

# ARMOR

*The Magazine of Mobile Warfare*



WILLIAMS

July-August 1983

# United States Army Armor School



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

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# **ARMOR** *The Magazine of Mobile Warfare*

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## **COVER**

Since 1970, in a little known example of allied training cooperation, Canada has hosted German and British armor units in maneuver and gunnery training exercises at Canadian Forces Bases Shilo and Suffield.



# LETTERS

## Heavy Force Needs Better Name

Dear Sir:

The 1983 Armor Conference was a good one because it was a working conference on the present and future—not just a rehash of past glories.

I have a suggestion that you may wish to pursue. We talked about the future armor force as the Close Combat Force Heavy (CCFH); the *heavy* brigade the *heavy* force. I think *heavy* is the worst possible adjective. *Heavy* connotes fat and expensive. Our naming armor forces *heavy* is like naming a boy Sue and not expecting him to have trouble.

Our *ARMOR* Magazine is dedicated to mounted combat—mounted forces in M1, M2, M3, attack helicopters, etc. The opposite of *heavy* is *light*. The opposite of *mounted* is *dismounted*. Enemy machines have become the principle target of mounted forces because their machines give them power and strength which must be destroyed or neutralized.

I remember my days in the Combat Developments Armor agency discussing heavy and light combat. It was a hopeless pit. Yet, we are designated *heavy* forces.

I feel that with all the resources of the Armor Association and the Armor Center and School we can come up with a better descriptive title of what we go to Congress for funds with than *heavy*.

I watch other arms and services in my DOD job pick their forces and equipment names and titles very carefully. There are a lot of *attack* things—no other *heavy* but ours.

Thanks again for a great Armor Conference and hope I have provided some food for thought.

DALE K. BRUDVIG  
Colonel, Armor  
Office of the  
Undersecretary of Defense  
Washington, DC

## Close Air Support

Dear Sir:

"Fight Early: an A-10 Pilot's Perspective," by Captain Edward H. Houle, USAF was an excellent article. I agree with his concepts, however, ground forces would have been served better had this article been published in *Air Force Magazine*. Ground force commanders have always recognized the value of close air support, and have been willing to use it. Doubts over the value of air power by ground forces have centered around the ability of strategic bombing and or interdiction

alone, to win wars; not over close air support.

Captain Houle cites the many close air support assets available to ground forces in the recent Southeast Asia conflict. It is doubtful that Captain Houle is old enough to have served in that war, but I did three tours. For that reason I think it behooves a member of the ground force community to point out the reality of close air support to the Captain. During this conflict Marine Air assets, trained and dedicated to close support of Army and Marine ground forces, were placed under the command of the Air Force, subsequently being used for missions other than their primary one. I don't want to start a controversy or a feud with the Air Force, but the fact remains that Air Force close air support leaves much to be desired.

Captain Houle doesn't have to sell us, we are already believers; what he should be doing is educating his Air Force colleagues and the Air Force generals on the value of good and timely close air support. Over the years, if the Air Force had really been serious about close air support the attack helicopter might not have been developed.

MARTIN L. STEITZ  
P.O. Box 612  
Sneads Ferry, NC

## Disagrees With Changes to Table VIII

Dear Sir:

I most strongly disagree with Major Blackburn's argument for changing Table VIII. He has missed the trees for the forest.

Table VIII is a *part* of an overall gunnery program. Each table, I thru IX, is a progressive step, a building block, to be mastered before going on to the next step. No one ever claimed that Table VIII judged "Battlefield Proficiency." Table VIII is a standardized measure of a tank crew's ability to shoot quickly and accurately. Having met the standard, a crew is then ready for the next challenge: Table IX, Platoon Battle Run.

What Major Blackburn's article proposes is basically an *individual tank crew's* Table IX. Each crew would go out, seek out possible targets, identify them as friend or foe, engage accordingly, occupy defensive and offensive firing positions, etc. A very ambitious program indeed, especially if the crew might or might not be able to hit the broad side of a barn while inside it.

I also question the scoring and realism of such a scenario. If a tank commander uses terrain properly and can't be engaged

(therefore, cannot himself engage), is this a "GO" or "NO-GO"? Remember now, tanks are not supposed to operate individually. A logical solution is to park turret-down, dismount, and observe. Sound, but not exactly my idea of a gunnery training program, which is what we are supposed to be doing in the first place.

To further point out the fallacy of Major Blackburn's concept, I draw attention to his claim that current main gun targets are so far away that only luck, not skill, is involved in hitting them. Yet the table in figure 1 shows that all HEAT-TP-T engagements are at 800-1,100 m, and TPDS-T are no more than 2,000 m, with most being even below 1,600 m. If an M60A1 crew cannot hit at those ranges with anything other than *luck*, then there is something terribly wrong with someone's *gunnery* program, and the commander had better look at getting back to basics like Tables I thru VI, and not worry about *challenging* his crews.

Don't get me wrong, now. Table VIII is not perfect. More realistic targets are fine. The idea of moving targets towards the firer is a great idea (not untried, in fact), but let's not get so wrapped up in tactics that we forget what we are trying to train for. Table IX is for *tactics*. Table VIII is for *gunnery*.

We can train tactics anytime. Gunnery on the other hand is expensive, both in manpower and resources. Let's set our priorities and learn to put steel on target, *then* worry about tactics. After all, a platoon of tanks maneuvering is just like a platoon of M88's, except that the M88's make less noise when firing their weapons. But our taxpayers (myself included) have paid a heck of a lot for some pretty nifty fire control equipment in order to differentiate an MBT from a 50-ton ram. In my opinion, we should learn to use that equipment.

CHESTER A. KOJRO  
Captain, Armor  
Ft. Knox, KY

## Add-On Armor Comments

Dear Sir:

In reference to the recent article on Israeli add-on armor (See "The Puzzle of Israeli Add-on Armor" January-February 1983 *ARMOR* Magazine, Ed.), some interesting theories were certainly presented. However, it would seem to me that the simplest solution—ordinary steel "boxes"—is the most obvious, particularly when close examination of one of the *Centurions* pictured reveals a definitely hollow



box on its glacis. In addition, the sudden proliferation of vehicles so equipped (to the best of my knowledge, none were noted before the invasion of Lebanon) would seem to negate the use of technological breakthroughs such as ceramic tiles or active armor, although Israel is certainly capable of such developments.

Another suggestion is the use of the fixed, rigid A-frame affixed to the front of some *Centurion* hulls. An edition of *BORN IN BATTLE* magazine first showed an A-frame-equipped *Centurion* operating in conjunction with an engineer platoon, which led me to speculate that it was used as some sort of battering ram.

Another item of interest is a picture which appeared in a recent issue of *TIME* magazine which showed an Israeli *M60A3* with what appeared to be an extended front slope, or, more likely, part of the mine clearance roller attachment.

In my opinion, the U.S. Army can learn a great deal from the Israeli Armor Corps because of their recent experience and success. Anything they do should warrant our attention.

JEFF SPENADER  
Specialist 4,  
Friedberg, Germany

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### Reenlistment Boards in 2/11th Cavalry

Dear Sir:

The following reenlistment board procedures are used by the 2d Squadron, 11th Armored Cavalry Regiment to ensure that all soldiers receive full consideration when they apply for reenlistment. Our procedures may not be the "best," but we feel that they are innovative and provide a concept that other units may want to adopt.

The reenlistment board is used to help the Squadron reenlist only "quality soldiers," and to establish a standing reenlistment list, based on the merits of each soldier appearing before the board. It is conducted in much the same manner as a promotion board, in terms of courtesies, introductions, etc. However, the board screens more than just the individual's recent duty performance.

In order to enhance and specify the reenlistment guidelines set forth in interim change I21 to AR 601-280 the Squadron has established a point system for reenlistment boards and amplified the results by publishing standing lists for P3 soldiers desiring reenlistment. The point system includes aptitude scores, military education, civilian education, SQT scores, awards, nonjudicial punishments, and waiver's required, as well as the soldier's military bearing, appearance and attitude.

A composite score is developed and a standing reenlistment list based on P1, P2, and P3 soldiers is published. Once this is completed it is easy for the Reenlistment NCO to schedule good soldiers for reenlistment, because he merely has to follow

the order of merit on the standing list. Recommendation for retention is based on the point system in addition to the board's subjective recommendation.

Of course each unit may have to tailor their point totals to match peculiarities of that unit. Perhaps an infantry unit would assign a point value to the EIB, for one example. Additionally, it is recommended that promotion boards be utilized as reenlistment boards because of the rank of the convening authority and because of the convenience of holding the board at the same time so that the soldiers desiring reenlistment can be screened after all personnel going for promotion have been boarded.

BRUCE B.G. CLARKE  
Lieutenant Colonel, Armor  
2/11th Cavalry

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### Requests Regimental Recognition

Dear Sir:

The membership of this organization eagerly awaits each issue of *ARMOR* which is distributed to all, read from cover to cover, and obviously used to our advantage.

We have become particularly interested in the back covers and have formed a display of all the back covers. We of the 1st Battalion, 127th Armor, New York Army National Guard, request that we be considered for recognition in a future edition on the back cover of your fine magazine.

I realize that you must receive many such requests, however, we do have a request that we be placed on your list for recognition.

FRANCIS J. BOWERS  
Captain, Armor  
NYARNG

(*Armor intends to continue its lineage series with Reserve Component units in the future.* Ed.)

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### Discussion of T-64 Continues

Dear Sir:

I am writing to offer some clarification as well as some comments in regards to the March-April 1983 *ARMOR*. I would like to thank Mr. Zaloga for his remarks concerning my comments on the T-64 main battle tank (MBT). Mr. Zaloga, however, failed to discuss one very distinct possibility. While Victor Suvorov states in his book *The Liberators* that his unit was the first to be equipped with the T-64 in 1967, adherence to this year as being the debut of the "actual T-64" is nothing more than speculation. Several sources including *International Defense Review* have reported that the predecessor of the T-64 was identified before the first public appearance of the T-64 in 1965. This vehicle, known as the M1970 or T-70 tank, has not only been

clearly associated with the start of the T-64 program but has also been widely displayed by the unclassified press for several years. The available information suggests that the M1970 or T-70 was produced in limited numbers during the very early 1960's. It seems quite possible that the Soviets would have had ample time to start production of an improved model of the M1970 or T-70 before 1967. Is it not possible that this improved model (the T-64) was put into production as early as 1966 or even 1965? Is it not also possible that the first batch of T-64's was fitted with the T-62's 115-mm main gun, until that new "Rapira 3" 125-mm gun became available and was refitted? This theory has been substantiated by several unclassified sources including *Jane's Armor and Artillery 1981-1982* and *The Soviet War Machine*. It appears that Mr. Zaloga may have made the decision to base his theory solely on the information provided by Mr. Suvorov.

Congratulations to Mr. Burniece and Mr. Hoven on their excellent article "Soviet Heavy Tanks," (*ARMOR* March-April 1983). I would, like to add a few comments to their discussion. The similarities between the British *Chieftain* MBT and the T-64, while present to some degree, do not seem to be quite as remarkable as reported. The British influence on Soviet tank design will probably become apparent with the introduction of the awaited future Soviet tank. The widely reported "acquisition" of Chobham armor by the Soviets, combined with some of the information which had previously been attached to the T-80 MBT would seem to indicate that a remarkable similarity will exist between the future Soviet tank and the new British *Challenger* MBT. The T-64, on the other hand, appears to be closely related to the American T-95 MBT which was developed between 1954 and 1961. The T-95 mounted a variety of smooth-bore main guns each firing APFSDS ammunition as well as having the latest form of composite armor. This similarity is indeed remarkable. The ideas and concepts brought out by Mr. Burniece and Mr. Hoven, i.e., the "T-85" with a welded turret (an early look at the future Soviet tank?), the possible tank mounting of the 130-mm cannon (along with the following possibilities of 130-mm APFSDS ammunition), and the possible role played by the T-64 in the Soviet tank plan; constitute the type of thinking that is demanded to stay abreast of an ever-changing situation.

JAMES M. WARFORD  
Captain, Armor  
Ft. Hood, TX

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### Stratified Armor and The Light Tank

Dear Sir:

In view of the general nonsuccess of the so-called "light" tank, since WW II, the design of a "light" tank, based on the needs of a rapid reaction force (RRF) that

depends upon airlift for deployment, must avoid the pitfalls of previous programs and approach the problem not primarily with making a "light" tank, but *how* it is made.

A tank is a compact package of crew, armament, powertrain, fuel and ammunition, all boxed in armor. If the overall weight is too high, armor is reduced or equipment is removed. The smaller the volume, the less armor weight is required, and a lighter tank evolves. When this principle is applied, however, to a "light" tank, the result is an overall inadequately protected vehicle.

The answer lies in stratified armor; i.e., critical elements (crew) have the highest degree of armor protection and the less important elements (weapons, powertrain, fuel, ammunition) have less armor protection. A priority system must be used.

The crew is the heart of the vehicle, the easiest to harm, and the most difficult to replace. Therefore, a well-protected crew is mandatory. The weapon system is the next in importance and requires only slightly less armor protection than does the crew. The powertrain ranks third in importance and is armored accordingly.

If the crew is killed, the vehicle is out of action. If the weapon system is destroyed, the vehicle can be returned for repair. If the powertrain is destroyed, the vehicle can be abandoned and perhaps recovered at a later time.

Should the total weight still exceed that allowed, equipment, ammunition, fuel and other components are given a lower level of protection. Equipment is reduced whenever possible rather than reducing armor. Stratification of armor avoids the problem of trading off *only* armor protection to reduce weight. This same concept may well be applied to main battle tanks.

The light tank has come a long way since the WW I French Renault FT, but the need for such a vehicle in today's RRF environment makes it imperative that designers follow the stratification of armor principle if they are to produce a viable, light tank that is air transportable and capable of holding its own against similar, or even larger, vehicles in combat.

ALFRED T. BOWEN  
Major, Armor  
Leavenworth, KS

### Sidi Bou-Zid Follow-Up

Dear Sir:

Regarding the Sidi Bou-Zid article (November-December 1982 *ARMOR*), the lessons learned from the fighting in Tunisia were published and distributed by Headquarters, Army Ground Forces, to the commanding generals of the various Commands and Centers in the U.S., including the Chief of the Armored Force. The following deficiencies were noted:

"1. Battalion and company commanders fail to use runners and frequently fail to have runners with or near them.

"2. Little if any use is made of the walkie-talkie radio.

"3. Messages and orders are sent in an inaccurate manner and not in concise, military verbiage. For example: an *aide-de-camp* was sent to a tank battalion to direct them to bring fire on hostile tanks. When the officer returned he stated he had delivered the message. When asked what he had said, he stated he had told the tanks to 'Get on the beam.' Other cases have been noted where junior officers, in telling a platoon or squad to make a movement, would say 'Get over there and attack the enemy in flank,' instead of saying, 'Move to such and such a position and attack in such and such a direction.'

"4. There is an almost universal failure to repeat orders back after they have been received. This failure is apt to, or almost certain to, result in grave errors.

"5. On the defensive, there is still a tendency to occupy linear positions instead of occupying a group of coordinated, supporting infantry cells.

"6. There is far too little emphasis placed on the hardening of men. I am sure that all soldiers and officers should be able to run a mile with combat pack in 10 minutes...

"7. We are too slow in putting out minefields and in wiring in positions for all-around defense. More training should be devoted to mine laying and mine removal.

"8. Emphasis must be placed on the fact that being surrounded is no reason to quit fighting. Troops must never surrender.

"9. Junior officers lack self-confidence. I believe that this can largely be inculcated through close-order drill because then officers state facts and correct errors, the act of doing this produces self-confidence on the part of the officer and confidence in the officer in the men.

"10. There is a tendency to deploy too early and advance by rushes when not under fire. The old axiom 'hit the dirt' is being overplayed. Men should not lie down until they have received casualties.

"11. Owing to our still imperfect training condition, we must take plenty of time to set up an attack. It takes at least 2 hours to prepare an infantry battalion to execute a properly coordinated attack. Shoving them in too soon produces useless losses.

"12. Security detachments must get out farther and must stay out at night. One radio car well off the road, but where it can see the road or where a crew member can observe the road from close quarters, can send information which will be vital.

"13. The courage of our troops is still too negative. They are fairly willing, in most cases, to be killed but they are not sufficiently intent on killing. In the first actions, new troops must receive aggressive leadership by all grades including general officers who must be seen in the front line during action.

"14. In my opinion, our artillery goes into positions too far back. It must be taught that in order to inflict losses, it must take losses. Forward positions are especially necessary against tanks.

"15. Our ability to fight at night, as opposed to moving into position at night for a dawn attack, is pitifully bad. We must be taught to attack at night, executing the

attack in the dark.

"16. Field artillery slit trenches are dug too far from the guns with the result that if we are subjected to a combined air and tank attack, too much time is required for the gunners to re-man their guns.

"17. The infantry still does not use all its heavy weapons to the maximum.

"18. Much more emphasis must be placed on military courtesy, on dress, and on cleanliness. If a man is so lethargic that he fails to salute, he is so lethargic that he will fail to recognize an enemy. If he gets himself dirty, he loses self-respect. Discipline is based on obedience. The best way to insure obedience is from the bottom. If men salute properly, pay attention to their dress, wear the clothes ordered, they will carry out orders in battle. If they fail in these respects, they will be negligent in battle and will be killed to no effect.

"19. The self-propelled tank destroyer is of very little value because it is less heavily armored than a tank and has no greater mobility. The tactics of attempting to pursue tanks, at least so far as this country is concerned, are utterly inapplicable to the realities of war. The tank destroyer should use its mobility to find a position, preferably on a reverse slope from which it can bring fire to bear when the tanks cross the fire range. Having found this position, it should withdraw to cover or a shadow, leaving dismounted observers on the crest. When the tanks approach it should re-occupy its position and be ready to fire. In duels between tank and tank destroyers, it is the question of who gets in the first hit. Usually there is only one shot fired. The above criticism will be less applicable in Europe or in any other country where there is foliage. In this country there is none.

"20. Emphasis must be placed, in the U.S., on maintaining intervals and distances between vehicles. No vehicle should, at any time, be within 75 yards of any other vehicle. If this is prescribed as a minimum distance and interval, it will develop into normal intervals of 100 to 125 yards and normal distances of 100 yards. If vehicles are ever allowed to close up while on marches or maneuvers, they will do the same in battle and it will entail their destruction.

"21. More emphasis must be placed on preventive maintenance particularly oiling, greasing, and tire pressure.

"22. Violation of distance and interval regulations or speed regulations must be immediately punished by revoking the license of the driver and reducing him to the grade of basic private.

"23. Officers who fail to maintain discipline, dress, distance, and speed regulations should be fined to the limit under the 100th Article of War beginning the first day they enter the service."

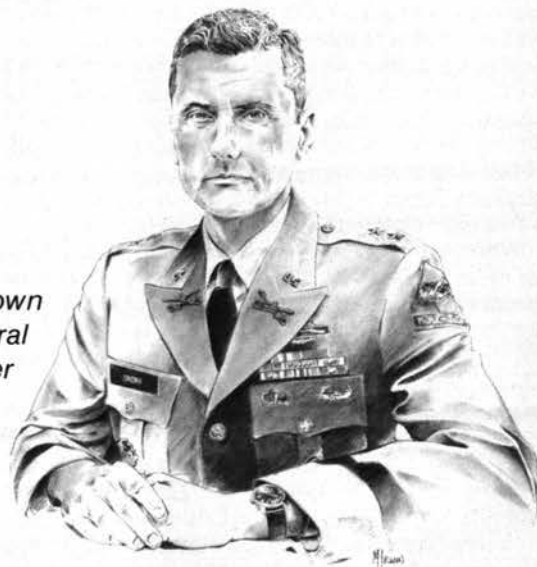
The message was found among the papers of my father, First Lieutenant David W. Houston, A/68 Tank Battalion, 6th Armored Division, 3d Army.

JACKIE R. HAMILTON  
Captain, Armor  
Bowling Green, KY



# COMMANDER'S HATCH

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



## Technology Improves Training

I stated in my opening article that we need to make better use of our national capability in science and technology to improve our training.

Technology has been applied vigorously to solving battlefield related problems, but the use of technology to solve *training related* problems has not kept pace. Early efforts to apply technology to solve training related problems concentrated on lowering the cost of training, so we could maintain the same proficiency in the face of dwindling monetary resources. Training at tasks more frequently and more effectively to reach and maintain higher individual and crew task proficiency was also emphasized. But that was not enough.

An old training concern has been brought into sharp focus—the need to train for tasks that are too dangerous or too expensive to accomplish in peacetime. Mobility, agility, survivability, and lethality have all been increased by the introduction of new weapon systems. The task that was too dangerous or too expensive has become even more dangerous and more expensive. We are moving farther and faster and shooting more lethal and costly rounds—day and night. It is in the area of these dangerous and expensive-to-train tasks that we must look to new ways of accomplishing our training mission.

If we do not change—and improve—our way of training, we will waste our increased combat potential and that cannot be allowed to happen. This increased combat effectiveness remains only a potential unless and until soldiers are trained in exploiting the attributes of the new equipment in battle. In almost every case, that exploitation is to be achieved by harmonious interaction of crew members, crews, platoons, companies and battalions. We must train for battle-type interactions, complicated by stress and other battle factors. By adding, through simulation, the capability of training interaction from crew interaction through intraplatoon and, platoon-versus-platoon and larger units, the capability of realistic battle action with

everything but casualties can result.

Technology has created greater combat potential; therefore, technology must provide the training to exploit that potential.

The training interaction which technology can give us will allow us to train the way we plan to fight: fully integrated, executing complex procedures by using checklists instead of memory, and accomplishing basic maneuvers in a wide variety of situations. Repetitive training, made economically feasible through simulation, will enable crews and platoons to reach the levels of precision required by realistic armor standards. Simulators will allow the programming of more realistic combat situations for this training than has ever before been possible.

Our training must move away from the narrow, predictable, shooting gallery-type exercises of the past (although these have a place for marksmanship training) toward battle-type exercises. That requires the application of simulator technology, for you can't shoot live rounds at one another to get realistic combat training. The Multiple Integrated Laser Engagement System (MILES) goes a long way toward achieving this realism, but does not take into account all the factors that would enter into a real battle engagement. It is simply too easy to get a hit, and MILES does not require the crew to do everything that must be done in a real battle situation.

In our search for technological solutions to training problems we are looking at both short- and long-term solutions. For the former, we are using the MILES as a basis for turning the tank into a full-crew interaction simulator (FCIS). To do this, two things are necessary—adding the capability for the loader to perform his combat tasks and interact with the rest of the crew, and adding an objective gunnery evaluation capability to refine the MILES engagement. We are now involved in building and testing such a combination.

For the long-term solution, we are looking at a tank-



appended, precision gunnery training system. One such development project is called the Tank Weapon Gunnery Simulation System (TWGSS) that not only incorporates all aspects of the gunnery problem but also provides an objective evaluation and a record of engagements. The project may require a completely new technological development, but it is more likely to be a product improvement or a modification of an existing laser device. In any case, we want to carry the FCIS concept as far as we can affordably go. TWGSS, and a loader interaction device, should do this. Tanks so equipped can be used for the whole range of training from engagement of targets on ranges (or even in motor pools) to intensive combined arms battles against a free-play opposing force.

When we say "range" in connection with TWGSS/FCIS, an entirely new vista opens. The TWGSS can be used for gunnery training on "standard" ranges when the targets are equipped with detectors, but such a range is not required. Any terrain where targets can be set up in a Threat scenario will do. More importantly, the FCIS with either MILES or TWGSS will be used in controlled force-on-force engagements in any environment, from a "postage stamp" to a larger maneuver area. Terrain will be selected for its suitability for teaching exploitation of mobility and agility, not for firing safety considerations.

Along these lines, we are also exploring the applications of new technology to training in the areas of targets, stand-alone simulators, and "tabletop" trainers. A brief account of what is being done in these areas follows:

**Targets.** Some improved targets have been fielded and an interim thermal target is in the process of being fielded. We are aiming for targets that are more realistic in looks, action, and in their reaction to fire. In addition to improved stationary and moving targets for gunnery ranges, there is the field of "intelligent" targets for tactical training in both scenario-controlled and free-play exercises. The initial product to permit this is the visual modification kit (VISMODO). The VISMODO changes the appearance of a U.S. vehicle to that of a Threat vehicle such as the T72, BMP or the BRDM. VISMODOs based on the M551 are now in use at the National Training Center, and VISMODOs based on the M113 and M880 are being fielded for army-wide use. They can maneuver the way a Threat vehicle would, provide battlefield visual cueing, i.e., Threat, not U.S. vehicle, and permit training to shoot for areas of vulnerability when the targets are close. We are also expecting robotics technology to be especially productive in developing evasive, free-moving, programmed-action targets for gunnery ranges. With the products of current target technology, VISMODOs, and the future robotics, we will be able to put together realistic opposing force scenarios.

**Simulators.** A significant effort has been made in this area with the Unit Conduct of Fire Trainer (U-COFT), which will be fielded in fiscal year 1985. The U-COFT uses computer image generation and training scenario control to create a system of standard, but progressive, tank commander and gunner exercises. The U-COFT will be fielded at battalion level for sustainment of gunnery proficiency and represents a major step forward in off-the-equipment training. It also represents a major step forward in creating force-wide gunnery standardization by measuring and certifying gunnery proficiency levels. It will also reinforce the need for the precise execution of procedures, just as the tank itself does.

**Tabletop Trainers.** Simulators in this category are cheaper to build and maintain than the U-COFT and can be used at company level for frequent, even daily, training. But, they do not have the variety of exercises, nor the completeness of function possessed by the more complex

U-COFT and other simulators. They do, however, provide the interesting and repetitive training for those tasks in which soldiers experience rapid skill decay. Current video disc, microcomputer, and video arcade technology can fill those needs. Trainers for gunnery tasks have been developed for testing and could be fielded by late fiscal year 1984.

Many platoon leaders, and their platoons, have been lost in battle before they gain battle experience. Tactical exercises provide some of the necessary training, but they are so difficult and expensive to set up and run that they cannot be conducted often enough. Additionally, the wide variety of possible battle situations cannot be adequately practiced in these exercises. An alternative way to train with as many of the expected battlefield factors present as possible is needed. An example of this type of training would require the platoon leader to maneuver the platoon under both direct and indirect fire, use the platoon and company communication nets, cope with NBC conditions, read maps and navigate, react to changes in orders, fight his own tank as well as direct the fire of other tanks, and so on.

These are real-life problems and we are working with the Army Research Institute to explore the technology and define the requirements to meet them. The training problems we expect to solve with such a device center on the command and control of the platoon on the "dirty" battlefield. Computer voice-generation and recognition circuitry will be necessary to enable the platoon leader to interact with his simulated tank commanders and his company commander. Such a trainer could be expanded to four stations to bring each of the tank commanders into play. Helmet-mounted visual systems would permit this to take place around a table. The immediate result will be a platoon leader more competent and confident in his duties and one able to use field tactical exercises to confirm and further hone his expertise. The result will be survival and victory on the battlefield.

MILES has given us an improvement in our tactical training capability. But from this quick look at training device developments, you can see that we anticipate even greater improvement as new technology moves from the lab, off the assembly line, and into the field. The soldier, the trainer, and the commander will have a wide spectrum of equipment to overcome time, range, cost, and boredom problems in current tactical and gunnery training. This equipment will also make training more challenging, interesting, and effective, and will permit it to be conducted more frequently in classrooms, in the motor pool, on the range, and in the field.

We must all strive to increase our combat readiness by using enhanced technology to improve training. As I said in my first article, the bottom line remains steel on target but that can't be a cop-out for lousy training when the steel is limited.

*Forge the Thunderbolt!*





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## What Is Our Number One Problem?

A few days ago, I found myself taking one of those infamous Army surveys where the selection to do so is a result of being unfortunate enough to have the wrong numerals in the last part of your social security number. Like many others who have been around for a while and who have taken many of these surveys, I found the questions familiar and my answers almost automatic. Moving rapidly through the survey, I came to the question: "In your opinion, what is the number one problem in your unit?" I found my pencil moving automatically to the answer I knew would be on the sheet and started to blacken in the circle that stated my answer to be the quality of the junior noncommissioned officers. After all, that had been my answer in the past, and for what I had always considered good logical reasons.

This time however, I hesitated. I thought about all the surveys where I had answered this same question this same way and wondered why it was still true. After much additional thought, I decided it was not true! I then moved my pencil to another answer that is always included with this question and blackened in the circle that stated my answer to be the quality of the *senior* noncommissioned officers. Let me relate *some* examples of why I answered this question the way I did.

At a recent ceremony that included Retreat, I was standing behind a group of military spectators. Directly in front of me was a young sergeant. As Retreat was sounded, the sergeant hesitated for a moment, looked quickly to both sides, then observing the senior noncommissioned officer in front of him at the position of parade rest, assumed that position himself. Because this sergeant did not know that the correct position when Retreat is sounded is that of attention, the quality of the junior noncommissioned officer could be questioned. However, the fact that he did not know the correct position raises the question of the quality of his *trainer*, the senior noncommissioned officer. The example he followed does the same.

I recently attended an indoor social event that included the Posting of the Colors. The Color Guard consisted of all sergeants with a staff sergeant as the Color Guard Sergeant. The Color Guard entered in single file with the National Color being the first Color in line, the proper honor position. However, when they formed on line, in front of the individual receiving the Colors, their move-

ments resulted in the National Color being *third* in line, *not* the position of honor. Once again, if you consider only the members of the Color Guard, you could question the quality of the junior noncommissioned officer. However, a first sergeant was responsible for training the Color Guard. That may cause the quality of the senior noncommissioned officer corps to be questioned.

To take this even further, it was *assumed* that this first sergeant had received training on how to Post the Colors. As he obviously had not (*from his senior noncommissioned officer trainer*), the quality of the senior NCO could definitely be questioned.

At another indoor formal social event that included only master sergeants and above, the Posting of the Colors was also incorrect. Additionally, many were not wearing name plates with their dress blue uniforms, and several had their U.S. and branch insignia, as well as their decorations, incorrectly placed on their uniforms.

When conducting E5 and E6 promotion boards, I require the noncommissioned officer of the individual appearing before the board to appear with his soldier. In many cases, particularly on the E6 promotion boards, this is a senior noncommissioned officer. I initiated this because of the many uniform discrepancies of those appearing for promotion recommendation. Without fail, if the junior noncommissioned officer appearing before the board has a uniform discrepancy, you can look over at his senior NCO leader and find the same discrepancy.

What I have stated through the examples above must be taken in the proper context. It relates only to the question cited within the survey. The quality of the Army's Noncommissioned Officer Corps is not in question as it has been determined to be better than ever before. The point I have tried to make is that if your answer to the number one problem in your unit is the quality of the junior noncommissioned officer, you should ask why. You may discover that your dissatisfaction with that quality is because the quality of their training is not all it should be. You may find that the necessary attention to detail required in their training has not been sufficiently provided by their trainers. If you determine that to be the case, then maybe some of us have been pointing our finger in the wrong direction and should point to ourselves...the senior noncommissioned officers...the trainers! It's worth thinking about.



