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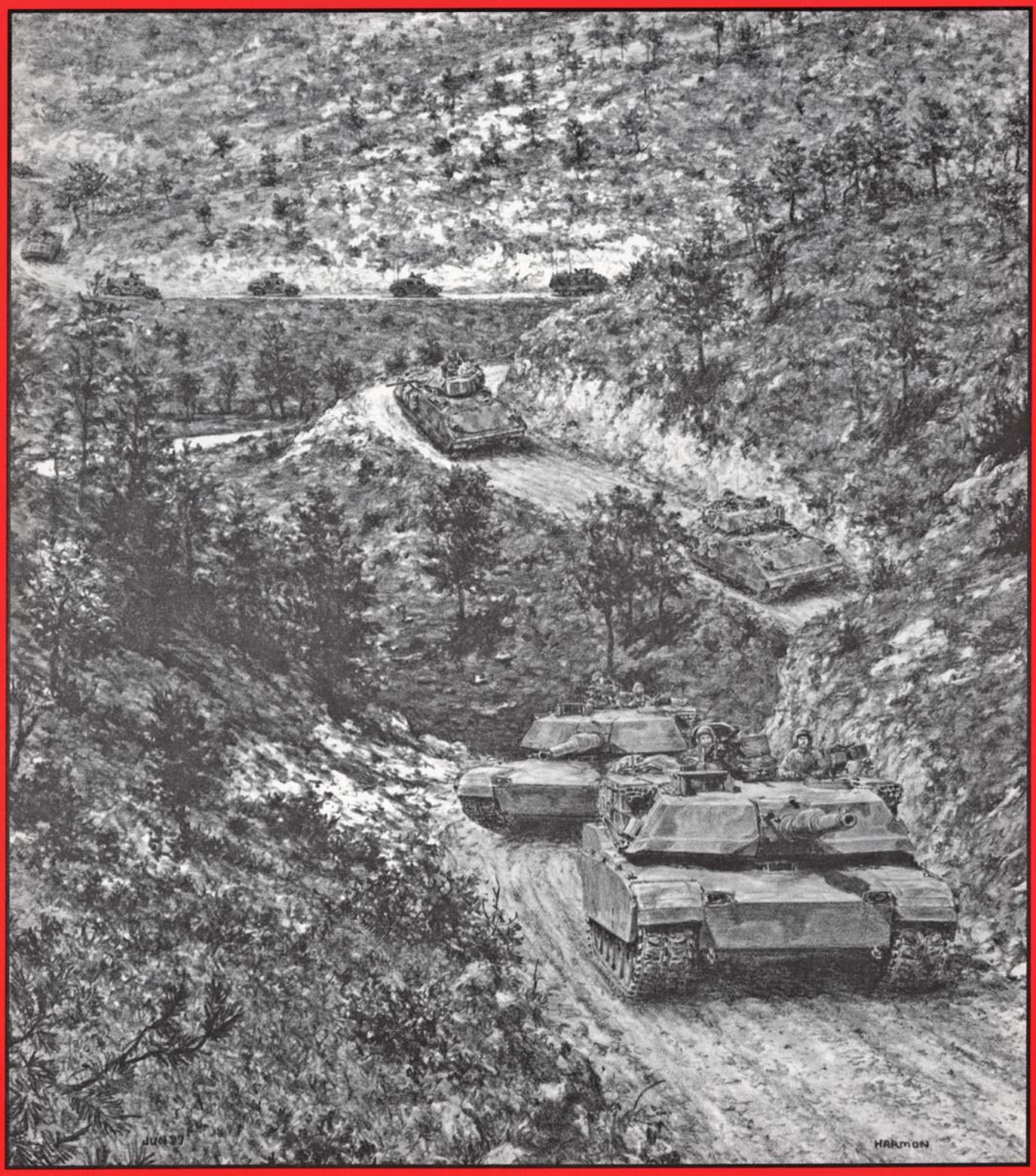

Road March Planning in Restrictive Terrain

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PB 17-97-5

September-October 1997

A piece of *in memoriam* mail, forwarded to me the other day, was cause to reflect for a few minutes about the loss of another ancestor warrior. I felt sad, and it was kind of weird because I don't know that I have ever met General Delk Oden. Why would I, or should I, feel sadness about a man whom I had probably never met, except in the paragraphs in various books?

Delk M. Oden, Major General (Retired), Honorary Colonel of the 35th Armored Regiment, recently passed away. General Oden was the commander of the 35th Tank Battalion of the 4th Armored Division during World War Two. His battalion was the sister unit to the renowned 37th Tank Battalion, seeing virtually the same action throughout the 4AD's triumphant sweep across Western Europe. Originally a horse cavalryman, like so many of his peers, he early saw a linear relationship between horse cavalry experience and its doctrine and the doctrine being developed for the growing armored force, "Everything we really did in armor, we kind of learned basically from the horse, you might say." (*Thunderbolt*, Lewis "Bob," Sorley, p.37)

The notification came to me from another, much later commander of the 35th Tank Regiment, who learned in his generation from some of the lessons forged in battle by General Oden. This current tanker, whose professional life was directly touched by General Oden, asked that some mention be made of the passing of one of our Armored Force's truly great combat leaders. As a rule, we don't publish obituaries, promotion lists, gunnery results, and the like, but this request felt different to us, as it carried an almost imperceptible tone of urgency. You see, more and more of these great men are passing away now as their age group passes the 80-year mark and move toward 90. They take with them their tales of battle, perseverance, and bravery. And they are stories worth hearing. General Oden (then a LTC), and his peers in the 4AD, received accolades later from General Bruce Clarke when he described, "The revolution wrought by Abrams and others in the field [Oden's battalion was the next one over] when they made up what was to become the armored forces that rolled across Europe. They had not been taught this. They invented it." (Sorley, p. 37)

We have also noticed an increase of autobiographical kinds of books from people involved in the "Big One." Some are the big-budget, Madison Avenue-promoted texts which come with book signings and free-standing, in-store display racks. Others are much more humble, like a recent book by retired Colonel Jim Moncrief, *As You Were Soldier: Recollections of a Thirty-year Veteran*. Colonel Moncrief, an ex-6th Armored Division soldier, self-published his work because he thought it so important to tell his tale. Like others who are feeling their mortality more acutely than many of us, Colonel Moncrief feels that, "These stories, likewise, might be interesting to the other Old Soldiers, as well as to the friends of Old Soldiers. And, if recorded, the tales would reflect the spirit and character, as well as the motivation, of the young men of the Forties, my generation." (Moncrief, p.7) I am certain that we can learn from their words. I am equally as certain that we should want to learn from them.

It is a sad thing for all of us when these pioneers of our vocation will be no longer available. It is inevitable, but sad nevertheless, to see those tankers and cavalrymen, to whom we all owe so much, fade away. With the passing of each one, there is a little gap that we, who remain ever vigilant in the turret, are duty-bound to step forward and fill.

I think that when Veteran's Day comes around in November this year, I will take some extra time to think about men like General Delk Oden, and I will do a little more than that. I will call a couple of them to say, thanks. On second thought, I won't wait until November. You shouldn't, either.

— TAB

By Order of the Secretary of the Army:

DENNIS J. REIMER
General, United States Army
Chief of Staff

Official:

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
03794

ARMOR

The Professional Development Bulletin of the Armor Branch PB-17-97-5

ARMOR (ISSN 0004-2420) is published bimonthly by the U.S. Army Armor Center, 4401 Vine Grove Road, Fort Knox, KY 40121.

Official distribution is limited to one copy for each armored brigade headquarters, armored cavalry regiment headquarters, armor battalion headquarters, armored cavalry squadron headquarters, reconnaissance squadron headquarters, armored cavalry troop, armor company, and motorized brigade headquarters of the United States Army. In addition, Army libraries, Army and DOD schools, HQ DA and MACOM staff agencies with responsibility for armored, direct fire, ground combat systems, organizations, and the training of personnel for such organizations may request two copies by sending a request to the editor-in-chief.

Authorized Content: *ARMOR* will print only those materials for which the U.S. Army Armor Center has proponency. That proponency includes: all armored, direct-fire ground combat systems that do not serve primarily as infantry carriers; all weapons used exclusively in these systems or by CMF 19-series enlisted soldiers; any miscellaneous items of equipment which armor and armored cavalry organizations use exclusively; training for all SC 12A, 12B, and 12C officers and for all CMF-19-series enlisted soldiers; and information concerning the training, logistics, history, and leadership of armor and armored cavalry units at the brigade/regiment level and below, to include Threat units at those levels.

September-October 1997, Vol. CVI No. 5

Features

Departments

Periodicals Postage paid at Fort Knox, KY, and additional mailing offices. Postmaster: Send address changes to Editor, ARMOR, ATTN: ATZK-TDM, Fort Knox, KY 40121-5210.

Distribution Restriction: Approved for public release; distribution is unlimited.

USPS 467-970

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MAILING ADDRESS: ARMOR, ATTN: ATZK-TDM, Fort Knox, KY 40121-5210.

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UNIT DISTRIBUTION: Report delivery problems or changes of address to Mary Hager, DSN 464-2610; commercial: (502) 624-2610. Requests to be added to the free distribution list should be in the form of a letter to the Editor-in-Chief.

ARMOR HOTLINE — DSN 464-TANK: The Armor Hotline is a 24-hour service to provide assistance with questions concerning doctrine, training, organizations, and equipment of the Armor Force.

ISSUES IN ARMOR: Visit the *ARMOR* Web site at the following address: http://www.entelechy-inc.com/docs/knoxdoc/armormag/index.html.

LETTERS

Guard Units Face a Squeeze, Too

Dear Sir:

Recently, *ARMOR* published an article by Captain Michael A. Kelley, TXARNG, concerning the incompetence of officers in the Texas National Guard. Captain Kelley went on to say that armor funds for tank training should be put into the active duty ranks, "WHERE IT BELONGS — WITH THE REAL TANKERS."

As a senior NCO, I believe it is our duty to teach and train our young people, enlisted or commissioned. If the abilities of our junior officers fall short, we carry a lion's share of the fault.

The National Guard is fortunate to have in its ranks many former active duty soldiers. They bring with them skills, knowledge, and experience we greatly appreciate and use in the 16 hours a month, two weeks a year that we have to train our soldiers. Unfortunately, on occasion we get people who hold the Guard in contempt from the onset. They make excuses to not attend drill, make little attempt to prepare for classes, and are more interested in advancement than caring for the soldiers for whom they are responsible. Yet, they expect to be put in command positions based solely on the fact they were an active duty soldier.

As for the funds Captain Kelley suggests should be transferred to active duty, there is very little in the way of funds for anything. Of the 118 M1 tanks at Fort Drum, New York, 80 have been mothballed because there is no money for parts.

Consequently, all units have to share what we have, and take great pains to keep them maintained and operating — in that's all we're going to get.

In armories, platoon sergeants come in on their own time to set up training, with training aids they have to make or buy out of their own pockets.

In order to provide an operational tank for the crews to train on, one maintenance section, after waiting a year for a hydraulic tank to be repaired, took it to a civilian welder and paid for it themselves.

Because there is only enough money for one training session per year per man, officers and NCOs have to attend leadership schools without pay in order to be able to accompany their soldiers on their two-week training.

One third of our soldiers drive more than 100 miles round trip to attend drill and still have to fight with employers to give them time off, risking being fired.

If this is the way it is with us, it has to be the same everywhere.

So, you see Captain Kelley, we need people like you. We need you to be part of the solution, not part of the problem.

SFC PATRICK D. SIMS
"D" 1/127th Armor
NYARNG

Book Review: Another Opinion

Dear Sir:

LTC(P) Hertling's review of *Into the Storm* in the May-June issue of *ARMOR* was not as informative as it might have been. As a civilian with no Army experience whatever, I rarely feel qualified to comment on current affairs in the military profession, but as a researcher for another publication (*MHQ: The Quarterly Journal of Military History*), the bafflement and annoyance I felt at the reviewer's comment that "...many will return to it as a reference work" must be communicated. The publisher has presented the book in the format of a work of fiction; General Franks' name appears in tiny print under Tom Clancy's on the jacket, as if he were a consultant rather than the writer of much of the text, and his career the subject of all of it. Worse, it is also completely without an index, which is unforgivable in these days of computer typesetting. If General Franks hoped this book would restore his reputation with the interested proportion of the American public, he may be disappointed, because his editors have not done well by him.

General Franks does make it clear where he stands on the matter of operational doctrine, however. At the end of the section on VII Corps operations in the Persian Gulf War, the reader will be aware as never before just how many synonyms exist in the English language for the word "synchronization."

JOHN FLUKER
New York, N.Y

Reactions: The May-June Issue

Dear Sir:

In his letter "Second Thoughts on New Ideas" (May-June 1997, pp. 3, 52), MG John C. Faith "hopes" the Louisiana Maneuvers people are paying attention." The Louisiana Maneuvers Task Force chartered in 1992 by GEN Gordon Sullivan and GEN Fred Franks ended its work in June 1996. It had served its purpose by imparting momentum to the continuing series of experiences that will propel the Army into information-age warfare. Army Chief of Staff GEN Dennis Reimer released a message in the spring of 1996 summarizing the accomplishments of the Louisiana Maneuvers Task Force (1992-96).

I was delighted to read LTC Jim Walker's "Vietnam: Tanker's War?" (May-June, pp. 24-30). I am among the many who probably owe their lives to the gasoline-to-diesel engine conversions he describes in "Equipment: Blessing and Nightmare." While a platoon leader in 3d Squadron, 4th Cavalry (25th Infantry Division) my M113 was twice hit by RPGs. Once on 19 Feb 68, and again (a different vehicle) in July of '68. Both RPGs entered in the fuel storage area in the left rear. On neither occasion did my track catch fire. I have always suspected that my track was chosen as a target because it sported two radio antennas rather than one.

I'm also pleased to see Jim Walker recall our field expedient use of spare track blocks, steel PSP, and chain link fence to cause enemy antitank weapons to pre-detonate before reaching the vulnerable parts of their targets. These ingenious field modifications also saved lives and remain part of the lore of armor. They may be useful again someday if our soldiers should face an enemy as tough as the VC/NVA, who would fire an RPG from 50 meters or less.

ROBERT FAIRCHILD
COL, ARNG (Ret.)
Hampton, Va.

Putting the New Ration Heater In Historical Perspective

Dear Sir:

Well, kiss my grits! "Desert Storm established the unmistakable need" for the capability to heat water and rations in and around armored vehicles. Mr. Larry T. Hasty, I know nothing of your background or experience in Armor, except your winning the Isker Awards (congratulations) for work in fielding the Mounted Water Ration Heater, or MWRH, but sir, I'll wager George Washington's cavalry was avidly seeking a way to boil water in 1776. I'll throw in my seat at Fiddler's Green if Genghis Khan's boys weren't establishing an unmistakable need or a way to heat their rice as they rode around the Great Wall.

We used to have something called OVM (on-vehicle materiel) on tanks that included a little pump-up Coleman stove. The intended use of this neat little piece of equipment was to (you guessed it) heat water and rations. I think it was called a Tank Crew Stove (TCS). I will tell you that it didn't get much use because if you used it and didn't get it really clean, you could flunk a Command Maintenance Inspection (CMI) or the Annual General Inspection (AGI). So what did we do from the plains of Texas to the far reaches of the world? We built fuel-fed fires in our helmets or C-ration cans; we drained water from radiators; we put rations on the transmissions of the tanks or manifolds of the trucks. I kept telling my stupid tanker friends that if we worked hard enough and demonstrated enough need, the Army would give us, in FY97, an MWRH.

BOB SHAMBARGER
LTC, Armor/Cavalry (Ret.)
Alma, Ark.

There's Need for Refresher Courses Tailored to Armor Enlisted

Dear Sir:

I have completed the required five hundred hours of correspondence courses to max that area of promotion criteria. During these long hours of study I noticed that the Armor branch of the U.S. Army doesn't have the same expanse of studies as the Infantry branch.

Continued on Page 50

COMMANDER'S HATCH

MG George H. Harmeyer
Commanding General
U.S. Army Armor Center

Force Development — Where We Are Headed

In a previous edition of the Commander's Hatch, I talked about the vision for the Armored Force which implied that we must forge the finest mounted combat force in the world, capable of winning decisively throughout the spectrum of combat. I firmly believe that vision of the future. To achieve it, we must have the best combination of soldiers, equipment, training, doctrine, leadership, and organization that we can muster.

This Commander's Hatch will address the equipment and organizational aspects of the equation and describe the direction we are headed over the next decade.

Over the past two years, we have conducted three Armor Caucuses, where the Armor Center presented to senior Armor leaders a proposed blueprint of where the Armor Force should go and how we should get there. Many of the resulting decisions were incorporated into our Tank Modernization Strategy that defines capabilities specifically tailored for Force XXI and beyond.

COL Dave Cowan's recent article in the May-June issue of *ARMOR* provides highlights of the Tank Modernization Plan. Other caucus decisions galvanized a scout strategy.

A key component of Senior Armor Leader guidance is that the follow-on to Abrams will not be an evolutionary derivative of the M1 platform. Instead, we will develop a Future Combat System (FCS) for fielding in the 2015-2020 time frame that will provide the leap ahead capabilities required for battlefield supremacy well into the 21st Century. We are now defining a Mission Need Statement for a Future Combat System. The following goals reflect what is feasible and a starting point for focusing operational and engineering analysis:

- Light enough to permit at least two systems for transport on one C17.
- Sensors and lethality to detect and destroy *any* target with a near perfect probability of hit/kill at ranges beyond an enemy's capability.
- A non-line-of-sight capability that will dramatically increase the task force commander's battlespace and combat power.
- An integrated survivability system will make the system nearly immune to enemy weapons.
- An advanced propulsion system that provides dash speeds in excess of 100 kph and requires significantly less fuel over time than the Abrams.
- No more than half the logistical support now required to support the Abrams.
- Fully embedded training, and ease of system operation.

Senior Armor Leaders also endorsed a new scout modernization strategy that consists of the near-term Long Range Advanced Scout Surveillance System (LRAS3) and the follow-on Future Scout and Cavalry System (FSCS).

LRAS3 is a line-of-sight sensor that will allow real-time target detection and identification, and target location using second-generation FLIR, high-definition TV, a built-in, eye-safe laser range finder, and integrated GPS.

The Future Scout and Cavalry System (FSCS) will be the pre-eminent reconnaissance platform for Force XXI and Army After Next operations. An extraordinary collaborative program between the U.S. and the United Kingdom is currently taking shape and will serve as a model for acquisition streamlining. Due to be fielded by

2007, FSCS will take the place of the HMMWV with LRAS3 and the M3A3 Bradley.

FSCS requirements include full digitization, long-range multi-spectral sensors, aided target detection and identification, fusion of data from internal sensors and external intelligence sources, high transportability and tactical mobility, survivability through signature management and modular armor, and a medium caliber self-defense gun.

The mast-mounted sensor package will increase survivability and reconnaissance capabilities. This system will be tied in to the digitized command and control system to provide commanders and precision weapon systems with exact enemy locations, intentions, and strength at very long ranges.

The Armor Center is also the proponent for battle command at brigade and below. Force XXI Battle Command Brigade and Below (FBCB2), a battle command information system, completes the Army Battle Command System (ABCS) information flow process from brigade to platform/individual soldier, and across all platforms within the brigade task force.

FBCB2 consists of a tactical computer with display, information software that provides a common set of messages and screens, interfaces with platform sensors, and a supporting communication infrastructure that allows for on-the-move operations. FBCB2 will provide friendly and enemy situational awareness, shorten planning time, and allow forces to operate at a high tempo.

To further assist the commander in command and control we are developing two new vehicles. The first of these is the Command and Control Vehicle (C2V), a program that resulted in response to the deficiencies the M577 demonstrated during Operation Desert Storm.

The C2V is an MLRS derivative chassis that provides increased mobility, and a tailorable command and control mission module that provides a working environment for the staff. The system has its own 43KW primary power unit, 40,000 BTU heating and cooling environmental control unit, and an NBC overpressure system. A 10-meter, telescoping mast antenna enables the crew to quickly increase its communication systems range while at the halt. The C2V has a unique inter/intra communications capability which allows staff officers to communicate digitally or by voice from one workstation to another within the same vehicle or between vehicles via a wireless local area network, as long as vehicle separation distance does not exceed 500 meters. The mission module is designed to be reconfigurable so that various arrangements of computers and radios may be assembled for a battalion, brigade, or higher staff.

The second system is the Battle Command Vehicle (BCV). This is intended to be either a Bradley or Abrams Battalion Task Force Commander's vehicle with enhanced digital communications and space for a staff officer/NCO.

In the force design and structure arena, we are examining — together with the other TRADOC centers — alternative organizations. Smaller, more effective organizations will make the mounted force more deployable and more agile.

Two BCV prototypes were evaluated for their conceptual usefulness during the recent Army warfighting exercise at the NTC. The BCV has merit, and we will continue to refine the concept with several focused experiments. Together, the C2V and BCV will provide maneuver commanders and their battle staffs with highly mobile, survivable platforms, adaptable to being configured with the most current state-of-the-art automation and communications suites.

Another key part of the Armor Force Modernization Strategy is Mounted Warrior. This program addresses current deficiencies with command and control, chemical, clothing, and equipment worn by all combat vehicle crewmen. Mounted Warrior is an integrated ensemble composed of modular subsystems. The complete ensemble will allow unrestricted movement, dexterity and tactility, provide NBC protection, and provide laser eye protection. Mounted Warrior will leverage host platform capabilities, such as sensors, computers, or radios, to enhance the armored crewman's performance. An affordable head-up display that may be used by multiple vehicles is an example of a Mounted Warrior component.

In the force design and structure arena, we are examining — together with the other TRADOC centers — alternative organizations. Smaller, more effective organizations will make the mounted force more deployable and more agile. Three division alternatives are currently undergoing analysis. Briefly, the first design reduces many organizations currently within the division to arrive at a division strength of about 15,000. This provides a benchmark as to the effectiveness of new systems and operational changes, relative to the current division. It is also the organization chosen for the Division Advanced Warfighting Experiment this fall. The second alternative features two ground brigades and one robust aviation brigade. The third option is brigade-based. It has a relatively small division headquarters with three ground brigades, an aviation brigade, and DIVARTY — all with organic CS and CSS assets. Each division alternative features a scout or cavalry troop in every ground brigade, as well as an HHC and three companies in each maneuver battalion. Approval of a final design, which will most likely vary somewhat from the three described above, is expected early next year.

The introduction of these various initiatives into the force must be preceded by the intellectual foundation in doctrine and training that gives leaders and soldiers the capability to exploit materiel and organizations, but more of that in a future article. We are excited about the future and confident of our success.

Forge the Thunderbolt!

Changes Coming in Armor NCO Structure

by CSM David L. Lady, Command Sergeant Major, U.S. Army Armor Center

Armor branch, good day.

As I climb into this hatch and run through the before-operations checks, there is much to learn in order to be an effective advocate for the force. Fort Knox, the Armor Center, and the Armored Force have changed dramatically in the past five years. Over the next five years, we must make even more dramatic changes in our force structure, our unit structure, our training strategy, and our personnel management. Armor and Cavalry must make the best use of the new technologies and equipment. As leaders, we must continue to improve so that we will always develop the best trained and motivated soldiers, and place them in the best synchronized and most cohesive units. There lies victory.

The key to my learning process is to get out and communicate with the force. You deserve information first-hand, and I need to assess your issues and challenges first-hand. Ft. Hood is first, in order to meet with our M1A2 NET team and the units they are training. These visits will become more useful to you, as I learn more about your needs and about what the branch and the Armor Center will do to fix them.

I am grateful to MG Harmeyer for his trust, and to CSM Davis for his example, as I hit the start button.

It is time to review the changes in Armor NCO structure proposed by the Armor Center and adopted by the Army Chief of Staff on 22 July 1997. These changes were only a part of the Army-wide reduction of the NCO structure from its current level of 49.6% to about 47.8% of the total enlisted structure. Since June, 1996, Armor has been developing and staffing the best way to support this goal.

Throughout the development and staffing process, senior sergeants were involved and CSM Davis took the lead in defending the critical leader and trainer positions throughout our force. He has been a worthy advocate and has advised MG Harmeyer well as some very tough decisions were made. We owe CSM Davis thanks for his battle on our behalf.

Armor NCO structure is currently 48.4% of the total armor enlisted force. A target structure of 45.5% was the goal of the Change in NCO Structure (CINCOS) initiative. This target would have required the downgrading of 1,616 NCO positions. Armor made a thorough, bottom-up review of every TDA position and every TOE function. This review included brigade, division, and corps staffs, and addressed the need for more opportunities for staff experience in MOS 19D.

As individual positions were considered, unit warfighting missions, branch health, and soldier development and morale were kept in clear focus. Armor was in a dilemma because the target figure could not be met without downgrading sergeant positions. Of these, 3,050 are MTOE, and only 240 are TDA. To recode all gunners and scout squad leaders to grade E4 would decrease NCO percentage below the target, but would be devastating to the morale and efficiency of the force. Our leaders recognized that other positions would have to be reduced, and that a reasonable, good-faith effort must be made to comply with GEN Reimer's goal.

The price has been paid throughout the force. The price has been paid in the following positions: On the TOE side, by reducing the grades of the division, battalion, and company/troop master gunners; on the TDA side, by reducing the grades of tank crew, IET tank/track commander/instructor, operations sergeant, and other staff positions. No reductions were made in TOE first sergeant, platoon sergeant, tank commander, or gunner positions. No reductions were made in TDA instructor (less certain IET positions), drill sergeant, recruiter, or AC/RC positions.

There is some impact on warfighting. This impact is acceptable. Division /regimental staffs with an operations SGM will suffer only limited impact by our reducing the SGM master gunner position in grade. Re-coding certain operations staff positions from 19K to 19D will improve the range of skills on staffs and improve career progression. Reducing battalion master gunners to SFC and company/troop master gunners to SSG will decrease master gunner experience levels, but it should not impact on master gunner technical skills. It will also better match our current training and assignment strategy.

There is legitimate concern that SGTs generally do not have the maturity, experience, and expertise to instruct in an institution. However, SGTs will only serve as instructors of basic skills for Initial Entry Soldiers, and then only under the direct supervision of a senior NCO. There will be no SGT instructors in NCOES/OES training.

In a future column, I'll present charts that show the changes by MACOM, the changes to Fort Knox positions, the changes to TDA positions outside Fort Knox, and the changes to TOE positions.

Our leaders have proposed a reasonable plan to reduce the NCO structure while protecting the keys to Armor and Cavalry effectiveness: Drill sergeants, NCOES/OES instructors, and noncommissioned leaders of tank and scout platoons. GEN Reimer saw the wisdom of the Armor proposal, and adopted it without modification: of the Armor enlisted force, 48 percent will remain noncommissioned officers. All MTOEs and TDAs are to be changed so that these changes will be completely documented by FY 99. The new TDA and TOE documents are to be available to the field for reporting purposes NLT June 1998.

We have reached the "Roger Out" moment. Let us accept, support, and carry on.

"SERGEANT, TAKE THE LEAD"

Road March Planning In Restrictive Terrain

by Captain Don L. Willadsen

"The finest theories and most minute plans often crumble. Complex systems fall by the wayside... Then raw truth is before us."

- Major General Charles W. O'Daniel

The tactical road march is the most appropriate mission to conduct when a unit must move over long distances through a secured area. Due to the complexity of such a movement, particularly in the context of the battlefield rear areas, a successful road march requires meticulous planning. In the Republic of Korea, restrictive terrain further complicates the situation. The purpose of this article is to present tactics, techniques, and procedures (TTPs) for planning road marches in restrictive terrain, particularly within the factors of METT-T, for an armor-heavy task force in the Republic of Korea. The technique for presenting these TTPs will describe how the Dragon Force performs them.

Restrictive Terrain Description

Restrictive terrain presents several unique problems for the planner, particularly in Korea, in which mobility is restricted due to a combination of steep, forested mountains and open rice paddies. The planner must contend with narrow mobility corridors, scarce or nonexistent alternate routes, readily available ambush positions for enemy forces, limited line of sight for direct command and control, and disruption of FM radio communication. In addition to these obvious problems which emerge with terrain analysis, however, further factors emerge with weather integration and threat integration.

Restrictive terrain, when combined with the effects of the weather in Korea, is particularly daunting. Precipitation variations result in widely varying water levels at fords, unpredictable soil trafficability, and varying road conditions. Temperature variations also affect soil trafficability. For example, the depth of the ford at the Sinyong-Ni River, commonly used by 2ID units, averages less than one foot in winter. During the monsoon season this year, the depth went from three feet to 30 feet deep in a week.

The planner must also contend with other variables, such as the effects of the local populace and the enemy. Even in peacetime, a road march in Korea is a dangerous exercise, though more so to the local populace than to an armor-heavy force. This is due to the poor conditions of the roads north of Seoul, the limited load classifications of bridges (which necessitate fords or bypasses by the heavier vehicles in the task force), the ever-increasing number of privately owned vehicles on Korean roads, and the impatience with which some Koreans drive. In wartime, the enemy would further complicate the situation by blending in with the local population to conduct their rear-area raids and interdiction missions.

Planning

A task force usually organizes into march units to enhance command and control. In the Dragon Force, the march is organized in one of two ways. In an administrative march, when the battalion is not task-organized, each company marches with its battalion-internal support slice as a march unit. In a tactical road march, when the task force is task-organized in its habitual task organization, the SOP dictates a specific formation called Attack from the March (Figure 1). In either case, the planning factors remain the same.

The march planner designates critical points on the route, defined as points at which interference with the march may occur. In Korea, two common critical points are built-up areas and bridges. Most of these points along the major routes are designated by standardized 2ID checkpoints, and so are easily referred to in our operations orders (OPORDs) and fragmentary orders (FRAGOs). Given the high threat of

Special Operations Forces (SOF) in Korea during a war, the planner must consider the naturally-occurring choke points on a route as critical points. Finally, restrictive terrain requires the planner to designate Command and Control (C2) node locations, so that the task force can maintain continuous FM communication with all of its units during the road march.

After identifying critical points, the planner decides what actions to take to minimize the impact of each critical point on the road march, such as establishing a Traffic Control Point (TCP) at an intersection, tasking the scout platoon to conduct area reconnaissance on a choke point prior to the arrival of the march column, or tasking a staff officer to man a C2 node to relay FM communications to the TOC.

In the Dragon Force, a peacetime task force road march quickly exhausts the scout platoon in providing TCPs and requires the mortar platoon and Military Police to augment the TCP force. The battalion TAC (an M113A3 modified as a command and control vehicle), battalion XO, and battalion S3 form the C2 nodes, augmented by other staff members if necessary. In wartime, the battalion SOP is to use an armor-heavy team to follow the scouts on their route reconnaissance and establish required TCPs in vehicle sections, with air defense support where appropriate, with the secondary task to protect any C2 node which may be co-located with the TCP. The battalion XO or B Team XO, depending on who controls the TCPs, collapses the TCPs as the task force passes.

