voyenizdat*, Moscow, 1970.

[5]Kazakov, K. P., "Artillery and Rockets," *Voyenizdat*, Moscow, 1968.

[6]Zhukov, I. I. et al, "Artillery Weapons (Fundamentals and Design)," *Mashinostroyeniya*, Moscow, 1975.

[7]Latukhin, A.., "Subcaliber Armor-Piercing Tracers," *Tekhnika i Vooruzheniye*, No. 3, p. 5 (March 1970).

[8]Anon., "Armor Piercing Ammunition, Part I -Projectiles for Tapered Bores, Part II - Special Projectiles for Cylindrical Tubes," Polte, Magdeburg, Germany (now Deutsche Democratische Republik), about late 1939.

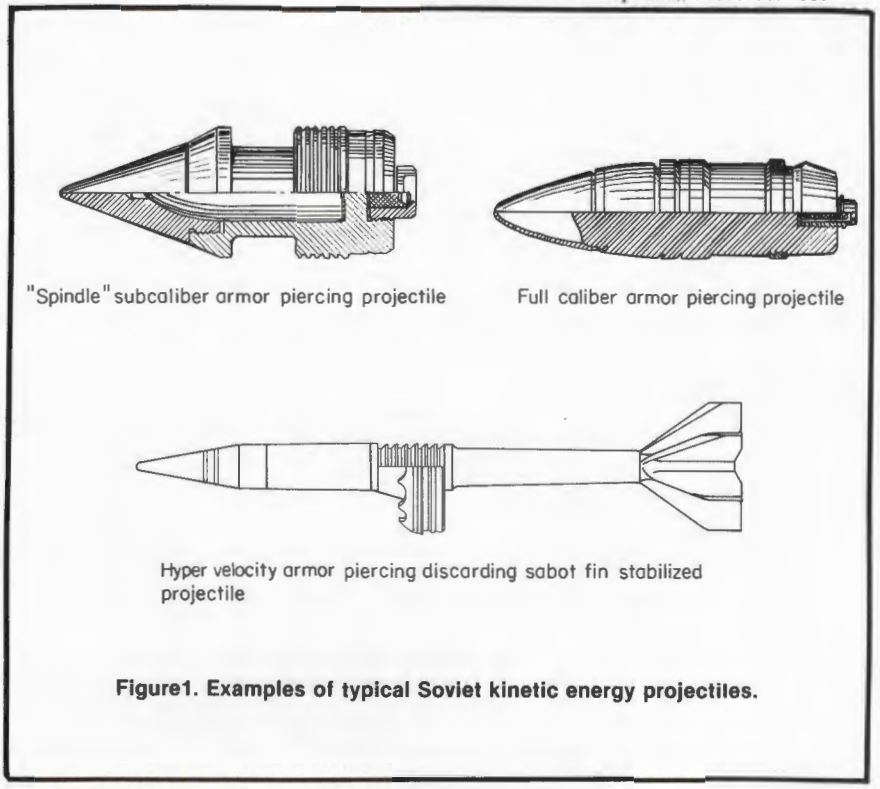


Figure1. Examples of typical Soviet kinetic energy projectiles.

It should be remembered that the German tapered-bore guns of World War II fired subcaliber penetrators at velocities of 1,100-1,400 meters per second, which is comparable to the performance of today's guns.[9,10]

Since World War II the Soviets have preceded the West in smoothbore technology. First they fielded the 115-mm smoothbore and hyper-velocity, armor-piercing, fin-stabilized, discarding-sabot (HVAPFSDS) ammunition on the *T-62* tank. Then they fielded the 100-mm *T-12* smoothbore antitank gun, and now the 125-mm smoothbore with HVAPFSDS ammunition has been introduced in the *T-72* tank.

Even though they were innovative in recognizing and exploiting the advantages of this technology, it may not have originated with the Soviets. Before and during World War II, the Germans were separately developing both the smoothbore antitank gun, 8-cm PAW or PWK8H63, and fin-stabilized, discarding-sabot (FSDS) projectiles.[10,13] The Germans had developed this type of projectile after experience with spin-stabilized, discarding-sabot ammunition which was under development by the firms of Bochumer Verein, Rheinmetall-Borsig and Firma Stock.[13,14] They realized that the APFSDS gave a better, faster, and longer trajectory as well as increased penetration capability because of the length of the projectile.[13] The Germans developed this type of ammunition for long-range artillery, antiaircraft guns, concrete penetrators, and quite possibly armor penetration.[13,15]

The Soviets often appear to reach back many years to pre-Soviet times to claim a Russian origin for technical advances. However, so far as is known to the authors they have not taken credit for the invention of APFSDS ammunition. Furthermore, they missed an opportunity to claim the APFSDS projectile in 1970 when they published a review of the state-of-the-art in Western countries.[4] This summary of Western sources included APFSDS ammunition and associated technology. By that time the West was aware of the projectile used in the *T-62* tank gun and the Soviets could have taken credit for the general form of the technology if it had been a Russian invention.

The new Soviet 125-mm HVAPFSDS projectile recently displayed with the *T-62* tank is similar to the solid steel 115-mm HVAPFSDS in external configuration. However, the sabot is somewhat more forward and the fins relatively a little smaller than on the predecessor projectile.[16]

This analysis of the KE penetrators fielded by the Soviets indicates that they have taken a careful but innovative approach in the development of armor penetrators. The 115-mm HVAPFSDS was fielded before similar ammunition was in use by any other country, although the basic concept can be traced to earlier German work. By fielding the 125-mm HVAPFSDS, the Soviets demonstrated a continued appreciation of the value of the KE penetrator on the modern battlefield.

As in the West, the trend in Soviet KE ammunition has been toward projectiles having a higher velocity, flatter trajectory, and shorter time of flight. This makes their ammunition lethal even at the longer ranges at which modern tank engagements may occur and against modern armors.[1] If combined with advanced fire control equipment such as laser rangefinders, ballistic computer, and closed loop spotting of hits and misses, the Soviets will present a deadly combination to Western forces at all engagement ranges. Since the Soviets closely monitor Western developments and invest heavily in their own research, they probably will not be surprised by Western armor developments, and can be expected to field a mix of antiarmor munitions suitable for the quick-kill of any anticipated threat.

[9]McLean, D. B., "Illustrated Arsenal of the Third Reich," Normount Technical Publications," Wickenburg, Arizona, 1973.

[10]Hoffschmidt, E. J., and Tantum, W. H. IV., "German Tank and Antitank in World War II," WE Inc., Old Greenwich, Connecticut, 1968.

[11]Hogg, I. V., "The Guns: 1939-1945," Ballantine Books, Random House, Inc., New York, 1970.

[12]Serebryakov, M. E., "Interior Ballistics," Moscow, 1949, Translated by V. A. Nekrassoff, The Catholic University of America.

[13]"The Story of Peenemunde" or "What Might Have Been;" Preprint of interrogation of 500 detained German scientists, 1945.

[14]Simon, L. E., "German Research in World War II," John Wiley and Sons, Inc., New York, 1947.

[15]Riel, H. R., "Arrow Projectile Development in Germany," APG-MISC 270, Development and Proof Services, Aberdeen Proving Ground, Maryland.

[16]—, "Details of the Soviet T-72 Battle Tank," International Defense Review, Vol. 10, 6, pp. 1031-1034 (December 1977).

LARRY W. WILLIAMS is a political scientist with the Defense Systems and Technology Section at Battelle's Columbus Laboratories. He has extensive experience in research programs involving technology and policy issues. He recently conducted studies of action and reaction in Soviet weapons developments and of offshore oil around Europe.

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.

