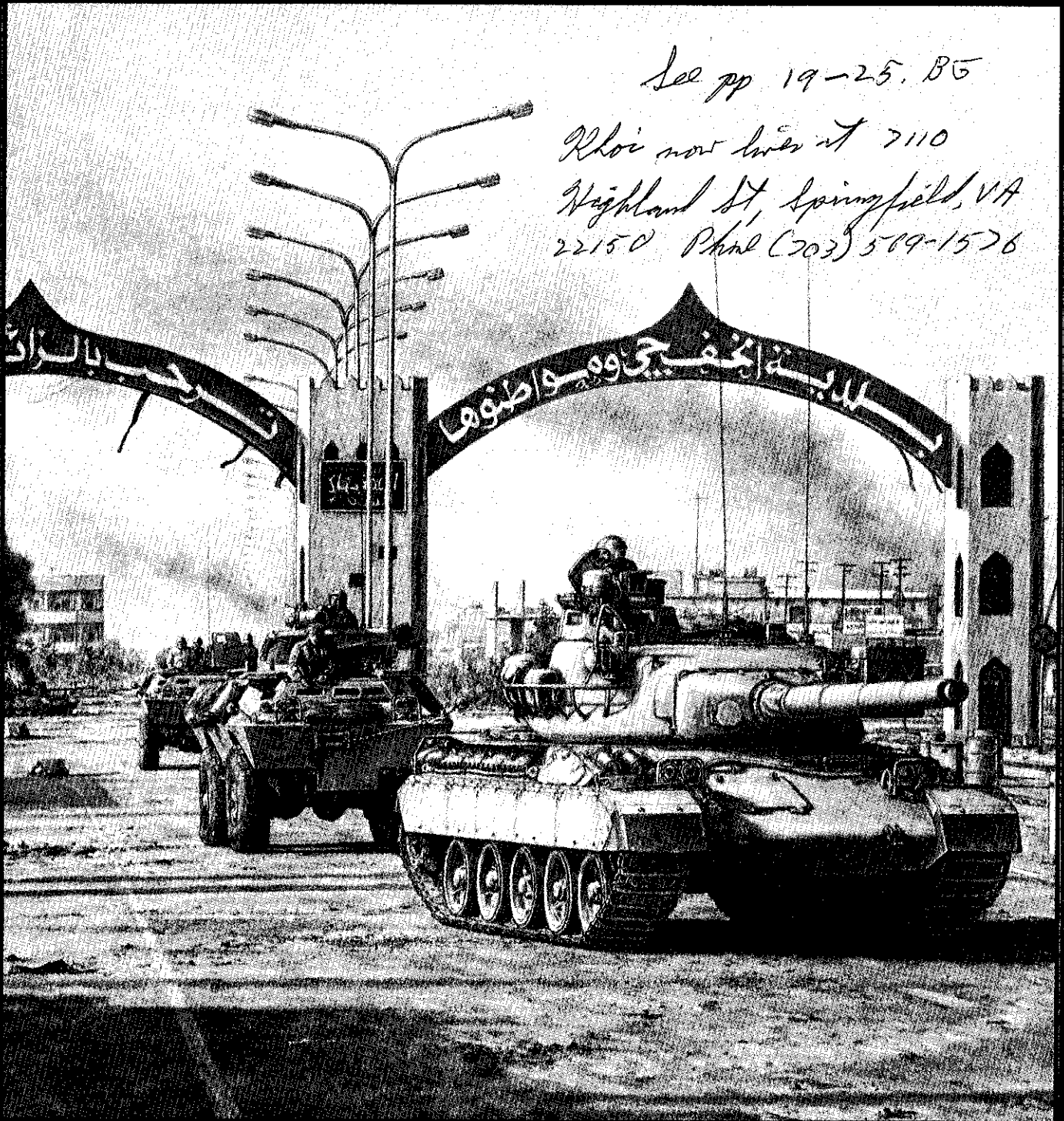


See pp 19-25. B5

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A couple of months ago, a private, semi-authoritative newspaper that often supplements official news channels ran an op-ed piece that bothered me. The columnist decried the choice of the First Armored Division as the main combat unit for our component of the NATO Implementation Force (IFOR). He said that it was the wrong force for the job; it was too heavy. The implications of that piece still upset me months later. Why? It is another tired addition to that flabby body of military analysis that periodically picks its head up out of the sand and says that tanks, and heavy operations in general, are dead. These analysts are often the same guys who still think the news media lost Vietnam, that the USAF destroyed all of Iraq's tanks, and that the force structure can never have too many special forces. This brand of military soothsaying unsettles me; I refuse to buy into it, and more importantly, I'm certain that some of our future adversaries won't have subscribed either. I urge you to resist this, and any other attack, on heavy units.

In nearly every conflict where our leaders have committed ground forces larger than a Special Forces "A" Team, armor has been a consideration, and sometimes even used. Recall those few, ancient, yet still trustworthy, M551 Sheridans snuck so cleverly into Panama in C-5 Galaxy bellies, satisfyingly seen blasting to the underworld parts of the corrupt dictator's command structure. How can we forget the too-late introduction of a heavy force into the Somalia mission, or the debate on whether to deploy it or not, a debate that some say helped bring down the SECDEF? Veterans of that deployment suggest that life improved — i.e., became safer — after the introduction of the armored task force. Of course, Desert Storm and Desert Shield were operations we had trained for at the National Training Center and during many home station training events. They were naturally heavy affairs.

Does anyone think that potential future hot spots won't have tanks involved? Yes, much of Korea is heavily urbanized, but we expect those M1A1s to figure heavily into our assured success in any future conflict there. Southwest Asia is still a cauldron of seething, centuries-old emotions where lots of well armed people still have imagined scores to settle. Our successes in 1991 demonstrated the relevance of tanks in that environment quite ably.

There are few substitutes for the many positive qualities a tank brings to your side of an argument. That gets me closer to the Bosnian situation. Yes, the road net above the valley floors is not impressive, and yes, tanks that weigh nearly 70 tons will tear them to pieces, earning the ire of the farmers and townspeople we are there helping to make safer. But send no tanks initially? Don't I hear the ghosts of policymakers for Somalia and Vietnam still advising that there is no viable armored threat, or that there is no trafficable terrain in those places as well? Hindsight shows that those people were thinking "in the box," and that they missed the value that armor was to play and should have played if used early.

Isn't a large part of the Bosnian mission one of deterring once bitter-foes from reigniting the hatreds that saw them kill their neighbors, and if that deterrence should fail, convince them to separate with whatever force needs applying, all the while minimizing our own casualties? That sounds like a job an armored task force can accomplish well. There is a reason why people — soldiers and civilians alike — stop to watch columns of Abrams and Bradleys roll by; they are awesome, fear-evoking monsters. Big machines. Lots of big guns. World-class soldiers and world-class reputations. That is why you send an armored division to Bosnia, not an airmobile one, and not a light one. I can't imagine that Mom and Dad want us to take their sons into danger without overpowering force if it's available. Force protection isn't some lip service buzzword that commanders gurgled out during their risk assessments. Our tanks offer a lot of force protection for their crews and for everyone else in the force. It is a whole lot easier to dial down your force and make it lighter as conditions improve than to piecemeal the force in a reactive mode.

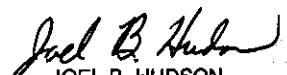
The next time you read a column or hear an interview by some self-appointed military expert who foresees the end of armor and heavy operations, call the guy to task. We know him to be wrong. Life is a whole lot different looking across the DMZ or through a gunner's primary sight than through a Beltway office window.

— TAB

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ARMOR

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Crusader Mobility Systems

Dear Sir:

We would like to thank you for your article on the Crusader System which appeared in the Nov/Dec 95 issue of *ARMOR*. It stated the case for modernizing the capabilities of the current U.S. self-propelled artillery force very well. Team Crusader (The Project Management Office, U.S. Army Field Artillery School and Contractors) is dedicated to providing the very best system for not only the Field Artillery, but for the Army and the U.S. taxpayer as well.

Toward this end, we conducted thorough studies and analyses prior to Milestone I to assess a variety of Crusader design approaches and alternatives. Among the alternatives considered were systems employing multiple variations of the M1A1 Abrams chassis, including the unmodified chassis, and the chassis with both minor and major modifications. Based on our analysis, we found that the design constraints imposed by the unmodified Abrams chassis compromised the overall design, resulting in a system incapable of meeting many of the user's most critical requirements. Modifications to the Abrams chassis alleviated some constraints and allowed for improved system performance, but it was still well short of user requirements.

In addition, our analyses provided several important pieces of information, some of which are outlined below.

- Replacing the Abrams torsion bar suspension with hydropneumatic suspension units (HSU) requires significant structural modifications within the lower hull; this has been verified during tests of an Abrams chassis modified to accept HSUs.
- Designs using the Abrams chassis cannot be reconciled with the user's combat loaded weight requirement of 55 tons. The basic Abrams hull structure (without armor boxes) carries a significant weight penalty due to the thickness resulting from the Abrams survivability requirement, a requirement which is not shared by the Crusader. The AGT-1500 power pack carries a fuel consumption penalty, particularly at idle which is a significant self-propelled howitzer operating mode.
- Extensive redesign of virtually all Abrams auxiliary systems, including fuel (tanks and lines), hydraulics, and cooling, is required for an Abrams hull-based howitzer application.
- New driver and crew stations are required to accommodate Crusader-unique crew requirements and operations/employment techniques.

With respect to the author's concept, we are obliged to note that the space claims for the AGT-1500 power pack necessitate

transverse power pack mounting to fit within the allocated space, an approach requiring significant engineering development at a considerable cost.

We acknowledge the benefits of commonality and plan to capitalize on existing commercial and combat vehicle systems (including the Abrams) whenever it is prudent to do so. Studies performed by the Program Executive Officer for Armored Systems Modernization (ASM) during AFAS/FARV Concept Exploration/Development revealed that component commonality offers the greatest cost and logistical contributions. Even if the Crusader chassis is not common with existing combat vehicles, many of its major components can be, including the track, road wheels, road wheel hubs/bearings, and drive sprockets, to name just a few.

In conclusion, although we have conducted extensive studies, including using the Abrams hull as a common chassis for Crusader, the concept of using this proposal introduces unacceptable operational performance deficiencies that become significant to overcome. Meanwhile, we welcome any fresh insights and cordially extend an invitation to Dr. Sharoni and Mr. Bacon to contact the Crusader Project Manager's Office if they wish to discuss the matter further.

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Product Manager
Crusader Mobility Systems

ROBERT D. FREEMAN
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Cannon Branch Chief,
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M1 Chassis AFAS Would Have Too Many Limitations

Dear Sir:

As a former active duty field artillery officer, I was assigned to the Gunnery Department of the Field Artillery School (USA-FAS), and have monitored the progress of the Advanced Field Artillery System (AFAS) with much interest. Therefore, I was glad to see that the future of this program has captured the attention of the armor community as revealed in the article, "The Common Chassis Revisited: Should the Next Howitzer Be Built on the M1 Tank Chassis?". However, my opposition to several of the points made in the article, has moved me to write in response.

In my opinion, the article's authors are possibly trying to further their own personal agenda at the expense of future readiness in the artillery branch. Their main points seem to be that, due to the expense and hard research involved in developing the technology which makes up the AFAS sys-

tem, we should instead settle for a "jury-rigged" weapon made up of components which are readily available now. While I do agree that some of the AFAS technology (such as the Regenerative Liquid Propellant Gun, RLPG) needs more time to "mature," I also feel that the risk involved in investing in the development of the program, is outweighed by the possible benefits it will bring. Even the authors agree that AFAS will serve as a "technology carrier" which could produce innovations used in future combat vehicles.

In principle, I agree with the authors on the concept of a common chassis, and the benefits derived from commonality among combat vehicles in our future heavy units. However, I do not believe that the M1 chassis is the vehicle that will carry the army in the future "Force 2000." The M1 is a remarkable, battle-tested system, but it is now reaching the limits of its potential for development. The authors admit that the M1 should be out of active service around 2020-2025. Between now and then, the current M109A6 "Paladin" howitzer system should be able to adequately support an M1A2-equipped force. The Paladin is more than equal to the task and will be fully fielded soon. To settle for an M1-based AFAS as a quick fix would be selling ourselves short in the long run.

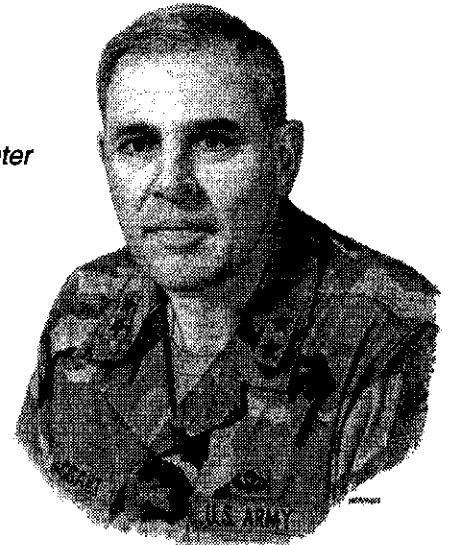
I believe that investing in the development of an entirely new chassis for the AFAS and FARV could provide a candidate future armored family of vehicles for 2020 and beyond. In times such as now, when R&D funding is scarce, we need to cooperate as branches for the good of the entire force. AFAS is one of the few weapons programs that still has avid support from the congressional defense policy makers. With the support of the infantry and armor community, the Crusader program may prove to be the best possible "testbed" for the development of the next generation tank or infantry fighting vehicle.

The authors' support for the 155mm L52 cannon coupled with the Modular Artillery Charge System (MACS) as the armament for the AFAS shows the nearsightedness of their thinking. I feel that this strategy is better suited to an armament upgrade of the M109A6 Paladin. We should commit ourselves to developing Regenerative Liquid Propellant technology. Bringing this system to maturity would allow us to set a future standard. It would also be the greatest innovation in cannon technology since the introduction of smokeless powder. In the interim, the AFAS developers have already identified the need to procure the "Unicharge" system as a backup to augment the RLPG.

While my main opposition to the proposed M1 AFAS is based on the philosophy behind its development, I have also noted some technical problems with the de-

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MG Lon E. Maggart
Commanding General
U.S. Army Armor Center



Mentoring — A Critical Element in Leadership Development

The Army is recognized around the world for its exceptional leader development programs. No other army has a system equal to ours. We have made great strides in counseling our subordinates to help them improve their performance. We are indeed very good. But the fact is, turbulence in the Army has created the need for a more personal approach to taking care of people.

The knowledge, skill, and experiential requirements placed on leaders today may well exceed the capacity of our formal education system to develop future leaders capable of dealing with the complex problems they will face.

As the Army grows smaller, we require our soldiers to perform increasingly more complex tasks, often in jobs for which they have insufficient experience or training. We ask our soldiers to work more efficiently and to produce quality work in diverse areas, like digital operations and experimentation on future force structures, on which precious little precedence exists.

It is up to all of us to give our subordinate leaders the best possible chance for success. Clearly, one of the easiest ways to do this is through mentoring. The personal mentorship between senior and junior leaders is essential in filling the information gap. Mentorship provides another avenue to help motivate, educate, and guide quality people to higher levels of performance.

Mentoring may be the critical missing key to help compress the learning curve of young leaders. In today's world, there is much to know and so little time to learn it that mentoring may be the best way to ensure professional development and survival on the battlefield. The mentor can help his subordinates sort through information overload and surface what is really important.

Mentorship has a self-perpetuating effect as well. Leaders who have been well mentored tend to become great mentors themselves. The bond of trust and confidence that results from a mentoring relationship lasts a lifetime. Mentoring provides a unique opportunity for young, upcoming leaders to have a permanent, personal linkage with experienced senior officers who have demonstrated professional competence, outstanding leadership, and intellectual ability.

The best mentoring comes from a personal commitment between the senior and junior, rather than through some type of assignment process. Mentoring may well occur outside of normal command relationships or branches. In fact, mutual trust and confidence must exist between the mentor and those whom he mentors long before a permanent mentoring relationship begins.

Mentoring may take several forms. It may be strictly related to branch issues, advanced warfighting concepts, or

through intellectual engagement. The subjects that can be discussed are unlimited, ranging from officership to theoretical constructs. It is up to the mentor to decide which areas are ripe for exploration and for those mentored to seek information which meets their specific needs.

Mentoring can be transformational for both the mentor and those mentored. Each learns from the other as they work together over the course of time. For the mentor, it is a way to influence the progress of bright, young leaders. Collective wisdom gained from years of experience is passed from senior to junior leaders as a bridge between the past and the future. The mentor gets the pleasure of watching young leaders grow and progress far beyond the level that could have been achieved otherwise. Those who are mentored learn, grow, and mature.

The mentor also gains access to what subordinates are thinking and insight on what is working well and what isn't. The mentor will gain invaluable and honest feedback from those who make the organization work. The mentor can use those who are mentored to help impart new ideas and ways of doing business throughout the organization and beyond. Mentoring provides both security and courage to those mentored. Security occurs because there is someone

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CSM Ronnie W. Davis
Command Sergeant Major
U.S. Army Armor Center



Creativity — The Soldier's Vision

Creativity — your vision of how to do things better, more efficiently, for optimum effectiveness — enhances our opportunity to improve the Army and its ability to fight and win tomorrow's battles.

Fort Knox's Directorate of Force Development, previously the Directorate of Combat Development, has one overriding mission — to modernize the force as we enter the information age. They also provide combat development interface for the armored force with industry, other government agencies, and allied nations.

One of the key programs managed by the directorate that directly impacts armor soldiers is the Soldier Enhancement Program (SEP). The program is a Congressionally-funded initiative that began in 1989 to increase the combat effectiveness of soldiers. Some of these items are already in use. They include lighter, more comfortable load-bearing equipment, field gear, survivability items, communication equipment, and navigation aids. The intent of the SEP is to quickly field (within 2-3 years) promising developmental and commercial off-the-shelf items. The program bypasses many of the steps in the current acquisition process.

For efficiency, the program is divided into categories and between proponents:

- Dismounted Soldiers: The United States Army Infantry School (USAIS)

- Combat Crews (Ground): A joint effort between The United States Army Armor School (USAARMS), and The United States Army Infantry School (USAIS)
- Combat Crews (Air): The United States Army Aviation School (USAVNS)
- Other Soldiers: Combined Arms Support Command (CASCOM)

These organizations are responsible for the identification, idea generation, documentation, and development of materials needed to eliminate battlefield deficiencies.

SEP is a team effort that begins with the Army's most valuable asset, the individual soldier. The program solicits suggestions from individual soldiers, commanders, and other combat development organizations. These suggestions are evaluated and documented. Those selected are taken through a series of steps which indicate either off-the-shelf procurement or contract development. To meet a crisis or rapid deployment situation, SEP can recommend emergency procurement, surge production, or special modifications of current equipment. Once the item is procured and field tests are conducted, the item is issued to soldiers in the field.

Some programs initiated under SEP are: The ambidextrous shoulder holster (ASH), a shoulder holster, usable by both right- and left-handed soldiers; the thellie suit, a camouflage-pattern suit that suppresses the thermal signature of

the wearer; the mounted crewmen boot, an all-weather, safety combat boot designed specifically for mounted warriors; and the mounted crewman compartmented equipment bag (MCCEB), a water-resistant compartmented bag to store and secure equipment as a supplement to the duffel bag and ALICE rucksack. These ideas weren't developed in a secret laboratory or an Army "think tank." They came from individual soldiers, like yourself looking for a better way to do business.

The Soldier Support Branch of the Directorate of Force Development manages SEP for Fort Knox. If you wish to submit material you can do so either by calling DSN 464-4794 or commercial (502) 624-4794. The E-mail address is AINSWORR@KNOX-EMH1.ARMY.MIL, or write to: Commander, USAARMC, ATTN: ATZK-FDS (SGT Ainsworth), Fort Knox, KY 40121-5000.

Your proposal should contain: the item's description, objective, application, possible commercial source of procurement, whether the proposal will replace an existing item, and if the item is used by a sister service. Finally, include your name, rank, organization, and telephone number. SEP was developed to harvest the wealth of knowledge of the force. Your participation in the program will enhance our ability to improve equipment and increase the survivability of our Army. The program is in place; now all we need is your imagination to make it a success!

The Saudi Arabian National Guard Motorized Brigades

Wheeled Armor Plays a Big Role In the Kingdom's Internal Security Mission

by Lieutenant Colonel Martin N. Stanton

Wheeled armored organizations are gaining new interest throughout the world as technology allows wheeled vehicles to mount larger guns and perform a more diverse range of missions. Cheaper production and maintenance costs make them attractive to many nations seeking more "bang for their buck." Additionally, although not suited to all terrains, wheeled armor is surprisingly adaptable.

Among the most dynamic and innovative wheeled armored organizations in the world today are the motorized brigades of the Saudi Arabian National Guard (or SANG). These two brigades (expanding to three) are the epitome of a robust force structure built around specific mission requirements, yet it is still very adaptable to other roles and missions.

The mission of the motorized brigades is to provide internal security within the Kingdom of Saudi Arabia, particularly for the oil fields in the Eastern Province. They provide quick reaction forces to the guard mounts and light vehicle-borne patrols that provide the actual site security. In addition, the brigades' internal security mission requires them to be able to quickly move anywhere in the kingdom to conduct a full spectrum of internal security operations. Lastly, in time of war, the brigades will fight alongside the MODA (Ministry of Defense and Aviation) forces in defense of the kingdom.

A key consideration in the design of the TO&E for the SANG motorized brigades was self-deployability. Saudi Arabia does not have the rail infrastructure to transport armored units quickly within its borders. It does, however, possess a modern road infrastructure supported by many improved dirt tracks into the hinterlands.

Wheeled vehicle mobility is quite good throughout the country. It followed that in this particular case, a wheeled armored organization had several key advantages over a tracked one. Wheeled armored vehicles would not require heavy equipment transporters, instead being able to self deploy along the nation's highways. In addition, most of Saudi Arabia's deserts are hard-packed sand, as opposed to dunes. A wheeled armored force can travel over 90 percent of Saudi terrain with only the worst dunes or most inaccessible mountain regions being untrafficable.

Motorized Brigade Organization

Currently there are two motorized brigades in SANG. The Imam Mohammed Bin Saud Brigade (IMBSB) is in Riyadh, and the King Abdul Aziz Brigade (KAAB) is stationed in Al Hofuf in the Eastern Province south of Dammam. They are identical in organization and almost identical in equipment, the major difference being in the anti-tank platoons of the line companies and in the artillery battalions' cannon systems (M102 vs M198).

Each of the brigades has over 5,000 soldiers and is organized as a combined arms command with four maneuver battalions — the IMBSB with the 1st, 2nd, 3rd, and 4th Combined Arms Battalions (CABs), and the KAAB with the 5th, 6th, 7th, and 8th. Each brigade has an artillery battalion, the 1st SANG artillery battalion with the IMBSB with M102 105mm howitzers and the 2nd with the KAAB has 155mm M198 towed howitzers. There is no automated fire direction system like TACFIRE; however, all missions are plotted using the Back Up Computer System (BUCS) with a manual com-

puter and check computer. Each brigade also has an organic air defense battery with four platoons of four Vulcan 20mm antiaircraft systems and a newly-formed Stinger platoon. The CS and CSS units organic to each brigade include a reinforced company (really a small battalion) of combat engineers with heavy equipment, a signal company, an MP company, and a robust logistical support battalion that is capable of supporting the brigade on sustained operations in a desert environment.

The key differences between the brigades (besides artillery systems) is the number and type of weapons systems in the antitank platoons of the line companies. The IMBSB line companies have only two TOW systems; in the KAAB, they have six. In addition, the 90mm guns in the KAAB are the more powerful Cockerill type. The IMBSB 90mm are of the less capable Mecer variety. These differences make the KAAB the most potent of the two brigades. In summary, the motorized brigade organization resembles that of a light cavalry unit with a large number of dismountable infantry, over 200 per battalion.

A Family of V150s

The first SANG motorized battalions began fielding in the mid- to late-1970s. The family of vehicles chosen for the motorized brigades was the Cadillac Gage V150. It was versatile, robust mechanically, fast (50-60 mph across open desert), and easy to maintain. The SANG operated 10 variants of the V150, to include:

- Armored Personnel Carrier
- 90mm Cockerill cannon turret
- 90mm Mecer cannon turret

- 20mm Oerlikon cannon turret
- Dual Machine Gun Turret (.50 cal/7.62)
- TOW 1 (pedestal version)
- 81mm Mortar
- Vulcan Air Defense system
- Recovery
- Command
- Ambulance

With the exception of the turreted systems, the TOW vehicle and the ambulance, all of the V150s carry an M2 .50 cal MG. The Saudi rifle squads carry FN/FAL rifles and FN 7.62 MGs. For antitank weapons, they have Carl Gustavs and later added Armor Piercing Infantry Light Arm Systems (APILAS). Radios were British RA-CAL, both HF and FM (which caused many interoperability problems with U.S. forces during the Gulf War.)

Tactical Employment Concept

The motorized brigades are capable of performing many of the Mission Essential Task List (METL) tasks of an armored cavalry regiment. The basic METL of the SANG motorized brigades includes the following tasks:

- Screen
- Delay
- Attack
- Defend

It was recognized that the brigades did not have the armor or firepower to stand head-to-head with armor units (i.e., perform "No penetration" guard missions). However, at the same time it was felt that the speed and mobility of the organization, along with its TOW and light cannon systems, would make it valuable in a cavalry role. The brigades could screen an extremely wide sector due to the large number of vehicles and the four battalion organization. Employed correctly, the SANG motor-

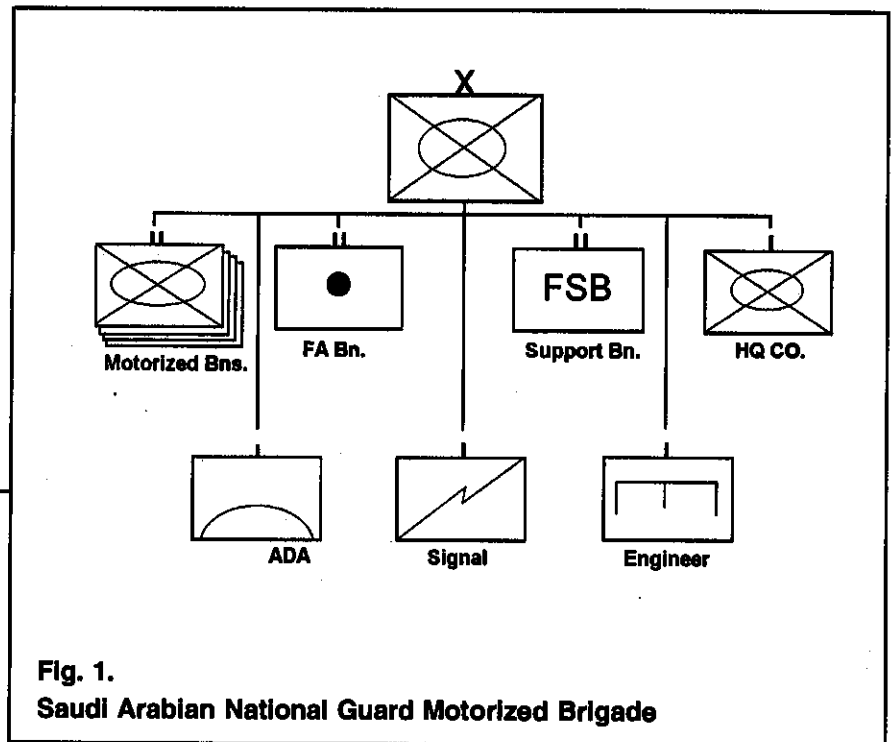


Fig. 1.
Saudi Arabian National Guard Motorized Brigade

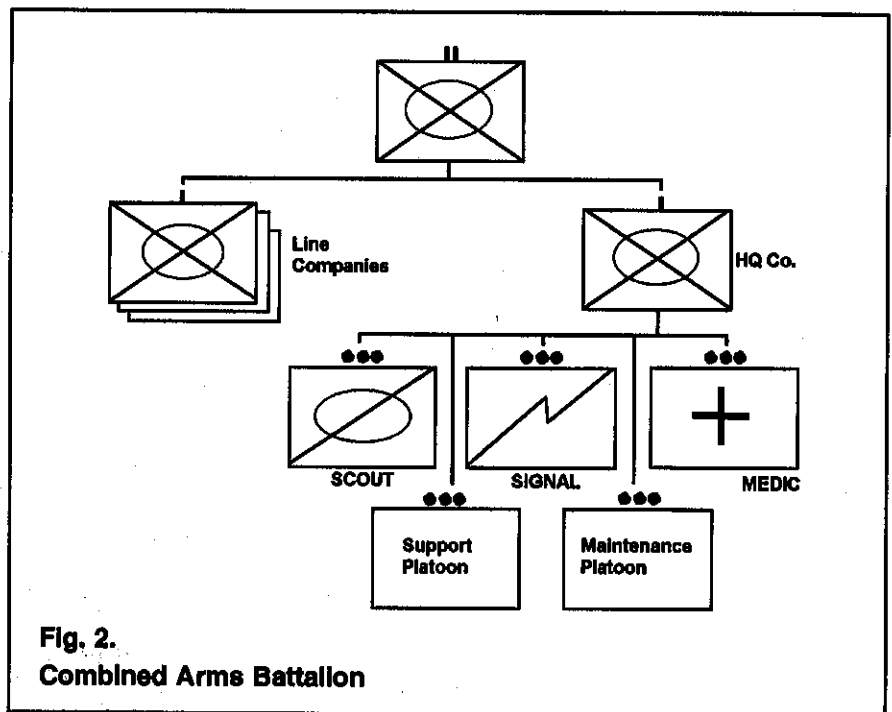


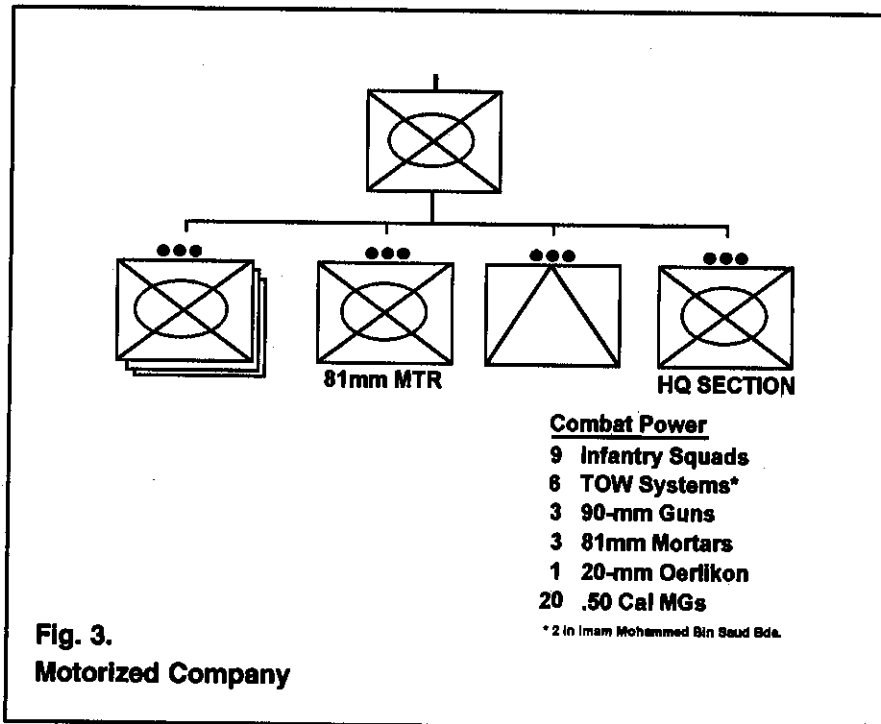
Fig. 2.
Combined Arms Battalion

ized brigades are more than adequate to strip off an enemy's screening or reconnaissance elements, halt an advance guard, and force an enemy to deploy main body elements from march to battle formations. The speed of the V150s would then allow the SANG elements to conduct a quick withdrawal to the next delay position. Additionally, in favorable circumstances (i.e., augmented

with tanks), the brigades could also conduct conventional attack and defend missions.