The march planner then designates and organizes the Reconnaissance Force, whose task is to recon the route in order to verify travel time, determine the condition of the route and its underpasses, bridges, fords, etc., and locate obstacles and enemy forces which influence the route. The instructions to the recon force must be clear and precise, and the planner must provide them with the resources, including troops, equipment, and time, to accomplish their mission.

The scout platoon conducts a doctrinal route reconnaissance only if enemy contact is not likely and time allows, such as in peacetime. If enemy contact is likely, the task force conducts an Attack from the March, with route scouts attached to Team D, the advance guard team, as in Figure 1.

If required, the march planner designates and organizes a quartering party whose task is to recon the area at the terminus of the march and guide the main body into the area. He tasks the quartering party with specific instructions as to the area to be occupied (assembly area, battle position, or attack position).

The CSM leads the quartering party, which consists of one vehicle per subunit and one combat vehicle per platoon. It may move with Team B or separately as it marches on the route.

The march planner must consider logistical issues, which for a heavy task force always include refueling, medical support, and recovery. He must consider where to position medical and recovery assets to best support the march units, while balancing flexibility to respond to emergencies. He must ensure that the coordinating instructions are clear and precise in describing how individual vehicle crews must respond to problems. In Korea, a single broken-down vehicle can block the entire route, because bypasses are difficult or impossible.

Each company has its Class III and maintenance support slice for the road march, with the remaining fuelers in the field trains, and the unit maintenance collection point (UMCP marching as the last element in the task force. In a tactical situation, the fuelers are prepositioned for a tactical refuel near the release point (RP), and the UMCP marches at the rear of the task force.

The march planner completes the plan in the form of a march OPORD or FRAGO. The road march table is the commander's tool for graphically depicting the road march over its planned time period. As such, it must contain information critical to understanding and executing the road march, including speed, interval, unit information, pass times, and SP times. The times at which units are expected to hit each critical point, particularly the refueling point, are helpful, because they allow the staff to coor-

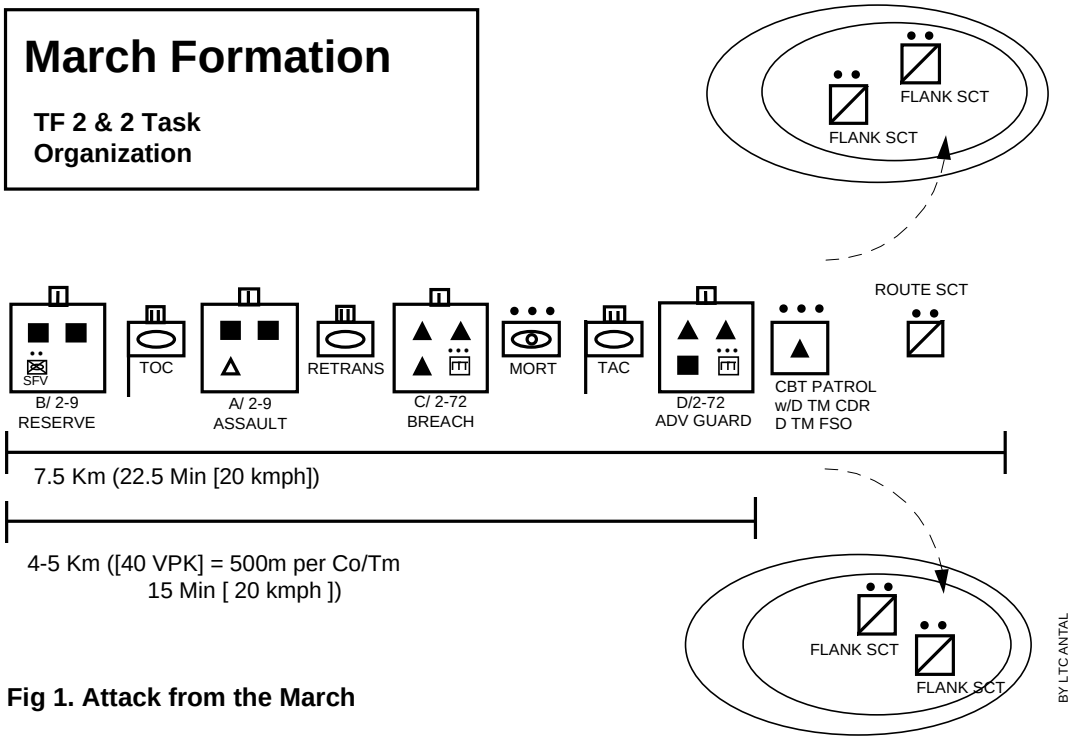

Fig 1. Attack from the March

DRAGON FORCE ROAD MARCH TABLE
FRAGO 1 TO OPORD 07-96: TRIPLE THREAT 3

SPEED:	20	KPH	CRITICAL POINT:		SP	CP	CP	CP	CP	CP	CP	RP
INTERVAL:	50	M	LOCATION (CP)		8	37	144	35	109	5	153	47
			TCP ASSIGNED:		SCT	SCT	SCT	SCT	SCT	MP	SCT	MP
			C2 NODE PRESENT:		TOC				TAC			CSM
			KM FROM PREV PT:			2	5	4	7	4	5	6
DATE	UNIT	#VEH	PASS	WT CL				TIMES				
21-Jul-96	A	23	5	70	1:30	1:32	1:38	1:43	1:51	1:56	2:02	2:09
	CTCP	18	4	15	1:50	1:52	1:58	2:03	2:11	2:16	2:22	2:29
	B	24	5	70	2:10	2:12	2:18	2:23	2:31	2:36	2:42	2:49
	UMCP	15	4	70	2:40	2:42	2:48	2:53	3:01	3:06	3:12	3:19

COORDINATING INSTRUCTIONS:

TCPs SP at 2030 under the control of the Scout Platoon Leader.
Heavy convoys use the "fisherman's bridge" at CP 144 and the ford at CP 109.
Light convoys stay on the main roads.
MP support available for CP 5 ("Little Chicago") and the RP (CP 47, Camp Casey Gate 2).
BN XO collapses all TCPs once the trail party has passed.

FORMULAS USED:
Pass Time {for cell D10} = IF (B10<>"",ROUND(C10*60/ ((1000/(B5+6))*B4),0)+ROUND(C10/25,0),""
CP Arrival Time {for cell G10} = IF ($B10<>"",F10+G$8/B4/60),"")

Figure 2. Road March Table

dinate sharing the march route with other units. Unfortunately, these CP times can be cumbersome to calculate.

In the Dragon Force, an Microsoft Excel spreadsheet on a laptop computer calculates the data automatically. The planner inputs the march speed, vehicle interval, unit data, critical point data, and SP times (shaded areas on the table). The spreadsheet calculates the pass times and the times at which the unit can expect to hit each critical point.

This allows the commander to evaluate his options. With the addition of coordinating instructions, the table itself becomes the road march OPORD or FRAGO. Figure 2 depicts an example road march table, with the addition of special notes and the row and column headings, to aid other units in reconstructing the table.

Additionally, task force SOP dictates a Driver's Sketch Card, which each vehicle driver prepares under the supervision of his vehicle commander. It contains a table with the azimuth, distance, and description for each leg of the road march, a sketch detailing the physical layout of the route and major landmarks on the route, and a section for the driver to calculate what his odometer readings should be at each critical point. The driver's sketch card ensures that each driver understands the route well enough that he can complete the march if separated from his march unit, without having to rely on his vehicle commander, and allows the driver to assist the vehicle commander with land navigation. A sample sketch card is shown in Figure 3.

Execution

Execution of a road march in Korea is almost always an exciting event. Traffic

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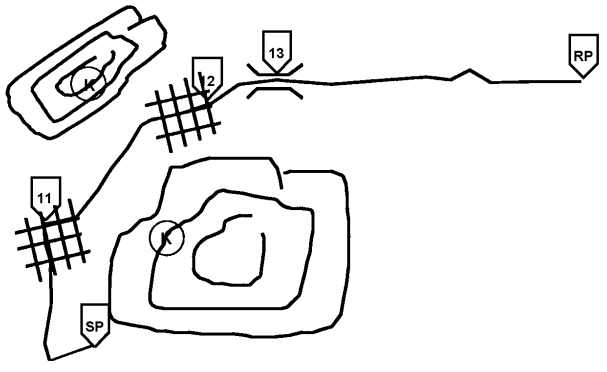
DRIVER'S SKETCH CARD

LEG	AZIMUTH	DISTANCE	DESCRIPTION
Route 1	12	10	Route 1 hard ball to village ABC, turn right at church
Route 2	39	20	Route 3 hard ball to village DEF, go straight at curve
Trail	84	10	Trail to bridge w/ white building on left
Trail	90	30	Trail to village XYZ with red building on right

ROUTE SKETCH

LEGEND SP CP RP
KEY TERRAIN K SP 11 RP



START ODOMETER READING 0100
CP 11 CP 12 CP 13 CP RP CP ___ CP ___ CP ___
OD 0110 OD 0130 OD 0140 OD 0170 OD ___ OD ___ OD ___

ROAD MARCH SPEED 20 KPH
(OPEN) CLOSED COLUMN

Figure 3: Sample Driver's Sketch Card

Mortar Support In the Korean Defile

by First Lieutenant Brian Pedersen

"Never depend completely on the strength of the terrain and consequently never be enticed into passive defense by a strong terrain."

-General Carl von Clausewitz

Providing mortar support for an armor task force on today's fast-paced battlefield is a very difficult mission. The mission gets more complicated when fighting in defiles[1] such as in the restricted terrain of Korea. There, providing mortar support requires a high degree of coordination and a flexible tactical approach to provide effective responsive or preemptive fires.

This article will explain how 2-72 Armor, the Dragon Force, evaluated the unique conditions of warfare on the Korean peninsula using METT-T analysis and formulated a plan to better use the mortar platoon to support the task force in the defile.

METT-T Analysis

Maybe the most important mission that a tank-heavy task force could execute in a war in Korea is to counterattack against an nKPA hasty defense. Focusing on the offense — for example a movement to contact — will exemplify the greatest need for flexibility in tactics and the modification of doctrine. In our unit, this first offensive engagement is the 'attack from the march.' The task force, presumably in its 7.5 km long column,[2] makes contact with the enemy at the entrance to a defile, attacks to gain a foothold within the defile, then fights through to exit the defile, and either establishes a defense or reinforces its success and maintains its momentum.

The North Korean threat that an armor task force could expect in the defile would consist of some of the following forces and weapons systems: VTT-323s, T-55s, T-62s, light amphibious tanks, truck-mobile infantry units, dismounted RPG and antitank weapon teams, artillery groups of various sizes, and SOF teams. An important fact to remember is that the North Koreans do not have any thermal sight capabilities for their tank and antitank weapon systems and precious few night-fighting systems and observation devices.

The armor task force has six organic 120mm track-mounted heavy mortar systems, with a maximum effective range of about 7000m. The tracks are manned by approximately 35 soldiers (MOS 11C). The most important planning factors to consider in this area are survivability[3] and required supply rate.[4]

Restrictive terrain is what makes Korea such a difficult place in which to fight and, in executing tactics, is at least as large a factor as enemy or friendly troop dispositions. Mountainous terrain dominates the Korean peninsula, with fewer and fewer trafficable roads toward the north. Mobility corridors are often reduced to a single-lane road, and battlesight ranges drop to less than 400m for the M1A1 tank. Numerous rivers and streams, combined with sprawling urbanization and swamp-like rice paddies, make the terrain difficult to impassable during the rainy season and canalizing during most other times. The broken, mountainous topography helps the enemy find keyhole[5] positions to counter the superior technology of allied weapons systems.

Evaluating time is the most difficult planning factor for warfare in Korea. Time works against the armored task force attacking into the defile. The faster it can muster its forces and mount an attack, the less time the defenders have to counter the technological advantages of the Abrams- and Bradley-equipped task force. In an artillery-dominated army such as the nKPA, the counter they hope to employ against us is indirect fire. Our speed in execution prevents them from accurately and effectively employing it. The paradox here is that the longer the task force has to prepare for its attack, the more combined arms assets it can employ, and the better coordination it can make for the conduct of operations. Finding the best balance between preparation and violent execution is the trick.

Building a Plan

Using these assessments, as well as other considerations, the Dragon Force formulated a method for maximizing the indirect fire support it receives from its mortar platoon. The plan first takes into account the terrain and its movement constraints on the task force. With the task force in column on a single lane road, the mortar platoon might never be in range to provide supporting fires if it is placed too far back in the road march order, so the mortars move immediately behind the lead company of the task force. To account for the mortars' logistical requirements, the mortar platoon's Class V follows closely behind the trail section, and prepositioned ammunition stores are used if possible. For survivability, the mortars will operate in split section. Despite their separation, both sections will be able to quickly mass as a platoon on targets along the length of the defile, due to the defile's narrowness. Next, taking into account the enemy's lack of thermal capability, the mortars utilize an equal number of smoke (WP) and HE in order to blind the enemy in the defile. To increase responsiveness, all potential keyhole positions will be

"Throughout the defile battle, the mortars must remain flexible, as they may be required to provide support for the scouts, the combat patrol, the lead company/team of the task force, the breach company/team, the assault company/team, or the reserve company/team...."

templated within the defile. As the lead elements of the task force (scouts or combat patrol) move toward these keyhole positions, the commander determines whether to fire smoke, HE, or allow the tanks to clear with direct fire. The normal procedure is for the mortars to suppress all likely keyhole positions sequentially in front of the lead tank. Using bounding sections will allow coverage of all priority targets continuously.

At the point in the entrance battle[6] when the scouts or combat patrol have found the enemy element they need to destroy in order to gain a foothold into the defile, they send a code word call over the task force net. This code word call gives the composition and location of the enemy force and is the task force priority target. All mortar tubes at this time will converge on this target, suppressing and smoking it until it can be engaged by direct fire. If bounding to a new firing position when this call for fire comes, a section will conduct a 'hipshot'[7] and converge its fires with the stationary section onto the enemy location.

Throughout the defile battle, the mortars must remain flexible, as they may be required to provide support for the scouts, the combat patrol, the lead company/team of the task force, the breach company/team, the assault company/team, or the reserve company/team. They might be required to suppress dismounts, disrupt lightly armored vehicle formations, smoke enemy tanks or antitank assets, or smoke suspected enemy observation points or keyhole positions.

Once the task force has its foothold in the defile, the lead team continues to move through the center of the defile. Enemy antitank ambush will be the primary targets of the mortar platoon. The mortars will conduct the 'hipshot' and converge platoon fires onto known enemy positions, keyhole positions, and observation points, attempting to blind, confuse, and destroy the enemy in place while the breach team conducts its breach.

The final element in the attack through the defile is the exit battle.[8] This is the point where the enemy will have both depth and width since he is no longer in the defile, while the task force will have a minimum frontage. For the mortars, this is possibly the most critical point in the battle. The lead element of the task force once again will determine the enemy element it must destroy in order to exit the defile. The code word call again goes out on the task force net, where the mortars immediately converge with smoke and HE onto this enemy position. However, once the direct fire weapon systems have converged on the enemy, the mortars must shift with smoke onto each successive enemy element in order for the maneuvering teams to bypass the fixing team (the lead element) and destroy the remaining enemy elements. Once all friendly elements have exited the defile and suppressed/destroyed all remaining opposition, the task force will set into an L-shaped ambush, in anticipation of a counterattack, and consolidate/reorganize.

Summary

This scenario is just one of many ways to approach the unique problems of fighting in the Korean defile. It represents a methodology that can be taught rapidly, utilizes commonly trained combat skills, and embraces current doctrine while introducing some innovative ideas to approach combat situations in Korea.

Notes

[1]In restrictive terrain, an area in which the mobility corridor can be reduced to a single lane the width of one vehicle and engagement ranges are under 400m.

[2]Due to terrain and infrastructure constraints in Korea, most task force-level movements will be tactical road marches in closed column, the length of which is 7.5 km.

[3]The carrier is from the M113 family of vehicles, lightly armored, and armed with a .50 cal MG.

[4]The M1064A3 carrier (120mm) carries only 69 rounds.

[5]A position in which the defender cannot be seen until after the enemy passes in front of him and presents his flank; usually gives defender only a 3-6 second window of opportunity to fire.

[6]There are three parts to the defile battle: Entrance battle, center battle, and exit battle. The entrance begins with the task force scouts making contact at the entrance to the defile. They will call for indirect fire and then hand off the battle to the combat patrol of the lead company/team.

[7]Mortar firing technique in which a track is aligned on a direction of fire using a hand-held compass rather than a ground-mounted aiming circle; advantage is a firing time standard of two minutes; the drawback is accuracy of initial fire for effect.

[8]The exit battle begins once the breach company/team has cleared the obstacle for the task force. At this point, the lead element in the defile calls for heavy smoke to mask its departure from the defile. Once he has contact with the enemy element, which he needs to destroy to clear the defile, he will call smoke and suppressive fires onto that position. The assault element will attempt to flank the enemy and make space for the rest of the task force to clear the defile and enter the fight.

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The Armor Battalion After Next

A Modest Proposal

by Lieutenant Colonel Kevin C.M. Benson

"I have seen the future of warfare...The Army's ability to use information to dominate future battles will give the United States a new key to victory, I believe, for years, if not for generations to come."

—Secretary of Defense William Cohen

(CSA Random Thoughts While Running, received via e-mail on 21 April 97)

The e-mail nets were alive throughout the Army during the Advanced Warfighting Experiment (AWE) conducted at the National Training Center in March of 1997. Somewhere around 21 April 1997, significantly put out on e-mail, our Chief of Staff GEN Reimer put out a clarion call for action and thinking on the subject of the size of our battalions. In the e-mail he wrote, "We stayed away from tinkering with the maneuver battalions on purpose because we really wanted to see what we had first. However, now that we see what we've got (based upon the results of the AWE *author note*), I think it's time to take this one on in earnest." (CSA Note)

The power of the new information technology the Army is testing is awesome. While it is not a panacea, the sooner we in the Army exploit this technology and articulate what it is we want the technology to do for us, the better we will be able to retain our fighting edge over potential adversaries. I once heard COL Jim McDonough, then Director of the School of Advanced Military Studies, call this the "Billy-Jack" approach. We will demonstrate what we can do to our enemies, and they know there is nothing they can do to stop us. This is the right attitude to take in an increasingly hostile world. This is asymmetrical application of force. Demonstration of conventional power is a deterrent.

The purpose of this essay is to outline a "modest proposal" for the structure of the tank battalion after next. I am deliberately staking out an extreme position in the hopes it will raise the blood pressure of my contemporaries and thus bring on the debate we really ought to be having in regards to this topic. Unless we in the Armor Force do this, we may find ourselves sounding like MG John K. Herr, the last Chief of Cavalry, arguing for keeping the horse cavalry while the rest of the Army modernized. In 1938, MG Herr said, "We must not be misled to our own detriment to assume that the untried machine can displace the proved and tried horse." (Petras, p.106) Similar words are spoken about the computer and information systems. We cannot be left behind.

I propose that the Armor battalion be reorganized as shown in Figure 1.

The organization I propose is smaller, thus it should be more strategically mobile. The heart of the matter is what is NOT in the battalion.

Assuming we can achieve maintenance situational awareness and just-in-time supply, we can then remove the maintenance platoon, support platoon, medical platoon — essentially all of the CS and CSS functions from the battalion. We can have battalions without staffs. The sole function of the battalion is to prepare tankers for war through training as crews, platoons, and companies. The battalion commander, his X3, and CSM are the proper trainers of the battalion's troopers. The Army selects these men based upon their demonstrated potential for future service, thus we can empower them to train their outfits. The CS and CSS functions are captured by the use of electronic means and transmitted to the proper level. We can make these networks happen in the field and the garrison.

I propose a battalion without a staff in the traditional sense. Capitalizing on the strengths of the information systems now available, as well as those in the near future, we can eliminate the staff at the level of the fighting element. There is, of course, the corresponding requirement to have an in-place support system in garrison and in the field to meet the battalion's CS and CSS needs. We can achieve these economies through the use of information systems we have on hand. The S1/personnel function can be taken care of at the central in-processing facility most divisions run right now. Our automated ID cards are supposed to carry information on the bar code on the back. It is time to make that work. Personnel transactions can then take place on a LAN with input from the 1SG (and the shadow staff any good 1SG will have, anyway).

The point is that the information systems must be/are in place before we put this effort into effect. A coordinated LAN within the division or brigade can take care of promotions, demotions, pay inquiries, etc. That is what the AGs of the force say, so it is time to put up.

The S4 supply functions will make use of the automated property book system we have, with refinements. The company commander would still be responsible for signing for his equipment and

Armor Battalion After Next

- 35 tanks, 9 HMMWVs
- 1 LTC, 1 MAJ, 1 CSM, 3 CPT, 12 LT, 3 1SGs, 11 SFC/19K40 (four Master Gunners), 15 SSG/19K30, 3 SSG/92A30, 109 PV1-SGT/19K10/20
- Total = 164 troopers

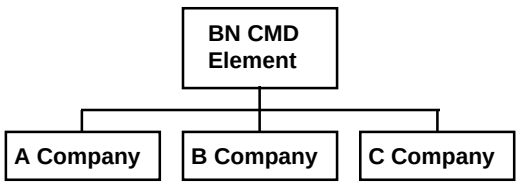

Figure 1

Armor Battalion After Next Command Element

- Two tanks, three HMMWVs
- 1 LTC, 1 MAJ, 1 CSM, 2 SFC (one Master Gunner), 4 19K 10-20, 3 19K10/20 HMMWV drivers
- Total = 12 troopers, 2 M1A2, 3 HMMWV

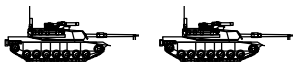

Figure 2

the monthly inventories. I really cannot see ever walking away from that need, even when we all look like the soldiers in Heinlein's *Starship Troopers*. The point is that in garrison we can take advantage of automated systems in place for the supply sergeants we will still need, if only for their familiarity with the CSS system and procedures. This integration can be at either brigade or division. The field system will take advantage of the systems for "just-in-time" logistics and the information-sharing systems which will track ammunition expenditure and fuel consumption.

The S2/S3 functions are handled through improved red and blue situational awareness. That is easy to say and very tough to execute, but within the realm of the possible given the power of the systems we have. Think about LTC "Abe" Abrams leading the 37th Tank into Bastogne. Abe led from the front and used his intuitive feel for battle and the enemy to guide the actions of his battalion. Battalions do not have a deep fight, they form the heart of the close fight of the brigade. Battalion commanders execute operations along with their troopers, and close with the enemy by fire and maneuver. This does not relieve the commander of the requirement to know the enemy and the terrain; in fact, the increased situational awareness afforded us via systems interface makes understanding the relationship of enemy, weather, terrain, capabilities, and the commander's estimate all the more important. Reports from the NTC seemed to indicate that the real problem was too much information and a lack of willingness to trust the information on the screen. Here then is the re-emergence of the art of command and battle leadership. The power of the information system will allow the commander to go to the critical point because he can first "see" where the critical point is, based on the positive knowledge of friendly locations and the collation of enemy locations on his display screen, then move to the point on the battlefield and see what is most important. In this way *fingerspitzengefuehl, coup d'oiel*, call it what you will, is enhanced, not befuddled, by technology. This situation will only get better as the systems improve and us "old dogs" learn some new tricks. Pilots say, "Trust the instruments." It is time for tankers to do likewise.

Here again are the words of our Chief of Staff, "In my opinion, we have at least a 30% increase in capabilities through situation awareness at the present time, and if we are able to develop it to its full potential, it could be a 50%-60% increase. Given the fact that, in power projection operations, getting capabilities there quickly makes a large difference, I think it's time we look at the size of these armor and mech infantry battalions and see if we can't downsize some of them. I know how emotional that is, but we have to take it on in my opinion." (CSA Note) This reduction in the size of the battalion also allows us to expand the number of heavy divisions while not exceeding the number ceiling placed on the Army by budget constraints.

The historians out there will quickly point out that the last Army to do this was the German Army after the invasion of Poland. The U.S. Army also did this during World War II, by decreasing the size and number of the armored regiments of the existing armored divisions in order to field more armored divisions. By saving 23 tanks from each battalion in the current force (five armored divisions each with five tank battalions), the Army could field at least three more reduced size armored divisions. Here are my numbers:

23 tanks from 25 battalions = 575 tanks

575 tanks = 2300 men = roughly 16 downsized battalions

The smaller battalions will enable the Army to focus and reduce the size of the support battalions and other battalions within the division. Since we cannot predict where and when the Army will be needed in the next fight, we can retain more, smaller armored divisions which give the Army more strategic flexibility in the application of force. Our Chief again put this thought concisely, "In my opinion, the Army has been drifting toward smaller, more mobile units in the last few years. I think most of us have recognized the need for strategic mobility, but we did not want to give up the combat capabilities we currently possessed." (CSA, 21 April 97) We are not giving up combat capabilities within the

Continued on Page 50

Armor Battalion After Next Tank Company

- Company Command Element
  - 1 CPT, 1 1LT (XO), 1 1SG, 2 SSGs, 1 SSG (92A Supply SGT), 4 19K10/20, 3 19K10/20 HMMWV drivers
- Tank Platoon
  - 3 2/1LT, 3 SFC (one Master gunner), 3 SSGs, 27 19K10/20
- Total = 49 troopers, 11 M1A2, 2 HMMWV

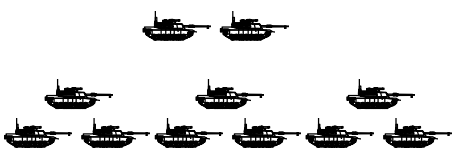

Figure 3

The M-26 tank, seen here on an M8 tank transporter, did not enter combat in the European Theater until the final days of WWII. Its armor protection, 90mm gun, and modern torsion bar suspension finally put U.S. tankers on a par with their German opponents.

Armor Combat Development 1917-1945

by Dr. Robert S. Cameron

This article was compiled on behalf of the Directorate of Force Development, and it provides an historical overview of the policies governing American tank design in this early period. Together with two subsequent articles, it is intended to recognize the basic accomplishments of combat developments with respect to the Mounted Force from their infancy in World War I to the sophistication represented by the Future Combat System.

When America joined the Entente in April 1917, it possessed no tanks of its own. Indeed, the tank originated from British and French efforts to end the Western Front trench deadlock. Following a study of British and French tank use, however, the U.S. Army established the Tank Corps, within the American Expeditionary Forces, to organize and train American tank units.[1] Headed by Colonel Samuel D. Rockenbach, the Tank Corps combined the French emphasis on small light tanks to accompany advancing foot soldiers with the British preference for large, heavily armed tanks to breach enemy positions in advance of an infantry assault. Consequently, separate American light and heavy tank units were formed.[2]

To overcome the absence of American tanks, the War Department endeavored to produce a copy of the French Renault FT 17 light tank, develop a new design through Ford Motor Company, and participate in a combined British-French-American effort to build the Mark VIII heavy tank. None of these endeavors proved successful. Rather than simply mass-produce a copy of the Renault tank, the Ordnance Department modified the design, although lacking tank production experience. Delays and confusion resulted, unrelieved by disagreement whether the speedometer of a tank capable of less than ten miles per hour should show kilometers or miles per hour. Only ten American-made Renaults were built by war's end.[3]

In an early effort to utilize the mass production capability of the automotive industry, Ford Motor Company received a contract to mass produce a three-ton light tank that it would design itself. Over the objection of AEF personnel who found the vehicle unsatisfactory for combat, the company produced only 15 by war's end.[4] The Mark VIII represented the first international tank design. It incorporated British and American concepts and technology — including the American Liberty aircraft engine — in a design that would be assembled in France. Intended to spearhead a planned 1919 offensive, production suffered from the slow rate of Liberty engine development and the priority given to aircraft for those engines produced. The war's end in November 1918 left the U.S. Army with a collection of parts that upon assembly provided it with 100 Mark VIII tanks.[5]

The continuation of wartime tank production into 1919 resulted in the Army's possession of a tank fleet expensive to maintain and mechanically unreliable. Worse, it provided an illusion of tank strength that impaired Congressional willingness to fund the development and production of new designs. Throughout the interwar era, the Army could afford only one new model a year.[6]

The exclusive use of tanks in a trench-breaching role resulted in their association with the Infantry. Consequently, the National Defense Act of 1920 that defined the Army of the interwar period abolished the Tank Corps and assigned tank development responsibility to the

Infantry. The Act precluded experimentation with tank use beyond the narrow mission of assisting the advance of the rifleman and seizing ground.[7]

Under the guidance of Rockenbach, now commanding the Infantry's tank force, tank development focused upon a medium tank. He sought a design capable of accompanying the rifleman in all terrain, able to withstand .50 caliber machine gun fire, carrying close support firepower, and weighing no more than 15 tons in order to utilize highway bridges. Such a balance of armor, mobility, and firepower proved beyond the capability of American tank technology in the 1920s.[8] Although three tanks were built under Rockenbach's supervision between 1921 and 1925, all proved over 20 tons.[9]

The difficulties of creating a satisfactory medium tank encouraged the Infantry to shift its focus in 1926 to light tank development. The higher mobility and speed of these vehicles also reflected the Army's preference for a war of maneuver over a positional conflict like the Great War.[10] In particular, the Infantry sought a tank capable of 12 miles per hour, possessing a 37mm main gun, and armored against .30 caliber machine gun fire.[11]

The resulting T1 series was designed as a light, fast tank suitable for portage by truck. The first model represented a collaborative effort between the Ordnance Department and the Society of Automotive Engineers. It embraced the newest advances in automotive technology, including the link type springless suspension and the use of an all-purpose chassis to facilitate standardization. Between 1927 and 1931, Rock Island Arsenal built a succession of pilot models, each one introducing new features but ultimately increasing the tank's weight to seven tons. The reliability of the series, however, demonstrated the viability of the tank's operation without a carrier.[12]

Since their invention, tanks depended upon railways and trucks for transportation to and from the battlefield. The speed of a tank-laden truck column, however, barely exceeded three miles per hour and precluded rapid, mobile operations. A tank that could safely rely upon its own engine, both on and off the battlefield, increased its versatility and permitted a higher tempo of operations. Eliminating carriers from tank units similarly reduced their cost and personnel requirements.[13]

J. Walter Christie's tank designs further reinforced the trend away from tank carriers. During the interwar years, he built tanks capable of moving 40 miles per hour cross country, fording rivers, allowing rapid conversion between wheel and track movement, and equal speeds forward and backward. Although the Army never adopted any of Christie's designs for standardization, it flirted with them throughout the era and purchased several models. It found them unsuited for the stresses of military usage and their designer unscrupulous in his business dealings.[14]

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Light tank development also benefited from the creation of the American Experimental Mechanized Force in 1928 and the Mechanized Force in 1930. Both forces sought to combine tanks with other arms and utilize them in a variety of tactical roles. Neither organization could survive, however, in the face of opposition from the combat and service arms that feared the loss of personnel and funding to them.