ATTACK HELICOPTER POTENTIAL

The full potential of the attack helicopter on the modern battlefield will not be realized until the prevailing tactical attitude toward the weapon is fundamentally changed. To effect this change, certain basic concepts must be adopted by all commanders:

- The attack helicopter is *not* an aircraft.
- The attack helicopter is a *highly mobile antitank* weapon.
- Attack helicopters are employed as cohesive units, not as individual machines and sorties.
- The attack helicopter unit is *not* a combat support unit.
- The demands of its mission on the modern battlefield have defined the attack helicopter unit as a *maneuver unit.*

The technology of the attack helicopter results from combining two technologies, that of the antitank guided missile (ATGM) and that of the helicopter. Introduction of the missile required the commander to significantly expand his perception of the battlefield. The acceptance by the ground commander of the ATGM and its tactical implications has been relatively easy, however, some show a general reluctance to accept the helicopter as a fighting machine.

The present development of the helicopter as a fighting machine is strikingly similar to that of the armored fighting vehicle (AFV) during the period between the two World Wars. By thoroughly studying that evolution of the AFV, the Army can learn much and avoid many pitfalls in its development of the attack helicopter. The similarity is even more striking from the perspective of mobility. In World War I, the AFV gave a major mobility advantage over infantry formations. During the interwar period, this vehicle was most highly developed by the Germans, who said mobility is the answer to numerical inferiority. Today the helicopter provides a decided mobility advantage over the equally mechanized formations in Europe, and it can offset the numerical inferiority that is a serious NATO problem.

Besides the normal difficulties expected when a new weapon is introduced, the attack helicopter has an added problem—it is classified by many as a coventional aircraft. This classification continues to obstruct the simple exploitation of the attack helicopter's potential. The differentiating factor between the helicopter and all other aircraft is speed: speed is *required* by aircraft in order to operate; speed is *used* by the helicopter to perform its mission. Proper classification is further hindered by the fact that the initial impetus in developing the attack helicopter was a requirement for speed.

In the low-intensity Vietnam environment where the attack helicopter achieved maturity, speed was needed to escort airmobile forces and to provide quick-reacting fire support for ground forces. It was in that environment that the majority of today's decision makers gained their perceptions of the attack helicopter. Thus it is easy to understand why most commanders erroneously view the attack helicopter as a fire-support and close air-support aircraft.

What has now changed the concept of the attack helicopter is its new mission on a new battlefield. The *combat mission*, not the type machine, must determine the employment and combat value of the attack helicopter. Again, similarities between the development of its operational concept and that of the AFV can prove instructive.

The attack helicopter should be seen as just another combat vehicle employed by maneuver units. This significant change in concept is forced by the new antiarmor mission in the midintensity ground environment. Seen in this light, the command, control, and employment of attack helicopter units becomes relatively easy. The same familiar combat planning and execution required of an armored reserve should now apply directly to the attack

helicopter unit. Admittedly, the helicopter is more mobile than an armored reserve, but the basics do not change. Just as the ATGM required a mentally expanded battlefield, so the attack helicopter will require an increase in mental mobility to match its capabilities.

In the conduct of the battle, the attack helicopter unit will provide the force commander a vital mobility advantage. With this advantage, the commander will be able to extend the time line of battle. More time is provided to employ superior weaponry and to benefit from its effect on a numerically superior force. More time is also gained to effect the reinforcing rate at the critical area of intended enemy breakthrough.

In the end, the mobility of the attack helicopter and the time it provides will assist in preventing anything worse than a 1:3 combat power inferiority. On the other hand its contribution to the first battle of the next war may be the same as the contribution of the French AFV in the first battle of World War II. The choice must be made now by the commanders of today's Army.

WILLIAM V. CHIARAMONTE
Major, Armor
USAARMS

THE COMPANY XO

History is replete with examples of sudden violent combat wherein unit commanders were quickly eliminated from the action—casualties, loss of communication, or capture—and the executive officer assumed the command. The ability, preparation for command, and the competence of the XO all too frequently meant the difference between failure and success. The company XO is the "next" commander, and it is the responsibility of the current commander to groom him for that role. Obviously, the XO must be regarded by the commander and by himself, as far more important than an administrative assistant. The alternative could be disaster in combat.

Little is written in the area of company executive officer duties. This is probably as it should be, to enable the commander to maintain maximum flexibility over his utilization. The commander will certainly brief the XO concerning his duties. What the commander may not brief is the foundation of the position, or more specifically, some of the "tools" to get the job accomplished. The purpose of this article is to provide the new XO with a few general guidelines to being an effective XO who is prepared to assume command.

First, get yourself organized. Keep a notebook with you at all times to record the results of meetings, progress of important projects, frequently required statistics, and most important of all, a continuing list of various items to be done. All successful leaders I have known have acquired the habit of committing the various actions required of their position to paper. These are then crossed off as accomplished.

Next, establish and maintain a personal, systematic filing system for records such as meeting notes, memos-for-record, approvals of actions, proposals, and the like. Sound like a high-level staff? Not at all. The ability to retrieve a memo-for-record for an inspection or investigation can save hours of extra work.

Develop the ability to take meaningful notes in an outline format. After sitting in for the commander at a meeting, you can pass your notes to him later for his review. With note taking comes the habit of writing down missions. With the thousand-and-one daily requirements and crises in a company, I look with skepticism on an XO who does not commit to writing an order or mission which I issue. If I see the XO writing, I am confident that the project won't be forgotten. As a commander, I do the same with my boss.

Keep the commander informed! Let him know of progress and problem areas within your sphere of responsibility. By the same token, do not burden him with unnecessary details. Sound contradictory? It certainly can be, but there is a middle ground. Experience with and guidance from the commander will assist in this area. When at all possible, talk to the commander, but an XO who constantly sticks his head in the door can wreak havoc with a tight daily schedule. The alternative is to reduce the less critical or nonperishable information to short written notes which can be read as time allows. Here again, a middle ground must be found.

Never present a problem without an accompanying recommendation for solution, or several solutions. The concept of completed staff action applies just as well at company level as it does at higher staff level, though less formally. The earlier this technique is developed and cultivated, the better. Executive officers who have mastered this technique are worth their weight in gold.

Organize your time. Take a few moments at the close of the day to list those actions which you must accomplish the following day. Then establish a priority. Once the items are on paper, fight tooth-and-nail against any distractions. Sure, you will have to stay somewhat flexible (*really* flexible sometimes), but the successful XO is the one who can, within reason, establish his priorities. Squandering time invites failure.