# MASTER GUNNER'S CORNER

Thomas P. Currie  
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## Improving Performance of the M219

Many M48A5 tank crews lack confidence in their M219 coaxially-mounted machinegun. As a result, some tank commanders elect to use their own or the loader's pintle-mounted M60 machinegun in preference to the coax. Although the pintle-mounted machineguns are excellent for area targets, they lack the steady mounting and precision sights needed for effective point target engagements. The continual preference for the M60 results in inadequate training of gunners and loaders in using and maintaining the coax machinegun.

In a few units this problem has reached the level where crews are failing to even mount the M219. Admittedly the M219 is not as reliable as the M240 machinegun mounted on M60-series tanks or the M60 pintle-mounted machineguns on the M48A5. However, its superiority against point targets (especially moving point targets), combined with the fact that it is the only machinegun on the M48A5 that can be fired from under armor with the hatches closed, make it an essential part of the tank's armament. Crews must train to use the M219 effectively.

Proper maintenance is the first step in improving the performance of the M219. Barrels and barrel jackets must be free of carbon fouling if the gun is to fire dependably. Soaking the barrel and jacket in carbon removing compound (CR) must be routine after-firing maintenance for this weapon. Whenever M219's are drawn from a multi-user facility, they should be carefully checked for carbon fouling before firing. Adequate, but not excessive, lubrication of the receiver and cover is also important. With the M219 properly maintained and lubricated, there are still several steps that the tank crew can take to further improve its performance.

The M219 must be solidly mounted in its bracket so it will not move when being fired. Lock washers on the mounting collar bolts are essential. An improvised tool consisting of a short piece of 3/8-inch Allen wrench, which is used with a regular 3/8-inch socket and ratchet is much more efficient for tightening the collar mounting bolts than the regular 3/8-inch Allen wrench included in the tank basic issue items.

Many M219s have feeding problems. Armorers should carefully check the feed and holding pawl springs and all moving parts for nicks or burrs. If the machinegun has no

mechanical faults, but still does not feed well, two additional steps will often solve the problem. Rotating the machinegun about 15 degrees clockwise from vertical will slightly improve the feeding angle. Raising the level of the ammunition in the ammunition box reduces the effort required to pull the ammunition into the gun. This can be done by building up a temporary filler for the ammunition box when only a limited amount of ammunition is being loaded, such as on a tank range. Two layers of cardboard from 7.62-mm ammunition cartons can be used for this purpose. Some masking tape is then used to cover the gaps in the top layer. A more durable platform of plywood, fiberglass, or plastic can be fabricated, but care is needed in designing such a platform to insure that it will fit through the limited space available above the M48A5's curved ammunition box.

When M219s are properly maintained, lubricated, mounted, and loaded, the majority of them will fire acceptably.

Technique of fire is also important with the M219. Like nearly all machineguns that fire from the open bolt, this weapon is designed to fire 20- to 25-round bursts. Short bursts, especially the 3- to 5 round "sighting" bursts that many tankers learned to use on the .50-caliber M2, cause excessive wear and almost always produce stoppages. Excessively long bursts can cause overheating and other problems in the M219, but this error is neither as common nor as serious as the short burst. Basically, the gunner should hold the trigger until he has seen four or five tracers fired. Loaders must know how to apply the proper immediate action procedures listed in the tank operator's manual to remedy stoppages in the M219.

The decision as to which weapon to use for any target must, of course, be made by the tank commander. Likewise, it is the tank commander's prerogative to cease fire with one weapon and reengage with another during an engagement. Thus, even in the event of a coax machinegun stoppage, the TC can always switch to his own or the loader's pintle-mounted machinegun. This flexibility is one of the strengths of the M48A5 tank and crews must be encouraged not to give up that flexibility by abandoning the M219 just because it requires a little tender loving care.



# RECOGNITION QUIZ

This Recognition Quiz is designed to enable the reader to test his ability to identify armored vehicles, aircraft, and other equipment of armed forces throughout the world. *ARMOR* will only be able to sustain this feature through the help of our readers who can provide us with good photographs

of vehicles and aircraft. Pictures furnished by our readers will be returned and appropriate credit lines will be used to identify the source of pictures used. Descriptive data concerning the vehicle or aircraft appearing in a picture should also be provided.

(Answers on page 50)





## The First U.S. Tank

by Colonel Thom

In direct contrast to the lightning-like thrusts of U.S. armored divisions across France and Germany during the last year of WW II, the first U.S. tank action was a slow, difficult, retrograde movement on the opposite side of the world in the Phillipines.

In July, 1940, there was only one Reserve tank battalion, the 70th General Headquarters (GHQ) Reserve Tank Battalion (Medium) stationed at Fort George G. Meade, Maryland. It was sadly lacking in personnel.

When news came to Major General Adna R. Chaffee that the War Department planned to use many similar units as special task forces, although they had made no provision for their organization, the "Father of the Armored Force" could foresee that without authorization for these reserve units, his armored divisions would be chopped to pieces to supply them and he dispatched a letter of protest to Chief of Staff Marshall. "So, already they are contemplating breaking up our divisions to fritter them away for small purposes," he wrote indignantly. "G-3 has set up no additional GHQ Reserve tank battalions so far. At least four more should

be set up at once. We will have material."<sup>1</sup>

In October 1940, General Chaffee wrote to Major General William Bryden, Deputy Chief of Staff, repeating his plea for "prompt formation of efficient GHQ Reserve Tank Battalions."<sup>2</sup> It was his proposal to use 18 scattered National Guard tank companies to provide personnel for the immediate formation of 4 tank battalions, with training of cadres for 10 more battalions to begin soon.

General Chaffee's work resulted in the first of these additional battalions being formed about 1 month later when, on 25 November 1940, the 192d GHQ Tank Battalion was inducted into Federal service at Fort Knox, Kentucky. Three more battalions were soon organized: the 193d at Fort Benning, Georgia, on 6 January 1941; the 194th at Fort Lewis, Washington, on 22 January 1941; and the 191st at Fort Meade, Maryland, on 3 February 1941.

Inasmuch as these battalions were only expected to be in Federal service for 1 year, no attempt was made to standardize them or to make them conform with any established tables

of organization or equipment.<sup>3</sup> Two of these units, the 192d GHQ Tank Battalion (Light), and the 194th GHQ Tank Battalion (Light), along with the 17th Ordnance Company (Armored), would soon become the Provisional Tank Group, U.S. Army Forces in the Far East (USAFFE).

After the formation of USAFFE in August 1941, General Douglas MacArthur, then commanding, had asked for an armored division. However, the Provisional Tank Group was to be the only armor in USAFFE and its nucleus was never augmented; although a medium GHQ tank battalion had been completely equipped and was on 48-hour standby for departure for the Phillipines when its orders were cancelled on 10 December 1941. Furthermore, the Group would have little time for training before embarking for the Phillipines. The 192d GHQ Tank Battalion from General Sylvester's 1st Tank Group at Fort Benning, Georgia, had carried out a defensive role in the 1941 Louisiana maneuvers. The 194th GHQ Tank Battalion had come from the West Coast where it had been taking part in minor maneuvers with, what was at that





## Action in WW II

Booley, USA (Retired)

time, Fourth Army. Both battalions had worked during this maneuver period with early models of the *M1* light tank.

The first of the units to arrive in the Far East, the 194th tank battalion and 17th Ordnance Company (Armored), reached Manila on 26 September 1941. One tank company of this battalion and a part of the battalion headquarters company had been detached to Alaska. Upon movement to Port of Embarkation, this battalion (as was the 192d later) was reequipped with new *M3* light tanks and half-tracks. The armament of these new tanks was strange to the personnel. The *M3* had for its main battery the 37-mm gun with a .30 caliber machinegun coaxially mounted in the turret. The two fixed sponson guns (fired by remote control by the driver) and the anti-aircraft machinegun were all new to the crews. This light tank was heavier and longer, had better flotation, and was equipped with radio facilities that were different from those of the *M1*. So little time and direction had been possible before departure that the unit had thought it necessary, in installing

the new radios, to remove the right sponson gun to make space, and to spot weld armor over the gun port.

The 194th was assigned to Fort Stotsenberg adjacent to Clark Field, in Pampanga Province. Before the group commander arrived, this unit undertook limited reconnaissance in North Luzon. It did not accomplish any firing problems nor cross-country driving as no ranges, fuel, or ammunition were released for these purposes.

The group commander, Brigadier General, (then Colonel) James R. N. Weaver, with Headquarters and Group Headquarters Detachment and the 192d GHQ Tank Battalion (Light) arrived in Manila on 20 November 1941. The headquarters detachment consisted of 10 enlisted men, no tanks, two half-tracks, two 2-way radios, two ¼-ton command and reconnaissance (C&R) cars, one sedan, and no trucks.<sup>4</sup> These units were also stationed at Fort Stotsenberg and were housed in tents pending completion of semipermanent housing to be built of *sawali*, a siding for houses and buildings made by the natives who wove 2-inch reeds onto a bamboo frame. The only training at this time was

limited reconnaissance work as far north as Lingayen and Baguio, the Philippine summer capital.

The Provisional Tank Group, USAFFE, was organized on 21 November 1941. Eight days later on 29 November, the 17th Ordnance Company (Armored) was assigned to the group at Fort Stotsenberg.

On 27 November, a general alert had been sounded for all forces in the Philippines, but for some reason or through the oversight of someone, the tank units were not included in the warnings. However, the commanding officer of Clark Field had been ordered by Far East Air Force (FEAF) to execute two alerts, one by day—one by night, before 2 December, and the tank group had been asked to participate, and on 1 December moved into battle positions for the defense of Clark Field.

The general change in commands which became effective about 22 November, may have contributed to the disrupted communication channels: FEAF, North Luzon Force, South Luzon Force, and The Philippine Division, all had new commanders. On 28 November, when General



Jonathan Wainwright arrived at Fort Stotsenberg to take command of North Luzon Force, his staff consisted of a chief of staff, two officers in the G-3 section and one in the G-2 section.

In the chain of command, the Provisional Tank Group was a separate tactical command under the commanding general, USAFFE, and was associated with the General Reserve only for administrative reports. The major unit of this reserve was the Philippine Division.

### Clark Field Attacked!

On 8 December, (7 December in the U.S.) when the news of the Pearl Harbor attack was received, the crews were at their tanks, and at 0830 the word was passed that Japanese planes were 40 minutes away. Final checks were made as the men stood by, but no attack came. However, at 1230, while the noon meal was being served, a surprise attack was made on Clark Field. Bombers at about 20,000 feet accurately blasted Air Force installations throughout the Stotsenberg area. The tank weapons were of no use until the strafers came in low immediately after the bombing. In this action Technical Sergeant Temon "Bud" Bardowski, B/192d is credited with the first enemy plane brought down by a U.S. armored unit in WW II. (The first armored soldier to die in combat in WW II was Private Brooks of Company D, 194th. (*Brooks Field, the main parade ground at Fort Knox, KY is named in his honor. Ed.*)

After the attack, the tanks were redeployed, with the 194th moving about 3 kilometers northeast and the 192d spreading out to more fully protect the relatively unbroken terrain to the south of the airfield.

There were two more air attacks, on 10 and 13 December, but the group losses amounted to only one half-track destroyed and two men wounded. During this time, tankers brought in the first prisoners of war, who were apparently Japanese naval aviators.

With landings imminent in Southern Luzon, the group headquarters moved to Manila and the 194th moved to an area north of Manila after having sent reconnaissance and liaison groups to the areas of Muntinlupa, Nasugbu Bay, Balayan Bay, Battaangas Bay and east and north around Lake Taal.

After the tank group commander arrived, General Wainwright entered Rosario. Movement of any kind was hampered due to unopposed enemy air activity, for after the airstrikes on 8 December, FEAF, on Luzon, con-

sisted of only a few P-40s, useful only for sneak reconnaissance missions, and a few Philippine Army BT-1s, which were good only for courier service. The general situation was not clear, but reports indicated that two companies of the 11th Philippine Army Division were engaged north of Damortis. Elements of the 26th Cavalry were enroute from Rosario to the point of contact but, as witnessed by the writer, the horse troops were at the mercy of enemy fighter-bombers.

An enemy motorized unit was reported approaching Damortis and General Wainwright asked the tank commander, "What can you do?" Resupply gas had not yet arrived, but the company fuel resources were pooled and a single tank platoon was gassed up and sent to contact the enemy reportedly moving on Damortis. This platoon was commanded by Lieutenant Morin.

### First Tank-versus-Tank Action

The platoon did not encounter opposition as they moved north out of Damortis and they continued on to Ago. There they met an enemy tank unit on the road and the first U.S. tank-versus-tank action occurred in WW II. The enemy tanks were of low silhouette, had no turrets, and with sloped sides so that penetration was difficult to achieve. On the other hand, their 47-mm gun was quite effective against our tanks with their perpendicular sides and high profiles—points that had caused their rejection by our allies before the war. Lieutenant Morin's tank, which had left the road in an attempt to maneuver, was hit and caught fire. This was the first U.S. tank lost in tank-versus-tank action in WW II. It was later determined that the crew survived and was captured, making them the first armored force POW's in WW II. The other four tanks were all hit but were able to pull out, one under tow. However, they were all lost later in the day to bombings and mechanical mishaps. The assistant driver of the platoon sergeant's tank, Private Henry Deckert, B/192d, had been decapitated when a direct hit penetrated the forward deck at the ball and socket joint of the bow gun mounting. This man was the first armored soldier killed in tank-versus-tank action in WW II. Hits on enemy tanks with our 37-mm guns had been observed during the fight, but many of the shots were seen to ricochet off the sloping armor.

Later, the situation around Damortis decayed to such a degree that it was imperative that tanks be used to

cover the withdrawal of the 26th Cavalry. The company at Rosario (gas had finally arrived by truck) was sent in with instructions to cover the withdrawal with a series of leap-frog actions.

Later that day the tanks were deployed to the north and west of Rosario but the rapidly developing situation caused the Commanding General of the 71st Philippine Army Division to order all elements south of the Bued River bridge, which was burned in the face of advancing Japanese tanks and cyclists. (*See "26th Cavalry in the Philippines, ARMOR Jan-Feb 1983. Ed.*)

The 192d at this time was deployed to the east of Highway 3, and on 24 December, because of the dire straits of the North Luzon Force, the 194th Battalion (less Company C) was sent from the south of Manila to the west flank of the arterial highway.

About this time a British ship, which had been unable to reach Singapore, put in to Manila and from its holds came potential augmentation for the tank group. Some 40 Bren gun carriers were made available and the initial plan called for organization of two companies. Bren machineguns were not available, but ordnance was to arm the carriers with either .50-caliber or .30-caliber Browning machineguns. Had this organization been completed, the tanks would have been strengthened by a much-needed economy force capable of carrying out both reconnaissance and security roles. Notice of the impending enemy landings in the Lingayen Gulf area, and subsequent moves of the tanks, halted this augmentation. Eventually all carriers were armed—Those operating with tank units, with salvaged guns from tank casualties. About 20 of the carriers were kept with the tank group and the remainder were sent to the Philippine Army divisions and to the 26th Cavalry. The latter group of Bren carriers, commanded by a Veterinary Officer, did noble work throughout the Bataan campaign. Those carriers that were retained by the tank units did good work in emergency supply runs and on cross-country reconnaissance patrols over doubtful terrain before committing tanks to action. It was soon found that the heat-baked ground that gave the appearance of good driving conditions was only a crust that would not support the 4-ton Bren carriers.

### Tankers Move to Lingayen Gulf

At a staff conference at USAFFE Headquarters on the evening of 21



December, orders were received to dispatch one company from the 192d by midnight and by resupplying with gas at Gerona and at Bauang, to get to the Lingayen Gulf area by daylight, where, according to reports, it was anticipated the enemy would land a sizable force at first light. The 192d was ordered to move up Highway 3 for such supporting moves as the battalion commander might direct after his contact with the commanding general, North Luzon Force (General Wainwright).

When the group commander arrived in the Lingayen Gulf area, he found the company which had been dispatched before midnight, stranded at Rosario, out of gas. The tank company commander reported that contradictory orders had prevented his refueling at Gerona and that his mission had been changed to that of providing cover for the rear elements of the 11th Philippine Army Division. This instance of changed orders was to be the case on several occasions in the next few weeks due to the confusion and lack of coordination between units of untrained troops and staffs.

It is only fair to explain that all Philippine Army divisions were comparatively untrained and understrength. Many of the troops had gone through 5 months of Philippine military training but some had not even had this background. Also, some of the units that were now moving to contact with well-trained Japanese divisions, had not been mobilized until after the declaration of war.

No steel helmets or individual entrenching tools were available to

Philippine Army troops. The uniforms habitually worn by these units were light tropical hats, fatigue clothes, and canvas-topped shoes. All men were equipped with bolt-action Enfield rifles, but very few spare parts were available. This point was of concern to unit commanders due to the many malfunctions caused by broken ejectors.<sup>5</sup>

Since the Orange Plan (the pre-WW II operational plan covering the Philippines) was in effect, the mission assigned the Provisional Tank Group was to cover the withdrawal of the Filipino-American Forces into the Bataan peninsula. There, the troops were to make a stand and await reinforcements from the States. But the Philippines had already been written off and the reinforcements never came.

#### Tankers Prevent a Rout

The withdrawal plan called for a retrograde movement to delaying positions on four successive phase lines (map 1, Lingayen Gulf to Clark Field). The tanks carried out this mission amid much confusion. Because of the tropical nature of the terrain, all units were instructed to plan each delay position to occupy all north-south roads and at the same time they were to reconnoiter for exit routes that would tie in with Highways 3 and 5 (the two north-south axial roads). Tanks occupying positions on the main routes were ordered to pay particular attention to enemy mechanized units, and were given detailed instructions on how to cover turns in the highway and to coordinate their

efforts with the self-propelled 75-mm guns mounted on half-tracks.

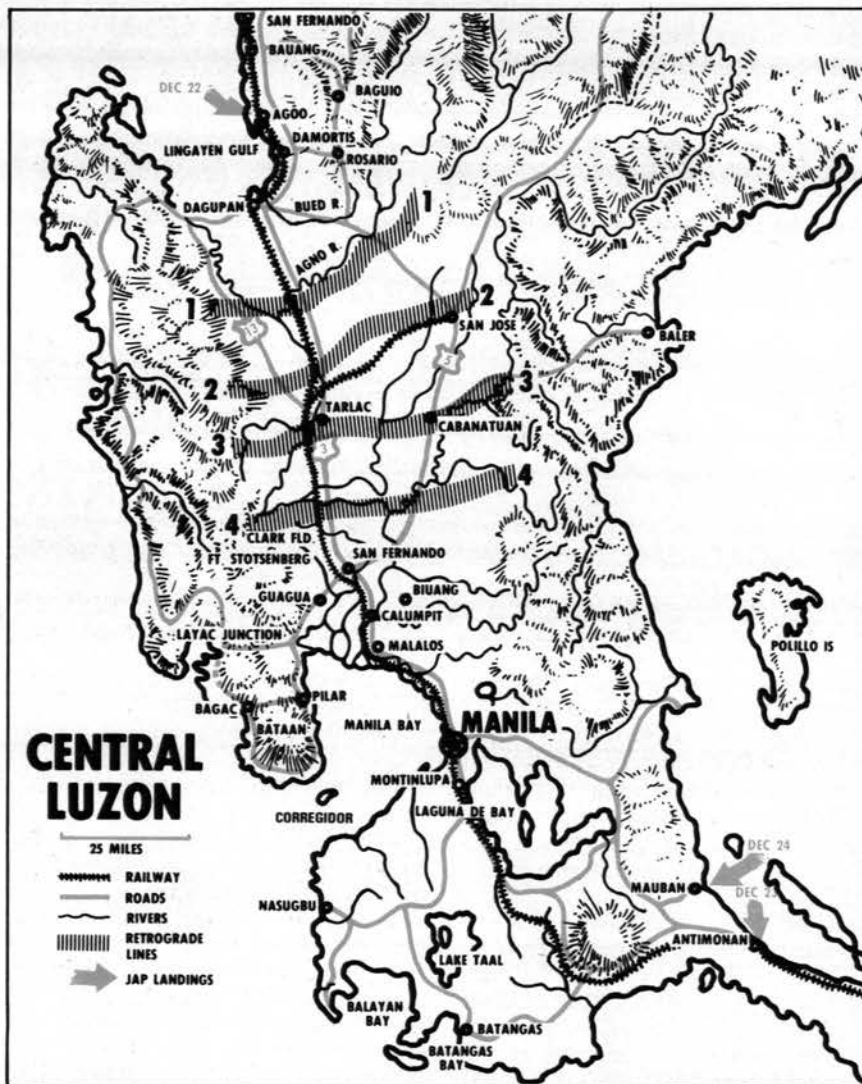
A number of tank actions now took place, one of the most notable of which was the action at Baliuag, Pampanga where two platoons of C/192d in a back-and-forth fight through the town, bagged eight Japanese medium tanks and prevented a complete rout of American and Filipino troops in the area.

Another, more tragic, incident occurred north of the Agno River when, due to lack of coordination between units, 10 tanks had to be abandoned due to blown bridges and a hard-pressing enemy.

The first phase of the final action before the withdrawal into the Bataan peninsula came in covering the Calumpit bridge position. At this junction, the last troops of the South Luzon Force joined the route of the North Luzon Force. The Calumpit bridge was blown during the night of 31 December-1 January. After the destruction of the bridge, the 192d was passed through the 194th, now reduced to about 30 tanks. Because of this reduction, Company A of the 192d was attached to the 194th and this force was to cover the retirement from the Calumpit junction to the Layac Junction position.

The attached company, in one instance, attempted a makeshift counterattack in the vicinity of Gagua with elements of the 11th Philippine Army Division. The infantry elements at one time mistook our tanks for the enemy and laid down very accurate mortar fire. They repeated this tactic on the group





commander's jeep as he attempted to establish some sort of coordination. The tank company, by trail and cross-country travel, and with the eventual loss of three tanks, rejoined the 194th on Highway 7 at a point west of Guagua.

On the afternoon of 5 January, C Company of the 194th, supported by four self-propelled 75s, ambushed an enemy unit of about seven or eight hundred infantry, and caused losses of about 50 percent. This group worked continuously during the withdrawal at retrieving tank gas cached along the route.

One other firefight marked the covering action just before entry into Bataan. This engagement, with few casualties, lasted from 1430 to about 1700 when the enemy withdrew. It is of particular interest only because it marked the first use of smoke by Japanese units.

The period from 6-26 January was marked by further covering actions in

the East Coast road and one attempted foray in the west (I Corps sector.) The covering action on the east was to aid II Corps in pulling back after a main effort was made by the Japanese in the Abucay Hacienda area.

The new and last main line of resistance (MLR) was along the Pilar-Bagac Road.

The action in the I Corps sector was an attempt to open up a road to extricate the 1st Philippine Army Division that had been cut off north of Bagac by a sizable infiltration of Japanese units. In this attempt, the lack of close-in infantry protection and the cleverly concealed Japanese road mines caused the loss of two tanks and the eventual withdrawal of the foot troops, without their heavy equipment, over a circuitous beach trail.

Also, during this period, the bulk of the tank units gained their first respite since 8 December, in a bivouac area south of Pilar. The tank units

were reorganized, companies of the 194th being reduced from 17 to 10 tanks; platoons from five tanks to three. This same reduction was shortly to be imposed upon the 192d. Tank overhaul and maintenance was done by the 17th Ordnance Company (Armored) that carried out third- and fourth-echelon maintenance using ordnance stocks on South Bataan that had not been released before 8 December. For the first time since hostilities began, crews were fed from their own kitchens, but this luxury was dampened due to the forced reduction in supplies on 6 January, which placed all troops on half rations.

#### Tanks Not Used Properly

During this period, the lack of knowledge among the infantry commanders of the characteristics, capabilities, and limitations of tanks was noted when requests were made for tanks to seek out and destroy snipers, flush Japanese troops from sugar cane fields, and to make sorties in front of the MLR into areas that had been extensively mined by our own troops.

The beach defense of the East coast was assumed on 28 January, and with it came contingency missions for the tank units: the 192d overwatched the north half of the East coast and was on call to support the western half of the II Corps front; the 194th was assigned the southern half of the beaches and was to provide secondary support to the western half of II Corps. The difficulty in supporting any frontline unit was accentuated by the narrowness of new trails. The old trails leading off the coast road were dead-end avenues, originally having been cut for timber operations.

On 1 February, composite platoons of tanks and half-tracks were assigned to each of three airfields that had been built on the peninsula in anticipation of the reconstitution of local air force units that were to have assisted the beleaguered troops.

Upon the request of the I Corps Commander, the 192d (less one company) was dispatched to the western sector to support foot troops in erasing three enemy pockets: The Tuol pocket formed by the infiltration of Japanese units on the I Corps front before the MLR had been cleared and definitely established; and the Aglaloma and Anyasen pockets formed through the uncoordinated Japanese landings in their attempt to cut the main supply route (the West Coast road).

The difficulties typical of these actions can best be described by quot-



ing from the citation awarded Lt. John Hay of the 192d:

"During this period and in the terrain involved, a rugged, dense jungle wherein tank movement had to be limited to the space cumulatively cleared by repeated charges of a few yards each, Lt. Hay's gallantry, persistence, and complete disregard of personal danger, in an entirely new phase of tank warfare, pre-eminently contributed to the ultimate success of the tanks and troops which they supported."<sup>6</sup>

In the Tuol pocket, the tank-infantry combination worked very effectively against the Japanese dug in around banyan trees, and Lieutenant Bianchi of the infantry company was awarded the Congressional Medal of Honor. Also in this action, one U.S. tank was lost when its crew was blinded by a Japanese flame thrower (the first used in the campaign) and the tank became wedged between two trees, which necessitated abandonment.

After the clearance of the pockets in the I Corps sector, the tank group instituted a plan for a comprehensive instruction in tank-infantry tactics among Philippine Army troops, but this was limited, due to gas rationing and lack of personnel. Although movement was at a minimum due to lack of gasoline, ammunition was adequate and ordnance personnel contributed to the effectiveness of the tanks by converting considerable armor piercing (AP) 37-mm to high explosive (HE) and cannister. These shells were much more useful in the absence of enemy armor. After the entry into Bataan, enemy tanks were never observed in strength—never more than three at one time—usually less, and these only in April during the last days of Bataan when U.S. artillery and AT weapons had been virtually reduced to inaction.

On 3 April, the Japanese started their all-out offensive and as enemy activity increased on the II Corps front, the 194th took on its contingency mission as its primary mission and moved its companies to support the frontline units to the west of the East Coast road. The 194th was later supported by one company of the 192d. The activities of the tank units in the next five days, with the resultant confusion of untrained, half-fed, malaria-ridden troops attacked by a superiorly-equipped, better-trained, better-organized enemy, can hardly be given in detail. Suffice it to say that the tank units supported the infantry

at every opportunity and on every trail that was not completely blocked by the supply vehicles of the retreating troops. At about 1830 on 8 April 1942, the tank battalion commanders were given the following order: "You will make plans, to be communicated to company commanders only, and be prepared to destroy within 1 hour after receipt by radio, or other means, of the word "CRASH", all tanks and combat vehicles, arms, ammunition, gas, and radios: reserving sufficient trucks to close to rear echelons as soon as accomplished."<sup>7</sup>

#### Decision To Surrender Is Made

At about 2230, 8 April, Major General E.P. King, commanding Luzon Forces, announced that further resistance would result in the massacre of the 6,000 sick and wounded in the area and of the 40,000 civilian refugees now congested closely about; that he was not in touch with any troops that were still resisting behind the closely drawn lines; that there were less than 25 percent effective of those in being; that at most he could not expect to hold more than one more day; that upon his, and his only, responsibility, he would send a staff officer with a flag of surrender across the lines the next morning. When asked by the tank group commander if any help was in prospect, General King could answer only, "No." The destruction of the main ordnance dump was to commence at 2340. Troops were to destroy all arms and ammunition and cease resistance at 0700, 9 April 1942.

After the surrender, the tank group commander and his staff were quizzed several times by the Japanese and from these investigations it was learned that the:

- Japanese had feared most the artillery and the tanks.
- Tanks, by their cordon coastal guard, had caused the Japanese to cancel an invasion from Manila Bay.
- Japanese had overestimated our tank strength by from 33 to 900 percent (158 to 1,080).

The Japanese had about 200 tanks, inferior to ours in armor, but better adapted to tropical terrain and better armed with a very effective 47-mm gun. (Report and recommendations on armored equipment was radioed to the War Department, by direction, sometime after the withdrawal to Bataan.)

These were the actions and circumstances that brought the members of the Provisional Tank Group, USAFFE, to that state, which is so ably described by Mr. Winston Churchill as:

"Prisoner of War! It is a melancholy state. You are in the power of your enemy. You owe your life to his humanity, your daily bread to his compassion. You must obey his orders, await his pleasure, possess your souls in patience. The days are very long. Hours crawl by like paralytic centipedes.

"Moreover, the whole atmosphere of prison, even the most easy and best-regulated prison, is odious. Companions quarrel about trifles, and get the least possible pleasure from each other's society. You feel a constant humility in being fenced in by railings and wire, watched by armed men and webbed about with a tangle of regulations and restrictions."<sup>8</sup>

#### Footnotes

<sup>1</sup> Mildred Hanson Gillie, *Forging the Thunderbolt*, p. 195, Military Service Publishing Company, Harrisburg, Pennsylvania, 1947.

<sup>2</sup> *Ibid.* p. 195.

<sup>3</sup> *Ibid.* p. 194-196.

<sup>4</sup> Operations of the Provisional Tank Group, United States Army Forces in Far East, 1941-1942.

<sup>5</sup> Report of Operations of North Luzon Force and I Philippine Corps in the Defense of North Luzon and Bataan from 8 December 1941, 9 April 1942.

<sup>6</sup> Operations of the Provisional Tank Group, United States Army Forces in Far East, 1941-1942.

<sup>7</sup> *Ibid.*

<sup>8</sup> Winston Churchill, "A Roving Commission", *The Reader's Digest*, July, 1940.



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## Improving Combat Crew Survivability

by Donald R. Kennedy

Photos courtesy FMC

There has been much criticism of the new U.S. armored vehicles in the open media. Some is perhaps justified, but for the most part, it often contains overstatements made by writers armed with a few random facts.<sup>1</sup> The writers often cite extreme and infrequent examples to make a public case for killing the new vehicle programs instead of making the constructive case to obtain needed support and guidance to make our new vehicles the best in their class.

The current public controversy over the *Bradley* fighting vehicles (BFV) attacking their cost, their size, their vulnerability, and their "explosive" aluminum armor is an example of such unwarranted overreaction.

It is one of the objectives of this article to present the real situation concerning the vulnerability and survivability issues.

This discussion concerns friendly armor vulnerability... in this instance, what might happen to the crew and troops in an armored combat vehicle if the armor system is penetrated and, more importantly, what measures can be taken today to ensure maximum survivability of both the crew and the vehicle in the event of such a penetration.

Most armored combat vehicles employ armor systems designed to provide protection from a specified threat and from a specified direction of attack. For example, an armored personnel carrier's (APC) armor system might be specified to require "95% probability that an X-caliber armor-piercing projectile traveling at a velocity of Y meters per second (or from a range of Z meters) will not penetrate

from any azimuth," or that overhead protection must be such that the probability of penetration by the fragments from a specified large-caliber artillery shell detonated overhead at X meters shall be no more than Y percent.