Active Employment

During the Gulf War, the KAAB was the first coalition unit to confront the Iraqis on the southern Kuwaiti border.



Receiving the deployment order on 4 August, the KAAB closed the border and took up screening positions on 6-7 August. For over two weeks, the KAAB was the only element screening between the Iraqis and the coalition units building up to the south. The IMBSB was held in reserve at Riyadh for the duration of the war.

The KAAB's baptism of fire came in the battle for Khafji from 29 Jan-1 Feb 1991. During this time frame, a series of battles took place from the point where the heel of Kuwait turns north, to Khafji on the Arabian Gulf (see Map 1). While the U.S. Marines correctly receive the credit for stopping two of the Iraqi thrusts into Saudi Arabia, the actual battle of Khafji itself was almost entirely an Arab battle.

The Iraqi attack on Khafji began on the late evening of the 29th of January when an (estimated) brigade-sized element of Iraqis crossed the border north of Khafji. The Iraqi forces that attacked and occupied Khafji were from the 5th Mechanized Infantry Division, a formation that had been in reserve behind the Iraqi forward defensive belts. The division passed through the defensive belts and split into two columns, one moving towards Wafra, the other headed due south for Khafji. By 0130 on the 30th, observation posts north of Khafji reported they were under enemy attack and began to withdraw. By 0300, Khafji was in Iraqi hands. But unknown to the Iraqis, two USMC reconnaissance teams had gone to ground in

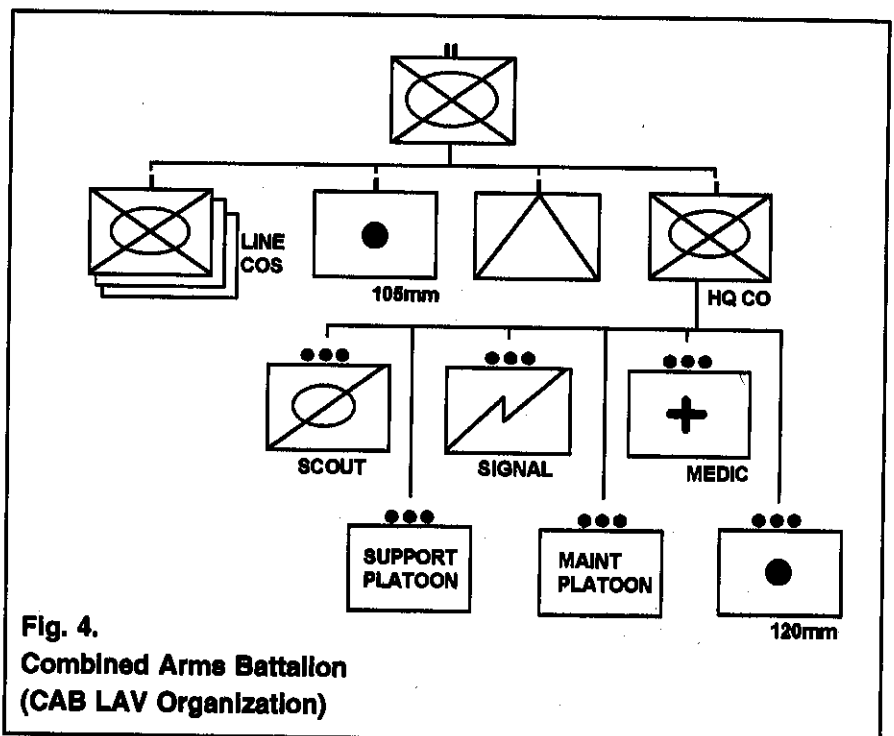
the town and were reporting on Iraqi movements.

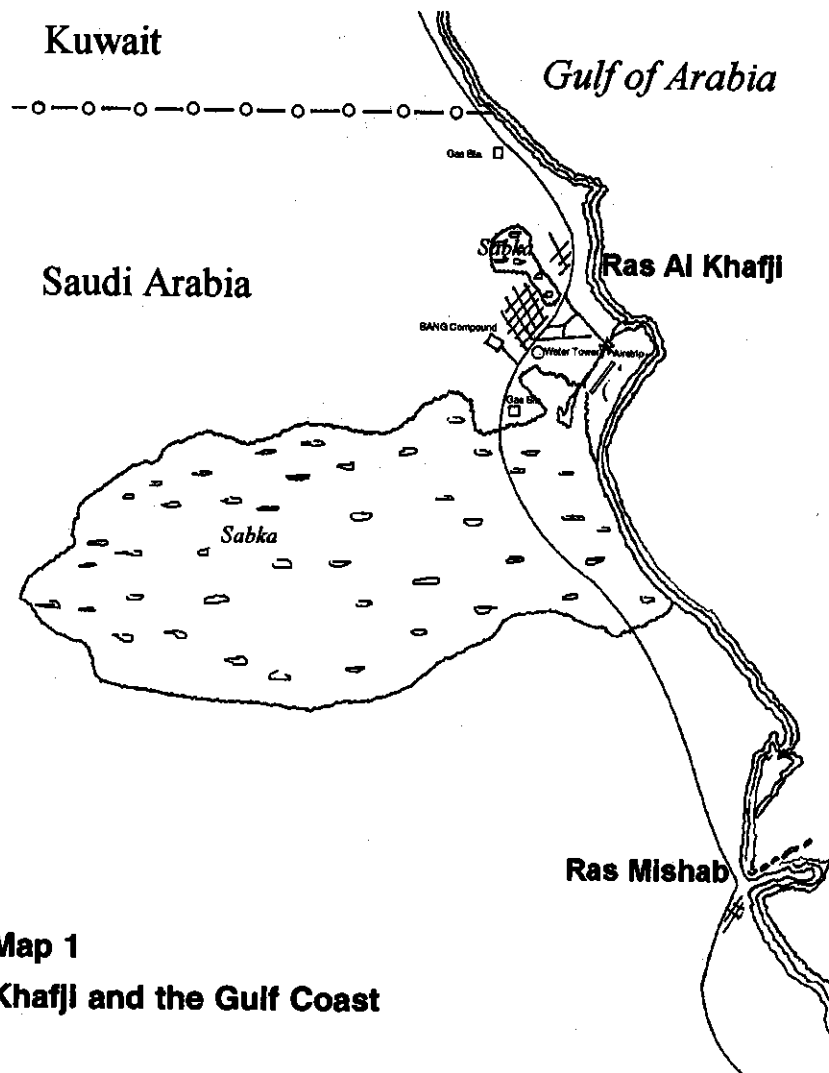
At approximately 1500 on the 30th of January, the KAAB was given the order from the Eastern Division to detach a battalion and contain the enemy in Khafji. At 1600, the 7th CAB was given the mission. For the purposes of this attack, two Qatari tank companies with French AMX-30s were attached to the battalion. The battalion commander

(LTC Matar) was given little intelligence and no time to conduct any reconnaissance. The battalion moved out shortly after 1700 and was accompanied by the U.S. battalion advisor, LTC Taylor, and his assistant, MSG Middleton.

When the 7th Battalion reached the gas station three kilometers south of Khafji, they encountered elements of the 3-3 Marines (see Map 2). At about this time, the 7th Battalion had its mission changed by the Eastern Division from screening south of the town to re-taking Khafji.

The scheme of maneuver developed by LTC Matar involved attack along the road with two companies abreast with a third in reserve. The lead companies would be accompanied by the Qatari armor. The scheme of maneuver was drawn up with only very rudimentary knowledge of the positions and strength of the enemy. In spite of the reporting by the Marine observer teams, there was still considerable confusion as to the Iraqi strength in the town. At this point, most of the Coalition forces were still under the impression that the Iraqis in Khafji were only in reinforced company or battalion mi-





Map 1
Khafji and the Gulf Coast

nus strength. As it turned out, elements of three Iraqi battalions reached the town.

Prior to the attack on Khafji, further delays were experienced trying to clear prep fires with the supporting USMC artillery. At 2300, the battalion began moving forward towards Khafji from its positions south of the town.

As they advanced towards Khafji, the 7th Battalion was met by intense direct fire from the town. LTC Taylor, a veteran of infantry combat in Vietnam described the volume of enemy fire as "flabbergasting." The initial Saudi attack was halted outside of Khafji with the National Guard companies and attached Qatari tanks exchanging fire with the Iraqis for over two hours. Finally at 0320, the 7th CAB commander ordered a withdrawal to behind the National Guard barracks compound adjacent to Khafji, temporarily breaking direct fire contact with the enemy, although intermittent tracer fire could still be seen coming from Khafji.

After the initial setback, the Brigade ordered 6th and 8th CAB each to cross-attach one company to the 7th CAB and ordered the 7th CAB to attack again at 0730. The 7th CAB attack was to be coordinated with an attack by the 5th CAB and a MODA tank battalion that would take place to the northwest of the town. It was decided that the 7th CAB would attack the southeastern part of Khafji with three companies, keeping the two attached companies in reserve. The MODA forces were to take the southwestern part of Khafji. From there, the Saudis would work their way south to north to secure the town.

By 0830, the attack had commenced with 7th CAB driving into the southeastern portion of town, meeting heavy but largely inaccurate fire. Most of the Saudi fatalities that occurred in this attack were from two catastrophically destroyed V150s. The 7th CAB commander committed his reserve of two attached companies to attack along the

southwestern part of town. The battalion made good progress and knocked out numerous Iraqi vehicles in the streets of Khafji. At 1000, the remainder of the 8th CAB under LTC Hamud was ordered by brigade to begin moving immediately to Khafji, along with several attached antitank platoons from the 6th CAB. Meanwhile, at 1000, the 5th CAB under LTC Naif had moved to engage and destroy an Iraqi company along the main road north of Khafji, knocking out 13 tanks and APCs and capturing six more, along with 116 prisoners, for the loss of two KIA and five WIA. After destroying all of the Iraqi forces in view and securing their prisoners, the 5th CAB withdrew about four kilometers to positions to the northwest of the SANG compound. This withdrawal was perhaps the most serious tactical error on the part of the SANG during the battle because the road from Khafji was vulnerable to being cut. Had the 5th CAB moved astride the road in a blocking position, they could have cut off all of the Iraqis in Khafji. Because of this failure, a few Iraqi vehicles managed to escape, although more could have taken advantage of this failure to block the road than did.

The attack in the town continued with the attached company of the 8th CAB making contact with and relieving the Marine observer teams at 1200. The remainder of the 8th CAB reached Khafji around 1330, linked up with the 7th CAB, and took over the northeast sector of the town. The attack continued with the two SANG battalions clearing most of the southern portion of the town. Around 1830 (dusk), the attack was discontinued with 7th CAB withdrawing to the SANG compound to rearm and the 8th CAB remaining in place within the town.

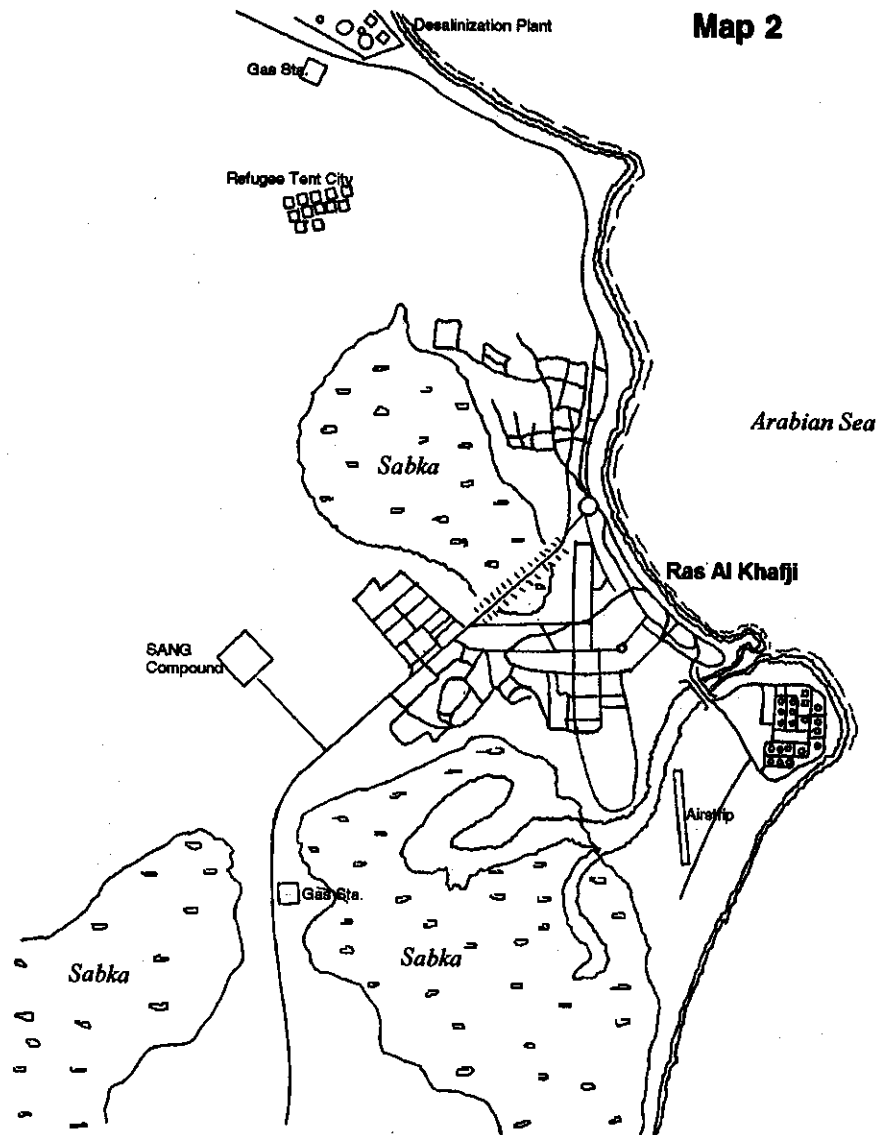
At this point, Iraqi remnants — approximately two companies and 20 AFVs — were still in the northeast part of the town. However, no attempt was made by the Iraqis to break out the night of the 31st, in spite of the fact that the road was not blocked.

The next morning (1 Feb), the attack was resumed at 0730 with the 7th and 8th CABs (+) attacking abreast, initially with the 8th CAB, then shifting south to clear the southern half of

Khafji. The 7th CAB advanced to the north to eliminate pockets of Iraqi resistance in northern Khafji and near the water desalinization plant. Iraqi resistance was sporadic, with most Iraqi soldiers surrendering upon being engaged. All remaining Iraqi armored vehicles in the town were destroyed or captured and the few remaining Iraqi soldiers who were not taken prisoner became fugitives among Khafji's deserted buildings. Meanwhile, the 5th CAB and MODA forces moved to the north and west of the town but never actually succeeded in cutting the road. Several Iraqi vehicles attempting to escape were destroyed either by Saudi TOWs or USMC attack helos. Later in the afternoon, the 7th CAB shifted to the west and the 8th CAB moved north abreast of the 7th to occupy positions forward of the desalinization plant. By 1500, the battle for Khafji was over, and the Saudis were consolidating to the north of the town.

The coalition casualties consisted of seven V150s of various types and two Qatari AMX-30s (which were subsequently recovered). Most of the V150s were knocked out by RPG-7 fire in the close-range fighting inside the town of Khafji, although one of the two that was a catastrophic kill was hit by a 100mm main gun round from a T-55. Two of the destroyed V150s were catastrophic kills with 100 percent crew casualties. The others were abandoned by their crews after being disabled. Some of these were burned out after being abandoned. A few Saudi vehicles were hit by 12.7mm MG fire, but none were disabled. Saudi forces suffered 18 dead and 50 wounded in the battle with most of the dead coming from the two killed V150s.

Iraqi casualties were much heavier, the author personally having counted 81 burned out hulks in and around Khafji. Most of these vehicles were Chinese Type 63 APCs or T-55/59 tanks. Some of the tanks had Iraqi-manufactured add-on armor. In addition there was one MTLB and a pair of SP 122s, as well as a half dozen soft-skinned wheeled vehicles among the enemy wrecks. A dozen of the type 63 APCs were taken intact. The enemy lost approximately 60 dead and 400(+) prisoners. The most effective direct fire antiarmor weapons against the Iraqi ar-



mor were TOW 1 missiles and 90mm Cockerill guns of the Saudi V150s and the 105mm guns of the Qatari AMX-30s. By far the most Iraqi armored vehicle kills were to air and ground launched TOW missiles, although surprisingly, several T-55s had to be re-engaged several times before they were completely destroyed. The TOW was effective in all cases against the Type 63 APC, with numerous spectacular catastrophic kills (several of which had roadwheels flung over 100 feet into the air). The 105mm of the Qatari tanks was successful against all armor encountered. No evidence of 90mm Cockerill hits on Iraqi T-55s could be found but the Cockerill gun was effective against the Chinese Type 63 APC with several catastrophic kills and numerous penetrations. In addition, some of the Type 63 APCs were knocked out by shoulder-fired Carl Gustavs (most

after they had been abandoned). Most Iraqi vehicles in the town evidenced numerous .50 cal MG strikes, but there was no way of determining if the damage had any impact on the cause of the vehicles' demise. The Iraqi armor at Khafji was also engaged effectively by USMC AH1s and high performance aircraft (USAF, USMC) as well as 155mm field artillery.

The SANG motorized brigade organization had proven that it could persevere in a stand-up fight with armored opponents. The cross-attachment of Qatari tanks and the massive expenditure of TOW missiles, as well as all other classes of munitions, literally smothered the Iraqi forces with fire. Significantly, much of the fighting was at close quarters within the town itself, where supporting arms did not play as critical a role. The Saudis commented

on the maneuverability of the V150 versus that of the Iraqi T-55s and type 63 APCs.

For the remainder of the war, the King Abdul Aziz Brigade secured Khafji and conducted artillery raids across the border. During the coalition offensive, its engineers breached the border berm and the first Iraqi obstacle belt to allow the other brigades of the Eastern Coalition division to pass through. The KAAB's FA battalion was cross-attached to division control, and the brigade itself was given the mission of MSR improvement and security in southern Kuwait.

The Future LAV 25s

SANG is currently in the process of reequipping its motorized brigades with LAV variants. The variants included are the basic LAV 25, the LAV recovery, command and control, ambulance, AT (with the Emerson turret), air defense, and 120mm turreted mortar system. The SANG is also funding the development of the LAV 105 with a soft recoil 105mm tank gun.

The organization of the motorized brigades will be identical in terms of number and types of units. LAVs will generally replace V150s in the CS and

CSS units. The difference in the new organization will be in the battalions. Each combined arms battalion will consist of three LAV 25 companies, one LAV AT company, and one LAV 105 company. The scout platoon will have LAV 25s, and the battalion heavy mortar platoon will consist of two sections of three LAV 120mm mortars each. The switch to single-system companies reflects SANG's recognition of the superiority of this type of organization following studies conducted in the late 1980s, when the replacement for the V150 was being sought. This decision was cemented by SANG experience in the Gulf War (the multi-system company being too cumbersome, especially in the employment of company mortar platoons).

Summary

Uniquely adapted for sustained operations in the harsh desert environment of Saudi Arabia, the SANG motorized brigade organization (both present and future) represents an innovative approach to what can be accomplished with wheeled armor. By itself, an extremely potent internal security force, the SANG motorized brigades, when employed in conjunction with the Royal Saudi Land Forces, represent the

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concept of a wheeled cavalry regiment in its most mature form. The SANG motorized brigades offer tremendous capability in terms of troops employed and the cost of the units to field and maintain. They represent a very successful example of sound force structure decision-making on the part of the Saudi government.

Commander's Hatch (Continued from Page 4)

with whom to check signals. Courage comes from knowledge.

The mentor provides focus for the natural curiosity of young leaders to learn and explore the various components of soldiering. The mentor serves as a guide to help young leaders gain the most from beneficial experiences while helping them avoid the pitfalls. The mentor can teach the art forms essential to the application of advanced tactics, battle command, and a thousand other equally important topics. The mentor can expose young officers to expert knowledge on the subtleties of operational art and strategic thought. And perhaps most importantly, the

mentor can model the values and war-fighting spirit so important for the mounted force and the Army.

Mentoring brings for both parties exhilaration and exhaustion. There is no greater satisfaction than teaching or learning something new and useful. However, considerable energy must be extended to challenge and teach even a small group of bright, young leaders; for those mentored, there is an expectation of performance to a higher standard.

Mentoring offers unparalleled opportunities now to build the mounted force of the future. If you are a battalion

commander and are not mentoring several promising young officers, you are behind the power curve already. Mentoring may be the single easiest way to develop our young leaders. But to do so, each of you must be willing to commit the time necessary to do it right, and to set the conditions so that your young leaders will seek you out as their mentor.

Mentoring is critical for growing future mounted warfighters. It is up to us to provide the guidance and inspiration to give them the tools to do in the 21st Century what we did in Desert Storm.

ON THE WAY!

Scouting at 52° Below

An Introduction to the Arctic Cavalry

by Captain Keith Sharples
and First Lieutenant Ken Dobert

With the downsizing of the U.S. military, it is interesting to note the activation of a truly unique — perhaps the most unique — American cavalry unit.

On 16 June 1994, A Troop, 4th Squadron, 9th Cavalry (recently reflagged as E Troop, 3rd Squadron, 17th Cavalry), was activated at Fort Wainwright, Alaska, as the cavalry troop for the newly formed 1st Brigade, 6th Infantry Division (Light).

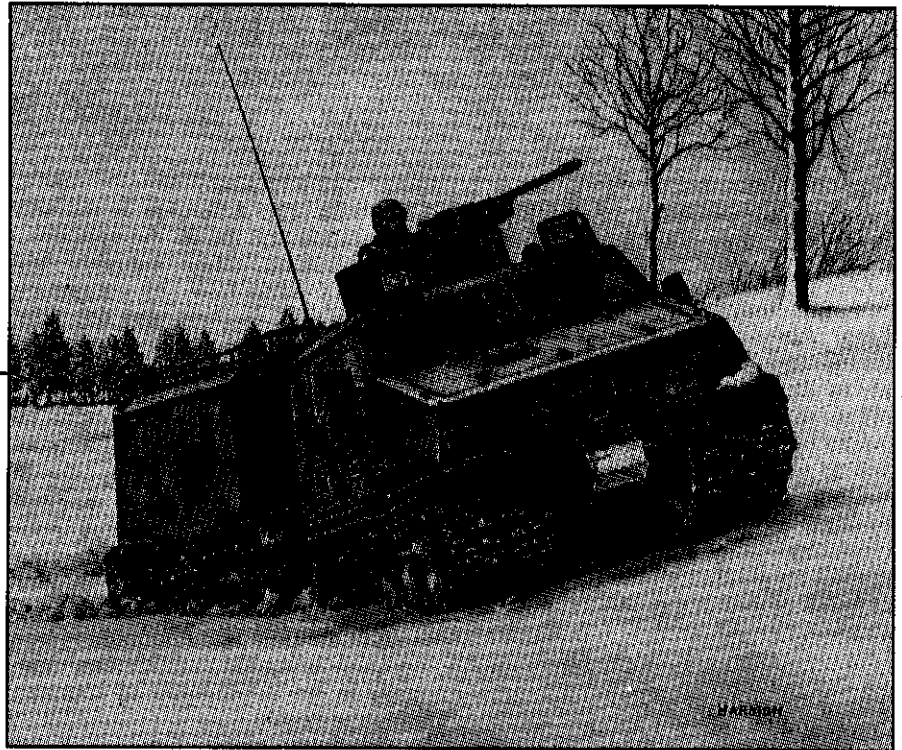
Echo Troop, "Arctic Recon," enjoys the distinction of being the only separate light cavalry troop and the only Arctic-trained and equipped cavalry unit in the U.S. Army. Because E Troop is the first ground cavalry to operate at Fort Wainwright in many years, the armor and cavalry communities have little familiarity with the type of environment and organization.

The deactivation of the 6th Infantry Division (Light) and its accompanying 4-9 Reconnaissance Squadron created a need for a new cavalry unit in Alaska. The 1st Brigade, 6th ID (Light), despite its misleading name, is a separate infantry brigade (SIB), aligned administratively under the 10th Mountain Division. Headquartered at Fort Wainwright, Alaska, the brigade actually falls under the control of the United States Army, Alaska (USARAK) and the United States Army, Pacific (USARPAC). It is a completely self-sufficient, rapid deployment force of three light infantry battalions, (one of which is airborne), one field artillery

battalion, and a support battalion. The 1st Brigade is the largest SIB in the U.S. Army, and has its own military intelligence company, engineer company, signal company (MSE), long-range surveillance detachment (LRSD), headquarters and headquarters company (HHC), and of course, its own ground cavalry troop. (Fig. 1)



Until its deactivation in June 1994, the 4th Squadron, 9th Cavalry was the divisional cavalry (reconnaissance) squadron for the 6th Infantry Division (Light) and consisted of a headquarters and headquarters troop (HHT) and two air cavalry troops equipped with OH-58 and AH-1 helicopters. The ground cavalry troop, which the squadron was authorized, was a round-out unit from the Army Reserves, stationed in Madison, Wisconsin. With the announcement of the deactivation of the 4th Squadron, 9th Cavalry, an immediate need arose for an active duty ground troop to be organized at Fort Wainwright to support the SIB.



Troop Organization and Equipment

The current Modified Table of Organization (MTOE) for the arctic cavalry is based on the ground troop of the reconnaissance squadron with additional support sections, to include mess, medical, fuel, cargo and maintenance assets. The troop's authorized strength is six officers and 93 enlisted, including an Arctic MTOE authorization of three mechanics for Arctic vehicles and equipment.

The troop's platoon organization (Fig. 2) is significantly different from the scout platoons outlined in FM 17-98, *The Scout Platoon*. Because E Troop is based on the light infantry division's reconnaissance squadron ground troop, there are some interesting characteristics not found in other cavalry troops. One difference is the use of six High Mobility Multipurpose Wheeled Vehicles (HMMWV) instead of ten in each scout platoon. Organizationally and, to a lesser extent, tactically, the Arctic cavalry platoons most closely resemble the six-vehicle Cavalry Fighting Vehicle platoon. Other characteristics include the absence of mortars at the troop level, the presence of an eight-HMMWV cargo section, and the Arctic MTOE authorization of 14 Small Unit Support Vehicles (SUSVs).

There are two platoons of six hard-topped HMMWVs each. The scouts come equipped with M1025 HMMWVs armed with MK19 grenade launchers, M60 machine guns, and .50 caliber

SIB TASK ORGANIZATION

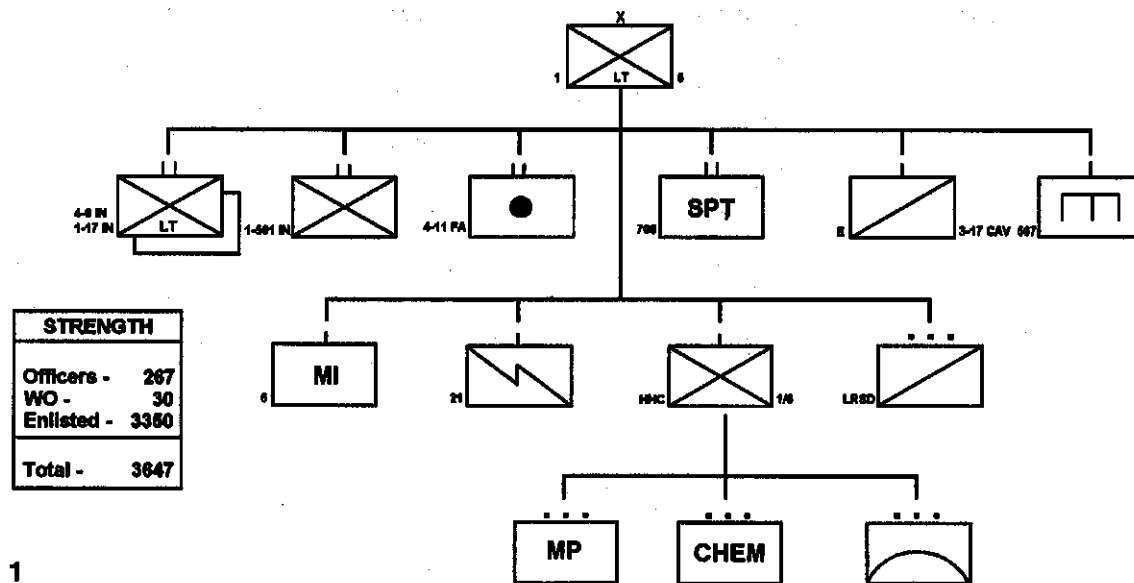


Fig. 1

Graphics by SGT Sean Daugherty

machine guns. Each vehicle carries a crew of three soldiers (driver, gunner, and TC), as well as M-16A2s, night vision devices, GPS, NBC equipment, and dual-net secure radios. The platoons normally operate in two sections of three vehicles each under the control of the platoon leader or platoon sergeant (Fig. 3).