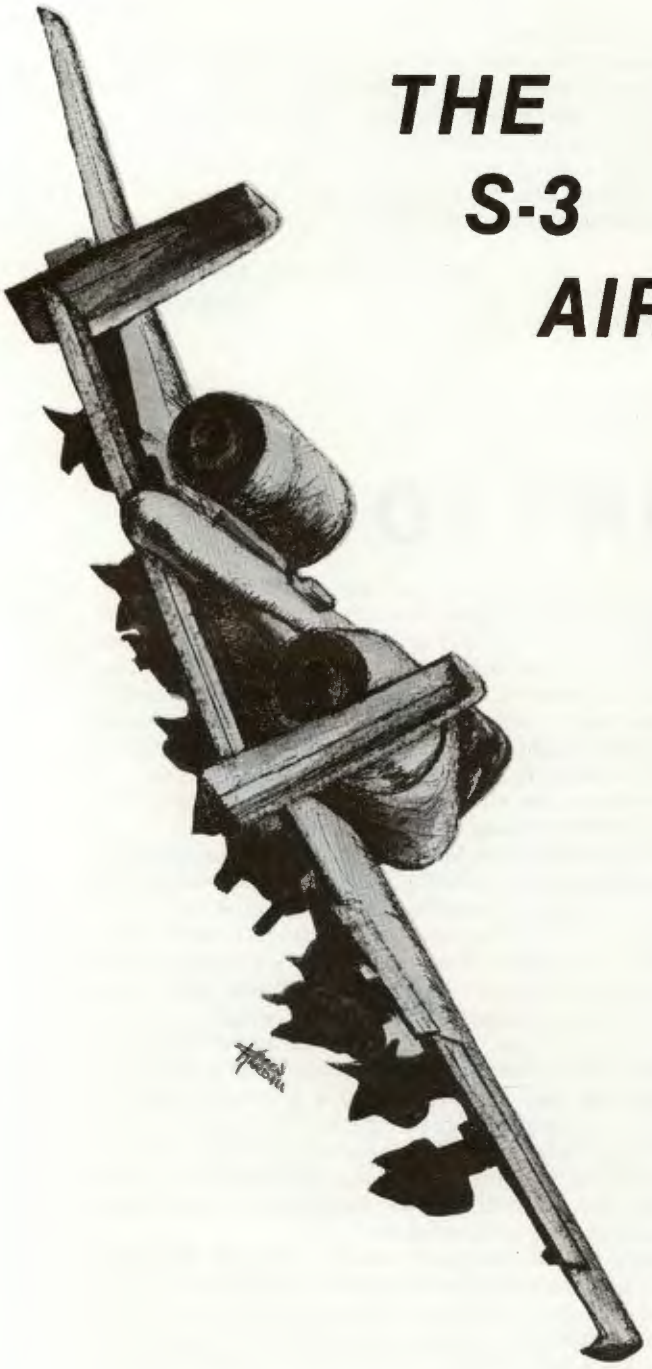
Perhaps one of the most ticklish areas of the XO's duties is his relationship with the platoon leaders. The XO must be prepared to assume command at any time. Such a situation requires a certain distance from the platoon leaders. This is a difficult situation for the XO who was lately a fellow platoon leader, but it must be addressed and resolved.

Finally, the XO should assume the state of mind of a commander. His actions must be based constantly on the answers to such questions as, "What would I do in this situation if I were the CO?" or "Where should I be right now?" Gaining this outlook will enable you to stay one step ahead of the commander and take the reins of command when the CO departs, whether temporarily or permanently.

So there you have it; a few common pointers applicable to any company-level XO. Though certainly not the total solution for successful tenure as an XO, they are the tools by which the XO can accomplish his mission–to prepare to assume command at any time.

MARSHALL L. HELENA
Captain, Infantry
APO New York 09033

THE S-3 AIR



"...U.S. Army commanders must recognize that battlefield success is dependent to a major degree upon U.S. Air Force, U.S. Navy or U.S. Marine Corps support..."

"... at critical times and places where victory or defeat may hang in the balance, the Army requires close air support of engaged ground forces..."

Toward the overall survival and success of a ground unit in contact, the application of close air support can be as vital as training tank and antitank gunners. It is easy in these days of austerity to overlook a key member of the Combined Arms Team, the U. S. Air Force and its close air support (CAS). The oversight is not intentional, but is a byproduct of our "get the most training for the dollar" attitude. This attitude focuses our attention on doing the basics and doing them well. The Air Force is in the same position, that is, of trying to fulfill their training requirements with limited aircraft and funds, and trying to do all of their basics well. Our natural tendency (Army and Air Force) is to be jealous of our own resources and time because we feel that we haven't enough of either to satisfy our training and readiness goals. Fortunately, we are getting more joint training and doctrine from FORSCOM and TRADOC because there is a growing concern over Army/Air Force interoperability and ability to develop and practice the tactics that will make us successful on the modern battlefield. Occasionally we get to practice our tactics and interoperability on Joint Readiness Exercises and Joint Training Exercises. The *BRAVE SHIELD, BOLD EAGLE* and *GALLANT* series have been excellent in training the various staffs, but unfortunately the training benefit for CAS delivery is minimal at the battalion level and below. The only training exercises that remain that have a high level of command emphasis are battalion field training exercises and ARTEP's. In order to get all the requested training resources command emphasis is critical.

Joint Army-Air Force Doctrine calls for an air liaison officer (ALO) and forward air controller (FAC) down to each maneuver battalion, equating to two officers, two enlisted radio operator maintainer/drivers (ROMAD's), and two *MRC-107/108* radio jeeps.

The Air Force has tactical air control parties (TACP's) stationed with all active Army divisions, but they are manned only down to brigade level. If you need an ALO or FAC to train with at battalion level and below, you must request them. The request for a battalion TACP usually goes through the division G3-air to the division ALO. The ALO transmits the requirement to his parent unit, usually a tactical air control wing, for the personnel and equipment. Since the battalion TACP is specified in joint doctrine, and since my experience has been that the Air Force will go out of its way to improve joint training, all you have to do is ask.

Another facet of CAS training is to properly use your personnel. I am speaking primarily of the S3-air. He has specific duties with respect to the planning and execution of CAS, as specified by FM 100-26, *The Air-Ground Operations System.* More often than not the S3-air ends up as the assistant operations officer responsible for getting the OPORD published, monitoring radios, TOC security, and other missions.

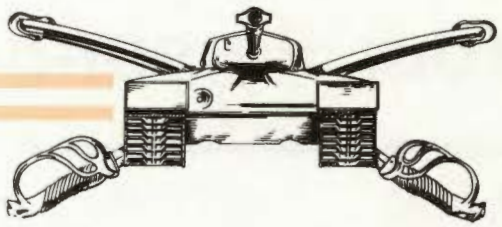
The U.S. Air Force Air-Ground Operations School at Keesler Air Force Base, Miss., runs the Air-Ground Operations Specialist Course. The course is cosponsored by TRADOC and is designed to instruct Army and Air Force personnel in the Air Force Tactical Air Control system and the Army Air-Ground system, and is excellent instruction for a present or potential S3-air. Commanders should make a concerted effort to school the S3-air, and discourage his change of duties for at least 9 months.

Training with a TACP at battalion level and the proper utilization and retention of the S3-air will greatly improve our ability to plan and manage our air resources, and hone to a fighting edge the effective application of air power on the modern battlefield.

CHARLES E. WRIGHT
Captain, Infantry
Ground Liaison Officer

Bergstrom Air Force Base,
Tex. 78743

OPMD - EPMD ARMOR



The following lists include all Armor officers in Brigade and Battalion level commands as of November 1978. 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 Nov 78

COL John M. Kirk
1st Bde, 1st Armored Division

COL Roger J. Price
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 Joseph C. Lutz
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 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
Aviation School Bde

ARMORED BATTALION/SQUADRON COMMANDERS as of Nov 78

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 James B. Taylor
1st Squadron, 11th ACR

LTC Joseph C. Conrad
2d Squadron, 11th ACR

LTC Thomas J. Haycraft
3d Squadron, 11th ACR

LTC John F. Jeszenszky
1st Squadron, 1st Cavalry

LTC Kenneth A. Evans
1st Battalion, 35th Armor

LTC James R. Harding
3d Battalion, 35th Armor

LTC William A. Izzard
1st Battalion, 13th Armor

LTC David A. Armstrong
1st Battalion, 37th Armor

LTC John C. Heldstab
2d Battalion, 37th Armor

LTC Anthony DiCaprio
2d Battalion, 81st Armor

LTC John L. Kennedy
3d Battalion. 63d Armor

LTC Vaden K. Watson
4th Battalion, 73d Armor

LTC William B. Blake
3d Squadron, 12th Cavalry

LTC Thomas L. Beale
1st Battalion, 32d Armor

LTC Victor T. Letonoff
2d Battalion, 32d Armor

LTC Edward D. Line
3d Battalion, 32d Armor

LTC Dudley M. Andres
1st Battalion, 33d Armor

LTC Dennis V. Crumley
2d Battalion, 33d Armor

LTC Charles B. Fegan
3d Battalion, 33d Armor

LTC Kent E. Harrison
3d Squadron, 7th Cavalry

LTC Peter F. Scott
1st Battalion, 64th Armor

LTC Robert W. Garrott
2d Battalion, 64th Armor

LTC George P. Miller
4th Battalion, 64th Armor

LTC Timothy H. Donovan
3d Battalion. 64th Armor

LTC Benjamin Covington
4th Battalion, 69th Armor

LTC Jonathan Searles
3d Squadron, 8th Cavalry

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 William Lozano
5th Battalion, 68th Armor