In 1931, Chief of Staff General Douglas MacArthur authorized a new mechanization policy that permitted each combat arm to control the pace and extent of its own mechanization program. Although this policy decentralized mechanized development, it ensured that mechanization no longer posed a resource threat. MacArthur's policy also engendered the Mechanized Cavalry to test the tank's application to Cavalry functions and implement the conclusions drawn from the Experimental Mechanized Force and the Mechanized Force.[15]

The Cavalry mission included reconnaissance, screening, exploitation, pursuit, and raiding operations, and it, therefore, necessitated a more dynamic use of the tank than the simple close support role of the Infantry. Throughout the 1930s, the Mechanized Cavalry's activities resulted in the development of mobile combat teams of tanks, self-propelled mortars, and riflemen working independently toward common objectives. The mobile, dispersed nature of these actions generated requirements for an armored personnel carrier and self-propelled artillery. A new set of tank specifications also emerged that stressed mobility and reliability over firepower and armor.

The fresh impetus given to tank development by the Mechanized Cavalry coincided with a general desire to jettison the World War I tank fleet of Mark VIIIs and Renault tanks. Such tanks did not permit analysis of the fast moving tactics now advocated by the Infantry and Mechanized Cavalry. Echoing the sentiments of those personnel associated with mechanized development, one Infantry tank officer advised that the "best solution for the present mechanized means of the U.S. Army is to get the biggest transport we have, load it all on, and dump it into the middle of the Atlantic Ocean."[16]

The Infantry and Mechanized Cavalry's combined interest in light tanks resulted in the T2-series that became the pattern for the later M3 and M5 Light Tanks. A single chassis served both arms. The series introduced the vertical volute suspension, necessary to handle the 35-mile-per-hour speed. Although intended to utilize a Wright-built Continental aircraft engine, Guiberson diesel engines equipped some models. In 1936, 19 T2s were produced, to be followed by 170 in 1937.[17]

The Cavalry version carried only a machine gun as armament, but the Infantry reacted to the growing efficacy of antitank guns demonstrated in the Spanish Civil War by seeking heavier armament and armor.[18] The 12-ton M2A4 reflected these concerns, carrying a 37mm gun in a rotating turret and a maximum armor protection of 25 millimeters.[19] Completing trials in September 1939, the M2A4 missed the August Plattsburg maneuvers, and its armor had already been surpassed by the German PanzerKampfwagen II.

The Plattsburg maneuvers demonstrated mechanized cavalry's ability to use its superior mobility to unbalance and envelop a slower force. The maneuver's conclusion coincided with the German invasion of Poland; both events underscored the importance of a powerful tank force.[20] The declaration of a limited national emergency resulted in an order for 329 M2A4s from American Car and Foundry Company and marked an

awareness of the importance of a tank force to national survival.[21] While Poland's prewar inventory included 1,000 armored fighting vehicles, the U.S. Army possessed only a variegated collection of 450 tanks.[22]

The fall of France in 1940, however, stunned the War Department and provided the catalyst for changes affecting the design, production, and employment of American tanks. In June, the War Department established the National Munitions Program to govern the mass production of war materiel.[23] Charged with implementing this program, the National Defense Advisory Commission sought to ensure effective coordination of industrial capability and military need. General Motors President William S. Knudsen served on the Commission as the advisor for mechanized equipment. He recommended the abandonment of Ordnance Department plans to utilize heavy engine and locomotive plants to build tanks, advocating instead the building of new arsenals for tank production that exploited the labor, management, and production expertise of the automobile industry. Consequently, Chrysler Corporation built the first such arsenal at Detroit.[24]

France's defeat also pushed the War Department in July 1940 to create the Armored Force with responsibility for creating the armored formations now deemed vital for modern warfare. The new organization absorbed the Mechanized Cavalry and Infantry tank force, but the former exerted a dominant influence, embodied by the appointment of the Mechanized Cavalry commander, Major General Adna R. Chaffee, Jr., as Chief of the Armored Force.[25] The Mechanized Cavalry emphasis upon mobility shaped the doctrine and organization of the armored formations. Despite the European trend toward more heavily armed and armored vehicles, light tanks constituted the majority of tanks in the new armored divisions expected to perform an exploitation role.[26]

Modifications to the M2A4 generated the M3 Light Tank. Lessons learned from France's defeat included an increase in frontal armor to 38 millimeters and enhanced protection of the engine compartment against strafing. Weight rose to 13.5 tons, but the German PanzerKampfwagen III possessed 90 millimeters of frontal armor. Nevertheless, the pilot model completed its trials in July 1940, and American Car and Foundry Company received a large production order.[27]

The fall of France also stimulated medium tank development, lagging since 1926. Although the M2 Medium Tank entered service in the spring of 1940, its 37mm cannon and eight machine gun armament was offset by a maximum armor protection of only 25 millimeters. It also suffered from being underpowered and unlikely to fare well against the newer models of German tanks.[28]

The M3A1 Stuart light tank, with its 37mm gun and light armor, quickly became obsolete in the European Theater. This 1st AD example has the unique "flag" markings and yellow turret stripes peculiar to vehicles used in the North Africa invasion of 1942.

The emergence of the PanzerKampfwagen IV, carrying a 75mm gun, led Chief of Infantry Major General George A. Lynch to declare the M2 medium obsolete and recommend developing a new tank carrying a turret-mounted 75mm and heavier armor. Chaffee concurred with these views and, together with the Ordnance Department, determined upon the creation of a new design based upon the M2 chassis but carrying heavier armament and protection.[29]

The larger weapon required a new turret. While its design began, an interim tank was developed that retained a 37mm gun in the turret but also carried a 75mm gun in its hull. Designated the M3 Medium Tank, it featured a redesigned hull and superstructure upon an M2 chassis and utilized the latter's mechanical layout. In August, 1,000 of the vehicles were ordered and construction began on a new arsenal to build them.[30]

Issued to the British through the Lend Lease program, the new tank entered combat during the Gazala tank battles of May 1942. These early models suffered from engines that overheated after 25 hours of use and the issuance of the wrong fuses for the 75mm gun. These problems had been corrected before the tank entered combat with American soldiers. Although the M3 proved popular with the British, the 75mm gun could not be operated from a hull-down position, and its limited traverse precluded tracking a moving target. It proved capable of penetrating the frontal armor of most German tanks encountered at a range of 400 yards, but newer models of the PanzerKampfwagen III and IV repeatedly destroyed it at 1100 yards.[31] Although the M3 continued in British service in the Far East throughout the war, its use in North Africa and Europe was eclipsed by the M4 Medium Tank, and it was declared obsolete in April 1944.[32]

The M3 Light Tanks also suffered from a number of problems despite their popularity with the British. They possessed a high silhouette and their angular hull and riveted armor offered poor protection. Their short cruising range proved an embarassment in North Africa and resulted in additional fuel tanks being built into the hull sides. Other principal series modifications included power traverse, periscopes for all crew members, and the use of the Guiberson diesel engine to alleviate shortages in the Continental aircraft engine initially intended for the tank.[33]

Continual modifications to the M3 resulted in the M5 Light Tank. Maximum armor increased to 51 millimeters, and two V8 Cadillac automobile engines replaced the Continental aircraft engine. Initial Ordnance Department skepticism with the idea ended after a prototype model drove from Detroit arsenal to Aberdeen Proving Ground without mishap. Production began in June 1942 but ended in June 1944, following development of the M24 Light Tank. The M5

remained operational, however, until late in the war, although outclassed by all German tanks.[34]

Growing dissatisfaction with the M5's insufficient turret space, weak armament, and cooling system resulted in development of a replacement design designated T7. Equipped with a 75mm gun, early trials proved so promising that it was considered a possible replacement for the M4 Medium Tank. The ensuing modifications to the original design, however, resulted in an overloaded and unsatisfactory vehicle. A new light tank design finally emerged in April 1943 that corrected the worst defects of the M5. Designated the M24, it featured a 75mm aircraft cannon, an enhanced torsion bar suspension system that increased stability and flotation, wet stowage of ammunition, power traverse, an electrical firing mechanism, and a Hydramatic transmission similar to that found in taxi cabs. In combat, however, the large floor escape hatch proved vulnerable to mine explosions. The M24 marked a significant advance over the M5, but few saw combat in World War II.[35]

The M4 Medium Tank entered production in October 1941, and during the course of the war over 70,000 of all configurations were built. This output was achieved by distributing production between 11 major firms and over 100 subcontractors. Use of the same chassis as the M3 further simplified construction. A variety of models were built around different power plants developed by the automotive industry in an effort to optimize performance and reduce the high demand for aircraft engines. Other modifications included armament of a 76mm gun or 105mm howitzer, the introduction of horizontal volute spring suspension, and the incorporation of wet ammunition stowage. The last feature necessitated over 2,500 changes to the vehicle's layout.[36] Later versions also carried a telephone for communication between the crew and supporting infantry.[37]

In general, however, the M4 proved mechanically reliable, and highly mobile. The tank's principal weaknesses lay in an inadequate main armament and armor protection. Tank crews feared that those M4s equipped with gasoline engines were firetraps following reports of tanks bursting into flames upon being hit. Tests conducted at Fort Knox, however, determined that the cause of the fires was not the gasoline, but the penetration of the tank by ammunition designed to explode inside the tank and ignite its combustible components.[38]

Field Expedient "Protection"

Testing ways to improve the Sherman's protection, units fired captured German antitank weapons against hulks. Above, a soldier examines the damage done by a 60mm shaped charge that blew away bags of cement before perforating the transmission casting. Spare track sections were also employed, as seen on the Sherman below, at the 1st AD's crossing of the Arno River in Italy during 1944.

Questions concerning the adequacy of the M4's armament began to emerge in 1943 and triggered a dispute between the Armored Force, the Army Ground Forces (AGF) responsible for combat developments, and the Ordnance Department. The Armored Force wanted to mount a 90mm gun on the M4, but AGF opposed this idea. Its commander, Lieutenant General Lesley J. McNair, considered this action unnecessary since American doctrine stressed the use of tanks for exploitation rather than destroying enemy armor.

He also opposed the Ordnance Department's preference for developing an entirely new heavy tank, because of the decrease in M4 production that would occur while industry retooled for a new tank.[39]

Adverse publicity concerning the weakness of the M4 in encounters with German Tigers and Panthers throughout

Above, although the U.S. did not field a heavy tank in time for WWII, it developed the 60-ton M6 early in the war. The few that were made never went into combat, the Army relying instead on mass production of the M4 Sherman.

At left, the M24 light tank did join the fight during the final months of the European Theater. Its torsion bar suspension was a big improvement over the vertical volute spring system of the Stuart series, and its 75mm gun was a formidable main armament for a tank of its size.

1944 only deepened the three-way rift. The M4A3E2 represented an improvised solution. A 42-ton heavily armored M4, the tank was initially designed for close infantry support during the Normandy campaign, but the U.S. Third Army found them useful in leading armored columns, where their heavier armor increased their survivability if attacked. Some of these tanks carried the more powerful 76mm gun, but overall numbers of the M4A3E2 produced amounted to only 254.[40]

The Ordnance Department continued to advocate a heavy tank, and had already acquired design experience. It had developed the M6 Heavy Tank following France's defeat. None of the 50 vehicles produced entered combat, but the tank's dual main armament of a 3-inch gun and a 37mm gun mounted coaxially, its 25-mile-per-hour speed, its track skirts, and ballistically shaped hull had been innovative for the early war period. Beginning in 1943, the Ordnance Department had also sought to improve the M4 Medium Tank, focusing upon transmissions, suspensions, larger guns, use of an autoloader, and increased armor and firepower without sacrificing mobility. Independently, the Ordnance Department continued to develop a heavily armored tank carrying the 90mm gun, resulting in the T26-series of heavy tanks. The demonstrated inadequacy of the M4 Medium Tank in combat against heavier German vehicles in 1944 finally provided the stimulus for AGF, the Ordnance Department, and the Armored Force to agree upon the production of 250 T26s.[41]

The 3d and 9th Armored Divisions received the first deliveries of T26s in January 1945. Mixed teams of civilian and military experts provided new equipment training, and their efforts stimulated theater demands for additional tanks. By May 1945, the T26 became standardized as the M26 and 200 had been issued to combat units in Europe. By war's end, only 20 had entered combat, including the capture of the Remagen Bridge. None saw action in the Pacific Theater of Operations, although they were requested for use on Okinawa.[42]

By the war's end, American tank development had drifted toward more versatile tank designs capable of performing multiple tactical roles and that incorporated a better balance of armor, firepower, and mobility. Light tanks continued to function in a reconnaissance role, reflecting the American preference for fully tracked vehicles over the cheaper armored cars favored by foreign powers. The M4 Medium Tank and M26 Heavy Tank, however, represented the emergence of the main battle tank concept that would shape Cold War tank designs. Production and design had matured since the confusion of World War I, and benefited from the effective utilization of the

automotive industry in all phases of tank development. The controversy over the M4's replacement, however, resulted in American combat troops entering combat with inferior equipment and underscored the importance of coordinating the needs of combat forces with doctrine and technological ability.

Notes

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Force Protection for Checkpoint Operations

by First Lieutenant Patrick R. Milligan

Checkpoints are used to control movement of vehicles, personnel, or materiel along a specified route; and are classified as deliberate or hasty. They help prevent trafficking of contraband items, ensure proper use of routes by both civilian and military traffic, prevent unauthorized access or infiltration of restricted or controlled areas by local civilians or military forces, maintain continuous monitoring of road movement, and serve as local security and observation outposts.

This article will focus primarily on the issue of force protection — planning for and implementing force protection measures for both deliberate and hasty checkpoints. It will also address some of the tactics, techniques, and procedures utilized during checkpoint operations. The article is based on the experiences of Apache Troop, 1st Squadron, 1st U.S. Cavalry from 1 January 1996 to 17 October 1996 in Northeast Bosnia-Herzegovina. The soldiers of A Troop established seven deliberate checkpoints in a five month time period, all on major routes through the Zone of Separation.

Two Bradleys guard Checkpoint Apache 2 along Route Arizona in northeast Bosnia-Herzegovina.

Force Protection Planning

Force protection and checkpoint defense are primary concerns in a stability operations environment, and are mutually dependent. Force protection was a primary concern and *the* buzzword of Operation Joint Endeavor. Many specific measures were taken to prevent the unnecessary loss of manpower — as outlined in the tactics, techniques, and procedures implemented and utilized for vehicular convoys, base camp protection, and checkpoint operations. Checkpoint force protection measures (the focus of this article) included the use of improved materials for cover and concealment of soldiers and checkpoint structures, obstacle and barrier plans, perimeter lighting, and operational procedures (to include defense contingency plans).

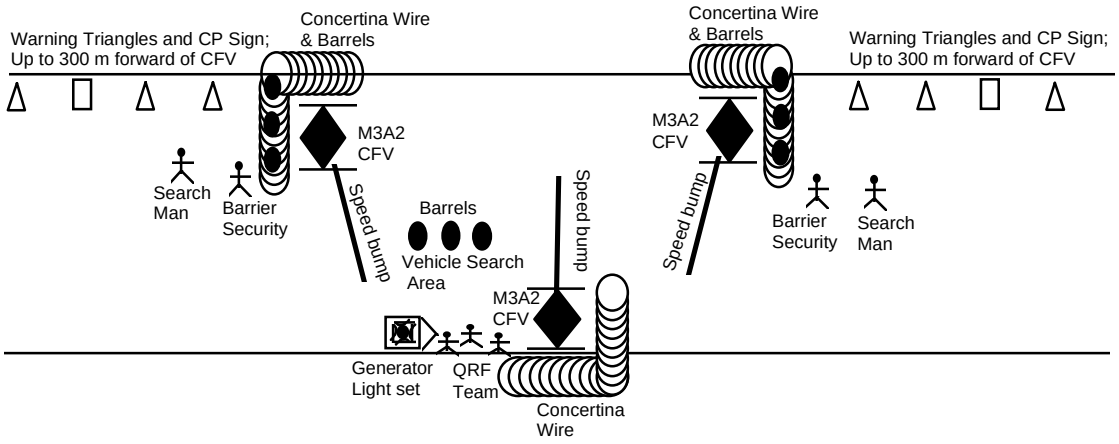
Force protection planning for checkpoint operations requires in-depth troop leading procedures (TLPs) conducted at the platoon level. During mission analysis, it is important to focus on three specific areas — the Threat, the terrain, and the supporting assets needed during checkpoint operations. Each item influences checkpoint force protection planning and may influence the execution of operations.

In a peacekeeping or peace-enforcing environment, the Threat is not always a visible, recognizable, or definable force. As the bombings in Beirut and Dhahran have both shown, invisible terrorists and factions dressed in civilian clothing, using guerrilla warfare tactics, pose a constant threat to our forces. During the planning phase, leaders must identify Threat avenues of approach (AAs) to the checkpoint (dismounted avenues of approach, possible sniper locations, and high speed vehicular AAs), and this vigilance must be continued by the soldiers manning a checkpoint. The Threat template incorporated with the checkpoint layout will assist in identifying threat AAs. The platoon leader, or checkpoint ground commander, must continually analyze, and if necessary, revise his threat IPB and make corrections to his CP defense plan. This becomes very important, especially if the checkpoint is located in a built-up area or if the activities in the area surrounding the checkpoint become more active. An example of the latter was our CP A2, established in January 1996. By early April, "Market Arizona" began nearby with a couple of dozen peddlers. By July, it had evolved into a large market with over a dozen permanent structures and more than a hundred merchants. The checkpoint provided the blanket of security for free-market trading and enterprise for merchants of all ethnic backgrounds, but like any built-up area, it was always considered a potential threat platform.

The old adage, "Terrain Dictates," is often true in checkpoint operations. Defense of the checkpoint and force protection for your soldiers must be a primary concern — good IPB will assist in both areas. Terrain will also influence or dictate the size of your checkpoint, operational planning, the obstacle plan, and resupply operations. Deliberate checkpoints should not be located on restrictive terrain, for example, low ground with minimal fields of observation, on a curvy road, or in a built-up area. Easily defensible terrain will support more efficient operations; it will support your obstacle and defense plan, assist in resupply and relief-in-place operations, and provide the ability to establish adequate force protection.

On the other hand, the intent of a hasty checkpoint is surprise. These locations should limit detection from long distances. When planning a hasty checkpoint, leaders should analyze terrain and other restrictions as to how they will affect your CP. Key terrain surrounding your checkpoint must be observable at all times and targeted with direct- and indirect-fire weapon systems.

Temporary Checkpoint



Also consider how the checkpoint will receive its supply and other support. How will supporting indirect fires be utilized? How will civilian contractors service the checkpoint? How will this affect operations, and will their presence increase the threat? These are common questions which must be addressed and answered with solid solutions.

Resupply and refueling at your checkpoint must be specified with a plan. In it, you must address how your resupply element will conduct operations. Consider the LOGPAC's direction of travel to the checkpoint, access points to be used, number of vehicles in the resupply element, how the checkpoint will be defended with additional assets on site, arrival and departure times, assets needed to support the LOGPACs arrival, etc. The lack of a reliable resupply or refuel plan will hinder and disrupt checkpoint operations at the most inopportune times, creating confusion that degrades checkpoint security and force protection.

Consider the supporting fires protecting the checkpoint and what assets are most appropriate — battalion or troop mortars, direct support 155mm, or attack helicopters? Where is this support located, and how long does it take to deliver fires? If fires are released, what type of round(s) will be fired to support the checkpoint [the most common fire plan would utilize illumination due to the effects of collateral damage on the civilian populace]? What organic weapons do you have that can deliver fires to deadspaces surrounding the checkpoint, and what types and quantities of round should you have on hand? All of these common and specific questions must have answers in the checkpoint defense plan. Plan fire support and air-ground coordination exercises and rehearsals on a regular basis; by doing so you will be able to accurately determine if they will be able to support you when it counts. By the time you get fires released, the "war" may well be over, thus the rehearsals will provide you insight to adjust your CP defense plan as needed. Utilize organic M203 grenade launchers to cover deadspace within short range of the checkpoint; again, illumination will be the most likely round utilized.

"Civilian contractors or their vehicles are an easy mode of transport for terrorists or terrorist activity. Coordinating the arrival of civilian contractors and keeping your personnel informed will assist in checkpoint force protection..."

It's also important to coordinate with supporting civilian contractors. An exterminator team arriving at your checkpoint at 0200 in the morning will most likely create immediate suspicion and tension within the guard force. All checkpoint personnel must know who your contractors are (access rosters do work), their normal arrival times, and what they do. Civilian contractors or their vehicles are an easy mode of transport for terrorists or terrorist activity. Coordinating the arrival of civilian contractors and keeping your personnel informed will assist in checkpoint force protection and allow the supporting civilian elements to do their jobs. Without prior coordination, access to the checkpoint should be denied — the OIC and NCOIC must enforce this unwaveringly.

Checkpoint layout and level of preparation will be heavily dependent on the threat, terrain, amount of traffic, and duration of operations. Restrictions such as road width, vegetation, and minefields will often affect or dictate the size and layout of your checkpoint. The sketch above depicts the layout and composition for a temporary checkpoint (the author's platoon SOP). This CP was occupied and manned for 48 hours by two 12-man scout sections.

Force Protection Implementation

Force protection measures will change with changes of mission, transition to a different phase of the same mission, or changes to the threat condition (THREATCON). The tactical commander must be flexible enough to plan and implement upgrades or reductions in force protection as needed. For example; about 180 days into our deployment to Bosnia, the force protection level was downgraded, which resulted in a change to the uniform requirement and a change in checkpoint operations. We transitioned from a rigid 100-percent vehicle search tactic to a more random method that facilitated freedom of movement through the Zone of Separation (ZOS).

Outlined below are the materials and TTPs utilized during checkpoint operations. The items are all available through normal Army supply channels, and will assist in establishing and operating an effective and defensible checkpoint.

Barrier Materials and Employment

Hesko bastions (see photo) filled with gravel or rock, with filled sandbags placed on top, provide cover and concealment approximately 5 feet high and 3 feet thick — a good base of force pro-

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Air/Ground Integration And the Combined Arms Concept

by Captain Charles Dalcourt

The complementary manner in which the U.S. Army's components function and fight is one of the principal reasons it is the best army in the world. Teamwork, cooperation, and the effective and timely synchronization of resources and assets creates synergistic effects that cripple the enemy and lead to success. This interdependence is tied to the pulse of every soldier, the success of every battle — it is the crux of our Army's combined arms concept.

Combined arms is the synchronized and/or simultaneous application of several arms — such as infantry, armor, artillery, engineers, air defense, and aviation — to achieve an effect on the enemy which is greater than if each arm was used sequentially.[1] The combined arms concept has long surpassed the dreams of its developers, but still has not fully exploited the capabilities at its core. To accomplish this, combined arms officers must be experts, not only in the employment of their own branch, but in the doctrinal employment of all elements of maneuver and fire support.

The purpose of this article is to discuss the capabilities and uses of attack aviation assets, highlight challenges associated with the integration of air and ground forces, and provide recommendations to improve future operations. All too often units at the Combat Training Centers (CTCs) demonstrate that there is a lack of familiarization by armored/mechanized force leaders with the missions and roles attack aviation assets can perform in concert with or in support of ground tactical operations.[2] This article focuses on how U.S. Army attack aviation and armored/mechanized forces can integrate to form one of the most effective forces on the battlefield.

Capabilities

Army Aviation bridges the gap between aerial and ground combat. To the ground commander, it offers speed, mobility, and flexibility in one hand and a lethal mix of firepower and versatility in the other. Army Aviation maneuvers its aerial firepower for optimal engagements, concentrates and disperses forces rapidly, and converges on objectives from multiple directions to support combined arms operations.[3] Although unable to occupy or seize terrain, attack helicopters can deny the enemy terrain for a limited time by dominating it with direct and indirect fires.[4] The helicopter's exclusive ability to use and interact with surrounding terrain serves as a defining characteristic of the advantages it offers to the ground commander.

Unencumbered by terrain and ground obstacles, attack helicopters can cover large areas of ground quickly. This allows the maneuver force commander to simultaneously attack threat forces — at almost any time, under almost any conditions — with significantly concentrated masses of combat power.[5]

When allocated by division or corps, an attack helicopter battalion (ATKHB) placed under the operational control of a ground maneuver brigade provides the commander with a highly mobile and lethal antiarmor, antipersonnel, antimateriel, and air-to-air destruction capability, both during the day and at night. The lethality of an AH-64-equipped ATKHB is extraordinary. The AH-64 Apache's weaponry includes Hellfire antitank missiles, a wide array of 2.75-inch (70mm) folding fin aerial rockets (FFAR), and a 30mm gun (See Figure 1). It is equipped with a target acquisition and designation sight (TADS) which provides the crew with day and night target acquisition by means of a direct view optical (DVO) telescope, a day television (DTV), and a forward looking infrared (FLIR) sensor system.[6] These acquisition systems, operating individually or in combination, elevate the commander's view of the battlefield to the third dimension.

Uses

Army Aviation performs myriad roles both in concert with and in support of ground forces on the battlefield. Ground maneuver commanders must understand not only the capabilities of aviation assets, but how to employ them as well. A maneuver brigade may receive an ATKHB OPCON for a specific mission or for a certain amount of time. The battalion, because of sustainability and other issues, is the smallest unit that is

AH-64				
Armament:	**Effective Range**	**Maximum Range**	**Quantity (STD)**	**Quantity (HVY)**
Hellfire	500m - 8 km	8(+)km	8	16
2.75" Rocket	7.5km	9km	38	0
30mm (API,HEI)	3km	4km	1200	1200
Optics (TADS):	**Detection**	**Recognition**	**Identification**	**Magnification**
DTV	10(+)km	8-10km	5-7km	14.3-127X
DVO				3.5-18.2X
FLIR	10(+)km	5-6km	900m - 1.2km	1.2-39.8X

Figure 1. AH-64 weapon/optical capabilities

"When allocated by division or corps, an attack helicopter battalion (ATKHB) placed under the operational control of a ground maneuver brigade provides the commander with a highly mobile and lethal antiarmor, antipersonnel, antimateriel, and air-to-air destruction capability, both during the day and at night...."

placed OPCON to a brigade. The ATKHB executes its missions using the attack helicopter company (ATKHC) to engage and destroy enemy forces. To do this, the ATKHB commander applies one of the following three methods of employment: continuous attack, phased attack, or maximum destruction.

ATKHBs are capable of conducting a variety of missions, to include reconnaissance, counter-reconnaissance, and security missions within the unit's capabilities. They conduct tactical offensive operations such as movements to contact and attacks to destroy, attrit, and disrupt enemy forces. ATKHBs can be used to overwatch and suppress, assist in obscuring, and provide security for breach operations; and additionally, serve as the commander's reserve or tactical combat force (TCF).

An AH-64 ATKHB can be extremely effective when employed in a reconnaissance role and can provide information that can have a significant impact on the ground commander's scheme of maneuver. Reconnaissance, performed before and during other combat operations, provides combat intelligence used to confirm or modify the commander's concept of the operation.[7] Equipped with clear and concise guidance, a thorough understanding of the critical tasks of the mission, and a prioritized list of reconnaissance objectives, the ATKHC can gather detailed information about the activities and resources of an enemy force. Onboard equipment that enhances the ATKHC's ability to conduct reconnaissance include the TADS and the video recorder subsystem. The video recorder system has the capability of recording up to 72 minutes of selected video. With the proper equipment on hand, or using the aircraft itself to play back the video, the ground commander or S3 can view near-real-time video footage of enemy locations and other reconnaissance objectives before departing the attack position.

During a movement to contact, commanders may employ attack helicopters forward of ground maneuver elements to establish contact with and destroy the enemy's first echelon forces. Although usually a division cavalry mission, the ATKHB can accomplish this task when and where the situation requires or permits its execution. Leading combat actions with attack helicopters establishes momentum and sets a rapid tempo for offensive operations. This action by the ground commander exploits the speed and mobility of his aviation assets and allows them to set the pace of the battle, versus responding to the pace of ground-based combat. Once contact is made and the situation developed, a battle handover is conducted with the ground maneuver force, which then assumes the fight. Attack assets may also be employed during a movement to contact as part of the covering force or advanced guard. Given this mission, attack aviation assets support the ground commander by extending the range of observation (thus, increasing reaction time) forward and to the flanks of the force, provides additional combat power to defeat an enemy force upon contact, and facilitates the rapid, aggressive action characteristic of a movement to contact. Additionally, the ATKHB may operate as part of the main body during this operation. Operating from successive forward assembly areas, the ATKHB remains prepared to exploit enemy weaknesses and attack counterattacking forces.

Whether close or deep, attack helicopters answer the call to strike. As part of the ground unit's attack, be it hasty or deliberate, the ATKHB can attack the enemy's flanks, diverting his attention and forcing him to fight in more than one direction. Coordinated properly, this increases the survivability of all assets involved and greatly enhances the paralyzing effect of our armor. In a deliberate attack, aviation assets can be used to destroy enemy second-echelon maneuver forces, logistical assets supporting enemy first-echelon forces, or the enemy's counterattack force. An ATKHB is capable of destroying an enemy armor/mechanized regimental-sized element. As an example, let's look at the capability of one ATKHC during a deliberate attack.

Assume that the enemy has formed a reserve force using a tank battalion from the Motorized Rifle Division's tank regiment. Given a 75 percent operational readiness rate (6 of 8 aircraft) and a standard configuration of eight Hellfire missiles, 38 2.75-inch FFARs, and 30-mm rounds, an AH-64-equipped ATKHC is capable of destroying an enemy tank battalion, assessed to be approximately 83 percent strength. The ATKHC departs its attack position with a total of 48 Hellfire missiles. Assuming a 60 percent probability of hit (P_H), which reduces the number of probable hits to 29, and a 90 percent probability of kill (P_K), the ATKHC can destroy 26 of the 31 tanks in the battalion. Using the same battlefield calculus, but modifying the configuration to reflect 16 Hellfire missiles on each aircraft, the ATKHC can be expected to destroy up to 52 point targets.