The two antitank platoons provide overwatch for the scout platoons. These TOW platoons consist of four M966 hard-topped HMMWVs each and are armed with the M220A2 TOW missile system. Each M966 carries a crew of three soldiers (driver, gunner, and TC), as well as two M-16A2s, a 9mm, night vision devices, GPS, NBC equipment and dual-net secure radios. Both TOW platoons also have four M998 cargo HMMWVs to transport soldiers' gear, Arctic equipment, and ammunition.

The terrain in Alaska is often not suited to operation of the TOW missile. Trees and close terrain limits the system's utility. By removing the Missile Guidance System (MGS) tray and adding the proper mount, the TOW vehicles can mount the MK19, M2 .50 cal, or M60 machine guns. This is also quite handy for contingencies where the threat may not have a significant armored vehicle capability. In these situations, the TOW systems are stored in the cargo HMMWVs for availability in case the threat or terrain changes (Fig. 4).

The headquarters platoon (Fig. 5) provides complete organizational level

E/3-17 CAV TASK ORGANIZATION

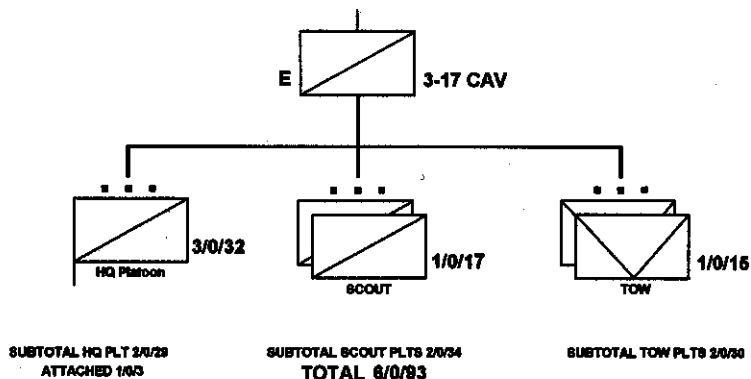


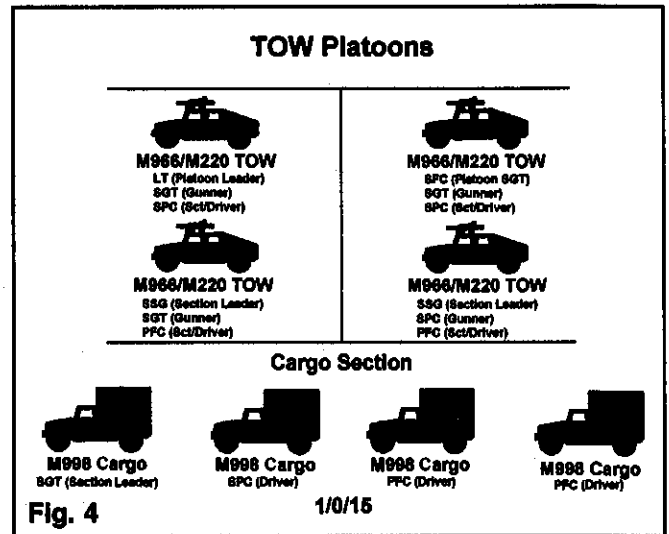
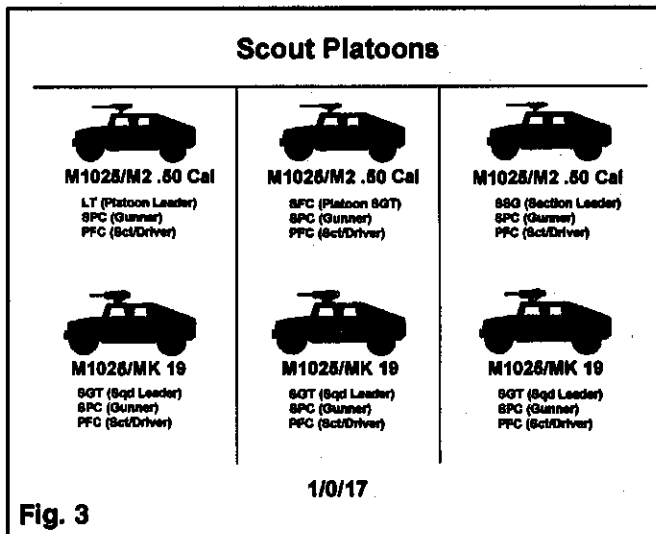
Fig. 2

support of the troop in the field. The headquarters platoon consists of medic, mess, maintenance, fuel, cargo, and headquarters sections. The medic section consists of two M996 HMMWV ambulances and five soldiers, two E5s and three E1-4s, one of whom is a combat medic.

The mess section is two M35A2 trucks and an MKT field kitchen, along with four soldiers, (one E6, one E5, and two E1-4 cooks). The maintenance section consists of seven mechanics and a one-man fuel section. The troop is authorized one E7 motor sergeant, one E5 light wheeled vehicle mechanic, one E5 equipment records clerk, one E4 signal specialist, one E4

recovery vehicle operator, one E3 petroleum handler, and two E3 light wheeled vehicle mechanics. Additionally, the Arctic MTOE authorizes one E5, one E4 and one E3 light wheeled vehicle mechanic.

Some reconnaissance squadrons cross-level TOW systems and scouts to make four mixed platoons of five vehicles each. It was decided to retain the MTOE platoon construction to facilitate training on the TOW and MK19s with the option of cross-leveling vehicles and crews after the initial equipment train-up. Retaining the basic organization was necessary due to the general lack of operator familiarization with the weapons systems.



Instead of mortars, the reconnaissance squadron support comes from the gunships of the air cavalry troops. Today, in the separate cavalry troop, indirect fire support is picked up by the troop's MK19s and by field artillery supporting the brigade. This means that the troop requires greater priorities of fire than might otherwise be necessary. The troop is also supported by a fire support team (FIST) of four soldiers mounted in an M966 HMMWV.

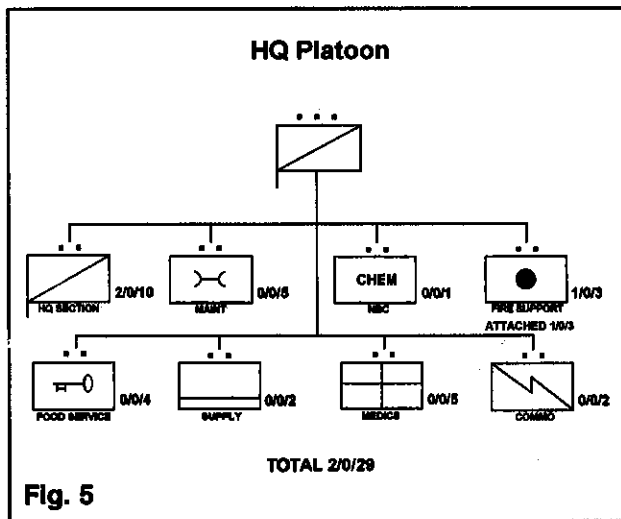
What makes the troop particularly unique is its second set of tactical vehicles, 14 Swedish manufactured Small

good vehicle to avoid getting stuck.) It is almost impossible to get a SUSV stuck. The SUSV, like the basic HMMWV, lacks armor protection, so these vehicles are used in a "battle taxi" manner, delivering scouts to a concealed position from which they can begin their dismounted reconnaissance or unload weapons for ground mounting.

The SUSV is not equipped with mounts for firing weapons off the vehicle. All weapons must, therefore, be dismounted onto tripods and fired from the ground.

The troop's unique organization, supported unit, and area of operations require the troop to perform some operations which might not be common to most cavalry units. These include air mobile and air load operations, cordon and search, convoy security, and escort tasks under the general heading of operations other than war. The majority of the Arctic cavalry's tasks, however, are typical cavalry tasks with only minor modification for over-snow movement and operation out of SUSVs in the winter.

Because of the inability to fire the TOW, MK19, .50 Cal, or M60 machine gun from the SUSV, it is necessary to dismount TOW/MK19 crews in over-watch positions and to set weapons systems up using tripods. This is complicated by the fact that the Alaskan interior averages over 70 inches of snow every year. All dismounted movement must be conducted on snowshoes or cross-country skis. Heavy loads are transported on vehicles or towed into position on Akio sleds, which are pulled by three soldiers wearing snowshoes. The TOW launchers and other crew-served weapons must be dug into the snow so that they do not sink further upon firing. The MK19 and .50 cal. machine guns can be fired off of the tripod mounted on the Akio Sleds. The M60 machine gun can be fired off of an Akio sled or a snowshoe.



Unit Support Vehicles (SUSV). The SUSV provides excellent over-snow mobility in extreme conditions. These snow tractors can move through deep snow, mud, and muskeg with little difficulty. (Muskeg is a phenomenon where water accumulates above the layers of permafrost in the soil. This creates an uneven almost bog-like surface which requires experience and a

Arctic Operations

Stealth, firepower, and mobility are the three key capabilities that the separate cavalry troop provides the SIB (L). By being part of a rapid deployment brigade, E Troop must be prepared to deploy to and fight in any environment, not only the Arctic. The brigade's participation in many training exercises throughout the Pacific region offers the troop diverse training opportunities outside of Alaska.

The brigade regularly participates in exercises Cobra Gold (Thailand), Balikatan (Philippines), and Tandem Thrust (conducted throughout the Pacific Theater), as well as rotations to the Joint Readiness Training Center (JRTC) and the National Training Center (NTC).

Mobility in the Arctic is challenging at best. During the winter months, mounted movement is restricted to SUSVs. In the long summer days, off-road mobility is complicated by muskeg. Wheeled vehicular traffic is confined to roads and trails. The SUSVs are also brought to the field during the spring and summer exercises to help recover mired vehicles.

SUSV ORDER OF BATTLE

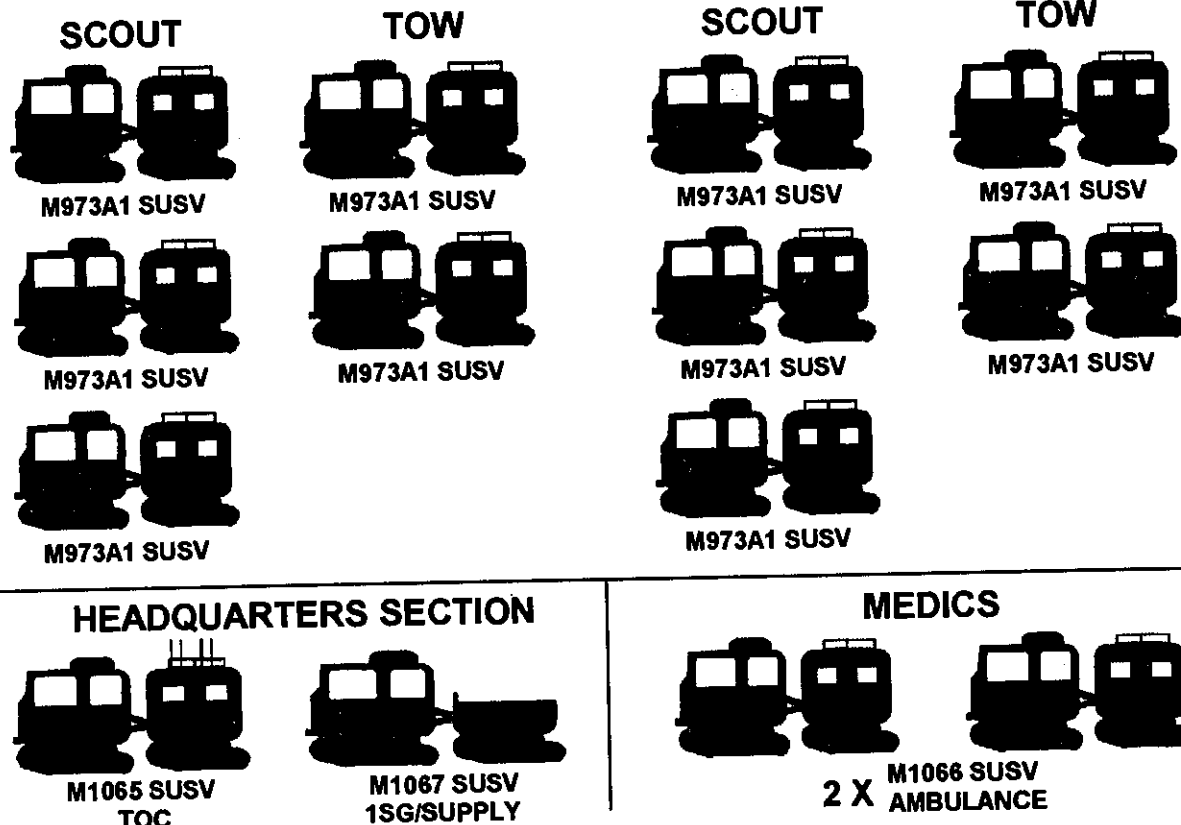


Fig. 6

Arctic Light Training

Fort Wainwright, including the adjoining Yukon Training Area, offers the largest Arctic training area in the world, with 916,000 acres. An additional 670,000 acres for firing, testing, and training are available 100 miles southeast, a short drive by Alaskan standards, at Fort Greely. These areas offer a variety of training environments, from open tundra, to high mountains, rivers, glaciers, hills, and thick forests.

Because of the extreme conditions under which units in the Alaskan interior must operate, training must be, and is, tough and realistic. Winter lasts generally from October to March while temperatures around Fort Wainwright hover near -20 degrees Fahrenheit for most of the winter and can dip down to -50 degrees Fahrenheit. These figures do not include wind chill. These are the weather conditions in which the Arctic cavalry specializes. The rationale is

that if the enemy is preoccupied with trying to stay warm, he will be less intent on his local security. Lowered security, of course, makes it easier to conduct reconnaissance or close with and destroy the enemy.

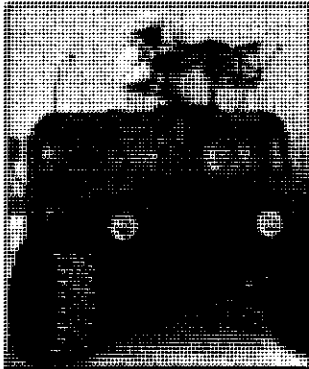
Training and proper equipment make operation in the Arctic possible and the soldiers have the equipment, vehicles, and clothing necessary to survive and operate in this harsh environment. Military vehicles are equipped with Arctic heaters which augment the standard heaters. Winterization kits are also necessary to keep engines and batteries from freezing in the extreme conditions. For the individual soldier, the Army's Extended Cold Weather Clothing System (ECWCS) combines state of the art fabrics, Gore-tex and polypropylene, into a clothing system that insulates and repels the elements even in the harshest conditions.

Activation of the troop created a training and experience gap, with only a few members experienced in extreme

cold weather conditions. After activation, it became necessary to develop a rigorous training program to prepare for the onslaught of winter. The Air Force Arctic Survival Training School, taught at Eielson Air Force Base, Alaska, helped provide some of the troop's leadership with winter survival skills. The Army's Northern Warfare Training Center provided the most valuable training. The entire troop attended the three-week Infantry Company Course during November and December of 1994, learning the basics of oversnow movement (snowshoe, skinjoring, Akio sled pulling, downhill and cross country skiing), and Arctic survival skills (snow cave shelters, tent and stove drills, fire building, and other field-craft). This course is taught at Fort Greely, Alaska, by some of the Army's top cold weather instructors and culminates in a three-day tactical field problem under extreme Arctic conditions. Temperatures during the course reached a low of -52 degrees Fahrenheit. The troop became the first

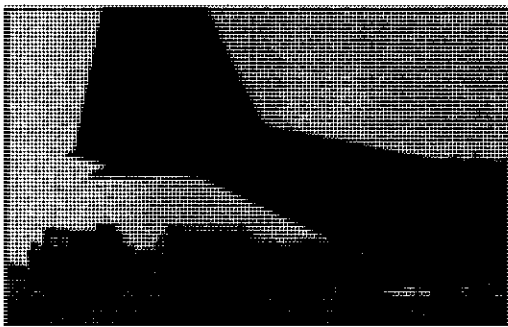


Above, troops engage enemy dismounts in a training exercise.



At left, a scout HMMWV on patrol.

Below, a SUSV loads aboard a C-130 during Northern Edge '95.



non-infantry unit to complete the demanding three-week course. Working closely with light infantry and other assets in the brigade requires an emphasis on light fighter skills. The troop conducts regular and extensive dismounted patrolling, quarterly 20km tactical ruck marches, aerial insertions, and sling-load training. In addition, there is a strenuous PT program that involves stretching and calisthenics outdoors in winter temperatures down to 30 degrees below zero, as well as snowshoe marches and cross-country skiing to keep physical training exciting.

Tactics, Techniques, and Procedures

Because the SIB possesses its own LRSD, ground cavalry troop, military police, chemical reconnaissance, ground surveillance radar, and battalion scout platoons it is equipped with a

wide range of reconnaissance and security assets. This allows the brigade to select the organization which best meets the needs of the mission.

The cavalry is an excellent choice for screen operations requiring quick, lateral (moving flank screens) or extended movements against enemy operating dismounted or using light armor vehicles. The troop's scout platoons can screen an area from three to five kilometers wide, depending on the terrain. In conjunction with the LRSD, battalion scouts, GSR, and ground cavalry, the brigade can create an excellent security zone possessing depth, firepower, and covering both mounted and dismounted avenues of advance. The LRSD, cavalry scouts, and TOW platoons operating out of hide positions can create a hunter-killer team offering stealth and punch.

Because of the firepower of the separate light cavalry troop, it can be used to bring overwhelming force quickly to bear on the enemy. It makes an excellent counterattack, reserve, or reaction force against a lightly armored threat where vehicular mobility is not a constraint.

The cavalry also provides firepower and mobility for convoy escort missions and quick reaction forces covering the movement of friendly convoys or patrols.

Other possible uses for the cavalry troop include airmobile operations which drop the cavalry behind enemy lines, with or without vehicles, to conduct deep reconnaissance of multiple locations and raids against rear support areas. Cavalry platoons can operate attached to infantry battalions or as part of the troop. Platoons can secure PZs, LZs, and key road intersections to support battalion or brigade movements.

Conclusion

E Troop, 3-17 Cavalry is a unique unit with a unique mission. The troop gives the separate infantry brigade (L) an organization capable of stealth, mo-

bility, and firepower under the harshest of conditions. The troop can fight and win in the most inhospitable area of the world. The troop also gives cavalry scouts and armor (cavalry) officers interested in a once-in-a-life time challenge a new test with the "Arctic Recon!"

Captain Keith A. Sharples is a 1985 Distinguished Military Graduate of Indiana University, where he received his Armor commission and a BS in Business. He served with C Company, 1-35 Armor, FRG, as an M60A3 tank platoon leader and an M1A1 tank company XO; as a doctrinal writer, U.S. Army Armor School, Ft. Knox; with the Special Forces Center training Egyptian Armor Crews in Cairo on the M1A1 during Operation Desert Shield; and as commander, D Trp, 5-15 Cavalry, and later as the squadron S3. He organized, activated, and commanded A Troop, 4-9 Cavalry (Arctic Recon) at Ft. Wainwright. He currently serves as the Armor Liaison to the 2d Bde, 38th ID, Indiana National Guard. He holds a Masters of Public Administration Degree from Western Kentucky University. His military schooling includes the Armor Basic and Advanced Courses, Cavalry Leader, Scout Commander Certification, Junior Maintenance Officer, Airborne, Air Assault, Arctic Light Individual Training, and the Air Force Arctic Survival Courses.

First Lieutenant Ken Dobert is a former TOW platoon leader and is currently assigned as XO of E Troop, 3rd Squadron, 17th Cavalry. He is a graduate of the Armor Officers Basic Course, Scout Platoon Leader Course, BNCOC, and the Basic Russian Course. He served as squad leader, cryptanalysis section leader, platoon sergeant, and instructor at the Ministry of Defense and Aviation, Kingdom of Saudi Arabia.

Introducing the Solargizer™ : Solar Technology for Lead-Acid Batteries

by Paul Hornback

THE PROBLEM: Dead or low batteries caused by sulfate accumulation on the battery plates.

THE CAUSE: During the normal charge and discharge cycles of lead acid batteries, sulfate molecules contained in the electrolyte solution move back and forth between the acid and lead battery plates. Unfortunately, not all sulfate molecules that attach to the lead plates are released. This results in sulfate accumulation on the lead plates causing electron flow (electric current) to be reduced. After deep discharge, severe sulfate build-up occurs, which practically eliminates electron flow. The final result is dead batteries. Maintenance personnel must then take specific gravity readings, which are generally low, to determine how many batteries have dead cells and require replacement. A battery in this condition is normally discarded since normal charging/recharging procedures do little to regain battery capacity. The problem here is not a "failed" battery, the problem is sulfate build-up. *In fact, sulfated batteries are the largest single cause of battery replacement in the armor fleet!*

THE SOLUTION: Armor units can extend battery life four to five times by installing a battery conditioning device called the Solargizer™ on their vehicles. The Solargizer™, in effect, prevents sulfate accumulation through the application of pulsed power technology, thereby maintaining peak battery performance. The Solargizer™ is designed for use on 12, 24, and 36 volt electrical systems employing lead acid batteries. A single unit consists of a small solar panel (5.5" x 4.5" x 0.125"), a circuit box (2.25" x 2.25" x 1.5"), and 25 feet of wire to connect the two together. The circuit box is equipped with two output wires which are attached to the vehicle's battery posts. As the name implies, the Solargizer™ uses solar energy to generate a high frequency, low amperage, pulsating electrical current which is passed to the vehicle's batteries. One caution though, the Solargizer™ is only a battery conditioning device, it is not a battery charger! Its primary function is to



The 24-volt Solargizers are seen here mounted on the Bradley hull.

prevent sulfate build-up on a lead acid battery's plates, thereby enabling the battery to accept a full charge, either from the vehicle's charging system or from a stand-alone charging unit. Installation and continual use of the Solargizer™ will provide the following benefits:

- Battery life extension by avoiding or reversing sulfate accumulation.
- Battery efficiency improvement to near 100% capacity.
- Battery charge lost due to unavoidable normal internal battery discharge will be replaced.

An additional not insignificant benefit of the Solargizer™, as reported in the Fort Hood Battery Management Task Force Final Report dated 30 September 1994, is:

"... a critical advantage of the Solargizer™ (but one that cannot be monetarily measured) is the improved confidence in, and improved readiness of, the equipment."

PROCUREMENT INFORMATION: The Defense Logistics Agency (DLA) currently has a contract with PulseTech Products Corporation for procurement of the Solargizer™. Mr. Joe Franklin, the DLA Item Manager, reports that units requesting a Solargizer™ will have them shipped directly from PulseTech Products Corporation once DLA forwards the unit's request. The Solargizer™ is a Class IX item, so battery budget money (OMA funds) are acceptable for its purchase. Every two 12 volt batteries connected in series

Item	NSN	Price/FOB Destination
24 Volt Solargizer		
1-9	6130-01-392-8347	\$131.64
10-99	6130-01-417-0968	\$116.30
100-999	6130-01-417-9073	\$105.63
1000-4999	6130-01-417-9079	\$94.96
5000 or more	6130-01-417-9291	\$89.63
Lexan Frame	6130-01-396-4074	\$167.00

Figure 1. Logistics Information

and forming a 24 volt system requires a 24 volt Solargizer™. An Abrams tank requires three 24 volt Solargizer™ units to continually condition the tank's six 12 volt batteries. Also developed for the Abrams Tank is a Lexan Frame (17.5" x 9.5" x 0.5") which conveniently holds all three solar panels and provides added protection against foot traffic and heavy objects. The preceding table depicts NSNs and item cost based on specific quantities. Additional ordering information can be obtained from Mr. Franklin at DSN 695-6148 or Commercial (804) 279-6148.

BACKGROUND DATA: In November 1993, LTG Funk chartered the Fort Hood Battery Management Task Force (BMTF). The primary goal of the task force was to institute a broad-based program that would reduce Fort Hood's battery consumption by 50% and associated disposal cost by 30%. The Solargizer™ was a commercially available technology recommended by the BMTF to help achieve this goal. An operational evaluation at Fort Hood, using M1A1s from the 3-66 Armor Battalion (2AD), indicated the Solargizer™ increases performance in vehicle lead acid batteries, makes the batteries last longer, and is durable enough to withstand an armor unit's rigorous operational environment. The BMTF Final Report estimated that the current 6TL lead acid battery life of one year could be extended to a minimum of five years.

MAINTENANCE INFORMATION: The Solargizer™ requires minimal Preventive Maintenance (PM) with the only PM procedure being to clean off the top surface of the solar panels or the Lexan Frame (if installed) to remove accumulated dirt, dust, and mud. Troubleshooting can easily be accomplished using a voltmeter to measure the no-load voltage at the battery terminal connection point to ensure the Solargizer™ is providing a high voltage, low amperage current to the platform's batteries. Recommended mounting locations for the solar panels on the Abrams, Bradley Fighting Vehicle, and High Mobility Multipurpose Wheeled Vehicle (HMMWV) are as follows:

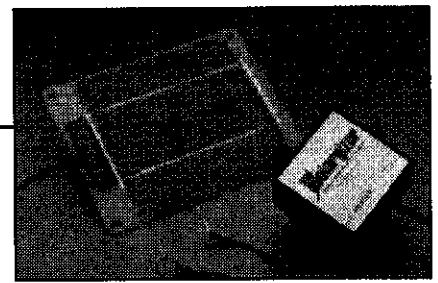
Abrams. The three solar panels are placed in the Lexan Frame and mounted on the back deck next to the battery box.

Bradley. Two solar panels are mounted on the non-skid surface area just behind the driver's hatch but ahead of the periscope (conditions hull batteries). One solar panel is mounted on the right side of the turret just below the antenna mount (conditions turret batteries).

HMMWV. One solar panel is mounted on the inside left lower corner of the passenger windscreen.

For a detailed list of installation instructions for the Abrams, Bradley, and HMMWV, contact the author or Mr. Roy Holley, III Corps Scientific Advisor, DSN 737-7145 or Commercial (817) 287-7145.

SUMMARY: Based on information obtained from operational evaluations and early use by armor/mechanized infantry units, the Solargizer™ performs as advertised. However, will the unit save money? The table in Figure 2 depicts the associated battery costs for an Abrams (without the Solargizer) and the projected costs with three Solargizer™ units installed (includes a Lexan Frame).



Solargizer and transformer

Cost data presented covers a five year period and is based on the 6TL battery cost of \$65.00 (six 6TL batteries @ \$65.00/battery is \$390), the one year 6TL battery life, the estimated five year (minimum) extended battery life resulting from Solargizer™ use, the initial Solargizer cost (three Solargizer™ units @ \$105.63 each is \$316.89, assumes a quantity discount for 174 units to equip an armor battalion), and the Lexan Frame (\$167.00 each). Maintenance costs were excluded in order to provide the units "pure" dollar savings (i.e., in-pocket, hard currency savings).

Installation of the Solargizer™ on an Abrams tank nets a savings of \$1076 over a five-year period. On a much larger scale, a battalion of 58 tanks could save approximately \$62,400 over a five year period with an initial investment of only \$28,065. Obviously, the Solargizer™ is a cost effective measure which would provide a substantial benefit to the armor fleet.

Paul Homback is a general engineer with the federal government. He is presently assigned to the HQ TRADOC Combat Development Engineering Division, Fort Knox Field Office, which provides engineering support to the Directorate of Force Development, Fort Knox, Ky. He holds a Bachelor of Science degree in Mechanical Engineering from the University of Louisville and is currently completing a Masters of Science degree in Industrial Engineering. His military experience comes from a six-year tour as a UH-1N helicopter pilot in the U.S. Marine Corps, where he attained the rank of Captain.

Item	Current Abrams	Abrams with Solargizer™
Battery Cost		
1st Year	\$390.00*	0
2d Year	\$390.00*	0
3d Year	\$390.00*	0
4th Year	\$390.00*	0
5th Year	\$390.00*	\$390.00*
3 Solargizers	0	\$316.89
Lexan Frame	0	\$167.00
Total 5-Year Cost	\$1950.00	\$873.89

*Cost to replace all 6 vehicle batteries

Figure 2. Five-Year Battery Cost Data

Fighting to the Finish

The Role of South Viet Nam's III Armor Brigade and III Corps Assault Force in the War's Final Days

by Tran Quang Khoi, Brigadier General, ARVN



BG Khoi

Foreword

Brigadier General Tran Quang Khoi graduated from the Vietnamese National Military Academy at Da Lat in 1952, the French Cavalry School at Saumur in 1955, and the U.S. Army Armor School at Fort Knox in 1959. As senior advisor to the Vietnamese Chief of Armor, I first met him in 1966 when he deployed the ARVN 5th Cavalry to Xuan Loc. I accompanied him on several operations to reconnoiter for the impending arrival of the U.S. 11th ACR. In May of 1966, he provided his 1/5 tank troop (M41A3) for airlift to Da Nang ("When Tanks Took Wings," ARMOR, May-June 1994). In early 1970, his combined-arms Task Force 318 spearheaded the U.S./VN incursion into Cambodia, earning his Corps CG the sobriquet "The Patton of the Parrot's Beak." In November 1970, he organized and trained III Armor Bde and commanded it in Cambodia, both before and after attending the U.S. Army Command & General Staff College at Fort Leavenworth in 1972-3. In 1971-72, I frequently met him in places like An Loc and Loc Ninh as his brigade raced between flash points in Cambodia. Released from "Re-education Camp" after 17 years, he now resides in Springfield, VA.

