ARMOR

Mech Infantry and the M113: Still Potent in Contingency Ops   pg. 6

First With The Most

So now we will have ten divisions. And while I can intellectually grasp the economic and political rationale for the shrinkage of the force, I must admit that seeing some of those special colors furled will, in many ways, be like saying good-bye to an old friend — one who saw us through war in Europe, Korea, Vietnam, and the assorted flame-ups of the 80s and 90s. Whatever shall become of the streamers, flags, plaques, awards, and memorabilia of the units that cease to be? Will the history and heritage of illustrious fighting organizations simply fade away? Will the proud past be relegated to a dusty, little-used volume on some library shelf? I certainly hope not. For when soldiers are taught the lineage and record of their unit, they are better soldiers because they have a historical and cultural investment in that unit. Armor and Cavalry troopers tend to be a particularly nostalgic crowd, taking pride in past accomplishments and training to surpass the record in future efforts.

But the problem for the leadership in the late 90s and beyond will be one of determining which lineage to teach. The myriad of deactivations, reorganizations, and reflagging actions leaves a serpentine trail of crossed branches, blended battle histories, and competing heroes. I fear that sorting out the mess will be too much trouble for some leaders, denying soldiers a true sense of heritage in their new organizations. Such ambiguity and turbulence may constitute a small but important aspect of what W.D. Henderson warned us about in his 1990 book, *The Hollow Army.*
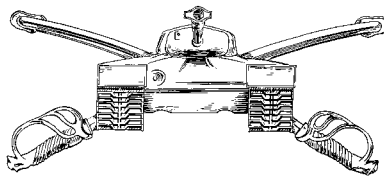
"The continual long-term decrease in soldier commitment to unit and Army values that occurs from the relative high reached by soldiers in basic training is a strong indication that the Army has not developed strong units and well-integrated, long-term soldier-leader relationships. Instead the Army has drifted into an organizational mode characterized by leadership and personnel procedures that result in nascent or turbulent organization at the troop level, which makes the development and sustainment of strong, well-led units very difficult."

I challenge leaders at all levels to recognize the importance of maintaining and teaching unit history to young soldiers. In some instances of reflagging, it will take research effort to reestablish the martial trail; but it can pay off in commitment to the unit. As some flags are cased, others will be uncased or expanded to new locations. Take the time in officer and noncommissioned officer professional development to make soldiers aware of the special entity of which they are now a part.
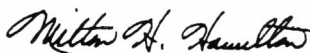
In the Bible, the Apostle Paul talks about being "surrounded by so great a cloud of witnesses," and I somehow believe that battle-tested soldiers in Valhalla, or Fiddler's Green, or wherever, may be watching us to see what kind of stewards of history we will become.

— J.D. Brewer

By Order of the Secretary of the Army:

GORDON R. SULLIVAN
General, United States Army
Chief of Staff

Official:

MILTON H. HAMILTON
Administrative Assistant to the
Secretary of the Army

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ARMOR

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Features

Departments

LETTERS

Improving Reserve Training

Dear Sir:

I was extremely interested in the article, "The Reserve Tank Company Organizational Readiness Exercise," by 1LT John A. Conklin in your last issue, since my unit recently completed an ORE cycle.

I would like to agree with his suggestion of each company-sized unit having a fairly large training area for their use. As a driver, I do not get enough time driving a tank to be very proficient. Having a nearby area available would assist units, like my own, in sharpening their maneuvering skills. This would also increase the hands-on training that makes being a member of a Reserve Component armor unit fun. Quality training that is useful and fun is good for morale and retention.

It would be outstanding if we were able to attend many active duty schools. I, myself, would love to go to several schools, but the funding does not seem to be available for this. We usually have to settle for correspondence courses, which I feel do not replace the actual classroom setting.

1LT Conklin mentioned giving units money to contract with local health clubs and require that the soldiers participate in a physical training program. One thing to take into consideration is that many of your soldiers do not live in or near the cities where their units are located. Many travel several hours. Some live in rural areas with the nearest club more than an hour away. This would present a problem with the suggestion, but the main idea is an extremely valid one. Many Reserve Component soldiers do not meet the standards for physical fitness, and something must definitely be done. When it comes to P.T., often the question is not "what did you score," it is "did you pass?"

Regarding the idea that E5s and above should attend an additional MUTA-4 every

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ARMOR Editorial Offices

Editor-in-Chief Major J. D. Brewer	2249
Managing Editor Jon T. Clemens	2249
Editorial Assistant Vivian Thompson	2610
Production Assistant Mary Hager	2610
Staff Illustrator Mr. Jody Harmon	2610

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

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month for gunnery training and other activities — you have to realize that being a citizen soldier is a part-time job. This would be asking a person to give up two weekends a month for the Guard or Reserves. Sometimes the weekend is the only time some of these soldiers have off from their jobs. This would probably cause many good soldiers to "burn out," rather quickly, which is not good for retention.