LTC Dennis E. Firestone
1st Battalion, 72d Armor

LTC Curtis W. Rosler
2d Battalion, 72d Armor

LTC David McMillion
1st Battalion, 40th Armor

LTC Garrett Duncan
3d Battalion, 77th Armor

LTC Robert L. Sloane
4th Squadron, 12th 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 Sqdn 1st Bde

LTC Ralph Wolfe
15th Battalion, 4th Brigade

LTC Raoul H. Alcala
2d Squadron, 1st Cavalry

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 Thomas A. Horner
3d Battalion, 67th Armor

LTC John H. Tilelli
2d Squadron, 6th Cavalry

LTC Charles McManamy
4th Battalion, 37th Armor

LTC William Schweitzer
1st Battalion, School Troops

LTC Donald W. Williams
2d Battalion, School Troops

LTC Paul E. Funk
5th Battalion, 33d Armor

LTC Timothy Grogan
2d Battalion, 77th Armor

LTC Walter Dillard
1st Squadron, 4th Cavalry

LTC Corless W. Mitchell
1st Battalion, 63d Armor

Your Personnel Manager Directory

The Officer Personnel Management System (OPMS) personnel manager structure in MILPERCEN has a specialty manager and personnel action/professional development officer assigned to each specialty (or group of specialities) or particular personnel action. These managers may be contacted directly by officers in the field with professional development, assignment, or personnel actions questions. If you're not sure "who does what to whom," contact your appropriate Armor (Specialty 12) manager and he'll identify the appropriate action officer to you. Following is a listing of all specialty managers and personnel action/professional development points of contact serving Armor officers.

You can contact any specialty manager at:

U.S. Army Military Personnel Center
ATTN: (Appropriate Office Symbol)
200 Stovall Street
Alexandria, Va. 22332

Commercial Phone:(202)325-(Appropriate Extension)
AUTOVON 221-(Appropriate Extension)

Lieutenant Colonels Division (DAPC-OPL)

		Ext.
COL Richard T. Lambert	(Chief)	7890
SGM Jerry O. Kinley	(Coordinator)	7891
Mrs. Loretta Vermillion	(Secretary)	7891

Assignments Branch (DAPC-OPL-A)

COL Peter J. Cofoni	(Chief)	7337
Mr. Frank Knight	(Mil Pers Staffing Tech)	7337
Ms. Margaret Dickson	(Mil Pers Staffing Tech)	7337
LTC David Roche	(Specialties 13 OVERSEAS, 54)	9789
LTC Michael W. Gilmartin	(Specialty 13 CONUS)	9789
LTC Ralph W. Pryor	(Specialty 11 OVERSEAS)	9529
MAJ James C. Joiner	(Specialty 11 CONUS)	9529
LTC Herbert E. Koenigsbauer,Jr.	(Specialties 12, 54)	9529
LTC Edmond S. Solymosy	(Specialties 14, 54)	9529
Mrs. Elaine Martin	(Mil Pers Staffing Tech)	9529
Mrs. Gloria Johnson	(Mil Pers Staffing Tech)	9789
Mrs. Jean Ince	(Mil Pers Clerk)	0423
LTC James P. Walters	(Specialties 25-28, 53, 72)	0423
LTC Thomas L. Elliott	(Specialties 31, 48)	9799
LTC Thomas P. Fisher	(Specialties 21, 52)	0423
LTC Jasper R. Harris	(Specialties 35, 36, 37, 48C, 48/35)	9799
LTC Robert D. Orton	(Specialties 43, 46, 47, 74, ROTC/USMA)	0423
Mrs. Helen C. Allen	(Mil Pers Staffing Tech)	9799
Mrs. Linda Hilliard	(Mil Pers Staffing Tech)	0423
LTC Garth H. Payne, Jr.	(Specialties 73, 75, 76, 77, 91, 51)	0422
LTC Donald L. Applegarth	(Specialties 44, 45, 49, OE)	0424
LTC Robert Bavis	(Specialties 41, 42)	0424
LTC Patty Brown	(Specialties 15, 71, 86-88, 95)	0422
LTC Richard H. Kenyon	(Specialties 81, 82, 83, 92, 93, 97)	0422
Mrs. Delores Fields	(Mil Pers Staffing Tech)	0424
Mrs. Virginia Robinson	(Mil Pers Staffing Tech)	0422

Professional Developments/Personnel Actions Branch (DAPC-OPL-P)

LTC Joseph H. Gilligan	(Chief)	0753
LTC Edward M. Gripkey	(CCSS Manager)	0753
Mrs. Velda Thomas	(CCSS Admin. Spt.)	0753
LTC Walter M. Smith	(Cbt Arms PD Monitor, OPMS,Straight Sys)	7892
LTC Duane E. Saville	(Cbt Svc Spt PD Monitor. PMDP)	7892
Mrs. Gertrude Younger	(Cbt Spt PD Monitor, Mil & Civ Education)	7892
Ms. Lynda Babylon	(Admin Spt)	7892
Mrs. Frances Lee	(Quotas, Projections, Language, Record & Reports)	7892
Mrs. Norma Brandt	(PA Actions)	7893
Ms. Bertha McCoy	(PA Actions)	7892

LTC Herbert F. Koenigsbauer, Jr.
Armor Lieutenant Colonels Assignments
EXT 9529/9549

MAJORS DIVISION (DAPC-OPM)

		Ext.
LTC (P) Carmen Cavezza	(Chief)	8115
MSG (P) Hector V. Bown	(Sergeant Major)	8114
Mrs. Cherie J. Felts	(Secretary)	8114

Professional Development/Personnel Actions Branch (DAPC-OPM-P)

LTC Jerome H. Domask	(Chief)	8119
MAJ Peter C. Swenson	(Cbt Arms PD)	8105
MAJ (P) Carlton H. Smith	(Cbt Arms PD)	8105
MAJ Alexander Okimoto	(Cbt Arms PD)	8110
MAJ Gary A. Frenn	(CSS Arms PD)	8112
MAJ Winnie R. Pittillo	(Personnel Actions)	8119
MAJ James M. Wright	(Personnel Actions)	8120

Combat Arms Division

Assignment Branch (DAPC-OPM-A)

LTC Henry H. Shelton	(Chief)	8104
MAJ Jim Bartlett	(Specialties 35, 36, 37)	8107
MAJ Beau Bergeron	(Specialties 12, 28, 47)	0686
MAJ James E. Bigelow II	(Specialty 48)	9697
MAJ Walt Busbee	(Specialty 74)	9697
MAJ Edward T. Christiansen	(Specialties 31, 46, 53)	8103
MAJ Thomas F. Conrad	(Specialties 41, 42 OVERSEAS, 44, 45)	8122
MAJ Arthur T. Dean	(Specialties 41, 42 CONUS. 43)	8121
MAJ James E. Hawley	(Specialties 73, 75, 76 77, 91)	8121
MAJ Gerald F. (Joe) King	(Specialties 81, 82, 83, 92, 93, 97)	8122
MAJ Richard N. Murray	(Specialties 14, 51)	0687
MAJ Richard Parris	(Specialty 15)	0686
MAJ Franklin S. Rawlerson	(Specialties 25, 26, 27, 72)	8107
MAJ Leonard W. Roth	(Specialties 21, 49, 52)	8108
MAJ Joseph A. Siraco	(Specialties 13, 54 CONUS)	0686
MAJ John C. Truesdell	(Specialties 13, 54 OVERSEAS)	0686