He is one of the finest Armor leaders I ever met; bold and daring, but not foolhardy, he knew full well how to use mobility and firepower to produce shock even in terrain like Viet Nam's. He also had the imagination and flexibility to task-organize in such a way as to get the most from his available assets. Had Khoi been a tank battalion commander in Third Army during World War II, General Patton would have acknowledged two peers: Creighton Abrams and Tran Quang Khoi.

RAYMOND R. BATTREALL
COL, Armor (Ret)

During the final days of the Viet Nam War, I commanded the ARVN III Armor Brigade and III Corps Assault Task Force (ATF) throughout III Corps Tactical Zone and in defense of the City of Bien Hoa against the final Communist offensive in South Viet Nam. For twenty years since the fall of South Viet Nam on 30 April 1975, I have read many articles by both Communist and Free-World writers. Many of them are ambiguous or inexact, especially when referring to actions east of and in Bien Hoa. Some even distort the truth and wound the honor of III Armor Brigade/III Corps ATF, so I have an obligation to both the living and the dead to correct the record so as not to be ungrateful to the heroes who willingly followed me and fought to the very last minute of the war.

The Early Days

From 1970 on, there were four armor brigades, one per corps. Each headquarters was highly mobile, track-mounted, packed with radio gear, and manned by a carefully selected, battle-tested staff. Designed to control up to six maneuver battalions (a division has nine) the brigades had no organic units but were "task organized" by their corps commanders according to the mission at hand: sometimes with as many as 18 battalions!

III Armor Brigade headquarters was activated in November 1970 and, after intensive training with a U.S. advisory team headed by LTC C.M. Crawford, with MAJ Racine, CPT Waer, and others, was declared combat ready and assigned to III Corps for employment in January 1971. Task-organized with the 15th and 18th Armored Cavalry Squadrons and a variety of infantry, artillery, and supporting units, it was the core and frame of LTG Do Cao Tri's III Corps ATF, established to meet battlefield demands in Cambodia. The ATF was the corps' combined-arms reserve. When reinforced for violent combat, its strength and capability were equivalent to a mechanized division. It operated

either alone or with the ARVN's 5th, 18th, or 25th Infantry Divisions. Whenever there was heavy combat in the III Corps Tactical Zone, the ATF was always present.

The Task Force crossed swords many times with the North Vietnamese Army's (NVA) 5th, 7th, and 9th Infantry Divisions, both in Cambodia and Viet Nam. It rescued from destruction the 5th Ranger TF at Chlong and Dambe in February and March 1971, the 8th Regimental Combat Team (RCT) of the 5th Infantry Division at Snoul in June 1971, and the 30th Ranger Battalion at Alpha Base, six km east of Krek plantation, in November 1971 (Map 1).

The tragic death of General Do Cao Tri in a helicopter crash in February 1971 marked the turning point of the war in South Viet Nam. LTG Nguyen Van Minh, succeeding General Tri as III Corps Commander, made mistake after mistake from the very start. He and I differed on many points regarding the conduct of operations in Cambodia. Because of his weakness, we suffered many setbacks and, little by little, lost the initiative to the enemy. Often, I could not help arguing with him, and our relationship became more and more tense. After the victory near Krek in November 1971, I made up my mind to apply for admission to the U.S. Army's Command and General Staff College at Fort Leavenworth, Kansas.

From 1972 to 1973, I went to the U.S. to complete my advanced military education. Shortly after my departure, General Minh dispersed the resources of the III Armor Brigade and completely disbanded the III Corps ATF. When the battle of An Loc — Binh Long broke out violently during the summer of 1972, the Armor units of III Corps were completely paralyzed.

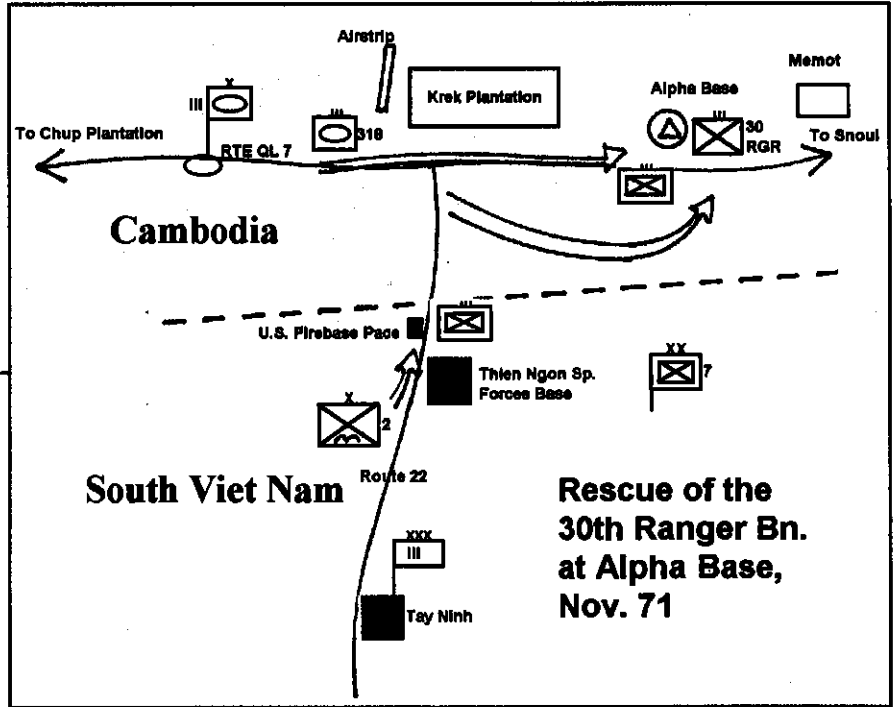
When I returned to Viet Nam in 1973, LTG Pham Quoc Thuan had replaced General Minh. He insisted that I rejoin III Armor Brigade. I resumed command of the brigade on 7 November 1973 and suggested to the new corps

MAP 1

At top right, detail map shows III Corps attack on the 7th NVA Infantry Division just over the Cambodian border.

MAP 2

At lower right, area map identifies major III Corps/III ATF sectors of operation.



Rescue of the 30th Ranger Bn. at Alpha Base, Nov. 71

commander that III Corps ATF be reestablished according to General Tri's model. He gave me complete authority for this task. I reassembled dispersed armor units and, with the new M48 medium tanks of 22d Armor and M548 tracked cargo carriers to transport fuel and ammunition, I changed the composition of Armor units and improved the mobility of 105mm towed artillery units.

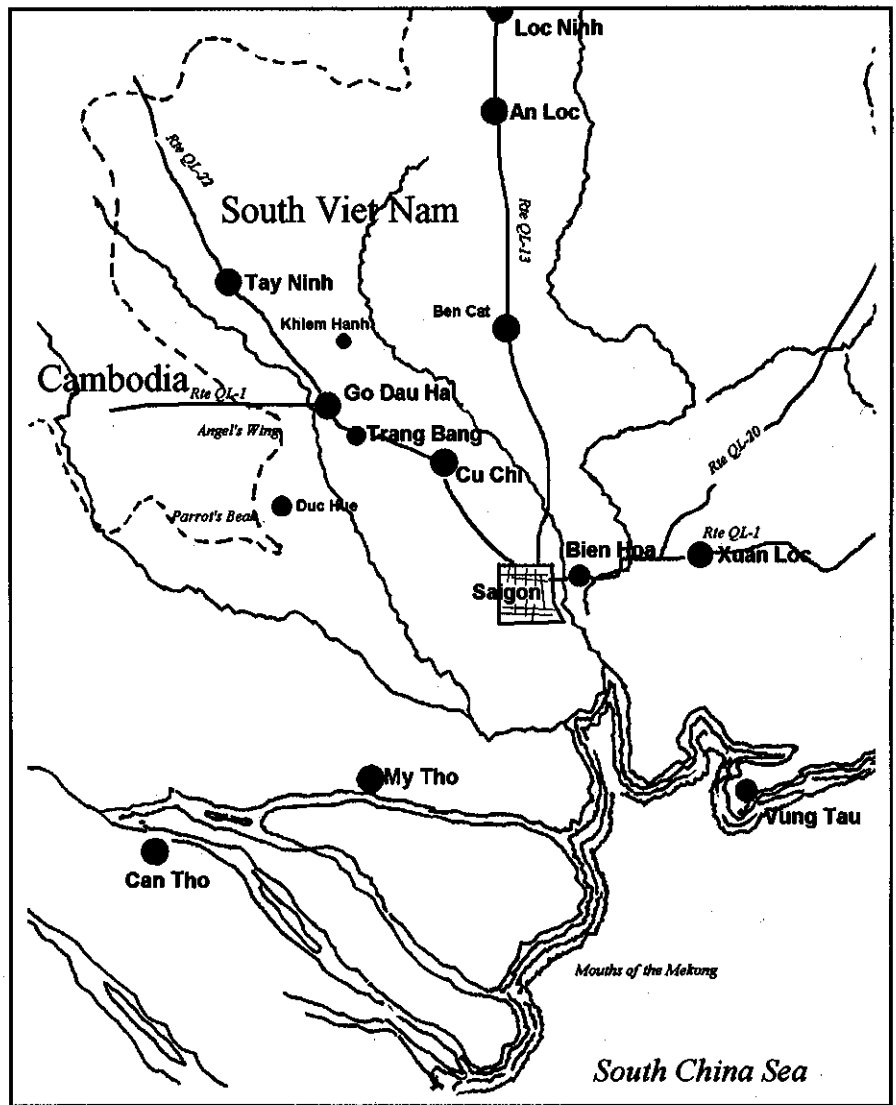
- The 15th and 18th Armored Cavalry Squadrons had had their M41A3 light tank troops reassigned during my absence. They had five M113-equipped Armored Cavalry Assault Troops (ACATs) when I returned. I shifted men and equipment to squeeze a sixth ACAT out of available resources.

- The recently fielded M48 tank battalion (22d Armor) was identical to the U.S. tank battalion of that time: three 17-tank companies plus three command tanks for a total of 54. I reduced their platoons from five tanks to three (easier for a platoon leader to control) which, with two command tanks, made eleven per company. I was then able to activate a fourth tank company which, with three battalion-level command tanks, gave a total of 47, with seven of the original tanks left over as a supply reserve.

- Reinforcements from III Corps were 33d Ranger Group, 46th Artillery Battalion (155mm towed), 61st Artillery Battalion (105mm towed), and 302d Engineer Battalion.

- The 105mm towed artillery battalion was converted to "self-propelled" by mounting the howitzers on M548 tracked cargo carriers. Each M548 was modified by adding two removable ramps for the 105s to mount and dismount. Each 105 crew was trained to mount and dismount its howitzer and fire as quickly as possible. The result was a unit almost as effective as a truly self-propelled battalion.

- III Corps ATF was organized into three sub task forces, 315, 318, and



322, based on the 15th and 18th Cavalry and 22d Armor. Each had two ACATs, one M48 medium tank company, one Ranger battalion, one track-mounted 105 battery, and one engineer platoon.

Under III Corps ATF control was the 33d Ranger Group HQ, with its own reconnaissance company and 105 battery, an M48 tank company, the 46th Artillery Battalion (155mm towed), the 302d Engineer Battalion (-), and a logistics company from 3d Log Command. (Fig. 1)

In addition to intensive combat training, the troops were also educated on the ideas of Communism so they could understand the enemy and his tactics. When all were well prepared both physically and mentally, I reported the ATF to the corps commander as combat ready. On 2 April 1974, III Corps ATF took the enemy by surprise on the border between Cu Chi and Trang Bang Districts, relieving enemy pressure on Bo Cap and Cha Ray outposts (Map 3). TF 315 inflicted heavy losses on the Viet Cong Tay Son Battalion.

Near the end of March 1974, the 83d Ranger Battalion at Duc Hue Base near the Cambodian border was surrounded by the NVA 5th Division. A valiant, month-long effort by the ARVN 25th Division — attacking, as expected, from east to west inside Viet Nam — failed to break the siege. Even aerial resupply and medevac missions were cut off, and the situation appeared almost hopeless. LTG Thuan asked me for a plan. My plan (Map 4), to take the enemy from the rear in a cross-border attack, shocked him. He feared that a new incursion into Cambodia would cause problems with the United Nations. I insisted, however, that this was the only hope for success, so he took the plan to President Thieu for approval.

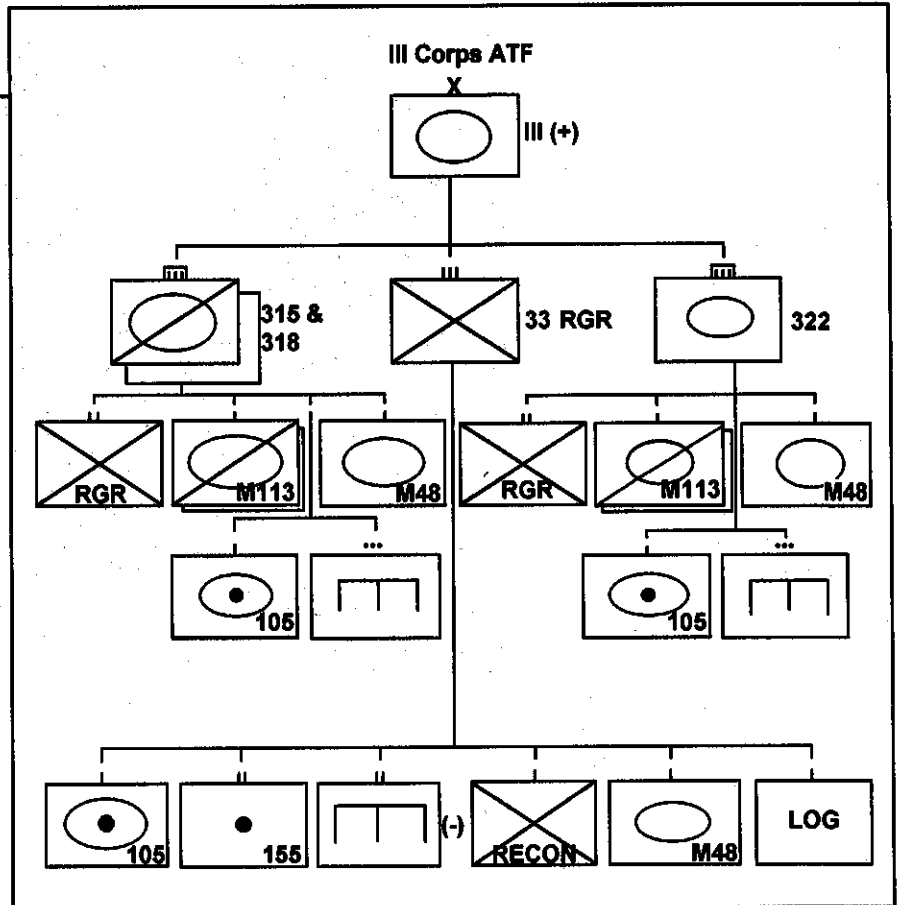


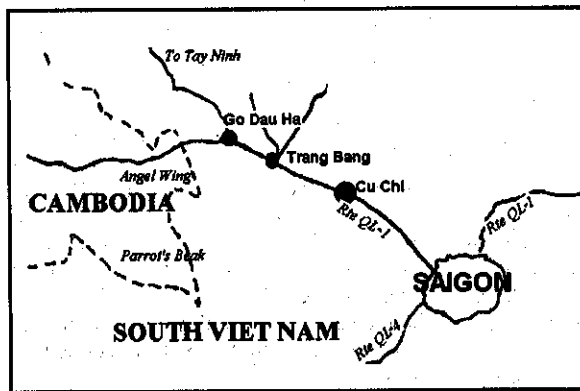
FIG. 1

The actual operation consisted of two phases:

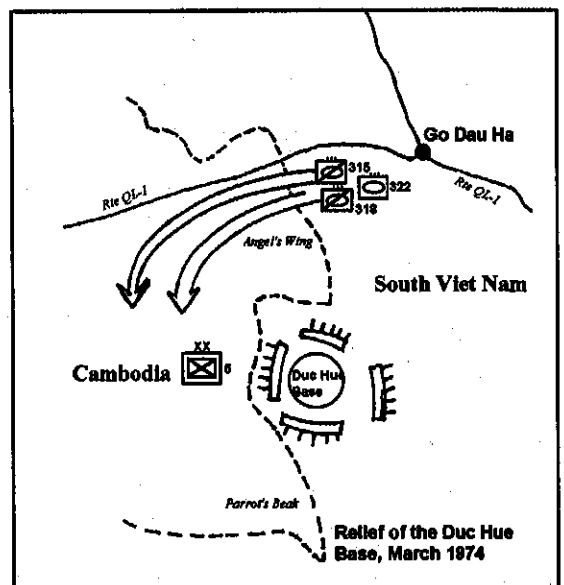
- Deception. On 22 April III ATF moved from Go Dau Ha to Lai Thieu in Binh Duong Province.
- Attack. III ATF returned to Go Dau Ha under blackout conditions on the night of 28 April. Tanks crossed the river at midnight on rubber rafts provided by the 302d Engineers. The ATF crossed the border and occupied attack positions by 0300 on the 29th. TF 315 made the main attack and TF 318 the

secondary. TF 322 in reserve followed TF 315. The mission was accomplished by 1 May.

This relief of the 83d Ranger Battalion at Duc Hue proved to be the last major ARVN offensive of the war. Severe constraints on ammunition, fuel, and flying hours caused by lack of



MAP 3



MAP 4

promised U.S. support allowed no new initiatives. Nevertheless, the NVA 5th Division was never again a threat.

From late May until November, the ATF supported the 18th and later the 5th Infantry Divisions in their struggle to retake An Dien, Base 82, and Rach Bap in the Iron Triangle.

On 30 October, LTG Du Quoc Dong replaced General Thuan as III Corps commander. Communist forces became stronger and stronger, and more and more aggressive. Their attacks all over the country flagrantly violated the Paris Peace Agreement. In January 1975, Phuoc Long Province fell into their hands; General Dong resigned; and LTG Nguyen Van Toan, the Chief of Armor, took command of III Corps. Toan, who had commanded II Corps during the Communist Easter Offensive of 1972, promptly set about making his over-worked regular divisions more mobile by assigning all fixed posts to Regional Forces. He also launched periodic spoiling attacks in an attempt to keep the enemy off balance.

As part of these efforts, III Corps ATF encircled northern Binh Duong Province in February and destroyed the VC Phu Loi Battalion headquarters. It also relieved enemy pressure at Go Dau Ha, Khiem Hanh, and Dau Tieng in March, and on the 25th retook Truong Mit, virtually destroying the NVA 271st Regiment in the process.

But, especially for 14 days and nights from 11 to 25 April 1975, III Corps ATF reinforced by the 8th Regiment of the 5th Infantry Division fought and stopped a ferocious NVA corps advance near the junction of National Routes 1 and 20 as part of the epic battle of Xuan Loc, the war's bloodiest. (See NVA General Van Tien Dung's book, *The Great Spring Victory*.) At the end of this time, I was forced to use two CBU-55 bombs from Bien Hoa Air Base to rescue the 18th Division's 52d Infantry. We then supported its withdrawal to Long Binh Base.

Events developed at a chaotic pace in late April. I and II Corps had disintegrated, all NVA fighting divisions were moving south, and pressure east of



BG Khoi, then a colonel, briefs LTG Do Cao Tri in early 1970.

Bien Hoa worsened with each passing day. I was invited to join a coup to overthrow President Thieu but refused strongly and publicly declared against it. Bien Hoa Air Base was neutralized by enemy artillery fires and shut down. On 20 April, BG Le Minh Dao's 18th Division finally abandoned its magnificent defense of Xuan Loc and withdrew to Long Binh. On the 21st, President Thieu resigned. From the front on 22 April, I wrote to General Charles Timmes, Assistant to the U.S. Ambassador in Saigon, "...I have been engaging with NVA divisions in the vicinity of Dau Giay, Xuan Loc while Congress debates whether or not to give further military assistance of 300 million dollars to the ARVN. I think the situation is almost hopeless. Even if Congress approves the funding now, it is too late. Nevertheless, I and my fellow soldiers have decided to stay and fight until the very end. My only request is that you would help my family migrate to a safe location...."

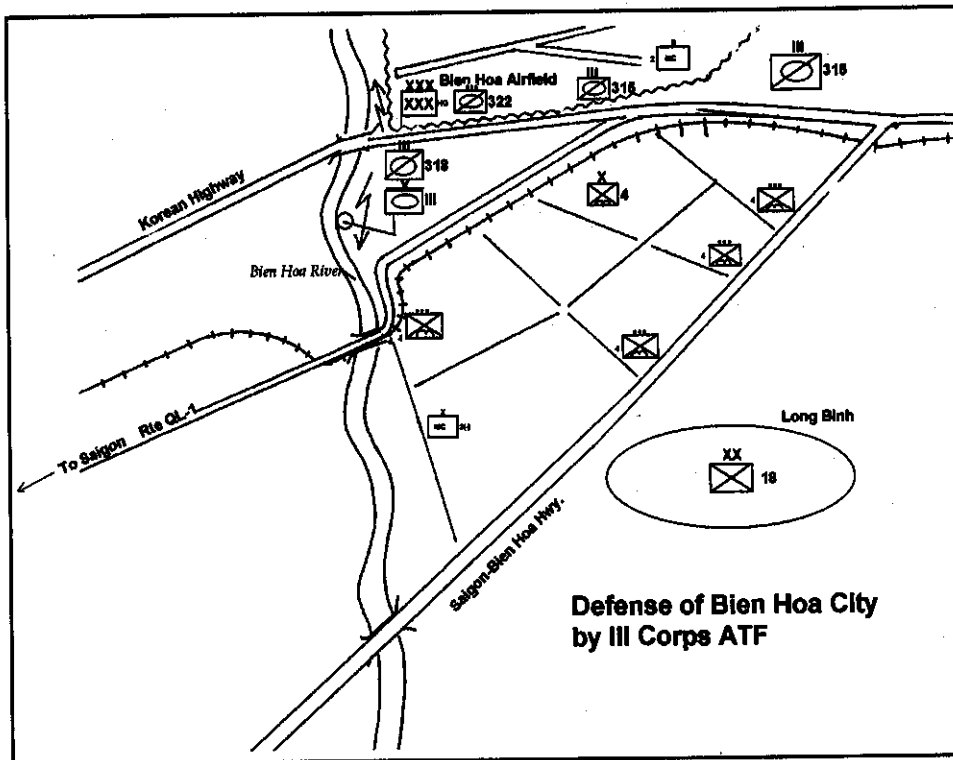
III Armor Bde and III Corps ATF The Last Five Days of the Viet Nam War

After five days of recuperation, the 18th Infantry Division was ordered to move east on 25 April and replace III Corps ATF on the front line at Hung Loc-Dau Giay. The ATF returned to its base in Bien Hoa for equipment maintenance and rest. The 8th Infantry

Regiment returned to its parent unit. That evening, the enemy seized the ARVN Armor School at Long Thanh. On corps order, I immediately sent TF 322 and a Marine Battalion to meet the enemy. They engaged heavily with a strong enemy force supported by tanks, destroying 12 T54 tanks and forcing the enemy to withdraw by midnight. This victory raised the morale and fighting spirit of all combat units in Bien Hoa. After inspecting the battlefield, LTG Toan promised a 1.2 million piastre reward (100,000 piastres per tank) to those who had contributed to the destruction of the T54s. From now on, the ATF became III Corps reserve.

On 29 April, III Corps ATF was reinforced by the 2d Marine Brigade and 4th Airborne Brigade. At noon, General Toan held an urgent conference at 18th Infantry Division Headquarters in Long Binh. Only General Toan, General Le Minh Dao, and myself were present. Dao was ordered to defend Long Binh and control the Bien Hoa highway. My ATF was to defend the City of Bien Hoa with all Regional and Popular Forces in the area under my control. At that time Cu Chi had been lost; the 25th Infantry Division had been overrun; and its commander, BG Ly Tong Ba, had been captured. General Toan withheld that information from us, as he was preparing to desert. Dao and I later learned the truth when we met Ba in a Communist concentration camp.

As the meeting concluded, COL Hieu, commander of the 18th Division's 43d Regiment, burst into the room to report in an emotional tone that the enemy was attacking Trang Bom and his regiment was retreating to Long Binh. General Dao's facial expression changed as he heard the news. General Toan reacted furiously and screamed his orders: Hieu was to take his regiment and return to Trang Bom. He pretended to accept the order, saluted, and left. I knew, however, that the 18th Division could not sustain the front at Trang Bom. It was already weakened by the fighting at Xuan Loc, had had only five days to recuperate, and the inevitable would happen in time.



MAP 5

streets, and the shops were closed. Everything seemed to be in order.

At around 1800 hours, the enemy began to infiltrate from the north. They were met by TF 322. A Ranger unit of TF 315 also engaged them near Camp Ngo Van Sang. The enemy hugged close to our positions, and both sides exchanged continuous fire at a distance of 15-20 meters. Even so, our men fought courageously and confidently. There was no incident of desertion within the ATF. Under strong fire support from Armor units, the enemy was pushed back.

At 2000 hours, I called Camp Phu Dong near Saigon. This was the location of Armor Command, where III Corps headquarters had settled a couple of days ago. There was an answer, but no one had the authority to receive my report. I

then called the Operations Center of the Joint General Staff without avail. Finally, I was forced simply to wait impatiently for further orders from Saigon. I wondered if the new President and commander-in-chief had a solution to this national disaster and if he had any further mission for us.

Around 2200 hours, I was called by LTG Nguyen Huu Co. He was a former chief of the Joint General Staff and Minister of Defense in 1965. Because of his political differences with then-Prime Minister Nguyen Cao Ky, he had been forced to resign in 1966. He said, "I am General Co. Right now I am standing next to the President. We want to know your current situation in Bien Hoa." I replied, "I am defending Bien Hoa. Le Minh Dao is defending Long Binh. Nguyen Van Toan has deserted. The airfield has been seized by the enemy. Heavy enemy pressure is coming from the north and northeast."

A few minutes passed, then General Co said, "The President wants to know whether you can defend Bien Hoa until 0800 tomorrow so that negotiation with the other side can take place." I replied without hesitation, "Yes, I can do that." At the other end of the line I heard General Co's voice reporting to the president. Finally he said to me, "General Khoi, this is your order from the president: Defend the City of Bien Hoa until 0800 hours, 30 April 1975. I wish you good luck." I responded, "Yes, sir."

General Toan stood up, shook my hand and Dao's, and said, "I wish you both the best of luck in combat. I will fly back to JGS to request support for you." He then turned to me and said, "As for the 1.2 million piastres, I will send someone to deliver the money to your headquarters." These were his last words to me before he deserted.

As soon as I returned to my headquarters, I held a meeting with my unit commanders. Everyone was present except the Bien Hoa sector commander and his assistant. They had deserted a few days earlier.

These were my orders as of 1300 hours, 29 April 1975:

- The City of Bien Hoa is now under martial law. Curfew will be at 1500 hours.
- Each Regional and Popular Force unit is to stay at its assigned post. No movement is permitted.
- The Police Force is responsible for the internal safety of the City.
- Absolutely no one is to enter or leave the City.

To defend Bien Hoa I organized the following (Map 5):

- TF 322 defend the northern sector from the airfield to III Corps headquarters.
- 2d Marine Brigade protect III Corps headquarters with one battalion.

Brigade (-) defend the southern sector south of National Route 1.

- 4th Airborne Brigade secure the new Bien Hoa highway and railroad bridges. Establish blocking positions on all routes of approach.

- TF 315 defend the eastern sector from the intersection of Bien Hoa Highway and National Route 1 to Lo Than (near Camp Ngo Van Sang).

- TF 318 assemble between the main gate of Bien Hoa Air Base and the new Bien Hoa Highway bridge as a reserve. Screen the western sector along the Bien Hoa River.

- Artillery support: Fire support plan.

- ATF Headquarters positioned in the garden of the Corps Commander's Palace.

Around 1500 hours, while I was having lunch with my staff in the palace, General Toan's helicopter landed next to mine in the garden. His pilot, MAJ Co, reported that he had flown General Toan and his aides to Vung Tau (Cap St. Jacques) where they were met by LTG Hoang Xuan Lam and BG Phan Hoa Hiep. The generals and their aides then booked a fishing boat to rendezvous with the U.S. fleet at sea. This didn't surprise me. MAJ Co then asked if he could stay and work for me. I agreed.

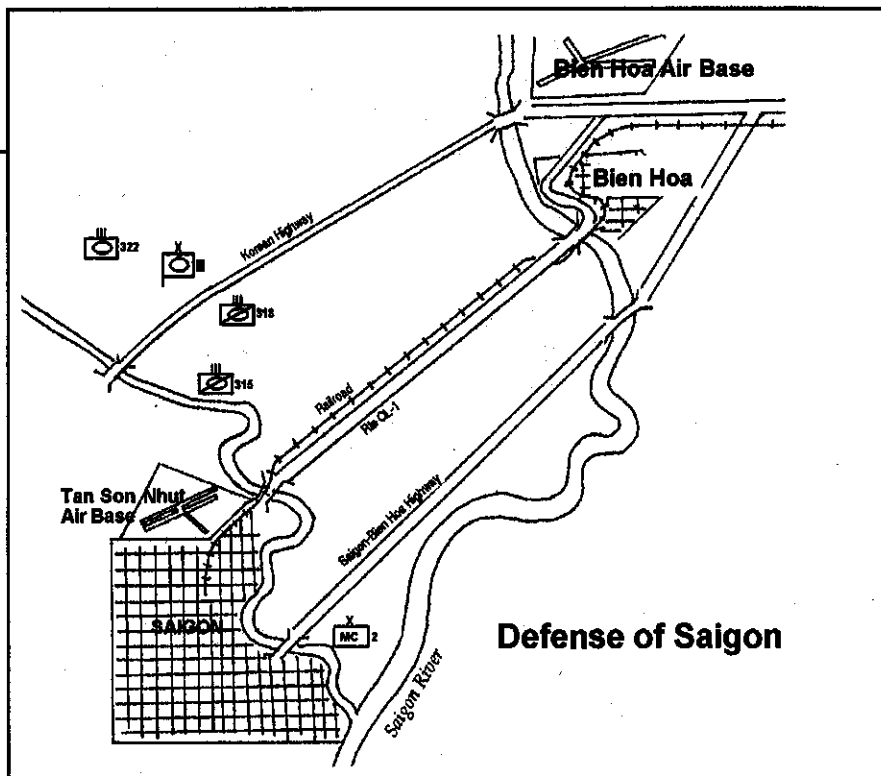
At 1700 hours, I rode in an escorted jeep to inspect inside and outside the city. The people were absent from the

Around 2345 hours, the enemy opened heavy artillery fire on the city. Then a regimental-size combined armor-infantry force attacked along National Route 1 from Ho Nai to the III Corps headquarters. TF 315, under LTC Do Duc Thao, engaged them and broke their attack. Many T-54 tanks were destroyed, and the enemy retreated.