Of course, we do want to improve the quality of our Reserve units, but we must remember that Reserve Component soldiers are serving their country part-time. Let's not take more family and leisure time away from them. But we should be providing them with the best training opportunities possible.

JEFFREY J. THOMAS
PFC, WIARNG
B-1/632 Armor

ROTC Is Not "Soft Duty"

Dear Sir:

I found many of the points in Major Morrison's "Armor Officer 2000" article (Sep-Oct 94) to be right on target (i.e. combining CAS[3] and the Advanced Course, two-year command tours, and rotation between operations and logistics in staff assignments).

I take exception to Major Morrison's inference that ROTC duty is somehow a less important assignment or is less vital to the Army than other assignments. Major Morrison's belief that an officer "qualified to command, but not a tactical unit" could be recommended for an "assignment as an ROTC or recruiting company commander or a transfer to the Reserve for continued training and development," is not only insulting to the 1,166 officers assigned to Cadet Command, it ignores the fact that the vast majority of officers within the Command are branch-qualified, having commanded units at almost every level.

I am not sure that Major Morrison fully understands the role Cadet Command plays in leader development. Currently, Cadet Command provides 67-78 percent of the active-duty officer accessions to the Army. We cannot do this without the wholehearted support of professional armor officers who recruit, train, retain, and commission the future officer leadership of the Army. I can think of few better opportunities to influence the future of the Army than service in an ROTC detachment. For Major Morrison to imply that this is somehow an assignment for officers unfit to command tactical units directly refutes the emphasis the senior leadership of the Army is placing on protecting leader development in the face of ongoing Army drawdowns.

This article merely reflects a perception I have encountered many times throughout the Army — that ROTC duty is "soft-duty" or that ROTC cadre are below-average officers. Nothing could be farther from the truth! The high-quality young officers we produce for our Army is a direct reflection of the quality of our cadre on over 300 campuses across the country. I have personally valued my time in Cadet Command and the opportunities I have had to influence outstanding young men and women toward service to the Nation. I hope that other Armor officers recognize this unique opportunity to contribute to our Army's future.

MARK G. EDGREN
CPT, Armor
U.S. Army Cadet Command

Enough Jobs to Go Around?

Dear Sir:

I am writing in reference to MAJ Douglas J. Morrison's article in the September-October 1994 issue of *ARMOR* ("Armor Officer 2000"). MAJ Morrison makes some very valid points about the professional development of company-grade officers and his suggestions for changes to career progression sound like the right path to take. I was fortunate enough to serve two years as a platoon leader and one year as a tank company XO during my first tour in Germany. The troop experience has proven invaluable to me and has had a positive influence during my first year in command. While MAJ Morrison's suggested career path for company-grade officers sounds great, I have questions about its feasibility.

One stumbling block is the availability of XO and specialty platoon leader positions in tank battalions and cavalry squadrons. With 12 tank platoon leaders and only eight XO/specialty platoon positions (in a tank battalion), it would be difficult to give every lieutenant two years in such an assignment. Another obstacle is the ever-present need to fill staff jobs with lieutenants due to shortages of captains. We all know that lieutenants will be needed to fill assistant and even primary staff positions, unless we can actually get enough captains to fill all these positions in all tank battalions and cavalry squadrons. That is not likely to happen soon.

I whole-heartedly agree with MAJ Morrison that CAS[3] should follow AOAC. Even better is the suggestion to combine the two. Most of the instruction in AOAC is geared toward staff training and spent in small group instruction, and combining the two would save the Army considerably. In this day of shrinking budgets, every dollar

saved is precious. Usually, when a captain attends CAS[3] he has already had command and is enroute to an assignment away from tactical units.

Regarding the suggestion that every advanced course graduate serve one year in an operational staff assignment, followed by a logistical staff assignment at the battalion/squadron or brigade level, I again question the feasibility of such a policy. Are there enough jobs to go around? I would also question the ability to keep officers in these positions for the suggested time limits. There will always be the command that comes open early due to relief, functional area assignments, schooling, and other causes common to battalions/squadrons today. I agree that officers must understand both the logistical and operational sides of our profession, and if we could train all company-grade officers in both applications, we would be an even stronger organization than we are now.