LTC William W. Crouch
Armor
Colonels Assignments
Ext 7873

MAJ Beau Bergeron
Armor
Majors Assignments
Ext 0686

LTC Warren J. Walton
Armor Branch Chief
Ext 9696/9658

MAJ Hartwell B. Stephenson
Lieutenant Assignments
Ext 9696/7849

MAJ Joseph R. Inge
Captain Assignments
Ext 9696/9658

MAJ Everette L. Roper Jr.
Aviator Assignments
Ext 9696/9658

Mr. Leo L. Leal (Accessions)	**9696/7849**
Mrs. Paula D. Leak (Secretary)	**9696/9444**
Mrs. Pat Stanford (Secretary)	**9696/9658**

PROFESSIONAL DEVELOPMENT/PERSONNEL ACTIONS BRANCH (DAPC-OPE-R)

LTC Turner D. Griffin	(Chief)	0700
MAJ Michael J. Scannell	(PD/Specialty Monitor)	7820
MAJ John F. Keith	(PD/Specialty Monitor)	0770
MAJ Marvin E. Mitchiner, Jr.	(Mil. Schools/Avn Mgmt)	7820
MAJ Charles E. Magaw	(Civil Schools)	0701
Miss Charlcie Campbell	(Civil Schools)	7818
Mrs. Vera Jean Arnold	(Avn Accessions)	7819
CPT Leo J. Baxter	(Personnel Actions)	0701
CPT Charles W. Hurd, Jr.	(Personnel Actions)	0701
Mrs. Hilda B. Gross	(Gains & Losses)	0701
Mrs. Mary L. Curiel	(Asst,PD/Spclty Monitor)	7820
Mrs. Sandra K. Powell	(Asst, Military Schools)	7820
Mrs. Adonia L. Blake	(Asst, Civil Schools)	7818
Mrs. Karen H. Welander	(Asst, Personnel Actions)	0701
Miss Margaret E. Walsh	(Asst, Gains & Losses)	0701

NEW FILING PROCEDURES

A new procedure for filing denied officer evaluation report (OER), enlisted evaluation report (EER/SEER), and academic evaluation report (AER) appeals was recently announced.

Effective 1 May 1978, denied appeal correspondence from individuals will no longer be filed on the performance fiche of the official military personnel file (OMPF) but will be filed on the restricted fiche. The HQDA letter announcing the appeals board decision *will* be filed on the performance fiche of the OMPF. The decision to eliminate denied appeal correspondence is based largely on surveys of recent selection/promotion boards and their after-action report comments.

This change is part of an extensive review being conducted by MILPERCEN to identify those documents in the OMPF that promotion/selection boards and career managers should use in their selection and assignment decisions.

The review includes not only denied appeal correspondence but many other documents. For example, in January, it was decided that subcourse completion certificates will no longer be filed in the OMPF. Currently only course completion certificates are included.

New Subsection Added

Previously the OMPF contained only two subsections, the performance fiche and the service fiche. A third subsection, the restricted fiche, has been added. The added portion will *not* be provided to promotion/selection boards or career managers. This protected file contains those documents which must be permanently retained to facilitate personnel administration and/or protect the interest of the government and the individual.

The new filing procedure will not be retroactive; however, individual requests to have previously denied appeal correspondence transferred from the performance fiche to the restricted fiche will be considered on an individual case-by-case basis. This transfer will not constitute grounds for standby promotion board consideration. Officer requests for transfer of these documents should be directed to: **Commander, MILPERCEN, ATTN: DAPC-PSR-EA, 200 Stovall Street, Alexandria, Va. 22332.** Enlisted requests should be sent to: **Commander. USAEREC, ATTN: PCRE-RP-A, Ft. Benjamin Harrison, Ind. 46249.** *FOCUS, 23 June 1978.*

SUBMISSION AND FILING OF BOARD COMMUNICATIONS

Letters of communication to selection boards are an important part of the centralized board process for both officers and senior enlisted personnel. Procedures for the submission of these letters are outlined in AR 624-100 for officers and AR 600-200 for enlisted. Through these letters of communication, the individual can call attention to any matter of record on file at HQDA which he feels is important to the consideration of his record.

In the past, these letters have been filed in the Official Military Personnel File (OMPF) after being considered by the board. On 1 August 1978, a new filing procedure for these items took effect. Beginning on that date, letters of communication, including all inclosures, for promotion selection boards are considered privileged correspondence and will be filed with the record of board proceedings maintained by MILPERCEN, instead of the OMPF.

Also effective 1 August, only letters from officers and enlisted personnel in the primary zone of consideration will be accepted. In the past, letters from enlisted personnel in both the primary and secondary zones were accepted and filed, while only those from officers in the primary zone were accepted.

Letters of Recommendation

For enlisted members, another means of getting more information to the board is through letters of recommendation for promotion. Past policy allowed anyone to write a letter to the selection board on behalf of the soldier. Effective 1 August, these letters will be accepted only for soldiers in the primary zone from their current chain of command/supervision. Letters for soldiers in the secondary zone are not authorized. Letters of recommendation for promotion, like letters of communication, are considered privileged correspondence and will not be filed in the OMPF.

In addition, current procedures permit officers and senior enlisted personnel in the zones of consideration for school, command, and CSM Selection/Retention boards to communicate directly by letter to the president of the appropriate board. Effective 1 August, these letters will not be filed in the OMPF. Letters, including inclosures, for command, school, and CSM Selection/Retention boards are considered privileged correspondence for board purpose only and will not be filed or retained after adjournment of the boards. Individuals desiring acknowledgement of receipt of their correspondence should enclose a self-addressed DA Form 209 (Delay, Referral, or Follow-Up Notice).

Because letters of communication have previously been filed in the OMPF, some members have been using them as a means to ensure that documents of career importance are added to the OMPF. With the changes in filing procedures, this means of file update is no longer available. OMPF material must be submitted through the MILPO, not directly to the board.

Special OMPF Update

A special processing section has been established in the Officer Personnel Records Branch at MILPERCEN and the Enlisted Records and Evaluation Center at Fort Benjamin Harrison, Ind. to expeditiously process OMPF updates on a priority basis for officers and enlisted personnel in the zone of consideration.

Documents for officer OMPF updates should be sent through the MILPO to: **Commander; MILPERCEN; ATTN: DAPC-PSR-RP; 200 Stovall Street; Alexandria, Va. 22332.** Documents pertaining to enlisted personnel should be sent through the MILPO to: **Commander; USAEREC; ATTN: PCRE-XX; Ft. Benjamin Harrison, Ind. 46216.** A letter of transmittal indicating name, grade, social security number, and the identification of the selection board by which the individual is being considered should be used. Only those documents authorized for filing by AR 640-10 will be accepted, processed, and forwarded to selection boards. *FOCUS, 18 August 1978.*

OFFICER DEVELOPMENT: A PARTNERSHIP

Professional development of company grade officers—the development of professional attributes and capabilities to meet the Army's needs through planned assignments and schooling—is a unique challenge in today's Army. With today's stabilization guidelines, longer tour lengths are the rule. In this environment, the commander's role becomes even more vital than in the past.

There are many competing demands on the company grade officer: military and civilian education plus duty in a primary and eventually an alternate specialty. MILPERCEN attempts to balance assignments with other aspects of professional development in meeting the Army's needs. The main objective in meeting Army requirements is to qualify all company grade officers in their primary specialty.

Duty with troops and command at the company grade levels are important professional development factors in most OPMS specialties. Selection of officers for troop duty and company command is controlled by field commanders. Thus, commanders are key players in the professional development of their assigned officers. A professional development team consisting of MILPERCEN and the commander must combine to give each company grade officer advice and counsel that will enhance career development and progression. *FOCUS, 23 June 1978.*

MISSING SSN'S CREATE FILING DIFFICULTIES

To DA selection boards, the Official Military Personnel File (OMPF) *is* the soldier. It represents the accomplishments and shortcomings of the soldier's military career. The OMPF is made up of many documents from a variety of sources, and it is important that every authorized item be included. As far as the selection boards are concerned, if it's not in the OMPF, it doesn't exist.