In the case of the main battle tank, the protection from frontal, flat-fire attack must be very heavy to prevent the opposing tank gun's high-velocity, kinetic-energy (KE) penetrator from defeating the hull or turret from the azimuths most likely to be involved during battle. Because the armor system weight is so great for such levels of protection, the remainder of the tank's protection is specified to be sufficient to prevent or minimize the probability of penetration by less powerful threats. The *Bradley* and *M113* APCs are not, for example, designed to "ride into battle alongside tanks." They are designed to transport infantry and provide protection for the occupants from *small arms* and *shell fragments*. The *Bradley* provides an under-armor capability for fighting opposing infantry, and when in *protected positions*, defending against tanks.

Clearly it is not possible to provide immunity to everything in the antiarmor designer's bag-of-tricks. Therefore, the questions are: What happens when the threat defeats the armor system? Is it necessarily a catastrophe?

We have all seen photographs of tanks and APCs knocked out in combat. Often there is little if any visible damage, sometimes a small hole is visible resulting from a penetration by either a high-explosive, antitank (HEAT) (shaped-charge) or KE munition. The question is: What



happened to the crews? Were they put out of action by effects produced behind the defeated armor? Were the effects of such a nature that the crew *thought* they were defeated, so they abandoned their vehicle? Of course, when we see a "brewed-up" vehicle we usually assume that the crew was probably unable to escape the rapid spread of the fuel or ammunition fire.

Now, the crews of our armored fighting vehicles (AFV) no longer need be lost or seriously incapacitated when the armor system is defeated.

The recent actions in Lebanon were among the first to test state-of-the-art AFV survival systems in combat. These were the crew and vehicle protection procedures employed by the Israel Defense Force (IDF) in their tank and APC fleet. The information received to date in the open Israeli press<sup>2,3</sup> indicates their success in sharply reducing severe AFV crew casualties. The above-noted success of the Israeli actions in Lebanon has not only demonstrated their great concern for the survival of their combat personnel, but also that the combat vehicle crew survival enhancement techniques that the IDF had already adopted, do in fact work in modern combat.

The following describes what happens behind armor when it is defeated by *medium*-caliber HEAT munitions and the measures available within present technology to minimize the effects on the crew and vehicle. The history of behind-armor-effects research is also briefly reviewed where pertinent.

#### Armor Paces the Defeat Mechanisms

At the outset of the WW II, armor systems were limited to protection against projectiles, ranging from .50-caliber armor-piercing (AP) to a maximum of 37-mm, depending on the type of vehicle and the developing country. Tank armor thicknesses increased rapidly as the threat munitions became more powerful, both as a result of the adaption of high-velocity antiaircraft cannon to antitank guns, (e.g., German 88-mm PAK, U.S. 90-mm), and, of even greater significance, the introduction of the shaped charge by the German Army in 1940.<sup>4</sup> The German-developed *Panzerfaust*, the British PIAT, the U.S. 2.36-inch *Bazooka*, and many similar weapons based on the shaped-charge principle, later made it possible for the infantryman to defeat heavy armor. The direct result was increased thickness and complexity of armor systems to defeat the shaped-charge threat. The increasing weight and cost of the combat tank was the natural consequence of the continued race between the armor designer and the antiarmor munitions designers.

During the Korean War, the Naval Ordnance Test Station (NOTS) (now the Naval Weapons Center (NWC)) at China Lake, CA, developed from scratch and fielded in the remarkable time of only 19 days, a 6.5-inch air-to-surface ballistic (free) rocket with a large HEAT warhead capable of defeating nearly 2 feet of armor! The 6.5-inch antitank aircraft rocket (ATAR) was designed to defeat what was then the heaviest known armor in the world, the *Joseph Stalin III* heavy tanks, which were reportedly enroute to Korea on the Trans-Siberian railroad. However, the *JS-III* was apparently not introduced into the Korean theatre and the number of North Korean *T-34/85* tanks was rapidly depleted.

#### The Beginning of Behind-armor-effects Research

Although the *JS-III* was never encountered by U.S. or NATO forces in combat, it became the target basis for the Western World's antitank developments for nearly 2 decades.

The scientists at NOTS who had observed the develop-

ment tests of the 6.5-inch ATAR were impressed by what they had seen, particularly when an *M3 Grant* medium tank was rather spectacularly blown apart in a dynamic test of the prototype ATAR rocket with its 50-pound HEAT warhead. Desiring to learn what caused such devastating effects, a NOTS in-house-funded study was authorized to determine the phenomena occurring behind armor penetrated by a shaped charge. This NOTS study and others that followed resulted in several significant discoveries, including the nature of the various effects produced behind the defeated armor, and how the effects are influenced by the liner material, size of the shaped charge, metal parts design (including line configuration), explosive properties, and attack attitude.<sup>5</sup>

As a result of the early NOTS study, and many other such studies world wide starting in WW II,<sup>6,8</sup> there exists a large quantity of data on the nature of events produced behind defeated armor by both HEAT and KE mechanisms.<sup>6</sup> However, the dissemination of such data has been severely restricted because of the security interests of the nations involved, but more important, because it concerns a subject that most governments do not wish to publicize for fear of its effect on their armed forces.

#### Behind-armor Effects Produced by HEAT Ammunition

The effects produced inside a combat vehicle are a complex function of the size and design of the antiarmor mechanism and the materials it introduces into the target. Briefly, the effects produced behind armor by HEAT (and to a similar, but reduced, extent by KE) mechanisms include the following:

- The production of an expanding cone of fragments originating from both the armor and the penetrator. The fragments are in a wide range of sizes from dust to large chunks, with velocities from a few hundred to several thousands of feet per second (ft/sec). In a normal (perpendicular) attack, the cone may typically have an included angle of 90-110 degrees. The fragments can be likened to the subsurface burst of an explosive grenade within the vehicle with the quantity of fragments being a direct function of the size (caliber) of the armor-defeating mechanism and the diameter of the hole made by the penetrator on the interior wall.<sup>7</sup> *The thickness of the armor does not necessarily correlate with the quantity of metal produced behind the armor.* The *Bradley* and *M113* armors, for example, are different; the effects produced by a given weapon behind the *Bradley's* armor may be less than those produced by the same weapon behind *M113* armor.

- Depending on shaped-charge liner material (such as copper, steel, aluminum, etc.), size and type of ammunition, and point of attack (e.g., belly, side, top), the penetration event may be accompanied by pressure, thermal, luminous, and gas producing events that may have severe effects on exposed personnel.<sup>7</sup>

- The internal explosion overpressures may range from as little as a third to as much as three or more atmospheres (e.g., 5-50 pounds per square inch with durations up to a 100 milliseconds, which can result in trauma ranging from ear drum damage to major injury. The lungs and other body cavities are particularly affected by excess overpressure. The suddenly-developed pressure may also throw the occupants about the interior of the vehicle's crew compartment with possible injuries resulting from collisions with hard objects within the vehicle.<sup>7</sup>

- The air temperature within the vehicle was observed to rise by as much as 300°F above the ambient, and to take as long as 3 minutes to return.<sup>7</sup>

- The events producing the pressure and temperatures

mentioned above may, depending on the penetrator and armor materials, also produce an intense blinding light resulting in temporary to permanent damage to unprotected eyes of the vehicles occupants (in addition to any physical eye damage that may be caused by fragments).<sup>7</sup>

• The vehicle interior may also be filled with a white, choking, particulate-filled gas with severely reduced available oxygen. The British have recently reported the production of exceptionally large concentrations of oxides of nitrogen when *large*-caliber, copper-lined shaped charges defeated aluminum armor typical of the thickness and alloy used on modern fighting vehicles.<sup>8</sup>

The above phenomena all develop within less than one tenth of a second. The initial pressure pulse, resulting from the shockwaves produced by the flight of the spalled armor and penetrator debris across the vehicle's interior, may be high but of very short duration (e.g., less than one millisecond). There is current debate whether such duration overpressures are in fact harmful to man. When materials are involved that can be rapidly oxidized with the liberation of heat energy, the oxidation, or combustion of the dust and impact-vaporized metals may take place over tens of milliseconds to produce both high temperatures and pressures. Materials that can be readily oxidized include both iron and aluminum, the two principal materials of construction of armored vehicles. Although the aluminum oxidation is more noticeable in practice, both metals may produce significant effects that need to be considered in the design of survivable armor systems.

*Small*-caliber, copper-lined, shaped charges, typical of the *PG-7*, and similar shoulder-fired antiarmor munitions, produce little of the side effects of pressure, temperature rise, and intense light described above. However, because of their inherent penetration capabilities, these small munitions can easily penetrate many of the armor arrays on today's armored vehicles, including the sides and rear of the latest main battle tanks. Depending on the point of entry, jets from even the smallest shaped charges can ignite fuels, hydraulic fluid, and ammunition within the vehicle. The typical "brewed-up" vehicle is often the victim of a fuel, ammunition, or hydraulics fire from a small-caliber HEAT attack. However, when a readily oxidizable metal is introduced, either by the armor or the penetrator, the fuel and ammunition-fire raising capability is enhanced, and the effects become much more significant.

When *large-caliber* shaped charges (100 to 150-mm) are used against *light armor*, the behind-armor antipersonnel effect will be at very high levels . . . *regardless of the materials involved*. The principal source of behind-armor antipersonnel effect is the fragment spray comprised of materials from the armor and the remaining part of the penetrator. Generally, steel fragments are more harmful to the crew than aluminum fragments because of their relative densities. These extreme "overmatch" situations are the cases frequently described by the *uninformed* press, who often fail to mention the fact that they are referring to such an extreme example.<sup>1</sup> A *large* caliber HEAT penetration can be quite violent. However, it is this author's opinion that even such extremes can be made more survivable if the crew compartment is properly designed and the crew members are provided with appropriate local protection (i.e., personal armor).

For the record, *aluminum armor plate does NOT burn*. Fuels, propelling charges, hydraulic fluids, and other organic materials *do* burn. Aluminum in a *molten* state *can* burn. In a finely divided form (e.g., powder, flake, ribbon, etc.), many materials, including aluminum and steel (even corn), *can* burn in a short duration event, that is similar to an industrial dust explosion, (e.g., grain silo

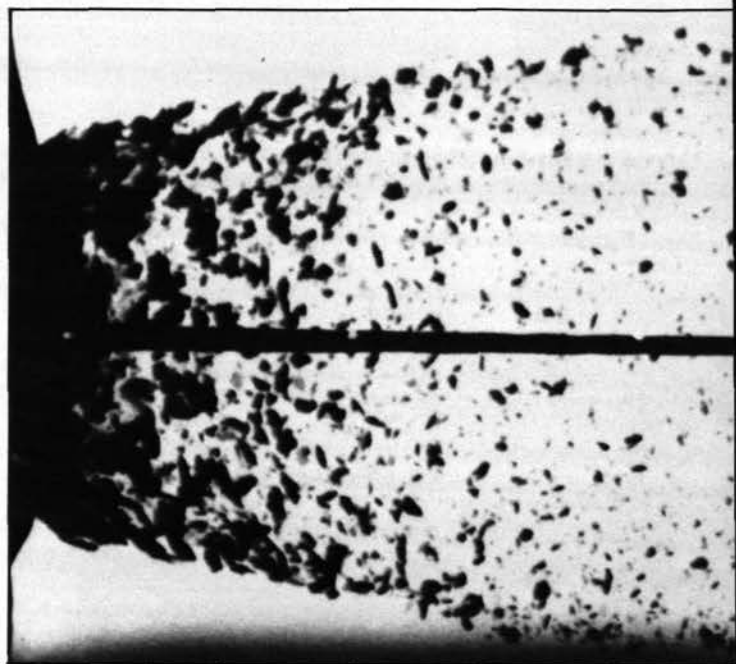


Figure 1. Flash radiograph of armor penetration by typical HEAT jet (center, left to right). Bulge in face of armor (left) is beginning of spall ring release. Jet tip has velocity in the order of 8,000

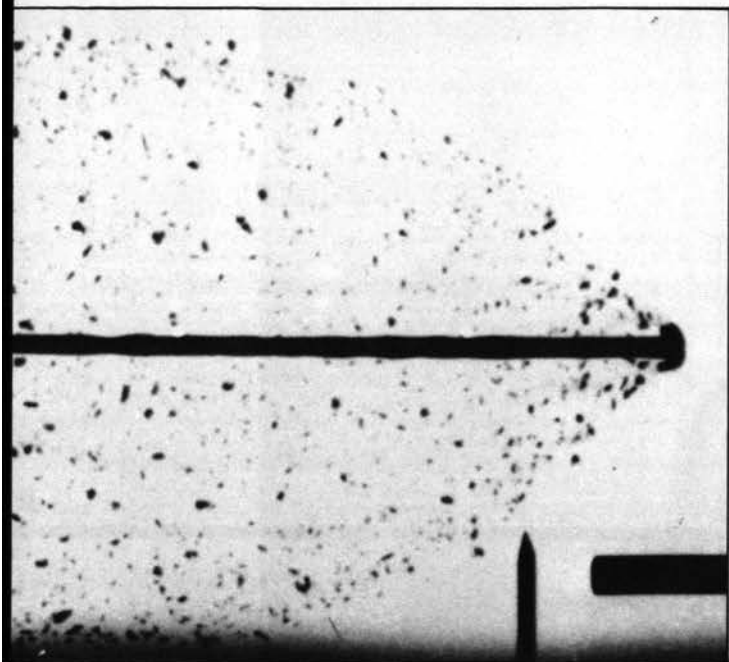
explosion). This point is emphasized because of the great amount of incorrect public information concerning "burning aluminum," which was given much space in the press following the *HMS Sheffield* sinking in the Falklands in the spring of 1982.<sup>9</sup> The *Sheffield* was in fact constructed of mild steel throughout.<sup>10</sup> The fire, which eventually resulted in the loss of the ship, was fed by the explosives of the undetonated warhead. The burning aluminum was provided by the airframe of the *Exocet* missile, which undoubtedly gave rise to the initial and apparently correct statement made by the captain of the *Sheffield* concerning his observation of burning aluminum. Nearly a year later, some military writers are still making statements about the aluminum superstructure of the *Sheffield* and worse yet, trying to make analogies to aluminum armor in the *M113* APC, *M2* infantry fighting vehicle and *M3* cavalry fighting vehicle.

#### The "Vaporific Effect"

The metal combustion event referred to above is known to the terminal ballistician as the "vaporific effect." Aluminum, when oxidized under the proper conditions of temperature and pressure, releases nearly 20,000 calories of heat per cubic centimeter (cal/cc) of oxidized material. This compares with about 1,500 to 2,000 cal/cc in the detonation rate of typical military explosives. The differences lie in the rate of energy release and the degree of completion of the oxidation process. Aluminum combustion is usually incomplete due to the development of a coating of aluminum oxide that inhibits its continued oxidation. Hypervelocity events, such as the shaped-charge jet formation and penetration process enhance the efficiency of the aluminum combustion process. *Both* steel and aluminum armors can produce a vapor explosion under certain conditions (e.g., extreme overmatch of weapon vs. armor).

*M113s* in Vietnam were attacked by Soviet made *PG-7s* (the "\$150" antitank rocket referred to in the media) yet no "aluminum vapor effects" were ever reported because the *PG-7* is small and its effects behind armor are mostly





m/sec., with fragments of the spray reaching velocities in the order of 2,000 m/sec. The latter spray is typically 90-110 degrees included angle.

confined to fragments. However, larger antitank weapons, which are designed to engage heavily armored tanks, can produce an aluminum vapor effect if used against a lightly armored vehicle. The enemy will use what he has in hand. If the target even looks like a tank, he may fire a tank-killing weapon.

Historically, various antiarmor and antihard-target weapons have been specifically designed to exploit the vaporific effect. These include the U.S. Army *Dart* antitank guided missile warhead developed in the 1954-1958 period;<sup>11</sup> the U.S. Air Force's *AGM-65 Maverick* missile shaped-charge warhead developed in the late 1960's; the Air Force's Hard Structure Munition, also developed in mid-1960-1970 period; Sweden's *FFV028* mine, and Sweden's most recently introduced, FFV-developed *AT-4* antitank rocket.<sup>12</sup> All have in common an aluminum alloy liner, although in different configurations, depending on the specific requirements of each munition. The Swedish *AT-4* light antitank weapon is currently advertised as "the ideal mass weapon with unique beyond-armor effect," and is described as being capable of igniting diesel fuel even in a cold Swedish winter, and having beyond-armor effects of "over-pressure within the vehicle, mechanical damage resulting from secondary fragments, immediate eye sight reduction and long-term blinding of the occupants, as well as heat effects . . ." They also note "overpressure measured during tests" of "approximately one bar" (i.e., about 15 psi), and "light intensities over 100 times stronger than sunlight result(ing) from the flash, blinding the occupants for several minutes."<sup>12</sup> The 84-mm caliber weapon penetrated 395-mm of homogenous armor in demonstrations in late 1981. The *AT-4* is the first known weapon to openly advertise its capability to produce the vaporific effect in a combat vehicle.

The *AT-4* may be the first of the next generation of antitank weapons specifically designed to produce enhanced antipersonnel effects behind the defeated armor. The introduction of new weapons such as the *AT-4* and their significance to the combat vehicle crew are among the main reasons for increasing our efforts to enhance crew

survivability should a penetration occur.

#### Behind-armor Effects Suppression Techniques

The effects produced behind armor by both HEAT and KE mechanisms have been known for over 30 years,<sup>5</sup> and the means to minimize such effects have been sought for more than 20 years. Polyethylene was identified in the early 1960's as an effective behind-armor spall-suppression material and the use of such materials in AFVs for the attenuation of both spall and radiation effects is well known worldwide.<sup>13</sup> Another material suggested in the early 1960's as an interior liner was glass-reinforced plastic (GRP) also known as Doron. Doron demonstrates excellent armor qualities, is a good radiation attenuator, and can be used as the primary construction material for the vehicle hull and turret. However, glass-reinforced plastic armor has a significant deficiency—when penetrated by a HEAT munition, a cloud of very high-velocity glass particles is produced which can be a severe hazard to the crew's eyes, flesh and lungs.

The search for materials ballistically superior to both GRP and polyethylene has continued. The *M113* APC has, for example, in the course of product improvement testing, been subjected to contact detonations by shaped charges as large as the 5-inch TOW warhead. Although the penetration holes were large and the spall production was widespread, experimental spall liners were able to capture the majority of the fragment spray behind the armor. As a result of the pioneering demonstrations by FMC in late 1974, both the Army<sup>15</sup> and Navy<sup>16</sup> became interested in DuPont's proprietary filament "Kevlar," particularly for use behind aluminum armor. The Navy undertook to line the interior of the aluminum superstructure of its Perry-class frigates, primarily as a precaution against so-called "cheap kills" by fragmentation munitions.<sup>17</sup> "Kevlar," is a high-modulus, aromatic fiber, and in an appropriate matrix and weave has been demonstrated to be a superior spall liner material. The early ballistic tests performed by FMC demonstrated that about one-half inch thickness of the Kevlar material placed in contact behind *M113A1* APC aluminum alloy armor plate, captured more than 90 percent of the spall fragment spray produced behind aluminum armor when a 66-mm *M72* LAW shaped-charge warhead was statically detonated in contact with the armor (figure 2). The Army subsequently funded FMC to perform a research and development program to develop spall-suppression liner systems for aluminum-armored fighting vehicles, such as the *M113A1* (figure 3).

Tests recently completed at Yuma (AZ) Proving Ground demonstrated the ability of a prototype spall-suppression liner system to withstand the rigors of 6,000 miles of cross-country travel in an *M113A1* APC. The prototype system has also been subjected to a thorough program of ballistic tests including static detonations of nearly 200 each 1.5, 3.2, and 5-inch HEAT antiarmor rounds.

#### Fuel as Armor

It has been demonstrated in the recent Lebanon fighting that both crew and vehicle combat survival can be significantly enhanced by removing fuel from crew spaces and relocating it in multiple cells, preferably within the external armor system. Diesel fuel has an excellent resistance to both kinetic-energy and HEAT penetrations and has a HEAT jet resistance equivalent to about three-quarters the same thickness of mild steel.<sup>18</sup> Armored external fuel cells for the *M113A1* APC have been developed by the manufacturer and have demonstrated their high efficiency in stopping both 12.5-mm armorpiercing and *M28 Superbazooka* HEAT rounds. The external cells are a preferred

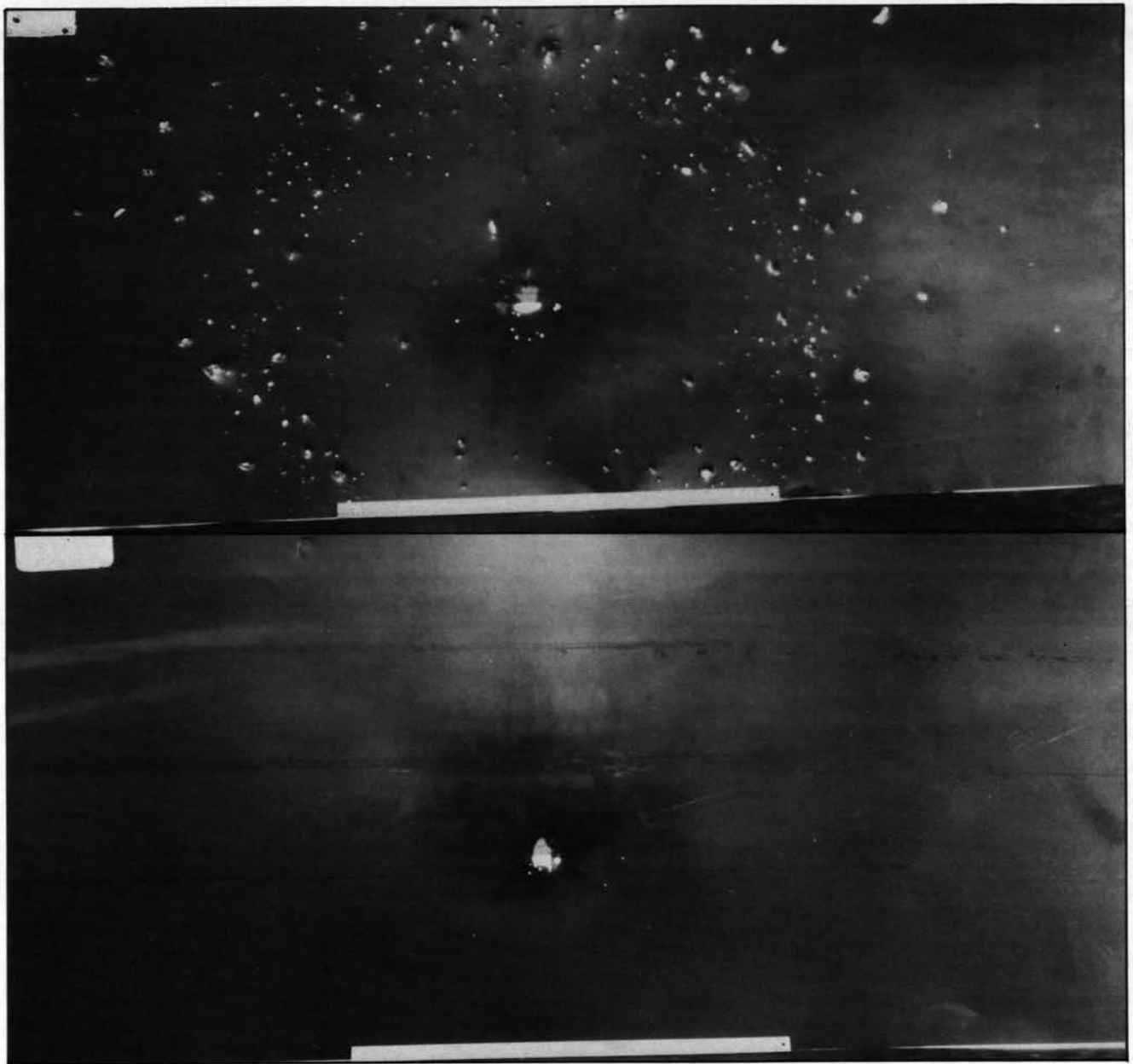


Figure 2. (Top) Spall pattern behind unlined M113 armor produced by 90-mm HEAT round. Panel is over 3 feet behind the armor.

(Bottom) Near total spall suppression behind spall lining. Same type of round, same distance behind armor.

option on the majority of *M113* offshore sales. Thus far, the U.S. Army has not undertaken a retrofit of its active *M113* fleet.

Diesel fuel was originally selected to replace gasoline as the fuel for combat vehicles because of its significantly reduced fire hazard. The Army was satisfied that cold diesel fuel could not be successfully ignited even by the HEAT charge, and that such fires would not be catastrophic, as compared to gasoline fires. However, various events have since demonstrated this to be a sometimes incorrect real-world finding. Researchers at NOTS in the early 1950's, demonstrated on many occasions, including tests in 1952 at Aberdeen Proving Ground, that aluminum-lined shaped charges would explosively ignite diesel fuel, regardless of the fuel temperature, and whether the cells were full or partially filled, exposed, or behind armor. The previously mentioned new Swedish *AT-4* antiarmor weapon is cited as having the same capability.<sup>13</sup>

Easy ignition has also been demonstrated when diesel

fuel is placed behind aluminum armor and the armor is penetrated by an ordinary copper-lined HEAT jet. In the U.S. APC, part of the diesel fuel supplied to the engine is used to cool the injectors and is returned to the fuel cell in a heated state. After a period of running, the remaining fuel in the cell becomes heated, sometimes beyond its flash point of 70°C. However, even a small quantity of a low-flashpoint material such as gasoline, may be inadvertently introduced should the fuel transport vehicle or pipeline be used to convey multiple materials, as is common practice. As little as 2 percent gasoline in diesel fuel reduces the flashpoint from its normal 70°C down to 15°C.

It was also known as early as 1967, that penetration by PG-7s at the left rear corner of the *M113*, would often guarantee a catastrophic fuel fire (i.e., a "brew-up" in today's parlance) if the gunner hit his mark.

In the recent Falkland Island's combat, the same situation continued to occur in aluminum-hulled vehicles with internal fuel cells. One example is a report that states



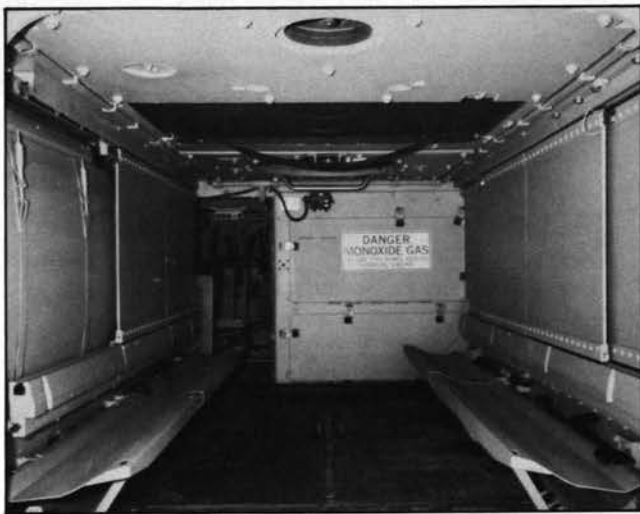


Figure 3. Antisplatter protection lining in an M113 APC.

"... following the "brew-up" of an LVTP-7 amphibious APC of the Argentine forces invading the Falklands (from which none of the 20 troops aboard escaped) as a result of a single HEAT round from a Royal Marines *Carl Gustav*..."<sup>19</sup> The case was made in the latter-cited article for the installation of Halon fuel fire suppression systems in combat vehicles to help counter such fires.<sup>20, 21, 22, 23, 24</sup> The U.S. Army has installed Halon systems in all of its new vehicles and is retrofitting some of the older ones.

Moving fuel from the internal vehicle location not only reduces a major hazard but makes more behind-armor space available for the stowage of other critical but non-hazardous materiel (e.g., potable water for combat operations in arid or contaminated environments).

When external, self-sealing fuel cells are penetrated by bullets and fragments, the fuel cell will usually trap the impacting material without significant loss of fuel or raising a fire. If the threat is a major one, such as a large KE penetration, or a HEAT jet, a properly-designed and located cell will still act to reduce the penetration. If the cell is nearly empty, it will have the same effect as spaced armor. If full or nearly full, and the penetrator passes through the liquid, the cell will fail by hydraulic rupture and the fuel will be discharged off the vehicle. In a properly-designed system, the partially-atomized cloud of fuel should be rapidly consumed in a harmless fireball well away from the vehicle.

The ideal external fuel system would have multiples of cells between a thin outer armor shell and a thick inner hull. The cells would be arranged along a manifold attached by valves that would be automatically actuated by the penetrator-induced hydraulic surge, so as to isolate any cell destroyed by a penetrator.

#### General Methods for Vulnerability Reduction

The guiding principles of how to design the combat vehicle to minimize its vulnerability to weapons effects, and at the same time ensure the survival of the crew are well established. The lessons of isolation, separation, redundancy, and localized armoring of critical elements were first learned in naval combat.<sup>25</sup> These naval principles were later applied to the first tanks introduced into modern combat (originally "landships")<sup>26</sup> and have been followed by the more successful armored vehicle designers. Perhaps the most notable current success is that of Israel's General Tal in his development of the *Merkava* and modified *Centurions*, *M60s*, and *M113s* (known as *Zelda* in the IDF.)<sup>2, 3</sup> General Tal has had several opportunities to prove his

designs in combat, a luxury not available to most vehicle designers until too late to do anything about basic design faults.

The U.S.-developed *M1 Abrams* tank incorporates many of the lessons in the survival "handbook." Considerable attention has been paid to the ammunition stowage so that in a catastrophic event, the explosive effect is directed away from the crew compartment.<sup>27</sup> However, the *Abrams*, like the new *Bradley* vehicles and older vehicles in the current inventory, will continue to require product improvements to further reduce their vulnerability and enhance both crew and vehicle combat survivability. Product improvements suggested to reduce vulnerability of the IFVs and APCs include relocation of the fuel to external cells, relocation and better protected stowage of ammunition and, of even greater importance, the development and provision of individual armor with associated life-support systems for the crew.

#### Armoring the Crewman

Although the relocation of fuel and ammunition, and the installation of spall liners and Halon fire or explosion-suppression systems, etc., can do much to enhance both vehicle and crew survival in combat, there is an even more urgent need to provide the crew with much improved personal protection. Personal armor and life-support systems will permit operation both within and outside the vehicle in a combat environment.

The principle of modular armoring dictates that the system's most vulnerable and critical elements (i.e., the crew) be provided with local armor to protect them if their basic protection system (i.e., the vehicle armor shell) is defeated. Clearly, the basic vehicle armor shell cannot keep out *all* of the threats on the battlefield and some antiarmor threats can't be kept out no matter how much armor is carried. (The 10-in diameter, 100-lb *Maverick* missile shaped-charge warhead, which was deployed successfully by the IDF in the 1973 Yom Kippur War, is a good example of the latter. Also, the new Swedish *AT-4* should be able to penetrate any current lightly-armored system and produce severe antipersonnel effects behind armor.<sup>13</sup>) The use of a spall liner, separation of the fuel and ammunition from the crew, and similar vulnerability-reduction procedures, can do much to linearize and diminish the potential catastrophic effects of such penetrations. However, there will continue to be sufficient residual effects to constitute a danger to the crew unless they are locally "armored" with a proper combat crewman's uniform.