During breaching operations, the AH-64 serves as an ideal platform from which attack aviation assets can assist the ground force. Using a tailored mix of missiles, rockets, and 30mm ammunition, the AH-64 can assist in reducing the loss of mobility assets at the breach site.[8] Supporting the ground force through all four breaching fundamentals (suppress, obscure, secure, and reduce), attack aviation assets prove to be an immeasurable asset during this type of operation. First, using their optics to view the obstacle, the aircraft can forward information to validate and refine obstacle intelligence, such as the obstacle's location and orientation, composition, and size, to the ground force or breach force

commander. If a bypass is available, they can reconnoiter the route, eliminate enemy resistance along the route, and overwatch the movement of ground assets along the bypass. Second, attack aircraft can suppress and destroy enemy forces overwatching the breach site. This task is accomplished by using on-board weaponry as well as through calls for indirect fire from the direct support artillery assets and the maneuver unit's organic mortars. Third, aviation can assist in obscuring the breach site. Again, aviation assets supporting the breach can call for, observe, and adjust indirect fires, as well as monitor and protect the movement of smoke assets at the breach site. The AH-64 is also capable of providing security, both near and far side, for the entire breach force. Additionally, the helicopters can impede or destroy enemy counterattack forces, or forces repositioning, before they get within direct-fire range of the breach site. In support of the reduction effort, the attack helicopter unit supporting the breach cannot directly affect the reduction of the breach site, but assists indirectly by providing the security necessary to protect the breach force.

To this point, we have outlined some of the capabilities and uses of attack aviation assets during the various forms of tactical offense, as well as in support of specific missions. The attributes of attack aviation mentioned are great, in and of themselves, but the full exploitation of these strengths rests in their integration and synchronization with the capabilities of other maneuver forces. With this in mind, let's discuss three key issues that can prevent the success of this merger.

Problems

One problem identified in the orchestration of air and ground assets is the integration of aviation assets into the ground unit's tactical decision-making process (TDMP). It is during the planning process that the commander determines the best use of the additional maneuver assets given to him. Understanding and considering the inherent limitations and capabilities of attack helicopters allows the commander to make prudent decisions about the decisive point or critical time in which these assets will be employed. This opens the door to the next issue; the capabilities of the aviation liaison officer (LNO).

The inexperience of some aviation LNOs assigned to ground units, coupled with their inability to articulate the capabilities of the aviation unit they represent, is another issue impeding the synchronization of air and ground forces. The aviation LNO is the critical link between the ground commander and the aviation unit. The LNO makes recommendations to the ground commander and facilitates the exchange of information critical to mission success. The presence of an LNO neither negates the need for the ground maneuver unit's S3 to coordinate with his aviation counterpart nor rescinds the requirement for the S3 to be familiar with the proper employment of aviation assets. What the LNO's presence should provide is a credible resource, an experienced hand, capable of assisting the ground maneuver commander in properly employing aviation assets to suit his scheme of maneuver.

A third dilemma is the employment of aviation assets under the operational control of armor/mechanized commanders. Due to the aforementioned problems, aviation assets are very often not employed throughout the ground unit's scheme of maneuver. Commanders do not exploit the agility, mobility, and versatility of aviation assets under their control. Attack assets are conceptually bound to the traditional roles of attacking second echelon forces, serving as the tactical combat force, or as the ground maneuver unit's reserve, thus opportunities to capitalize on the helicopter's strengths are overlooked. Too often, aviation assets are placed in this capacity (TCF or reserve) because of deficient planning, and are required to provide support anywhere on the battlefield without required planning and synchronization. Assigning an ATKHB a reserve mission, without a clear task and purpose, results in numerous branches with no detailed planning, and the result is that it very seldom works. More often, the quick reaction force/reserve mental-

"The integration of aviation assets into the tactical decision making process (TDMP) is a simple problem to correct — do it."

ity results in destroyed aircraft and a high probability of fratricide because of their rapid employment into areas where the enemy and friendly situations are unclear.

Recommendations

So, what steps do we take to reverse these trends? The integration of aviation assets into the tactical decision making process (TDMP) is a simple problem to correct — do it. In the early stages of the command estimate process, coordinating staff members from both units (air and ground) should meet to exchange information and discuss, by battlefield operating system, the general requirements of each. The ground commander should identify critical times and places where attack aviation will assist his scheme of maneuver. After doing so, the aviation unit commander or S3, through the aviation LNO, confirms the aviation unit's ability to accomplish the desired task. This leads us to the next step; the integration of the aviation LNO into the ground planning process.

The Aviation LNO is the critical link that facilitates the continuous integration of aviation assets available to the ground commander during the planning, preparation, execution, and consolidation phases of the mission. The aviation unit has the responsibility of providing a competent LNO to the ground unit. LNOs must be knowledgeable in all aspects of aviation employment and must ensure that the planned employment is within the capabilities of the unit. This individual must be able to provide the ground commander with:

- Recommendations on the employment of the aviation unit
- Recommendations on the location of tentative support-by-fire positions, attack-by-fire positions, and battle positions in support of the ground commander's scheme of maneuver
- Facts regarding the capabilities and limitations of the aircraft and its weaponry, based on environmental conditions as well as mission constraints
- Updates regarding the aviation unit's status.

Additionally, the LNO must keep his parent unit informed, notifying them as soon as possible of changes that occur in the ground unit's mission or timeline.

In prescribing a solution to the lack of familiarization in employing aviation assets, one may consider it a matter of professional development. Soldiers are trained to be tactically proficient and exhibit an overall adeptness in the mission of their particular branch. Our branch schools/centers do a great job of training warfighters to meet this requirement, but where do we train warfighters to *fight* as they would during *war*? That is, where do the doctrinal principles learned in school meet with the practical application needed to produce that valuable resource called experience?

We no longer have the luxury of training as a single arm because we are not going to fight as a single entity. The onus for training leaders to operate with and alongside other members of the combined arms team rests on maneuver unit commanders. Commanders should seek ways to cross-train personnel in spite of budget constraints. Officer professional development sessions conducted by members of the other branches, exchange programs, and efforts such as sending leaders to the field with other arms to observe their training are all inexpensive methods of familiarizing leaders with the capabilities and limitations of other arms.

Conclusion

As we outgrow the ways in which we have fought in the past, we must also embrace the need to impart in each leader a true understanding of the combined arms concept. By ensuring that we promote interdependence among combined arms team members, we can collectively reverse the trends that tend to isolate an arm, thus reducing the effect of the team. As a team we should conduct tough, realistic training at every opportunity. Through innovative thinking and an aggressive approach, we can, in spite of budget constraints, familiarize our leaders with the doctrinal employment, capabilities, and limitations of fellow team members. Combined arms warfare is the simultaneous application of combat, combat support, and combat service support toward a common goal.[9] There will never be a war that a single arm can or will win alone. It is when we work in concert with one another — synchronizing both efforts and effects — that we are most capable of delivering such a crushing blow, from which no opponent could recover.

Notes

[1]FM 100-5-1, *Operational Terms and Graphics*.

[2]Conversation with LTC(P) E.J. Sinclair, Jan 6, '97.

[3]FM 1-100, *Doctrinal Principles For Army Aviation In Combat Operations*, February 1989, p. 1-18.

[4]FM 1-112, *Attack Helicopter Battalion*, 21 February 1991, p. 1-3.

[5]FM 1-100, p. 1-18.

[6]TM 1-1520-238-10 (Change 2), *Operator's Manual For Helicopter, Attack, AH-64A Apache*, 31 August 1994, p. 4-40.

[7]CPT(P) Ronald F. Lewis, "AH-64 in the Reconnaissance Role."

[8]FM 90-13-1, *Combined Arms Breaching Operations*, February 1991, p. 2-4.

[9]FM 100-5, *Operations, 14 June 1993, p. 2-3.*

The author would like to thank LTC (P) E.J. Sinclair, LTC Steve Moore, MAJ Jim Richardson, and CPT(P) Ron Lewis for their advice in the writing of this article.

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The Russian T-90S: Coming into Focus

by James M. Warford

- *Shown for the first time on June 28, 1993 at the Kubinka test center.*
- *Called "Supertank" with a "perfect" fire control system.*
- *The best Russian tank vs. the T-80/T-72B.*
- *107 T-90s were produced as of Sep '95, all located in Siberia.*
- *1 Battalion of T-90s fielded at present.*
- *1996-1997 deployment plan is to equip an entire Military District with T-90s.*
- *Has many features unsurpassed in the world.*
- *In the same class as the Abrams, Leopard 2, and Leclerc.*
- *The main vehicle of the Russian Army up to the year 2005.*

(As reported by: Izvestiya, Rossiyskaya Gazeta, Krasnaya Zvezda, Armeyskiy Sbornik, and Voyennyye Znaniya)

Since the publication of the article "The Russian T-90/T-90S Tank: An Old Dog with Some Dangerous New Tricks" (*ARMOR*, March-April 1995), some new information concerning this mysterious Russian MBT has come to light. Various open sources have confirmed that there are at least three different variants of the T-90. The Russians confirmed the existence of an export variant in June 1996,[1] and Russian promotional materials have discussed both the T-90S (or "C" if you prefer the sometimes-used Cyrillic non-translation) and the T-90SK command variant. There are also occasional references to a T-90E, but these appear to be unsubstantiated. It's possible that the T-90E designation could have been a deliberate piece of disinformation intended to keep the actual T-90 a secret a little bit longer; or maybe it was an attempt to get some quick export sales of the T-72BM MBT prior to the first public appearance of the T-90. Additionally, some of the information and specifications attributed to the T-90 differ from information now known to belong to the T-90S. Ballistic computers, day/night sight systems for the tank commander, and communication systems are some of the areas where a difference can be identified between the T-90S and a third variant of the T-90. Finally, the T-90S that was recently shown to the public for the first time was not fitted with thermal night sights, although thermals are reportedly available as an option if desired. As reported previously in *ARMOR*, the Russians have had thermal sights available for their tanks since at least 1992; and there are reports that the T-90 is fitted with the latest Agava-2 thermal sight. So, based upon the available information, the three T-90 variants are as follows: the **T-90** (non-export MBT), the **T-90S** (export version, and *the focus of this article*), and the **T-90SK** (command variant).

Times have changed since the T-90/T-90S first appeared in 1993. Built upon the poor performance of Iraqi-employed T-72s in Desert Storm, network news footage of turretless M-84A MBTs ablaze in the former Yugoslavia, and the misplaced bad press dumped on the T-80BV MBT for its performance in Chechnya, large export orders for modernized T-72s and T-80U MBTs have not materialized. It may have been this very lack of export business that pushed the Russians into finally showing the T-90S to the public. Although certainly related to the tanks that fought those recent battles, the T-90/T-90S was not directly involved and was spared the scrutiny and bad press. In effect, the T-90/T-90S actually benefited from the war in Chechnya.

In February 1997, information was circulated concerning Russia's participation in the bi-yearly IDEX international military exhibition. Originally organized and held in Abu Dhabi in 1993, IDEX has quickly become one of the most significant military exhibitions for ground weapons and hardware in the world. IDEX '97 was conducted from March 16-20 1997, and included over 750 contractors from 42 countries. The delegation from Russia consisted of 350 personnel and about 500 exhibits; including the T-90S. The following description of the T-90S is based on the most recent open-source information, including the tank's sales brochure distributed at IDEX '97.

The T-90S is armed with the 125mm 2A46M smoothbore main gun firing HVAPFSDS, HEAT-FS, and FRAG-HE ammunition. The T-90S can also fire the 5km range "jam proof" 9k119 REFLEKS gun-launched ATGM (AT-11 SNIPER). The tank's autoloader carries 22 ready-to-fire rounds of ammunition. The T-90S is fitted with an integrated fire control system that is capable of engaging targets day and night, from a stationary or moving tank, by both the gunner and commander. The night sighting system is either passive/active IR or thermal. The question to be answered here is which thermal? According to *Jane's Intelligence Review*, it could be either the TPN4-49-23 Buran-PA sight used on the older T-80Us, or the newer Agava-2 sight intended for newer T-80Us and the T-90. With the Agava-2, the commander is provided with a small

video screen which provides the same image as that seen by the gunner.[2]

The T-90S is powered by the multi-fuel V-84MS 840 hp diesel engine. This gives the tank a maximum road speed of about 60 kph and an operating range of 550-650 km (the higher number with external fuel drums). There have been reports that this engine (a derivative of the V-84-1 that powers the lighter T-72BM) is underpowered for the increased weight and causes the T-90S to be "somewhat more sluggish than either the T-72BM or the T-80U."[3]

More information is required, however, since the combat weight listed for the T-90S is 46.5 tons, while other sources put the T-90's combat weight at 50 tons. There are reports that the Russians are working on new, more powerful diesel engines providing up to 1,100 hp, which may be incorporated into the T-90/T-90S in the future. The T-90S is capable of deep fording to a depth of 5 meters using a snorkel, and can also be fitted with KMT-7 mine clearing equipment.

The T-90S is one of only three or four tanks (the others being the T-90, the T-80UK/T-80UM Model 1995 MBT, and possibly the Ukrainian T-84 Model 1995 MBT) that is fitted with a "three-tiered" protection system: advanced base armor known as "Combined" or "Sandwich"[4] armor by the Russians, Kontakt-5 Explosive Reactive Armor (ERA), and the TshU-1-7 Shtora-1 Defensive Aids Suite (DAS). Very little information concerning the advanced base armor of modern Soviet/Russian tanks has been published to date. It is known that the T-64 series, T-72 series, and T-80 series tanks incorporate composite/laminate armor over their 60-degree frontal armor arc; and reportedly, the T-90 is no different. According to *Jane's Intelligence Review,* the T-90 consists of a modified T-72BM turret and hull that incorporates a Russian version of Chobham armor in the turret; consisting of a basic armor shell with an insert of alternating layers of aluminum and plastics and a controlled deformation section.[5] So far, no specific additional information about the T-90's front-slope or glacis armor configuration is available. The most likely design would be a much improved version of the 5-layer armor that protected the hulls of Iraqi T-72s in Desert Storm.

Based upon the information currently available, it's not clear if the T-90S is equipped with the same base armor as that attributed to the T-90. Added to this impressive base armor is the second tier of protection, Kontakt-5 ERA. First identified in 1989, and initially shown to the public in September 1994, Kontakt-5 represents a huge jump in capability over previously fielded HEAT warhead-defeating ERA systems. According to the Russians, Kontakt-5 has the ability to significantly degrade the penetrating power of kinetic-energy APFSDS ammunition. To date, Kontakt-5 ERA is used on the T-90/T-90S, T-80U, T-80UM, T-80UM Model 1993, T-80UK/T-80UM Model 1995, T-84 Model 1995, T-80UD, and the T-72BM. Since its introduction, unclassified photographs have also appeared showing a T-55 MBT equipped with this new ERA.

The two SHTORA-1 electro-optical/IR transmitters are arrayed on either side of the main gun, and the receiver is in the center of the turret just above the gun mantlet.

The third tier of protection incorporated into the T-90S is the TshU-1-7 Shtora-1 DAS. The Shtora-1 is an electro-optical countermeasure system designed to reduce the probability of the tank being hit by ATGMs and laser-guided projectiles by three to five times.[6] The system consists of two electro-optical/IR "dazzlers," one each mounted to the left and right of the main gun, a set of laser warning receivers mounted on the turret, and smoke grenade launchers using a new type of smoke, which reportedly has the ability to "defeat" lasers and thermal sights. The Shtora-1 can be operated in fully automatic or semi-automatic modes and has the capability to operate continuously for six hours. Against ATGM attack, the electro-optical "dazzlers" each emit an IR light that is intended to confuse the missile IR tracking system used by the ATGM launcher; against laser-guided projectile attack, the system warns the crew that they are being illuminated and either fires the smoke grenades or waits for the tank commander's decision to fire them. As this article is going to press, Shtora-1 has been seen fitted to the T-90/T-90S, T-80UK/T-80UM Model 1995, and T-84 Model 1995.

In the March-April 1997 issue of *Military Parade* magazine, an article written by Vladimir Seryakov (the Director-General of Uralvagonzavod, the Design Bureau that builds the T-72 series and the T-90 and T-90S) provided an almost unprecedented look at one of the latest products of the Russian military-industrial complex. Titled "T-90S Gun-Missile Tank: New Generation of Russian Tanks," this article provides a very interesting look at how the Russians present the T-90S to the outside world. Described as incorporating "a number of design innovations and the use of state-of-the-art technologies," the T-90S "is not only on a par with the best foreign tanks in terms of combat and service characteristics, but it even surpasses them in terms of a number of vital parameters."[7] What some Russians think of the T-90/T-90S, however, is apparently another matter. Reportedly, the T-90 was selected as the "main tank" for the Russian Armed Forces in 1993 after a series of competitive trials with the T-80U. It was also declared in 1996 that the decision was made to "move gradually to the T-90" as the single tank produced for the Russian Army. According to *Jane's Intelligence Review*, the selection of the T-90 over the most recent versions of the T-80U has not been unanimously supported by the Russian military. Colonel-General Aleksander Galkin, the Chief of the Russian Ministry of Defense's Main Armor Directorate, told an interviewer in September 1996 that the T-90 decision was "a mistake" and that he still considers the T-80U a superior tank.[8]

While the position occupied by the T-90 in the Russian Army may not be as fully supported as originally thought, the position of the T-90S and its intended role are all too clear. Accompanied by an uncharacteristic flow of technical and sales information from Russia, the T-90S has quickly established itself as a serious competitor on the export market. Russia's success exporting its modern MBTs in recent years has been minimal at best; and the one real exception to this lack of success has come from another former Soviet State. In July 1996, the Ukrainian and Pakistani governments announced the completion of a deal for the delivery of 300 Ukrainian-produced T-80UDs to Pakistan. According to a variety of open sources, the unit price for a T-80UD is reportedly $1.8 million, bringing the total value of the deal to about $550 million. According to Yu. Mirgorodskiy, General Director of the Zavod Imeni Malysheva State Enterprise (tank plant), the T-80UD was selected by the Pakistanis after a long "competitive struggle with other vehicles. "The T-80UD is a state-of-the-art tank which meets all requirements."[9] The first batch of 15 T-80UDs have been shipped and reportedly arrived in Karachi on March 23rd. While this landmark deal provides the Pakistani Army with a significant tank qualitative advantage over Indian armor, it also firmly establishes the Ukraine as the principal exporter of T-80 series tanks. The Russians, of course, are keenly aware of this situation and are looking to the T-90S to achieve a new level of export success. The delivery of a large number of T-90Ss by the Russians to any one of a number of possible customers represents a very serious potential threat. Based upon the appearance of the T-90S at IDEX '97 and what is now known about the tank's capabilities, it is unlikely that this significant new armor threat will take long to materialize.

Notes

[1]Rynyanov, Mikhail, "Arms Bureau: This is a Bobcat. You can't tell it to 'Shoo'! Our Correspondent Visited Secret Firing Ranges," *Komsomolskaya Pravda*, June 28, 1996.

[2]Zaloga, Steven, "T-90: the Standard of Russian Expediency," *Jane's Intelligence Review*, February 1997, p. 62.

[3]*Ibid.*, p. 64.

[4]Seryakov, Vladimir, "T-90S Gun-missile Tank: New Generation of Russian Tanks," *Military Parade*, March-April 1997, p. 40.

[5]Zaloga, Steven, p. 61.

[6]Warford, James M., "The Russian T-90/T-90S Tank: An Old Dog with Some Dangerous New Tricks," *ARMOR*, March-April 1995, p. 8.

[7]Seryakov, p. 41.

[8]Zaloga, p. 61.

[9]Chepalov, Aleksandr, "Our Tanks by Southern Seas," *Trud-7, August 16-22, 1996, p. 11.*

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PART TWO: ARMAMENT

The Future Combat System (FCS):

Technology Evolution Review and Feasibility Assessment

by Asher H. Sharoni and Lawrence D. Bacon

(This is the second in a series of three articles exploring a conceptual future combat system. -Ed.)

Main Gun Armament Evolution and Technology Assessment

This article will examine the potential main and secondary armament systems for the FCS in view of their forecasted technologies, their feasibility, and their predicted evolution:

Conventional 120/140mm Guns

A major consequence of the diminished urgency to develop novel guns in the near foreseeable future is that conventional, Solid Propellant (SP) guns will remain in service for many years to come, and their lethality will be gradually enhanced. This was the predominant reason behind the selection of the 120-mm high-pressure gun for the FMBT. The typical High Velocity Armor Piercing Fin Stabilized Discarding Sabot (HV-APFSDS) projectile has been successively improved over the last three decades with suggested near-future penetration capability of up to 800-900^{+} mm of Rolled Homogenized Armor (RHA). This was primarily achieved by a progressive increase of the geometrical ratio 'Length/Diameter' (L/D) of relatively long and slender rod penetrators and continuous improvements to their corresponding materials (Tungsten Alloys, Powder Metallurgy-PM, Depleted Uranium-DU, and Variable Density Penetrators-VDP).

Penetrators with high 'L/D' ratios proved effective against RHA but they were found *considerably* less effective against composite and/or complex armor. To augment its effectiveness against the latter, the penetrator rod must have a larger diameter. Without reverting to lower and adverse ratios of 'L/D' (approximately 20/1 for 120mm and experimental 140mm and still increasing), it must ultimately result in an increase of volume and mass of the penetrator rod and therefore, inevitably, in a corresponding undesirable reduction of the effective muzzle velocity. Utilization of progressively heavier rod penetrators to defeat contemporary and ever-improving armor protection required higher muzzle energy [presently 18-20 megajoules (MJ)]. Consequently, it led to guns with ever-increasing chamber pressures and likewise, larger gun calibers (90, 105, 120, 140mm, Western preference).

No future U.S. plans have been announced in regards to the 140mm gun, Advanced Tank Cannon System - ATACS, subsequent to the untimely cancellation of the 'Block III' Main Battle Tank Program. Following a MOU previously signed in 1988 with the U.S., Giat (France), Rheinmetall (Germany), and Royal Ordnance (U.K.) are contemplating a joint venture to develop, market, and produce a standardized 140mm smoothbore/rifled gun and ammunition. The weapon system is designated by NATO as the *Future Tank Main Armament* (FTMA) and is claimed to have a significant increase in armor penetration over the standard 120mm tank gun.

Notwithstanding the 140mm gun and ammunition's indisputable potential, the larger gun size will command a bigger and heavier vehicle. If the requirement to reduce weight and volume is going to remain firm and strictly enforced, it is most unlikely that the 140mm gun and heavy ammunition will find their way into the FCS. Furthermore, because of the major changes required and the high cost involved in upgunning the M1 Abrams tank from 120 to 140mm (storage, autoloader, and turret/hull reconfiguration), it is highly doubtful whether the 140mm gun will ever be utilized in any future upgrade to the M1 tank series. Grounded on the author's personal work experience with the ill-fated 'Block III' Tank Program, a 140mm main armament system could only be successfully integrated into an entirely new tank (turret and hull) that is built around the main armament system. It will weigh at least as much as contemporary heavy tanks (70^{+} tons). The changes would also increase vehicle mechanical complexity and significantly reduce ammunition complement. This scenario is entirely unacceptable under the FCS's current prevailing philosophy. But the 140mm gun could become a valid and *urgent* proposition if the U.S. encounters a major threatening rival, similar to the U.S.S.R. during the cold-war era, within the next 10-20 years, prior to the deployment of the FCS.

The following improvements are feasible in the short term and make the 'generic' 120mm M256 smoothbore gun and its derivatives (e.g. XM291) viable propositions for the next three decades and beyond. Extraction of more energy from the propellant gases by increasing the effective length of the gun barrel up to 55 calibers long is a viable alternative, but it will not yield dramatic results. For instance, the 120mm L55 gun developed by Rheinmetall (Germany) for the Leopard 2 MBT, is 1.30 m longer(!) than its predecessor, the standard L44 Rh120 120mm smoothbore gun. The L55 gun will provide a moderate incremental higher muzzle velocity, resulting in improved armor penetration. Notwithstanding its benefits, it will definitely make it more difficult for the Leopard to maneuver in heavily built-up areas or cross-country terrain textured with densely grown vegetation or other ground obstacles.

The XM291 gun is a spin-off of the dual-caliber approach previously adopted by the U.S. Army. It was developed by the Army Armament Research, Development and Engineering Center (ARDEC) in collaboration with Watervliet Arsenal, and is a combination of a common reinforced 120/140mm high-pressure breech/chamber with a light 120mm gun tube. This newly designed "Lightweight 120mm

Tank Main Armament System," could yield comparable results to the 140mm gun at the lower performance range of the latter. Another improvement in gun performance could be obtained by the use of propellant with greater surface burning progressivity, which generates higher pressure gradients to propel projectiles. An additional increase in gun performance could come from a reduction in the temperature sensitivity of propellants, which will allow the increase of burning rates at lower temperatures. Maximum allowable chamber pressure at normal and high temperatures can be raised by employing higher strength improved steels commonly utilized in construction of gun barrels.

Advanced 120mm KE penetrators, Sensor Fused Weapons (SFW), Smart tank munitions and Smart Top Attack Weapons[1,2] (STAW) will soon be introduced into the inventory. These munitions have extended autonomous capabilities such as independent target acquisition, identification, prioritization, maneuver control, and improved lethality.

One representative candidate is the Defense Advanced Research Projects Agency (DARPA) M872 'X-Rod' Rocket-Assisted KE (RAKE) long rod penetrator that defeats targets with kinetic energy and could achieve a boosted 'muzzle' velocity of 2000 m/sec. Another is the XM943, Smart Target Activated Fire and Forget (STAFF) top-attack round, which kills with a downward firing, non-axis symmetric, Explosively Formed Penetrator (EFP). The STAFF is designed to penetrate the thinner turret roof armor and lightly armored tank top deck. The guided round's sensor and explosively formed penetrating warhead are capable of destroying evasively maneuvering armored targets that attempt to make use of terrain texture and defilade.

The M829E3 is a dramatically improved kinetic energy (KE) round developed to defeat advanced explosive reactive armor. The Advanced KE Cartridge Program is about developing a round with composite sabots, precursor, axial thruster assembly, and *fastcore OXETANE/CL20* propulsion. It will have improved performance over the standard M829A1/A2 rounds in defeating Explosive Reactive Armor (ERA) and penetrating Rolled Homogeneous Armor (RHA), and greater hit probability. Categorically, these types of advanced munitions will further extend the useful life of the 120mm solid propellant gun.

These improvements, impressive as they are, will probably not lead the way to the FCS's main antitank armament due to large caliber burden, ammunition vulnerability, and the inherent limited growth potential of solid propellants (SP). According to basic governing thermodynamic laws, the velocity at which chemical SP could accelerate a projectile is controlled by the velocity at which a gas could physically expand. For all practical purposes, contemporary 120-mm guns may ultimately reach a muzzle velocity of 1800-2000^{+} m/sec. Future 140mm guns (if fielded) may reach an extended muzzle velocity of 2100-2300^{+} m/sec while their effective 'kill' range will not exceed 6-7 km at best.

With industrial and logistic infrastructures already in place, backed by battlefield-proven technology, conventional 120mm guns will remain the 'backbone' system in service for the next 20-30 years and beyond. They will progressively continue to receive incremental improvements until replaced, while allowing sufficient time for a new main armament weapon system to mature. The 120mm main armament gun system, though extremely potent in its own right, will not justify the enormous expenditure in development, production, and deployment of a new tank. It will serve as the standard gun of existing M1A1/A2s, and as an indisputable, cost-effective upgrade for tanks that are equipped with an inferior caliber gun (105mm). Regardless of how SP guns will ultimately evolve, both users and the defense research community have concluded that solid propellants are not the most efficient medium of conveying to a projectile the energy required to defeat the ever-evolving threat. Consequently, since the mid-80's, there has been a significant increase in Western R&D interest and research efforts aimed particularly at developing new technologies which will substitute for contemporary SP gun systems. Most of these efforts (ETC, EM, high-power laser) are descendants of the U.S. Strategic Defense Initiative (SDI) space-oriented weapons program.

Liquid Propellant Guns

Liquid Propellant (LP) gun propulsion technology is another viable alternative. Unfortunately, it has recently received untimely poor publicity when the U.S. Army finally decided it will not be implemented in the *Crusader*, the advanced self-propelled howitzer currently under development for the U.S. Army. To the best of our information, the U.S. Army has reluctantly given up on this promising technology in *Crusader.* Ostensibly, it was compelled to make that decision because of the detrimental impact it would have on production and deployment schedules if the Army had to wait until LP technology matures enough to warrant its near-term implementation. LP technology is the outcome of extensive R&D efforts performed in several countries ever since the end of WWII.

Though LP is technologically based on a sound engineering foundation, it is presently known to experience inherent, pre-maturation, 'nagging' problems such as ignition control, excessive corrosion, combustion non-repetitiveness, sealing, exorbitant weight growth, material contamination, and difficulties in handling of LP. It may be adaptable to naval applications where better controlled environment, available space, larger guns, handling, storing, and operating LP armament systems seem more plausible. LP guns require continuous resupply of propellant working liquid, which does not conform favorably with stringent requirements for reduced logistics. LP, in conjunction with 120/140mm tank guns with regenerative, multi-stage propellant injection systems, could reach unassisted muzzle velocities up to 2200/2500 m/sec respectively at best. (It is about 10-15% higher than what could ultimately be achieved with conventional SP 120/140-mm guns). This only holds true if ailing problems with "traveling charge" or "stage propellant" will be satisfactorily resolved to match the injected "charge front" propagation speed — through the entire injection process — with that of the projectile as it advances down the barrel.

It has already been demonstrated that by using a 30mm two-stage traveling-charge LP demonstrator gun, velocities as high as 3100 m/sec and beyond could be achieved. Trade-offs between projectile velocity and mass will dictate the preferred caliber for future applications. If limited vehicle weight and ammunition count are to remain the main drivers, the selected caliber of LP guns is probably not going to exceed 60-80mm with maximum muzzle velocities of up to 2500-2800 m/sec.

LP technology, though once believed to be the prime alternative to SP, is nowadays viewed as less attractive for ground mobile applications and thus may not

become the main armament for the FCS. Nonetheless, all this may dramatically change if these technical difficulties would somehow be satisfactorily resolved. As with the implementation of any novel technology, LP requires currently nonexistent industrial and military infrastructures for production, deployment, and logistics.

In spite of its temporarily recent handicap, research and development of Regeneratively Injected LP guns (RILP) for various ground and naval applications, will most likely continue.[3] In all fairness, there is much to be said in favor of LP technology, despite its disadvantages. Chiefly these are its inherent growth potential and high level of design flexibility. LP guns possess controlled, variable lethality and permit a relatively larger stowed load due to improved efficiency of LP storage and reduced volumetric requirements in comparison to SP combustible solid cases. Other advantages are safer storage of LP via compartmentalization, improved piezometric efficiency, and extended barrel life due to a much cleaner and better controlled combustion process. Last, but not least, RILP technology represents a rational leverage of the substantial investment already made in the LP version of the revolutionary *Crusader*. Notwithstanding a myriad of technical and logistic problems, given sufficient time and resources, LP technology could mature to warrant its future implementation as the principal armament system in heavy armored vehicles and the FCS in particular.