Currently, thousands of these very important OMPF documents are backlogged because of one common problem, missing or incorrect social security numbers.

Maintenance Responsibility

The responsibility for maintaining the OMPF on the Army's more than 760,000 soldiers rests with MILPERCEN. This maintenance includes not only storage and security of the files but also posting updates of the documents they contain.

The Officer Personnel Records Branch (OPRB), a part of MILPERCEN's Personnel Information Systems Directorate, maintains the OMPF for the nearly 98,000 commissioned and warrant officers in the Army today. More than 750,000 documents are received for inclusion in the OMPF by the OPRB every year.

The Records Maintenance Division at the Enlisted Records and Evaluation Center (EREC), a field operating activity of MILPERCEN located at Fort Benjamin Harrison, Ind., maintains more than 666,000 enlisted records. Over two million documents flow through this office every year.

Even though the problem is not new, it has been magnified during the past 2 years by the on-going conversion of the OMPF from paper to microfiche.

Microfiche files are maintained in an automated system consisting of three major components: terminals, a computer data base, and a storage and retrieval device.

OMPF Posting

Adding a document to the microfiche OMPF is a relatively quick and simple process when that document contains a valid social security number. The number is keyed into the terminal and within seconds information about the individual's file is recalled from the data base and displayed on a cathode ray tube, much like a television screen. This information includes the soldier's name, the location of his file in the storage device, and the number of the last frame used on the film. A frame number is assigned and the document is sent to the next station. There the file is retrieved from the storage device and the new document is filmed on the fiche at the assigned position.

Because the information in the computer data base is arranged in sequential order, using each individual's social security number, it is of utmost importance that each update document received by OPRB and EREC contain a valid social security number. If an update document is received without a social security number, or if that number is incorrect, the once instantaneous process can become an extended administrative nightmare.

In these cases, the OMPF can no longer be located by a social security number search, meaning that a "by name" search must be done. This process takes about 20 times longer than when using a social security number. Also since more than one update is processed simultaneously to the computer, a "by name" search suspends all other processing.

If this process is not successful, additional external processing is required—for example, a search of the Active Army Locator System. Another method used is a computer search of the Army's Officer Master File or the Enlisted Master File. Although workable, these procedures are costly and time consuming.

SSN Placement

Every document submitted for OMPF inclusion needs a valid social security number. Most items authorized for inclusion by AR 640-10 have a place for this information. Some, such as college transcripts, orders, and letters of appreciation and commendation don't. It is the responsibility of the individual or organization submitting the item to ensure that it contains a social security number. The number must be prominently displayed on the document, preferably in the upper right hand corner. If more than one item is submitted as a packet, the number must be on the first page of the packet.

The OMPF is an important part of the management process of all personnel. Because of this, great care must be taken by all involved to ensure that these documents are complete and of high enough quality to be used in the microfiche process.

NOTES

The crew of this *M-60A1* tank learned firsthand that antitank ditches can be very formidable obstacles. In the background, a German crew prepares to attempt a crossing during a demonstration of antitank obstacles at Grafenwoehr, Germany. The tanks later cleared the barrier with help from a Universal Engineer Tractor.

A new laser device that will enable U. S. Marine Corps forward observers to spot targets accurately for conventional artillery and to direct sophisticated laser-guided weapons with deadly precision has entered full-scale engineering development. A mockup of the device, called Modular Universal Laser Equipment (MULE), is shown to demonstrate how it might be used in combat. The man-portable, tripod-mounted MULE is compatible with all laser-guided weapons now operational or under development, including laser Maverick and cannon-launched, laser-guided projectiles. Six engineering development models will be built for the Marine Corps by the U. S. Army Missile Research and Development Command, Redstone Arsenal, Ala.

Expendable Jammer

An unattended/expendable jammer is being developed to support the Army's Intelligence Surveillance and Target Acquisition mission. It will be delivered by artillery, operated automatically, and spent after a single use. It will be packaged in an *M-483* canister round and delivered from a standard 155-mm artillery piece. When dispersed well behind the front edge of the battle area the jammers will disrupt and confuse enemy tactical communications without affecting that of friendly forces.

Pictured is the thermal receiver unit of a Thermal Imaging System (TIS) for the *XM-1* tank. The system enables the crew to see through darkness, smoke, or haze. It produces an image by sensing the small differences in infrared heat radiated by objects in view and converting the detected energy into electrical signals which are displayed on a cathode ray tube, much like a TV picture. More than 400 rounds were accurately fired by a tank using this system in tests at Aberdeen Proving Ground, Maryland. Delivery of the first production system is planned for October 1979.

Fire-safe Diesel Fuel

Diesel fuel mixed with a special additive plus water promises fire-safe fuel without significant penalties in engine performance.

The U.S. Army Fuels and Lubricants Research Laboratory at Southwest Research Institute in San Antonio has produced a new hybrid diesel fuel which is self extinguishing if ignited by accident. The new fuel could reduce fires from highway accidents and from off-highway diesel operations such as underground mines.

The discovery is the result of a 10-year effort. The new hybrid fuel is practically clear and consists of up to 10 percent water, 6 percent additive, and the remainder diesel fuel. Its appearance is much like typical diesel fuel.

BOOKS

JUST AND UNJUST WARS: A MORAL ARGUMENT WITH HISTORICAL ILLUSTRATIONS by Michael Walzer. New York. Basic Books, Inc., Publishers. 1977. 361 pages (with index and notes). $15.00.

Michael Walzer, known for his opposition to the Vietnam War, has written an important book which confronts all of us with the demand that war be judged by moral standards. Such judgment is divided into two parts: the justice *of* war, and justice *in* war. In the first instance, the concern is with the reason the war is fought (i.e. is it a "just war"?). In the second case, the concern is with the moral standards by which the war is fought. Thus, it can immediately be seen that an "unjust" war may be fought by "just" means, while a morally defensible war may be fought by morally repulsive means.

The unjust war, Walzer argues, is represented by the crime we call "aggression" ("the only crime that states can commit against other states"). Proceeding from what he calls the *"legalist paradigm,"* Walzer sums up the theory of aggression in six propositions:

- There exists an international society of independent states.
- States have the right to territorial integrity and political sovereignty.
- Any use of force or imminent threat of force by one state against another constitutes the crime of aggression.
- Aggression justifies self-defense by the victim-state.
- Nothing but aggression can justify war
- Once the aggressor state has been repulsed, it can be punished.

Not satisfied that the *legalist paradigm* encompasses all justifiable wars, Walzer expands the definition to take account of circumstances which are certainly debatable. He asserts "that there are threats with which no nation can be expected to live." Under this rubric he justifies the Israeli attack of 1967 as a legitimate anticipation, the only case offered to prove the point. He also expands the *legalist paradigm* to argue that"representative" secessionist movements can be justly assisted by invading states; that interventions may be just if they balance previous interventions; and, that interventions for humanitarian reasons can be justified. Even in this sketchy form, Walzer's arguments may be more useful in starting a debate, rather than ending one. It is apropos to recall that the United Nations took three decades to arrive at even a minimally useful definition of aggression.

Citing a number of historical cases, Walzer threads his argument through all types of war and war activities. He treats guerrilla warfare, blockades, reprisals, conventional and nuclear war, and in a very valuable chapter, terrorism. His treatment is broad enough to accommodate any of a number of military and political science courses.