Personal armor is certainly not a novel concept. Man has worn body armor for centuries. In WW I, tank crews were provided with protective personal armor to counter bullet splash and shell splinters that entered through the gaps in their vehicle armor.<sup>28</sup> The main concern was to protect the crew from eye and head injuries. There was also a significant chemical threat, and the crews were provided with gas masks to protect against war gases and the gasoline and engine-gas contaminated interiors of the WW I tanks.

Although modern combat vehicles are built much better than WW I and II models, the stresses and speed of modern combat may actually have made the crew more prone to injury. It may be necessary to protect the men from vehicle-caused injuries as from damage that may be caused by enemy action.

The U.S. Army has developed new helmets based on "Kevlar," new fire resistant Nomex combat crewmen uniforms,<sup>29</sup> new NBC uniforms,<sup>30</sup> improved face masks,<sup>31</sup> photochromic goggles for eye protection from intense light (e.g., nuclear flash),<sup>32</sup> and liquid-cooled garments to permit

complete-coverage uniforms to be worn in extreme temperature environments.<sup>33</sup> These all appear to be steps in the right direction but, thus far appear to be independent steps. The need here is for a coordinated effort to develop a combat vehicle crewman's uniform combining such features as fire protection (e.g., Nomex), a modest ballistic protection (using a properly matrixed flexible "Kevlar"), NBC protection, and an integrated helmet providing total protection to the eyes, ears, nose and mouth, and at the same time providing a communications link, breathing air, and when required, cooling or heating. (See *NBC and the Armor Crewman*, *ARMOR*, Sep-Oct 1981, p. 39. Ed.)

The integrated combat vehicle crewman's uniform should make the wearer comfortable in all extremes of temperature and humidity so that he will want to wear the protection provided for his combat survival. Provision should also be made that will permit the crew to exit the vehicle in a hostile environment (e.g., NBC) and to maintain their basic cooling, breathing, and communications, for at least an hour.

The combat vehicle crewman's uniform should also look good so the crewman can take pride in his appearance. We know that such personal protection measures work from the number of racing drivers who have survived high speed crashes and fires.

### Conclusions

It is the author's sincere hope that an integrated effort

will soon be implemented to provide our combat vehicle crews with the tools to better ensure their combat effectiveness and survivability on an increasingly hostile battlefield.

We know what must be done to improve crew survival in our present and future fleets of combat vehicles. We know that fuel and ammunition must be placed so as to minimize the hazard to the crew and other men in the vehicle. We know how to line vehicles to linearize the effects of penetrators. We have seen the IDF's success with such deliberate efforts to ensure personnel survival in combat in Lebanon. We have also seen the example in the Falklands where 20 Argentine soldiers were killed in a U.S.-built vehicle that stored its fuel inside the crew compartment.

Implementation will not be inexpensive. Materials that can survive in the ballistic and fire environment are costly. But, compared to the incredible cost of a man, in particular one who is badly hurt and may require extensive, immediate, and long-time institutional care, the cost is low. The Army is keenly aware of the deficiencies in our armored fighting vehicles and has already incorporated some of the corrective measures. Others are in various stages of planning, research, and development. The procedure followed in all new systems is an orderly program of product improvement that includes retrofits when necessary. Improvements in the older *M113* systems are still being incorporated because the vehicles are expected to remain in both US and NATO inventories well into the next century. The choice is clear. Time is now the enemy.

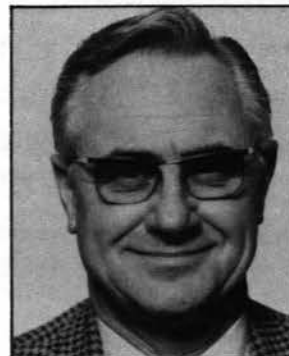
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*Note: All references are unclassified and unlimited.*

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# The Broad and Narrow Of It

by Richard E. Simpkin

In this article I will address a question raised at the Fuller/Liddell Hart Memorial Symposium, in the fall of 1982, by the well-known armored warfare historian, Kenneth Macksey.<sup>1</sup> Steady advance in the state of the automotive art is placing the armored vehicle designer in a position to offer his user a measure of choice in the width of his vehicle and, thus, in the type of terrain it will cross. To discuss this, we need to set up and define, maybe redefine, a pair of buzzwords.

I first visited Detroit Arsenal shortly after somebody there, Joe Williams, I think, had coined the term *mobiquity*—the ability to go everywhere. Since then, I always understood this term to refer specifically to the ability to cross soft terrain, in other words, to *nominal ground pressure* (NGP). If I am wrong, I apologize, but ask the reader to accept this definition.

The other word we then need to define is that of *trafficability*, which I see as the proportion of prepared routes a vehicle can use. This evidently is dictated in the first place by *weight*, the critical factor often being the load-carrying capacity of bridges. But the trend, now perhaps most pronounced of all in the U.S., towards much lighter armored weapon platforms at once opens up the kind of route where *width* becomes limiting, and combines with technological advance to offer some choice over width.

The problem is accentuated by the way trafficability marches with almost every other aspect of mobility, from fitting into an aircraft, to roaring down a turnpike, to weaving along a forest path. *Mobiquity* conflicts with these, entailing increased width, rolling resistance and unsprung weight, along with increased liability to track throwing and track damage. It thus behooves the user to consider which he wants, bearing in mind that a track can be widened by fitting grouseers, while neither track nor hull, once designed, can be narrowed.

## Technical Aspects

At the root of the "vicious spiral of tank design" lies a relationship originally borrowed from naval architecture and known as the *L/C ratio* (figure 1). This ratio determines the

certainty and precision with which the vehicle steers. American, German, and Soviet practice used to limit it to around 1.5:1,<sup>2</sup> with the Swedes keeping it a rather lower;<sup>3</sup> but with modern power-to-weight ratios and infinitely variable regenerative transmission and steering systems, the figure can rise to 1.75 or higher without a tendency to proceed in a straight line becoming evident. This means for instance, that, theoretically and *in terms of this factor alone*, the width of the *M113A1* could be reduced from 2.69 meters to 1.90 meters, or of the British *Scorpion* from 2.18 meters to something under 1.75 meters. Very roughly, allowing the L/C ratio to rise in this way allows a width reduction of 20 to 25 percent for a given weight and ground pressure.

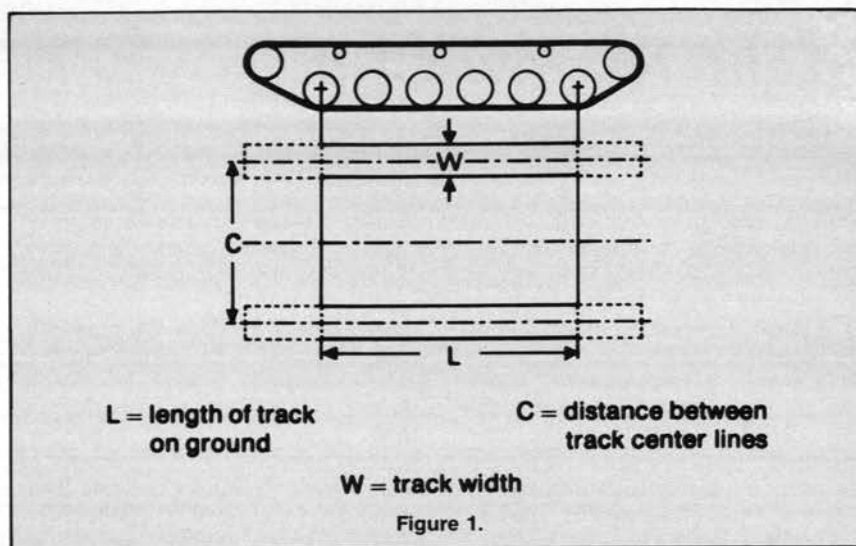
Turning now to *ground pressure*, we must first be clear that the ability to cross soft terrain is often limited by two quantities other than the NGP. One is the limited shear strength of some soils, notably alluvial soils (figure 2). Here we are concerned not with the microcosmic effect of pressure but with the macrocosmic action of vehicle mass on the whole area affected by that mass. In plain words, the whole bank, or whatever, collapses and the vehicle falls with it. The second effect is compounded by dynamic loading and peak ground pressure. NGP is calculated in static terms (mass/area of track on ground), so it would be reasonable to apply to it the normal dynamic loading factor of 2 in estimating instantaneous pressures between a moving tank and the ground. The actual pressures peak at the points of contact of the roadwheels (figure 3), typically with the highest peak under the front roadwheel. Let us suppose, conservatively, that the peak pressure under the front roadwheel is 150 percent of the NGP. Then, under dynamic conditions, the *soil bearing pressure* required to ensure that the track link under the front roadwheel will not dig in is some *three times the NGP*. So, quite apart from the problem of measuring or estimating soil bearing pressures in the field, NGP provides no more than a second-order yardstick in determining whether or not a given vehicle will cross a particular piece of real estate. This situation is well, if uncon-

sciously, reflected in the experienced tanker's chariness about venturing onto marginal going, of which more in a moment.

Nonetheless, NGP is the only convenient yardstick we have. Leaving aside dedicated, unarmored, snow and bog vehicles, we can maybe pinpoint three significant levels of armored vehicle NGP. The lowest of these, which we might call the light armored vehicle level represented by *M114* (still in Canadian service as *Lynx*), and the British combat vehicle, reconnaissance (tracked) (*CVR(T)*) family, is *0.3 to 0.35 bars*.<sup>5</sup> This matches lightly-packed snow and very soft wet ground short of a true bog—wet paddy, for instance. It can, in fact, creep up to 0.45 or even 0.50 bars with little discernible loss of *mobiquity* and considerable payoffs in other characteristics. The second or medium armored vehicle level is *0.5 to 0.6 (+) bars*. As I have suggested, it is hard to define a cutoff point in terms of terrain between this and the first level. This second level is represented by *M113A1*, *M2/3 Bradley*, *AMX-10P* and, very significantly, the Soviet BMD and BMP and the Swedish *Pby302*. The third level, say *0.75 to 0.85 bars*, features main battle tanks (MBTs), including Soviet tanks from *T-54* onwards<sup>6</sup> and, almost needless to say, the West German *Marder*. The corresponding terrain is again hard to define; it includes packed snow, and most of *ARMOR's* readers will know from experience what it means in terms of mud and soft ground.

The key point is this. The Soviets, who do their homework excellently and have to cope with snow or liquid mud for around 6 months of the year, from fall to the end of the spring thaw, are evidently prepared to trade off NGP to at least the same extent as everybody else. This suggests that NGP can fairly be allowed to rise to around 0.8 bars.

By contrast, if the philosophy of trading off low ground pressure for reduced width is carried to the extreme, there is evidently a danger of allowing the opposition's vehicles free play in terrain that one's own cannot enter. The Soviets, and their satellites and Third World clients, have the wide-tracked version of light combat transport vehicle (*the mashina tran-*



portmaya lokkhaya boyeraya (MT-LB)) with an NGP of 0.28 bars, and a number of dedicated soft-terrain vehicles to fall back on. But, as already stressed, they seem to be in no doubt about allowing the NGP of their primary armored vehicles to rise to western levels and beyond. The main positive point in the Soviets' rather negative attitude toward the ground is the avoidance of difficult terrain; their commanders up to regimental level are—I now believe rightly<sup>7</sup>—thought to have difficulty in coping with the intricacies of European terrain; and the risk of being slowed down or funneled by bad going cuts right across the principles of their operational and tactical concepts. In any event, those who try to get an edge by using marginal terrain have always been apt to emerge from it in a measure of disarray. Current and future possibilities of the lethal

engagement of armor with attack helicopters and indirect-fire antiarmor weapon systems on the one hand, and the resurgence of handheld and crew-served antiarmor systems on the other,<sup>8</sup> will enhance this tendency. And the process of shifting back to a higher gear to regain their tempo on emerging from a belt of bad going will inevitably reduce the density of the Soviet advance guards and lay them open to containment and destruction. Thus, the risk entailed in sacrificing the ability to cross soft ground is, from NATO's point of view at least, a somewhat academic one.

#### Types of Terrain

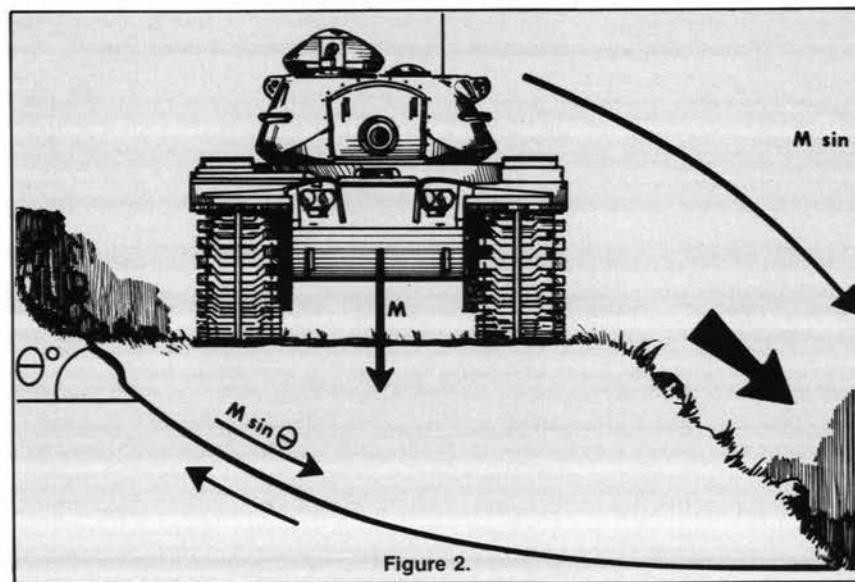
If we define a weight class, say from 15 tons up to 18 tons military load classification (MLC20), we can consider terrain as *gradient-critical*, *NGP-critical* or *width-critical*. Steepness does not directly affect the

“mobility versus trafficability” argument, but it does have a bearing on the user angle. The second category consists entirely of unprepared surface. It comprehends snow, soft and/or driven sand, wetlands, excluding true bog (whose bearing pressure tends to zero), and mud, whether natural or the result of vehicle movement. The width-critical category consists mainly of prepared routes, from mountain passes and forest paths to farmland trails; but it also includes a significant proportion of ground shaped by man for other purposes, floodbanks for instance, and some natural formations like desert escarpments and wadis (dry watercourse beds), or the moraines and the like encountered on the *bergschrund* (crevasses at the head of a glacier). By no means least important, it includes urban terrain. Width is closely associated with the ability to use *natural cover*, at operational, tactical, and minor tactical levels alike.

Ken Macksey's particular point was that there is a great deal of soft going on the NATO center between the inner German frontier (IGF) and the Rhine. Over a relatively small area like this there is no great problem about analyzing the terrain and classifying it under one of the three above categories. This is exactly what the Swedish military authorities have done for the limited and rather unusual territory of Sweden; and because they know they will only fight there, they can base their military vehicle policy on this analysis. But with intervention outside Europe increasingly becoming the most probable conflict for NATO's major armies, such an analysis becomes prohibitive in time and cost. In any event, I am convinced that the military “usability” (to borrow an ugly but valuable term from the Soviets) of marginal terrain turns not on its detailed physical characteristics, but on the user's subjective judgment of it as an element in his evaluation of the tactical risk as a whole.

#### User Judgment

In training, the penalty for getting a vehicle stuck is no more than a rebuke, maybe some loss of face, and a great deal of hard, dirty work. For the defender in war, it is very possibly death, probably capture, or, at best, evasion and escape. Even in training, one very seldom sees experienced vehicle commanders deliberately traversing a side slope likely to throw a track, or continuing to nose their way forward when they find the going get-





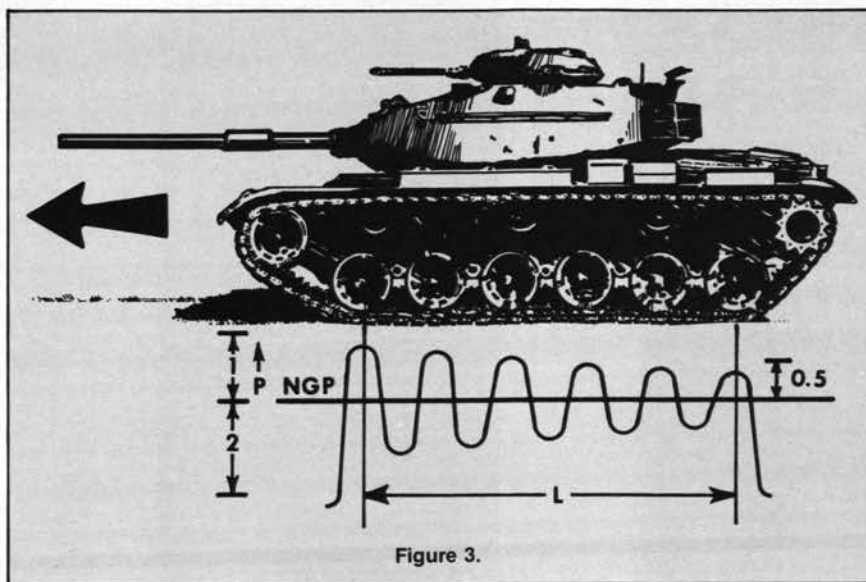


Figure 3.

ting softer. Nor do tactical commanders as a rule order them to do these things. The reason is simple. The only way to find out whether a slope or a soft spot is negotiable is to try it. Even if the first vehicle succeeds, there is no guarantee that subsequent ones will, even on the rare occasions when it makes sense to "track" the leader. The use of gradient-critical and NGP-critical terrain is a high-risk expedient, which sensible and experienced tankers will only resort to as a result of a conscious decision that the tactical payoff justifies the risk.

*Width* is a different kettle of fish. The width of a bridge or a gap can be measured sometimes from air photos, sometimes by mounted or foot reconnaissance patrols, sometimes by the crew of the lead vehicle. An occasional encounter with most of the kinds of objects likely to limit width—gateposts, projecting walls, small trees and the like—is one an armored vehicle is likely to win. A lead vehicle with an over-width dozer blade can clear a route of isolated obstructions almost at normal movement speed. And if the width of the deck or carriageway is limited, vehicles can be guided by hand. In sum, restriction of vehicle width confers a *usable* advantage; low NGP offers one which is unlikely to be fully exploited and is at best risky.

### Conclusion

Two advances in armored vehicle technology appear to offer an exciting bunch of convergent trends for 1990's designs. Optronic and optical improvements (notably image processing and the "optical slip ring") will allow the primary armored-vehicle weapon platform (the MBT successor) to have

an externally mounted gun with the crew in the hull. This configuration will allow its weight to be reduced certainly to MLC40 and very possibly to MLC20, and will dispense with the large turret ring. Existing technology has reduced the trunnion reaction of high-pressure guns by as much as 75 percent.<sup>9</sup> At the same time modern transmission/steering systems are allowing an increase of 15 to 20 percent in acceptable L/C ratio and thus reduction of the width required for a given vehicle mass. Exploitation of these trends, coupled with acceptance

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<sup>1</sup> "The Future of Armoured Warfare," second Fuller/Liddell Hart Memorial Symposium of the Royal United Services Institute for Defence Studies, held in the Carver Hall, Royal Armoured Corps Centre, Bovington Camp, on October 14, 1982.

<sup>2</sup> British designers always seem to allow L/C ratios to run away. *Centurion's* was 1.94:1 and this tank showed a marked reluctance to steer when most of the load was on the end roadwheel stations, as when crossing a gully.

<sup>3</sup> Swedish L/C ratios tend to be low. *S tank's* is right down at 1.11:1, because its gun is laid by slewing on the tracks; an eighties *S tank* could have an extra roadwheel, giving a L/C ratio or around 1.35:1, and still steer accurately enough.

<sup>4</sup> Attempts to smooth out the ground pressure profile, like the overlapping roadwheels of (e.g.) the Wehrmacht's *Pzkw.5 Panther*, bring in their wake a host of problems ranging from added weight and mud-packing.

<sup>5</sup> I use bars to avoid the solecism of using centimeters (not in the SI system) without resorting to unfamiliar units. (1 bar  $\times$  0.9806 kgf/cm<sup>2</sup>  $\times$  10 N/cm<sup>2</sup>  $\times$  14.5038 lbf/in<sup>2</sup>)

<sup>6</sup> *S tank's* NGP is up at 0.94 bars.

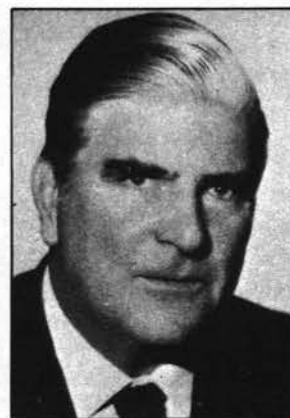
<sup>7</sup> I never believed this before; but I have researched this topic in some depth for my book *Red Armour*, which will be with my publishers by the time this article appears, and I now think that the assertion contains a large grain of truth.

<sup>8</sup> Not so much because of advances in light ATGMs as of spectacular improvements in the performance of HEAT warheads against compound armors.

<sup>9</sup> In the U.S. with the soft recoil mode of the *ARES Super 75*, in Sweden (on *UDES XX20*) with the Bofors muzzle brake and increased recoil length.

of a rise of some 25 percent in NGP from the level now customary for MLC20-ish vehicles would further reduce weight. More importantly, the combined effect of all these trends could reduce width from the 3.5 meters or more of today's MBTs to something not too far from the limit of 2.0 meters (+0.5% max) which is finding increasingly wide international acceptance for commercial vehicles.

The way may lie open to an armored vehicle fleet with the strategic mobility and trafficability now associated with softskins *plus* first-rate tracked vehicle performance. The only price to be paid for this may be the nugatory advantage of low NGP. This is why "mobility versus trafficability" is a user argument worth having—now.



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



*Ed. Note: The following article is a composite derived from articles and photos supplied by the authors. Major Heymans supplied the British Army material and photos and Mr. Green supplied the German Army material and photos. (British Army equipment photos courtesy Defense Research Establishment, Suffield, Canada.)*

Since the early 1970s, Canada has been host to the British Army and the *Bundeswehr* who each lease thousands of acres of prairie upon which to conduct combined arms training. The first agreement was signed with the British government in August 1971 and the other with the Federal Republic of Germany in 1973.

The agreements call for the establishment of the British Army Train-

ing Unit, Suffield (BATUS) at Canadian Forces Base (CFB) Suffield, Alberta, and the German Army Training Establishment Shilo (GATES) at CFB Shilo, Manitoba. Since the agreements were signed some 30,000 German and more than 60,000 British troops have trained in Canada.

#### BATUS

CFB Suffield is located in southeast Alberta about 150 miles southeast of Calgary; and 100 miles north of the border with Montana. The rolling terrain is almost treeless. Military units have been in the area since the Northwest Rebellion of 1885 through WW II. In 1941, the Canadian and British governments opened a joint experimental station for biological and chemical defense tests, but 5 years later the British ended their part of the agreement. In 1947, the

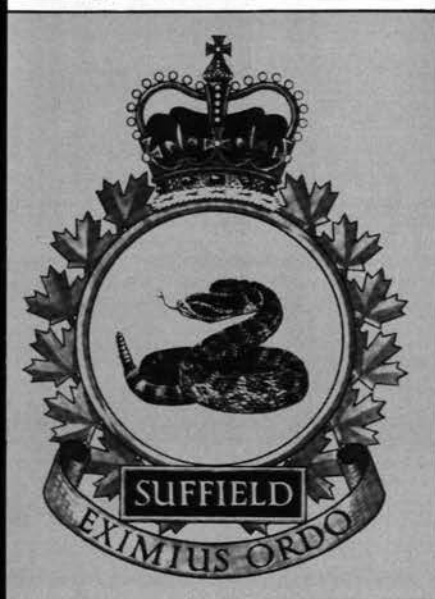
## Allied Armor Tra

by Major John  
Canadian Forces, a

1,039 square-mile range was taken over by the Defense Research Establishment Suffield. In 1971, the 10-year British/Canadian agreement was signed permitting the United Kingdom (UK) forces to use about three-quarters of the range for armor, artillery, and infantry training purposes. The site is currently administered by the Chief of Research and Development within the assistant Deputy Minister (Material) group of the Department of National Defense.

The first BATUS commander arrived at Suffield in mid-January 1971 and the equipment began arriving the next month. The first battle group to undergo training at BATUS





## Training in Canada

H. Heymans,  
and Mr. Michael Green

arrived that summer. BATUS was originally designed to support a battle group consisting of one tank squadron (U.S. company equivalent), one infantry company and an artillery battery. Two years later, the battle group was expanded to include two tank squadrons with 15 *Chieftain* tanks each, two infantry companies, a close recee troop, an additional artillery troop, an engineer troop, a long range antitank missile troop, and antiaircraft missile detachment, and a flight of reconnaissance helicopters. The augmented battle groups are comprised of more than 1,000 men and include 42 *Chieftains*, 60+APC's, 4 M109 SP Howitzers, 7 *Abbot* 105mm

Self Propelled Guns, 8 *Simitar*'s, 13 *Ferret*'s, and 100+ Soft Skinned Vehicles.

Seven battle groups train at Suffield between May and November each year. Each group remains for 1 month of intensive training that includes live-fire and maneuver exercises.

Each battle group's advance party arrives 2 days before the main body and signs for the vehicles and equipment to be used. When the main body arrives the vehicles are equipped and crews assigned. The group is then given the required orientations and briefings before commencing their training. These briefings cover such topics as highway safety (the British drive on the "wrong" side of the road at home), Canadian customs and "out of bounds" areas in the nearby town of Medicine Hat. This latter topic

always causes a flurry of note taking! Following the briefings, the group takes to the field for 2 weeks.

The first phase consists of 2 days and 1 night of branch-specific (armor, artillery, infantry) training. During this time each squadron and company commander has an opportunity to train his unit separately. It may be the unit's first time in the field for quite a while so they practice map reading, tactical driving, formations, battle drills and unit SOPs. Additionally, the entire battle group takes part in an afternoon of firepower demonstrations that includes all weapons. After this opening phase comes the first of three 1-day maintenance periods. Maintenance is vital, for all of the equipment receives heavy use in all kinds of weather. The BATUS permanent party is credited for their excellent maintenance efforts during

the 5-month "slack" period from December to April which ensures that the first battle group arriving in May can draw a full complement of operational vehicles and equipment.

Following the maintenance day, the battle group commander takes control, and for the next 3 or 4 days establishes and practices SOPs with a view to shaking down the battle group for the all-out operations that will follow.

This 10-day training period involves live firing and maneuvering in realistic defensive and offensive scenarios. Commanders at all levels are provided the opportunity to integrate and coordinate live tank, artillery, infantry small arms, and support weapons fire onto objectives represented by hard or remotely-controlled pop-up targets. Stringent safety measures are enforced at all times.

Long approach marches and night operations in all types of weather add to the overall training experience.

Two maintenance days are scheduled during this period. Daily resupply enables the battle group to practice logistical support, including ammunition resupply. During this period, crews can expect to fire up to a full basic load of a mixture of service and practice ammunition.

The BATUS staff meanwhile has been working as exercise controllers—watching, guiding and assessing the unit's effectiveness. They critique the unit after each phase of the operation during the 10-day period.

Upon their return to the base camp, the battle group is debriefed and extensive maintenance and equipment cleaning is undertaken before



A Royal Electrical & Mechanical Engineer (REME) FV434 mounting a HIAB crane waits in readiness to recover bogged or damaged vehicles at Suffield during the British Army Training exercises there.

the vehicles are handed over to the incoming battle group. This is also the first time that the troops have an opportunity to relax, take hot baths, clean their clothes and eat hot meals. But the pace is far from slow as all hands labor to complete the vehicle cleanup because a 4-day rest and recuperation period lies ahead. Group tours of Banff, Calgary, and Edmonton are laid on and a few troops manage to get as far afield as Vancouver, some 800 miles away. When the battle group departs, a few soldiers are selected to remain behind and take part in "Adventure Training" that includes canoeing and mountain climbing before rejoining their units in Europe.

British forces spend about \$17 mil-

lion annually for fuel and about \$24 million for ammunition which equates to about 2,000 tons of tank, artillery, mortar, and small arms ammunition for each battle group.

Under the agreement the Canadian government does not charge the British government a rental fee for using the training area, but neither can the British activities result in any expense to Canada.

Britain chose to train its troops in Canada because of the lack of large training and impact areas in the UK and Europe. At CFB Suffield the British Army has a training area equal in size to the country of Luxemburg, allowing the freedom to maneuver and conduct live-fire exercises that is unparalleled for the British Army anywhere else in the world.

Although BATUS enjoys neither the sophistication of a live "enemy" opposing force, the instrumentation nor the mechanical targets on the scale found at the U.S. Army's National Training Center at Fort Irwin, California, it does satisfy the needs of the British Army. The initial contract has been renewed for 10 more years.

#### GATES

Although the Canadian bison is nearly extinct it is a viable symbol of Canada and is perpetuated in bronze in many *Bundeswehr* messes in West Germany. There, the bronze statuettes stand as a symbol of unity and fraternity between the two nations.

CFB Shilo is located about 125 miles west of Winnipeg in the Province of Manitoba in central Canada about 50 miles north of North Dakota. It is the home of the Royal Canadian Artillery. The Federal Republic of



German panzer grenadiers and a field artilleryman discuss the live-fire exercise results at Shilo.



Germany concluded its agreement with the Canadian government for the use of extensive ranges and training areas for the same reasons as did the British government—lack of adequate space in Europe.

Lieutenant Colonel Hemming Brunner, a former commanding officer of a training battalion at GATES, said: "There is no possible way we could do this type of training in Germany.... It's extremely important to be able to exercise firing and maneuvering techniques at the same time. In Germany, only a platoon of three tanks abreast can be used for training and a German tank platoon consists of four tanks, 12 armored infantry vehicles, and an artillery battery all together."

There are some firing ranges available in Europe, notably Grafenwoehr, West Germany, that are shared by many NATO nations, including Canada, but scheduling is tight and training times are short.

Generally speaking, the German units use as much of the Shilo area as they require, although some portions are unsuitable for armor training. Shilo terrain is similar to that of northern Germany with open plains, small bluffs, light scrub and forested areas.

When the *Bundeswehr* received permission in the mid-1960s to winter test their *Leopard 1* main battle tank, they opened negotiations that led to a 10-year lease agreement that was signed in 1974. Negotiations are now underway for a 10-year extension of that lease.

The *Bundeswehr*, like the British Army, does not pay rental fees to use Shilo.

They do, however, pay for terrain damage, fire protection, road resurfacing, troop accommodations, the use of base facilities and a German school for the dependent children of their permanent party personnel.

The German-armored pop-up targets used for gunnery training emit smoke puffs to simulate enemy tank gunfire. The German government spends between \$3-5 million annually for food, fuel and support services at Shilo. To date they have poured about \$25 million into the Canadian economy as well. The permanent party and transient troops funnel another \$3 million into the local economy each year. Local stores stock German foods for the troops. The German soldiers buy large quantities of Canadian and Indian souvenirs to take home. "The impact of the Germans is felt commercially and is appreciated," said Ken Burgess, Mayor of Brandon, a



A German corporal stares intently into the distance as his *Leopard 1* negotiates the rolling prairie at Shilo.

nearby community. "They (the Germans) help keep Shilo viable and its impact on the community is much larger than many of us realize," he added.