At 0200 hours, 30 April, BG Dao of the 18th Infantry Division called me on the radio and said, "I have been overwhelmed and Long Binh is lost." I asked, "Where are you now? Do you need any help?" He replied, "I am at the National Military Cemetery and retreating toward Thu Duc." I felt very sorry for Dao. During the last two years, he and I had worked very hard together, always on the move and against time. We had been together at all the battlefields in III Corps Tactical Zone because my ATF was Corps Mobile Force 1 and Dao's 18th Division was Corps Mobile Force 2, according to General Do Cao Tri's SOP. When we were together in prison, the Communists kept a close watch on both of us because we had caused the most damage to their forces and were considered the two most anti-Communist "fanatics."

Around 0300 hours, the enemy bombarded Bien Hoa again. This time their fire was stronger and more accurate. I guessed their intention was to control Bien Hoa at all costs after seizing Long Binh. I was preparing to engage in this decisive battle with my entire force; but surprisingly, TF 315 stopped their frontal attack, enveloped their left flank, and inflicted serious casualties upon them. They were forced to retreat to the Bien Hoa Highway, and the city returned to calm.

At exactly 0800 hours, 30 April, I tried to call General Co or the JGS headquarters in Saigon, but to no avail. I then held a conference with all my unit commanders to exchange information concerning the internal and external situation of the city. The enemy had retreated, leaving only minor guerrilla activity outside the city. Inside, it was calm. Everyone stayed indoors in compliance with the curfew, and the streets were deserted. The night before, I had helped the city police with additional manpower to prevent any outbreak



from the jail. I was so happy to see that our troops' morale was still high. They had plenty of courage and discipline. There was no rioting, looting, raping, or other activity in the streets. The city was under complete control. Also, the night before, a group of disbanded 18th Division soldiers had tried to enter under curfew. I had ordered them driven out because their presence might have caused major security problems to the civilians and loss of morale and discipline among our troops leading to chain-reaction disintegration, as had occurred last month in the Central Highlands.

Now it was 0830. I concluded that Bien Hoa was no longer the enemy's objective; he was concentrating all his forces to attack Saigon. We had no communications with any higher headquarters, so I decided to pull out of Bien Hoa and march to rescue the capital. All the unit commanders present supported my decision. I immediately issued an operations order. III Corps ATF was to move toward Saigon as follows (Map 6):

a. 4th Airborne Bde, LTC Lo:

- Move on the right side of the Bien Hoa-Saigon railroad.
- At the outskirts of Saigon, deploy to the right of the railroad and await further orders.

b. 2d Marine Bde, LTC Lien:

- Move on the left side of the Bien Hoa-Saigon railroad.
 - At the outskirts of Saigon, deploy on the left side of the railroad and await further orders.
- c. III Corps ATF:
- Remain in position for support until the Airborne and Marine troops have safely crossed the new Bien Hoa Bridge.
 - Using the Korean Highway as the axis of advance, move toward Saigon in the following formation:

(1) TF 315, LTC Do Duc Thao:

- Lead the column
- Deploy on the near side of the Binh Trieu bridge and await further orders.

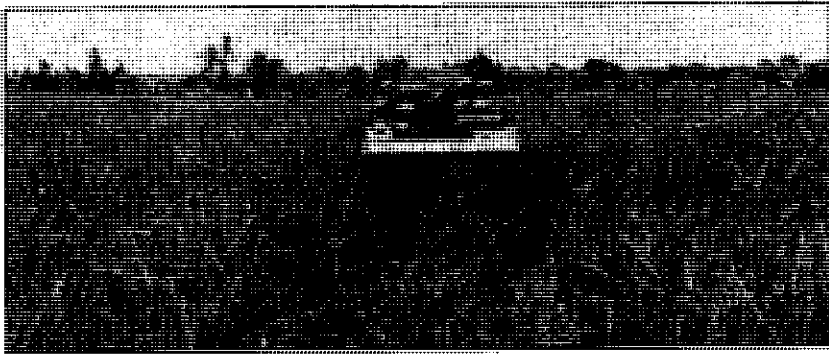
(2) TF 322, LTC Nguyen Van Lien:

- Follow TF 315
- Deploy behind TF 315 at the Binh Trieu bridge and await further orders.

(3) III Corps ATF and units under direct control:

- Follow TF 322
- Deploy behind TF 322 at the Binh Trieu bridge and await further orders.

(4) TF 318, LTC Nguyen Duc Duong:



Above, ARVN cavalry conduct reconnaissance over swampy terrain near Cu Chi.



At left, an ARVN M41 light tank, used by III Corps/III ATF until replaced by M48s. Thought to lack firepower, the M41's 75-mm gun proved quite adequate against NVA T54s when they appeared on the battlefield.

- Rear guard
- Deploy behind ATF Hq at the Binh Trieu bridge and await further orders.

Before boarding my helicopter, I inspected my troops for the last time. They were departing the City of Bien Hoa in an organized formation. Each man was neatly dressed, of dignified bearing, with a look of self-confidence and resignation on his face, showing no fear. They looked just as proud as they had in earlier times when we fought in Cambodia under General Do Cao Tri. I looked at my watch: it was 0900.

I boarded General Toan's helicopter, piloted by MAJ Co. My own helicopter, piloted by CPT Tan, followed. We flew over Bien Hoa at low altitude and saw that the city was still calm and apparently in good order. My forces moved steadily toward Saigon, destroying all enemy blocking positions in their path.

Then an anxious thought came to mind: what would happen if our forces approaching Saigon were mistaken for the enemy and fired upon? Without communications, this was a great risk to my men. While I was pondering a solution to this problem, MAJ Co inter-

rupted and asked, "Sir, if you wish to flee the country, I can help you." I replied, "What about you?" He said, "After flying you out there, I will return to my family in Bien Hoa." I responded, "Thanks very much for your concern, but I have decided to stay with my men."

We flew at high altitude toward the Armor Command and III Corps headquarters in Camp Phu Dong. Far below, I saw a huge concentration of enemy guns, tanks, and troop-carrying trucks stretched out along Bien Hoa Highway and Route 13, like two long snakes crawling into the Capital. We landed at Camp Phu Dong, and I dashed inside looking for an officer on duty. People were pacing back and forth anxiously, and I didn't meet anyone in authority except a young lieutenant wearing III Corps insignia. I told him that I needed to use the telephone to contact the Capital Military District to inform them that my troops were approaching and should not be fired upon.

I made countless attempts to contact CMD, but it was hopeless. I then tried calling the JGS Operations Center, also without success. In the meantime, I heard volleys of enemy artillery fire

coming from the direction of Tan Son Nhut Air Base. At that moment my Armor units arrived at the Binh Trieu bridge.

Then I heard the President's voice on the radio ordering all Republic of Viet Nam Armed Forces to cease fire and surrender. It was 1025 hours, 30 April 1975 by my watch. This was the end. I was most sorry for the outcome of the war, but I had done my best. I let my troops execute the President's final order for themselves: I had nothing more to say. But deep in my heart, I silently thanked all of them for their courage, sacrifice, and dedication until the very last minute of the war. Together, we had fulfilled our obligation and oath of allegiance.

Conclusion

I was, of course, arrested by the Communists and held captive in various concentration camps for 17 years. After my release in 1992, I came to the U.S. as a political refugee in 1993.

During the early years of captivity, I was interrogated intensively. The Communists were puzzled by the effectiveness of III Armor Brigade/III Corps ATF. They studied our organization and operations and made me write a composition entitled "How could III Armor Brigade/III Corps ATF fight unflinchingly against the Revolutionary Forces during the Spring Offensive?" They told me that III Corps ATF had been the only ARVN unit to confront them successfully until the last minute of the war.

Later on, we were transferred from the management of the Communist Ministry of Defense to that of the Ministry of Interior. They investigated our past military activities and were shocked by our exploits, which they regarded as war crimes. They accused me of prolonging the war for years and, along with the other commanding generals, I was selected to be prosecuted as a war criminal. Happily, the U.S., the UN, and the international media intervened on our behalf.

I shall never repent having done what I did, nor complain about the consequences of my captivity. If history were to repeat itself, I would choose the same path. By so doing, I know from experience that I would lose everything but HONOR.

The Three to Six Second Advantage: Tank Combat in Restricted Terrain

by Staff Sergeant Stephen Krivitsky
Dragon Force Master Gunner

"Terrain is not neutral — it either helps or hinders each of the opposed forces. Commanders must develop an eye for terrain; they must recognize its limitations and possibilities for protecting friendly forces and putting the enemy at a disadvantage. Successful commanders understand terrain and how it affects operations. They are able to grasp the potential capabilities and limitations of the space in which they operate."¹

FM 100-5

U.S. Army tank crew training, tactics, techniques, and procedures (TTP) and doctrinal manuals focus on open terrain. Tank crew training, from UCFT to CALFEXes,² is specifically designed for open terrain. Many potential battlefields, however, are located in areas with mountainous terrain. Many of our potential enemies — primarily Second Wave³ military forces — will leverage the terrain to make up for their training and technological disadvantages. A war in Korea, or in the Balkans, will find the enemy using infantry and second-generation tank and antitank weapon systems to ambush American tankers in restricted terrain.

If the U.S. Army fights in restricted terrain, force protection will be a major issue. Tanks and mechanized infantry provide a force with mobility, firepower, and enhanced protection; however, there is never enough dismounted infantry or artillery. In restricted terrain, an armored combined arms force is the weapon of choice for quick, decisive victory that produces a minimum of friendly casualties. Our Abrams tank supplies this with its excellent armor protection, mobility, and tough, battle-winning platform.

Commanding a tank in restricted terrain is much more demanding than in open terrain. In restricted terrain, a smart enemy in concealed positions will use the folds in the ground to ambush the attacking tanks at point-blank ranges. To defeat the ambusher, tank crews must wrest the initiative from the defender and fire first. This is a very challenging task. This challenge was dramatically evident during the Korean War (1950-1953), when superb tankers demonstrated "on numerous occasions that they could operate effectively in terrain that doctrinally was considered completely unsuitable for tanks."⁴

Tank commanding in restricted terrain, therefore, requires superb tank commanders with highly trained crews. Superb tank commanders use skill and enhanced battlefield situation awareness to gain a decisive time advantage to win in the defile — a "three-to-six second advantage." The three-to-six-second advantage is the ability to fire on an enemy ambusher at close range, in a defile, before he fires at you.⁵ To gain this advantage, the tank commander must build a high performing tank crew, master the critical crew tasks, and perform training that pre-

pares the crew to win the close-range, direct-fire fight.

Build a High Performing Crew

In the past, most tank crewmen performed single-skill tasks. The driver drove. The loader loaded. The gunner aimed the gun. Only the tank commander had to master multiple-skill tasks. The tank commander was expected to acquire the target, guide the tank, talk on the radio, and decide how to fight the tank. This delegation of tasks works well in open terrain, where the tank commander has more time to react to enemy threats, and when the engagement ranges allowed more time to acquire, designate, and destroy targets.

In restricted terrain, a tank commander has less time to react to enemy actions. To react successfully under these conditions, the tank crew must share some of the multiple skill tasks that were once the sole role of the tank commander. This requires tank crewmen who know much more about fighting the tank as a whole. It requires



a team that can anticipate the enemy's moves.

The tank commander is responsible for training his crew in these multiple skill tasks. To develop the crew into a high-performing team, every crewmember must work together to accomplish the common goal.⁶ The tank commander must build two high-performing teams: the tank commander/gunner team and the tank crew team.⁷ As a team builder, the tank commander must teach his crew. He is responsible for the crew and teaches them how to operate the tank as a team. The goal of this training is to create a high performing team where each crewmember is a part of mission success. The exchange of information in the tank resembles the actions of a pilot, co-pilot, navigator, and bombardier of an attack bomber.⁸

Not every tank commander will have the skill or the experience to build a high performing tank crew. Platoon sergeants, company master gunners, platoon leaders, and company commanders must reinforce the training effort by mentoring weak tank commanders in multiple-task skills. There are as many

methods to produce high performing tank crews as there are combat situations. The key is to address the issue and plan to grow crews that can function as more than the sum of their parts.

The multiple-task skills of the tank crew fighting in restrictive terrain center on battlefield situational awareness. The situational awareness of the tank crew in restrictive terrain combat must occur faster than in open terrain combat. Effective weapons employment is a crew task that requires a high degree of interaction and drill. Each member of the crew — loader, driver, gunner, and tank commander — apply a collective battlefield situation awareness to employ the tank's firepower on the close-range engagements typical of fighting in restricted terrain.

The driver must be more than a passive extension of the tank's movement; he must master the battlespace to the tank's front. To accomplish this, the driver must know where he is going and know how to get there. The driver must be trained to use a route chart effectively and efficiently.⁹

The loader's tasks involve scanning, reporting position location, employing

the loader's machine gun and, finally, loading the main gun. When traveling, the loader must be trained to constantly cover his crew search sector of responsibility,¹⁰ while at the same time keeping track of the vehicle's exact position using a global positioning satellite receiver device (PLGR or SLGR).

The gunner, while primarily responsible for identifying, engaging, and destroying enemy elements with the main gun and coaxial machine gun, must continually keep the tank commander abreast of the fire control system status. This includes manually indexing battlesight ranges (to be discussed in depth later), tracking ammunition expenditures, creating sketch cards, etc. Equally important, the gunner must maintain a high state of situational awareness, for he is the coupling between the tank commander and the fire control system. This requires him to maintain positive control of his orientation on the battlefield and, therefore, the gun tube orientation. His ability to track the vehicle's progress keeps the main gun oriented effectively to gain an advantage. This translates to going to a gun fight with your weapon al-

ready drawn and, for the most part, accurately aimed and armed.

The tank commander must master situational awareness. His ability to see, anticipate, and react to expected enemy situations is decisive. Anticipating the keyhole shot requires an acute understanding of the ground and effective map reconnaissance. The tank commander must be a technical expert in his navigational abilities — map reading, PLGR use, terrain association on the move, and terrain interpretation. Terrain interpretation develops the possible ambush site, keyhole position, intervisibility line, or kill sack without a visual reconnaissance of the area. The tank commander primes the crew for success by clearly relating checkpoints, phase lines, likely enemy keyhole positions, engagement areas, and the axis of advance/route. From these interpretations, a picture of the possible keyhole positions can be clearly made. He must inform the crew, prior to movement, of areas of interest, suspected enemy locations, difficult maneuver sites, restricted areas, and expected engagement areas. Guided by the tank commander, the driver, loader, and gunner are fused into a team that maximizes information concerning the tank's battlespace.

The quality of the tank crew is, in large measure, dependent on the tank commander. The tank commander must not only be in command of his vehicle but must also command the situation. His leadership, skill, determination, and drive are the linchpins for gaining the three-to-six second advantage. Training focused on techniques for winning in restricted terrain must be arduous, realistic, demanding, and conducted at a frequency that will achieve a 3-6 second advantage over the defender in the defile fight.

The Crew's Critical Tasks

FM 17-12-1-1, Tank Gunnery, establishes that Abrams Tank Crews must have "a thorough knowledge of their tank's functional capabilities, the techniques of acquiring targets, and the effective use of all crew-served weapons. In addition, U.S. tank crews must develop and sustain tactical crew skills that will allow them to maneuver effectively and survive on the battlefield."¹¹ Speed and accuracy of engagements depend on crew proficiency in the critical tasks listed below:

Acquire Targets in Restricted Terrain: Target acquisition is the critical crew task in restricted terrain combat.¹² Short engagement ranges make target acquisition the single most critical factor in gaining the three-to-six second advantage. Target acquisition is the timely detection, location, and identification of targets in sufficient detail to permit accurate attack by either direct fire or supporting fire. The entire crew must practice search techniques from their crew positions: rapid scan, slow scan, and detailed search.

Collectively, the crew must master target acquisition.¹³ The crew must instinctively perform all elements of the target acquisition process to achieve the three-to-six-second advantage. The target acquisition process has six essential progressive and interdependent steps: crew search, detection, location, identification, classification, and confirmation, all of which must be mastered by each member of the crew.¹⁴

Crew search, or observation, is the act of carefully viewing or watching the area of operations, using search and scan techniques and sectors of observation, to acquire targets. Each crewman must be responsible for his assigned area of observation and be able to perform all types of visual searches. The crew must master the rapid scan, slow scan, and detailed search techniques.

Detection of objects with potential military significance on the battlefield is an important way to get an edge in a defile fight. The crews must master the ability to identify the current or recent presence of vehicles or personnel by the telltale indicators or clues left by the enemy. These clues include empty foxholes, hot spots, recent fires, track marks on the ground, dust clouds, exhaust smoke, ATGM residue, loose or disturbed dirt, etc. The crew's awareness of these items will alert them to battlefield hazards (ambush, obstacles) or enemy emplacements.

The crew must be able to locate the potential enemy by looking and listening. The crews must be highly skilled at putting the weapon systems to bear against the suspected enemy location using the TC override, traverse method, reference point method, clock method, sector method, or EA system method (to be detailed later).

The tank crew must be able to identify the vehicle or position as friend or foe, rapidly and correctly,¹⁵ and sub-

sequently classify the target as most dangerous, dangerous, or least dangerous. The most dangerous is the threat vehicle that has the ability to kill you, and is preparing to do so; the dangerous threat is one that has the ability to kill you, but for whatever reason is not prepared to engage; the least dangerous is the threat that does not possess the ability to kill you, but has the means to call someone who can. Once complete, the tank commander must confirm the target for destruction as a threat and most dangerous of the present threat vehicles.

In restricted terrain, a smart enemy defends the defile against an armored penetration by reinforcing his defense with the terrain. Keyhole positions anchor his defense. A keyhole position is a defensive position that allows for single or multiple flank or rear shots at the enemy during limited windows of opportunity, without directly giving away the firing position. It is as if the enemy was firing at you through a keyhole as you passed down a hallway. Keyhole positions are typically found in defiles.

Each member of the crew, not just the tank commander, works as part of a team to anticipate and identify enemy keyhole positions. Once anticipated, the crew prepares to engage and destroy the enemy, orienting the main gun in the direction of the anticipated keyhole position. Gun tube orientation is instrumental in gaining the three-to-six second advantage. If the situation permits, the tank should advance and execute reconnaissance by fire,¹⁶ using 7.62-mm machine guns and .50-caliber machine guns to suppress the keyhole shot with fire as the tank approaches.

Graphics and Overlays: The crew must have a basic, thorough understanding of all common graphics used by their unit and their SOP. The primary training references for this are FM 17-15, Oct. 1987, Chapter 2, and FM 101-5-1, Chapter 2. Each crewman must have the ability to interpret all graphics given to the tank commander and understand their meaning and correlation to the mission. Understanding military graphics and overlays is a fundamental factor in situational awareness and mission accomplishment.

PLGR (AN/PSN-11, Precision Lightweight Global Positioning System Receiver): Each member of the crew should master the PLGR. The PLGR gives each tank crew the ability to determine an accurate 10-digit grid

coordinate, check time, rate of movement, direction of movement, and navigational waypoints. The ability of each crewman to use this equipment accurately and efficiently directly correlates to battlefield situational awareness.

To keep the number of tasks per crewman manageable, the PLGR should be located in the loader's position. The loader must be trained to plot way points, track movement, locate current position, and update the PLGR as the tank commander demands. Once the loader has mastered this, the tank commander can receive updates without losing his situational awareness through the defile, on the road march, or when maneuvering cross country. Simply put, this time-saving measure allows the tank commander freedom to concentrate on the movement of his vehicle, tracking the map with the terrain, and the rapid employment of his direct fires from all weapon systems. It helps the crew to perform quickly as a team.

The placement of the PLGR in the loader's position, to the right of the AM-1780 VRC, allows for easy access and allows the crew to go into protective posture quickly. The external antenna cable should be run through the turret to allow for this.¹⁷ With this ability, information can quickly get to the tank commander, gunner, and driver via intercom to provide an accurate assessment of the tank's location and direction of travel.

Route Chart: This is a navigational aid to the tank commander, and is used by the driver, gunner, and tank commander. The route chart is a sketch card of the area he will be traveling through, along with key points such as terrain features, man-made objects, grid lines, engagement areas, and cardinal directions. The route chart must list all critical checkpoints and phase lines as outlined during the troop-leading procedures following the OPORD.

Through a thorough map reconnaissance, and using the graphics issued from the OPORD and the driver's odometer, the driver maintains his situational awareness through all phases of the operation using the route chart.¹⁸ The route chart (see FM 17-15, p. 2-38) breaks up the route or operation into legs or segments, each with a unique direction or distance. Each leg includes major terrain features, and manmade objects or other identifiable features along the route to aid in determining current location. The curve line

distance of each leg is measured to the nearest 100 meters. The route chart will also contain the general azimuth of each leg of the operation. The loader — utilizing the PLGR — will keep the driver up to date on all changes. The driver will use the odometer to keep track of the distance traveled on a particular segment of the route. The driver reviews the written description of the route to help prevent navigational errors. The driver should announce these occasions/locations to the crew, identifying them through use of his odometer as necessary to continually keep the crew informed of their progression. As the loader announces way points (check points and phase lines), the driver can verify the vehicle's current location and direction of travel from his route chart and can anticipate the tank entering impending engagement areas. Without this knowledge from the loader, the driver's orientation is degraded, and he cannot actively anticipate the evolving situation. These events, such as entering engagement areas or the center battle area of a defile, key the driver to identify hull down positions, covered routes, alternate positions and other tactical areas of interest. The gunner should also have a route card with similar information to enhance his battlefield situation awareness and tactical orientation.

Battlecarry: Most Threat armies have purchased Russian manufactured armored personnel carriers [APCs], tanks, and artillery.¹⁹ At close range, all current Threat tanks and APCs can be destroyed with a 120-mm High Explosive Antitank (HEAT) round. Utilizing the Sabot round in the defile, where vehicles will typically be in column, places lead vehicles in danger of being struck with discarding components. These sabot pedals separating from the penetrator may cause injury to friendly soldiers or damage friendly vehicles. At close range, faced with split-second target identification, the HEAT round is the round of choice. It is also the preferred round against bunkers and anti-tank positions. The commander must make a conscious decision to employ HEAT as his element's battlecarry ammunition.

Battlesight Ranges: When fighting in the defile, engagement ranges may be anywhere from 25 meters to 1000 meters. This makes it difficult for the crew to fight the tank when the tank to target range is less than 200 meters.²⁰ A common occurrence is that the target is

so close, the computer cannot determine an accurate ballistic solution, causing confusion in the turret. Using METT-T, the commander should determine defile battlesight ranges.²¹ Currently, most armored units use 900 meters for HEAT and 500 meters for the coax machine gun (7.62mm, M240) battlesight ranges. During the defile fight, when ranges to targets may be as close as 25 meters, these standard ranges may cause the crew to miss the target using battlesight techniques currently in SOP.²² A specific battlesight range for the defile fight should be used by the tank commander upon entering a defile. This range for HEAT-MP-T, for instance, should be 400 meters.²³ Another range must be determined for coax. For instance, a battlesight range of 300 meters allows a crew to engage troop and troop like targets accurately from 25 to 400 meters.²⁴ These defile battlesight ranges are significant additions to the crews' gunnery techniques and require practice to integrate into their tactical operations. These battlesight range changes will be directed by the tank commander upon entering the defile identified by the loader, the driver, and the tank commander's collective situational awareness.

Indexing the defile-specific battlesight range is simple. The tank commander tells the gunner to index the defile battlesight ranges (HEAT and coax) when the vehicle is nearing a defile determined during the map recon with the operational graphics. The crew works as a team to check and re-check current position and upcoming named areas of interest such as engagement areas or defiles:

"We just passed Check Point 4," says the loader over the intercom.

"Hey, then we should be entering EA Colorado in 300 meters," the driver says.

"OK, gunner, Colorado is a narrow defile, index defile battlesight ranges! Loader, let me know when we hit Check Point 5," commands SSG Tank-sley.

"Ranges indexed, HEAT indexed, main gun armed, give me battlesight," CPL Gunn replies.

"WILCO," says the TC as he depresses the battlesight button. "Dump your trash," he says, telling the gunner to dump his lead.

"Check Point 5 in 100 meters!" The loader scans his crew search sector, checks the waypoint, and announces direction of travel to the crew: "Azimuth 046 degrees, Northeast."

Collectively, the crew should be working together, aided by a shared situational awareness. This will get smoother with training and repetition. The example above reflects actions in the tank while on the move. It occurs prior to entering the defile, and only shows a portion of what has been already covered in this article. The second phase of training for the defile fight applies all the individual and crew critical tasks through mounted training.

Lay the Main Gun: The tank commander must master the ability to accurately and instinctively place the gunner on target (or anticipated keyhole position) using the override, and ensure smooth transition back to the gunner's control. This is clearly a critical skill when focusing on the three-to-six second advantage. The three-to-six-second advantage is based upon the approximate time it takes for the enemy to identify you as the target, lay his weapon on you, and fire. A basic rule of armored combat is that the first to fire is the first to kill. The three-to-six-second advantage is, literally then, a matter of life and death. The words of Field Marshal Erwin Rommel concerning this issue are as true today as they were in WWII: "the day goes to the side that is the first to plaster its opponents with fire. The man who lies low and awaits developments usually comes off second best."²⁵

When fighting the defile fight, firing first is a decisive advantage to the attacking tank, section, platoon, and company. If the lead tank is destroyed or disabled, and the defile blocked, an entire task force attack can be slowed or stopped. The smooth transition of control from TC to gunner includes having the 3X reticle encompassing the target or the area of interest. This task, although part of the Tank Crew Gunner Skills Test (TCGST),²⁶ must happen within two seconds, on the move, rather than six seconds stationary. At the same time, the tank commander must execute a "Battlesight Drill," where he indexes the battlesight range using the MANUAL RANGE BATTLE SIGHT button once he releases control of the override. The speed at which he does this allows the gunner

the maximum time to engage and destroy the target or anticipated target.

Fighting in 3X vs. 10X: When fighting the defile and other types of restricted terrain, it is not uncommon to engage targets at ranges far less than normal battlesight ranges. Because of this, the gunner must be able to engage targets in three power (3X) using day (GPS) or thermal (TIS) channels. Although this is never used in open terrain, it saves critical time in restricted terrain. The gunner must be fully capable of engaging targets at extremely close range without moving to 10X. This allows the gunner to scan further in azimuth and elevation, find the targets, and kill them when the targets are between 25 meters and 400 meters. When engaging troop or troop-like targets at ranges between 25 and 400 meters, the gunner, firing in 3X, has the agility to observe burst on target, destroy a target, identify a subsequent target, observe burst on target, and adjust to another troop target without moving back and forth between power selections. His ability to engage in this manner is a critical task.

In 3X, the gunner could easily identify and engage all troop targets while tracking others in the area. This also holds true for enemy light armor. The gunner will be able to easily identify the enemy light armor in 3X at ranges out to 400 meters and, also in 3X, engage and destroy the same. The target will appear large enough in the 3X sight picture in TIS and the GPS day channel at ranges less than 400 meters to lay with killing precision. If the target is at a greater distance, the gunner can instinctively move to 10X, lase, and blaze.

Recon by Fire: To conserve main gun ammunition, tank machine guns should be used for reconnaissance by fire to cause a hidden enemy in a keyhole position to react. The loader or gunner should fire a single burst from their M240 machine guns (20 to 30 rounds) while constantly observing for enemy movement, enemy return fire, or the flash of rounds striking metal. The gunner should conduct his recon by fire in 3X, allowing him further scanning of the suspected enemy emplacement. The tank commander should not perform recon by fire with the caliber .50 unless absolutely necessary. When loaded for combat, the caliber .50 has only 100 rounds readily available, and the rounds are typically Armor Piercing

Incendiary with Tracer (API-T). These rounds create a flash that could be mistaken for the rounds striking a threat vehicle, and cause the unnecessary expenditure of a main gun round.

Reconnaissance by fire is used when other means of enemy detection have been unsuccessful or are not available. It is best employed with tanks in section. One tank can fire on a suspected enemy position or suspicious area to cause the enemy to react and compromise his position at the time of our choosing, not his.²⁷ The second tank can then engage and destroy the enemy from a different location. Each crew must be prepared to perform this critical task with their vehicle alone, or in tandem with their wingman.

Engagement Area System: An engagement area is an area in which the commander intends to trap and destroy an enemy force with the massed fires of all available weapons. Engagement areas are routinely identified by a target reference point in the center of the trap area, or by prominent terrain features around the area. Although engagement areas may also be divided into sectors of fire, it is important to understand that enemy defensive systems will focus on avenues of approach. Engagement areas and sectors of fire are not intended to restrict fires or cause operations to become static or fixed; they are used only as a tool to mass fires.²⁸

Engagement areas offer unique control opportunities in offensive and defensive fighting in restrictive terrain. The nature of restrictive terrain lends itself to designation by quadrant. The quadrant method of fire control is the most suitable and easily understood of the many engagement area systems for fire control in narrow defiles.