Electro-Thermal-Chemical Guns

Encouraging results have been obtained with Electro-Thermal-Chemical (ETC) experimental guns. In principle, an ETC gun utilizes a chemically energetic (reactive) working liquid instead of conventional solid propellant. It requires considerably less electrical energy to achieve adequate projectile propulsion than its predecessor, the Electro-Thermal experimental (ET) gun. It needs relatively smaller and lighter auxiliary equipment to produce and store electricity. This equipment could ultimately be reduced to a suitable size to warrant its installation in an armored vehicle. Energetic working liquid is naturally prone to be problematic in operation, handling, storage, and supply, such that its utilization will pose a potential safety concern and a logistic burden, much similar to LP guns. As in LP, ETC implementation requires new industrial and military infrastructures for production, deployment, and logistics.

Current developments are aimed at a medium caliber (60-80mm), antitank gun with a firing rate of 10-15 rounds/min. At this caliber range, various types of rounds could be comprised of KE projectiles and CE rounds, as well as future 'smart' sensor-fuzed munitions. The ultimate objective is aimed at an ETC automatic gun with a muzzle energy of 20^{+} MJ (corresponding to 2500-3000 m/sec for medium calibers) which is comparable to that of the conventional, solid propellant 140mm gun. Much like LP guns, ETC technology allows better control of the pressure (propulsion) generated, so that it is maintained relatively close to its maximum while the projectile is moving down the barrel, resulting in more energy conveyed to the projectile.

This is quite contrary to conventional SP technology, where the pressure quickly diminishes as the projectile departs from the combustion chamber. ETC technology is recognized by many to show promise of "infinite" or multistage variable lethality and improved propulsion controllability. It also requires significantly less electrical energy in comparison to Electro-Magnetic (EM) guns that use only electricity for projectile propulsion. Nevertheless, ETC technology, as promising as it may seem, requires further fundamental research beyond the laboratory stage. Much detailed research and testing has yet to be accomplished in the field and at weapon system level. It must achieve maturation to warrant its applicability as a stand-alone solution, or in conjunction with other mature technologies, or with existing 120/140mm guns.

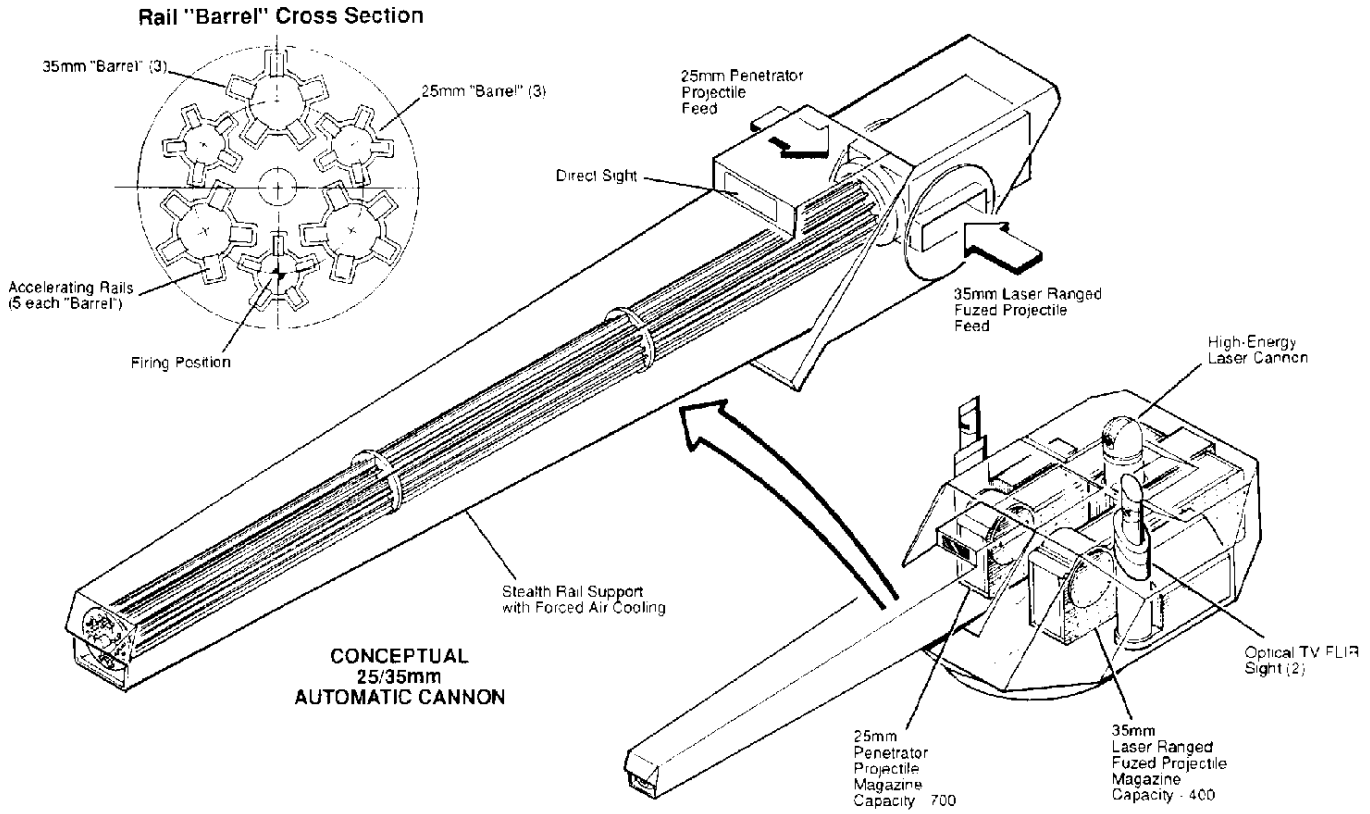
As an additional practical alternative, ETC technology could be combined with existing conventional SP 120mm and/or future 140mm guns and ammunition, though a new cartridge and modified gun chamber are required. It represents a near-term upgrade application of already leveraged and proven technology. The size of the electrical equipment is much smaller than that of current EM research guns and present ETC as a viable upgrade proposition. Research has shown that specially designed ammunition and ETC gun technology could be combined with existing conventional SP guns to further enhance the performance of the latter up to 30% and beyond. Augmenting the energy of solid propellant is possible by implementing a plasma regenerative injector and combustion control to the conventional pressure chamber. In the event that ETC technology will become practical, existing conventional 120mm and future 140mm guns could be economically converted into ETC/SP guns as one more step in the evolution of SP guns. There are still various predominating problems to be addressed and resolved before ETC guns can become a practical proposition in conjunction with conventional solid propulsion. The combination of controllable, repeatable inner ballistics with a compatible solid propellant, and the significant increase in performance (e.g. muzzle velocity) in large caliber guns, has yet to be demonstrated.

Regardless of whether ETC technology will become a viable proposition, the use of large consumable ammunition in addition to 'energetic' liquid propellant is contradictory to the requirement of reduced dependency on logistics and weight. The combined implementation of SP with ETC, will probably not justify the enormous investment in design, development and deployment associated with the fielding of an entirely new tank fleet. Though new and promising technology, it will not change the nature of armored warfare.

Electromagnetic Guns

Electromagnetic (EM) railguns or coilguns, also known as Pulsed-Power EM guns, are expected to launch light projectiles (KE, up to 5 kg) with 30-60mm in diameter, at unprecedented hypervelocities between 4000-8000 m/sec (30-60 MJ). Contrary to conventional SP guns, the EM pulse travels at near the speed of light (@ 186K miles/sec) and thus provides propulsion means inherently immune to natural limits of gas expansion. At these extremely high velocities, EM guns are unsurpassed, being more efficient than any other type of existing gun.[4,5] EM railguns operate on the same principle as 'linear' electric motors. The barrel consists of two (or more?) highly conductive rails with the projectile positioned between the latter and enclosed in the leading bore. As high current is supplied to the rails, a strong magnetic field is created by the electric arc across the rails which accelerates the projectile down the barrel. Hypervelocities appear to improve the effectiveness of kinetic energy projectiles against some types of homogenized armor but may not do so against others. It increases with velocity against explosive *reactive* armor if the

FCS Unmanned Weapon Station

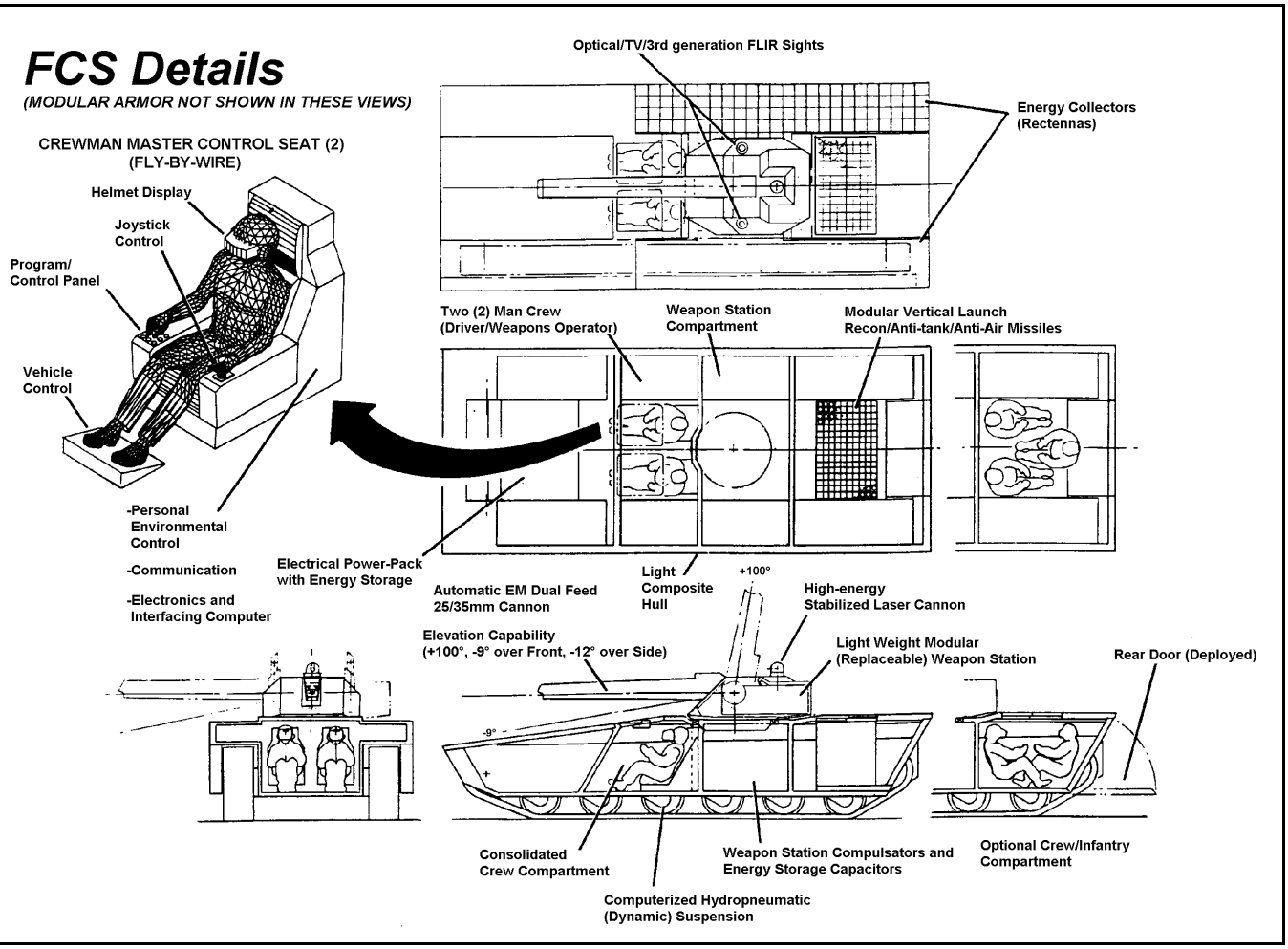


projectiles are segmented, but will not increase against a variety of complex composite armors. The benefit of hypervelocity projectiles is obvious against RHA, missiles, helicopters, and low flying ground support aircraft, but requires further development for full adaptation to antiarmor complex applications. For instance, in order to achieve muzzle energy of merely 9 MJ at velocities of 2500-4000 m/sec, a Compensated Pulsed Alternator (CPA) system that weighed 20 tons was used as recently as less than a decade ago. Considerable size, low energy density, and a multitude of unresolved technical problems indicate that EM guns still have a long way to go before they could become practical enough to be incorporated as the main gun armament in a relatively small, highly mobile weapon system such as the FCS.

Because of the high secrecy associated with outer-space military weapons applications, no recent information has been published nor released about EM guns and their applicability. Many in the research community believe that significant technical breakthroughs have been achieved over the last ten years, but have not become public knowledge. In International Defense Review (IDR)[4] it was reported that ARDEC and DARPA, with funding assistance from the SDI office, embarked upon a two-phase, multi-tasking joint venture, to demonstrate that both rail and coil type EM guns could repetitively fire projectiles at 2500-4000 m/sec with a muzzle energy of 9 MJ (equivalent to 120mm SP KE round). Phase I was divided into multiple tasks culminating with the construction of repetitively firing skid guns. In phase II by 1995, they were supposed to down-select one of the concepts identified in phase I, as the basis for a self-contained, vehicle-mounted 15 MJ EM gun. The mobile demonstrator vehicle was supposed to be equipped with an EM gun firing at a rate of 4 rounds in 24 sec.

Two contracts have been awarded. One to the University of Texas (UOT) under ARDEC, and the other to Maxwell Laboratories under the Defense Nuclear Agency (DNA). In 1989, it was reported that the Maxwell Single Shot Gun (SSG) was a simple bolted design, 8 m long, weighed 18 tons and had a 90mm circular bore. The associated capacitor was rated at 32 MJ. Reportedly, Maxwell Labs succeeded in accelerating a plasma-armatured projectile weighing 1.1 kg up to 3500 m/sec, corresponding to a muzzle energy of 7 MJ. As of today, ME systems have been demonstrated with 30-35% efficiency, though 50% is the acknowledged practical maximum.

Under SDIO sponsorship, the Westinghouse Research and Development Center constructed a 56mm/60 MJ "Thunderbolt" railgun for lethality demonstrations at high-end hypervelocities. Much detail could have been reported herein about recent advancements in ME technology research if it was not considered classified information. There are still fundamental issues that must be investigated, researched, and developed before EM guns could become a practical proposition, among them: 1) Material ablation effects due to extremely high friction with the atmosphere at hypervelocities could cause the projectile to burn unevenly, resulting in substantial degradation of its ballistic trajectory accuracy, velocity attenuation, and subsequent reduction in penetration effectiveness. Materials demonstrating low ablation must



also possess high mechanical strength (hard to find); 2) Interface repulsive force between the projectile and the accelerators (rails or coils) must be determined to quantify the critical implications in safety, structural integrity and launch reproducibility; 3) Selection of gun barrel material for overall weight reduction while maintaining adequate resistance to ablation and durability; 4) Accelerations of 10^6 g's produce previously unknown and unique material problems (e.g. vaporization) with critical implications for both lethality and accuracy. [At hypervelocities, materials behave like liquids, requiring the implementation of hydrodynamics, gas thermodynamics, and compressible fluid dynamics to represent the impact interaction between the penetrator and its target]; and 5) Reduction of electrical equipment size (e.g. capacitors, compulsators, and homopolar generators) and development of coaxial inductors and first-generation, Barber repetitive opening switches operating at extremely high-current; 7) Railguns exhibit difficulty with initial acceleration. To avoid excessive heat and stress associated with the initial projectile launch phase, a method of gas-injected running-start for initial acceleration (up to practically 1 km/sec), prior to the projectile entering the railgun breech, has been developed. This method introduces mechanical complexity and additional undesired logistic burden.

Nevertheless, in spite of immense technical challenges, especially extensive pulse and power requirements for extremely short periods of time, and virtually nonexistent infrastructure, EM gun technology is the preferred long-term ultimate choice. Consistent improvements in super high-efficiency copolymer resin-based capacitors, compulsators (e.g. UOT developed 'alternator' type generating sharp-pulse shapes), homopolar generators, HPG (e.g. Faraday rotating disk requiring large inductors for sharp-pulse shaping), high energy density superconducting inductors, and very high-density EE storage devices ('super capacity'-batteries), will yield *dramatically* reduced volume and weight. Sizable computers that only 30-40 years ago filled-up enormous volume and weighed 30(+) tons, have been reduced in volume and weight into today's personal computers. There is no logical or any known physical barrier to preclude it from happening also to EM guns if driven by high priority operational requirements, and given sufficient time and adequate resources. Ten years ago, under project Mile Run, DNA conducted research to reduce a 10 ton EM system into an affordable 1.2 ton package with 32-50 MJ copolymer resin-based capacitor technology, intended to be fitted in a tracked vehicle for ground mobile lethality and feasibility demonstrations. EM guns have reduced vulnerability and operate on electrical energy alone.

Electrical energy is much simpler to transport, handle, store, and control than any ETC or LP energizing "liquids" that require special handling and storage, and could become a paramount hazard concern. The notion of simplified logistics will further tip the scale in favor of EM guns. An FCS equipped with main systems operating *solely* on electrical energy is a tremendously reduced logistic burden. Even if friction and atmospheric attenuation will limit the antiarmor projectiles to only say, 6000 m/sec, it is still by far superior to any existing conventional gun. EM gun technology, though still in a premature stage and presumed

Continued on Page 49

Training Lethal Crews

by Sergeant First Class (P) Ernest Roth

Throughout armored warfare's history, victory at the small unit level has gone to the tank crews that were able to act and react faster than their opponents. Poorly trained and prepared crews were, and still are, nothing more than targets, casualties waiting to happen. Today, many tank crews are weak in the tactical skills that will allow them to survive while defeating the enemy.

What follows are some observations on why many tank crews fail on the battlefield. They are based on my experience as an observer/controller at the National Training Center.

Often, crews lack "tactical sense." They cannot analyze and plan an upcoming operation at their level because they don't know how to visualize and anticipate the battlefield. Many crews do not have an awareness of their own situation, much less the enemy's technical capabilities, how the enemy operates tactically, or how the effects of terrain will impact on them all. Because crews cannot do these things, they can't take advantage of the ebb and flow that make up every battle to best position themselves to kill and survive. Situational awareness and tactical sense are directly related. Tank crews often display poor situational awareness, leading to confusion and slow response. Confusion and slow response times means poor actions on contact. Additionally, crews will not display much initiative at seizing opportunities or reacting to the unexpected, which is the bread and butter of all successful tactical operations. The result? One less tank and crew in the fight. Many tankers have a poor understanding of the technical aspects of their weapons systems. Obviously, if crewmen don't understand how to optimize the tank's fire control system, they will be at a great disadvantage on the battlefield. They might also be dead.

The core of this problem is a lack of well thought-out, focused, and aggressively executed training at crew level. Training tends to be top-heavy, with little emphasis on individual or crew skills. Most units do a poor job of defining what *really* needs to be trained at the crew and platoon level. The first step in developing lethal crews is defining realistic collective tasks. Only tasks that are absolutely critical to mission success should be included in a collective task list. Critical collective tasks should be selected from tasks that are related to "shoot," "move," and "communicate." Collective task lists often include too many tasks, and are very generic, leaving crews to guess at what tasks they should train given the usual training constraints all units have to deal with. Of the five manuals that relate to tank company training — FM 17-15, FM 71-1, FM 71-1 MTP, ARTEP 17-237-10-MTP, and FM 17-12-1-2 — only the last one discusses crew training, and then only in very broad terms. As a result, training is often haphazard and broad in nature. Following is an example of a platoon collective task list focused on shooting, moving, and communicating:

- Perform tactical planning
- Produce a platoon fire plan
- Prepare for tactical operations
- Conduct rehearsals for a mission
- Perform platoon fire and movement
- Perform an attack by fire
- Assault an enemy position
- Occupy a platoon battle position
- Action drill
- Contact drill
- React to indirect fire drill
- Change formation drill

Fundamentally, being a lethal crew is simple — kill the enemy and survive. Using terrain, and acquiring and engaging the enemy must be second-nature and quick. A tank crew contributes to battlefield success by being at the right place at the right time and killing the enemy. To kill the enemy, a crew must first find them by searching constantly in a focused manner. Focus comes from the ability to anticipate enemy actions and locations, to recognize signatures, and to have a sense of how terrain af-

fects both the crew and the enemy. Contributing to survival are movement routes and firing positions that give cover and concealment, proper speed, and early acquisition of the enemy — as well as the skills to kill him quickly. Maintaining situational awareness enhances a crew's survival. While simple in concept, situational awareness requires much practice and discipline to develop to a high degree. Communication is keeping the boss, other crews, and subordinates informed of what you and the enemy are doing, your status, any support that you may need, and any other important information. The two paragraphs above are functions of shooting, moving, and communicating; training must develop the self-discipline to perform these functions continuously, whatever the circumstances. Collective task lists should include *only* those functions.

After identifying the right collective tasks, crews can begin training using the crawl, walk, run technique. An excellent start is to play through historical small unit engagements using a terrain board with micro armor while the NCOs and officers in the company look on. Replaying historical engagements has several advantages. First, they reinforce doctrine by showing what happened when units followed, or failed to follow, doctrine instead of just talking about it. Second, leaders can learn — visually — how every battle, however large or small, has periods of intense activity and lulls. The instructor can show how movement techniques, standard drills, communications, use of terrain, killing, and the ability to "read" the battle are related, and when applied together result in lethal crews. Reading the battle is quickly analyzing the situation and understanding what you have to do to create a result in your favor. Finally, historical replays give today's soldiers a link to the past that reinforces a sense of continuity and stimulates thought and the will to emulate the past performances of others. Some good examples include: the battle of Singling, Hill 253 during the Battle of Kursk, 25th Panzer Regiment's attack against the French 3rd DLM, and 11th Panzer Division's small unit actions along the Chir River in 1942. Accounts of Israeli armored actions during the 1973 war also provide good examples for use as historical vignettes. A bibliography at the end of this article lists sources where these and other vignettes can be obtained. Using the terrain board, leaders can train soldiers to analyze situations quickly and teach techniques and methods of shooting, moving, and communicating, as individual crews and as part of a platoon. The instructor gives tactical problems to the leaders (tank commander and above) with a time limit to come up with a solution. One leader is selected to move to the terrain board and show his solution. Other leaders and the instructor ask questions about how the demonstrator arrived at his solution and point out its strengths and weaknesses. Then another leader is chosen and the process repeats itself. The advantage of this technique is that it allows everyone to learn that there is more than one way to solve a tactical problem. It also leads to a standard way of thinking within the unit about tactical situations; this is the first step in developing an effective SOP.

Tactical problems should be simple at first. Moving a tank from point A to point B is a good start. Leaders should be given a fair amount of time to work out a solution. As NCOs and officers gain experience and knowledge, the problems can become more complex and the time allotted for solutions shortened. Eventually a platoon will be given a problem and each leader will demonstrate how his crew would contribute to the overall success of the platoon.

Some things must happen for this type of training to be successful. First, the technique requires an instructor with both an excellent grasp of history and knowledge of the tactical thought necessary to have success on the modern battlefield. Ideally, both the commander and the first sergeant should be able to do these things. If they are not able to act as instructors, another leader must step up. There are almost always one or two soldiers in every unit that meet the prerequisites. Second, this training must be scheduled at least one day every two weeks, preferably weekly. Third, leaders must train their soldiers on the things they learn in these classes. Sergeant's Time, UCOFT, PGT, and the SIMNET all provide a good training environment for junior leaders to train their soldiers on the things they have learned on the terrain board. Company leadership must hold subordinates accountable for passing on lessons learned. Finally, the training event must remain focused on crew level tasks that must be accomplished to be lethal on the battlefield.

The walk phase of crew level training is an extension of the crawl phase using the same methods and techniques at a training area. Because it costs so much to operate tanks, the unit may have to substitute with HMMWVs, M113s, or simulations. It is time now for the entire crew to perform the task instead of just the tank commander. The training should be built around a lane and focused on one crew task from the collective task list. As with the terrain board, initial situations should be simple to allow the crew to build competency, and the task should be repeated until the crew displays a high degree of proficiency. Too often, units try to train too many tasks, allowing little or no time to repeat tasks — much less repeat them until they become second nature. This is critically important, because so much of what a tank crew does in combat is based on drills. Drills only become such when the crews doing them can act almost without thinking. The same is true of SOPs.

The company or troop leadership must be involved in evaluating the lane. The experience the commander and first sergeant bring to the lane is very important in teaching junior leaders how to do something better. More importantly, their presence reinforces the importance of tactical proficiency. During crew training, two lanes will normally be used to teach separate tasks and maximize training time. The commander, first sergeant, executive officer, and a platoon leader or platoon sergeant can operate the lanes as observer/controllers. When the commander and XO are going through a lane as tank commanders, the other platoon leaders or platoon sergeants can act as observer/controllers. This allows a company or troop to train two critical tasks per training period for every crew. While this may not sound like much, an entire average battle task list can be trained over a six month period if the company trains two tasks per month. By keeping the tasks trained in any one period to a minimum, crews can repeat a given task many times until they are truly proficient — not just familiar — with that task.

Lanes should be set up to reward those crews that do things right by allowing them to kill and survive. A lane should also punish incorrect tactics and techniques by "killing" the crew, or the crew failing to "kill" the enemy. Obviously, the terrain and tactical problem should allow a crew to use cover and concealment and force it to correctly acquire and engage enemy forces. Using two O/Cs per lane allows the training to be viewed from two separate locations, giving a better overall picture of how a crew tackles a tactical problem. The company or troop leadership must know what the pace of each training event will be so that they can be at the right places in time to observe

events. The focus should always be on tactics, techniques, and procedures that are directly related to killing and surviving — being lethal. Finally, a capable OPFOR must take part in the lane. Tanks or units assigned as OPFOR must understand that their primary task is to help train BLUEFOR. The OPFOR must be competent at tactics and able to use OPFOR doctrine effectively. Controllers must make sure that the OPFOR takes part in rehearsals for the lane and in AARs that follow each exercise.

The final level of tank crew training — running — is platoon-size lanes. The focus of these lanes is the same as tank crew lanes. Platoon lanes require more planning and resources than crew lanes; battalion level effort is required. The battalion or squadron staff must plan and resource the execution of platoon-sized lanes. They must control O/Cs, OPFOR, and any support elements involved in the training exercise. The staff must also conduct training rehearsals of all involved personnel. The primary lane trainers are company/troop commanders, executive officers, and first sergeants.

As with crew lanes, a single tactical exercise should be trained with the focus on lethality. Supporting individual tasks should be observed and noted during the exercise, then talked about in the AAR. If a task is required in combat, then it must be included in the training. If a unit ignores casualty evacuation, for example, it will not be able to perform during an ARTEP or in combat when all tasks must be done. As with crew lanes, a tactical exercise must be repeated until the platoon and its crews are proficient. Three to five repetitions is the goal of each lane. Conditions must change for each run down the lane so that the platoon and crews do not merely copy what worked the last time they did the exercise. Each exercise should be progressively more demanding. Having OPFOR vehicles fully exposed on the first run, than partially exposed, and finally hull or turret down is a way to increase the difficulty of a lane. The goal is for tank crews to be able to acquire and take action on vehicles, signatures, soldiers, and weapons systems, not just whole tanks. An AAR should follow each run to give the platoon's crews feedback and identify areas for improvement or sustainment. Two days should be allotted for each platoon per lane.

Before each exercise, the senior lane trainer should have a briefing with his controllers to identify key issues to be observed during the exercise. A "pre-battle" briefing provides O/Cs with a focus and results in much better information for the senior trainer's AAR. Observations should be linked to small unit collective and individual tasks that support lethality. At the end of a lane, the O/Cs should get together with the OPFOR commander and conduct a "post-battle" assessment. Both strong and weak points of the crew are discussed using key issues to provide focus. Key issues can be refined at this time allowing the senior trainer to set up his AAR. Notes made during this meeting can be used by the crew during later runs down the lane to assess improvement. There are many possibilities to generate enthusiasm in crews. If desired, you can induce competition by timing like runs to determine which crews are most lethal and able to negotiate the course in the shortest amount of time. If a crew is destroyed, it is disqualified, and if it bypasses OPFOR vehicles, a time penalty is assessed. Lethality is the synergy of armored maneuver and gunnery and should be the ultimate goal of crew training. There are individuals with a natural aptitude for fighting. Good training will make them even more lethal than they naturally are, improve weak crews to a dependable level of proficiency, and transform your target crews into more of the killers for which our armored force is reknowned.

Sergeant First Class (P) Ernest Roth enlisted in the Army in June 1984. He served in I Troop, 3/2 ACR, Amberg, Germany, from Nov 84 to Sep 91, and in 1-6 Infantry, Vilseck, Germany, as a scout platoon sergeant from Sep 91 to Mar 95. He is currently assigned as an observer/controller at the National Training Center.

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Comments Sought On Initial Draft of ARTEP 71-1 MTP And on Revision of FM 17-98

The Platoon and Company Team Doctrine Branch is currently revising *ARTEP 71-1 MTP, The Tank and Mechanized Infantry Company Team Mission Training Plan*, which will be published as an initial draft and distributed to Tank and Mechanized Infantry Battalions Army-wide in July 1997. Additionally the manual will be on the Armor School's Doctrine Homepage. The branch is also beginning revision of the 9 September 1994 edition of *FM 17-98, Scout Platoon.*

We are looking for your specific comments on the content of the *ARTEP 71-1 MTP* and *FM 17-98,* along with any suggestions you have that will assist in making these manuals the best tools for training the Armor and Infantry Company Teams as well as the Scout platoons of the future.

Comments can be sent to this headquarters by e-mail or regular mail. Please include the name and telephone number of your POC with the comments.

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For further information, call CPT John Washburn at DSN 464-3228 or commercial (502) 624-3228.

Tactical Vignette 97-1

"The Battle of Durango Valley"

The tactical vignette is a training tool for tactical decision-making during mission execution. The Marines have long used similar vignettes, which they call Tactical Decision Games (TDG), in the *Marine Corps Gazette* as an efficient and inexpensive exercise for leaders at all levels. An article detailing the uses of the TDG can be found in the May-June 1997 issue of *ARMOR*.

The following tactical vignette serves as the first in a series of scenarios developed by the Doctrine Division of the U.S. Army Armor Center. Readers are encouraged to send their solutions for the tactical vignette to *ARMOR* as a means of discussion and instruction. The author's solution, along with several of the best solutions from the field, will be published in a subsequent issue of the magazine.