The Shilo facility is also used by the Canadian Militia (Reserve Forces) forces who provide artillery support during the final battalion-size exercise, that is conducted in each training period called "Black Bear."

Armor and artillery units were the first sent to Shilo from Germany but after a few years it was decided that

armor and armored infantry units (*panzer grenadiere*) could better train as combined arms on the almost unlimited ranges, so the switch was made. Together these units engage in night exercises during the final week's training, but without live fire because of safety restrictions.

The Germans now maintain two *Leopard 1* battalions (30 tanks each), and one armored infantry battalion (25 *Marders*) along with 16 American *M113s*, three *Leopard*-chassis recovery vehicles, and 183 wheeled vehicles



A British Chieftan in company with an APC maneuvers on the limitless expanses of Suffield during a recent training exercise. The range affords the British Army its only unrestricted training area in the world.



for support. About 30 percent of the tracked vehicles are returned to West Germany annually for depot-level maintenance, or replacement.

The Germans use the Shilo facility from May through October for their training rotation but maintain a permanent party of 40 men who serve a 3-year tour of duty. This force is augmented by a rotating support force of 180 men who spend 9 months at Shilo and return to Germany for 3 months each year.

The *Bundeswehr* sends about 5,500 tank and armored infantrymen to Shilo in eight groups for the rugged 3-week course. More than half of the enlisted men are 15-month conscripts and their Shilo experience supplements their home training. Lieutenant Colonel Nikolaus Frankenstein, a commander of the Germans at Shilo, said, "It isn't very often (in Europe) that recruits in an armored unit have a chance to fire their heavy weapons. We are very grateful to the Canadian government and people for this opportunity."

The combat elements of a German armor brigade are airlifted from Cologne to Winnipeg in German Air Force transport planes and are then bused to Shilo.

Upon arrival, the troops take over their accommodations and their equipment. Following safety briefings they begin training immediately with zeroing and basic firing schedules.

On Monday and Tuesday of the first week they begin single-tank battle runs followed by two-tank battle runs. These exercises continue until Friday. A 1-day maintenance period is scheduled during this first week. This training schedule continues through the second week. The Germans use five ranges, all named for German cities: Aachen, Berlin, Cologne, Dielinghofen, and Essen.

At the end of the second week there is a weekend break in training and the troops go sightseeing. German families in Winnipeg take many of them into their homes and on local tours. Over the weekend, the permanent party pulls maintenance on the vehicles and readies them for the third and final week of training.

This week consists of combined arms battle runs from platoon to company-size units with live artillery support. Exercise "Black Bear," the final phase consists of a reinforced armored battalion firing live ammunition and runs for the final 3 days of the training session and a separate session is run each day.

The Canadian militia artillery units that support the Germans are also undergoing summer training at Shilo during this time.

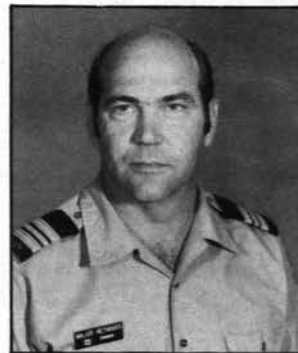
Following "Black Bear" the vehicles are once again brought up to operational readiness and turned over to the incoming unit.

It is at the formal conclusion of each unit's training period that the coveted bronze bison statuettes are presented to the departing unit by the German permanent party at Shilo. Some *Bundeswehr* units have five or six bisons to show for their visits to Canada.

The intensive training at both Suffield and Shilo have raised some questions in the minds of Canadian environmentalists as to the ecological damage done to the areas. Of great concern is the fire danger posed by the live-fire exercises. Because the range areas are restricted to training, no urban or farming development is damaged or disturbed by the military activities and the areas remain essentially "wild." Joint studies are, however, underway to determine the exact amount of damage done to the ecology during training and how that

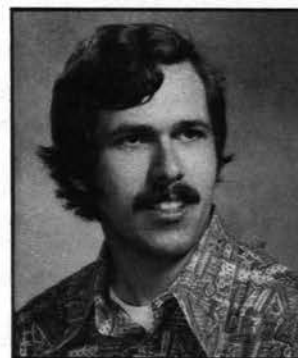
damage can be minimized. One result has been that tracked vehicles are restricted to well-defined tank trails, with cross-country traveling confined to the actual maneuver training area.

Both British and German troops appreciated the immense advantages they derive from their Canadian based training exercises.



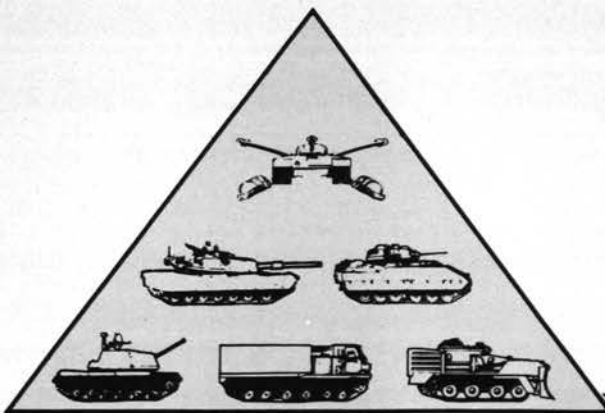
**MAJOR JOHN H. HEYMANS**

was commissioned into the 8th Canadian Hussars (Princess Louise's) in 1962 and served with his regiment and with the UN Force in Cyprus in 1966 and in 1974. Later, he served as a staff officer in Headquarters, Mobile Command and in Headquarters, Canadian Contingent, UN Middle East. He is a 1973 graduate of AOAC at Fort Knox and is a graduate of the Canadian Forces Staff College. He was an instructor at Canadian Combat Arms School and the Canadian Forces Staff School and has served as the Canadian Liaison Officer to the USAARMS since July 1981.



**MICHAEL R. GREEN** is a graduate of San Francisco State University and is a freelance writer and photographer, specializing in modern military technology. He has been published in *Western Prospector Magazine* and the Japanese military hobby magazine, *Tank Magazine*.





# Armor Conference '83

"Looking Ahead"

## Commander's Report

MG Fredric J. Brown, III, Commander, USAARMC

We are at an important time. In preparing for this Armor Conference, I reviewed the reports of past Armor Conferences. When we assembled in 1973, before the Mideast War, we were just starting to bring the TOW Cobra on line and had just begun full production of the M60A2. We were debating the product improvement of the M60A1, especially image intensification, and the Source Selection Evaluation Board was working on the M1. We were just about to begin a 12-week officer basic course and to institute the basic NCO course for our noncommissioned officers. We were about to convert the 45K turret mechanic, who had been trained to maintain all tank turret systems, to the 45N,P,R, who would be trained on specific systems. We were moving.

Today we have the momentum and are, in fact, accelerating. We have institutionalized a superb "hands-on—do-it" basic course for our young officers. And in the units that I have visited both before and since assuming this position, I have found that more often than not the platoon leader is the most competent individual in the platoon, which should cause us to reflect on what we're doing in our basic and advanced NCO courses. We have identified what we need to teach by task, condition and standard, and we are graduating technically competent platoon leaders who have occupied every position on the tank. That is an achievement of great significance. The application of our knowledge of training requirements at the Armor School, and even more crucially, the demonstration of our combat skills at the National Training Center to measure our proficiency is also a significant achievement.

The analytical process, from the scenario oriented recurring evaluation system (SCORES) to the mission area analysis (MAA) of the battlefield, and its evolutionary application to the Airland Battle, has given us a very real asset—an offensive orientation which we must exploit. The mobility, agility and survivability characteristics of the M1 enhance our ability to exploit our offensive capabilities. And I would suggest to you that we also need to think about the implication of simplified test equipment and Skill Performance Aid-Training Manual (SPA-TM). And I'll be the first to say that we here at the Armor Center have yet to develop how we can best exploit that capability. It is no longer a problem of attaining and developing a new capability—the capability is there, and our challenge is to determine how to get the most from it. Today, our momentum is accelerating.

What challenges do we face as we look ahead to tomorrow? For one thing, the momentum that we talk about here, as we move from the concept to reality, is unfortu-

nately equalled, if not in many cases exceeded, by the Russians.

We need to carefully consider the support that we can provide our rapidly improving force. It is hard to think of another army that is literally converting doctrine, organization and equipment simultaneously as our army is.

We have an obligation as we look ahead to address far more seriously the challenges that face the Reserve Component of the armor force. The most vital part of our armor force for the long term, the National Guard and Reserve training divisions, are the foundation for future mobilization.

The cost of sustaining proficiency is going up dramatically and one of the things that we all need to consider is the extent to which we have, not just a conceptual, but a practical parallel of tankcrew training to aircrew training. In other words, our concerns go beyond hours, dollars and gallons, to the very real problems of sustainment and transition training. It may be that what we currently associate with aircrew training, in terms of standardization programs, transition training, and flying hour programs, is virtually around the corner for the M1, M2 and M3.

Lastly, as we think ahead and plant the seeds of progress for our successors, we face an enormous and very stiff competition for resources for future systems development. But the plate is simply not as large as the menu. We need, therefore, to be very thoughtful as we project our systems requirements.

We've tried to lay out for you, in a series of White Papers for panel deliberations, a straw man—very, very much in draft—addressing the matters of developing, training and maintaining our force. In the future, we'll have one on manning our force, based upon our panel deliberations.

Several of the responses to these trends that I have described are laid out in these White Papers. One of our findings is the essential need for a unified Close Combat Vehicle program. A program that focuses not only on the future close combat vehicle (FCCV), or family of vehicles, but one that flows logically and progressively from what we have today through interim evolutionary capabilities into the future. And it must be a program that recognizes that if we fight today, we will do so primarily in M48A5s and M60A1s, and we need to use our best talents to make that the most capable force that we possibly can.

The challenge has been fairly given us by Lieutenant General Richardson to improve officer and NCO tactical and technical competence. A way to do it is laid out in the Training White Paper. The Paper is intended to be as applicable and appropriate for the Guard and Reserve

training divisions as it is for the Active Component. We need to look at that very closely in our deliberations.

I propose that one of the primary roles of the Armor School must be not just to train our officers and noncommissioned officers how to fight, but also *how to train to fight*, whether the training area is down on the west side of Hopkinsville, or on the postage stamp area outside Baumholder or Kitzingen. Our obligation to properly serve you is to train, educate and discipline our officers and noncommissioned officers to exacting standards so that you, as field commanders, can make whatever changes you deem necessary based upon your estimate of your situation and mission. But, we want you to receive an officer or noncommissioned officer who you know has been trained to a very specific and precise level of capability.

We need to take a very hard look at the interface between the crew and organizational maintenance responsibilities. I can tell you that little of the advances in maintaining our combat equipment, as shown in the support package for the *M1*, is being taught today at the Armor School. We have a fair challenge to teach these

capabilities.

Lastly, I wear my armor insignia with great pride. We have the green light to exploit the position of Chief of Armor to improve the readiness of our force. And I look to you, the commanders of both Active and Reserve units, to tell us how. We are listening very carefully to how you believe the Armor Center can better support you.

So that's the challenge of looking ahead and, hopefully, we're going to stimulate considerable discussion. We are going to listen carefully to your reaction to what we propose. Then, together with you, I foresee a year of testing, discussing, working and refining the issues. And, as appropriate, this time next year—it will be decision time.

I hope that from the panel reports tomorrow afternoon we will be able to go on to the next step of working in all those areas of concern with the various Active and Reserve units.

So that's where we are going. I am absolutely delighted with the diversity of thought that we have in the Armor Force today.

*Let's get with it!*



## Keynote Address

GEN William R. Richardson, Commander, TRADOC

General Starry, General Brown, fellow soldiers, ladies and gentlemen, as an infantryman and a long time advocate of the combined arms team, I come before you with great respect and admiration for tankers and cavalymen. The rich tradition of cavalry and armor in our army is admired by so many of us not born in your branch. You have carried your colors magnificently for 205 years. You and those who have preceded you are a great credit to our profession. I am proud to be associated with you.

Change is now coming so quickly in this decade that if we don't know how to respond to it, we will be accused by those who follow us of not taking the responsibility that is ours to make things happen the way we want them to. Let's face it, the American Army should not, better yet, will not be satisfied until it is in control of its destiny on the battlefield.

History is replete with stories of those who have initiated change and of those who reacted to it, or, put another way, those who seized the initiative and took charge to make things happen, and conversely those who have been seized by it and were left in the dust.

Perhaps nowhere is this more significant than in the annals of military history, and more to the point of this conference, in the history of armor and cavalry.

The introduction of the horse and chariot in the tenth century B.C. is usually cited as the origin of the cavalry. Although the first written report of cavalry in battle is from the Persians in the sixth century B.C., this use of horses in battle must have represented at least a small *Future Shock* to opposing armies who were not used to fighting against mounted opponents. Even then the cavalryman was already earning a reputation as an innovator—as a thinker ahead of his time and his contemporaries.

It was Alexander the Great who perfected cavalry tactics by realizing the synergistic effect of the proper cavalry/infantry mix. Alexander recognized the value of the combined arms team and used it to his advantage. He

*acted rather than reacted.*

Not only great men, but great battles can also be watersheds of change. Two particular ones highlight the impact of new technology and its crucial impact on the early cavalry.

The Battle of Crecy in 1346 changed the role of cavalry forever. The accuracy of the archers proved deadly and ended the reign of the heavy cavalry. After this battle the use of armor by both men and horses gradually shrank in size and importance. It was also during this battle that gunpowder weapons were used for the first time.

The second significant battle that I'll mention involved Napoleon at the Battle of Waterloo in June of 1815. It was another watershed in the history of cavalry, partly because of the failures of the French cavalry to break the British infantry squares, but also because the introduction of mass conscript armies by Napoleon meant that there was neither the time nor the resources to properly train the peasants as cavalymen. In this instance, it was a societal change that impacted on the French Army. The lesson for us is that it highlights the critical role that training must play in preparation for battle. To relegate it to other than the highest priority in peacetime or in a mobilized state is to court disaster.

With the dawning of the 20th Century came an even greater change for the military, for this brought the advent of the tank. Once again, after a slow start, some forward-looking leaders came to the fore to control their environment and use the tank to its advantage. The *panzer* leaders on the German side and the Pattons and Gaffeyes on the American side in WW II, followed by those Israeli commanders in 1967 and 1973, brought a new dimension to mobile warfare. They formed for us the opportunity to seize the initiative and fight for the sole purpose of winning a battle, rather than fighting to avert defeat.

Today we are witnessing and are a part of the awesome impact of change brought about by improvements in technology and modernized fighting machines. Truly we are in



a period of transition, modernizing our force by organizational changes; by the production of tanks, fighting vehicles, advanced attack helicopters, missile systems, and improved command and control means; and by the provision of new doctrine for fighting.

This period of transition in the 1980s is becoming another one of those historical crossroads, like Crecy and Waterloo. It is a time that demands men of vision, of skill, and with strength of character, who can get us ready for tomorrow's battle.

Today we need leaders who can figure out how to win when outnumbered. We need leaders who are willing to take calculated risks. We need leaders who are so expert at fighting that their own self-confidence breeds a similar impact throughout their units.

In August of last year, the army published FM 100-5. You and I, our allies, and even the Soviets know that manual as the army's keystone how-to-fight manual. It also carries the full message of the Airland Battle.

Now, in the minds of many, Airland Battle is synonymous with deep attack or the attack of the enemy's follow-on echelons. This is a misunderstanding and is due in large measure to our efforts to get commanders at all levels, especially those from division and up and the U.S. tactical air force, to understand that we must think of fighting the enemy where we can find him, not just in front of us at the forward line of troops (FLOT), but also 70-150 kilometers beyond, where he is preparing to generate the mass and momentum to reinforce his forward echelons engaging us at the FLOT.

It is true that we must delay the forward movement of the enemy's follow-on echelons by attriting his forces with missiles and aircraft so as to reduce his presentation rate at the FLOT, and to find the windows of opportunity for our forces to strike him with both fire and maneuver, and we need to know how to do that.

What I fear is that these efforts have overshadowed the vital and deadly battle at the FLOT and the critical and substantial threat to our rear areas. You must know that we have to fight all three.

We were very careful when we wrote FM 100-5 to make this point crystal clear. Here is what we said:

"The objective of all operations is to destroy the opposing force. At the foundation of the U.S. Army's operations are the principles of war and their application to classical and modern theories. The Army's basic operational concept is called Airland Battle Doctrine. This doctrine is based on securing or retaining the initiative and exercising it aggressively to defeat the enemy. Destruction of the opposing force is achieved by throwing the enemy off balance with powerful initial blows from unexpected directions and then following up rapidly to prevent his recovery."

Let me put it another way. With the 1976 version of FM 100-5, we fell into the trap of thinking too defensively. Unfortunately, many saw such defensive thinking as an excuse to delay the enemy. What they thought it meant was to draw back, pound the enemy with artillery and air strikes, and hope for the best.

Today we are saying that *maneuver* is the dynamic element of combat at every echelon, and firepower provides the destructive force essential to successful maneuver. We are trying to get across to students that Airland Battle means the spirit of the offensive. So in the 1980s, let's start using the words defeat and destroy. For that is what battle is all about. And if you don't want to play that game, you should never have joined up. We were trained to fight and win, and if we don't quickly learn how to do that with the tools at hand, we, the Army, will lose.

And so will the nation.

The Combat Arms Team will soon have a new player: Army Aviation. I want to see—and will give my full dedication to making it happen in TRADOC—that those cavalry and attack teams working with infantry and armor will be better than they ever were before. The enormous potential which army aviation can provide to the offensive spirit has yet to be fully developed. We are not going to just sit on our side of the FEBA and try to take out enemy tanks like a fire support element. We must indoctrinate our armor and cavalry-oriented aviators with the view that cross-FEBA operations will be the norm, and that we are simply not going to win if we don't exploit the capabilities of those fine helicopters we are building and figure out how to beat the enemy on *his* territory. That must be our reason for being, and army aviation with infantry and armor will help make that happen.

In TRADOC, we are putting a full effort behind our top two priorities: training today's Army to go to war and finish writing the doctrine, tactics, techniques and procedures that flow from FM 100-5. Here at the Armor School, General Rick Brown has also put training at the top of his list. One of the most important parts of his stewardship as the Chief of Armor is to train your leaders to acquire a feel for the tactics of the battlefield so that the U.S. Army will start breeding some of the finest tacticians we can possibly put in command of our units. Implicit in that—no, let me correct that—explicit in that is to inculcate in young officers a resolution to be superior on the battlefield, to be the truly skillful tacticians the army needs.

All of us must work toward building an army of excellence—an army whose true competence is measured by its junior and senior leaders. We cannot be content with mediocrity.

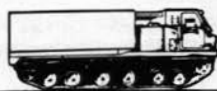
Young officers can only acquire tactical and technical competence by constantly training their units in battle tactics and tank gunnery. You must be compulsive about wanting to train your unit out in the field. You must have a great desire to take your platoon, company, or battalion to the field to practice, practice, and practice in how to move, shoot, and communicate. You can always find excuses for not going to the field and to put your troops in a classroom instead, but you won't get a feel for ground, for time and space, and for command and control in the classroom. You cut your teeth and gain your confidence out there where it's tough, cold, and dark; but it can be fun.

To see your tank-infantry team move successfully against a position is a marvelous experience. It will whet your appetite for more. And that's what is missing today—a yearning to train to perfection. It's always been my belief that good trainers are good tacticians, and good tacticians are good trainers; and, more importantly, if you are a good tactician, you are thinking offensively all the time.

At the National Training Center we built an OPFOR that is twice the strength of the friendly battalion task force. While the training for our CONUS heavy battalions has been a splendid experience, the friendlies have lost far more engagements than they have won. We simply must turn that around.

The leadership that the Armor School is developing today must unquestionably provide the purpose, direction, and motivation in combat. You can lead the way for the army in tomorrow's fight. You have the potential. You have the tools, all you need is the *will*. If you demonstrate it, the field of battle is yours.

General George S. Patton said it well: "Wars may be fought with weapons, but they are won by *men*. It is the spirit of the men who follow and of the *man* who leads that gains the victory."



## Lessons for Armor Leaders

GEN Donn A. Starry, Commander-in-Chief, USREDCOM

The world has turned over many times during my 40 years of service. Some sorting out of what changes and what doesn't change is important for us to remember.

I was commissioned in 1948. We had just finished a war that had changed the world. Inflation was thought to be under control. Unemployment was high. There were labor troubles in some industries and, in the heartland of Europe, Moscow was gathering its strength and seemed everywhere successful. Colonial empires were breaking up. Militarization was spreading in the Third World. North Korea was girding up to come south in a few years. It was a world of growing resource interdependencies. We had uncertainty about nuclear weapons and their role in future warfare. Where have you heard all that before? The world may have turned over many times in the past 35 years, but today's problems are strikingly similar, and in some cases extensions, to those that were around when I began my commissioned service. Not only are the larger problems likely to continue, but many other things are likely to remain the same.

Let me offer a few words that might be meaningful to you as you try to look ahead. In my 35 years as an officer, I have been in two outfits that were very good. The reasons they were good have formed the basis for what we've tried to do with the Army and armored forces in the last 5-10 years. One was a tank battalion in an infantry division in Germany back in 1949-1953. It was the 63rd Tank Battalion, and commanded by Lieutenant Colonel (later General) Creighton Abrams. Later, in the early 1960s, I was the executive officer and commander of a tank battalion in the 3rd Armored Division commanded by M. G. Abrams. Both battalions were made up of volunteers. The draft had stopped in 1947 and it was not started again until a year or so later. In 1961, the total strength of the 3rd Armored Division was composed of 93 percent volunteers, for reasons I have never understood; General Abrams, was very proud of that and used to talk about that alot.

Perhaps one reason we were so good was that we stayed together for long periods of time. When the Korean War started, everything was stabilized in the 63rd Tank Battalion and we settled down to business. The battalion had been created a year before from the cadre offerings of the regimental tank companies of our division. We cleaned house and 72 substandard men out of one company were sent home. When I left in 1953, there were still tank commanders and platoon sergeants who had been tank commanders and gunners when I had arrived. We were together in some cases more than 3 years.

General (then Lieutenant Colonel) Abrams had absolute standards in the 63rd Tank Battalion. They went like this: captains could sometimes turn in an acceptable performance; first lieutenants, never; second lieutenants were the dregs of the earth, and the NCOs could do no wrong. He graded everything against his own standards and they were so high that it was very tough to meet them.

He tested individual platoons on their training exercises. He could do that because he knew every job and every weapon and when he was finished you knew that you had been thoroughly examined. That was the battalion com-

mander's job as he saw it. We went over things again, and again, and again until we got them right. That taught us that we were not ever going to do anything right the first time. That's why we train.

We even had live-fire exercises, against each other! Of course, we only used our coaxes and painted the tips of our bullets to record hits. We shot off phone boxes, blew off some antennas, and chipped some vision blocks—but it was great sport! And we learned individual and organizational leadership lessons. The example was set by our leader. He was the first to do everything, and he expected everybody to be as good as he was.

Our unit had good organizational leadership because we had been together for so long. We never lied to one another. No matter what we discussed good or bad, the truth came out. We knew each other well, developed professional competence, became good soldiers, and had good outfits. We were committed to our units. There was no question that we were the best platoon, the best company, the best battalion in the regiment. Our battalion commander had the courage to do things that he had to do. For example, I remember an incident where we only had two platoons of operational tanks out of the battalion because we could not get spare parts. So, Lieutenant Colonel Abrams went down to Heidelberg, walked into the office of General Thomas T. Handy, the theater commander, and announced, "Sir, the only tank battalion in your theater is deadlined this morning." As a result, the depots provided the parts, and we were suddenly mobile again. It took guts to do that. I am sure that when he walked through that door he didn't know but what he might be thrown out through that door—or even out of the Army. But he had the courage to do it. He didn't write a letter or send a staff officer, he did it himself and confronted the boss with the problem.

Those were the lessons we learned from our experiences in that battalion.

In the other unit, the 32d (later 1-32d Armor) Tank Battalion that I was in during the early 1960s, we were stabilized for the Berlin crisis. The circumstances were quite similar to those a decade earlier. When I arrived, the 3d Armored Division had an enormous sports program going as directed by the corps headquarters but no worthwhile military training was being done. The new corps commander, LTG Frederic Brown stopped that at once and our new division commander Major General Abrams sent us a four-word message: "Get back to work!" That's what we did. We started with individual training and worked up to unit training. We wound up with a good outfit because the guys stayed together for so long, and because the lessons learned earlier in the 63d Tank Battalion still applied.

Someone once asked Colonel Abrams to compare the 63d tank battalion and the 37th Tank Battalion he commanded in WW II. He said, "I don't know really, because we can't take them both to battle. But, I'll tell you what—this outfit can do more things better than the 37th. The 37th trained for one mission and as the war went on, they got less and less good at that mission." Then he noted that it took much more ammunition to kill a tank towards the



end of the war as opposed to how much it took at the beginning. He said that it reflected our inability to train soldiers adequately in the training base, before they joined their unit and our inability, in units, to put people together in crews and train them as crews, teams, and platoons before we put them on the battlefield.

I said that some of the units I had been in were not as good as these two. Why? Because of the lack of personnel stability, the lack of experienced leadership, and insufficient individual and unit training to provide organizational leadership. Those are lessons you can all relate to. Why hasn't the army learned them better? General Abrams commentary on the 37th Tank Battalion highlighted the problem in World War II.

During the Korean War it was said that the American Army was as good as it was ever going to get by the summer of 1951. Why? Because of the 1-year rotation policy that had been put into effect. The Army couldn't get better because of the turbulence created by the combination of rotation, combat and non-combat losses. General Lawton Collins, Chief of Staff of the Army, testified to that before the House Armed Services Committee after Korea.

More recently it has been asserted that the American Army came apart toward the end of the Vietnam War because the ethic of the officer corps went to hell. That is not true. What really happened stemmed from the manner in which our troop strength was reduced. As we wound down, to the last few thousand we had the spectacle of officers standing up in the morning in front of soldiers whom they didn't know, and who didn't know them, or know one another—and they were supposed to get out and fight a battle that morning. They were not very successful! What happened had nothing to do with the ethic of the officers corps. The institution did that to itself—we did it to accommodate personnel managers.

Throughout this, I have tried to convince you that some things don't change much. But other things do change, and there has been a revolution in progress. If my conclusions about what makes the good units good, and the not-so-good units not so good are right, how do we apply those lessons to the future? We have been slow to apply these lessons in times gone by and even slower to understand the changing world to which those lessons apply.

Beginning in the 1950's, white collar workers outnumbered blue collar workers for the first time in history, computers were born; sputnik went up; mass circulation magazines began to die out; jet airplanes came on strong; the pill liberated some parts of the society. That era ended in the Berkeley riots and the death of John Kennedy. Those were all manifestations of change in many arenas—in the supply and demand of energy; production of goods; social structure including the family; in the corporate structures, and the management techniques within them; and the communications world began to explode. All these, and more, Alvin Toffler described in his book *The Third Wave*. In his latest book, *Previews and Premises*, he puts it all in

perspective. I don't know if I believe everything in *The Third Wave*, but after reading it the first time, we sat down and began to write that we now call "AirLand 2000."

In Toffler's words, we've got a second wave army. (*The Third Wave* describes the first wave civilization as the industrial society and a rapidly emerging Third Wave civilization). It is a mass consumption army; a mass conscript army; a "factory system" army. Some of you work in "tank factories" or in "airplane factories." The theory is that the "materiel factories" and the "people factories" do their thing independently and some place out there their products come together and go to war. How are they going to do that? We all know they can't, unless they have the competence, the cohesion, the individual and organizational leadership that I've alluded to as being the secret to good units.

Change will continue. We will continue to live in a world in which we find the Soviet menace growing. We'll see further militarization and modernization of conflict in the Third World. The nuclear dilemma will continue to be with us, in spades. The growing resource interdependency of the world foretells conflict along the areas where the interdependencies conflict. Now, how does this affect us? Well, whatever happens, however the world changes, the basic ingredients that make good outfits are likely to remain the same. We have to continue to search for ways to build and nurture those values of competence, commitment, courage, and candor; leadership—individual and organizational. We know they work. We must contrive some way to make them relevant to the United States' role in that Third Wave World. AirLand Battle is an attempt to do the Army's part of that. AirLand 2000 is an attempt to carry it through the next step.

Let me finish with a couple of quotes. One is from the Greek, Xenophon. He wrote, "There is a small risk that a leader will be regarded with contempt by those he leads, if whatever he may have to preach, he first shows himself best able to perform."

The second quote is from my friend Jimmy Morrison, taken from his review of *The Horse Soldier*. He wrote: "The cavalry... a combat arm which in the face of starvation budgets, and the unending hostility of its sister branches, established and maintained standards of professional excellence that are still unmatched... the cavalry... the story of once progressive leaders who eventually turned reactionary and condemned their branch to oblivion by attempting to defy change. The cavalry had been a way of life, transcending the bow-legged colonels and the hay-burners. It had uniquely personified the spirit of mounted warfare, a way of thinking, and fighting, which though born of the cavalry, was independent of the means of transport. Spirit was what counted."

It is that spirit—the leader spirit, the soldier spirit, the unit spirit that is the heart and soul of our profession; that will never change.



## Training Armor

For some time, the Armor Center has recognized the need to capitalize on the full potential of the wide-ranging system improvements throughout the Armor Force. This can be achieved by using a systems approach to training development. The primary features of this approach to

training are systematic analysis, close integration of related actions and programs, and field validation. These efforts have produced evolutionary changes in the following major aspects of training armor units to reach and sustain top performance.

Although the tank gunnery tables in FM 17-12 series have changed somewhat over the years as new tanks were fielded, the manuals and their tables have continued to confront gunners and crews with "shooting gallery" or "bowling alley" situations. The old tables teach gunners and crews how to fire gunnery tables—not how to fight and win on the modern battlefield. The existing tables and ranges were good when they first appeared, but they do not meet the needs of today's crew, in today's tanks, preparing for tomorrow's battle.

The Armor Center is completely reworking the FM 17-12 series tank gunnery manuals and tables. The first step involved analysis of current U.S. tank capabilities, our armor doctrine, and the Threat we face. The results of this analysis are 12 tables with engagement ranges, ammunition allowances, and times allowed for engagements that are related to demanding, but achievable, performance standards and current U.S. tank capabilities. Even the Threat's ability to acquire and hit U.S. tanks is considered as it relates to exposure times and movement of the firing tank.

The new gunnery tables exploit the array of newer training devices. The "table top" gunnery trainer, unit conduct-of-fire trainer (U-COFT), and full crew interaction simulator (FCIS) are integrated into the overall gunnery program. Current subcaliber devices will continue to be integrated when situations or ammunition limitations warrant.

Tables I thru XII in the draft FM 17-12 are structured progressively resulting in qualification firing for crews on Table VIII, sections on Table XI, and platoons on Table XII.

A similar process has been applied to upgrade tactical training. The tactical exercises in the new family of manuals will also be based on analysis, integration, and validation.

The proposed multipurpose range complex (MPRC) is designed to support training objectives in concert with the newer literature and training devices. The MPRC provides a diverse target array that challenges the crew, section, and platoon. It challenges them to demonstrate the capabilities of the tanks and their own gunnery and tactical proficiency. The result is training that is flexible, challenging, and effective. The MPRC is adaptable to full-caliber, sub-caliber, and simulation exercises. It accommodates combined arms exercises with tanks, fighting vehicles, attack helicopters, supporting fires, and U.S. Air Force close air support aircraft fighting as a team.