Most defiles can naturally be divided into quadrants based on intervisibility lines. Generally, these intervisibility lines can be identified during the map reconnaissance. Designating these portions of compartmentalized terrain as engagement areas breaks the battle into bite-sized chunks. Using engagement areas that are 1-3 kilometers long, this system employs cardinal directions as floating Target Reference Points (TRPs). These floating TRPs offer more precision to pass information to follow-on forces than the direction of travel or clock methods. For a tank commander to continually identify TRPs while on the offense is increasingly more complex as the mission

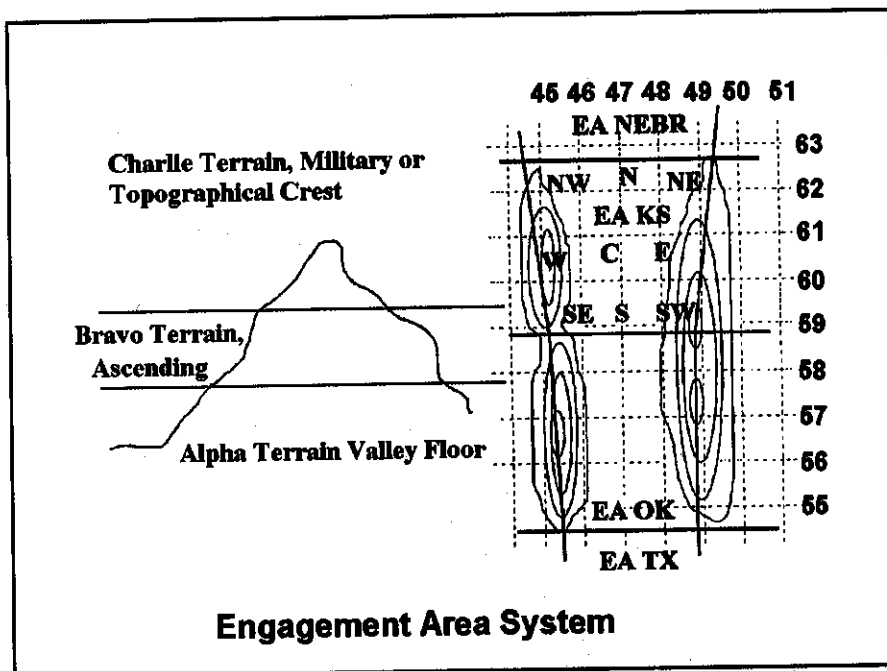


Figure 1

continues. A successfully tested EA system uses cardinal directions as "floating" Target Reference Points. This method breaks down the engagement area into nine (9) sub-areas, much like a tic-tac-toe board, subsequently named after their cardinal direction [north, northeast, east, southeast, etc.] and "center," respectively.

In addition, the altitude of the terrain is designated. Each mountain or hill is explained as either ALPHA [valley], BRAVO [ascending terrain], or CHARLIE [military crest to topographical crest] terrain.

This EA technique is exactly suited for controlling direct fires in a defile. Phase lines outlining each engagement area are designated along visible portions of compartmentalized terrain. This helps the tank crew understand the mission, relate the actions to acquisition reports from other vehicles, and apply immediate and accurate target acquisition and massing of fires. Speed and accuracy of reporting improves with practice. An example of a standardized engagement area system using the quadrant method is shown

Spot Reporting: Each section, platoon, company and task force needs a clearly articulated method of massing direct fires. Tank commanders must be able to report enemy locations clearly and rapidly. One method, developed for the restricted terrain of Korea, employs the refined version of the quadrant method of direct fire control described above.²⁹ Using this engagement area system, a tank can relay critical battlefield information to every tank on his radio net, and subsequently higher nets.

A standard spot report using this system offers quick and discernible information for the entire platoon, company, or task force to mass direct fires:

"CONTACT, TANK, ENGAGEMENT AREA KANSAS, EAST, ALPHA."

This method allows follow on tanks to quickly identify the enemy, anticipate the direction and location of keyhole shots and mass direct fires. Mastering the EA system and spot reports by the tank commander and crew is a critical multiple-skill task which incorporates all we have discussed thus far.

Call for Fire: In a defile fight, suppression saves lives and buys the tank crew time. Accurate artillery or mortar fire, suppressing enemy keyhole positions, historically makes a 30 percent difference in the casualties of the attacking force in the defile fight. The lead tank attacking down a defile is key to the indirect fire suppression task. The tank commander should call for fire based on known enemy locations or anticipated keyhole positions. Once a target is identified and the TC calls for fire, he can adjust fire using the loader's PLGR, the Gunner's Laser Range Finder (LRF), and his map. With an accurate grid location and direction relayed to him by the loader [read off his PLGR], the TC lases to the target to determine the range. From these three known data points [location, direction, and range], he determines the enemy's location. The tank commander can then call for, or adjust, fire on the target.

Camouflage and Light Discipline: Camouflage and light discipline³⁰ are

combat skills that pay high dividends when fighting in restricted terrain. The tank's crew must make all attempts to camouflage the vehicle to blend with the surroundings. A moving tank, well camouflaged, is harder to see than a tank that is not camouflaged and could provide a few minutes of indecision on the part of an ambusher. This is dramatically evident when one considers that there are no right angles in nature. The crew must actively distort the outline of the vehicle and its organic equipment to deny the enemy any possibility of detection. The entire vehicle should be camouflaged, causing the enemy to misinterpret the actual outline and appearance of the vehicle. Obscuring the right angles of the Abrams tank may be accomplished with shrubbery, bushes, branches and even sod during the spring and summer months. Blending the overall color of the vehicle with the surroundings is completed using snow, mud, off-colored burlap sandbags, or whitewash, depending on the season.

Most Threat armies are equipped with passive, light intensification sights and night vision devices. Light discipline, therefore, is an important survival task. Light discipline can be enforced by turning off all interior lights and taping over master power, driver's instrument panel and control panel lights. Covering the lights with tape will significantly reduce light emitted from the vehicle's periscopes, yet still allow for identification of crucial fire control, automotive, and vehicle status information.

Training for the Defile Fight

To win in restricted terrain requires frequent training, as most tank crew skills are highly perishable. Personnel turbulence exacerbates the challenge of maintaining a high level of training on the functional capabilities of the tank. To train at a high frequency, most training will have to be conducted in the motor pool and in local training areas. The tank crew's mastery of technical and tactical subjects, the link to reaching the objective at the other side of the defile, will require study, drill, and repetition.

Training for the defile fight requires use of the basic and intermediate Tactical Tables, as found in FM 17-12-1, November 1986.³¹ The Tactical Tables

best suited for the defile fight, which should be completed concurrently with the gunnery training program, are listed in Table 1.

Tank gunnery tables train armor units to hit targets; tank tactical tables use gunnery skills and Multiple Integrated Laser Engagement Systems (MILES) to train armor units to fight on the real battlefield. In free-play force-on-force engagements, the tank crew learns to respond rapidly to OPFOR activity in order to destroy the opponent. Tactical tables train crews, sections (tank with wingman), and platoons at the basic (crew), intermediate (section/wingman), and advanced (platoon) levels of 24-hour combat operations. Engagements should be conducted both in the day and at night. The focus of this training should be to win the defile fight — teaching the critical crew tasks in the process.

A high frequency of training in local training areas is a requirement to master these tactical tables, so the availability of local training areas is a prerequisite. Every effort should be made to develop local training areas to their maximum potential. Training areas for the defile fight are often available because they represent the areas least suitable for "open terrain" operations by platoon-sized tank and mechanized units. In many cases, these defiles represent unwanted training land. This unwanted land, deemed incapable of armored maneuver on large scale, is exactly the kind of terrain that armored forces will have to move through and fight in on some of the potential battlefields of Korea or the Balkans.

The tactical tables in FM 17-12-1 w/C3 contain detailed information on most of the critical tasks listed previously. Units must develop specific task, conditions and standards to employ the PLGR, Route Chart, and engagement area system. Use of "jump radios," during these training events will allow for detailed information for after-action reviews (AARs) and will enhance learning.

The goal of this training is a tank crew that functions as a team, passes critical information quickly and clearly, and controls the tank's battlespace. The flow of information from crewmember to crewmember is a combat multiplier and a major goal of this training. Crews must learn to anticipate the enemy, and engage and destroy the enemy

Tactical Table

Task

A	Negotiate a route using terrain for cover and concealment Navigate from one point to another point Analyze terrain using the Five Military Aspects of Terrain Detect a target and give crew acquisition report
B (B7)	React to Indirect Fire
(B8)	Evade Antitank Guided Missile (ATGM)
C (C1)	Engage Simultaneous Targets
(C3)	Engage OPFOR Tanks
(C4)	Engage OPFOR Security Element
(C5)	React to Ambush
(C6)	Engage Sniper
D (D1)	Coordinate Between Crews
(D2)	Execute Herringbone
E (E1)	Execute Action Drill
(E2)	Execute Contact Drill
(E3)	React to Indirect Fire
F (F1)	Engage Multiple Targets
(F2)	Engage Multiple Machine Gun Targets
(F3)	React to Ambush/Recon By Fire
(F4)	Engage Enemy Tank Platoon
(F5)	Engage Patrol and Sapper

Table 1

enemy before being ambushed. An enemy in an ambush position with a keyhole shot has a very limited field of view. His success involves firing before being seen. Increasing the situational awareness of the attacking tank crew is an integral part in gaining the 3-6 second advantage and getting the jump on the defender who is waiting in ambush.

Conclusion

In restricted terrain, an armored force may be reduced to a frontage of one tank. During the Korean War, the U.S. Army found that "armor remained an indispensable part of ground combat, regardless of any limiting conditions under which it had to operate."³² "Open terrain" tactics, successful in desert-like terrain, *will not work* in restrictive terrain. If armor leaders are sent to Bosnia, or fight again in the mountains of Korea, the ability of tank crews to fight through and penetrate defended defiles in restricted terrain will be decisive. This requires a different approach to tank commanding and crew responsibilities. The crew must work together to defeat the defender. Their collective skills are at a premium in restricted terrain. They must learn to obtain and express critical combat information within their tank and with adjacent tanks in new ways. The end result is creating an unmistakable advantage.

In Korea, we call this advantage the "3 - 6 second advantage".³³ If the tank crew is prepared, anticipates the defending threat, and aims his weapon systems at the anticipated keyhole position, the enemy can be suppressed or killed before he can identify, aim, and engage the attacking tank. This is a tough challenge, requiring thoughtful, focused training. Gaining the 3-6 second advantage over an enemy waiting in ambush takes an integrated crew effort to nullify the defender's terrain advantage.

To be ready for tomorrow's battlefields, U.S. Army armor crewmen must "grasp the potential capabilities and limitations of the space in which they operate."³⁴

Notes

¹Department of the Army, *FM 100-5, Operations*, (Washington, D.C.: U.S. Government Printing Office, June 1994), p. 14-4.

²UCOFT stands for Unit Conduct of Fire Trainer and is the primary simulator for training Abrams tank crews. CALFEXes is an acronym that stands for Combined Arms Live-Fire Exercises. A CALFEX usually involves a company or higher formation conducting a live-fire engagement training exercise.

³The concepts of Alvin and Heide Toffler, as found in their book *War and Anti-War*. First Wave occurred during the agricultural revolution, characterized by hand-to-hand combat; the Second Wave as the Industrial Revolution, represented by wars of mass destruction as in

WWI and WWII; and the Third Wave, the ongoing information revolution, is knowledge-based warfare as evidenced in Operation Desert Storm.

⁴David A. Niedringhaus, "U.S. Army Armor in Limited War: Armor Employment Techniques in Korea and Vietnam," Masters Degree Thesis: Ohio State University: 1987, p. 27. "Initial assessments of armor performance and usefulness in Korea concluded that armor remained an indispensable part of ground combat, regardless of any limiting conditions under which it had to operate." p. 54.

⁵The three-to-six second advantage is defined by the author as the approximate time it takes for the enemy to identify you as the target, lay his weapon system on you, and fire. A basic rule of combat is that the first to fire is the first to kill.

⁶Kenneth Blanchard, et al., define high performing teams as teams with the following characteristics: Purpose, Empowerment, Relationships and Communications, Flexibility, Optimal Performance, Recognition and Appreciation and Morale. See *The One Minute Manager Builds High Performing Teams*, (New York: William Morrow and Company, 1990), p. 21.

⁷In addition, superb tank commanders must support the growth of three teams: the tank commander/platoon leader team; the platoon leader/platoon sergeant team; and the platoon leader/company commander team.

⁸The building blocks for all tank-related training are contained in three manuals: *TM 9-2350-264-10 (Technical Manual, M1A1 Abrams)*, *FM 17-12-1-1 (Tank Gunnery)*, and *FM 17-15 (Tank Platoon)*.

⁹Department of the Army, *FM 17-15, The Tank Platoon*, (U.S. Army Armor Center, ATTN: ATZK-DC, Fort Knox, Ky., 9 March 1993), p. 2-50.

¹⁰Department of the Army, *FM 17-12-1-1, Tank Gunnery (Abrams)*, (U.S. Army Armor Center, ATTN: ATZK-DC, Fort Knox, Ky., March 1993) pp. 6-2 through 6-5.

¹¹*FM 17-12-1-1, p. 1-1.*

¹²*FM 17-12-1-1, p. 6-1.* This manual describes Target Acquisition as "a process that is a series of progressive and interdependent steps or actions by which a tank crew acquires enemy targets for destruction. It is a continuing requirement for all tank crewmembers, whether in the offense or defense, moving or stationary. The six steps in the target acquisition process are Crew Search, Detection, Location, Identification, Classification, and Confirmation."

¹³*FM 17-12-1-1, Chapter 6.* "Speed and accuracy of engagement depend on crew proficiency in target acquisition and gunnery; yet target acquisition is one of the hardest gunnery tasks to train effectively."

¹⁴*FM 17-12-1-1, Chapter 6,* describes in detail the Target Acquisition Process. The training process for target acquisition begins with an in-depth understanding of *FM 17-12-1-1, Chapter 6*, by all crewmembers. It must become second nature to the crew through repetitive training.

¹⁵Typically referred to as "IFFN," Identify Friend, Foe, Neutral.

¹⁶*FM 17-12-1-1, p. 9-10.* To conserve main gun ammunition, use tank-mounted machine guns in reconnaissance by fire to cause a hidden enemy to react. Fire a single burst (20 to 30 rounds with the M240 or 10 to 15 rounds with the callher .50) while constantly observing for enemy movement, return fire, or the flash of rounds striking metal."

¹⁷The external antenna cable can be run from the inside of the turret to the external antenna easily following the power cable to the left or right Grenade Launcher. Some modification may be required with the use of some silicone to ensure a secure, sealed outlet to the external antenna. This procedure will not interfere with operation of the Smoke Grenade Launchers or the Over-Pressurization System.

¹⁸*FM 17-15, Oct. 87, pp. 2-38, 2-39.*

¹⁹Currently, there are approximately 35 countries that still utilize either the T54/55 or T62 as their Main Battle Tank.

²⁰*FM 17-12-1-1, p. 2-7.* The ballistic computer provides only ballistic solutions for ranges between 200 and 4000 meters for main gun ammunition. No ballistic solution will be created for ranges between 4000 and 7990 meters (+/- 10m). Laser returns under 200 meters and over 8000 meters will be displayed as flashing zeros. When the gun select switch is set to COAX, the TC can use the Manual Range Battlesight button to select ranges down to 25 meters.

²¹*FM 17-12-1-1, p. 8-1.* Unit SOP will set battlecary ranges based on the commander's analysis of mission, enemy, terrain, troops, and time (METT-T) available.

²²Department of the Army, *FT 120-D-2, Firing Tables*, (Washington, D.C.: U.S. Government Printing Office, 15 April 1994), pp. 42 and 43, (HEAT-MP-T, M830), the maximum ordinate, or highest part of the projectile trajectory to the target, is 1 meter above the gun/target line, 468 meters from the gun. *FM 17-12-1-1, p. 7-1,* evaluates the average size of Commonwealth of Independent States (CIS) manufactured or styled vehicles being 2.3 meters high, 3.4 meters wide, and 6.7 meters long. When a vehicle is in the defense, creating a substantially shorter target than 2.3 meters, the firing tank using battlesight gunnery techniques at 900 meters will miss the target completely if the vehicle is actually between 250 and 600 meters.

²³*FT 120-D-2, pp. 42 and 43, HEAT-MP-T, M830, Max. Ord. for 400 meters is 20 centimeters, 203 meters out from the gun.*

²⁴Department of the Army, *FT 7.62-A-2, Firing Tables*, (Washington, D.C.: U.S. Government Printing Office, 30 June 1973), p. 18. M80 Ball, battlesight range of 500 meters allows for a maximum ordinate of 1 meter at 300 meters. A battlesight range of 300 meters has a maximum ordinate of 0 meters (meaning less than 50 centimeters) out to 400 meters, which is 100 meters past the battlesight range.

²⁵Kenneth Macksey, *Rommel: Battles and Campaigns*, (New York; Mayflower Books, 1979), p. 32.

²⁶*FM 17-12-1-1 Chapter 13, Page 13-10 and FM 17-12-1-2, p. A-81.* The tank commander must lay the main gun from the tank com-

mander's override such that the target appears in the 3X sight within six seconds.

²⁷*FM 17-12-1, Coordinating Draft, Oct. 1990, p. 7-6.*

²⁸Department of the Army, *FM 101-5-1, Operational Terms and Symbols*, (Washington, D.C.: U.S. Government Printing Office, 21 October 1985), pp. 1-29 thru 1-30.

²⁹The quadrant method of engagement areas is used by the Dragon Force, 2-72 Armor, in Korea for both defensive and offensive operations. In the offense, units attack into a series of sequential engagement areas. Each engagement area is defined by intervisibility lines (usually 1000 to 2000 meters long and as wide as the defile).

³⁰Department of the Army, *FM 20-3, Camouflage*, (U.S. Army Engineer School, ATTN: ATSE-TDM-PP, Fort Leonard Wood, Missouri 65473, 14 Nov 90). This manual explains in detail the art of camouflage, its concepts, fundamentals, principles, and application through all phases of operation.

³¹Department of the Army, *FM 17-12-1 w/C3, Tank Gunnery, M1/M1A1 Abrams*, (Washington, D.C.: U.S. Government Printing Office, 3 Nov 86), Chapter 12, Tank Tactical Tables, were to be retained because they are to be republished in the next edition of *FM 17-15, Tank Platoon*, and are not currently published in *FM 17-12-1-1/2, Tank Gunnery*.

³²Niedringhaus, p. 54.

³³Three to six seconds is the time that an enemy requires to identify an attacker, aim, and engage the target.

³⁴*FM 100-5, p. 14-4.*

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Staff Sergeant Stephen Krivitsky entered the U.S. Army in November 1986. He has been assigned to 4-67 Armor, Friedberg, Germany; 2-8 Cavalry, Fort Hood, Texas; 2-77 Armor, Fort Carson, Colorado; and currently 2-72 Armor in Korea. He has performed all crew duties on an M1A1 Abrams and is currently the Battalion Master Gunner for 2-72 Armor.

The Field Trains Command Post — Organizing For Success

by Captain Kevin P. Banks

The role of the Field Trains Command Post (FTCP) is to coordinate task force combat service support requirements with the brigade S4 and forward support battalion.¹ Under the control of the HHC commander, it serves a critical function in the success of the unit's combat service support (CSS) plan. Many of today's military publications, such as ARTEP 71-2-MTP, FM 71-123 and FM 71-2, discuss the responsibilities of the FTCP, but amazingly, say little about exactly how these responsibilities are best accomplished. It is, therefore, the mission of the HHC commander and his key personnel (XO, 1SG, S4/S1 NCO) to plan and prepare the FTCP manning and organization to achieve success.

Essential in this planning is developing a command post that is able to simultaneously track the tactical operations of the task force while maintaining an accurate and easy-to-read picture of the companies' and attachments' logistical status. By tracking the tactical situation, the HHC commander and his staff are better able to anticipate the changing logistical situation as demonstrated by the following:

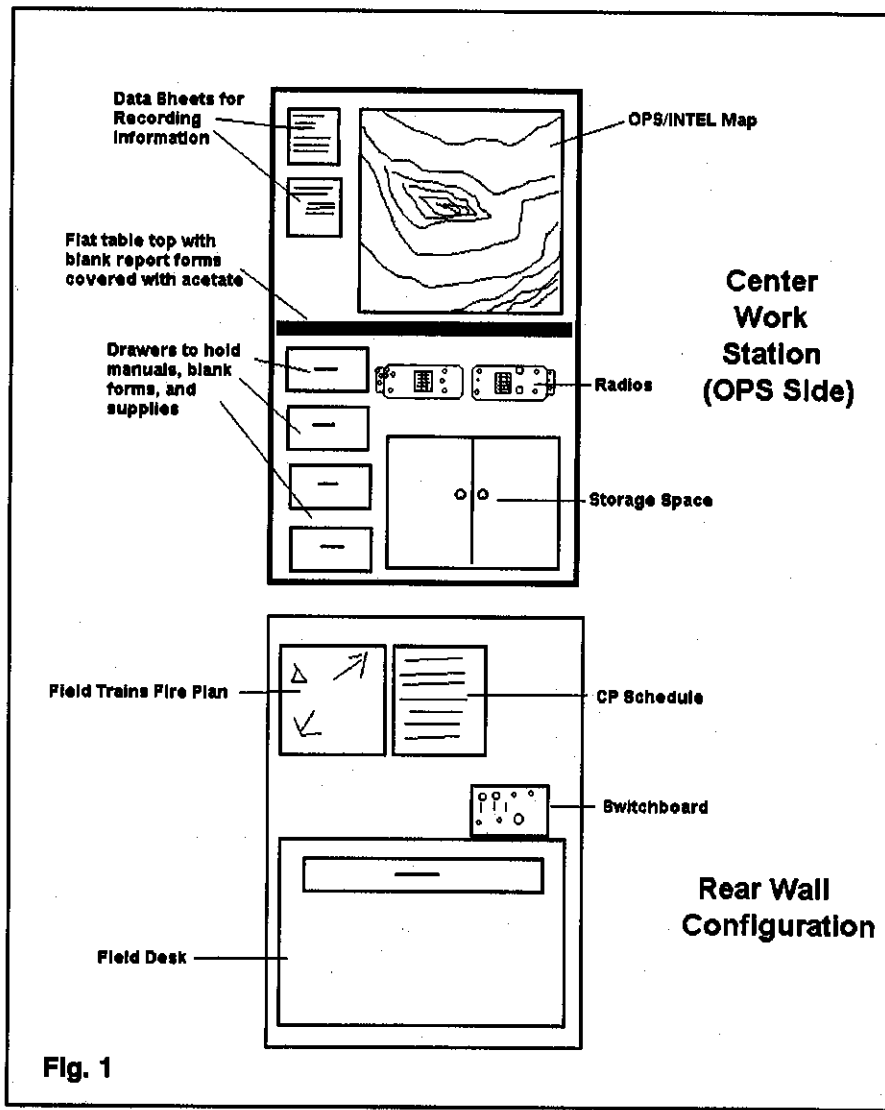
TF CMD NET: "Guidons, this is Saber 6. FRAGO follows... Execution - Team Mech establishes a roadblock along Hwy 144 vicinity North Church in order to prevent the passage of contraband across the zone of separation... Acknowledge, over." (Based upon this transmission, the HHC commander may alert the FSB that they will require additional barrier materials for the new mission.)

TF CMD NET: "Saber 6, this is Ghost 6. SPOT report follows... we are in contact with an AT company that is defending along the forward slope of the hill located at grid ES544323... unit is unknown... time is 1345S... enemy is equipped with AT4s and AT5s, out." (Here, the FTCP may begin requisitioning medical supplies and asking the

brigade S4 to alert Charlie Medical Company of the FSB as to the likelihood of casualties.)

By staying abreast of the tactical developments, the field trains CP is better able to provide the responsive support units need. At the same time, the FTCP crew will be receiving reports from the

combat trains command post that detail the companies' specific logistical needs, from personnel and major end items (tanks, Bradleys, trucks) to repair parts and food. This is the focus of their existence. Task force SOPs, with established formats, reporting times, and brevity codes, will assist in this process,² but unless a workable system is in



LOGREP

- Line 3 (Class III Items)
- Green 90%
 - Amber 75%
 - Red 60%
 - Black <60%
- Line 5 (Class V Items)
- Green 90%
 - Amber 75%
 - Red 60%
 - Black <60%
- Line 7 (Class VII Items)
- a. # M1A1s FMC
 - b. # M3A2s FMC
 - c. # M106s FMC

PERS-SUM

- Line 1 (Unit)
- Line 2 (DTG)
- A. OFF B. WO C. ENL D. TOTAL
- Line 3 (Auth - Organic)
- Line 4 (Asgnd - Organic)
- Line 5 (Attached)
- Line 6 (Detached)
- Line 7 (KIA)
- Line 8 (WIA)
- Line 9 (MIA)
- Line 10 (Noncombat Loss)
- Line 11 (Total Loss)
- Line 12 (Total Gains)
- Line 13 (Current Strength)

Table 1

place and well rehearsed during peacetime, the FTCP will undoubtedly fail to accomplish the numerous, critical tasks placed upon it.

The two parts of any successful command post are the right equipment and the right people to do the job. With some smart planning and early preparation, both can be available in time to conduct the mission proficiently.

Equipment

The first thing needed to establish the FTCP is the actual command post. Although the vehicle available for use will vary from HHC to HHC, an M934/820 5-ton expando van or M577 Armored Command Post with TOC Extension, in conjunction with a generator, work best. Both vehicles provide the space and versatility needed for tracking the tactical and logistical situation simultaneously while monitoring three nets (TF CMD, TF A/L and FSB CMD), and the generator provides the auxiliary power source necessary to power radios and lights when the vehicle's engine is off. The expando van offers a much larger operating space and is already configured for an air conditioner, which will assist greatly in preventing radios from overheating when the weather is extremely hot. The decreased mobility of a

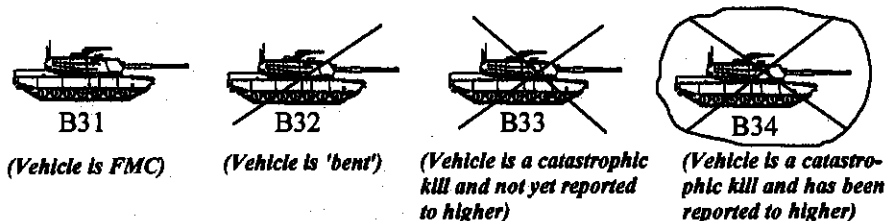
wheeled vehicle will not adversely impact FTCP operations because it will be near the mess section, support platoon, and other wheeled elements and thus be on trafficable terrain anyway.

Once a vehicle is chosen, it must be configured for use as a multifaceted command post. The following setup utilizes an expando van, but is easily adaptable to the M577.

The first thing to emplace is a two-sided tracking station running lengthwise in the center of the van. Tool tables from a local DRMO or fabricated entirely from lumber by the unit R&U NCO are the most cost effective. Directly in the center, extending to the ceiling, will be a piece of plywood that will be the basis of the map boards. On one side will be a map with the OPS and ENEMY SIT TEMP graphics; the other side will have an identical map with the CSS graphics. This will allow

the personnel manning the FTCP to have a clear delineation of tasks and not interfere with each others' duties. Cover the table tops with blank report formats and then top them with acetate so that information received over the radio can be recorded quickly and in a readily accessible location. The area below the table top is the radios' location, along with any necessary COMSEC equipment. The TF A/L and FSB CMD nets will be tuned in on the logistics side of the station and TF CMD on the ops side. (Note: The FSB CMD is a redundant source of communication when the FTCP is located in the BSA since it can communicate with the FSB via wire or messenger. In this case, the additional radio may be used as part of the base cluster defense system or alternate use.) The remaining storage space and drawers are useable for manuals, battle tracking supplies, and other miscellaneous items.

In addition to the center workstation (where the majority of the CP's activity will occur) the back wall of the expando van offers valuable space. In one corner is a field desk with switchboard (SB-22). WD-1 commo wire and TA-312 field telephones allow command and control of the subordinate elements (mess section, support platoon, DS maintenance...), OPS, and crew-served weapon positions. The rear wall is useful for posting the field trains fire plan and daily CP schedule, to include critical LOGPAC actions, report times, and shift changes. The remaining area in the Expando Van houses the S1's TACCS computer or other necessary automation equipment. A generic example of how this may look is shown in Fig. 1.

Visual Depiction of 3rd Plt, B Co's Vehicle Status**Fig. 2**

	<u>DAY (0600-2100)</u>	<u>NIGHT (1900-0800)</u>
CP OIC:	CDR	XO
CP NCOIC:	1SG	OPS NCO
OPS/INTEL NCO:	TRAINING NCO	TRAINING CLERK
CSS NCO:	S4 NCO	S1 NCO
RUNNER:	CO'S DRIVER	XO'S DRIVER

Table 2

plished on schedule. Each soldier should maintain a log or note system to facilitate the information exchange.

Conclusion

It was said long ago that "without supplies, neither a general nor a soldier is good for anything."³ The maxim is still as true today. If the field trains command post is not prepared to fulfill its role in the execution of the task force logistical plan, then the unit will quickly find itself without equipment or personnel. Getting the field trains command post organized for its mission is the first step in achieving success. By using time in garrison to create a CP equipped to efficiently perform the myriad of tasks expected of it, the HHC commander will achieve the standard required during deployments.

Notes

¹Headquarters, Department of the Army, Mission Training Plan for the Tank and Mechanized Infantry Battalion Task Force, HQDA, Washington, D.C., 1988.

²Headquarters, Department of the Army, *Cavalry Operations*, HQDA, Washington, D.C., 1991.

³Clearcus of Sparta, from *Cavalry Operations*, HQDA, Washington, D.C., 1991.