Situation:

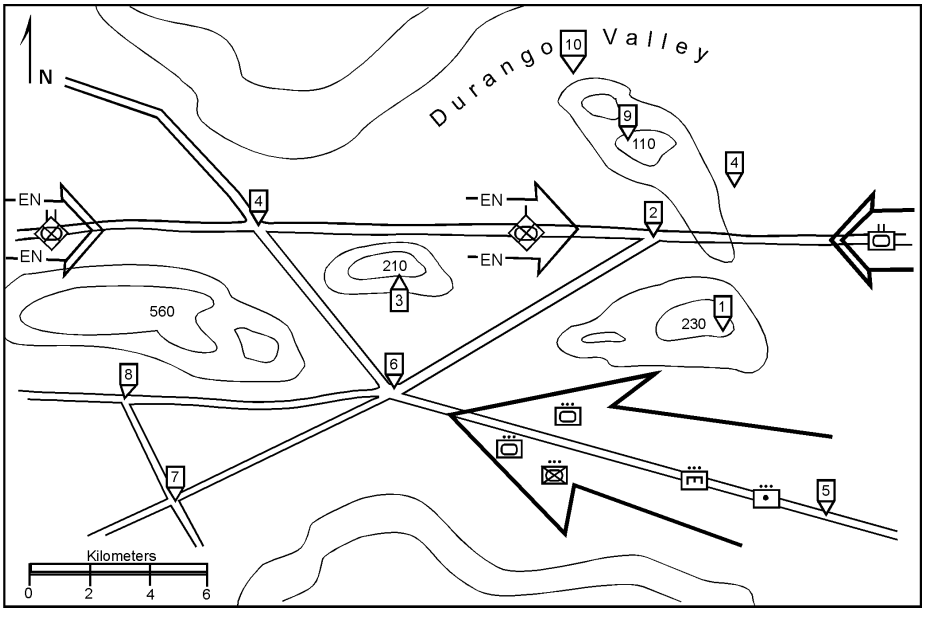
You are the commander of A Team (tank heavy), TF 2-8. You are the advance guard company (AGC) of the TF as it conducts a movement to contact. The brigade commander wants the task force to find, fix, and destroy the advance guard of an MRR that is moving east. This will allow the rest of the brigade to maneuver and destroy the regimental main body, with enough combat power left to block the second-echelon MRR. The task force commander directs the AGC to find, fix, and destroy the FSE allowing the task force main body to maneuver into the flank of the AGMB.

Your team consists of two M1A1 tank platoons and one mechanized infantry, (BFV) platoon. An engineer platoon and the mortar platoon follow in support; you have priority of mortars. Your team is moving on an axis south of the task force based on an erroneous report that the FSE was at CP 8. The terrain is mostly open desert flanked by mountains, with some high terrain in the center of the zone. As you approach the intersection at CP 6, your 1st Platoon reports seeing approximately 20 vehicles moving east and starting to deploy vicinity CP 2. A moment later, task force scouts report they have identified the AGMB north of Hill 560 moving east toward CP 4.

You suddenly realize that the element identified by 1st Platoon must be the FSE and that it is probably deploying to engage the task force from Hill 110. You attempt to contact the task force commander but receive no response. The last transmission with the task force had them approximately 15 minutes out from CP 2. Based on the scout's last report, the AGMB is 20 minutes from CP 4. It will take you 9-10 minutes to move northeast to engage the FSE or 11-12 minutes to move northwest to intercept the AGMB. You must act now! What do you do?

Requirement:

In 2 minutes or less, make your decision and issue your FRAGO and any other reports you would submit. Readers wanting to submit their solutions to the scenario should provide the following: Fragmentary order to the company team, the rationale behind your decision, and a sketch of your plan of action. Mail your solution to ARMOR, ATTN: ATZK-TDM, Fort Knox, KY 40121-5210 or send your solution by e-mail to: washburj@ftknox-dtdd-emh5.army.mil



Using Computer Wargames To Train at the Co/Tm Level

by Captain Darren P. Fitz Gerald and Captain James E. Ward

The use of simulations as a training tool for military operations has grown rapidly in the past decade. These simulations, often referred to as "wargames" or "battle simulations," have leapt from simplistic board games to highly technical and accurate computer simulations which realistically portray hand-to-hand combat; tactical, operational, and strategic level planning and execution; as well as real-time employment of combat forces, ranging from the individual soldier to the theater level. The industry has succeeded in incorporating the capabilities and vulnerabilities of our modern military equipment — as well as the human elements of morale, experience, and leadership — in an inexpensive, low-level unit trainer, the computer wargame. This article describes how commercial computer wargames might be used at the company/team level as an additional or alternative training tool and to address the feasibility of fielding commercial wargames for training soldiers at company level and below.

The Army's primary simulation development organization is the U.S. Army Simulation, Training, and Instrumentation Command (STRICOM). STRICOM, which along with the Naval Air Warfare Center Training Systems Division, provides the military services with realistic training simulations for many different military platforms and levels of training. On the whole, STRICOM has succeeded, providing excellent simulations such as MILES, UCOFT, Janus, SIMNET, BBS, as well as the battlefield tracking system for CMTC (CMTC-IS), which tracks and records vehicle movement and records the battlefield for after-action reviews.

However, there is a gap in the training tools available to soldiers at company level and below. While STRICOM has developed excellent trainers that provide quality training to soldiers, they are usually corps- or post-level resources not available to company-level trainers on a daily basis. While STRICOM has over 300 simulations either in existence or in development, existing commercial computer wargame simulations may fill the void that currently exists for simulations at the company, platoon, and squad level.

Two of the computer wargames currently available that can be used to train at the company/team level are *Steel Panthers II*, from SSI, and *TacOps*, from Arsenal Publishing. Both are ground warfare simulators employing a modern database of weapons and equipment in an effort to accurately depict modern tactical combat.

Steel Panthers II allows you to portray any of the major military powers and contains virtually all of the equipment fielded from the end of World War II to today. The game's strengths lie in its graphics and sounds, providing the user with detailed icons for each piece of equipment and accurate battlefield sound effects. Another strength of *Steel Panthers II* is the flexibility of its battle editor. The user can create his own maps, orders of battle, and tactical situations, as desired. One drawback to *Steel Panthers II* is that its reliance on "turn-based" play — where one player moves and/or shoots all of his equipment and then the other player, or computer, does the same — does not accurately depict the fluidity of the modern battlefield.

The designers of *TacOps* felt their game could succeed on its own as a simulation without the eyewash of fancy graphics, sounds, and animations. In *TacOps*, the user plays as either the U.S. Army, U.S. Marine Corps, or Canadian forces versus various opposing forces. *TacOps* provides a detailed online database of weapons and equipment and includes tables of hit and penetration data for various weapons and ranges. *TacOps* also comes with an editor (although not a map editor), allowing the user to customize any of the game's scenarios as needed. TacOps, however, does not use a standard "turn-based" system for resolving combat. Instead, each player enters his orders for a turn and they are then executed simultaneously, allowing for a more realistic approach to the sequence of events in combat.

By using the respective game's scenario/battle editors, each may be used to simulate any number of tactical situations at the CO/TM level. As an example, consider the breaching of a tactical obstacle. Prior to going to the field for CO/TM lane training, a company commander can use the game as a walk-through rehearsal of the breaching operation. He can create or load a map that represents the nature of the terrain his unit is preparing to train on, and then he can create an order of battle representing the task organization of his CO/TM. Additionally, he can also dictate the composition and disposition of the OPFOR and the layout of the obstacle for the scenario. Once the commander has set up his initial scenario, he has several options on how to execute the computer rehearsal. He and his platoon leaders can

Estimated Comparison

	Computer Wargames	Janus	SIMNET
Cost	$40-$50/Copy	$$$	$$$
Training Level	CO/TM/PLT/SQD Individual	BN/BDE	BN/CO
Controlling Agency	CO/TM Cdr	Post/Corps thru Division	Post/Corps thru Division
Frequency	Daily	Annually	Event driven
Realism	Computer Icons	Computer Icons	Actual crew Positions

play the part of the BLUFOR and allow the computer or the XO to play the part of the OPFOR, or, he can play the OPFOR while his platoon leaders execute their tasks.

For the following example, the commander will play the part of the OPFOR while his platoon leaders execute the mission, allowing him to control and adjust how the OPFOR may influence the battle, based on the performance of his platoon leaders. As the simulation begins, the platoon leaders maneuver their platoons, analyzing the terrain through what they can see on screen, as well as through the game options that depict lines of sight and cover and concealment.

Once the lead platoon makes contact with the obstacle, the commander has the option to use his OPFOR to engage immediately or wait until the breach begins. The lead platoon leader picks an appropriate piece of terrain from which to provide suppressive fire, and uses the game's indirect fire system to call smoke between the obstacle and the OPFOR. The smoke in the game will obscure enemy observation and line of sight, allowing the breach force to move forward and begin breaching the obstacle.

As the breach force negotiates the obstacle, the game incorporates an appropriate delay to simulate the time needed to breach the obstacle, throughout which the support force must continue to use direct and indirect fire to suppress the enemy on the far side of the obstacle. By comparing the armor protection of individual vehicles against the lethality and accuracy of the weapons firing at them, and subsequently incorporating the distance and obscuration on the battlefield, the game makes a realistic prediction of which shots will hit, miss, damage, or destroy the vehicles at which they are shooting.

Upon breaching the obstacle and establishing security on the far side, the assault force moves through the breach lane and assaults the remaining enemy on the far side of the obstacle. The assault force must employ sound fire control and distribution techniques in order to defeat the OPFOR controlled by the company commander. Again, the simulation calculates the hit probability for both OPFOR and BLUFOR and delivers realistic results as the assault force closes with the enemy.

Neither simulation forces you to fight doctrinally, however, the commander can require his platoon leaders to follow the principles of war and apply the breaching fundamentals in order to train those

concepts. Additionally, dependent on the commander's training objectives, he can run as many iterations of this same scenario as necessary, subtly altering it each time in order to achieve his goals. This breach mission is only one example of how these computer wargames may be used. They also have the capability to model other offensive and defensive missions, as well as meeting engagements.

Some of the benefits of using computer wargame simulations are that they provide a realistic model integrating enemy and friendly BOS capabilities. They also allow the trainer great flexibility in determining which tasks and scenarios he wants to train. Although the wargames mentioned above do not have any computer network play capability, there are computer wargames that do. Network play would allow for multiple force-on-force missions and training scenarios played from different computer terminals. Another advantage of commercial wargames is that there is already a system in place, through STRICOM, for the acquisition of commercial wargame simulations. Acquisition and funding for these wargames could be handled much as other computer software already is: at battalion and company level. Because the unit cost for these simulations is roughly $40-$50, with approval from higher headquarters, a battalion could local purchase copies of these simulations for use at the CO/TM level.

Although these computer simulations are a great training tool, they are far from perfect. One disadvantage of procurement of these simulations is that the start-up costs would be seemingly high. Also, most of the better simulations require Pentium computers, and the Army still has many, many 386 and 486-based personal computers. From the tactical perspective, there are weaknesses to using these simulations as trainers: some simulations do not accurately portray OPFOR doctrine, some allow varied degrees of command and control, and others ignore control of logistical support functions.

From the example provided above, it is evident that these computer simulations can effectively be used beyond the scope of amusement as a tool to develop tactical skills. The simulations allow small-unit leaders to experiment with new techniques and procedures, and also can provide an opportunity to practice and rehearse repetitive, complicated tasks before deploying to the field environment. No simulation is meant to be totally realistic, as evidenced in the STRICOM motto "All That Is Not War is Simulation," which applies even to maneuver training in the field. However, use of these simulations is not intended as a substitute for maneuver training, but as a supplement. An adept leader will be able to overcome these shortfalls and adapt the simulation to fit his planned training objectives. Finally, these computer wargames do provide CO/TMs an organic training tool that can be easily understood and enjoyed by all soldiers.

CPT Darren Fitz Gerald graduated with a BS in Computer Science from the U.S. Military Academy in 1992 and was commissioned as a lieutenant in Armor. He spent four years with 1-66 Armor at Fort Hood, and served as a platoon leader, scout platoon leader, and Battalion S1. He is currently a student at the Armor Officer Advanced Course. His follow-on assignment will be as an ROTC instructor at Kemper Military School in Missouri.

CPT James E. Ward graduated with a BS in Computer Science from the U.S. Military Academy in 1992 and was commissioned as a lieutenant in Aviation. He spent three and a half years with 2-1 Cavalry and 1-10 Cavalry Squadrons at Fort Hood. He served in the positions of aero-scout platoon leader, liaison officer, and assistant operations officer. He is a student at the Armor Officer Advanced Course. His follow-on assignment will be the advanced aircraft transition to the OH-58D Kiowa Warrior.

TWGSS/PGS: Pushing the System

**by Lieutenant Colonel Donald M. Campbell, Jr.
and Captain Christopher K. Kennedy**

"The objective was to train troop-leading procedures, battle drills, fire distribution and control, engagement area development, and validate platoon standard operating procedures."

Brigadier General Bolte's article in the November-December 1996 issue of *ARMOR* provided excellent insight into the new Tank Weapon Gunnery Simulation System/Precision Gunnery System (TWGSS/PGS) system which units are currently fielding. Although his article primarily focuses on the technical aspects of the system and its use in gunnery training, he does begin to explore maneuver issues at the end of his article. At Fort Lewis, 1-33 AR, 3/2ID recently completed a TWGSS/PGS maneuver and gunnery rotation in lieu of crossing the mountains and conducting similar training at Yakima Training Center. The exercise goal was to sustain platoon and individual gunnery skills, improve platoon maneuver tasks and battle drills, explore the new simulation system's limitations, and reduce unit OPTEMPO. This exercise was the product of a brainstorm of our Brigade Commander, COL Peter W. Chiarelli, who had previously served as the G3 for First Cavalry Division at Fort Hood and was extremely impressed with the system. It was this relationship that enabled us to borrow a company TWGSS and PGS set from Fort Hood; otherwise the exercise would have been limited in scope to gunnery only.

Exercise Concept

The exercise had three phases. Although it is the reverse of conventional platoon and gunnery training, we initiated training at the platoon level by conducting a Janus exercise which allowed platoon leaders to practice many of the tasks which they would have to complete in the Situational Training Exercise (STX) lanes, on the same terrain which they would actually conduct the tasks. This consisted of one day for system familiarization, one day for an attack lane, and one day for a lane training defense of a battle position. The objective was to train troop-leading procedures, battle drills, fire distribution and control, engagement area development, and validate platoon standard operating procedures. This training paid large dividends in the platoon STX lanes as all platoon leaders had established a solid foundation in these tasks to build on during the STX lanes.

STX Lanes

The second phase was platoon STX lanes. Although the terrain on Fort Lewis is heavily wooded, we were able to take advantage of the drop zones and some open areas to conduct the STX lanes. The first two days in the lanes were independent training days for company commanders to train platoons on skills and tasks, such as TWGSS/PGS gunnery, actions on contact, battle drills, and developing an engagement area. On the afternoon of the second day, the platoon leader received an operations order from the company commander to conduct a hasty attack the next morning. A platoon observer/controller linked up with the platoon at this point and stayed throughout the next three days, concentrating on observing the platoon leaders' preparation for each mission. At 0900 the next morning, after a short road march, the platoon conducted a hasty attack into a small 1.5km x 3km "bowl" surrounded by woods. The OPFOR was an M1A1-equipped with TWGSS, an M113 equipped with MILES, and a dismounted AT team equipped with MILES. This simulated a degraded combat security outpost (CSOP). The Bradley Fighting Vehicle (BFV) platoons' OPFOR consisted of two BFVs which also had a dismounted AT team. After the scenario was completed, the second O/C, who was the permanent lane O/C, downloaded the data from

the OPFOR vehicle's Turret Drive Retrieval System (TDRS) card. In the M1A1 or BFV, the TDRS card fits inside the TWGSS or PGS computer. This card is a computer PCI card that fits into the side of a laptop computer and utilizes SAAB TWGSS/PGS software to download data retrieved from the TWGSS/PGS computer in the M1A1 or BFV. The O/C or master gunner can also program into the card the number and types of rounds each vehicle will have "on board" for each scenario, as well as ammo dispersion and load time for each round. The information that the O/C downloads shows where the BLUEFOR vehicles hit the OPFOR vehicles and identifies each weapon system and type of ammunition used. The lane O/C subsequently marked and labeled these hits and misses on a data board which we constructed to show the crews where their rounds were impacting and where they were receiving direct fire hits. This board had several M1A1 and M2 side silhouettes and frontal silhouettes; the front was OPFOR vehicles and the back was BLUEFOR vehicles. The computer identifies which vehicle fired each round and presents the azimuth and elevation of the projectile, as well as a silhouette illustrating the point of projectile impact. We duplicated this display with our board to provide this information to the platoon during the after-action review (AAR). While the lane O/C debriefed the OPFOR, the company commander issued a FRAGO to the platoon leader to conduct a tactical road march and prepare for a dusk attack.

In the afternoon, once the platoon was set in the new assembly area, the lane O/C downloaded the platoon's TDRS cards and transferred the information to the data board. At this point, the platoon O/C and the lane O/C presented the platoon with their first formal AAR. The format was essentially the basic AAR format, except that, when we talked about what happened during the engagement, we used the data board to illustrate the results of the battle. This aided the O/C in presenting gunnery results and maneuver mistakes. The feedback provided a limited informal TC/BC Proficiency Couse, which COL Chiarelli felt would be an imbedded byproduct of using the TWGSS/PGS system.

A few hours later, the platoon conducted another hasty attack against a degraded CSOP, this time in open terrain on Rogers DZ, the largest drop zone on Fort Lewis. Once again, the lane O/C downloaded OPFOR information from the vehicle TDRS cards after the attack. In the morning, the O/C downloaded the BLUEFOR information, marked and labeled hits and misses on the data board and both O/Cs guided the platoon through their second AAR. The company commander then provided the platoon with a final FRAGO, which was to defend a battle position in Rogers DZ.

After about 20 hours of structuring the engagement area, which included utilizing ACEs to dig battle positions, the platoon conducted an early morning defense against an MRC or TC. At the end of the defense, the platoon was engaged with artillery which delivered a persistent chemical agent. The platoon moved to an operational decontamination while the lane O/C simultaneously downloaded nine to ten OPFOR cards and transferred pertinent information to the data board. Once the platoon completed operational decontamination, the O/C downloaded the platoon's cards and transferred the information to the data board. The platoon received its final AAR from the O/Cs and then moved back to a company assembly area to prepare for gunnery as the two other platoons in the company subsequently completed the STX lanes. This did not take long, as the schedule was echeloned so that when the first platoon was completing the defense lane, the second platoon was conducting the first attack lane at 0900 the same day. This allowed company commanders to observe and participate in each platoon's STX lane.

Gunnery

The third phase was a full gunnery exercise. Gunnery on Fort Lewis was a little more tricky than maneuver because, although we were able to use drop zones, the largest drop zone was simultaneously occupied by STX lanes as another company was conducting gunnery. Additionally, to run a Tank/Bradley Table (TT/BT) VII-XII on the same drop zone required over forty main gun and troop targets and TT V/BT VI live fire required ten more targets. This may not seem like much on most installations, but since we usually conduct TT/BT VII-XII at Yakima Training Center, the majority of targets and lifters were across the mountains. SFC Barry Putney, our Battalion Master Gunner, and MSG Larry Burch, our Brigade Master Gunner, worked with Range Control and TASC to finally meet all of our target needs. The second challenge was to create a challenging TTV and BTVI on a narrow, confined MK-19 range and create another range on the drop zone which could accommodate TT/BT VII-XII with minimal movement and changeover of targets. SFC Putney, with the help of the company master gunners, designed and built these ranges from the ground up in less than three weeks.

TT V and BT VI were conducted on a range usually utilized for Mark 19 familiarization. Although limited to one lane, we were able to build a solid range for both gunnery tables. TT/BT VII and VIII were conducted on Point Salines Drop zone using TWGSS/PGS. SFC Putney was able to place almost all of the targets at doctrinal ranges +/-100m-200m. Feedback provided to crews through the TWGSS/PGS system was comparable to live fire. The crew could see the splash on the target during engagements. During their AAR debrief, using the laptop computer, they could see exactly where they had hit the target and the azimuth and elevation of the strike. For the A2 tank engagement, we were forced to use a MILES transmitter on the .50 Cal. as there is no TWGSS transmitter for this weapon. Scores were comparable to previous gunneries conducted in Yakima, although to conduct a valid test we would have had to fire both main gun and TWGSS/PGS on the same range during the same weather conditions. TT/BT XII was conducted on the same range as TT/BT VII and VIII. Changeover from one range to the other was minimal due to the range design. There were two drawbacks to conducting TT/BT XII on Fort Lewis. The first was that, due to intervisibility lines and drop zone size, we were limited to 2200 meters as our farthest engagement line. This meant that the range bands for TT/BT XII were closer than desired.

The second drawback was that the TWGSS/PGS system in panel gunnery mode (there are two modes: combat, for force on force and panel gunnery, for gunnery tables) does not provide multiple vehicle target feedback. In combat mode, you can load multiple cards and it will show where a vehicle fires and impacts and where he receives fire. Therefore we were not able to see where vehicles were double-servicing targets and shooting out of their assigned sectors within the platoon. We could count target hits by watching the targets fall and we could find out how many rounds were expended to kill those targets, but we

could not actually distinguish one target hit from another using the computer. This could be corrected with a software upgrade by SAAB, which produces the system.

Maneuver Lessons Learned

TWGSS/PGS was an excellent simulation device for force on force training. Later in the exercise, we scanned maps of the maneuver areas into the laptop computers and were able to take advantage of the full capability of the AAR system. Once OPFOR and BLUEFOR cards are downloaded into the laptop computer, a global positioning system in the TWGSS/PGS system that tracks vehicle movement during the exercise also shows the platoon where the enemy was, where BLUEFOR vehicles were, who shot whom, which weapon system was used, where each vehicle hit and was hit, and how the scheme of maneuver developed. During the exercise, we learned to clear each vehicle's TDRS card just prior to execution of the mission. This meant storing fewer events on each card, lessening the chance of a computer lockup due to data overload. Even if the cards are clear, the system can only reliably hold eight cards downloaded from tanks and about five to six cards downloaded from Bradleys (each time a vehicle fires or is hit is an event. Bradleys have more events because of the 25mm chain gun) before it locks up during AAR playback in AAR map mode. Another lesson that we learned is that, although MILES and TWGSS/PGS are compatible, they do not operate well with each other. You must mount retro reflectors on the MILES vehicles to direct the TWGSS/PGS beam back to the TWGSS/PGS to make the system compatible. An exercise like ours, where we needed the retro reflectors for gunnery, makes this impossible since each company system comes with only a limited number of target retro reflectors. Even if retro reflectors are mounted on the MILES vehicles, the feedback system would be of minimal use as the system shows impact points only on the TWGSS/PGS vehicles. Additionally, MILES impacts on the TWGSS/PGS vehicles are displayed as sectional blocks instead of impact points. MILES also has an advantage over TWGSS/PGS in force on force. Since it is not a precision gunnery instrument like TWGSS/PGS, the MILES vehicle has a larger killing potential. We recommend either using one system or the other. Another lesson that we learned was that PGS TOW is an excellent weapon system. During the defense of a BP STX lane, a BFV platoon completely destroyed a TWGSS-equipped tank company with TOW, a performance that would be rare from a MILES BFV platoon.

Gunnery Lessons Learned

TWGSS/PGS was an excellent tool for TT/BT VII-VIII. The feedback system offered crews information, such as azimuth and elevation of shots, which they could not receive during live fire. The one drawback was that most crews had an inordinate amount of trouble hitting targets with the coaxial machine gun on both tanks and BFVs. This was due to an extraordinary amount of 7.62mm dispersion built into the TWGSS/PGS program and the fact that only every third tracer is presented in the GPS and GPS-E. Although the tracer-to-ball ratio is the same as in live-fire gunnery, the increased dispersion makes machine gun use extremely difficult. The technicians from SAAB who visited our unit during training indicated that the Army had requested the tracer simulation ratio and felt that the problem could be remedied through a software upgrade or changing the tracer-to-ball ratio to 1:0; either way this problem must be corrected to harness the full potential of the system's capabilities. As stated previously, we also had to use MILES for the .50 Cal., making A2 engagements difficult to evaluate since the MILES transmitter on the .50 Cal. is notoriously difficult to zero. If the intent is to use the TWGSS/PGS system for home station gunnery, the Army needs to purchase .50 cal. transmitters from SAAB. We had previously discussed the problems with the AAR feedback system for TT/BT XII. We are currently giving feedback to SAAB on these problems. Once again, a software upgrade should be able to solve the multiple card problem in panel gunnery mode.

Conclusion

TWGSS/PGS is an excellent system which, with some minor improvements, could provide an almost true to life simulation for gunnery and maneuver. Although TWGSS/PGS was originally intended for home station gunnery, the system has also proved to be an excellent maneuver simulation. The feedback system, and the fact that crews must prepare their vehicles for precision gunnery instead of simply aligning a rifle scope to a laser, creates a more realistic environment, and allows for more informative AARs. Although we have not experienced the improvements of MILES 2000, we can evaluate the system against MILES and MILES II. TWGSS/PGS appears to be a better system for home station maneuver and gunnery training. Brigadier General Bolte mentioned GAMER on page 47 in the earlier mentioned article. This system allows O/Cs to receive real-time feedback and save the engagement for feedback during the AAR which is one step above current TWGSS/PGS capabilities. The system also allows TWGSS/PGS to evaluate indirect fire and mine simulation within the scenario. Although relatively expensive (around $500,000), this system would allow for greater home station maneuver training and feedback for AARs. TWGSS/PGS is the future of home station training in the U.S. Army; we should use it as frequently as possible and push the system to its limits. We should also continue to improve the system as more feedback is obtained through frequent use.

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CPT Chris Kennedy received his BA from Widener University in Pennsylvania in 1989. He earned his commission in Armor from Officer's Candidate School at Ft. Benning, Ga. He is currently the S3 Air for 1st Battalion, 33rd Armor. Previous assignments include assistant corps training officer for I Corps at Fort Lewis, and company executive officer and tank platoon leader in 4th Battalion, 67th Armor in Friedberg, Germany.

Ground Surveillance Radar Operations in Heavy Units

by Captain Frank Sobchak

The Ground Surveillance Radar (GSR) team is perhaps the least understood, if not most underutilized asset that the heavy battalion task force has in its bag of tricks. However, with proper education, leadership, and coordination, this asset can greatly assist units for both their reconnaissance and surveillance missions and their counterreconnaissance battles. Although this article focuses entirely on GSR assets, some of the principles addressed here apply universally to using slice or support elements.

How the System Works

This type of radar works similarly to those used to guide civilian aircraft safely into airports, although the Army system, the PPS-5B (Figure 1) is older, more spartan, and only tracks targets in two dimensions. The radar has two major components, the radar transmitter (RT) and the controller indicator (CI). The RT puts out the electronic waves, and the CI (Figure 2) is used to interpret them. Basically, the radar puts out electronic bursts of energy at a constant rate. These pulses reflect off targets and cause an echo, which is then transformed back into an electronic signature by the controller indicator. The system determines range by the length of time that the echo takes to return to the radar. Targets must be moving, or have moving parts, like an engine idling, in order for the detection to be accurate.

The system can detect targets by three methods:

- **Through an audio return on headphones**. Once the range gate marker is set at the desired range of detection, the radar cycles through its scanning sector. The operator will hear the signature of the target located at the range he has dialed in on the range gate marker. An operator can hear footsteps, engine noises, wind or rain.

- **Through a bright spot on the B scope.** The B scope on the controller indicator shows a vertical trace line that oscillates back and forth across the screen as the radar sweeps through its sector of scan. Targets and "clutter" show up as brighter areas. Reflections from the ground show up as less bright areas, and areas not covered by the radar appear dark.

Because the trace creates a map-like image over the distance the radar covers, it can be used to visualize dead space.

- **Through a spike on the A scope.** The A scope gives a temporary picture of activity along a particular bearing, and constantly changes as the radar sweeps through its sector. Targets appear as spikes on the one horizontal bar.