These gunnery and tactical proficiency programs are designed to be complementary and to help crews and units gain and maintain their full battlefield capabilities.

The door has been opened to tasks previously thought "untrainable" or "not feasible for training," and training remains within the constraints imposed by availability of fuel, ammunition, time, equipment life, training support, and safety considerations.

The Armor Center has worked closely with the Training

and Doctrine Command to develop the Army Training Evaluation Program (ARTEP) Mission Training Plan (MTP) to support platoons and company teams. The MTP provides leaders a tool to "adjust" and "operate" ARTEP training, including help on "how to" prepare for and conduct an ARTEP. The MTP accommodates combined arms force-on-force exercises against a Threat-oriented opposing force (OPFOR).

The MTP presents situational training exercises (STX) based on the following eight missions that are critical to all units, and have been tailored for armor platoons:

- Tactical road march
- Occupation of an assembly area
- Movement to contact
- Hasty attack
- Deliberate attack
- Hasty and deliberate defense
- Forward passage of lines
- Rearward passage of lines

The MTP supports the ARTEP, and both training documents compliment the gunnery and tactical training initiatives of the FM 17-12 series and supporting training devices.

Recent and upcoming improvements in this area affect the Basic and Advanced Noncommissioned Officer Courses (BNCOC and ANCOC) and the Master Gunner Program.

The BNCOCs for 19E, 19K and 19D soldiers are being upgraded to emphasize training in tank commander (TC) and scout squad leadership duties. All three courses will share the three key features.

- High training standards throughout, especially for TC and leader tasks.
- "Training the trainers to train" through teaching sessions in a unit setting.
- Letting young NCOs see and experience ways to make training effective in a collective setting using the STX.

The ANCOCs will also be upgraded and standardized. They will include advanced gunnery subjects, master gunner qualification, and a core of common subjects developed by the Sergeants Major Academy. Armor instruction in ANCOC will also include an STX related to platoon-level leadership.

The three Master Gunner Courses, (19E, 19K and the 2-week M60A3 transition) are working well. To keep them that way, their programs of instruction are undergoing detailed analysis. One of the objectives is to further standardize the instruction wherever possible. At the same time, the Armor School is researching ways to fill recently-perceived needs of soldiers who have already completed master gunner training. These needs include master gunner refresher training and better ways to field updated information.

Efforts at the Armor Center to train the force are integrating the factors that impact on training effectiveness. This integration, coupled with careful analysis and field validation, will have a profound effect on the whole character of training armor.

Proposals outlined here will be validated using the Fort Knox test agency and FORSCOM units.



## Developing Armor

The Directorate of Combat Developments at the Armor Center is responsible for the organization, operational concepts, and equipment in tank and reconnaissance units. Over 1,049 M1 Abrams have been produced, the

Bradleys are coming off the production line, and our cavalry fighting vehicles (CFVs) will go to Fort Hood for testing this fall. Improvements that will increase the Abram's fightability and survivability are being exam-



ined, and the *M1E1*, with its 120-mm gun, will be tested at Fort Hood later this year. Additionally:

- New rounds of ammunition are being examined to increase the tank's lethality.
- New NBC equipment is being pursued.
- Light, armor-defeating gun platforms are being analyzed.
- New trucks are being developed.
- Rapid refuel and resupply vehicles are being examined.
- New doctrine is being fleshed out.
- Mid- and far-term analysis of force needs are being proposed, and test bed developments are being organized.

We have begun the work to field close combat forces beyond the year 2000 by taking a total systems approach to modernizing the force. Equipment is becoming more complex and costly, soldier skills more difficult and support systems more varied and essential.

Global considerations and army missions are identified, the Threat estimate is made, and historical lessons are researched. Then, technological opportunities are combined with organizational and operational concepts and analyzed. The result is a list of force deficiencies pertaining to doctrinal, training, organizational or materiel functional areas. Ranking these deficiencies and associated corrective actions into priority lists, plus providing a strategy for implementation, results in the Close Combat (Heavy) Development Plan, which will be integrated with other plans by the Training and Doctrine Command into one master strategy document, the Battlefield Development Plan (BDP). This BDP is the army's force modernization blueprint.

The *M1* tank and the *M3* CFV chassis will be with us for a long time and budget realities dictate that corrections to tank and cavalry force deficiencies will have to be product improvements to existing equipment. However, we also need to offer incentives to develop the technology required by the future force. The Army Tank Program Analysis (previously called the Tank Fleet Analysis), which is being conducted at Fort Knox, will tell us how many and what type of tanks we need in our fleet. The Armor Center is examining options available in the mid-term through a Tank Armament Review Group follow-on analysis, and *M60* and *M1* product improvement programs will be pursued.

The Armor Center has devised a test bed program strategy that will encourage early developer and user cooperation in heavy force issues. Instead of *studying* developments to death, we want to examine real performance and capabilities. The Tank Test Bed, as part of this strategy, as based on an *M1* chassis, is designed to exploit automatic loader technology, and mounts an external 120-mm cannon. Another program, the Surrogate Research Vehicle, has as its primary purpose the analysis of target acquisition, man-machine relationships, and crew member size and positioning. An *M1* chassis and a specially designed turret will be used to examine crew sizes of 1 to 4 men, controls that permit firing from all positions except the driver's, the submarine type environment created with all crew members below the turret ring, and the requirement to view the outside environment through video displays. Testing will commence in July of this year.

In the future we will be fleshing out the Airland 2000 concept and developing the Future Close Combat Vehicle (FCCV) family. A common thread in both Airland Battle and Airland 2000, and certainly a key attribute of the defeat mechanisms of Airland 2000, is flexibility. We see ourselves fighting anywhere, in a brigade-sized force, in a decentralized fashion, with synchronous operations.

Therefore, if we design flexibility into our systems and organizations, while at the same time doing what is necessary to cause a less flexible opponent to fight in this environment, we accrue significant advantages. Our flexibility in combat should allow us to get inside the Soviets' combat decision loop and force him to react to us. We should be able to present the Soviet commander with both real and imagined contingencies beyond his ability to cope. We should capitalize on flexibility to compress the time available to him, and to permit us to regain or retain the initiative.

Furthermore, if we employ a family of Future Close Combat Vehicles that have similar signatures, whether real or projected, plus some other deceptive measures, we can limit the enemy's understanding of our intentions and seriously complicate his operational and tactical planning. He cannot tell what he is up against because, properly developed, all vehicles will look the same.

FCCV is really a family of vehicles with a common chassis capable of performing various functions. This single chassis may be either light or heavy, depending upon the amount of strap-on, variable armor it carries. The FCCV can be viewed as a mobile protected space which can be left as is, or fitted for specific battlefield functions. Weapon modules will provide a soft or a hard kill capability. A chassis configured for an assault could conceivably carry multiple means of attack, but would at least be capable of killing in two ways. All vehicles, regardless of their primary function, should have a soft kill capability. Command and control modules could include normal command and control as well as the means to manage subordinate robotic vehicles. Depending upon its function, a vehicle would have an appropriate command and control module placed in it.

Reconnaissance modules could include the capability to control unmanned aerial vehicles or to manage robotic vehicles. Automatic processing and reporting of intelligence, various sensor suites, or other capabilities would also be modular, with all vehicles possessing some minimum reconnaissance capability.

Indirect-fire vehicles might have arrays of fiberoptically guided missiles, self-guided top attack missiles or other indirect-fire weapons. All modules would be installed or removed at the lowest possible command level to enhance flexibility and "tailoring" for specific missions.

The FCCV family will also have common spectral signatures, regardless of module or function, to prevent the enemy from identifying or stressing any single system. Vehicles may carry a crew of zero to 10 or more men; a zero-man version would, of course, be robotic. The organizations of the Close Combat Force must permit redundancy and there must be redundancy within the vehicle itself to prevent the loss or absence of a crewman from seriously degrading individual vehicle effectiveness. The FCCV will have integral NBC protection and should be capable of operating for 72 hours without logistic support.

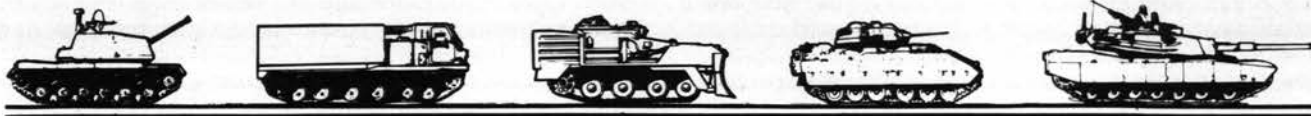
Robotics are important in our FCCV concept. We see robotic vehicles augmenting, or in some cases, replacing, manned systems on the future battlefield. Robotics also offer potential improvements in training and combat support for the heavy force, and the Armor Center is involved in several robotics programs.

Another element of our testing and development strategy is the Loading Research Vehicle, a new test bed system that will allow us to build our family of vehicles on test chassis and examine major system variables. We could examine the trade-offs that would permit a commander to rely on the speed and strategic mobility of light armor, or allow him to opt for a heavy blanket of armor protection.

The results of this program will be the development of a future vehicle family, its supporting systems, and flexible organizations that optimize our ability to execute and exploit the intentions of the Airland 2000 concept.

We're developing a strategy that will permit us to pro-

duct improve the near-term fleet of armor vehicles, and transition the force through the mid-term in preparation for the far-term. There are many issues presently confronting us and we invite your comments and suggestions in meeting them.



## Armor Manning Issues

The following is a summary of the results of the panel discussion concerning the manning of the Armor Force.

The first issue addressed by the panel was how to enhance the technical and tactical qualifications of Armor officers. After several alternatives were discussed, the panel recommended that additional specialty designation not take place until after attendance at CAS<sup>3</sup>, and that officers desiring to remain competitive for lieutenant colonel and colonel command positions should strive for repetitive troop duty in order to remain technically and tactically proficient. The panel concluded that the current selection system placed the best people in command.

The issue of branch qualification of armor officers is at present a rather vague concept, especially at grades above captain. The concept for branch qualification would include consideration of assignment experience as well as military education. A precise definition of qualification for each grade would have to be developed. The determination of qualified, or not qualified would be provided to selection boards. The Armor Center will recommend a change to DA Pamphlet 600-3 that clearly defines armor branch qualification at each grade level.

The issue of armor officer requalification training stems from the requirement for officers to maintain armor expertise in the technical and tactical arenas. To requalify these officers, a system specific course at Fort Knox is being developed that will include hands-on training in gunnery and maintenance as well as the latest developments in the doctrinal arena. All SC12 majors and senior captains will attend the course prior to reassignment to a TOE unit. The panel recommended implementation of this program.

The panel noted that success on the battlefield will be determined in part by the quality of the soldiers that are enlisted and retained in the armor force. Projections of the armor personnel strengths based on current enlistments show that there will be a high percentage of mental category IV soldiers at skill level 3. The Army Research Institute is currently conducting a study to determine the trainability of a soldier, linked to high school graduate versus non-high school graduate, in each mental category. Historically, the high school graduate is found to be twice as successful in the completion of his first term enlistment as the non-high school graduate. Furthermore, the decision-making ability of tank commanders (TC) in the mental category I through IIIA is considered to be significantly higher than that of the TCs in the lower mental categories. The Armor Center has requested that the NTC provide data to support the Armor Force's desire to enlist only mental category I-III A soldiers. The Armor Center has provided input to the U.S. Army Recruiting Command (USAREC), the Training and Doctrine Command (TRADOC) and the Selective Service stating that we do not want to access any more category IVs than will be attrited by the end of their first term enlistment.

The next enlisted personnel issue discussed concerned

the requirement for policy decisions to increase turn-around-time (TAT) for armor soldiers, especially at grades E5 and E6. Short TAT had an especially adverse impact on Forces Command TOE units and TRADOC TDA organizations. In order to reduce the effects of short TAT, additional stabilization requests have been generated. Currently, there is no method available to measure the effects of increased stabilization.

The panel recommended adoption of a policy to limit assignments in TDA positions to one normal tour at grades E5 and E6, thus precluding back-to-back non-MOS or special duty tours. The panel felt it is essential that NCOs remain in tactical units as much as possible in order to enhance development of MOS-related skills. In addition, the panel recommended that the major commands be solicited to support reduction of the number of stabilized positions. In order to reduce the significant impact of recruiter duty on CMF 19, the panel recommended that qualified, knowledgeable and motivated retirees be used to fill those duty positions. Finally, the panel recommended that selection boards should give more consideration for advancement to those individuals returning promptly to TO&E units from assignments in career-enhancing TDA assignments.

The Armor Center currently conducts requalification training for NCOs returning to TOE positions from USAREC duties. At issue is whether this training should be expanded to include all NCOs returning from TDA assignments; e.g., drill sergeants, instructors, etc., and the panel strongly supported the concept of expanding this program to include all NCOs returning from TDA assignments. The panel recommended that Directorate of Training Developments (DTD) establish a package to be used in resident and exportable programs. The concept entails requalification of tank commanders, either TDY enroute, or within 90-days of assignment to the TOE unit. Should tank commanders fail to recertify then they would be candidates for reclassification or elimination.

The recommendation for the Reserve Components (RC) was the establishment of an interim resident course at Fort Knox for the RC training divisions pending receipt of the *M60A3/M1* at their home station. Following receipt of the new equipment, home station training and testing would be conducted. In addition, the training divisions could conduct requalification training for the RC tank commanders during the annual two week active duty training.

Presently, there is no enlisted career progression model that provides guidance to soldiers on the proper management of their careers. The panel accepted the need for an enlisted career development pattern. The basic concept was modified to eliminate the recruiter or drill sergeant opportunity at the E5 level. In addition, attendance at the primary noncommissioned officers course will be scheduled beyond the first enlistment to reduce the waste of



training assets. The panel recommended the development of a separate career pattern for the RC.

In considering the issue of incentives for duty as a master gunner, the panel made the following observations.

The master gunner has been recognized as an individual asset to the armor force; however, there is little perceived incentive for an individual to become a master gunner. The average life cycle of a master gunner is about 5 years due to separation, promotion, and frustration resulting from misuse and overload from handling platoon sergeant duties in addition to company master gunner duties. Nevertheless, the panel overwhelmingly opposed providing any incentives for master gunners, but supported upgrading the battalion master gunner authorization to E8. In addition, the panel recommended that the headquarters tank section leader be upgraded to E7, but did not want that position to be coded as the company master gunner. The panel vehemently opposed adoption of a mas-

ter gunner badge or providing the master gunner with any monetary incentive. The panel supported development of a job description for battalion-level and above master gunners but recommended that the job description for company master gunners remain as platoon sergeant. The panel recommended adding master gunner subjects to ANCOC and selecting the top 10 percent of ANCOC graduates to attend the full Master Gunner Course.

The Armor Center and the Department of the Army are continuing to study providing incentives to master gunners. The Master Gunner Course is extremely resource intensive; therefore, means must be developed to retain the valuable asset that is the result. USAARMC will seek to reduce the high in-course attrition rate. In addition, the concept of adding master gunner subjects to the ANCOC POI will be thoroughly evaluated. Action is on-going to upgrade the headquarters tank section leader and battalion-level master gunner authorizations.



## Maintaining Armor

The Maintenance Department is deeply involved in force modernization initiatives. Military Occupational Specialty (MOS) 45E and 63E courses have recently been revised; *M1* training has been integrated into the Advanced NCO (ANCOC), Armor Officer Basic (AOB) and Pre-Command (PCC) courses; training on the *Bradley* Fighting Vehicle System (BFVS) has been integrated into the MOS 63T and 45T courses; and aviation maintenance training is being provided to aviators attending the Armor Officer Advanced Course (AOAC). Training on the *M1* and BFVS will soon be integrated into the AOAC and JOPMC and the baseline vehicle for the MOS 45N course will become the *M60A3* in January 1984. Additionally, changes to the Army's Maintenance Management System have been coupled with these modernization initiatives. Interim changes 1, 2, and 3 to TM 38-750 have formalized most of the Supply Maintenance Assessment and Review Team (SMART) messages and these have subsequently been incorporated into the maintenance management instruction presented by the Maintenance Department.

Division 86 doctrine for the *M1* tank battalion consolidates all maintenance assets in a maintenance platoon at battalion level. Armor doctrine prescribes dedicated company maintenance team support to a maneuver company, with each team being habitually associated with the same company. This doctrine, however, is not being consistently practiced in the field. Feedback indicates that the following methods, and perhaps others, are being used. The company maintenance teams are:

- Attached to the maneuver company.
- Placed under operational control of the same company on a habitual basis.
- Placed under operational control of a company, not necessarily the same one.
- Consolidated at battalion level by function.

The successful employment of the forward support doctrine requires soldiers in the company maintenance teams and the maneuver companies to fully understand the mission, capabilities, and limitations of each other. It

- Places increased emphasis on recovery.
- Is contingent on battle damage assessment and repair expertise.
- Requires disciplined performance of preventive main-

tenance checks and services at the operator, as well as organizational maintenance levels.

- Requires an accurate, and available, combat prescribed load list (PLL).
- Relies heavily on the technical competence of the maneuver company (fighters) and the company maintenance team (fixers) personnel.

These doctrinal changes are being assessed to determine what changes should be made to resident and field training programs. Clearly, though, maintenance discipline and the technical competence of the fighters and fixers must be enhanced. The skills performance aids (SPA) format of technical manuals and the highly proceduralized nature of test equipment being issued in support of *M1* and *M3* vehicles are assets that can be focused on *now* to ensure that maintenance is consistently structured and performed with precision. The SPA and Simplified Test Equipment-M1/FVS represent breakthroughs that must be fully used.

Peacetime and wartime maintenance must be brought closer together. The training that soldiers receive in service schools should duplicate the way units function in the field and in combat. This will require:

- Clarification of, or changes to, armor doctrine pertaining to employment of company maintenance teams.
- Battle damage assessment and repair training in resident courses followed by practice of these techniques in the field.
- Development of load plans for the company maintenance team.
- Enhanced recovery training, including garrison, day, night, and combat recovery using smoke and other obscurants.
- Enhancement of the Army's ability to predict repair part needs during combat.
- Mission-essential maintenance operations to ensure minimum combat serviceability criteria are not jeopardized.
- Assessment of maintenance authorization criteria to ensure that doctrine, organization, and peacetime and wartime maintenance requirements are fully considered to ensure that tables of organization and equipment are developed that will enable the Armored Force to fight in the

Close Combat Heavy environment.

Currently the Maintenance Department presents instruction and hands-on training in operator and organizational maintenance of tracked and wheeled vehicles, vehicle recovery, driving, and maintenance management to students attending the AOB, AOAC, PCC, ANCOC, and Master Gunner and Senior Officer Preventive Logistics courses. The Maintenance Department also conducts eight Career Management Field (CMF) 63 Advanced Individual Training Courses, which graduate skill level 1 apprentice mechanics. Training is conducted for Military Occupational Specialties 63E, *M1* automotive mechanic; 63N, *M60* automotive mechanic; 63T, Improved TOW and *Bradley* Fighting Vehicle (ITV/BFV) Automotive Mechanic; 63D, self-propelled field artillery automotive mechanic; 63Y, tracked vehicle automotive mechanic; 45E, *M1* turret mechanic, 45N, *M60* turret mechanic, and 45T, ITV/BFV turret mechanic.

The Armor School, and the Ordnance Center and School are involved in a joint initiative that will result in the transfer of several CMF 63 skill level two and three courses from Aberdeen Proving Grounds to Fort Knox. Priority is being given to the *M1* courses followed by the *M60* course. This training will ease the interaction between the fighters and fixers and will promote viable units in the field.

Other initiatives being pursued include:

- Development, validation, and ultimate export of certi-

fication for mechanics, PLL clerks and battalion motor officers.

- Development and export of load plans for company maintenance teams.

- Review of the army's battle damage repair program now being developed by the Army Materiel System Analysis Activity to determine the impact on resident training programs.

- Publication of two technical manuals, one for the *M1* and the other a general TM covering field expedient repair methods applicable to combat, tactical, and support vehicles, that should be available in September 1983.

- Enhancement of maintenance training for NCO's and officers to increase their technical competence will include hands-on training on the actual equipment to be complemented by training in forward support doctrine, maintenance management, recovery, supervision and quality control of maintenance.

- Development and validation of situational training exercises for maintenance/logistics.

- Increased communication with the field.

A draft white paper that addresses organizational maintenance, and discusses the above issues and initiatives, was distributed during the conference. The Maintenance White Paper will be used as a reference document for completion of current initiatives, as a guide for future actions, and as vehicle for communication with the field.



## Closing Remarks

**MG Frederic J. Brown, III, Commander, USAARMC**

I want to report to you today about my plans as I address the "hats" that have been vested in the position of the Commanding General, Fort Knox. I should begin by saying that I was extraordinarily fortunate in coming back to Fort Knox, to an operation that's been exceedingly well done over the years. It's a solid operation involving some very competent people—military and civilian.

I am, also, tremendously respectful of the accumulated expertise that we have been able to bring together for this Conference. I'm acutely aware of the contributions that have been made to the evolution of our army by some great professionals here present. I make the same comment with respect to members of industry who are here. I think you hold a very important relationship with us. We must be a team working together to produce the best Armor Force possible for the resources expended.

We've talked about some difficult issues during this conference. If I've posed the questions right in the White Papers, you should be at the stage of having your feet up on the table and thinking. I look forward to your responses in the weeks and months to come.

First, let me doff my hat as Commanding General, Fort Knox. This is a large TRADOC post with a very sizable dollar inventory and all of the challenges of running a major installation. So, it keeps us well occupied and it is important to our force. We all want a competent branch "home" of which we can be proud. But, I want to put that hat aside for the moment.

As commandant of the Armor School, as the Chief of Armor, and as the proponent of Close Combat, Heavy (CCH), I really look at the combat army through 3 different lenses.

From my Commandant's hat, I hope you have sensed new directions from Knox: in terms of honing the Armor School to be an institution that is training well not only discipline, standards, and how to fight, but *how to train to fight*. We have laid out a way, most certainly not *the way*. That is a fundamental responsibility of the chain of command.

A second point that is vital from the standpoint of the school is the necessity to improve the war fighting capability of our force today. During the conference, I have sensed the concern of our Reserve Components (RC), particularly National Guard commanders with *M48A5s* and *M60A1s*, about the training of their personnel. As Commandant, I assure you that I fully acknowledge and accept the responsibilities to support you in your day to day responsibilities to be prepared as a wartime commander. It is obvious that we need to figure out a better way to continue doing so at the school.

Let me talk for a minute about my Chief of Armor hat. I think that I owe it to the field commanders to do all that can be done from Fort Knox to support the creation and sustainment of viable organizations in the field. I'm not really sure as to how we can most responsively execute that responsibility. By virtue of the functional reviews in the personnel system, I have become increasingly involved in the personnel policies and space for officers and non-commissioned officers. I have deliberately stayed out of assignment of *faces* because I simply do not have a data base on which I can, with good conscience, recommend the assignment of our officers and NCOs. But, in terms of a fundamental concern about *policies* to ensure that we have adequate grounding of our officers and NCOs in the



intricacies of fighting our combat arm, I am deeply concerned.

I must tell you that after successful *M1* fielding, the next most serious problem that I can see is the *M60A1* and the *M48A5* battalions (largely Reserve Component). My concern is: Are we doing all that we need to do to provide viable tank battalions and cavalry squadrons in support of our wartime mission? I think it highly likely that in time, the personnel functional review will be expanded into an organization functional review to work that problem out.

As Chief of Armor, I deeply appreciate the support from General Cowles and the Armor Association in giving us the mandate to look *together* on how we can support the regimental system.

Now, as the proponent for Close Combat Heavy (CCH) I'm concerned about the adequacy of our support to the *M1*, *M2*, *M3*, and *AHH* individually and in combination; about the advice that I wish we could be able to give in terms of the best combinations. I think that I need to be watching, honing, advising, providing anything that I can to support unit commanders in the fielding of this absolutely vital CCH capability. And I might say that I'm equally conscious that we need to do precisely the same in the inactive duty training and active duty training environment for the *M48A5* working with the *M113*, because that is the majority of the force that we are going to be fighting with for the immediate future.

A second CCH area is laid out in the exploratory work on future close combat vehicles. It has manifested itself in a search to drive technology to give us flexibility and innovation. The initiative of the American of all grades is something that can never be equalled by the Russians. The moment they allow that, they will have lost their control over their system. So, to the extent to which we can capitalize on that innovative capability, we will possess an advantage that can be exploited. And, as we think through that technology and its application to the Airland Battle, I think there is much that we ought to be looking for and moving into, as the arm of mounted combat.

Next, I have been told that we at Knox will be assuming proponentcy for the heavy brigade. It's going to be challenging. I think, however, as we discuss the Airland Battle and, particularly, the deep battle, there is a great deal of work that needs to be done.

As you know, the decision has been made to establish an Aviation Branch at Fort Rucker. The consolidation of Aviation at one place, with unity of command and focus of effort, is an absolutely necessary step. We are fully supporting this consolidation.

Now, I must also tell you that I'm doing everything that I can to bring *attack* aviation aircraft to Fort Knox! The

reason goes back to proponentcy of CCH. The attack helicopter is an *integral* part of the combined arms team. And, given the criticality of the employment of attack aviation with the heavy combined arms team, I want an attack capability here for instruction and CCH doctrinal work. Also for this reason I am working to develop the capability for, and the case to establish, a CCH Precommand Course at Fort Knox.

I must add here that the proponentcy for Close Combat *Light* (CCL) will go to Fort Benning, and we will do all that we can to support Benning as it evolves CCL.

I have raised my concerns about the support of CCH fighting ability with the Ordnance School. What I'm saying is that within the battalion environment it is very hard to split organization and unit maintenance. Each must be done better separately, and in combination. We are working that out smoothly due in large measure to the positive support of Jack Rozier, Commanding General of the Ordnance Center at Aberdeen, Maryland.

As for Health Services Command, I have yet to open the offensive on that front. But I just know that 91 Bravos (Aidmen) in a tank company need to get more information about Halon, burn injuries and similar armored vehicle type injuries.

I am also about to get into a discussion with the Chemical Corps. We've got some very tough problems in the nuclear, biological, and chemical (NCB) areas; among them are vehicle decontamination and NBC reporting.

Finally, when everything else is said and done, our greatest strength is *us*—the officers, the noncommissioned officers and the individual soldiers who make up our great branch. And here, as I did recently with the Chief of Infantry and the Chief of Artillery, we have to sit down together and look at the personnel question. The fundamental purpose of an army is to *fight*, and the personnel system has got to be supportive of the *fighting* army.

In sum, I think this is an exciting time. I sense that we are, in fact, moving attuned with, and hopefully, in advance of, that which we need to be doing for our mounted arm. I can assure you that the lines of communication are open. If anything, it is going to be the suction of a slight vacuum because we're looking to get from you *ideas* as to how we can better support you. The greatest help that I can offer to all of us is to be the nerve center, the message center, and to dedicate the necessary resources to programs to improve our ability to fight. And I pledge to you that sort of dedicated, outward-looking effort from Fort Knox.

We are delighted that so many of you could come back to the Home of Armor for this conference. You have helped us these past several days. We solicit your cooperation and comments in the future. Thank you.

### General Officers Attending Armor Conference

#### Manning Armor

LTG Walter F. Ulmer, Jr.  
BG James L. Dozier  
BG Ronald W. Zeltman  
BG Roy C. Gray

#### Maintaining Armor

MG John R. Galvin  
MG Dale A. Vesser  
BG Thomas W. Kelly  
MG George S. Patton (Ret.)

#### Developing Armor

MG John W. Woodmansee, Jr.  
MG Duard D. Ball

BG Robert J. Sunell  
LTG William R. Desobry (Ret.)  
LTG Robert J. Baer (Ret.)

#### Training Armor

LTG Julius W. Becton, Jr.  
MG Neal Creighton  
BG Robert E. Wagner  
BG John M. Kirk  
BG John W. Foss  
BG Thomas F. Cole  
BG Edwin S. Leland, Jr.  
BG Douglas S. Smith  
MG Robert C. Forman  
MG Lewis Stephens

MG Zack C. Saufley  
MG Robert Erffmeyer  
MG Wilbur J. Bunting

#### Others Attending

LTG Donald H. Cowles (Ret.)  
LTG David E. Grange, Jr.  
LTG William J. Livsey  
LTG Jack N. Merritt  
MG Melvin J. Crain  
MG John S. Crosby  
MG Kenneth E. Dohleman  
MG James N. Ellis  
MG Francis R. Gerrard  
MG James J. Lindsay

MG James P. Maloney  
MG Carl H. McNair, Jr.  
MG Stephen E. Nichols  
MG Lawrence Schlanser (Ret.)  
MG Willie L. Scott  
MG James C. Smith (Ret.)  
MG Carl E. Vuono  
MG Billy G. Wellman  
BG William H. Harrison  
BG James F. Ingram  
BG William A. Jackson  
BG Robert D. James  
BG Kenneth C. Leuer  
BG Kenneth L. Reith  
BG William C. Roll



## Economy of Force—the Cavalry Connection

by Major Thomas A. Dials

As the army reorganizes under the Army 86 concept, the divisional armored cavalry squadron will lose its tanks and become a light reconnaissance unit. The reduction of combat power in this critical unit will have far-reaching implications for the heavy division. The absence of a credible economy-of-force unit in the division may well be the fundamental flaw in the Army 86 heavy division. This article addresses the critical relationship of economy forces to the principle of mass and the capability of the Army 86 heavy division to wage decisive combat. The elimination of the main battle tank from the divisional cavalry organization so reduces the effectiveness of the squadron that its defensive capability against Warsaw Pact armored units is questionable. This article proposes some alternative organizations that will increase available combat power and overall unit effectiveness.

"I have travelled a heap of late, and had occasion to retire into some very sequestered regions, but nary hill or holler, nary mountain gorge or inaccessible ravine, have I found but what the cavalry had been there, and 'just left.' And that is the reason they can't be whipped, for they have always 'just left,' and took a horse or two with 'em."<sup>1</sup>

Bill Arp, Confederate humorist

The organization and functions of cavalry have long been subjects of doctrinal debate. It would seem a safe observation that the last time there was general agreement, the source of the cavalry's mobility was fueled with oats rather than diesel fuel. We have organized cavalry with gun jeeps and armored cars, light tanks and armored cars, specialized scout vehicles and standard personnel carriers, varying combinations of light and medium tanks and assault vehicles, mortar squads, infantry squads—the permutations are almost endless. With all our experience, we haven't gotten it right yet: reconnaissance troops, tank troops, combined arms platoons, H-Series, J-Series, 3×5 platoons, conceptual cavalry platoons, and scout platoons. Where are we going, and where will it end?

To organize cavalry units, one must first define what it is that cavalry does. The task then becomes to structure the force to accomplish its mission. This two-step process is not as straightforward as it would seem; cavalry units (troop and platoon) have been reorganized no fewer than four times (including the impending Army 86 reorganization) since 1970. Either the armor community has improperly defined the role of cavalry, or it has been unable to determine the proper force structure to execute the functions of cavalry.