The actual forms the FTCP will use for tracking each team's logistical status are a final, major factor to consider. The forms for OPS tracking can usually be copied from those used by the TF TOC or TAC. This will save effort and ensure uniformity. It is likely that similar logistical reports for tracking equipment and manning status already exist, probably at the brigade combat team level. A careful review of these reports must be made in conjunction with the other key CSS players (S4, Bn XO, S1, and BMO) in order to ensure that they are current, practical, and standard. Examples of two logistics reports you may use are shown at Table 1.

In addition to the detailed reports that are necessary when relaying information between the FTCP and task force/company combat trains, it is critical that the HHC commander has a system in place that will immediately tell him the status of the task force's major end items and personnel and what actions have been taken to obtain replacement equipment/soldiers. One technique used with success is to have visual depictions of each company's vehicles by nomenclature and bumper number. A simple marking system indicating whether the vehicle is FMC or NMC, a catastrophic kill, or just 'bent' and if a replacement requisition has been forwarded to brigade is easily trained to the FTCP personnel. This method is depicted in Fig. 2 and can be used just as readily for tracking the status of individual soldiers once the FTCP staff acquires unit crew rosters with battle roster numbers. With a bit of interaction in garrison, identical charts can be created for habitual supporting attachments such as engineers.

Manning

Equally as important as planning out how you will equip the FTCP is how you will man it. CSS is an around-the-clock task. The HHC commander must

compose a competent command post crew which can sustain the operation from 0001 to 2400 hours, seven days a week. This is not a simple task, given the limited number of available personnel. Like the TF TOC and TAC, a day and night shift rotation allows the field trains command post to provide quality support at any given time. The minimum personnel that should comprise each shift are:

CP OIC: Has overall responsibility for FTCP, ensures crew is tracking all TF logistical and tactical activities and forwarding applicable information higher, oversees the formation of LOG-PACs, is responsible for security of field trains, and assists the S4 in planning future CSS operations.

CP NCOIC: Assists OIC management of FTCP crew, oversees the field trains security plan, and guides HHC LOGPAC to TOC, TAC, CTCP and UMCP.

OPS/INTEL NCO: Is responsible for tracking all tactical reports/activities in the TF over O/I and CMD nets and alerting CSS NCO to any activities that may impact significantly on the supply system.

CSS NCO: Is responsible for tracking all logistical reports/activities from company and TF combat trains and forwarding appropriate reports higher while disseminating any information sent down from the FSB or BDE Rear.

RUNNER: Assists in monitoring the switchboard for all wire communications, serves as messenger to FSB CP and other elements in the BSA, and conducts vehicle/generator maintenance.

A typical manning plan is at Table 2. Notice that there is time to allow personnel to brief their counterparts on any significant activities that have occurred and actions ongoing. This period of double manning allows the crew to catch up on any maintenance or other activities that have not been accom-

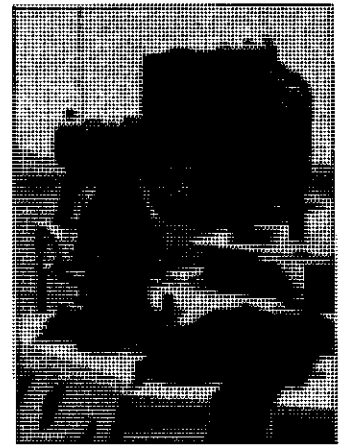
Captain Kevin P. Banks is a 1991 graduate of the U.S. Military Academy. After completing the Armor Officer Basic Course, he was assigned as a cavalry platoon leader in 1-1 Cavalry, 1AD. After 12 months, he was assigned as the squadron asst. S4 for 11 months and then served as the HHT XO. His military schooling includes AOBC, AOAC, Airborne, Air Assault, SPLC, and SCCC. He is currently serving as the Deputy Commanding General of Fort Knox.

A Temporary Solution to an Ongoing Problem:

Now, Make a FIST...

Converting the M3 Bradley for Use as a FIST Vehicle

by Captain Thomas A. Crowson and Staff Sergeant Marty J. Peterson



G/VLLD installed on Bradley

In the Field Artillery Officer Basic Course, as well as in the 13F Advanced Individual Training, new fire supporters are taught that the greatest killer on the modern-day battlefield is the dread Fire Support Team Vehicle (FISTV), with its eight smoke grenade launchers, mighty M-60, and turret-mounted Ground Vehicular Laser Locator Designator (G/VLLD). Perhaps this was once true, but with the fast pace of modern warfare, the FISTV, as a mobile harbinger of death and destruction, is quickly proving itself to be ineffective in meeting current demands.

Nowhere is this more true than in the cavalry. Reconnaissance forces are known for swift, decisive action on the battlefield. The FISTV is simply unable to meet the challenge of rapid maneuver. Regimental armored cavalry FIST lieutenants and NCOs often joke about being effective for the first 10 to 15 minutes of the battle, then being reduced to a radio relay station as they watch the dust trails on the horizon.

Although the 19D scouts are trained as maneuver shooters, there is no substitute for 13F eyes (or the G/VLLD laser) on the target. What is needed is a vehicle that provides improved overall capability for job performance, compatibility with other vehicles and weapons systems in the troop, reliability of both weapons and automotive systems, and survivability on the battlefield.

Field Artillery branch has noted this problem and is developing a solution: the Bradley FISTV (BFISTV). Unfortunately, fielding for this system is several years away. We need a more immediate solution.

Background

In a recent National Training Center rotation, 3d Squadron, 3d Armored Cavalry Regiment was beset by problems with the FISTV fleet. Despite drawing newly rebuilt vehicles, maintenance problems abounded, mimicking those commonly found in the aging fleet at home station.

Those vehicles that did survive the maintenance war quickly found themselves looking at the rear of the tanks as they thundered past into a battle the relatively immobile FISTs were unable to influence. Attempts at observation plans in the offense were laughable. If a FIST did manage to occupy its Observation Post (OP), the rapidly advancing troops were often in the way by the time the OP was set up and ready for missions.

The squadron commander noted this problem and decided that a temporary, immediate fix was necessary. Our goal was to improve the capability, compatibility, reliability, and survivability of the FIST. The solution was to move the troop executive officers to the super command and control environment of the M577 and use their M3 Bradleys as platforms for fire support vehicles. From this base, the FIST teams could easily assemble a vehicle which could maintain pace with the rest of the troop, and be maintained by the maintenance assets within the troop.

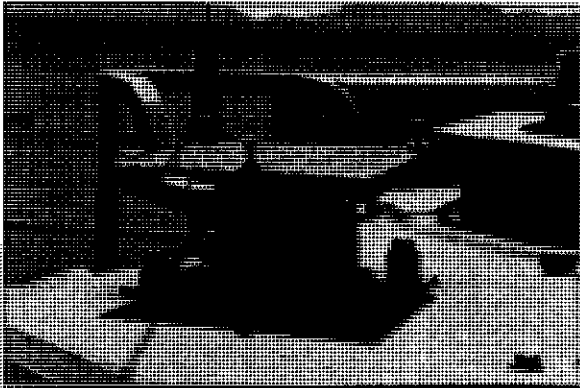
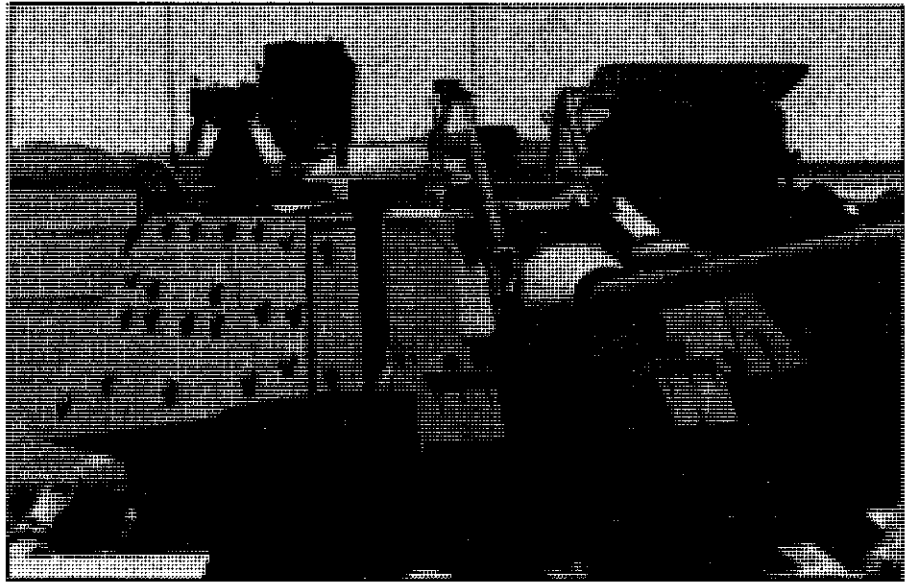
In transferring the FIST teams from the M981 FISTV to the M3 Bradley, two areas had to be addressed to take advantage of the M3 Bradley platform, communications and G/VLLD operations.

Communications

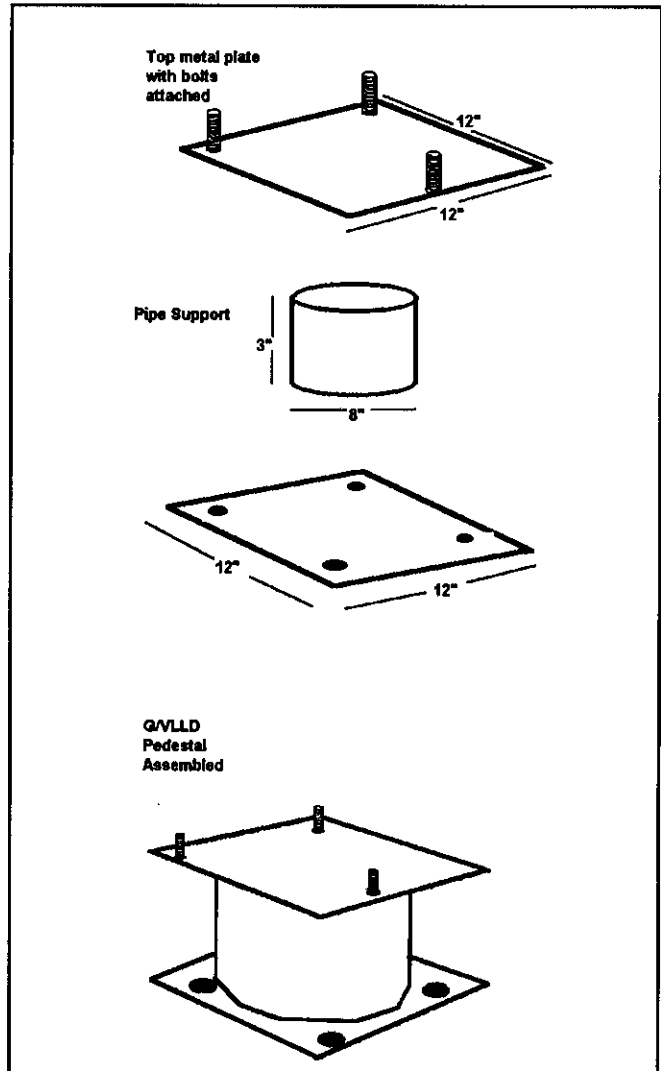
The M3s were originally configured with two radios in the turret. After some consideration, the FSOs and FSNCOs decided to leave those radios in place and mount two more in the crew compartment. This configuration has been tested in the command and control vehicles of the regimental and squadron commanders and S3s. The conversion requires the removal of the 25mm ammunition racks in the left rear of the vehicle, and installation of two SINCGARS radios in their place. The antennae were mounted to the reel mount assembly on the left and right rear of the vehicle, with cables run into the crew compartment through the ramp seal. For power, we removed the ground mount power cable from the FISTV, lengthened it, and installed it in the M3. While not optimal, another option units wishing to follow our lead may pursue is to run power from a wire spliced into the power cable for the interior lights.

Although these radios are not connected to the intercommunications system, the RTO has no problems monitoring both nets, as one is exclusively digital to our supporting Field Artillery units and the other is the squadron FSE net, which is primarily a digital net. The two radios in the turret hold the troop command net and the troop fire support (mortar) net. The FSO and FSNCO can key both of these nets through the CVC, whether riding in the crew compartment or turret of the vehicle. The two crew seats were removed and reinstalled with the backs to the radios, and a Forward Entry Device (FED) stand was fabricated and em-

Construction Details And Project Views



Above, two views of the G/VLDD pedestal mounted on the Bradley turret roof. Radio installation in the crew compartment is seen below. At right, construction details of the pedestal with dimensions. Installed device is seen at upper right.



placed between the seats. This allowed easy access to the radios and the FED for both the FSO and RTO while leaving the entire opposite hull wall open for a situation map.

G/VLLD Operations

We mounted the G/VLLD on a stand fabricated from a three-inch section of pipe with a thick metal plate on each end bolted in place in front of the Bradley Commander's (BC) hatch. On the upper plate, the squadron welder permanently affixed bolts in a pattern to accept the traversing unit (TU) of the G/VLLD tripod (see illustration). The TU was then removed from the tripod and bolted into place on the pedestal with wing nuts, allowing quick installation and removal of the TU and G/VLLD. This pedestal is high enough to permit the free movement of the G/VLLD, yet low enough to prevent forcing the FSNCO to come far out of defilade for its operation. The pipe used in the stand must be at least six to eight inches across and thick enough to withstand the constant abuse commonly associated with movement of a tracked vehicle. For G/VLLD power, we fabricated a cable to run from the A4J2 connector on the SINCGARS mount to the EMI filter of the G/VLLD. We routed the cable through the antenna mount directly behind the radios, around the BC's hatch, and into the G/VLLD. Because power is derived from the same circuit as communications, the FSNCO/BC must ensure all CVCs are unkeyed when firing the laser. This has resulted in a new pre-lasing command of "unkey." After the BC/FSNCO announced "unkey," he listens for each crewmember to announce "unkey" followed by his position. He then announces "lasing," unkeys his CVC, and fires the laser. When finished, the BC/FSNCO keys his CVC and announces "all clear," allowing crewmembers to use CVC communications again. Interface between the G/VLLD and FED or Digital Message Device (DMD) is accomplished through verbal commands from the FSNCO to the RTO over the vehicular intercom.

M3 Operations

In addition to the normal crew of a FISTV, the troop has supplied us with one E5 and one E4 19D cavalry scout.

The additional NCO not only acts as gunner for the vehicle, but also contributes a measure of expertise in training the fire support personnel in Bradley operations. In a field scenario, his presence allows the fire support personnel to focus on the FIST mission while he concentrates on the gunnery mission. He rides in the turret with the FSNCO, providing an additional set of eyes and aiding the FSNCO/BC in maneuvering the vehicle. If METT-T allows, the gunner can also ride in the rear of the vehicle, keeping the situation map updated and aiding the RTO. This allows the FSO to ride in the turret, expanding his ability to visualize the battlefield. The E4 acts as the driver of the Bradley, allowing the 13F slotted for the driver position of the FISTV to remain in the howitzer battery with that vehicle. The RTO and FSO ride in the crew compartment of the vehicle, providing command and control, as in the FISTV. To carry the numerous accessories required by a FIST team, we removed the TOW racks from the rear of the vehicle and created a load plan similar to that of the FISTV. Since the interior of the M3 is much larger than that of the FISTV, storage space has not been an issue in the conversion.

Our bottom line goal was to increase ability in compatibility, capability, reliability, and survivability, while addressing issues of communications and G/VLLD operations. The increased compatibility with other weapons and automotive systems in the troop has decreased supply and maintenance difficulties that were the hallmark of the FISTV. In turn, this has increased the reliability of our vehicle, stated both in operational readiness rate and in actual use.

By working out of a Bradley, we are now able to do our job without presenting a conspicuous target to the enemy, as the Bradley looks like any other vehicle on the battlefield. This, coupled with the upgrade in armor from the M113 to the M3, has greatly improved our survivability.

Finally, our overall capability has increased exponentially. No longer are we resigned to watching the rear of vehicles. We are fully able to keep up with any vehicle on the battlefield and no longer have to worry about the time required to erect the targeting head as we can now ride with the G/VLLD in place.

Conclusion

Although most members of the Fire Support Element in 3d Squadron were hesitant to make the switch, the conversion to the Bradley has proven to be surprisingly easy. The crew, with some help from the squadron welder, took only one week to fabricate and install everything in the vehicle. In the field, the M3 has provided us with the ability to maintain contact with the troop, afforded us additional security, and given us a more mechanically reliable mode of transportation. Although we lost the Targeting Station Control and Display (TSCD), most of its functions can be replicated using the FED or DMD interfaced with the G/VLLD. We still have the ability to lase targets, communicate on all nets, both digitally and voice, and compute data. The biggest loss was the directional control provided by the gyros of the FISTV, but we have found that with an M2 compass and a SLGR GPS, there is little degradation of our ability to accurately acquire targets. Despite its few drawbacks, the Bradley is proving to be an excellent interim replacement for the FISTV until the BFISTV is fielded.

Staff Sergeant Marty J. Peterson, a former Navy Aviation Boatswains Mate, Equipment, entered the Army in October, 1989. Upon completion of Basic Training and AIT, he was assigned to HHS, 6-8 FA, Ft. Ord, Calif., as a fire support specialist. He is a graduate of PLDC, BNCOC, FED/Forward Observer Command Course, and DMD Trainer Course, and is currently assigned as FSNCO, K Troop, 3-3 ACR.

Captain Thomas A. Crowson is a 1990 Distinguished Military Graduate of the University of Texas at El Paso ROTC program. A graduate of FAOBC, FAOAC, and SPLC, he has served as a fire direction officer, howitzer platoon leader, and support platoon leader in 1-11 ACR and as the fire support officer for K Troop, 3-3 ACR. He is currently S4 and BMO, 2-17 FA, Ft. Sill, Okla.

The Guard Unit Armory Device Full Crew Interactive Simulation Trainer (GUARDFIST-1)

by First Lieutenant Stephen J. Snyder

The tank commander called for the driver to move out, as the gunner moved his head to view through his auxiliary sight. As the view through the auxiliary sight cleared, the gunner called out "driver stop!" The driver eased on the brake and the tank commander evaluated the range through his primary sight extension and waited for the target to emerge from the treeline it was traveling behind. Once the target cleared this obstacle, he issued the command, "fire!" The gunner announced "on the way!" and squeezed the trigger on his cadillacs. Although no recoil was felt, one was heard through the subwoofer mounted beneath the breech. Shell obscuration shielded attempts by the crew to sense impact of the round. The loader safed

"Soldiers can only be ready when they are trained for the job they are doing and doing the job they are trained for. To ensure that our Army can perform as the nation deserves and expects, we must continually ensure that they are assigned where their training, knowledge, and experience contribute to the Army's readiness."

- General Creighton W. Abrams - 1973

the main gun and punched the box mounted on the ready door, waiting for the light to indicate a round was available for loading. Once lit, he pushed the load light on the breech-mounted box and armed the main gun. Once the obscuration cleared, identification of the target showed flames leaping from

the side of the turret. A catastrophic hit! The tank commander called "target, cease fire — driver back up" to complete the conduct of fire. Having succeeded in destroying the enemy in another engagement, all of the crew took off their CVCs, dismounted their tank, and made their way across the armory

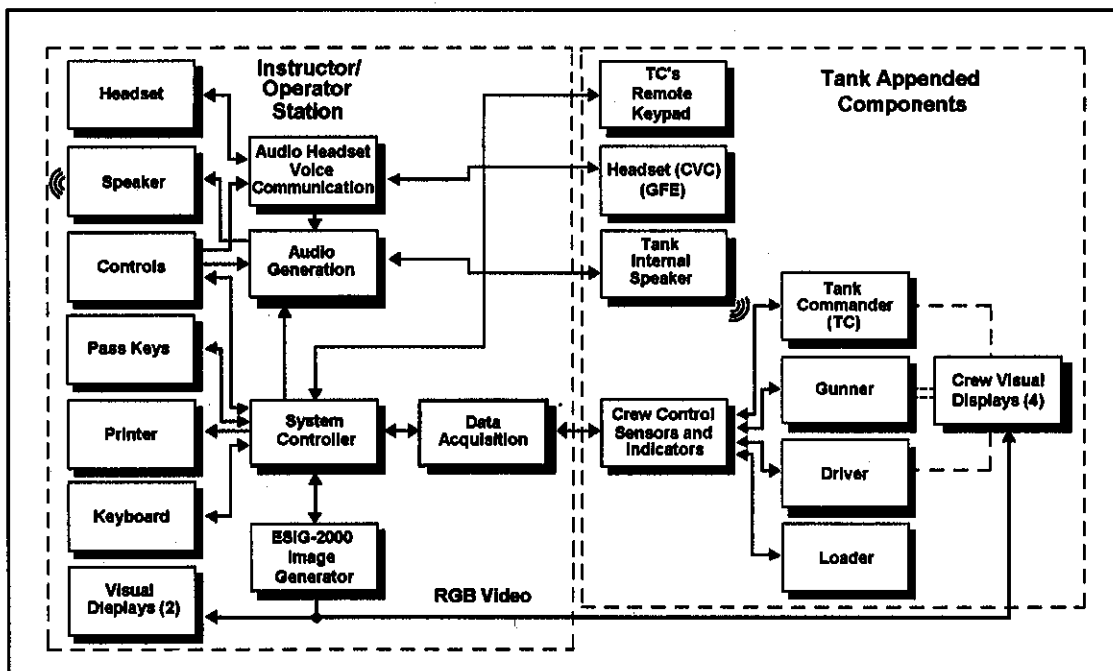


Figure 1.
GUARDFIST-1
Systems
Architecture

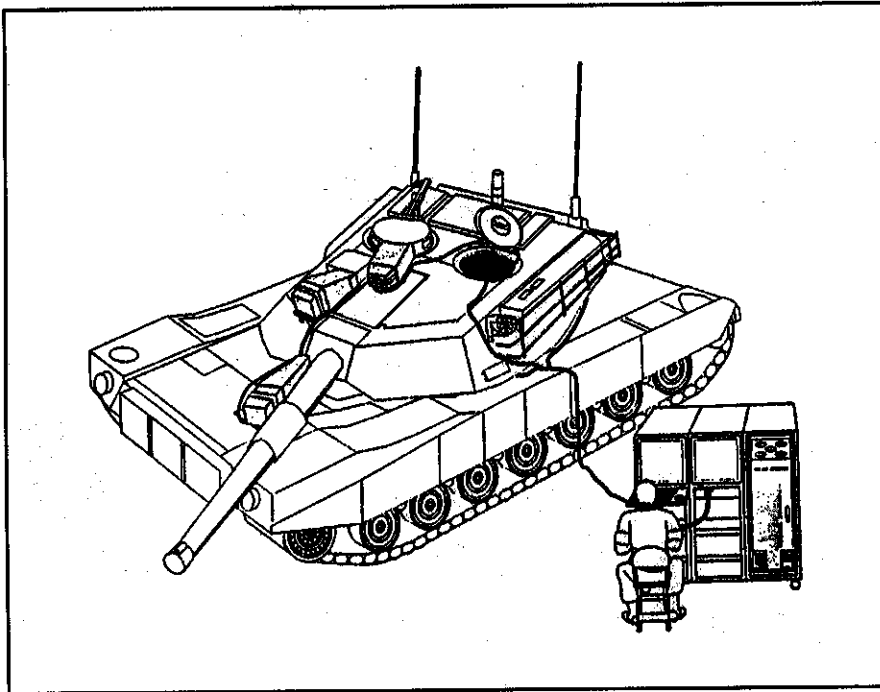


Figure 2. Perspective of M1 Tank with GUARDFIST-1 Appended Training System

hall to the soda machine. The tank commander made a detour to the side of the vehicle to get a hard copy from the printer at the instructor/operator station on the times to fire and reticle aim of his gunner. As he too headed to the soda machine, he looked back at the looming hulk of the M1 sitting in the corner of the armory and he pondered on how much tanking had changed since he first rode on "A5s" and "steel dinosaurs."

The sleepy post of Camp Shelby, Mississippi was the field test site for the latest in virtual-reality, synthetic environment-based simulators. Camp Shelby's humidity and oppressive heat are known more for wearing out field troops and harboring bird-sized mosquitoes than for assessing simulators. The post housed technicians, instructor/operators (I/O), and Alabama National Guardsmen in conducting field-tests on the simulator, now in the hands of some Guard units. The U.S. Army's latest application of armor-oriented virtual-reality-based simulators, the GUARDFIST-1¹ was field-tested under the Initial Operational Test and Evaluation (IOTE) program. The purpose of this IOTE was to (1) assess the training effectiveness of GUARDFIST-1 and (2) assess the possible configuration and funding requirements. The program consisted of assessing pre- and post-test scores on modified Tank Tables VII and TTVIII for control and experimental groups. These groups were comprised of four National Guard tank

companies, scheduled during their two-week Annual Training period.² Optimally, the test would have been conducted during the course of one year, however, a less than ideal test was designed to simulate approximately one year's use,³ and to obviate delays that have hampered the program, such as software and hardware bugs.

The benchmark targets for assessing the maintainability and integrity of the GUARDFIST-1 system for the IOTE were (1) that the system demonstrated a mean-time-between-operational-mission-failures (MTBOMF) equal to or greater than 170 hours and (2) that the system must demonstrate a mean-time-to-repair (MTTR) less than 30 minutes 95 percent of the time.

On dimensions of both maintainability and experimental/control groups differences benchmark targets were achieved. The GUARDFIST-1 was superior. This is especially important since, unlike the Mobile Conduct of Fire Trainer (MCOFT), the GUARDFIST-1 has many components that must be crated and mounted, increasing the chances for system malfunctions. The system also performed well under adverse environmental conditions. On several occasions, the huts where the tanks and simulators were located became balmy from humidity. The various GUARDFIST-1 systems performed to standard under such conditions. Heat and humidity are more damaging to such systems, due to cooling require-

ments of the CPUs and monitors. Upgrading of CPUs to Pentium-class chips will increase the cooling requirements.

"The GUARDFIST-1 program was initiated by a Training Device Requirements (TDR) in 1987, ...and was designed to fill a gunnery training deficiency withing NG armor and cavalry units. Many of these units store the majority of their tanks at installations far from their local armories and do not have access to local training areas and ranges. In order to conduct gunnery training, they must travel, in some cases, hundreds of miles to use their equipment and have access to training areas. This is costly in terms of both training time lost while traveling and assets required to actually move unit personnel. The GUARDFIST-1 is designed to allow NG armor units to more efficiently train their soldiers in tank crew gunnery skills at their local armories."⁵ It was also designed so that each armory could house one GUARDFIST-1, mounted on a stationary M1 tank. Current use of MCOFTs for this purpose are allocated on the basis of one MCOFT per battalion. GUARDFIST-1 would quadruple the use of virtual-reality-based simulator training for NG Armor units.

The GUARDFIST-1 is a full-crew, on-tank trainer, with hookups slaved to each crew station's controls. Television monitors are attached to the driver's, gunner's, and TC's optics.⁶ All cables and optics are further slaved to a 486-66 microcomputer and driven by a Paradox-engine UNIX-based 32-bit operating system.⁷ System components consist of a systems controller, image generation system, audio system, data acquisition system, system software,⁸ and the I/O station.

The system controller is the core of the trainer, and synchronizes all activities by communicating with the driver, gunner, and tank commander image generation system. During training on the simulator, the controller reads from exercise scripts, controls the simulation, and monitors the performance of the tank crew. In addition, the controller follows, analyzes, and grades each exercise, and provides printed reports. The image generation system provides the synthetic environment to the TC, gunner and driver's stations. These images are generated from a polygonal database in real time.

The gunner has both the Gunner's Auxiliary Sight (GAS) and the Gunner's Primary Sight (GPS) to view from, including thermal, while the TC has access to the unity periscope and Gunner's Primary Sight Extension (GPSE) as sights. The driver observes through his center vision block from the closed-hatch position. The audio system provides all sound effects, played from digitized sound files, and broadcast through JBL speakers and subwoofers. Audio cues are provided to the crew through the CVC helmets. The data acquisition system consists of mechanical linkages and electrical buffers needed to allow communication between the tank controls and the training device. The I/O station consists of a keyboard to allow control of training programs, two monitors for displaying visual simulation and status information, the console which houses the computer system,⁹ and a printer to provide feedback information.

The use of microcomputers instead of minicomputers or mainframes has significantly reduced the cost of GUARDFIST in comparison to its virtual cousin, the COFT. The capabilities of the GUARDFIST-1 include:

- Full crew on-tank training.
- Simulated European and desert terrain.
- Simulated unrestricted tank movement.
- Simulated 360-degree turret rotation.
- Simulated full main gun and coax ballistics.
- Simulated day and night engagements.
- Simulated malfunctions.
- Real tank and gunnery sounds.
- Detailed crew performance printouts.

GUARDFIST-1 is a tank-appended training device that will be used by active, reserve, and NG units for collective tank crew training in a simulated closed-hatch mode on an M1-series tank. Aural cues are provided, representing responses to driver input (engine speed, steering actions, and transmission shifting) and gunner input (weapons firing). During training, the tank is in a dead turret, power-off mode. Visual simulation allows the vehicle to move at will through an exercise or battle environment, constrained only by the physical conditions of the surrounding terrain (trees, rocks, buildings, and water).



GUARDFIST-1 Synthetic-Environment Graphics

Training Environment

Training on the GUARDFIST-1 is quite different from training at SIMNET or on COFTs. Like its virtual reality counterparts, GUARDFIST-1 is hampered by the use of electronics rather than the more solid-feeling hydraulics. Gunnery in the GUARDFIST-1 is also quite different. GUARDFIST-1 simulates firing individual engagements or tank tables, and provides critiques after each engagement. These critiques include exposure time, target identification time, time to fire, and reticle aim, as well as fire command errors or manipulation errors. However, unlike the COFT, where a series of ten engagements are run before stopping to critique, the GUARDFIST-1 gives grades after each engagement. During the field test, this proved distracting to many crews who were used to firing a series of engagements before being critiqued. Evaluation after each engagement tended to break the rhythm that the crew was developing. On the plus side, GUARDFIST-1 has an innovation in the TC's compartment. A magnetic box mounts above the TC console, and permits running of the simulator from the TC station. This box has toggles that switch the TC's unity periscope view back and forth between the synthetic environment view and the view that is presented to the instructor/operator. This capability allows the I/O to better show the TC results of engagements and prepare the TC for subsequent engagements. Should an I/O not be available, a qualified TC can operate the trainer from his station.