After detecting a target, the operator has to stop the radar from scanning and dial the range gate marker (visible on both the A and B scopes) onto the target. Once the range gate marker is on the target, the operator will hear the loudest signature, and from this, can get a range, down to 1m distance, and an azimuth. The azimuth and distance are then transposed onto a plotting board or a surveil-

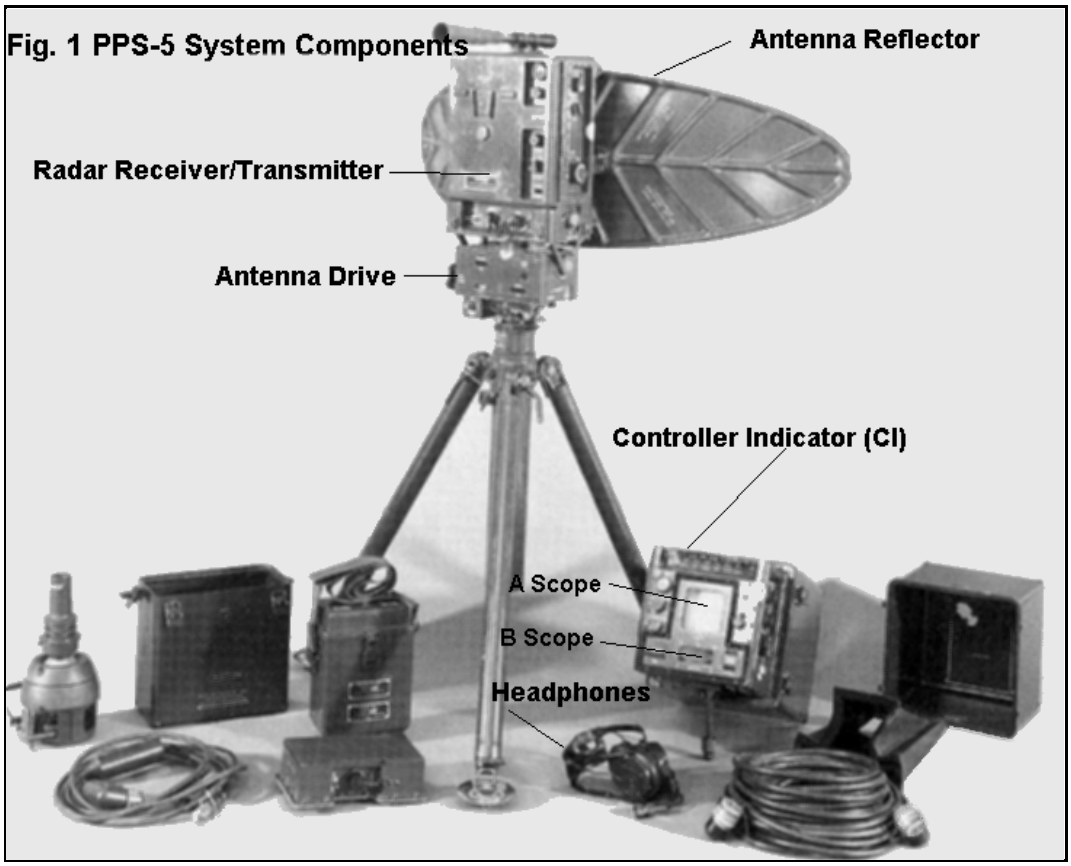
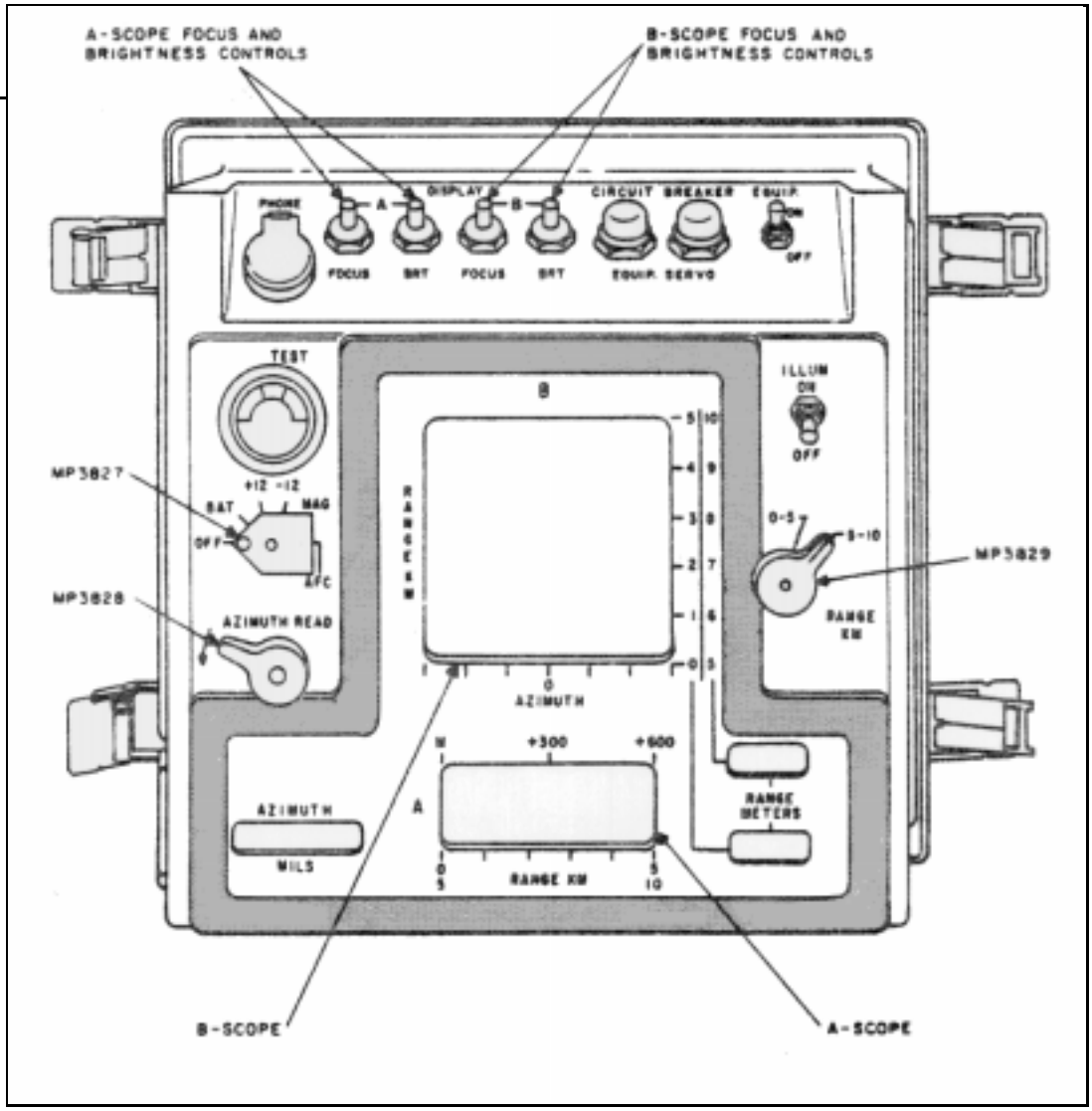


Fig. 2.
Controller Indicator



lance card and plotter (SCAP) to get an 8-digit grid, much the same way that a polar call for fire is computed.

Capabilities

The radar team can produce an 8-digit grid, accurate to 10m and based on the quality of the operator, for vehicular targets out to 10km, and out to 6km for personnel. Operators have detected targets beyond these distances, but getting an accurate grid past 10km is nearly impossible. Operators can track multiple targets and can identify the type of target, either wheeled or tracked, from the audio signature. Skilled operators can tell exactly what type of vehicle the system is tracking from its telltale audio signature (e.g., the whine of turbine engines in an M1-series tank). Many NCOs who served on the Inter-German Border before the decline of communism state that it was extremely easy to distinguish the bouncing of track on older Warsaw Pact vehicles equipped with their Christie-derived suspensions.

During the counterreconnaissance battle, GSR teams are effective hunters in a hunter-killer team. Once the GSR detects enemy movement, operators can vector the killers toward the enemy (Figure 3). By tracking enemy movement and friendly movement on their plotting boards, the operators can calculate an intercept course for friendly forces, and talk the friendly force into position to kill the threat.

For reconnaissance, GSR teams can offer great night capabilities and decent daytime capabilities. The GSR soldier (96R, an all-male, combat-exclusion MOS) should be skilled in scout techniques of infiltration, intelligence gathering, and reporting. Furthermore, they are available for cross-FLOT operations (with security support or detailed planning), and for use as standard scouts, even if their radar is inoperative or ineffective due to terrain. They should also be masters of the scout's primary weapon: the call for fire.

The system slaves off vehicle batteries, and can be remoted 50 feet from the prime mover. However, an operator must still be present at the CI (only 12 feet maximum from the RT). While the entire radar can be dismounted and manpacked to an OP, weight and special battery needs makes this impractical.

Limitations

The radar has a 10-15 minute setup time and a 5-10 minute tear-down time and cannot be operated on the move. Consequently, offensive operations in continuous operations or a movement to contact are extremely difficult.

Because the radar is a line-of-sight system, terrain will create dead space like that of any direct fire weapon system (Figure 4). The radar cannot look through or over hills, mountains, or intervisibility (IV) lines. Additionally, the radar waves are broken up by trees, particle smoke, rain, or fog. This leads to two main conclusions:

- Radar effectiveness is based upon the terrain you will be operating in (part of METT-T); if you have thick woods with few sparse areas, the radar is limited to open areas and straight roads. This is the radar's weakness in LIC operations in either woods or urban areas.

- Because most people with binoculars can see 10km line-of-sight during the daytime, the radars make their money at night.

Like any other weapons system, the GSR is only as effective as the operator using it. If the system is not leveled, doesn't have a correct center scan, or the operator is not proficient in detecting or pinpointing targets, the system will be as ineffective as a non-boresighted tank.

Enemy forces can easily use direction-finding (DF) to locate and kill the GSR, which was a high-priority target for the Soviet forces stationed in East Germany. Although the soldiers sardonically joke that their job is seven seconds to Hell (the time necessary to DF a GSR), real-

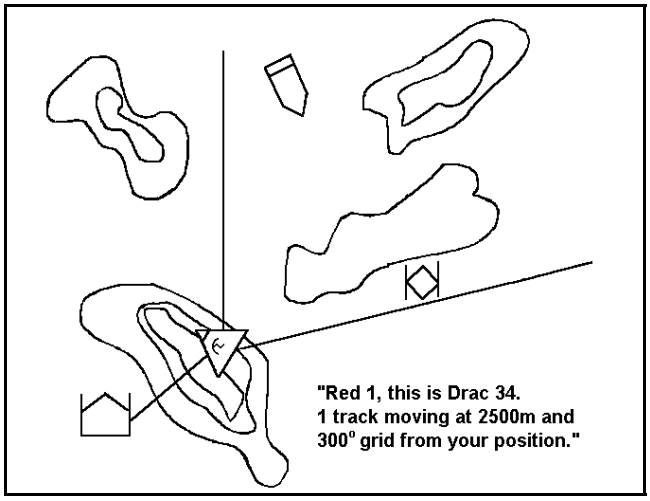


Fig. 3. Vectoring

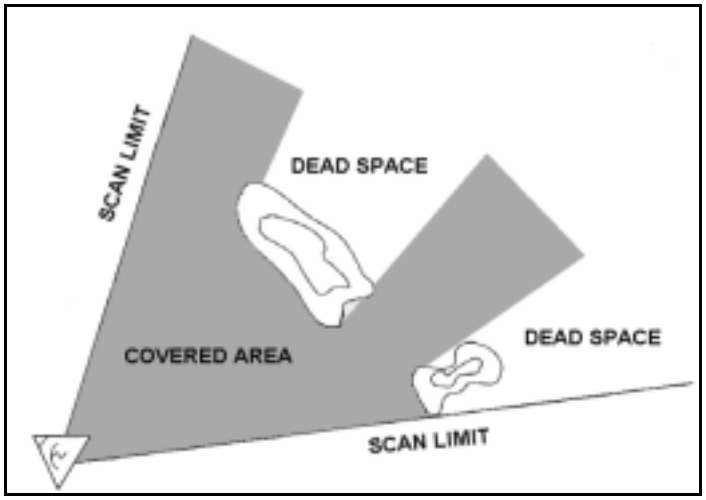


Fig. 4. Dead Space

istically there are almost no countries left that have this capability. Furthermore, if a threat exists, the operators can scan intermittently and displace to avoid fire.

Tactical Considerations

The MTOE personnel authorization (Figure 5) has a significant effect on GSR operations. The current DS company operations platoon contains one HUMINT (Human Intelligence) squad and one GSR squad made up of four teams. Each team is composed of an M113 and three personnel (one track has four personnel with the squad leader), and a headquarters with a platoon leader, platoon sergeant, and an HMMWV. This causes problems in two areas, coordination and sleep plans.

Usually the GSR/operations platoon leader is the brigade LNO for the direct support military intelligence company and can do little or no coordination for his teams. If he does get a chance to get out of the brigade TOC, he may only see one of the two task forces being supported or might only visit his HUMINT squad. This leaves task forces and teams coordinating directly with an E6 (by MTOE, which would not be a major problem), or more likely an E5 or E4. Although some of these junior team leaders conduct great coordination, many do not understand the intricacies of reconnaissance and surveillance to effect proper coordination. The fact that the squad leader still has to run his own team adds to coordination problems. The S2 should take a vested interest in the coordination of the GSRs attached to his brigade or battalion, but many do not. This lack of leadership available for coordination causes problems in fratricide, logistics, and employment.

Failure to coordinate for near and far recognition signals, call signs, COMSEC, and locations cause instances where GSR teams get killed by the units they support. Another problem is that the PPS-5's radar signature, sometimes and at certain frequencies, will cause the radar warning receiver of an AH64 Apache to go off, indicating to the helicopter crew that it has detected a ZSU-23-4 radar (Gun Dish). This unfortunate electronic problem, along with a failure to coordinate, caused a fratricide incident which destroyed a GSR team and killed two crew members during Desert Storm. Simple coordination directly or by FM can prevent the wasting of this asset.

Without logistical coordination, GSR teams support units, but frequently don't have individual, crew-served, or antitank weapons (AT4s) to defend themselves. This problem is further accented when the GSR teams move from supporting one team (or the scout platoon) to supporting another. Head count for meals (or forgetting to tell the GSR team that LOGPAC has arrived) is also too often a problem. Mistakes in employment occur when leaders do not want to, or forget to, coordinate with the subject matter expert, the GSR team leader or squad leader, and employ the team in an unsound tactical method.

Second, the MTOE causes further problems. Even if teams have all three crew members, usually all three crew members are awake while they are conducting operations. The team leader mans the M2 machine gun, provides security, and monitors the radio. The senior radar operator (SRO) mans the radar and listens on the earphones. The third soldier provides dismounted security and plots targets picked up by the SRO

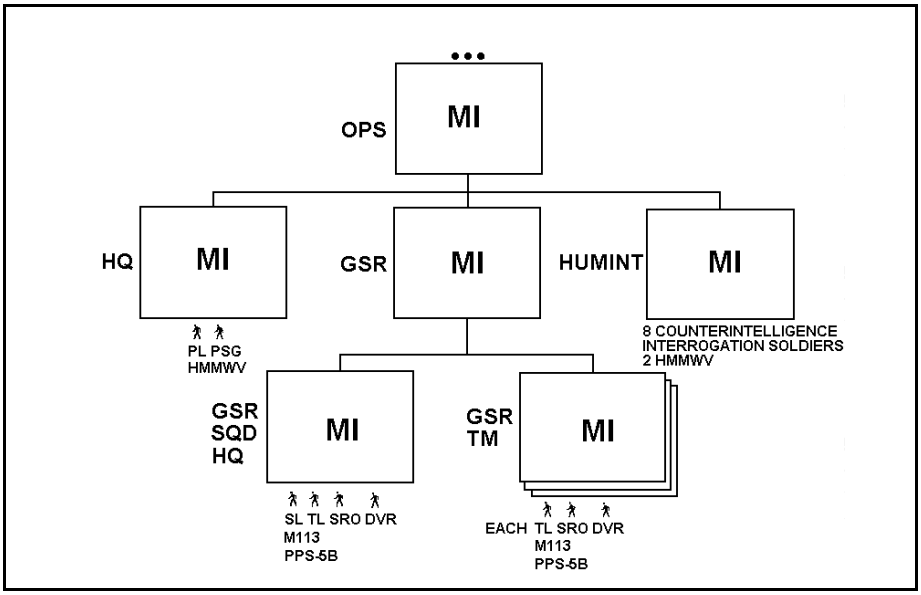


Fig. 5. MTOE Strength

(based on METT-T, he could be in the driver's compartment or resting). Due to personnel shortages and the standard losses from nondeployables and chapter actions, etc., some teams have only two members, with the SRO taking up the slack, which further constrains operations and slows reporting. Additionally, monitoring duties must be rotated at least every hour to keep the operator fresh because viewing the radar screen and hearing the earphone noises tend to lull some operators into unconsciousness. Some task forces and companies do not take this into consideration and have the GSRs scanning all night, and moving during the day, and then repeat the cycle, never allowing for rest, which other members of the company usually take at night. One suggestion to solve this problem is to keep your GSR teams working reverse cycle, taking their rest during the day when the radar is less effective.

Since each GSR team has only one .50 caliber M2 for protection, they should either have some sort of security provided for them, or be infiltrated to a position (hide site) where they can be concealed and enemy contact is highly unlikely. Providing security through some sort of command relationship benefits both the attached and supported unit. It prevents the GSR from becoming a "loose cannon," wandering around the battlefield, and provides security for the team.

Employment Principles

Generally, maneuver commanders should rely on the subject matter expert (the GSR team leader or platoon leader) to position his unit. However, everyone needs to know some of the general rules for effective GSR employment. Higher terrain is usually better because it allows you to look over small bumps in the terrain and presents less dead space. Finding a location that has a hard background (trees, hills, mountain) makes for clearer radar returns. Having a good concealed position is critical to survival. Orient your sector of scan to cover the designated named area of interest (NAI) so that it maximizes the system's range and minimizes dead space (avoid close hills and mountains). The system has an average sector scan of 90 degrees, so position the radar where you can take advantage of this large sector. Do not waste it covering point NAIs. Having high terrain to the flanks and rear, beyond the sector being covered, is a bonus. These features can absorb the rear- and side-lobe radar signature, making it harder for the enemy to find the radar.

Offense

GSR employment is more difficult in the offense. It is most difficult in the movement to contact, but several options are still available. One is to attach two or more GSR teams to a company/team on the flank to protect that flank from an enemy counterattack. The teams would subsequently bound forward in a leapfrog fashion to ensure constant coverage. This method requires detailed planning and rehearsal, to synchronize the set-up and tear-down of the two systems to ensure seamless coverage.

During a stationary counterrecon battle prior to the offense, the GSRs could be used in hunter-killer operations.

Finally, they could be attached to the TF scouts to establish a stationary OP with a scout far across the FLOT looking at enemy reserves or repositioning.

Defense

GSR teams can be attached to the scout platoon to establish an OP past the FLOT with a scout vehicle and either monitor the same or different NAIs. One variation of this is to establish the OP with just the GSR team, although it is risky and not recommended.

Teams could be attached to the battalion's forward or flank to provide night security, and cover an NAI to observe where the enemy main attack is coming from.

Teams also work well attached to a company as the hunters in a hunter-killer concept. The GSR can even talk the killer toward the prey with azimuths using the vectoring technique.

Common Problems

- **Poor use in the offense.** Many task forces either expect too much of the GSR, thinking it can operate on the move, or giving it multiple missions to perform in too short a time. Or they throw up their arms and under-utilize the GSR (providing security for the CTCP) because they do not coordinate for bounding coverage.

- **Coordination.** This causes several problems: First, lack of understanding can cause underutilization and nonparticipation in the R/S plan (the GSR may be attached to a CO/TM without an NAI to cover, or SIRs to answer, or any sort of plan). This can be fixed with coordination with the subject matter expert, either the GSR platoon leader, platoon sergeant, squad leader, or team leader. Second, lack of coordination can cause fratricide — the unidentified vehicle approaching your rear or flank that you shot may have been the GSR sent to establish an OP on the flank of your company. Third, without logistical coordination, teams may not have ammunition or food to carry out their mission.

- **Inefficiency.** This stems from three major areas: Lack of a rest plan because of multiple missions burns out crews and makes them combat ineffective. Lack of security or a good plan/hide site makes them an easy kill for the enemy. Use of GSRs as a scout (mobile as opposed to OP) degrades their ability. If you can use the 10km range of the radar, you should. I have seen task forces attach GSRs (with functioning radars) to scout platoons to plus up the strength of a scout platoon, and not plan to use the radar at all, even though the radar had a good mission available to work with the counterrecon screen. If possible, use the radar properly.

Future

Plans are for the PPS-5B to be phased out of the Army inventory without replacement. Originally, they were slated to disappear in FY95, current plans are for FY99, but that may change again. Most likely, soldiers in the 96R MOS will be retrained to 96U (UAV operator) or reclassified, although evaluation of a British radar (MSTAR) and an American imagery system (Nightstalker) might indicate that American GSRs are not dead yet.

Conclusion

Although GSR assets are frequently misunderstood and underutilized, a task force which uses the combat multiplier of the GSR properly can greatly assist their reconnaissance and surveillance missions and their counterreconnaissance battles.

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Checkpoint Operations *(Continued from Page 21)*

tection. Hesko bastions should be used for inner perimeters and to protect soldiers' living areas at a static checkpoint; they may also be used as serpentine barriers, but unless reinforced with more dense materials they will not stand up to many vehicle hits. The inner compound of CP A2 included over 150 Hesko bastions and over 350 cubic meters of gravel fill, topped off with over 3,000 sandbags.

Wood sentinel sheds at the entrances to the checkpoint were placed behind concrete barriers (approximately four feet thick) and surrounded by double layers of sandbags — creating good cover and concealment for barrier guards when needed. The windows of the guard shack were shatterproof Plexiglas over wire mesh, creating a double layer of protection.

Checkpoint obstacle and barrier plans (vehicle serpentine) are essential to control checkpoint operations, and are a vital element of force protection. A short and narrow serpentine can restrict and impede movement, while a long and wide serpentine will be ineffective in controlling movement through the checkpoint. For static checkpoints, tetrahedrons constructed of heavy duty steel (e.g., railroad rails), 50-gallon drums filled with debris and reinforced with wire, anchored concertina wire sections, and telephone poles split in half lengthwise [laid on the ground and anchored under a tracked vehicle at a 45 degree angle to create speed bumps] are ideal for use in an obstacle/barrier plan as they are easily made or procured and are sturdy and durable enough to withstand continual vehicular traffic. Light one-man-lift tetrahedrons, 55-gallon drums, concertina wire and pickets, sandbags, and split telephone poles can be used effectively for a temporary checkpoint; they are transportable by 5-ton truck or by Bradley Fighting Vehicle. The well-planned and evenly-spaced serpentine will canalize movement through the checkpoint while providing an additional measure of force protection.

Perimeter lighting is very important and can be easily provided by using a standard 10,000 kilowatt military generator light set (which can be towed behind HMWWVs, 113 Series vehicles, or Bradley Fighting Vehicles). One light set can provide adequate lighting for a CP 75-100 meters in length (good enough for a temporary checkpoint of 24-48 hours in duration); however, for a long-term deliberate checkpoint, two light sets would be more efficient and effective, offering a contingency in case of maintenance troubles. Portable light units (mounted on a telescoping tripod, on a guard shack roof, or on a guard tower) provide additional barrier and perimeter lighting wherever needed [portable light units should be positioned to support ID checks and/or vehicle searches at CP entrances and on the CP vehicle search area]. Perimeter lighting is an important element of checkpoint operations, as it serves two purposes: it assists the occupying force in conducting normal operations with enhanced visibility during the hours of darkness, but just as important, a well-lit checkpoint sends a message of activity, alertness, and vigilance.

Operational Force Protection Measures

Operational TTPs established and executed on the checkpoint will assist in force protection, the key element in establishing and operating a successful checkpoint is the professional soldier who executes his mission on a daily basis with pride and vigilance. A professional-looking and acting soldier, backed by the firepower of an M1A1 tank or a Bradley Fighting Vehicle, creates an atmosphere of deadly force that local civilians and factional elements acknowledge and respect. A "We mean business" attitude and image establishes the base relationship for all activities, thereby reducing the possibility of actions against the checkpoint.

Checkpoint personnel must be capable of rapid transition from a peaceful to combat posture, should the need arise. Operations should always be supported with direct fire weapons and a form of communication. Entrances to the CP should be supported with your most lethal firepower asset [e.g., an M3A2 Cavalry Fighting Vehicle facing oncoming traffic] and be manned at all times to provide security and communications support for barrier personnel.

Barrier sentinels should operate under the two-man rule (one pulling security for the other) at all times. An additional form of communications (e.g., a Motorola radio or PRC-126 squad infantry radio) on the ground can greatly assist movement of traffic through the checkpoint and during potential threat situations. Redundant security measures and redundant communications are another method of enhancing force protection while conducting normal checkpoint operations.

Defensive procedures, such as CP alert rehearsals, vehicle searches, and use of MP canine units, contribute to force protection and deadly force image. CP alert exercises conducted on a regular basis ensure that soldiers and leaders are ready to defend the checkpoint at any time. No-notice alerts from an external element provide an element of surprise and realism. Prior to occupying the checkpoint, the author would coordinate an alert exercise time window and scenario with the Troop TOC. A 100-percent alert during the designated time window would be executed at the CP, with the Troop TOC providing intelligence updates to the CP as it executed the exercise. The CP would be defended accordingly for a specified time, requiring the soldiers to execute tasks ranging from casualty evacuation to conducting normal checkpoint traffic flow while at full alert. Following stand-down, normal CP operations resumed and an AAR was conducted. Soldier reaction time, proficiency of individual soldier skills, command and control discipline, and preparedness to defend the checkpoint greatly increased with the execution of no-notice alert exercises.

Direct fire target reference points (TRPs) and indirect fire targets should be close to Threat AAs for ease of identification during checkpoint defense operations or exercises. Quick identification of targets located around the checkpoint are vital to defensive operations, and should be reviewed daily by all personnel. A detailed sector sketch posted in key locations (i.e., at the entrance or exit of the soldiers' living quarters; in each sentinel shack, observation tower, or fighting position; and inside the turret of each vehicle) will continually serve as a reminder. However, the best approach is the constant question and answer sessions between leaders and their soldiers regarding checkpoint defense operations — every soldier must know the CP defense plan.

Random vehicle searches, hasty and deliberate, will ensure that local civilians and factional elements will not attempt to transport contraband through the checkpoint (or Zone of Separation). Vehicle searches often resulted in the confiscation of arms, ammunition, and explosives. Persons found to be violating the GFAP (General Framework Agreement for Peace) of the Dayton Peace Accord were dealt with in specified IFOR Rules Of Engagement. While the use of vehicle searches will not completely

eliminate transport of contraband, they will effectively disrupt the trafficking of such items which, in turn, will also reduce external threats to soldiers on the checkpoint.

If available, military police canine search teams attached to a checkpoint serve many purposes and can produce immediate results. Search dogs will find designated contraband items, such as explosives, weapons, or drugs, and use of canine search teams reinforces the vigilance and deadly force image projected at the checkpoint. One such GFAP offender was so intimidated by the sight of a canine search team that he voluntarily gave up his contraband (pistol and ammunition) prior to the dog searching his vehicle. Search dogs can also provide advanced notice of trouble — signaling the barrier security personnel of unseen explosives placed on a vehicle. Canine search units are an excellent asset for conducting checkpoint operations, and if available will directly contribute to mission success while providing an additional force protection measure.

Medical evacuation planning and execution is a critical task for checkpoint operations, and can often test leaders and soldiers alike. Detailed planning of medevac (ground or air) procedures for numerous situations, such as individual or vehicle mine injuries, must be addressed. CP medevac plans must be specific, detailed, and rehearsed on a regular basis. Medevac rehearsals at CP A2 were incorporated with CP alert exercises to ensure all personnel could execute their specified tasks, and someone else's, if needed. Restrictions and obstacles near the CP must be recognized and dealt with – for example, clearing vegetation or removing debris to support a helicopter landing zone. If activity surrounding the CP is too heavy to execute ground medevac or land a helicopter, then soldiers must know how to aeromedevac a casualty by hoist. During medevac or emergency situations, it is natural for checkpoint personnel to become focused on the immediate activity; however, leaders must ensure security and force protection are maintained.

Relief in place during checkpoint operations will not differ much from the same activity executed in the high intensity conflict (HIC) environment. Reliefs ideally should be conducted during periods of limited visibility and during periods of minimal activity near the checkpoint. A plan for relief must address specifically time, method, and sequence of relief; time of transfer of responsibility for the CP; actions on contact during relief; transfer of responsibility procedures; target handoff procedures; contingency plans for changes of mission, etc. Execution techniques of the relief will vary by unit, however, a RIP checklist will facilitate ease of transfer between units. During execution of the relief, normal CP operations must continue; A2 was unique in that it was large enough that the outgoing unit could reposition vehicles to alternate positions and still maintain assigned areas of surveillance as the relieving unit occupied primary vehicle fighting positions on the CP. RIP operations conducted on a regular basis between organic units can become very efficient, but leaders and soldiers alike should not take this for granted and downgrade security measures for speed of relief. The RIP checklist should specifically address the following: current "enemy situation" (factional military or police operations, civilian activity or disturbances, criminal activity, expected factional operations, etc.), changes to the CP defense plan (TRPs, indirect fire target numbers and locations, obstacles and barriers added or removed, etc.), changes in supporting units (fire support assets, civilian contracted elements, LOGPAC times or methods of resupply, etc.), changes to access rosters, updates on suspected criminals, etc.

"Regardless of the mission, commanders must protect their forces at all times. They must be ready to counter activity that could bring harm to their units or jeopardize the mission." (FM 100-5, *Operations*) In the low intensity conflict environment, peacekeeping missions will often include ambiguous situations which will require peacekeeping forces to deal with tense or violent situations without becoming participants — one of the keys to success must be the preventive measure called force protection. Force protection is more than wearing your Kevlar vest and full battle rattle, or traveling in a four-vehicle convoy; all are necessary measures taken by leaders at all levels to ensure that our soldiers are not unnecessarily injured or killed. In this environment, FP is a critical element of checkpoint operations and requires detailed planning and stringent execution.

This article is not all-inclusive regarding checkpoint operations, nor is it intended to be a doctrinal revelation. It is, however, intended to assist the scout platoon leader in planning, and executing, checkpoint operations, specifically addressing the important element of force protection. It is increasingly likely that the United States Army will continue to conduct stability operations throughout the world for years to come, and no matter the region, country or situation, force protection will be a major issue for every level of command, all the way to the platoon leader.

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1st Squadron, 1st U.S. Cavalry TACSOP

1LT Patrick R. Milligan previously served as M3A2 scout platoon leader of A Troop and assistant S3 with 1st Squadron, 1st Cavalry in Germany and Bosnia. He received a Regular Army commission in May 1995 as a finance officer, but was detailed to Armor. He recently attended Finance Officer Branch Qualification Course and is currently assigned to HHD, 39th Finance Battalion in Hanau, Germany, where he is the detachment executive officer. An ROTC Green to Gold Scholarship Recipient (2 year scholarship), he is a Distinguished Military Graduate of Austin Peay State University, Clarksville, Tenn. His prior enlisted service as an 11B and 19D (5 years) includes air assault squad leader, 3-502 INF, 101st Airborne (Air Assault) Division; HHT, 2d Squadron, 2d ACR, during Operation Desert Shield/Storm; and A Co., 2/4 INF, Neu-Ulm Germany. He has attended Armor Officer Basic Course, Scout Platoon Leaders Course, Airborne, and Air Assault Schools.

FCS *(Continued from Page 33)*

high-risk in development, but with leap-ahead *variable lethality* potential through hypervelocity, is chosen as the preferred main gun armament system for the FCS.

For demonstration purposes only, our *visionary* and conceptual EM gun is constructed of six 'barrels,' three are of 25mm, and the other three of 35mm (inner diameter) for two kinds of ammunition. Each 'barrel' is comprised of five equally spaced accelerating rails which also act as cooling fins to enhance heat dissipation. Only one barrel is firing at a time, and only one type of ammunition (25 or 35mm) is being fired in every burst. The multi-barrel assembly is enclosed in a stealthy rail support structure through which ambient air is forced for cooling. The anticipated controlled variable rate of fire is from 1 to 60 projectiles/min, depending on battle conditions and availability of targets, while optimizing and conserving energy. Obviously, it is highly dependent upon the rate of electrical consumption for firing projectiles and the cooling requirements of the barrels. There are two magazines (700/25mm and 400/35mm, caseless projectiles only) on each side of the gun and each separately stores one type of ammunition. Ammunition is fed directly from the magazines to the dual feed EM gun via mechanical 'twisters' that reorient the projectiles from their original outboard position in the magazine to align them with the firing direction. There is no need for any manual loading or an autoloader since the ammunition is fed directly from the magazines to the guns.

Granted, much research has yet to be performed to overcome the present limitations of EM guns before they reach a state of maturity. The EM gun will fire rounds at unequaled velocities, which will directly contribute to lethality. Without propellant case, EM rounds are much smaller, requiring less storage space, and therefore could be carried in greater quantities for extended firing operations. Because plasma containment and energy conversion efficiency tend to improve with bore diameter, it is possible that single, larger barrels with 90mm diameter will be used. The latter represents a major disadvantage in that the larger the diameter — the lower the ammunition complement, the heavier the gun, and the more difficult it is to reach higher velocities.