Over a century ago, Prince Kraft zu Hohenlohe-Ingelfingen, a division commander in the Franco-Prussian War, described six basic functions of cavalry.<sup>2</sup>

- To "lay down the law to the enemy." To fight the main battle only at the time and place of our choosing.
- To harass and raid the enemy main force.
- To produce shock action at the decisive point of the battle.
- To perform vigorous, relentless pursuit.
- To perform reconnaissance and security, thereby freeing the main body for close combat.
- To conduct rear guard operations.

Today, the function of shock action has been largely assumed by modern tank battalions employed in a manner similar to that of Napoleonic heavy cavalry. The other functions remain cavalry roles.

Cavalry forces find the enemy and gain and maintain contact with his main force, and (through the aggressive application of combat power) harass, deceive and delay him so that the battle may be joined under circumstances most favorable to us. Cavalry is an economy force; its proper employment is the catalyst that produces mass. The cavalry connection is the interdependency of economy-of-force and mass, the essence of decisive combat.

### The Role of Cavalry

Two years ago *ARMOR* published a general overview of the Army 86 heavy (armor and mechanized) divisions.<sup>3</sup> That article included a first glimpse of the division's light cavalry squadron. Several amplifying publications have since been fielded by Training and Doctrine Command (TRADOC), including a coordinating draft of a new FM 17-95 *Cavalry*, which details the employment of the light squadron. Like Bill Arp, I too have travelled a "heap" of late and have found support for the light squadron to be almost nonexistent among my contemporary armor officers. In my opinion, a consensus exists that there are fundamental flaws in the organization and doctrinal concept of the light cavalry squadron.

Almost 10 years ago, General (then Major General) Donn A. Starry asked some very basic questions about cavalry.

- What is cavalry?
- What does it do?
- Why do we have it?

The Cavalry Scout Ad-Hoc Committee (CSAC) was formed at the Armor Center to address these issues. For 18 months the committee labored, and produced a superbly-documented study defining the doctrine of cavalry combat. Not surprisingly, the study concluded that cavalry performs two basic functions: reconnaissance and security. Cavalry "finds the enemy with the least force possible" and provides security with "a force tailored to leave the largest residual of combat power in the main body." General Starry concluded that cavalry "should be a force uniquely tailored to satisfy the definition of economy-of-force . . . Cavalry is an 'economy-of-force' force".<sup>4</sup>

Reorganization of the divisional armored cavalry squadron into the "tankless" light cavalry squadron under Division 86 stems principally from the following: "The heavy division [will], as a rule, operate as part of the heavy corps, and the corps [possesses] an armored cavalry regiment that, in its Corps 86 design [has] considerably more combat power than [has] the current regiment. With this additional combat power in the corps regiment, the divisional cavalry squadron [will] no longer be called upon so frequently for economy-of-force missions".<sup>5</sup>

If one defines cavalry as an 'economy-of-force' force, then the above statement presents the doctrinal commun-

ity with something of a paradox—at least in the case of the divisional squadron. If we are not to call on the division's organic "economy-of-force" force to perform economy-of-force missions, then we are back to General Starry's questions of 10 years ago. Cavalry is an economy force; it must be organized and employed as such. The unstated question is, perhaps, whether there is a requirement for cavalry in the heavy division.

### The Tactics of Deception

The Shenandoah Valley Campaign of Confederate Major General T. J. "Stonewall" Jackson (spring 1862) is perhaps history's most classic example of economy-of-force. The Valley Army never fielded more than 17,000 men and fought most of its major engagements with detachments of one-third that strength, or less, against an enemy force that outnumbered it by as much as five to one. Yet, Jackson's victory in this "sideshow" campaign was so pivotal that it altered the entire course of the Civil War.

On 25 May 1862 Jackson's Valley Army routed a Union force under Major General Nathaniel Banks at Winchester (figure 1). Reports of Banks' collapse caused considerable alarm within the Federal government. Alarm heightened to hysteria on 26 May with the receipt of dispatches from Brigadier General John Geary (commanding Union forces in the Manassas Gap), indicating a general advance on Washington by Jackson, including "as many as 10,000 rebel cavalry . . . Two or three hundred half-armed southern cavalry were responsible for this force. . . It was this motley handful that Geary multiplied into the rebel hordes that haunted [Secretary of War] Stanton".<sup>6</sup>

By defeating Banks at Winchester, Jackson precipitated McDowell's withdrawal from the approaches to Richmond in order to pursue the Valley Army. As a result, McClellan's forces were isolated on the Peninsula, and Lee and Johnston were able to concentrate their efforts successfully against this threat to the Confederate capital. Jackson's campaign bought the Confederacy time to reorganize and counterattack McClellan's stalled forces, ending the Peninsula Campaign and, in affect, prolonging the war for three more years.<sup>7</sup>

Deception, both intentional and unintentional, was the key to success in the campaign. There were no elaborate

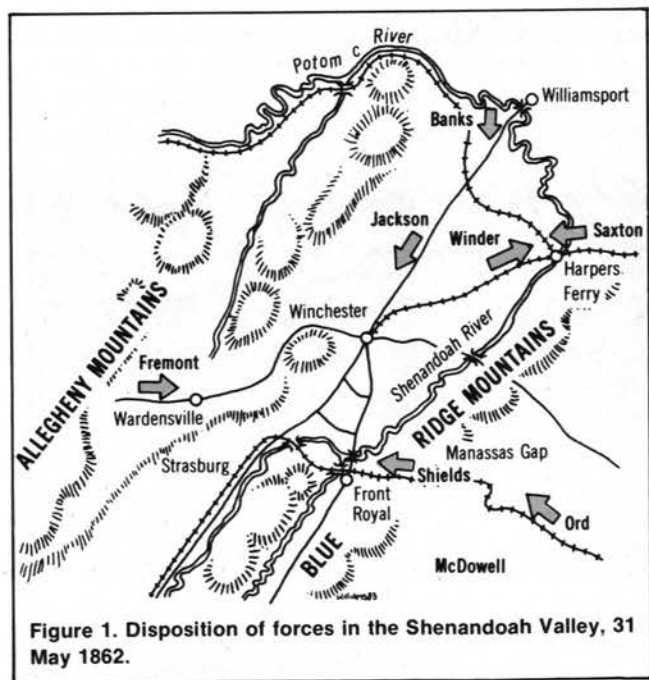


Figure 1. Disposition of forces in the Shenandoah Valley, 31 May 1862.

plans and feints, it was simply "hit and run." The Valley Army possessed such a mobility advantage over the Union forces (Jackson's infantrymen boasted of themselves as "foot cavalry") that the Federals were unable to gather timely intelligence as to Jackson's movements. Therefore, they were unable to prevent the piecemeal engagement of their numerically superior forces. Deception is the key to surprise.

The lessons of the Valley Campaign are timeless. Jackson was a brilliant, aggressive leader who out-thought and out-fought his opponents. Superior tactical mobility was fundamental to his success as commander of an economy force. The Valley Campaign teaches that an advantage in maneuver is, perhaps, the greatest combat multiplier of all.

#### The Mobility Dilemma

An ancient adage states that to execute its economy role, a reconnaissance unit must possess a mobility advantage over line units of roughly five to one. Technology has pushed the cross-country speeds of main battle tanks (MBT's) to the point that the primary limiting factor has become the ability of the crewmen to withstand the physical punishment of riding in the vehicle, not the mechanical system itself. The helicopter is the only current system that can sustain the requisite mobility advantage without crew-damaging physical punishments. Should we then convert all cavalry units to air cavalry? Air cavalry has more than proved its worth in training in Europe, particularly in countering the "quick-breaking battle" characteristic of the offensive armor battlefield. Air cavalry may well be the next transition point for the reconnaissance

arm, but for now the limitations of current rotary-wing aircraft in poor weather and limited visibility dictate that the cavalry retain its ground orientation.<sup>8</sup>

The mobility dilemma arises from the question of how to insure a mobility advantage for cavalry units having the same equipment as infantry and tank battalions. In my opinion, the problem is a matter of perception. We tend to think of tactical mobility in terms of road marches and assaults over open ground. In these situations, ground cavalry has forever lost the advantage of the horseman over the foot soldier. Fortunately, the subject is far more complex than a mere question of speed.

Reconnaissance and security missions are generally executed in areas where the battlefield has not yet developed into the more familiar linear form characteristic of major battles. In this ill-defined environment, cavalry retains most of its mobility advantage over other types of units simply through its organization. Scouts and tanks, operating as a team, yield a clearer picture of the battlefield than any other type of unit can obtain. The commander who "sees the battlefield" more clearly, reacts more quickly and maneuvers his forces more effectively to engage the enemy. Cavalry employs scouts to locate the enemy and to determine his strength and disposition, and combined arms in order to fight through or around him. In short, cavalry units gain a mobility advantage because they waste less time developing the situation.

The 3d Cavalry Group's operations along the Franco-German border in November 1944 clearly illustrate this principle. On the night of 16 November, Task Force (TF) Polk (3d Cavalry Group and attachments) began moving across the Moselle River toward the German frontier. The 3d Squadron, operating on the left flank, aggressively pushed toward the border, its advance marked by several sharp engagements. Employing two reconnaissance troops (Troops A and C), the tank company (Company F), engineer and tank destroyer (TD) platoons in the lead.

"...the squadron pushed forward early in the morning. Troop C...proceeded to APACH thence across the German border. The 2d Platoon...reaches MAIMUHLE while another platoon advanced to PERL. Heavy enemy small arms and artillery fire forced the reconnaissance troops to withdraw. The tanks were then brought up and blasted their way into MAIMUHLE. Troop A, reinforced with tanks and TD's...encountered stiff enemy resistance in the vicinity of MANDERN, but the town itself was by-passed and the force fought its way to MERSCHWEILER."<sup>9</sup>

During the day's action, 53 German prisoners were taken and 15 enemy confirmed killed. By nightfall, the lead elements of TF Polk were continuing their reconnaissance inside the Third Reich. Cavalry maintains the initiative through superior tactical mobility.

The CSAC Study's recommendation for a cavalry platoon organization which included four MBT's, caused concern that the platoon would be unable to carry out its reconnaissance role. "The current main battle tank, the M60A1, lacks the mobility and stealth to accompany the scouts."<sup>9</sup> The scout either becomes a fighter, providing his own support, or spends all his time finding trafficable routes for the tanks. These concerns certainly merit some consideration. Given the quantum improvements in the M1 Abrams, the mobility argument loses most of its validity. The tank, however, remains large and heavy and is incapable of negotiating small bridges and other restrictions. The presence of the MBT in the divisional cavalry does, however, offer commanders one unarguable advan-

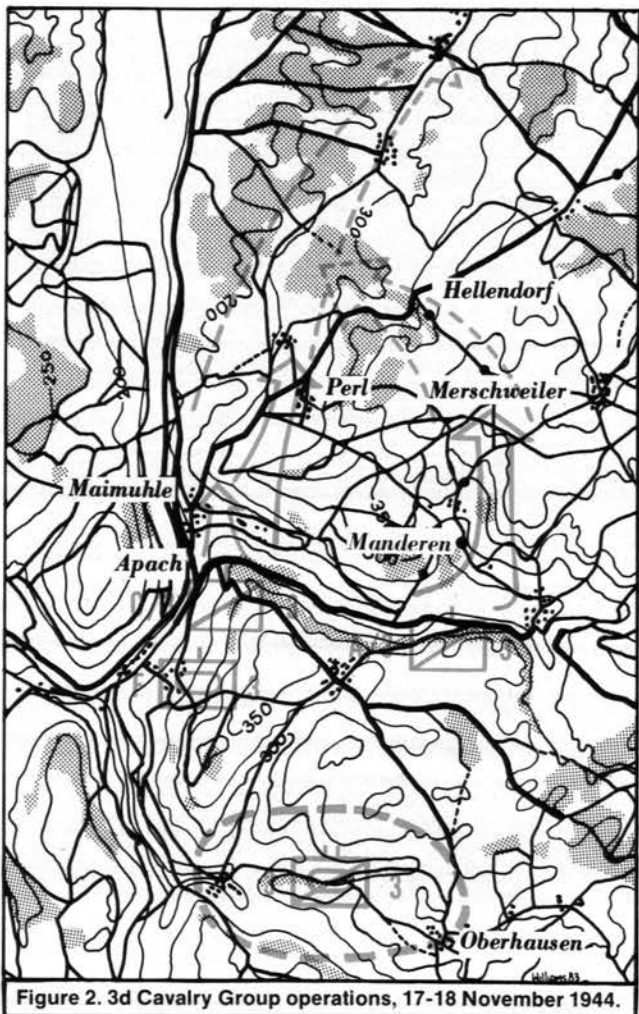


Figure 2. 3d Cavalry Group operations, 17-18 November 1944.

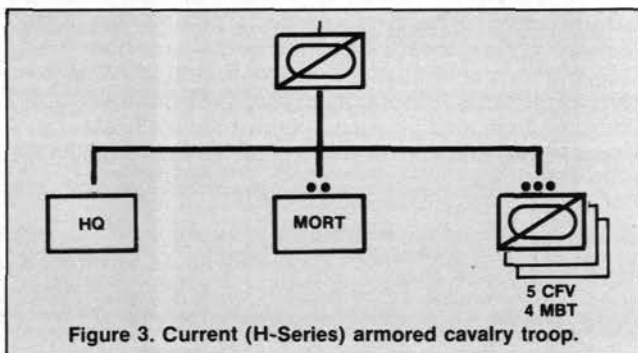


tage: the absolute assurance that wherever the cavalry can maneuver, the tanks of the line battalions can also maneuver. Few armies today have an inherent capability in their reconnaissance elements to test the terrain.

Lack of stealth is a specious argument against the MBT, deriving from the erroneous assumption that cavalry platoons ought to perform reconnaissance in the same manner as scout platoons. Stealth certainly plays a role in cavalry operations (as it does in all military operations), but generally it is not the paramount consideration. Scout platoons perform reconnaissance by stealth in order to survive, but cavalry platoons are organized to fight for intelligence. The fight for intelligence is violent, offensive in nature, and highly fluid. It requires high tactical mobility, aggressive maneuver, and sustained, all-weather combat power. Only one weapons system so dominates the battlefield as to provide the edge needed to win the intelligence fight: the main battle tank.

#### Economy of Force — Catalyst for Decision

Mass is a prerequisite for the execution of decisive combat. No armed force, either in history, or at present, is so large as to be able to be strong everywhere. There are always areas where, because of scarcity of assets, the commander must accept risk in order to gain the decisive advantage. This principle is applicable at every level of command from platoon to army group. Economy of force



is an axiomatic function, for without it there can be no mass. Napoleon clearly understood this relationship and the central role that cavalry plays as an economy force: "Without cavalry, battles are without result."<sup>2</sup>

In the US Army's operations bible, FM 100-5, we are given the following division of responsibilities on the battlefield:

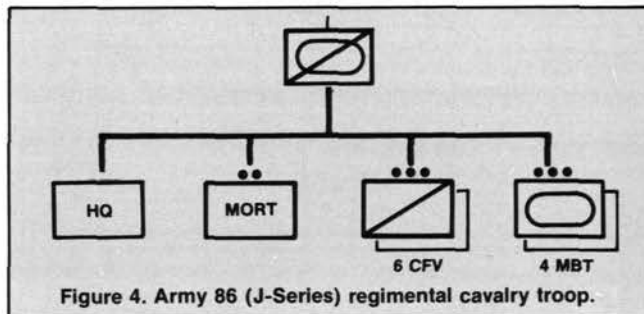
- Generals concentrate the forces.
- Colonels control and direct the battle.
- Captains fight the battle.

The division commander is an organizer; he structures the battle through an integrated concept of engineer obstacles, fires, and maneuver to divide the total enemy force into smaller increments, which his subordinate commanders can then defeat in detail. The development of this operational concept is beyond the scope of this paper, but the potential for error, or the introduction of unforeseen circumstances, is extremely high.

The fluid, high-mobility armor battlefield produces a high degree of uncertainty in the conduct of combat operations, placing a premium on flexibility. The commander must preserve as many of his options as possible to deal with the unexpected. He must tailor his forces so that he retains the capability to decisively influence the battle. Cavalry, as an economy force, is a major factor in providing this flexibility.

In my view, the assumption that the heavy division generally will be able to rely on the corps armored cavalry

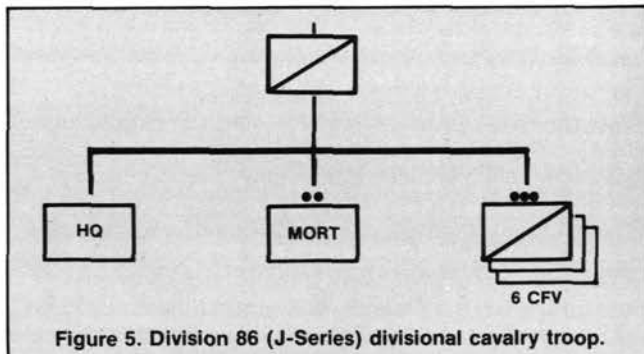
regiment (ACR) to carry out its economy-of-force requirements is questionable. Using this vital corps asset to accomplish divisional missions only "passes the buck" to the corps commander, who must then pay the flexibility penalty in fighting the corps battle. A far more reasonable assumption is that the corps will retain the ACR to meet its own requirements, leaving the division to form its own economy forces.



The light cavalry squadron will certainly play a role in any divisional economy force, but its employment will be severely constrained by the lack of MBTs and the consequent lack of combat power. The division will be forced to draw assets from its line battalions to form the shell of the current armored cavalry squadron. What cannot be recovered under the Division is the training edge inherent in habitual association and battle drill achieved in the current cavalry organization. Armored cavalry must train as it fights—combined arms down to the platoon level. Light cavalry is a solution that only exacerbates the problem for the division commander. It provides an economy force that must draw on the strength of its parent unit to accomplish the same function with less efficiency. Weak economy forces are a liability, sapping the strength of the main force and inhibiting decisive combat.

#### False Economy

The emasculation of the divisional cavalry has enabled force planners to place more tanks in the maneuver battalions. Although an increase of combat power in the "teeth" of the division is desirable, I believe that the net effect will be to diffuse combat power throughout the division area of operations. This diffusion will be necessary to compensate for the reduced capability of the cavalry. The weakening of



the division's organic economy force is the fundamental flaw in an otherwise impressive war machine.

What is it that makes the tank so crucial to cavalry operations? It is certainly not my intent to downplay the role of the scout. He is the *raison d'être* of cavalry. The presence of the MBT increases the effectiveness of the scout; the application of the tank's combat power enables the scout to move more freely over the battlefield. Cavalry

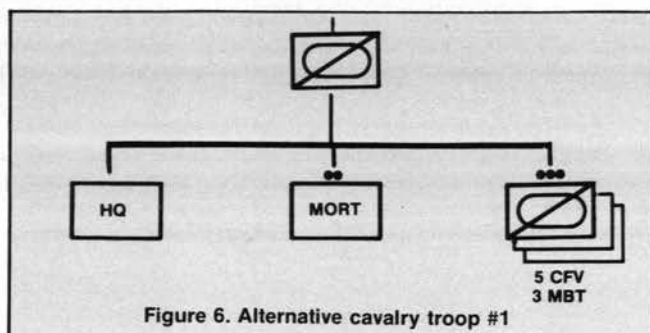


Figure 6. Alternative cavalry troop #1

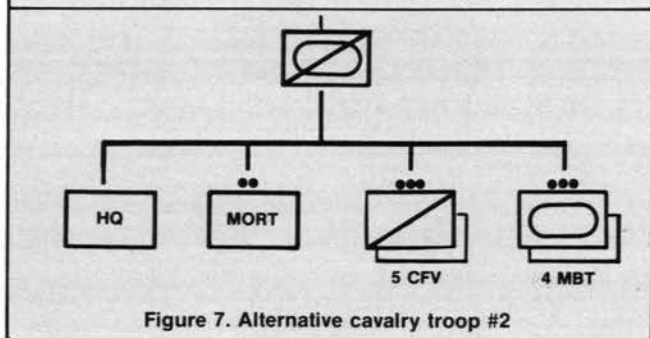


Figure 7. Alternative cavalry troop #2

platoons are able to "punch" through light reconnaissance elements to establish contact with the enemy main body. Napoleon teaches a lesson and provides an example of the importance of powerful cavalry elements—"it is impossible to fight anything but a defensive war, based on field fortifications and natural obstacles, unless one has practically achieved parity with the enemy cavalry. For if you lose a battle, your army will be lost." In the disastrous retreat from Moscow, with his once-proud cavalry reduced to 500 sabres in the Sacred Squadron, Napoleon's army was lost.<sup>2</sup>

The capability of our current armored cavalry organizations to defeat the reconnaissance and security elements of any potential adversary is an advantage we should not surrender without careful consideration. Armored cavalry can accomplish all of the reconnaissance functions of light cavalry and, when required, force the enemy's main body to deploy and fight, revealing its strength and intent. The current armored cavalry organization provides far more than reconnaissance and warning of enemy movement. It gives the commander the crucial moments required to react to the unexpected thrust. The loss of this capability is a crushing blow to the heavy division.

#### The Cavalry Connection

Does the Army 86 heavy division have the capability to conduct economy-of-force operations? Certainly, but that mission capability is much less than the current division's. Line battalions (tank and infantry task forces) can be employed in an economy role, but they suffer an inherent organizational limitation—line units are designed to concentrate combat power over relatively narrow frontages. These units lack the requisite command and control and training necessary to operate over the extended frontages and depths required of a true economy force. Economy forces are most effective when specifically organized to carry out that function.

In order to survive on the armor battlefield, the heavy division must be able to rapidly mass its forces to achieve locally favorable force ratios. Credible economy forces are a prerequisite for the conduct of successful combat operations in this environment. There are two primary characteristics essential for a credible economy force:

- A mobility advantage over the enemy.
- Sufficient combat power to defeat enemy reconnaissance and security forces.

The light cavalry squadron perhaps will retain a mobility advantage, but it most assuredly will lose the capability to defeat Warsaw Pact security forces, composed as they are of main force detachments. Figures 3 through 5 contrast the current armored cavalry troop structures (both divisional and regimental) with the proposed organizations under Army 86. Possible alternatives are shown in figures 6 and 7; it should be noted that these options represent no increase in manpower levels over the Army 86 organizations.

If one accepts the premise that cavalry, as an arm, is an economy force, it then follows that the organization of both regimental and divisional elements should be similar and at troop and platoon level, identical. Squadron organization may vary somewhat because of the increased combat power available within the division and its organic combat support and service support organizations. Though the scale may be reduced, the operational requirements for conducting divisional economy of force missions are essentially the same as for the corps.

Cavalry is the catalyst of decisive combat. Its capability to generate mass through economy-of-force is absolutely essential to the heavy division. The nature of modern armored warfare dictates that modern cavalry must be heavy cavalry. "The very essence of cavalry lies in the offensive. . . . The service of reconnaissance, therefore, must necessarily be carried out in an offensive sense".<sup>10</sup> Combat power is the essential ingredient of the offensive; the tank is the quintessence of offensive combat power. Without the tank, the divisional cavalry is ill-suited to carry out its role on the battlefield.

#### Footnotes

<sup>1</sup> Ellis, John. *Cavalry, The History of Mounted Warfare*. New York: B. Putnam's & Sons, 1978, p.158.

<sup>2</sup> Hohenlohe-Ingelfingen, Prince Kraft zu. *Letters on Cavalry*. Trans. LTC N. L. Walford, R.A. Longon: Edward Stanford, 1911, pp. 56, 139.

<sup>3</sup> Rosenberg, Ralph G. LTC. "Increased Combat Power." *ARMOR*. November-December 1980, pp.30-34.

<sup>4</sup> Starry, Donn A. "Modern Armor Battle III -Cavalry." *ARMOR*. March-April 1975, pp. 5-8.

<sup>5</sup> Romjue, John L. *A History of Army 86*. Ft. Monroe, Virginia: U.S. Army Training and Doctrine Command, 1981, Vol. I and II, p. 7.

<sup>6</sup> Tanner, Robert G. *Stonewall in the Valley*. Garden City, New York: Doubleday & Company, Inc., 1976, pp. 323-325, 240-241.

<sup>7</sup> Battreall, R. R. Col. and Riggins, Joe L. MAJ. "Flying Tanks." *ARMOR*. July-August 1980, pp. 56-59.

<sup>8</sup> U.S. Department of the Army. Headquarters, 3d Cavalry Group (Mechanized). *After Action Report*, (1 August 1944-9 May 1945). Washington: The Adjutant General, p. 144.

<sup>9</sup> Bunce, Peter L. SSG. "The Reconnaissance Dilemma." *ARMOR*. March-April 1976, pp. 18-20.

<sup>10</sup> Bernhardt, Frederich von, GEN. *Cavalry*. Trans. MAJ. G. T. M. Bridges. New York: George H. Doran Company, 1914, p. 40.

#### MAJOR THOMAS A. DIALS,

was commissioned in Armor from the University of Kentucky in 1970. He has held various positions in both regimental and divisional cavalry units in the United States, the Republic of Vietnam, and USAREUR. He recently served as the XO, 3d Squadron, 7th Cavalry, Schweinfurt, Germany. Major Dials is a graduate of the Armor Officer Advanced Course, the United Kingdom Long Armour-Infantry Course, and the Armed Forces Staff College.





## The Regimental System and the Trainer

The newly introduced "Regimental System" is one of the most exciting programs that has entered the manning arena of the U.S. Army and may be the most important transition to date. With the highly-trained and sophisticated force we currently possess, it seems that the regimental approach to organizing the Army for training and future wars is the ideal way to employ today's tough, combat-ready Army.

It is generally said that soldiers fight for their country, flag and way of life. This is certainly true as a group, but when viewed from the pragmatic foxhole position of the individual soldier, he tends to fight hardest for those he knows, trusts, loves and, if necessary, dies with. Consider almost any Medal of Honor winner who "rallied" his unit to fight against seemingly impossible odds at the risk of his own life, or the soldier who threw himself on a hand grenade that landed in the midst of his comrades. In either case, the soldier didn't think of America or his mother's apple-pie when placing his own life in jeopardy. He thought of the lives of his comrades. To put it simply, an army fights for its country; soldiers fight for those they respect and trust; from their commanders to their peers. (See 'Determination in Battle,' by MG T. S. Hart, *ARMOR*, May-June 1980. Ed.)

This can be taken one step further and applied to a unit as a whole. In other words, through time and intimacy with a specific unit there exists three entities a soldier will fight for: his country, his comrades-in-arms, and his unit (including its particular traditions).

Soldiers must be motivated through their emotions to fight harder and longer than the enemy if success is to be realized. This translates to a term we all understand—*Loyalty*. The idea of loyalty is so simple that it sometimes eludes us as a basic reason for why things are done.

Currently, a soldier during a 20-year period, serves in an average of 6 to 8 units. This translates into approximately 3 years of service with each organization. Each unit has its own way of doing things from standing operating procedures to customs and traditions within the unit. It usually takes the newly joined soldier 6 months to "learn" a unit. This means 3 to 4 years of time during a 20-year career that a soldier spends just becoming familiar with, or acclimated to his new "home."

The regimental system as currently envisioned should solve, or at least significantly reduce the acclimation problem. A soldier in an armor regiment should serve with that regiment for a longer period (6 to 12 years) before having to leave that organization for a nominative assignment, or due to promotion. Thus, assignment to a regiment will allow a soldier to stay with a parent unit regardless of where he physically serves. He will also know before rotation between regimental battalions how his unit trains, what the regimental mission is, and how it will be executed. But what should be done to enhance the regimental system during initial entry training (IET)?

A proposal has been made that would give each regiment responsibility for training its own replacements. This idea must first be examined by asking how:

- A regiment will conduct a training program for IET

(i.e., basic training, advanced individual training, one station unit training) that is standardized throughout the army?

- A regimental unit is going to train its own replacements during wartime when every man is needed to man the combat battalions within the regiment?

- A unit, that *has* a continuing training mission for its already seasoned members, reverts to the all important basics (the foundation) and devotes men, money, and resources to train IET soldiers?

- We ensure that all recruits receive the same level of MOS training as his comrades before him?

- We ensure that all commanders interpret an MOS-producing program of instruction as it was intended and that modifications or adjustments are not made to the training program based on local conditions, or the local commander's opinion?

The answers to these, as well as other questions, rests with the training center as it presently exists. Fort Knox and the 1st AIT/OSUT Brigade, Armor, will be used as an example. However, the following scenario could be applied to other training brigades as well.

Training IET soldiers to become qualified 19E/K armor crewmen or 19D cavalry scouts has developed over the years into a "fine art." Currently the U.S. Army has the best trained IET soldiers, produced by the most sophisticated training systems in the world. Examine what is *already* available to ensure *standardization* and *quality* of training for CMF 19 soldiers:

- An independent Test and Evaluation Branch that tests all soldiers to the same exacting standards required by field units.

- A multi-million dollar complex containing numerous classrooms equipped with instructional aids simulating basic-level armor technology;

- A committee of instructors who teach approximately 50 percent of all armor and cavalry subjects on a technical level and who teach the *same way every time*.

- A trainee Personnel Branch dedicated to accomplishing all IET soldiers' administrative needs.

Rather than sacrifice an established system that works, we should consider how it can best be modified and used to meet tomorrow's needs today under the Regimental System.

Currently, there are sixteen basic armor training companies and nine basic reconnaissance training troops organic to the 1st AIT/OSUT Brigade, Armor. These companies and troops presently supply *all* CMF 19 replacement/personnel for armor and cavalry units deployed worldwide. The Regimental System once initiated will not change the total number of replacement personnel needed, but will realign existing manpower into more efficient units. Logically, then, instead of dismantling a proven training system, it should be realigned to *support* the new Regimental System.

Considering the annual projected regimental replacement requirements and the number of personnel each OSUT company/troop graduates each year, it would be appropriate to align each OSUT armor company or

cavalry troop with a designated regiment. For example, redesignate Company A, 2d Battalion, 1st AIT/OSUT Brigade as Training Company, 35th Armor Regiment. All of the initial entry soldiers who enlist for or are assigned to the 35th Armor Regiment will be trained by this single OSUT company. Doing so will provide several advantages.

First, the soldier will be trained by the cadre that also belongs to the 35th Armor Regiment. The cadre will know that during future regimental assignments they will serve with the personnel they train and will be able to infuse regimental ties from the very beginning. Currently, a soldier is trained by professional soldiers who know only that the students they graduate from training *may* end up with them in future units. Basic psychology should enhance this proposed alignment because when people do something for themselves, they tend to do a better job.

Second, the cadre assigned to each training company should be selected by the regimental command sergeant major and approved by the regimental commander. The 2-to 3-year assignment rotation of cadre trainers can still be used and will fall within normal career progression patterns. Therefore, the personnel chosen to be the regimental training company troop drill sergeants and tank/track commanders belong to the regiment and will feel personally responsible for the quality of training. Selected personnel can be trained to assume their duties by using insti-

tutions already in existence (i.e., Drill Sergeant School, Cadre Training Course, etc.)

Third, IET soldiers undergoing OSUT training will have a tendency to train better under regimental cadre knowing that the same officers and noncommissioned officers will be their leaders during future assignments.