At the loader's station, boxes attach to the ready door and the breech to simulate duties that the loader must perform. Unfortunately, the loading time was taken from standards from the 17-12-1-1 for an M1A1 — 7 seconds per load. TC's and gunners found this an annoying delay, and loader's continually complained that loading time should be variable, depending on the speed of each individual loader. The loader must also move the safety arm to the safe position before reloading each round. Other than loading, the loader has little to do. He is not provided with a monitor and cannot assist in scanning.

The driver in the GUARDFIST-1 must conduct his normal duties, including moving out to a hull down position when conducting defensive engagements. Should the driver move out too little or too much, either a berm shot results or the gun tube ends up pointing at the ground. The only difficulties experienced at the driver's station were an occasional loss in calibration on the T-handle, which required a few minutes for the I/O to recalibrate, and no sense of feeling for where the driver was going. This was particularly true when moving up during defensive engagements.

The quality of the synthetic environment in the GUARDFIST-1 is a significant improvement over the graphics of both SIMNET and COFT, including the newer COFT graphics disk. Tanks are no longer box-shaped, but have lines similar to actual BMPs and T-72s. Rounds have two different effects

when hits are scored on targets. The first occurs during a mobility kill. The target will no longer move, but can still fire. The second type of target strike is a catastrophic hit. When such a hit is made, the tank flames to signify the ammunition cooking-off. In addition, the vehicle remains on the battlefield, adding smoke and flame to the battlefield obscuration. Hits are also possible through tree branches and small berms. Every detail of the synthetic environment is realistic, including toolsheds, bars, and horizons. Target acquisition under desert conditions tested the best of eyes, and made crews adept at looking for muzzle flashes to identify locations of targets.

The quality of instruction on the GUARDFIST-1, like most other training, is only as good as the training devices and the trainers. GUARDFIST-1 instructor/operators were highly qualified to perform their duties. They were enthused about the capabilities of GUARDFIST-1 and up to all assigned duties, including correcting system malfunctions during training. Since the same two I/Os worked with each crew during their entire week of training week of simulator training, a rapport was developed, and both the crew and the I/O learned each other's training habits.

The rigor of training of GUARDFIST-1 was challenging. Each level of training in the matrix has both training and evaluation modes. Table VIII in the simulator is known affectionately as the "widow-maker," due to its level of difficulty. Targets pass behind treelines, buildings, and outcroppings during engagements, adding to engagement difficulty. While most crews in the experimental groups had a chance to fire TT VIII, few were able to qualify, this after almost 20 hours of simulator training. TT IV, a preparatory Tank Table for TT VIII, took some crews 10 iterations to pass. Crews were well accustomed to donning protective masks by the time they began live fire exercises on TTs IV, VII, and VIII. Upwards of 20 percent of the GUARDFIST-1 training was spent wearing protective masks.

Target acquisition for the TC was daunting. Targets were indistinguishable through the unity periscope, therefore making the job of target identification a CBS and GPSE task. Good crews soon found that assistance rendered by the driver was critical to good opening

times. The driver's view was superior to the tank commander's unity periscope view. This fact made TCs less likely to use the unity periscope to scan and more likely to improve driver/crew interactions. In GUARDFIST-1, the driver takes the place of the eyes of the loader during scanning, since the loader has no optics or viewscreen.

The only other software glitch in GUARDFIST-1 occurred at the TC's station. TC override calibration was sometimes lost, causing the view to appear as though the turret slew drastically when the TC attempted to hand-off control to the gunner. A recalibration quickly corrected such problems.

Use of GUARDFIST-1

At present, the GUARDFIST-1 is not designed to replace the COFT or SIMNET. The capability is being developed to link GUARDFIST-1s together to simulate platoon gunnery, along the lines of the UCOFT's Platoon Gunnery Trainer (PGT). Its primary role in the immediate future will be to supplement NG training at armories. Precision gunnery for tank tables is the strong suit for the simulator. It is not as yet designed to replace the tactics training of SIMNET, or the introductory and matrix training of the COFT. Since GUARDFIST-1 does not at present possess introductory gunner or TC manipulation exercises, its setup is for crewmembers who already have a firm grasp of station duties.

The GUARDFIST-1 system was granted a low rate initial production (LRIP) of 50 units by the Simulation Training and Instrumentation Command (STRICOM), with a first unit equipped date scheduled for April 1995.

Notes

¹The current name, GUARDFIST, is being changed to A-FIST (Abrams-FIST) as the program target spreads to include a Regular Army dimension.

²Details of this report were gleaned from the author's experiences during this experimental training.

³An ideal test would have been to put the GUARDFIST-1 through its paces for a full one-year field-testing.

⁴The control group did NOT undergo COFT training. By standard training, I am referring to Conduct of Fire classes, AACs, TCPC, TT IV subcaliber, and TT VII. Results of the experiment could also be due to intercrew differences in skills. The experiment attempted to go around this fact by drawing on a sample size of 28 experimental and 28 control group crews. Crews were forced to maintain integrity, meaning that once the training began, no crewmember could change positions or withdraw from the training.

⁵Taken from page 1-2 of 1994-OT-1360A.

⁶The system at present does not include a monitor for the CWS. Future add-ons will provide this dimension in gunnery.

⁷There were delays in training between engagements, which consisted in wait times due to the 486-66 CPU architecture. In addition, each GUARDFIST-1 only had 8 megabytes of Random Access Memory (RAM). For such a graphics-intensive use, it is recommended that a minimum of 32 megabytes of RAM be used (of a 56 nanosecond wait state) and a 100 Pentium CPU be integrated. This would reduce wait states to approximately one-tenth of the current levels.

⁸Software was developed according to DOD-STD-2167. Sixty-seven percent of the software was written in C language and 33 percent in ADA. The software is compiled and executed on a UNIX-based operating system.

⁹The console is approximately the same size as the COFT's computer console and is on wheels for ease of movement.

First Lieutenant Stephen (Doc) Snyder was commissioned in Armor from Arizona State University's Army ROTC, where he received an MBA and Ph.D. in strategy. His undergraduate degree was in history from Shippensburg University, Pennsylvania. He is a graduate of AOBC, and is Air Assault qualified. He is currently scheduled for Phase 2 of AOAC and is assigned as XO, B Company, 1st Battalion, 131st Armor, Alabama Army National Guard. He is an Assistant Professor of Management/Management Information Systems at the University of West Florida.



Patton Museum Courts a New Generation

by John Rickey

Nestled in Keyes Park, Fort Knox, overlooking the route Morgan's Confederate Cavalry took on its raids into Union territory, lies the home of modern day cavalry and armor, the Patton Museum.

The museum attracts over 300,000 visitors a year. Surrounded by lush scenery and an assortment of international mounted and mobile weapon systems of the past, the museum reaches out to young and old alike, from 70-year-old sergeants of the past, to 10-year-old lieutenants of the future.

Hosting mock battles or showing off its collection to the viewing public is only part of its mission. With support from the Cavalry-Armor Foundation, corporate sponsors, volunteers, local tourism agencies, and the donations of generous visitors, the Patton Museum of Armor and Cavalry is our link to the past, educating armor warriors of the future in tactics and leadership.

Never is this link more evident than when present-day warriors host one of the many dedication or reunion ceremonies held in the park. When the morning sun burns off the mist shrouding the monuments to cavalry and armor, visitors can almost see the silhouettes of past warriors felled on the fields of honor, standing alongside the new mounted warriors honoring their comrades who have come to pay tribute.

"All you have to do to realize the importance of our facility is walk outside into the memorial park and admire the tributes to armor and cavalry units who have made this country safe," said John Purdy, director of the museum. "Thousands of former armor and cavalry soldiers have dedicated monuments to

their efforts on this field of remembrance, and as those veterans dwindle in numbers, it is up to the new generations of mounted warriors to ensure survivability of the museum."

Plans by Purdy and the foundation are more ambitious than just survival. Through its ongoing restoration projects, plans for future site renovations and additions, and work with state and local tourism bureaus to promote the Dixie corridor and Fort Knox's impact on the region, the museum staff has maintained high visibility as one of Kentucky's more popular tourist attractions.

"Visitors will notice a subtle shift in the museum's focus over the next few years, from a historical message to an educational focus," said Purdy. "There has been a shift in the demographics of America since Viet Nam, and the number of families in this country who have military ties or know someone in uniform has decreased dramatically since World War II and Korea. Without educating our visitors about the reasons for mounted combat and mounted warfare — how the perception was that armor's role decreased after World War II, and how armor proved its worth again on the Desert Storm battlefields — the necessity for a strong mounted force could be lost on the general public. Part of the museum's role is not only providing a historical perspective, but the museum staff now filters its exhibits for appropriateness and understandability to an ever-increasing, unfamiliar audience.

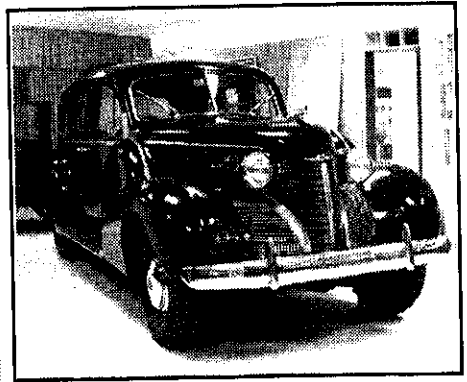
"Fort Knox and the entire mounted community could become isolated if we fail in our education mission."

To combat this possibility, the museum continues to acquire previously unobtainable equipment for displays by strengthening its ties to the international armor community. Recent additions include a German "Tiger" tank, and an M3 light tank obtained from Australia, a tank used in the Philippines against Japanese forces.

"The M3 is part of an exhibit in progress highlighting armor's first role in World War II," said Purdy. "Some of the first armor combat was seen by the Army National Guard in the withdrawal into Bataan in late 1941 and early 1942. This combat is almost the forgotten element of early armored warfare by U.S. forces, but Kentuckians from Harrodsburg are very familiar with those campaigns. Its Company B, 192d Tank Battalion was very involved in providing rear-guard action during the withdrawal into Bataan by holding crossroads and bridgeheads. Unlike the later overwhelming use of active armor in North Africa and European, it was not unusual to have Guard armored forces on the Pacific front lines while the Army built its armor force.

"Just as the Army grew its armor and cavalry force in WWII, we can't move forward and grow without the help of the new generation of mounted warfighters," said Purdy.

As the museum moves forward to examine armor and cavalry since World War II, veterans of that conflict can rest assured that there will be no examination without inclusion of their accomplishments in shaping the force since their service in WWII. Their tactics, doctrine, and legacy have shaped the force of the future and nowhere is this



Patton's Cadillac limousine, above, is one of many exhibits focusing on the great armor general. At left, an ex-Nazi tank destroyer prowls Keyes Park prior to a July 4 reenactment. Below, an American infantry patrol closes in on the "Germans," actually members of a reenactment group from St. Louis.

more prevalent than in the decisive armor and cavalry victories by their grandsons in Desert Storm. Those veterans who fought in Desert Storm, both active and reserve component soldiers, have experienced the shock and lethality of battle, as their grandfathers did some 50 years ago!

"Their legacy and stories are the areas we must focus on in the near-term through projects, exhibits, and additions that highlight their overwhelming superiority on the battlefield," said Purdy. "This is a large group of veterans and current duty-status soldiers whose ties to the museum must be exploited by pride in ownership. Many of those soldiers and their families have never enjoyed the museum, so we know there is a future audience out there for us to reach out to and ask to assist and support our efforts."

One effort in need of support is the acquisition of an M1-series tank to complete the Desert Storm exhibit. Included in this exhibit will be elements of General Franks VII Corps command and control actions, many of which have led to the present use of battlelabs to shape and design control of the battlespace. The museum has a captured Iraqi T-72 tank; it needs some help to obtain the M1.

Whether through donations, higher corporate sponsor participation, or endowments, the museum and foundation are examining ways to attract new visitors and spur new growth. To compete in the future as the cornerstone-showcase of the Army's technology center of excellence, the museum and foundation has to raise money and its level of support.



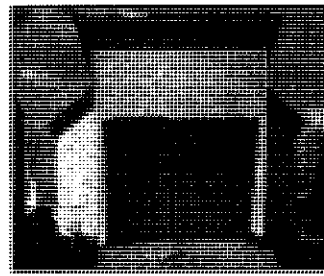
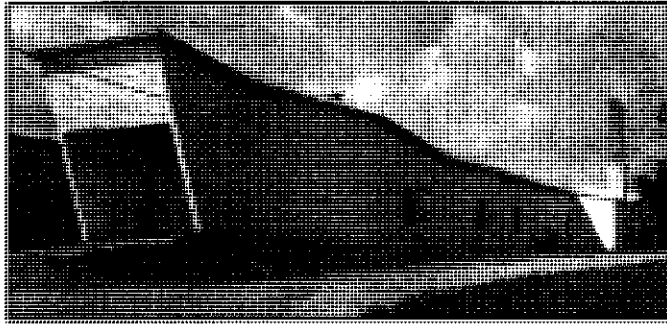
"Those are issues the Armor and Cavalry Foundation are meeting regularly on as we move into the future," said Purdy.

Future long-term projects will include an expansion of the already popular "Cold War" exhibit, featuring actual segments of the Berlin Wall and familiar border posts. There will also be a move towards "interactive videos," where museum visitors can walk through armor and cavalry's history, as well as use some early versions of the training equipment mounted warriors practiced on.

These equipment exhibits will chronicle the Army's move into expanded simulation training, virtual reality, and the digitized communication battlefield, highlighting many of those same soldiers who fought in, and brought their ideas back from, Desert Storm.

"Those Desert Storm veterans are the ones who are shaping Force XXI, by applying battlefield techniques and enhanced communications to ensure lethality and survivability in 21st Century battlefields," Purdy said. "If we are unable to attract a core of those Desert Storm veterans in support of the museum, I don't think we'll be as successful in highlighting armor and cavalry's continued role and necessity for tomorrow's warfighters. We need them as advocates of the Patton Museum, advocates of the Home of Mounted Warfare and Fort Knox, and advocates of armor and cavalry soldiers past, present, and future!"

John Rickey was the Fort Knox Public Affairs Officer when this article was written.



The Fort Knox "LST Building," at left, was built to test methods of ventilating the ships that would carry tanks and trucks ashore in the Sicily invasion. The model below, from the Patton Museum collection, is an LST, the ship on which the building was based.

The Fort Knox Navy

by Captain Matthew D. Morton



Driving around Fort Knox, many of the things we pass daily remind us of the rich heritage of cavalry and armor. More often than not, we give little thought to the roles played out on the battlefields of this century by the silent armored sentinels that grace our installation. Certainly we would never give a second thought to a strange-looking building, let alone a strange-looking building that isn't even made out of red brick. Fort Knox has such a building, one that played a role in the invasion of Sicily and the cross-channel invasion of Europe, our own "Landing Ship, Tank" building located just off of Eisenhower Avenue in the collection of WWII-era buildings near Harmon Hall.

The fall of France made it clear that a cross-channel invasion would be required to defeat the Third Reich. The British Admiralty was quick to submit designs to the United States for boats and ships that would be required for this invasion, hoping to have them built under Lend-Lease. One of the designs called for a ship that could carry 20 tanks and a dozen 2½ ton trucks, hence the Landing Ship, Tank, or LST. At the time, 1941, the Navy and its ship designers had no experience building such a ship, and even less interest.¹

One reason for this shortfall was the mistaken belief that, should events in Europe force the United States to return there, forces would disembark on secure docks in friendly ports.²

The requirement for tanks to deploy onto a hostile shore brought with it many difficult, implied tasks. One was the ability to warm up tank engines be-

fore driving down the ramp into hostile fire. Another was the need for enough fresh air to keep the crews of those 20 tanks alive long enough to drive down the ramp. This was like starting up 20 tanks inside a small garage with the door closed, not on a deck in the open air. This quest, determining how to ventilate an LST, is how Fort Knox got its own "navy."

With preliminary testing conducted at Aberdeen Proving Ground, construction of a full scale mock-up began at Fort Knox in April, 1942, and was completed less than two months later. Testers then tried different types of baffles and vents until they decided that the best way to ventilate the ship was with large exhaust fans that cleared the entire tank deck area. This eliminated the need for individual hookups to each vehicle exhaust. The individual hookups would have hindered debarkation speed, reduced ability to perform routine maintenance, and would have to be replaced after the tanks were off-loaded.³ It also gave the ships a flexibility that General Truscott would fully exploit during the Sicily invasion, when he loaded his LSTs to twice their capacity, in one case 94 vehicles on one LST.⁴

After testing, the building became a classroom, and no further amphibious training was conducted.⁵ Today, it serves as an annex to the Patton Museum. Perhaps a coat of gray paint and some bow numbers would make it a more befitting tribute to forward-looking Army thinkers in the realm of amphibious operations, men like Colonels Daniel Noce and Arthur Trudeau, who

formed the 1st Engineer Amphibian Brigade and started working out the problems of how to assault from the sea. It is also a round-about tribute to General George S. Patton, Jr., who did his homework on amphibious operations in the mid-1930s with his staff study of 19 amphibious landings throughout history and his general staff study of Gallipoli. It should serve as a reminder to us all that history takes many shapes and forms, not all being old tanks or red brick buildings.

Notes

¹Geoffrey Perret, *There's A War To Be Won*, (New York: 1991), p. 182, note, Perret cites James A. Huston, *The Sinews of War: Army Logistics 1775-1963*, (Washington, D.C.: 1966).

²Perret, p. 181.

³John Campbell, LTC (Ret.), Fort Knox's Dryland Navy, *Armor Magazine*, July-August 1979.

⁴Perret, p. 188.

⁵Telephone interview with William Goldie, CPT, U.S. Army (Ret.).

Captain Matthew D. Morton is a 1991 graduate of the U.S. Military Academy. He has served as a tank platoon leader with 2/11 ACR; BMO, 3-5 Cav (Mech); and as a rifle company XO.

LETTERS (Continued from Page 3)

sign. A major drawback is the traverse limitations caused by the placement of the main armament. AFAS must have 360-degree (6400 mil) traversing capabilities in order to be able to support the maneuver commander on a fluid battlefield of the future. The M1 AFAS's 30-degree (531 mil) azimuth limitation would make it less versatile than the current Paladin. This limitation seems to be caused by the basic design of the M1 chassis, which more than likely can't be overcome.

Ammunition resupply of the M1 AFAS by a similarly designed FARV would be difficult. Any resupply operations would be hindered by uneven or non-uniform terrain. Both AFAS and FARV would have to have a highly developed hydropneumatic suspension system similar to that found on the Bofors S-Tank. The suspension system would have to be capable of adjusting not just elevation/depression, but also adjusting vehicle cant. Once again, the amount of flexibility in the design requirements seems to exceed the M1 chassis modification parameters.

The article raised my interest in aspects of the design which were not described in any detail. Reading about the "integral ration microwave heater" is fine, but I would have liked to read more about the weapon's fire control system. No mention was made of what the weapon's self-location capability would be. I assume it would be equivalent to that of the Paladin, but it should be even more developed (utilizing GPS).

In the final analysis, I feel the M1 chassis AFAS has more limitations than it does advanced capabilities. I welcome the authors' interest in this vital weapons program, but I also feel that the plan they have put forward does not fit the bill. Some of their ideas have merit and could possibly be incorporated in AFAS design. However, I feel we can get a better overall system by continuing research into new technology. As the main customers of the fire support system, infantry and armor commanders should demand more versatility in this cannon system of the future.

ROBERT W. NEGRO
CPT, Infantry
NCARNG

M1-based Howitzer Makes Sense

Dear Sir:

Comments on the cover story and kudos to your staff artist, Mr. Jody Harmon, on his excellent work. As a Redleg, I have more than a passing interest on any new howitzer system and have worried over the speed limitations of both the Paladin and Crusader systems for some time. The innovative design shown using an M1 chassis and the MACS solid propellant for the how-

itzer make a great deal of sense. The material-handling equipment suggested would improve high-tempo operations greatly. The consolidated crew compartments in both vehicles are logical extensions of the MLRS cab design. I'd personally add a 40mm Mk-19 grenade launcher and 7.62mm minigun (perhaps an upside-down AH-1 Cobra chin turret) on the commander's station and a large-caliber chain gun at the second position. I'd also consider placing half the six notional anti-air missiles on the left side of the turret well to allow more traverse capability (80° off center line on either side) and to allow more flexibility in fire support. I'd also consider using a lightweight panel system to provide a stand-off portable overhead and side cover for the vehicles, something that would detonate shaped charges before contact with actual vehicle armor.

The RCLR article was excellent. If you mate the 106mm RCLR with a laser rangefinder and SACUMS, the maximum effective range can be greatly extended. 1100m is the burn-out of the .50 cal spotter rifle tracer round; maximum range of the 106mm RCLR is 7700m. Since HEP and HESH rounds are not velocity-dependent for terminal effect, any items that can extend effective range are welcome. If beehive has a time fuze mode, indirect and/or long range attack becomes more effective against light infantry and thin-skin vehicles. A hard-shell HMMWV might mount 2, 3, or 4 RCLRs (an ONTOSita?) for rapid fire on multiple targets. I'd consider converting half the vehicles in the antiarmor company to RCLR; 2 out of 20 doesn't sound like near enough to me, considering likely foes and roles for light forces in future conflicts. If you figure that one TOW costs the same as a gun mount kit, we get more bang for the buck from RCLRs. Mr. Sparks' comment on the lack of sea-based gunfire support is another subject I've worried about for years, and yes, I do have a solution.

With the apparent, final demise of the AGS, the need for the 82d and 2d ACR to have some mobile firepower is past critical. I suggest the LAV with a 105mm soft recoil cannon, already developed and tested, or even using the ARES 75mm dual-purpose auto-cannon. The LAV is also amphibious, which is another pet peeve of mine, but more on that later.

LARRY A. ALTERSITZ
LTC, FA, USAR
Cdr, Det E (Marksmanship)
1182d Reinforcement Training
Unit, USAR

Don't Dismiss External Guns

Dear Sir:

I found Don Loughlin's article on the External Gun Turret to be incredibly naive.

This sort of logic also opposed the machine gun and the airplane.

Contrary to Mr. Loughlin's claim, the external gun has not been extensively tested. Such tests as have been conducted to date indicate that external gun arrangements can provide a major gain in survivability at a weight reduction that greatly enhances deployment. Such arrangements also appear to be less expensive than the usual, ordinary full-turret schemes. To dismiss those gains because of imagined vision problems and fanciful mechanical difficulties is cavalier in the extreme.

What motive might prompt an attack, such as Mr. Loughlin's, on any probable solution to cost, weight, and deployment challenges is difficult to understand.

JEFFREY A. BOUCHER
U.S. Army, (Ret.)

External Guns Have Real Benefits

Dear Sir:

It was with great dismay that I read Mr. Loughlin's article on external gun turrets. I have never read such a collection of misinformation, disinformation, sour grapes, and downright drivel. The author would have us believe that external gun turrets have been extensively tested and rejected, and this is simply not true. It is quite obvious that he has no experience in a real external gun low profile turret (not a remote gun as in the Tank Test Bed). This would explain why each one of his numbered points are not true and have no validity in fact. The one truth is that every new weapon design or concept has had a host of "authorities" who have condemned the new as bad and pointed the way straight to the status quo that gives us the feeling of security while we stagnate.

Warships should be of wood, not iron; sails, not steam; the soldier cannot safely handle a self-loading pistol; magazine-fed repeating rifles will cause the troops to waste ammunition; biplanes are superior to monoplanes; I won't be able to see out of an enclosed cockpit; the guns should be in front of the pilot so he can clear any jams; the M1 will never replace the '03 Springfield; submarines are unfair weapons only useful in coastal waters; tanks are expensive, unreliable, awkward white elephants; and the aircraft carrier will never replace the battleship! Do these sound familiar? They should, if you have studied military history to any extent.

To dismiss the external gun, low profile turret prior to the extensive testing/field evaluation that the author erroneously implies has already been conducted is to bury our heads in the sand and add ourselves to that sad list described above. The low profile turret concept provides a number of very real survival, mobility, and lethality

benefits, and almost none of the drawbacks attributed to it by the author. I had the pleasure to serve as the Marine Liaison Officer on the Armored Family of Vehicles Task Force under MG Robert Sunell, an officer that many considered to be the top expert on armor in the Army. General Sunell endorsed the external gun, low profile turret concept, and it did become one of the designs examined as part of the follow-on ASM program. Far from invalidating the concept, it was a recognition of the many advantages to be gained by adopting it. However, I am sure that the author knows much more about this subject than all of those experienced senior officers who examined the competing concepts presented to the AFV Task Force.

The search for increasing levels of protection while reducing vehicle weight will not be solved by some new wonder armor (unobtainium) that weighs less and keeps out more. The solution will come from innovative design concepts like the low profile turret, autoloaders, composites, hydropneumatic suspensions, electric drive, height control, modular armor, low observables, electric guns, and other upcoming technologies that will allow the designer to strike a workable compromise in the vehicle design. We must examine all of them but not from the viewpoint of "that's the way we always did it," for that is the least supportable answer. With that thinking, the Wright brothers would be little-known bicycle repairmen. Let's not listen to the voice of the reactionary; let's look to the future, even if it is unfamiliar and uncertain. Our forefathers did, and developed the weapons we have today, and we owe the future soldiers and Marines the same consideration.

R.G. DUVALL
MAJ, USMC (Ret.)

Digitization Could Exclude Allies

Dear Sir:

I'm coming up on the Net responding to ARMOR's call for SITREPs from the force. I have been tracking the progress of Force XXI through the numerous articles in our professional journals and concept papers, such as TRADOC Pam 525-5, *Force XXI Operations*. It is difficult not to use the cliché of "working in dynamic and exciting times," but certainly there have been few times in history when an Army has had the opportunity to conduct the intellectual staff rides the U.S. Army is doing.

As an exchange student in a foreign staff college, I have had a unique opportunity to interact with many officers, representing military forces from around the world. Many of their armies are also looking inward as the decade ends. The end of the century

seems analogous to a danger area, a symbolic fold in the ground, in which units have conducted a short halt to assess the situation, take stock, and attempt to scan as far forward as their sensors will let them, before launching out into unknown territory. Maybe "halt" is not the best term. We know that we can never truly halt on this battlefield.

I can report that there is a great admiration of our Army's boldness of embracing the Information Age technology. There is no doubt that as we enter the 21st century, we will continue to be the premier land force. Our friends recognize this, but I would like to share some observations of their concerns.

Our doctrine recognizes that future operations will, more often than not, be pursued by some form of coalition. (Most OOTW missions almost guarantee that we will operate with foreign armies). We have always recognized the challenges of combined operations, and I have gained invaluable insight into their planning, especially after Operation Desert Storm. However, new challenges are emerging. Herein lies one of the great concerns. Allied armies currently do not have the resources to pursue Information Age technology, specifically digitization, to the extent that the U.S. Army is doing. Coordination between Allied units, even in the days of compatible communication systems, was always a tough nut to crack. What will happen when units cannot share the kind of battlefield information that digitization can provide? Perhaps an Allied unit only a few kilometers away, cannot share a critical SPOTREP in a timely manner. As any potential OPFOR develops courses of action, he will certainly target the physical boundary between U.S. and Coalition forces. Boundaries have always been vulnerable areas, but due to this incompatibility of battle command systems, they seem to be even more assailable, both physically and intellectually. Simply put, there is a concern that Allied forces could find themselves literally "out of the loop."

One doctrinal answer to this challenge lies in the use of liaison officers. In my observation, we seem to overlook this critical mission in peace-time training. Honestly, most units can ill afford to put their most experienced officers in these positions. Perhaps, during operations, they can't afford not to. Interestingly, many World War II veterans recall that, often, only the most combat-seasoned officers were LNOs. LNOs who knew their jobs permitted great flexibility in fast-paced operations. I can only offer that we need to emphasize the importance of LNOs in combined operations. We must take a hard look at the MTOE. Perhaps one LNO, a HMMWV, and SINCGARS radio is not sufficient. The Force XXI LNO Team will require a C² hardware package that ties in with current

battle command systems. This package could include a number of appliques or remotes that an Allied CP could use on a mission-by-mission basis.

There is a tough mission ahead. It will be a truly major effort just tying in the battle command systems of our sister services, let alone our Allies. However, we must recognize that coalition forces can and will operate on our flanks, front, or rear. We can assume that in the near future, they will not have the resources to field significant numbers of digital systems and thus, they cannot fully share in our technological advantage. Although we may be familiar with their doctrine and procedures, disparity of battle command systems will pose a significant challenge to the Force XXI commander.

BART HOWARD
MAJ, Armor
U.S. Exchange Student
Australian Army Command
and Staff College

MG Grow Misidentified in Photo

Dear Sir:

I read with great interest "The End of the Ride" by Dr. Denver Fugate in the November-December 1995 issue. As one who rode with GEN Patton and MG Robert Grow, I wonder if the photo (top) on page 11 is accurate.

I knew GEN Patton and MG Grow from 1939 on. I consider them the two greatest soldiers of WWII. I served under GEN Patton in Europe when our division was part of Third Army. I served under MG Grow from 5 May 1942 on.

I do not believe the brigadier general shown in the photo is really Bob Grow. He does not look like the Bob Grow I knew. Besides, he was promoted to major general in June 1943 and served in that grade until his retirement. If it is General Grow, he was wearing someone else's helmet.

JOHN J. FLYNT, JR.
COL, USA, (Ret.)
6th Armored Division

- Colonel Flynt is correct. Our archived photo had a label identifying the general officers as Patton and Grow. While the helmet on the man standing next to Patton appears to have only one star, the original photo indicates two, although some glare does obscure one of the stars. However, the man holding the trophy bowl is MG Ernest Harmon. We apologize and have relabeled the photo.

- Ed.