An interesting and promising 'spin-off' of EM technology is *EM Armor*.[5] It is still highly classified and in its infancy, but some initial reports indicate that steel plates that get 'energized' upon impact could form a unidirectional strong magnetic field that is capable of deflecting and attenuating shape-charged warheads (increasing survivability up to a factor of 10). If this is feasible, there is another major application for electrical energy available on board the FCS to assist in its protection against anti-armor threats.

***Note**: All information contained in this article was derived from open-sources and the analysis of the authors.*

Notes

[1]Major Held, B. J., "Tomorrow's Smart Tank Munitions," *ARMOR*, March-April 1995, p. 21.

[2]Lt. Colonel (Ret.) Boschma, J.H., "Smart Top Attack Weapons," *ARMOR*, September-October 1996, p. 8.

[3]*Defense Daily*, 20 November 1996, p. 285.

[4]Pengelley, R., "A New Era In Tank Main Armament - The Options Multiply," *INTERNATIONAL DEFENSE REVIEW*, 11/1989, p. 1521.

[5]Metzgar, T. L., "From Dreamworld To Realworld: Electromagnetic Guns," November/December A&DS/ 19, p. 41.

Mr. Lawrence D. Bacon is the Director of Graphic Arts at WDH where, for the past 18 years, he has been responsible for creating numerous concepts for automatic ammunition handling, loading and storage systems.

Dr. Asher H. Sharoni is the Director of Engineering at WDH. He holds a Sc.D. in Mechanical Engineering from MIT and a M.Sc. & B.Sc. in Mechanical and Industrial Engineering from the Technion, Israel Institute of Technology. Dr. Sharoni is a former colonel in the Israeli Defense Forces in which he was involved in various major armored weapons developments. Dr. Sharoni has accumulated more than 30 years of experience in armor design and production.

[6]Editorial, *"We Have a Winner!," ARMOR*, July-August 1993, p. 6.

***Western Design HOWDEN (WDH)** is a small defense company in Irvine, California, which specializes in the design, development and production of ammunition and material handling systems for the U.S. and international military markets. WDH's track record includes a variety of air, land, and seaborne weapon systems which require automated feed, resupply, and optimized ammunition packaging. WDH has been involved among others in the Tank Test Bed, AC-130 U Gunship, AH-64 Apache, and Tank Compact Autoloader Programs.*

ROAD MARCH PLANNING *(Continued from Page 9)*

jams, ROK units on unscheduled road marches, the occasional vehicle breakdown, and the occasional accident all serve to stress the C2 nodes as they maintain control of the march units. The C2 nodes use the road march table to track the actual progress of march units. Vehicles in need of assistance must report their locations accurately, so that the C2 nodes can vector in the support. Finally, accidents or incidents must be reported up immediately, so that the appropriate elements can take action.

In wartime, the road march would be further complicated by the increased traffic of other units, SOF activity along the route of march, and the increased number of elements in support of the task force. In wartime, units in Korea can expect to see from 8 to 12 divisions (3 mechanized and 6 to 9 motorized) in a 20km by 20km area.

Conclusion

The reward for good planning is a smooth road march, one in which lost vehicles, wrong turns, or traffic jams are nonexistent. Avoiding accidents, damage to equipment, and lost training time are well worth the effort required to plan coherently and completely.

CPT Don L. Willadsen is a 1991 graduate of the U.S. Military Academy. He served in 3/11 ACR in Bad Hersfeld, FRG, as a tank platoon leader. He served in 3-77 AR (now 1-33 AR) as an S3 LNO and company XO in Mannheim, FRG, and Fort Lewis, Wash., as a training officer in the DPTM at Fort Lewis, and S3/Air for 2-72 AR at Camp Casey, Korea. He is a graduate of ABN, AASLT, AOBC, SPLC, and CMOAC. He is currently the commander for D Company, 2-72 AR, at Camp Casey, Korea.

LETTERS *(Continued from Page 3)*

There are no refresher courses for the 19K or 19D like there are for the 11M, 11C, 11H, and the 11B. The Armor curriculum is geared more for the officer than the enlisted. I ask, why are there no courses related to the duties and tasks for a cavalry scout or a tank crewman? Why are there no courses for the NCOs to become more familiar or reinforce skills needed to lead and maintain the multi-million dollar equipment and vital manpower of the armored forces?

True, there is the PLDC Preparation Course, Infantry Weapons Specialist Course, Civil Disturbance Course, to mention a few available to Armor enlisted men without writing the school of origin permission to take and receive credit, or being told to just take the subcourses.

It would be nice to see the, "19D Cavalry Scout Course," "The Armored Crewman Refresher Course," and NCO refresher courses to the related fields. If need be, take courses from the other school areas of the Army Correspondence Course Program that are part of the METL or "skill tasks" and compile them into a course. Generate a new curriculum for the Armor enlisted soldiers so that they, too, can get knowledge, course credit, and promotion potential like the rest of the branches within the U.S. Army.

SGT WILLIAM C. BROWN
HHC, 1/118th Inf Bn
218th Inf Bde

How to Find a Friend

Dear Sir:

I'd like to pass along some good information for your readers about how to find your old military comrades on the Internet. Veterans with internet access can get help at the following website:

www.army.mil/vetinfo/vetloc.htm

Anyone who has an addition or correction to the site, or who would like to be listed as a point of contact may get in touch with Ben Myers, P.O. Box 6019, Lake Worth, FL 33466-6019, or email at:

Vet_Locator@prodigy.com

In addition, an index of web pages containing information about the military and military organizations is available at the following location:

www.army.mil

BEN MYERS
1SG Retired
Tanker/Cav

Battalion After Next *Cont'd. from Page 13*

battalion or the division as we can truly increase the situational awareness of the commanders and then do what philosophers of war have exhorted throughout the ages, get the right mix of force to the right/critical place on the battlefield at precisely the right time. Information systems can give us this edge in the next fight.

This downsizing does not overlook the requirement to train. Smaller is not better, better is better, to paraphrase GEN Sullivan, our retired CSA and a distinguished tanker. The current Chief of Armor wrote in an e-mail note to the CG of TRADOC, "Digital equipment doesn't make a digital force. The force must be well trained and experienced to be decisive." (MG Harmeyer Note to the CG TRADOC, 28 March 1997) We can concentrate on the task at hand, which is training ourselves and our troopers to take the maximum advantage of the digital equipment and information systems we have within our force. The tank battalion commander will have just tankers to train, and a higher leader-to-led ratio within the battalion.

Are there more changes possible due to our new abilities to focus battle command? There certainly are, and they should be the focus of other articles in this journal and other professional journals. For instance, the entire system of TOC/TAC/Rear/Command Group needs to be evaluated and streamlined for rapid decision-making and command and control at the brigade, division, and even corps level. Our staff system needs another look; after all, we've been using the French staff system since Black Jack Pershing adopted it in France in 1917. The focus of main effort for this journal right now needs to be, what should we, the armored force, look like in the Army after next?

An undated, unsigned e-mail forwarded all over the Army contained this impression of the Advanced Warfighting Experiment, "the results were much better than the pessimists expected and not quite as good as the optimists were hoping for. Under normal NTC rotation conditions, it would have been labeled a draw." (undated note off the Army e-mail, Subject: AWE at NTC) In my own experience against the OPFOR, a draw is not that bad, and considering that the fellows in COL Goedkoop's brigade had to spend time learning how to use the appliqué equipment and make sense of the systems, it reinforces the Chief of Armor's point that digital equipment does not a digital force make. We need to train and train hard. This, in itself, does not alter the fact that the potential for a real breakthrough in how we fight is just around the corner.

The focus on the size and purpose of our tank battalions is worthy of lots of chin stroking and deep thinking. Either we armored force officers do this, or the Beltway bandits and Armed Service Committee staffers will do it for us. I see the battalions of the future being the buildings blocks for the reinforced brigades of the future, which in turn will do what our divisions of today do. It will be a while, and our hair will be white, or in my case completely gone, before this transformation happens throughout the force. It may be that brigade commanders will be the big boys to aspire to be like — they will probably need to be brigadiers, with colonels as the XO/Dep Cdr, with subordinate battalions assigned as the mission dictates; sounds like the combat commands of the original Armored Force, doesn't it? In that kind of environment, the battalion's structure seems like a pretty big deal to me.

These have been one man's thoughts and musings, based on 20 years in our Armored Force. BG Chaffee, the father of the modern armored force, once said that the armored force is not only the tank, but all arms and services, with equal glory for all. We need to recapture that spirit and recast the Armored Force as THE force for the warfare of the information age. What do the rest of you think? If you don't write it, no one will ever know.

LTC Kevin C.M. Benson is currently the Chief of War Plans at Third U.S. Army. He served in armor and cavalry units in the United States and Germany, as the Chief of Plans of the XVIII Abn Corps, and as the Regimental Executive Officer of the 2d Armored Cavalry Regiment. He is a graduate of the Army Command and Staff College, and the School of Advanced Military Studies. He has been published in *Parameters, Military Review, Army,* and *Armor, Infantry,* and *Special Operations* journals.

"He's enough to restore your faith in the S2..."

Ralph Peters' Novels: More Than Just a Quick Read

Red Army (1989)

The War in 2020 (1991)

Twilight of Heroes (1997)

by Ralph Peters. Pocket Books, Inc., New York, N.Y.

Next time you're hanging around the Intermediate Staging Base, or standing in the commander's hatch waiting for the Sava River to drain, chances are good that you'll reach into your cargo pocket for whatever you grabbed at the PX before heading down to the motor pool. Tankers and cavalrymen have made millionaires out of Max Brand, Louis L'Amour, Stephen King, and Clive Cussler. Living cheek to jowl with three other guys for months on end can lead one to appreciate a few moments of solitude. After all, casual small talk is not too manly. But reading a good paperback? Well, any trooper could go for that.

Most of us do, and when we do, we reach for some brain junk food, like westerns, or detective novels, or spy books. But being soldiers, we often pick up something military in theme. There is no shortage of such stuff on the racks down at Wal-Mart. Most of it is pretty harmless, and some proves mildly informative in a professional sense. But if you're like many of us, you want something that's really useful, but not straight history, and not written like the -20 manual. What you want is a damn good military novel, real armored warrior stuff.

In that case, stick with fellow professionals. Some still swear by Tom Clancy, although he's approached the level of self-parody in his last few Jack Ryan novels. At bottom, brother Clancy remains a "wanna-be," an overweight former insurance salesman who pals around with high-ranking officers and has an inordinate interest in firearms and modern weaponry. Like Howard Cosell on Monday Night Football, he never played the game. Sometimes, it shows. You can't learn only by watching, folks.

No, if you want real Army stuff, stick to novels by real soldiers: Ed Ruggero, Harry Coyle, or Leonard Scott, among others. Best of all, check out the most gifted American military writer of them all, a lieutenant colonel of military intelligence named Ralph Peters. He's enough to restore your faith in the S2. If you haven't read Ralph Peters, you haven't read a good war book lately.

Peters has written numerous books and articles, but three of his novels in particular will appeal to tankers and cavalrymen of all ranks. They're all in paperback, and widely available. Taken as a trilogy, they trace the arc of our once and future Army.

For openers, try *Red Army*. This 1989 work describes the invasion of Western Europe. Back in the 1980s, such World War III books were all the rage. General Sir John Hackett, Brigadier Shelford Bidwell, and Tom Clancy, wrote three of the best. Peters turns the genre on its head and gives us a very honest, exciting, and (dare I say?) sympathetic portrayal of our Soviet enemies, a great armored army on the attack. The book is about people, warriors both like us and, yet, not like us at all. The hardware is in there, but in a Peters book, the tanks and guns remain tools, not stars. His wars, like real wars, are fought and won by men.

The stories in *Red Army* grip you. When you read the gruesome story of Major Bezarin's running tank gun battle in and among a panicked German refugee column, or follow an outnumbered air assault team's lonely, courageous stand at an encircled bridgehead, you cannot help but marvel that this massive juggernaut never did cross that well-patrolled border. Ever wondered how the big one would have turned out? *Red Army* offers one very sobering version.

The author also gives enough high-level insight to put the reader in the big picture. As long predicted, the Soviets in *Red Army* push their main effort through the North German Plain, smashing up the British and West Germans. The Americans down south make an appearance, but Peters does not dwell on their role. The Soviet soldiers, from motor rifleman to front commander, hold center stage. You can't help but admire them, even as you give thanks that this bloody war never happened.

Looking at *Red Army* almost ten years later, you see the American Army's past in stark relief. For more than forty years, our armor battalions and cavalry squadrons held the line against the Soviet mechanized hordes. To see what your regimental CSM or battalion commander means when he talks about the Cold War, and why it consumed us as an Army and a nation, read *Red Army*. Those are the guys we beat.

For a look at the uncertain, dangerous world of the present Army, look at Ralph Peters' 1997 effort, *Twilight of Heroes*. You won't find a tank in the book, but you will find a lot of great characters fighting an undeclared war on narcoterrorists in the badlands of Bolivia. The book is the story of a Cold Warrior in his final days, Colonel John Church. Named for the gaunt, overage-in-grade commander who succeeded to command of the 24th Infantry Division in 1950 after the North Koreans snared Major General Bill Dean, Peters' protagonist holds the line far from home. Church is the face of today's Army, outnumbered, out in the backwaters of the Third World, fighting phantom enemies who can kill you just as dead as any Soviet sabot round.

Church does not fight alone. Readers will recognize familiar faces, including a Commander-in-Chief of U.S. Southern Command who bears an uncanny resemblance to the Gulf War commanding general of the 24th Infantry Division (Mechanized). The bad guys come in several flavors, all drawn believably: drug dealers, elderly Nazis in hiding, and slick-tongued D.C. bureaucrats playing fast and loose with our lads out on the firing lane. At the climax of the book, with the Yankees encircled and desperate, armored troopers will find themselves wishing that Colonel Church and his comrades had a platoon of M1A2 Abrams tanks on hand. But in *Twilight of Heroes*, the Americans live by wits and character, not big guns. In an Army with a lot fewer tanks than any of us might wish, that's reality. Ralph Peters shows us the face of today's small, ugly wars.

Continued on Page 53

BOOKS

The Fighting Pattons by Brian M. Sobel, Praeger Publishers, Westport, Conn., 1997. 248 pages, $49.95.

While this book is about the Patton family, going back to an ancestor just before the Revolutionary War, the bulk of it is devoted to George S. Patton Jr. (III) of World War II fame, and to his son George S. Patton Jr. (IV). There are no fewer than five George Smith Pattons in the narrative, and the author is highly successful in keeping them clearly identified.

The portions devoted to GSP III are interesting, but I found essentially no new ground being broken here. I did wonder if Hammelburg would come up, and it did, but only briefly (for more detail, see *ARMOR* September-October 1996). Also, nothing particularly new was discussed regarding the motor vehicle accident that ultimately leads to Gen. Patton's death (see also *ARMOR* November-December 1995).

Most of the book is about GSP IV, and to his building an Army career independent of his father's reputation. Given the comparisons inevitably made, this is not an easy task. Great wars make great generals, and his father had WWII.

Yet GSP IV had no great war. He had terrible wars, the Korean War and Vietnam, but none that captured the imagination and support of the American people.

While he seems resistant to talking about his personal life, GSP IV does seem open about his military life, and is not reticent in discussing his lack of aptitude for his early schooling, describing himself as a "lousy student." He repeated his first year at West Point, as his father did. He graduates with the class of 1946.

After being in Germany, and Korea, he requests assignment to Vietnam and serves two tours there. He makes some penetrating observations about relations with the press and the public perception of the war in Vietnam.

He says a turning point was at Ap Bac in January 1963, where reporters had free run to see for themselves what was happening, only later to receive a briefing in which they were told things they knew were not accurate. He says we lost them at this point.

During an exchange with a captured North Vietnamese captain, Patton asks, in French, who is winning the war, and the captain replies, "you are," but then states that his side will win because the U.S. will tire of the war first. This is a good example of how well the enemy had gauged us, and equally how little we knew about the enemy.

Patton distills his experience into advice, and here underscores the importance of knowing the customs and background of the country where you are, and of your adversaries, and rightfully suggests that our deficiency in this regard hurt our effort in Vietnam.

He additionally stresses the importance of language training. His knowledge of French served him well in Vietnam, and he suggests that those now in school should consider learning Arabic.

During his second tour, Patton is commander of the 11th Armored Cavalry Regiment (Blackhorse). He says he was broken-hearted when our troops left Vietnam, and it was a low point for the Army.

GSP IV refers to Creighton Abrams as his mentor, and serves with him often. During Patton's first tour in Germany, when he failed to move his tanks off the road fast enough, Abrams punches him in the face and knocks him to the ground. Later, Abrams gives Patton the opportunity to press charges, but Patton quickly refuses. They are portrayed as life-long friends, and when Abrams is Chief of Staff of the Army and dies in office, Patton serves as a pallbearer at his funeral.

One of the great accomplishments of Patton and other professional soldiers in the 1970s is that they held things together during a time of great turmoil. For example, upon a return tour to Germany as assistant division commander of the 4th Armored Division, Patton has to deal with drug and alcohol abuse among troops, racial unrest, run-down facilities, and low morale among short-timers who had just come from Vietnam. There are bomb threats to the division, and Patton personally receives multiple death threats.

Though wounded in Vietnam, and then suffering a broken hip in Germany which almost results in early retirement, Patton serves five more years, which includes being assistant commandant of the Armor School and CG of the 2nd Armored Division, the first time a father and son commanded the same division. Following this, when Patton is given a posting he objects to, his career does suffer, and he describes being eased out of the Army. His departure from service is a painful sequence. Rather than select a retirement ceremony with the 2nd Armored Division, he chooses instead to retire at the monthly ceremony at Fort Knox. It is a quiet way to end a 34-year career, and he leaves as a Major General in 1980.

In reading the book, I frequently wondered what Patton's rank was when he went to new assignments. The information was eventually forthcoming, but I wanted to know it right away. It is also not clear whether Patton IV starts out as an Armor officer or Infantry officer. After West Point, he attends the basic officers course at Fort Benning, so Infantry is the assumption.

Some of the references to mystical experience and reincarnation were a bit disconcerting, but GSP IV states that for a long time he thought everyone believed in reincarnation just as his family did. One sequence I did find particularly moving was his father's prediction of his own impending death, and his farewell to his family. There are eleven photos, including two of GSP IV with his father and two with Abrams. There is also a useful index. An efficiency report and other personal appraisals of Patton are referenced in great detail, which makes a reader wonder, why not just a sentence? Perhaps Patton wanted to get these ratings on the record.

This is not a broad view of the man – there are no quotes from detractors, no countering opinions, which on the surface seems strange, since the book is not written by Patton but by someone else. However, this lack of bad news does not make the book any less valuable, or less believable for that matter; it is simply Patton's story told mainly through author Sobel. While a bit pricey, military readers will find this book a good read that can be finished in three or four nights. Even if you do not have a strong interest in the Patton family, the portions of the book on Vietnam alone and Patton's observations on the war make it worthwhile. Patton IV leads a full and remarkable life, and this review has only scratched the surface. General Patton now operates the family's Green Meadows Farm in Massachusetts.

Is this book successful in developing an image of GSP IV that keeps him separate from his father's accomplishments? I remember GSP IV from the mid-1960s, when he was an LTC and I was a lieutenant, and we both lived in the Newgarden BOQ at Fort Knox. To me at that time, he was the son of Gen. George S. Patton Jr. of World War II fame.

Now I view him in a different way, as MG Patton who served our country in hard places during difficult times, and whose father also happens to be a famous WW II general.

PAUL S. MEYER
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Former USAARMS Information
Officer and Armor School Historian

NOTE: If not available at a bookstore, the publishers note that credit card orders may be placed by calling 1-800-225-5800.

The Storm Of Steel - From the Diary of a German Storm Troop Officer on the Western Front by Ernst Junger, New York, NY: Howard Fertig, Inc., 1996. (Reprint of London: Chatto and Windus, Inc., 1929) ISBN 0-86527-423-1. 319 pages, $13.95 (paperback).

Once a generation, a battle-hardened soldier tells a tale so encompassing and descriptive that it chills the reader to the bone even decades after the smoke has cleared. In *The Storm of Steel*, Ernst Junger captivates the reader as he vividly and thoroughly recounts all the horrors and frightening realities of trench warfare on the Western Front, 1914-1918. From the stench of rotting corpses to the incessant drumming of artillery fire, from the blur of the night flares to the foul grit of lice and trench foot, Junger brings the reader along through a four-year odyssey as a platoon leader and company commander in the unbelievable savagery. This is a gripping, hor-

rific, and fantastic story of leadership and selfless service.

Not unlike Guy Sajer in *The Forgotten Soldier*, Junger struggles to understand why fate has brought him to such a grim existence. He relates how: "I learned from this four years' schooling in force... that life has no depth of meaning except when it is pledged for an ideal, and that there are ideals in comparison with which the life of an individual and even of a people have no weight." (316) He writes of how he seemingly traded his youth for the higher ideals of Germany and how war is largely an inner, existential experience.

Against this powerful theme, Junger relates many amusing anecdotes of a soldier in a foreign land. He describes his relationship with a young French girl; remembers the late night card games in the trenches; and even describes how he and several of his cronies happened across some red wine, got drunk, and almost walked into a British dugout by accident. Throughout the book, Junger expresses his admiration for the British Tommy, whom he regards as a most formidable foe. He continually praises the bravery and skills of his enlisted soldiers and holds them in close affection. During the Battle of Cambrai, he comes across his younger brother, Fritz, who was wounded; here he takes excerpts from both of their diaries to illustrate the fury of battle.

He continually expresses his anger toward the generals for the stupidity and bloodshed of trench warfare: "I cherished the firm suspicion that this operation had been ordered from the rear and by map, for it could not have occurred to anyone who had seen the lie of the land to give such orders as these" (292); then he becomes an ardent supporter of the new infiltration (von Hutier) tactics. He asserts the need for constant rehearsals, retraining, and reconnaissance before any mission. Junger also places leadership from the front as a tenet of success. Junger was wounded 14 times and received every medal for valor that his country gave, to include the *Pour le merite* after the Battle of Amiens.

Despite the historical significance and firsthand account of the Great War, I believe this work has relevance today for two reasons. First, like Junger, we are faced with changes due to improved technology. Yet it is still the *soldiers* at the small unit level that must apply the new technology in order to succeed. There is no substitute for experience, rehearsals, and leadership from the front. Junger addresses this as he retrains and drills his soldiers on the new system of infiltration tactics. Second, in light of the new technologies, many of the lessons Junger discusses are timeless. Basic troop leading procedures and care for the soldier have not changed very much since Junger's time and his thoughts on them have much relevance today. These are universally treasured lessons that all soldiers should ponder and exercise.

Also worthy of mention, as this book went to paperback print in October 1996, Ernst Junger was still alive in Germany at 101 years old. After a brief stint in the Freikorps, he left the German Army in 1923 to become a writer. *The Storm of Steel* was originally published in English in 1929 in London, with Junger doing his own translation.

This is truly a superb work, and every professional soldier will find value in it.

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Patton's Tank Drive, D-Day to Victory by Michael Green. Motorbooks International, Osceola, Wis., 1995, 160 pages, $19.95 (paperback).

Patton's Tank Drive starts with a brief overview of Patton's early military career. The development of armored vehicles within the U.S. Army following World War I is covered with some mention of Patton's role in training tank units. The book then leaps forward to Patton's involvement in North Africa during World War II. The book continues, covering Patton's role through Sicily, France, the Battle of the Bulge, and his march across Germany. It concludes with Patton's "Postwar Thoughts" and finally, his death.

The most striking feature about *Patton's Tank Drive* is that it is primarily a picture book. Much to the author's credit, he cautions readers at the beginning that it consists mostly of photogrpahs for entertainment. Overall, there is very little text, but the photographs are outstanding. Those familiar with the Patton Museum in Fort Knox will recognize many of the photographs. Some of Patton's letters and his better known speeches to the troops are included as well. There is an ample amount of information relating to the development of the armored fighting force, although much of it does not necessarily involve Patton.

One small annoyance is the captions seldom match the photographs they accompany, and even rarer do they correspond with the subject of the author's text. Typically, the captions cover a story or individual soldier's experience completely unrelated to the photograph. However, the information in the captions is interesting even if incongruent with the text or photograph. I did find the wartime reports and the after action reviews particularly interesting.

For those interested in a photographic history of Patton and the tank, it is an enjoyable book. If you want a good picture book on tanks, or a memorable souvenir of the Patton Museum, then I highly recommend *Patton's Tank Drive.* However, those seeking something more in-depth involving Patton or his World War II campaigns may be surprised or disappointed.

JOHN MURPHEY
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Ralph Peters' Novels

(Continued from page 51)

But what about the future? Peters has written about that, too. By far his darkest, most depressing work, *The War in 2020* offers, in Peters' own words, "a book about nightmares." Do you ever wonder what might happen if everything really went to hell? Peters has, and his 1991 novel serves up a pretty grim scenario. Even so, the author presents his usual stress on character and people, not things. The future may be bleak, but the U.S. Army is still in there swinging, just the way we'd want it.

The world of 2020 is an even bigger mess than most of us could imagine. A remilitarized Japanese state stands opposed to an exhausted America. Arming and assisting unsavory allies, including intransigent Iranians and other bellicose Central Asian powers, the Japanese unleash their high-technology war machine on the rotting corpse of Russia, half-heartedly re-Communized following an aborted fling at democracy. It is the Russian Civil War of 1917-20 again. This time, though, the United States helps the enfeebled Reds.

Leading the small but potent American expeditionary force, Colonel George Taylor's 7th Cavalry Regiment brings into play a true wonder weapon. America's last major Army unit, the 7th relies on the new M-100 "Flying Frog," a sort of armed V-22 Osprey tiltrotor aircraft on steroids. The M-100s are chocked to the gills with stealth capability, jammers, and an unerring electromagnetic gun, not to mention great cavalry troopers. Guided by the brilliant intelligence analysts and collectors of the 10th Cavalry Regiment, Taylor's 7th joins with the ramshackle Soviets to try to stop the powerful Japanese and their numerous fanatical friends. If Force XXI ever goes to war, will it look like this, great flying cavalry raids spanning near-continental distances?

The War in 2020 strikes the reader as visionary, exciting, and disturbing, all at the same time. For a country enjoying a peace dividend, busily carving up the remnants of our Cold War armed forces, Peters provides a wake-up call. Peace is not at hand, now or in the future. And when the great war comes, in 2002 or 2020, our Army will be only as good as its mounted arm of decision.

This, then, is Ralph Peters' contribution: three well-written military novels guaranteed to interest and challenge all professional soldiers. Peters clearly understands the art of soldiering, and that shines through on every page. He has made the best use possible of his own military experience. The books ring true because the author has been there. He has marched in our boots, and is marching still. Shove a Peters novel in your cargo pocket next time. You won't regret it.

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The Weekly 10% Inventory System

by First Lieutenant James E. Warder

Although a sub-hand receipt holder, a tank platoon leader is responsible for the accountability of millions of dollars worth of equipment. Unfortunately, he often discovers critical equipment is missing or unserviceable during such inopportune times as pre-combat inspections, command directed inventories, or during missions. To help circumvent this problem at the company or troop level, a commander uses a monthly 10% inventory to track his property and keep hand receipts accurate. A similar concept, weekly platoon 10% inventories, is an excellent way for a platoon leader to manage property accountability and increase the overall readiness of his platoon's equipment.

A weekly 10% system does not require a significant investment of time. With major end items, basic issue items, and organizational property, a typical tank platoon leader signs for approximately 120 different items. Thus, to quarterly inspect all property, the 10% system requires a 12-item layout per week. Compared with a 100% inventory, which usually requires three to four hours, inventorying 12 items demands only about 15 minutes per week. Requiring only this short time allows the platoon leadership to schedule the inventory when it will not interfere with other field or garrison training.

The weekly 10% system is very flexible. The platoon leader can tailor what property he will inventory, based upon upcoming mission requirements, concern over the condition of property, or a need to initiate supply action. Not only is the inventory flexible in its content, but also in its method. By providing the platoon the inventory list just prior to the layout, the platoon leader can spot-check how well junior leaders are maintaining their equipment. If he distributes the inventory list in advance, the platoon leader's subordinates will most likely pre-inspect and service the equipment prior to the layout. Both methods of inspection serve a different, but equally valuable, purpose.

Property List for Weekly 10%

NOMENCLATURE	NSN	AUT QTY	DATE INV
Adapter, Socket 3/4 to 1/2	5120-01-123-2645	4	
Anderson Device	1005-01-203-7442	2	
Ax	5110-00-293-2336	4	
Bag, Tool	5140-00-473-6256	4	
Bar, Crow	5120-00-240-6040	4	
Bar, Pinch	5120-00-526-6044	4	
Bar, Pry	5120-00-224-1389	4	
Binocular, M19	1240-00-930-3833	2	

Figure 2. Portion of Property List

Designing and implementing a weekly platoon 10% inventory system is simple and can be utilized in garrison or in the field. The only requirement is a copy of the platoon hand receipt and some variation of an inspection checklist. An easy and convenient way to organize the system is to use a desktop spreadsheet program. One spreadsheet contains a list of all property organized by nomenclature, NSN, and date of last inventory. Another spreadsheet is a template for an inspection checklist. A simple cut and paste operation from the property list to the inspection checklist makes it easy to prepare the paperwork for the layout and track the dates of when the platoon last inventoried the property. A sample Microsoft Excel property list and inspection checklist (based on one unit's MTOE) is available for download and modification on the *ARMOR* home page.

PLATOON WEEKLY 10% INSPECTION CHECKLIST
Date:

ITEM NOMENCLATURE	NSN	AUT QTY	ON HAND	Tank 1	Tank 2	Tank 3	Tank 4
			TC Initials				

NOTES:

KEY
1 - 1 item present and serviceable
S - On Shortage Annex
T - Turn-in Document
U - Unserviceable
X - Not Accounted For

Figure 1. Sample Inspection List

When used faithfully and in conjunction with periodic 100% layouts, commander's monthly 10% inventories, and proper pre-combat inspections, a weekly platoon 10% inventory system enhances a platoon leader's property accountability program. This system fosters a healthy emphasis on property accountability for all leaders and soldiers in the platoon and increases the unit's overall readiness.

1LT James Warder is a 1995 graduate of the U.S. Military Academy. He served as tank platoon leader in B Company, 1-33 Armor, 2d ID for 19 months. Currently, he is the scout platoon leader of 1-33 Armor. His military education includes ABN, MWS, and AOBC.

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