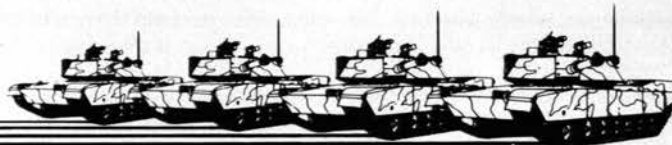
Fourth, from the initial day of training one of the most essential elements to the survival of a unit during combat, loyalty, will be instilled. As previously stated, unit loyalty can cause soldiers to rise above themselves during battle.

Finally, this proposed alignment of training units with established regiments will ensure complete and standardized training, as well as provide for quality assurance.

The Regimental System is a "Better Mousetrap" for a myriad of reasons. What is remarkable is the fact that we will be adopting a new concept system that has minimal implementing costs and offers countless benefits. If implemented, the proposed system would not cause disruption either to field units, or the training base. All the requirements needed to improve training and increase efficiency already exist.

As an old Army axiom states: "If it works—do it". This proposal will work.

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## We Need Realistic NBC Training

Warsaw Pact forces can be expected to employ NBC weapons on a terrifying scale, and their use to neutralize NATO strong points, communications centers, road and rail lines, and airfields is emphasized in Soviet tactics. This is designed to gain an insurmountable advantage for the Soviets in the opening phase of the battle. Presently the Soviets are believed to be employing chemical weapons in Afghanistan, and it would seem that they may be refining their NBC tactics and equipment.

On the other hand our attitude toward NBC training is somewhat lax. Oh sure, commanders say that their command is high on it, but can they really bank on that training to pay off?

Most of the time we take a *ho-hum* attitude toward this part of the training schedule. There is too much simulation with nonexistent troops and equipment, lack of support for the training schedule, and leaders do not enforce the training. Ask your officers and senior NCOs how often they have participated in NBC training with the unit. How often has guard duty, charge of quarters, staff duty non-commissioned officer, details, and compensatory time, thinned the ranks of your troop so that only a few of the soldiers get the training? Also, doesn't it seem that the same soldiers are always there, while the same ones are always gone? Add these factors up and you can see why NBC training is not stressed as it should be. In the short term, we can always cover up for our deficiencies, but we are only short-changing ourselves if we do. Our lack of good quality NBC training may cause us to lose the "First battle of the next war," especially if NBC weapons are used.

In order to defeat the threat, we must train like him. Soviet troops are accustomed to spending long periods of time in NBC conditions. "NBC conditions" means just that! They employ real, diluted chemical agents in their exercises. Casualties occur, but, the Soviets believe in the motto, "Hard in Training, Easy in Combat." Warsaw Pact forces use real equipment in exercises to give their soldiers maximum training benefits. Chemical alarms, detectors, decontamination kits, Geiger counters, and markers are used extensively in all FTXs. Their soldiers are given training in identifying agents, marking them, working around and in them, and a variety of other tasks to make them competent in an NBC environment. Also, unit-level training is given high priority. Decontaminating vehicles, equipment, and personnel are done during these exercises.

The greatest difference between their NBC training and ours is that they do it more realistically. There is no substitute for realistic combat training.

How many times have you participated in an NBC exercise? Does your squad/platoon/troop know how to go through a decontamination point? Do your chemical personnel know how to set one up? How well can your crews decontaminate their vehicle and other equipment in order to continue with the mission? If you can honestly say "yes" to those questions, congratulations! You may survive your first chemical attack and still kill the enemy.

Our soldiers need to be taught the fundamentals of NBC warfare and the fact that they must learn to live and fight in an NBC environment. They won't reach that level if NBC training is not the most demanding training we can make it.



A sample NBC program might include classroom lectures on NBC equipment, instruction in identification of NBC hazards, and first aid and evacuation of NBC casualties. The program might also have a cycle of wearing the NBC mask and clothing—2 hours a week initially, and then increase it to 4, 6, and finally 8 hours “suited up.” Do you think your soldiers could run an obstacle course in an NBC suit? They’ll have to do it in combat. How well can they fire the main gun or TOW or *Dragon* missile systems while wearing the NBC mask? It is my conviction that we

tend to do the easy aspects of training. Taking the easy way out may make our training easy and show good test scores, but on the battlefield there is no substitute for experience. Let’s buckle down and train our soldiers to live, fight, and kill the enemy in an NBC environment! We can’t afford not to!

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## The Case for Professional Reading

No subject receives more attention from the Army’s officer corps than military professionalism.

Professionalism always has been one of the most popular topics of conversations among military people, and the various thoughts and ideas on the subject number in the thousands.

Two decades ago, Lieutenant General Sir John Winthrop Hackett, a British Army officer, delivered a series of three lectures at Trinity College, Cambridge, on the profession of arms. (His lectures were later reproduced by the U.S. Army and distributed as an official pamphlet.) His was a most telling presentation, and he made a number of excellent points about military professionalism.

General Hackett did not define a military professional in so many words because “the man-at-arms is different things at different times to the same people,” but he made clear his concept of a military professional’s functions and duties: to bear arms; to lay down his life, if need be, for the group; to develop his skill in the management of violence to the utmost; and to act as the true subordinate of properly constituted authority.

In effect, he was saying that mere path-taking does not make a military professional any more than does a fancy uniform. Rather, it is an individual’s mental approach to the profession of arms that determines his professionalism, his desire to develop to the utmost his skill in the management of violence.

In many respects, the U.S. Army provides its officers with ample opportunity to develop a sense of military professionalism—service schools, unit and staff assignments, ever-increasing command responsibilities, and varied duties around the world. At some point in their careers, officers are also given special instruction in effective speaking and creative writing. They are then judged with their contemporaries on their effectiveness as speakers and writers.

But at no time is an officer ever judged on his effectiveness in reading, or rated with his contemporaries on his knowledge of current, professional, military thinking. In fact, it sometimes seems that the Army goes out of its way to discourage professional military reading in the apparent belief that an officer who reads a great deal—particularly a combat arms officer—must be some sort of academic intellectual and, therefore, should not be considered a member in good standing of the profession or arms.

This is unfortunate, because there is so much being written today that can stand any officer in good stead, be he young, old, experienced or inexperienced—material that

can add a full measure of richness to his career.

If reading is so important, what, then, should military professionals read?

First, they should read periodicals. All officers, for instance, should subscribe to and read their own branch journals. Each branch service school publishes one. These journals contain the latest in branch thinking on many and varied professional subjects. They are staffed with well-trained and knowledgeable editors and writers who turn out fine professional products. These journals also provide an excellent forum for the airing of differing professional opinions.

However, officers should not restrict their reading to their own branch journals; they should make every effort to peruse other branch journals as well. Thus, an armor officer, in addition to reading *ARMOR Magazine*, should try to read, at the least, *Infantry*, *Field Artillery*, *Air Defense*, *Engineer*, *United States Army Aviation Digest*, and *Military Intelligence*. They should also look at *Army Trainer* and *ARMY*.

Field grade officers, usually have more time to devote to professional reading. Accordingly, they should make it a point to also read *MILITARY REVIEW* and *PARAMETERS*. And since they are often concerned as well with the conduct of joint operations, they should look at the periodicals that are produced by and for the other armed services. Three excellent publications are: *Air University Review*, *Naval Institute Proceedings*, and *MARINE CORPS GAZETTE*.

Officers should consider joining the American Military Institute, and subscribing to their quarterly journal called *MILITARY AFFAIRS* published for them by the history department of Kansas State University.

Finally, in the periodical field, there are several commercially produced publications that deal with military and strategic affairs, that provide valuable sources of information such as: *AEI FOREIGN POLICY AND DEFENSE REVIEW*, *ARMED FORCES AND SOCIETY*, *ARMED FORCES JOURNAL INTERNATIONAL*, *DEFENSE AND FOREIGN AFFAIRS DIGEST*, *DEFENSE WEEK*, *INTERNATIONAL DEFENSE REVIEW*, *MILITARY TECHNOLOGY AND ELECTRONICS*, *NATIONAL DEFENSE*, and *NATO’S FIFTEEN NATIONS*.

Then there are books, which may be even more important to the military professional. Dozens of excellent military-oriented books are published each year in the U.S. and abroad. The service school libraries issue periodically up-dated reading lists, and these lists are usually available on request. In most cases, unit and post libraries may use

inter-library loan procedures to get particular books for their readers. In short, then, few military professionals have any reason for not reading the latest military books.

While no reading list should be considered complete, a reading list can be an excellent starting point for the military professional who is truly serious about his reading. Here are three "starter lists" of my own—one for company grade officers, one for field grade officers, and one, the so-called "military classics," which all military professionals should read. I have refrained from including biographies and autobiographies, histories of various wars and battles, reference works, and books about particular armies, feeling that these should be read after the "starters" have been allowed to do their work.

#### Company Grade Officers

Alger, John I., *The Quest for Victory: The History of the Principles of War*.  
Baynes, J.C.M., *Morale*.  
Baynes, J.C.M., *The Soldier in Modern Society*.  
Brodie, Bernard, *From Crossbow to H-Bomb*.  
Dupuy, R. Ernest and William H. Baumer, *The Little Wars of the United States*.  
Foner, Jack D., *The United States Soldier Between Two Wars*.  
Griffith, Paddy, *Forward Into Battle*.  
Hicken, Victor, *The American Fighting Man*.  
Higham, Robin and Carol Brandt, *The United States Army in Peacetime, 1775-1975*.  
Hittle, James D., *The Military Staff*.  
Keegan, John, *The Face of Battle*.  
Leckie, Robert, *The Wars of America*.  
Lord Moran, *The Anatomy of Courage*.  
MacDonald, Charles B., *Company Commander*.  
Macksey, Kenneth, *History of Land Warfare*.  
Marshall, S.L.A., *The Officer as a Leader*.  
Montgomery, Bernard Law, *A History of Warfare*.  
Pyle, Ernie, *Brave Men*.  
Weigley, Russell F., *History of the United States Army*.  
Williams, T. Harry, *The History of the American Wars from Colonial Times to World War I*.

#### Field Grade Officers

Aron, Raymond, *On War*.  
Bell, J. Bowyer, *The Myth of the Guerrilla*.  
Borklund, Carl W., *Men of the Pentagon: From Forrestal to McNamara*.  
Brodie, Bernard, *Strategy in the Missile Age*.  
Collins, J. Lawton, *War in Peacetime*.  
Dupuy, Trevor N., *The Evolution of Weapons and Warfare*.  
Foner, Jack D., *Blacks and the Military in American History*.  
Gavin, James M., *War and Peace in the Space Age*.  
Goodpaster, Andrew J., *For the Common Defense*.  
Howard, Michael, *War and the Liberal Conscience*.  
Huntington, Samuel P., *The Common Defense: Strategic Programs in National Politics*.  
Janowitz, Morris, *The Professional Soldier: A Social and Political Portrait*.

Just, Ward, *Military Men*.

Karsten, Peter, *Law, Soldiers, and Combat*.

Kintner, William R., *Forging a New Sword: A Study of the Department of Defense*.

Laqueur, Walter, *Guerilla: A Historical and Critical Study*.

McNeil, William R., *The Pursuit of Power*.

Millis, Walter, *Arms and Men*.

Montross, Lynn, *War Through the Ages*.

Moskos, Charles C., Jr., *The American Enlisted Man: The Rank and File in Today's Military*.

Mylander, Maureen, *The Generals*.

Nickerson, Hoffman, *The Armed Horde, 1793-1939*.

Osgood, Robert, *Limited War*.

Osgood, Robert, *Limited War Revisited*.

Preston, Richard A., *Men in Arms*.

Ropp, Theodore, *War in the Modern World*.

Taylor, Maxwell D., *Swords and Plowshares*.

Vagts, Alfred, *A History of Militarism*.

van Creveld, Martin, *Supplying War: Logistics from Wallenstein to Patton*.

Weigley, Russell F., *The American Way of War*.

#### Military Classics

Caesar, Julius, *The Battle of Gaul* (a new translation by Anne and Peter Wiseman).

Clausewitz, Karl von, *On War*.

Delbruck, Hans, *History of the Art of War Within the Framework of Political History* (three volumes translated into English as of this date).

Douhet, Giulio, *The Command of the Air*.

Earle, E. M. (editor), *Makers of Modern Strategy*.

Fuller, J.F.C., *Decisive Battles of the Western World and Their Influence Upon History*.

Fuller, J.F.C., *A Military History of the Western World* (three volumes).

Herodotus, *The History of Herodotus* (two volumes).

Jomini, Antoine, *Summary of the Art of War*.

Liddell, Hart, B.H., *The Great Captains Unveiled*.

Liddell, Hart, B.H., *Strategy*.

Livy, *The War with Hannibal*.

Machiavelli, Nicolo, *The Art of War* (two volumes).

Machiavelli, Nicolo, *The Prince and the Discourses*.

Mahan, Alfred Thayer, *The Influence of Seapower Upon History, 1660-1783*.

Polybius, *The Histories of Polybius*, (two volumes).

Saxe, Maurice, Comte de, *Reveries or Memoirs on the Art of War*.

Spaulding, D.L., et. al, *Warfare*.

Sun Tzu, *The Art of War*.

Upton, Emory, *The Military Policy of the United States*.

Vegetius, Flavius Renatus, *The Military Institutions of the Romans*.

Willoughby, C.A., *Maneuver in War*.

Wright, Quincy, *A Study of War* (two volumes).

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#### Recognition Quiz Answers

1. **AMX-13 DCA (French)**. Twin 30-mm self-propelled antiaircraft gun; crew, 3; maximum road range, 300 km; maximum road speed, 60km/hr; combat weight, 18.9 tons; power-to-weight ratio, 14.53 hp/ton.
2. **RATEL-20 (S. Africa) (IFV)** This 18.7 ton armored vehicle is crewed by 3 men and carries 7 passengers at a maximum road speed of 105 km/hr. It is diesel engine and is armed with a 20-mm main gun, a 7.62-mm coaxial machinegun and a 7.62-mm AA machinegun.
3. **T-59 (China) (MBT)** Essentially the same as the USSR T-54 MBT. It has a 4-man crew and weighs 39.7 tons loaded. It has a 14.44 hp/ton power-to-weight ratio, 48-km/hr maximum road speed, 400-km maximum road range, and a 520-hp diesel, and is armed with a 100-mm main gun, two 7.62-mm machineguns and a 12.7-mm AA machinegun.
4. **TYPE 74 (Japan) (MBT)** It has a 4-man crew and weighs 41.9 tons loaded. It has a 53-km/hr maximum road

speed, 19.7 hp/ton power-to-weight ratio, 500-km maximum road range, 750-hp diesel, 105-mm main gun, 7.62-mm coaxial machinegun and 12.7-mm AA machinegun.

5. **MTLB (USSR) (Multipurpose Vehicle)** It has a 2-man crew and carries 9 passengers as an APC, and weighs 13.1 tons loaded. It has a 20.16 hp/ton power-to-weight ratio, 61.5-km/hr maximum road speed, 6-km/hr maximum water speed, 400-km maximum road range, 240-hp diesel, and a 7.62-mm machinegun.

6. **AMX-10P (France)** It has a 5-man crew; mounts 2 HOT launchers on power-operated turret, and weighs 15.2 tons loaded. It has a 20-hp/ton power-to-weight ratio, 65-km/hr maximum road speed, 600-km range, and 276-hp diesel.

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Following are corrections for May-June 1983 Recognition Quiz Answers: (1) M48 is an M48A1. (3) M47 is an M46.





## Officer Personnel Actions Clarified

*This is the final article in this series.*

### Officer Evaluation Reports

The following notes were compiled from the after-action reports submitted by promotion and selection boards, from members of the DA Secretariat who run the boards, from branch assignment officers, and from OPMD experts on the Officer Evaluation Report (OER).

- Boards check Part Ij, "Reason for Submission," because it tends to indicate the flavor of the report.
- The longer the rated period, the more weighty the evaluation.
- The Duty Description (Part III) is extremely important. Remember that the single armor officer on any board may not even see all the armor files! Even if he does, he has only one vote. It is important to explain to board members from other branches exactly what the officer does because they may not have as good an appreciation for what the duty entails as does the commander. Be specific, especially if the officer is working in his additional specialty. It is suggested that some statement about the officer's function, the number of people he leads or supervises, and the types and number of vehicles for which he is responsible be included.
- Negative comments have a negative impact. If something needs to be said, then say it, but say it clearly. There are no magic words for writing OERs. Negative comments on professional ethnics hit hard, but deservedly so.
- Make qualitative statements on how the officer performed his duties (e.g., "best platoon leader in my company").
- Cite what the officer's key duties were, and explain how well they were performed.
- Some raters are still trying to put potential remarks in the performance narrative (Vc). This results in an administrative nightmare and the report may miss a board.
- It is definitely not necessary to fill up the performance narrative or potential blocks. Be concise.
- Do not leave remarks open for interpretation. Be precise.
- Platoon leaders do not *command* ground platoons in armor, they *lead* them. Statements such as "He commanded his platoon in an outstanding manner" detract from the rater's credibility.
- Only make comments in part Ve, "Potential narrative," that are appropriate to current grade and duty.
- It is a waste of time and OER space to recommend the rated officer for attendance at an advanced course or CAS<sup>3</sup>. All officers will attend OAC and there is no such thing as attendance ahead of contemporaries. All officers in BYG 1976, and later BYGs, should attend CAS<sup>3</sup>.
- Gimmicks (underlining, words in upper case, big words that no one understands, trendy words like "stud") have an amazingly negative effect in the eyes of board members. Boards infer from such remarks that the officer's performance cannot speak for itself. When gimmicks are used, the rated officer may suffer.
- Intermediate Rater comments do not add weight to a

report simply because they are present. They are taken at face value. About 10 percent of OERs received have Intermediate Rater comments.

- The Senior Rater's part is viewed in its entirety to obtain a single idea of what the rating says. All three elements must be considered together. By matching the same words with different profiles, entirely different evaluations emerge.
- Many company grade officers perceive that the box checked in the Senior Rater's profile is the most important aspect of the rating. It is definitely not. Again, all three elements must be viewed together.
- The use of small type makes reading difficult. Remember that a board member will read the OER on a microfiche reader.
- Senior Raters, please check the OER for neatness, spelling, and grammar. A poorly prepared OER makes an unfavorable impression.
- Senior Raters, when counseling officers on their OERs, at the very least give them an idea of what your profile looks like. Many officers are surprised when they finally see the senior rater's profile.
- If several OERs are written by the same Senior Rater, for officers of equal rank (e.g., all captains), and they are received at DA on the same day, then all the potential evaluations are computed and the same profile is entered on all the reports (i.e., the same profile totals, not the same box checked).
- The Senior Rater's profile cannot be inflated. There are still some Senior Raters who believe it can be inflated, and they think they are doing their officers a favor by putting them all in a high block. This could not be more incorrect. When all or most rated officers occupy the same block, regardless of its location, that only means they are running with the pack. This type of rating has little credibility, and the rating is normally not taken at face value. The rater also surrenders his capability to single out his most outstanding officers.
- If, when starting the profile, and there are only a few rated officers in the profile, your rating philosophy should be explained, e.g., "Although I have placed Captain Jones in block III, this does not imply anything negative. I intend to put the top 20 percent of all captains I will rate in the top three blocks."
- If it is felt the profile has become disproportionate, Branch recommends the Evaluation Officer at MILPER-CEN (DAPC-MSE) be contacted either in writing or by telephone (AUTOVON 221-9570) to discuss restarting the profile. They will provide the necessary guidance to insure it is done correctly. Raters are cautioned not to try to adjust the profile on their own unless they restart. In other words, do not fill lower blocks just because it is felt that too many officers are in higher blocks. By the way, that constitutes substantive cause for an officer to appeal the report.
- Branch needs feedback on how it is serving Armor Officers; please let us know.

**QUARTERED IN HELL: THE STORY OF THE AMERICAN NORTH RUSSIAN EXPEDITIONARY FORCE, 1918-1919**, by Dennis Gordon. The Doughboy Historical Society, Missoula, MT. 1982. \$11.95.

Here we have the story of the hapless ANREF/Allied incursion into North Russia at the end of WW I. Gordon briefly traces the complex political background to this little known chapter in American military history and records the testimony of the participants themselves, officers and enlisted men. Most of the 42 chapters are, thus, personal accounts of that campaign in which they fought an unknown enemy for unknown reasons in a strange and hostile land. The obvious lessons of this "Frozen Vietnam" for our own times were overlooked or long forgotten.

A few inaccuracies do not prevent this little book being a good account at the personal level of this forgotten war.

BILL HANSEN  
Armor School Library  
Fort Knox, KY

**PATTON'S PRINCIPLES: A HANDBOOK FOR MANAGERS**, by Porter B. Williamson. Simon & Schuster, New York, 1979. \$4.95

This book is more entertaining than it is informative. The author was a lieutenant who served with the general, on his staff, in the early years of the U.S.A.'s participation in WW II. The author has taken information and memories from a host of individuals connected with the general, combined these with his own experiences to produce in essence "The Patton Quotes."

The author uses a writing technique that is different from the general run of such books. He presents the principle and then goes into the historical background/context of how the principle was said and/or offered by General Patton. Through these short glimpses of history, the reader is given an insight into the complex nature of the famous general. These short stories help to keep the quote/principle in perspective, the most often overlooked element when quoting an individual.

The subtitle, "A Handbook for Managers" was an error. It would lead a prospective buyer/reader to believe that these principles will help them in some way to manage better. Patton lived these principles. To him they weren't for on-the-job application. A manager can manage things and people but a leader/commander leads/commands people. Patton was a leader/commander. The application of these principles is a personal thing, to say the

least, but whether these principles will help a manager to succeed in business is debatable.

The principles that Patton followed are solid and sound, as relevant today as they were 40 years ago. Not surprisingly, these principles are ones that many great and ordinary people have lived and continue to live their lives by. This is the author's intended point/theme of the book, but it is really never fully developed.

Overall, the book is good if viewed as an entertaining piece rather than a "handbook." The short stories are excellent and present yet another view of the famous General Patton. A view that many junior officers can feel very comfortable with as it may give some insight of how and why their superiors say and do things.

JAMES M. DUNN  
Captain, Armor  
Fort Knox, KY

**TANKS AND OTHER AFVs IN THE BLITZKRIEG ERA**, by B. T. White. Blandford Press, England. 1972. \$9.95.

This is a superb little book filled with technical information and colorful pictures of armored fighting vehicles during the first two years of WW II. It covers 80 different types of tanks, armored cars, reconnaissance vehicles, etc., with development background, technical characteristics and their use in combat. Nations represented include France, Italy, Germany, Soviet Union, Great Britain, Poland, Czechoslovakia, Belgium, Finland, Holland, South Africa, India and the Irish Free State.

This extremely useful book should be in the personal library of anyone interested in the weaponry of this period.

ROBERT A. DOUGHTY  
Lieutenant Colonel, USMA  
West Point, NY

**SILENCE WAS A WEAPON: THE VIETNAM WAR IN THE VILLAGES**, by Stuart A. Herrington. Presidio Press, California. 222 pages. \$15.95.

This account of advisory duty in Hau Nghia province from 1971 to the cease fire is recommended for those trying to understand the Vietnamese war. The author was a district Phoenix advisor during the difficult years of ebbing American power in southeast Asia.

The book lacks some strategic scope, but compensates with its first person singular approach. It concentrates on the political struggle in the villages and offers many insights concerning South Vietnam's collapse following America's failing crusade.

Finally, the vital question—was defeat inevitable after the U.S. departure? Herrington's answer parallels Colonel LeGro's 'official' history of Vietnam from cease fire to capitulation.

FRANKLIN Y. HARTLINE  
Lieutenant Colonel, USA  
Defense Systems Management College

**RIFLES AND AUTOMATIC WEAPONS**, by Major Frederick Myatt. Arco Publishing Inc., New York. \$9.95.

This is a compact, fully illustrated guidebook of 78 of the most important rifles, carbines and submachineguns used in this century. It is part of the Salamander military guide series and, as is the case with others in this series, contains excellent photographs, supplemented with brief histories of each weapon and includes tables of basic characteristics and capabilities.

Photographs include not only the weapons, but also their ammunition and many were taken in the field showing them being carried and used in combat.

It is a must for gun enthusiasts and collectors, as well as for the general military historian.

DONALD J. BUTZ  
Ordnance Systems & Technology Sec.,  
Battelle Columbus Laboratories

**THUNDERBOLT: HISTORY OF THE 11TH ARMORED DIVISION**, by Hal D. Steward. The Battery Press, Nashville, TN. 1981. \$22.50.

This book fills an important gap in our histories of our Armored Divisions. The Division was activated at Camp Polk, LA in 1942 and deactivated in Gmunden, Austria three years later. It took part in the relief of Bastogne, the breakthrough of the Siegfried Line, the race to the Rhine and across central Germany into Austria. It once advanced over 36 miles in 24 hours, capturing 32 towns and more than 10,000 prisoners, including a division commander and his headquarters.

What makes this book particularly interesting to today's armored soldiers is that the 11th fought through the same cities and dorfs where our present units are stationed—Darmstadt, Hanau, Buding, Gelnhausen, Fulda, Coburg, Bayreuth and Grafenwohr. It's good to know that you're living on land that your armor predecessors captured.

JIM BYERS  
Colonel (Ret.), Armor  
Alexandria, VA



# **STEEL ON TARGET**



*Much has been made in the pages of this journal of the stamina shown by steadfast fighters who refused to capitulate in the face of wartime dangers. Less attention has been paid to the stamina necessary to practice our profession in peacetime.*


*Physical endurance is achieved through tough training in the field. Mental endurance comes from working through long and complex problems. But the bedrock on which physical and mental endurance rests is the steady stamina of the spirit and, as soldiers, we must cultivate that virtue as diligently in peacetime as we practice it in wartime.*

*All about us a debate wages within our society about how to best achieve peace in an imperfect and dangerous world. Quiet voices express the view that the price of freedom has outpaced our national income. Others argue that a strong economy, effective social programs, and quiet diplomacy are a sufficient deterrent to aggression. Some would return to the days when might made right. Louder voices lament the futility of it all. But, the loudest doomsday cries arising above the din proclaim that free people, their representative government, and a strong military force are themselves a threat to peace!*

*While the pendulum of public opinion swings left and right in response to the winds of rhetoric, we who are soldiers must remain as steadfast to our mission in peacetime as we would in wartime. Our strength to do so lies in our stamina of the spirit and in our firm conviction that our course is marked by the high calling of duty, honor, and country.*

*To negotiate that route we must be farsighted, clear-headed, and steady of nerve. While many despair, our vision of the future must define not only the dangers but the opportunities as well. We must impart to those around us a sense of hope that has been bought with the price of our vigilance. For those whose minds are muddled from the steady onslaught of the doomsayers, we must clearly articulate the case for perseverance on the path of freedom. To those who cower before the menace in the east, as well as to those others who threaten us, we must provide unmistakable evidence of our nerve.*

*Should the clouds darken, many will desperately look about for a sign of light. Let the courage of our soldiers, fueled by their indomitable and steadfast spirit in peace and war, shine in the darkness and light the way. Good Shooting.*





#### Symbolism

The principal colors of the shield are those of armor. The dragon is represented as a strong and fierce creature covered with invulnerable plates of mail and in heraldry is properly applied to the overthrow of an enemy. The fleur-de-lis charged on the wing symbolizes the campaigns in Europe and the three blue roundels represent the Korean operations. The crest commemorates participation in the Korean War with special emphasis on the action on the Naktong River Line. The Yin Yang symbol in red and blue alludes to Korea. The Naktong River Line is represented by the wavy blue, white, blue bar, for water. The spiked mace is used as a symbol for armor and is placed over the Naktong River Line and the Yin Yang symbols to represent the holding, counterattacking, and hurling back of the enemy from the Naktong line. The savage nature of this action is alluded to by the flames rising from the Naktong River Line and engulfing the mace. The type of mace used—morning star—is an allusion to the time of the enemy's crossing of the line, his repulse, and his final withdrawal. The Presidential Unit Citation awarded for the action is symbolized by the wavy blue stripe, which simulates a streamer and, in conjunction with the white stripe, refers to Korean service.

#### Distinctive Insignia

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

## 72d Armor (Crusaders)

### Lineage and Honors

Constituted 14 January 1943 in the Army of the United States as 5th Armored Regiment. Activated 15 July 1943 at Camp Chaffee, Arkansas, and assigned to 16th Armored Division.

Regiment broken up 3 September 1943 and reorganized and redesignated as follows: 5th Armored Regiment (less 1st and 3d Battalions, Maintenance, Service and Reconnaissance Companies, and Band) as 5th Tank Battalion and remained assigned to 16th Armored Division; 1st Battalion as 717th Tank Battalion and relieved from assignment to 16th Armored Division; 3d Battalion as 26th Tank Battalion and remained assigned to 16th Armored Division; Reconnaissance Company as Troop D, 23d Cavalry Reconnaissance Squadron, Mechanized, an element of the 16th Armored Division; Maintenance and Service Companies and Band disbanded.

5th Tank Battalion inactivated 16 October 1945 at Camp Shanks, New York. Relieved 8 February 1951 from assignment to 16th Armored Division and allotted to the Regular Army. Activated 2 March 1951 at Fort Leonard Wood, Missouri. Inactivated 16 March 1956 at Fort Leonard Wood, Missouri.

717th Tank Battalion reorganized and redesignated 6 April 1948 as 717th Heavy Tank Battalion. Reorganized and redesignated (less Company D) 15 October 1948 as 72d Heavy Tank Battalion, allotted to the Regular Army, and assigned to 2d Infantry Division (Company D concurrently redesignated as Company D, 2d Engineer Combat Battalion—separate lineage). Reorganized and redesignated 6 June 1950 as 72d Tank Battalion. (New Company D, 72d Tank Battalion, constituted 27 September 1954 and activated 10 October 1954 at Fort Lewis, Washington.) Relieved 8 November 1957 from assignment to 2d Infantry Division. Inactivated 25 June 1958 at Camp Irwin, California.

26th Tank Battalion inactivated 16 October 1945 at Camp Myles Standish, Massachusetts. Disbanded 23 March 1953. Reconstituted 25 January 1963 in the Regular Army.

Troop D, 23d Cavalry Reconnaissance Squadron, Mechanized, inactivated 15 October 1945 at Camp Shanks, New York. Redesignated 13 August 1954 as Company D, 23d Reconnaissance Battalion, and allotted to the Regular Army.

5th, 72d, and 26th Tank Battalions and Company D, 23d Reconnaissance Battalion, consolidated, reorganized, and redesignated 25 January 1963 as 72d Armor, a parent regiment under the Combat Arms Regimental System.

### Campaign Participation Credit

*World War II*  
Rhineland  
Central Europe

*Korean War*  
UN defensive  
UN offensive  
CCF intervention

First UN counteroffensive  
CCF spring offensive  
UN summer-fall offensive  
Second Korean winter  
Korea, summer-fall 1952  
Third Korean winter  
Korea, summer 1953

### Decorations

Presidential Unit Citation (Army), Streamer embroidered *HONGCHON* (72d Tank Battalion cited; DA GO 72, 1951)

Presidential Unit Citation (Army), Streamer embroidered *YONGSAN* (72d Tank Battalion cited; DA GO 81, 1951)

Republic of Korea Presidential Unit Citation, Streamer embroidered *NAKTONG RIVER LINE* (72d Tank Battalion cited; DA GO 35, 1951)

Republic of Korea Presidential Unit Citation, Streamer embroidered *KOREA* (72d Tank Battalion cited; DA GO 10, 1954)