What MAJ Morrison's article suggests is the "perfect solution" for training company grade officers. But the Army isn't perfect, and what he proposes would be next to impossible to execute. Personally, I would love to see these changes made to our professional development system, but I'm not holding my breath. Hopefully, MAJ Morrison's article stirred as much interest with the Personnel Management folks as it has with me. As a 41 designee, I would like to hear MAJ Morrison's (or anyone else's) ideas on how we could make such a system work.

CLIFFORD E. WHEELER
CPT, Armor
3-66 Armor, 2AD
Ft. Hood, Texas

Why Cav Changed in the '70s

Dear Sir:

BG (Ret.) Philip Bolte's article in the September-October 1994 issue, "Full Circle: The Armored Cavalry Platoon," is square on target, no adjustment needed for the second round. As the Director, Combat Developments, the Armor Center, during the mid 1970s to the early 1980s, I was involved in the elimination of the combined arms type cavalry platoon. BG Bolte's subjective reasons for the Armor Center's position for change were influencing factors. However, one major driving force of the studies was obsolete performance equipment available for that platoon as projected into the 1980s-1990s period when tank battalions and mechanized infantry battalions would be equipped with the M1 and the M2.

MG Larry R. Jordan
Commanding General
U.S. Army Armor Center

Battle Command Vehicle:
Command Post for the 21st Century

One topic that will often elicit intense and differing views among mounted warriors is that of the proper vehicle for the commander. In the past, the debate has raged over whether a tank, a personnel carrier, or some other platform best suited the requirement. I am of the opinion that commanders, particularly at brigade and above, will choose a platform based on their command style and the factors present on the battlefield. However, the capabilities provided by the Information Age, and the corresponding impact on the way we conduct operations, will dictate functional characteristics of the leader's battle command vehicle, regardless of what specific platform it is based upon. Digitization of the battlefield not only influences the C^3 design of the vehicle, but also the entire concept of command posts and battle staffs.

The battle command vehicle concept envisions a suite of digital communications capabilities consisting of situational awareness displays, the ability to pull intelligence and other data on-demand, the capability to broadcast and receive graphics, imagery, and information, and finally, automated decision support aids to assist in rapidly synthesizing information and developing options. This suite should prove adaptable to numerous platforms — tanks, infantry fighting vehicles, aircraft, and others. It must also be compatible with the capabilities being planned for dismounted elements under the 21st Century Land Warrior concept. In this way, seamless battle command can be achieved, and commanders may use the platform most suited to their mission, battlefield conditions, or command style.

Such a C^3 capability would enable the commander to truly conduct high-tempo, continuous operations. More than that, if provided to the battle staff, it would give the staff unprecedented real-time information, and the capability to do rapid, continuous planning. These capabilities could fundamentally alter the size, composition, and operational concept for battle staffs and command posts. The commander's BCV, with one or more assistants aboard, could perform the function of the current TAC command post. A very small battle staff mounted in a platform with similar or expanded capabilities could replace the current TOC, with its relatively large number of vehicles and personnel. All C^3 functions within a task force or brigade across all of the battlefield operating systems might be conducted from a single battle staff or command and control vehicle (C^2V). Synchronization of maneuver, fires, logistics, and the like would be assured to an unprecedented degree.

By leveraging the power of technology to automate appropriate tasks, the smaller battle staff is provided the time, information, and capability to operate at a greater tempo and higher level of detail, but with fewer manpower resources. In short, the battle staff would consist of electronic data collectors and sorters, and human decision-makers.

A task force or brigade might have two or more C^2Vs, so that one could be conducting the current fight, while the others plan future operations or rest. Such command posts would be more survivable due to their reduced size, mobility, redundancy, and adaptability to a variety of platforms.

As we work to equip Force XXI, the question is not what vehicle the commander should ride, but rather what changes will be brought about in doctrine, tactics, organization, and training as a result. The battle command vehicle concept and a fundamental adjustment of command post structure and function may be one of the most significant outcomes. The purpose of the BCV and other applications of technology is to enable us to have better informed and more capable commanders. Better leaders and soldiers, not more sophisticated equipment, will make the greatest difference. In the end, commanders will not command from "the screen." Most of their time will be spent in the hatch or talking face-to-face with other commanders. The fine balance between the personal aspects of command and "systems" must be maintained. A good commander will always put his personal touch at the decisive point.

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

What You Can Expect From an OSUT Graduate

This is the first in a series of articles detailing the institutional education we provide here at the Armor School, specifically for Armor and Cavalry soldiers. As you may already know, scouts and tankers start and return here for most of their formal military education. I'll be your guide through the various courses, weaving our way through until we reach the final goal of each course: Graduating a technically and doctrinally proficient soldier/leader. In this fashion, I believe everyone will understand how our dollars are being spent, what is being taught, and what to expect when the soldiers arrive at your orderly room. See you on the high ground!