Walzer's discussion of justice *in* war is quite distinguished and deserves careful reading. Much of this treatment builds on the "principle of double effect" which Walzer explains and modifies as permitting an act likely to have evil consequences (the killing of noncombatants) providing the following holds: the act must be a legitimate act of war with a morally acceptable end, such as the killing of enemy soldiers, and the evil consequence should not be sought or made more likely by the choice of means. Finally, the good effect must outweigh the evil consequences. Thus, Walzer finds a stringent requirement for the soldier to put himself at risk (when possible) rather than kill noncombatants, since "soldiers... lose the rights they are supposedly defending."

It is scarcely possible that anyone would find himself in total agreement with *Just and Unjust Wars,* yet Walzer's provocative and lucid treatise demands examination and serious reflection. Not the least because "...soldiers and statesmen ought to know the dangers of cruelty and injustice and worry about them and take steps to avoid them."

Major A. R. Norton
USAIMA

1945 YEAR ZERO by John Lukacs.. Doubleday & Company, Inc., 322 pages. 1978. $8.95.

Since more than half of the population is less than 30 years old, this book will be ancient history to most readers. The author, John Lukacs, who actually experienced *Year Zero* in Budapest, has given us a most articulate and interesting history of that period. His thesis that 1945 terminated the period of the World Wars, and began a new age is cleverly done through a description of its five key actors: Hitler, Churchill, Roosevelt, Stalin, and Truman and their intrarelationships in 1945. He then relates what American public opinion was and why. His comparison of *Year Zero* to 1870 and the establishment of Germany to the end of the Civil War and other critical firsts adds credence to his thesis. In Part II, he personalizes this history by his auto-history of the period which has impacted so heavily on us.

All in all, John Lukacs has provided a most delightful and readable history of the period. A perusal will give most every reader a better understanding of this critical period of the 20th century and explain some of the why of the daily news.

Colonel C. A. Mitchell
Command and Staff Department
U.S. Army Armor School

CUSTER IN THE CIVIL WAR--HIS UNFINISHED MEMOIRS by John M. Carroll. Presidio Press, San Rafael, California. 1977. 233 pages. $27.50.

Graduated last in the Class of 1861 at the USMA, a Brigadier General in 1863 (at age 23), brevetted seven times, and ended the American Civil War as a Major General commanding a cavalry division. Most will instantly recognize the above as describing George Armstrong Custer. A fascinating, controversial, and somewhat complex individual, Custer has much to offer the historian who studies any portion of his adult life.

Mr. Carroll's book focuses exclusively on the American Civil War period. Art work by Joe Grandee and the late Randy Steffen is first rate. The print is clean, bold, and easily read. A comprehensive bibliography of most books or other printed items which mention Custer in the American Civil War fill the last 66 pages. Two major portions comprise the remainder of the book; one, a reprint of Custer's 11 official reports on his unit's actions in the war, and the other a reprint of his unfinished memoirs from *Galaxy Magazine*. Accompanying the reprints in this book, there are approximately 5 pages of original writing by Mr. Carroll.

For those who do not have access to a library, and to dedicated "Custerphiles,"who yet wish to read Custer's war reports and memoirs, this is a valuable book.

Arthur B. Alphin
Rice University

IMBALANCE OF POWER:SHIFTING U.S.--SOVIET STRENGTHS by John M. Collins with Anthony H. Cordesman. San Rafael, Calif.: Presidio Press, 1978, 315 pages.

As most observers of defense matters are aware, CIA appraisals of Soviet capabilities before 1975 were probably badly understated. In fact, CIA analysts adjusted estimates of Soviet military manpower and defense spending sharply upward in 1975. Then, in January 1976, a study by John M. Collins a Senior Specialist in National Defense for the Congressional Research Service (CRS) of the Library of Congress, was published by the Senate Armed Services Committee (SASC). The study outlined evidence that the Soviet Union had made and was continuing to make significant gains in its military power. The result was the formation of a special team President Ford directed to make independent analyses of raw intelligence data. This group, known as Team B, produced analyses which were far more conservative than those of the Board of National Estimates (Team A; which was essentially the CIA). Team B, argued that not only was the Soviet Union approaching strategic superiority in some areas, but the USSR had definite plans to establish and *use* world-wide strategic superiority.

Meanwhile, John M. Collins was completing an update of his now famous 1976 study. This update, as Philip Petersen noted in a recent *Parameters* article, further heightened the debate: "The attempt to suppress this second report has further fueled the assessment controversy. In fact, both the contemporary military trends as analyzed and the reasons for the attempted suppression have been thrust into the debate."

While Collins relied entirely on unclassified and declassified material, his conclusions were far from what the SASC was prepared to accept. Consequently, pursuant to Congressional Research Service guidelines, Collins offered the report to the House Armed Services Committee, which was in turn told that SASC planned to publish the report. Petersen tells the story best:

> U.S. Representative John Breckinridge received permission from CRS to obtain the report and hoped to make it available to the Congress and the public. After Collins provided Breckinridge with a copy of the study, CRS claimed that there must have been a "communication foul-up" and refused to release the report, threatening Collins with disciplinary action for breaking the confidentiality of his client. On 3 June 1977, Collins was given 60 days to improve his performance or be denied a pay increase. He was to demonstrate his understanding of guidelines concerning the review, dissemination, objectivity and nonadvocacy of CRS work, and the confidentiality of congressional relationships.

Collins was subsequently denied that pay raise, but the stink had by then become pronounced, so Senator Jesse A. Helms asked permission to place the study in the *Congressional Record* on August 5, 1977. Shortly afterward, Congressman Jack Kemp also placed a summary of the details of the attempted suppression in the *Record*.

The Presidio Press has now taken the Collins report, added a net assessment appraisal by Anthony Cordesman, and forewords and statements by Senators Howard Baker and Jesse Helms, and published it as the *Imbalance of Power*. The result is a superb handbook which collects masses of comparative data in one volume, presents it in a highly usable form, and provides cogent and useful analyses of the meaning of the data. But the book's greatest strength is that it details why intelligence estimates often go awry, and why they must always be viewed with caution. Both Collins and Cordesman repeatedly emphasize that this study relies entirely on publicly available information, and that "no study of the balance [of power] can ultimately be better than the data that are released by, or leaked from, United States intelligence agencies."

Among the many examples produced by both Collins and Cordesman of the traps sophisticated analyses can hold for the unwary are these:

- Comparisons of total spending on military forces between the United States and the Soviet Union are seldom totally reliable. While reasonably accurate assessments of U.S. military spending can be made, such assessments of the USSR are incredibly difficult since Soviet budgeting is intriguingly different. Much of the Soviet military training budget, for example, is accounted for under the Ministry of Education, while material is costed differently based upon its use. A truck for a farm collective may be budgeted at 30,000 rubles; the same truck for the military may be listed at only 10,000 rubles.
- The Soviet Navy possesses a significant advantage in the total number of ships, running nearly 3:1 over the U.S. But, the U.S. has ships of such greater size that we enjoy a nearly 2:1 advantage in total tonnage.
- Composite strengths [in U.S. airlift capacity] have...stayed constant statistically, but combined capabilities have decreased. Reliance on reserves, once modest, is now marked.
- The U.S. still has a striking lead (though rapidly shrinking) in the number of available nuclear warheads, but Soviet missiles have a significant throw-weight advantage which, with successful MIRV'ing, may also allow the development of an advantage in total numbers.

There is much more, but not much of it will help reassure defense-minded citizens.

While Collins was principally concerned with organizing the raw data, Cordesman attempts with considerable success to place it in perspective. Cordesman has also contributed material which updates the report to the very early part of 1978, making it probably the most current and most complete single-volume survey of the balance of power between the U.S. and Soviet Union now available.

Captain David G. Boyd
ROTC Detachment
University of Illinois

THE SECRET OF STALINGRAD

by Walter Kerr. Doubleday & Company Inc., 274 pages. $10.00.

This is a highly informative look at one of the most important battles of World War II. The approach made by Kerr to this subject adds additional information and new light to the reason why the mighty German Sixth Army under the command of General Fredrich von Paulus was soundly defeated.

Kerr adds his journalistic experiences in Moscow during this period to give the reader additional insights into the thinking of Stalin and the action of Stvaka. These behind the scene looks provide additional insight into the actions and motivational forces that drove Stalin and Stvaka to decisions on the battlefield before and during the fighting at Stalingrad.

Not only does the reader have behind the scene cameos with Stalin and Stvaka, but also the meetings between Stalin, Churchill, and the U.S. Representative, Averell Harriman.

Kerr ably points out that faulty intelligence provided by LTC Gehler led to an inaccurate estimation of the total Soviet strength. However, the estimate made by General Halder was nearly correct, but Hitler would not believe this estimate. Not known to the Allies or Hitler, Stalin had a strategic reserve of seven full armies and over 1.7 million men to join in the fight.

The author also recreates the street-by-street, building-by-building, day-by-day fighting for Stalingrad. Before and during the battle for Stalingrad, Kerr introduced the reader to the future ruler of the Soviet Union, Commissar Khrushchev.

Stalin's secrecy and his use of deception led to the defeat of the Sixth Army, the destruction of the Third Reich and the loss of hundreds of thousands of German and Russian lives.

For a new look at an old subject, this book is highly accurate, very convincing, and will fascinate most military historians.

Major Ronnie W. Nall
Command and Staff Department
U. S. Army Armor School

NAPOLEON: THE LAST CAMPAIGNS. 1813-1815

by James Lawford. New York: Crown Publishers. 1977. 160 pages. $12.95.

At first glance, James Lawford's book seems intended for cocktail table display rather than for serious reading. It is an oversized book, replete with illustrations and a full-color cover sporting Napoleon's brooding countenance. Indeed, Lawford himself labels the book "no military treatise," which is a prudent admission on his part since the serious student of military history will find little of interest in this volume. Lawford neither advances new theories nor adduces new evidence. What he does do, however, is tell a straight-forward and interesting story of the final campaigns. This volume would provide the novice an excellent introduction to the closing phase of Napoleon's brilliant career. In his effort to restrict his material and retain narrative focus, Lawford undoubtedly falls victim to oversimplification. For example, his contention of Napoleon's belief in his own invincibility receives little in the way of documentary evidence. The price paid, however, is probably worth the clarity obtained.

The battle maps, the downfall of many military histories, also reflect his effort at clarity. They include minimal detail but require little cross-referencing to the text. Lawford also avoids that most maddening of sins—referring to places that do not appear on maps. He also includes dozens of many illustrations in full color, which are generally not put to good use. Some are excellent, either helping to visualize the troop dispositions or assisting in conveying the flavor and pace of the battles, but serve little purpose. Also, much of the graphic work is gaudy and tasteless. The wreathed page numbers and chapter leads done almost totally in red provide cases in point.

All in all, however, Lawford does a good job describing the complex last campaigns. He handles the 100 days particularly well, and his account of the demise of Napoleon's Old Guard is first rate. For the amateur historian who wants a showpiece, the $13.00 price tag is not too steep.

Major Jerry M. Sollinger
101st Airmobile Division
Fort Campbell, Kentucky

RECOGNITION QUIZ ANSWERS

1)	ITALY----	**Augusta 109 helicopter armed with TOW missle.**
2)	U.S.--------	**OH-58 helicopter flying NOE.**
3)	ISRAEL--	**155-mm SP artillery piece mounted on U.S. M-4 tank chassis.**
4)	SOVIET--	**T-62 tank employing on-board smoke generator.**
5)	U.K.--------	**FV-438 firing Swingfiren missle.**
6)	AUSTRIA	***Greif* recovery vehicle.**

STRATEGIC DISARMAMENT VERIFICATION AND NATIONAL SECURITY

by SIPRI, the Stockholm International Peace Research Institute. Crane Russak, and Company, Inc. 1977. 174 pages. $16.50.

The stated purpose of this work is to prove the simple point that verification of strategic disarmament, conducted by two superpower adversaries, is difficult. Ultimately, national pride and national interest, and perhaps a critical measure of insecurity, may make verification all but impossible. Along the tiring and turgid road to demonstrate this point, however the reader may lose interest and move on to something a little less contrived. Although the message is itself uncomplicated, the book goes a long way in advancing the popular thesis that political science writing is an excercise in abstracting and obfuscating that which is intuitively clear.

The book is a collective effort of the Stockholm International Peace Research Institute (SIPRI). Its principal author was Andrzej Karkoszka, now in the Polish Institute of International Affairs in Warsaw. If you now expect the tone of the book to be tendentious, you are correct. In the introduction to one of the many case studies, it is postulated that governments of different socio-economic systems are highly mistrustful of each other—"....Verification thus became a kind of substitute for trust....In general two positions developed. According to that adopted by the United States and its allies, the verification system should be set up before disarmament." The Soviet Union and the other socialist states, on the other hand, adopted the view that actual disarmament should precede measures to ensure that an agreement was being observed. Such is the tone of the book.

There are, however, some solid contributions to be found in the appendix. Of particular interest to the student of national security affairs are the data on U.S. and Soviet ICBMs and silos, including estimated hardness of each type, and their estimated survival potential.

Unhappily, the work is not sufficiently footnoted nor credited to permit any estimate of the accuracy of all these figures. Although containing some interesting interpretations of contemporary defense strategies, the book cannot be considered particularly valuable to even the most ardent and patient of military readers.

A. W. McMaster III
St. Leo College

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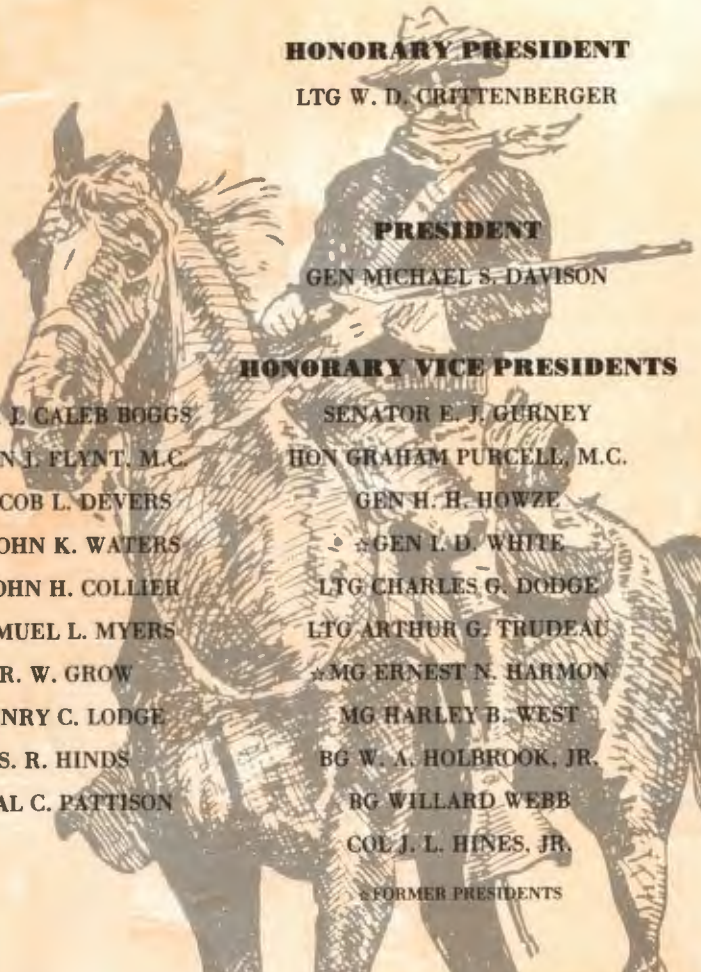

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