The United States Army undoubtedly has the best trained, most combat ready Armor units in the world today. Since the first American Cavalrymen mounted their horses to the most recent combined arms deployments, we have continually improved the training that prepares our soldiers and units for combat. Our ability to develop combat skills in the individual soldier forms the roots upon which readiness thrives.

While collective training is equally essential, we cannot accomplish it without a firm foundation of individual skills. Preparing Armor Crewmen and Cavalry Scouts for combat and success in the Army is a shared task. It begins

in 19K and 19D One Station Unit Training and continues throughout the soldier's enlistment. Institutional training, attentive leadership, and experience interact to hone our soldiers into effective unit members.

Armor Crewman and Cavalry Scout training begins at the 1st Armor Training Brigade, Fort Knox, Kentucky. Three battalions within the brigade, 5-15 Cavalry, 2-13 Armor, and 1-81 Armor, conduct One Station Unit Training (OSUT) for all Armor Crewmen and Cavalry Scouts in the United States Army. In OSUT, we focus on providing training that will ensure each graduate can accomplish basic soldier tasks and can function as a Skill Level 1 loader, observer, or driver. Both the Armor Crewman and Cavalry Scout Programs of Instruction (POI) provide demanding training within a relatively short period of time. Drill sergeants and tank/track commanders/instructors assigned to the training battalions, as well as subject matter experts from 3-81 Armor (also in the 1st Armor Training Brigade), combine their efforts to teach and sharpen these essential skills.

The development of the discipline, motivation, and commitment starts the first day of OSUT. Soldierization is a tough, comprehensive process that transforms civilians into soldiers, and this soldierization process is the com-

mon thread that permeates all OSUT training. During the first eight weeks of OSUT, we focus our training on basic soldier skills. This instruction encompasses a wide variety of tasks that prepare Armor Crewmen and Cavalry Scouts for military life and teach them the essential skills necessary to survive on the battlefield. While basic skills are the major thrust during the initial two months, we also begin to introduce our soldiers to their MOS-specific training.

Throughout both the 19D and 19K POIs, we provide instruction and establish competence in 14 different areas, ranging from general military subjects to the situational training exercise (STX). Within these 14 areas, we teach them how to qualify with their individual weapon, ensure that they meet the Army standard on the APFT, and instruct them on basic first aid, NBC, and individual tactical training. For OSUT Armor Crewmen and Cavalry Scouts, the primary difference between their programs exists in what training they receive on their respective vehicles and what they do during their STXs.

Within the 15-week 19D POI, we begin Bradley/HMMWV training in Week 3. From Week 3 through Week 15, we provide the 19D Cavalry Scout

M113s Maximize Mechanized Infantry Mobility and Firepower in Contingency Ops

by Mike Sparks

Talk is underway about converting the infantry units in the Enhanced Readiness 30th Mechanized Infantry Brigade ("Old Hickory") of the North Carolina U.S. Army National Guard from the M113A3 Armored Personnel Carrier (APC) to the M2 Bradley Infantry Fighting Vehicle (IFV). The intent is to improve combat capabilities to meet the unit's new strategic mission in the "Total Force." This conversion may also be made in other enhanced readiness mechanized infantry brigades in the U.S. Army National Guard.

Getting rid of all M113A3 infantry battalions in favor of M2 IFV units would be a serious mistake. Some of the M113A3's capabilities have yet to be fully exploited, and there are still nagging flaws in the M2. Moreover, future world conflicts will require infantry that is more rapidly deployable — and situation/terrain flexible — than units equipped with the M2 Bradley can be. We would be wise to keep at least one mechanized infantry battalion equipped with M113A3s — fully enhanced to be "Super M113A3s" — in order to meet the demands of modern, nonlinear combat.

COMPARISONS: M113A3 and M2

STRATEGIC MOBILITY

The M113A3 (22,000 lbs) can be easily airdropped from available C-130s ("H" models can carry 42,000 lbs), while the M2 is too heavy (basic A1 model is 49,138 lbs combat-loaded) and too large to be airdropped from any USAF aircraft except the new C-17. Only the C-17's rear ramp is high enough for an M2, rigged to an airdrop platform, to exit. In the past, the XVIII Airborne Corps has used several older-model M113A2s as Dragon Brigade headquarters vehicles.

M113A3s can be moved rapidly and easily to world conflicts in C-130s. The M2 is too heavy for this, and requires C-5Bs or structurally failing C-141Bs
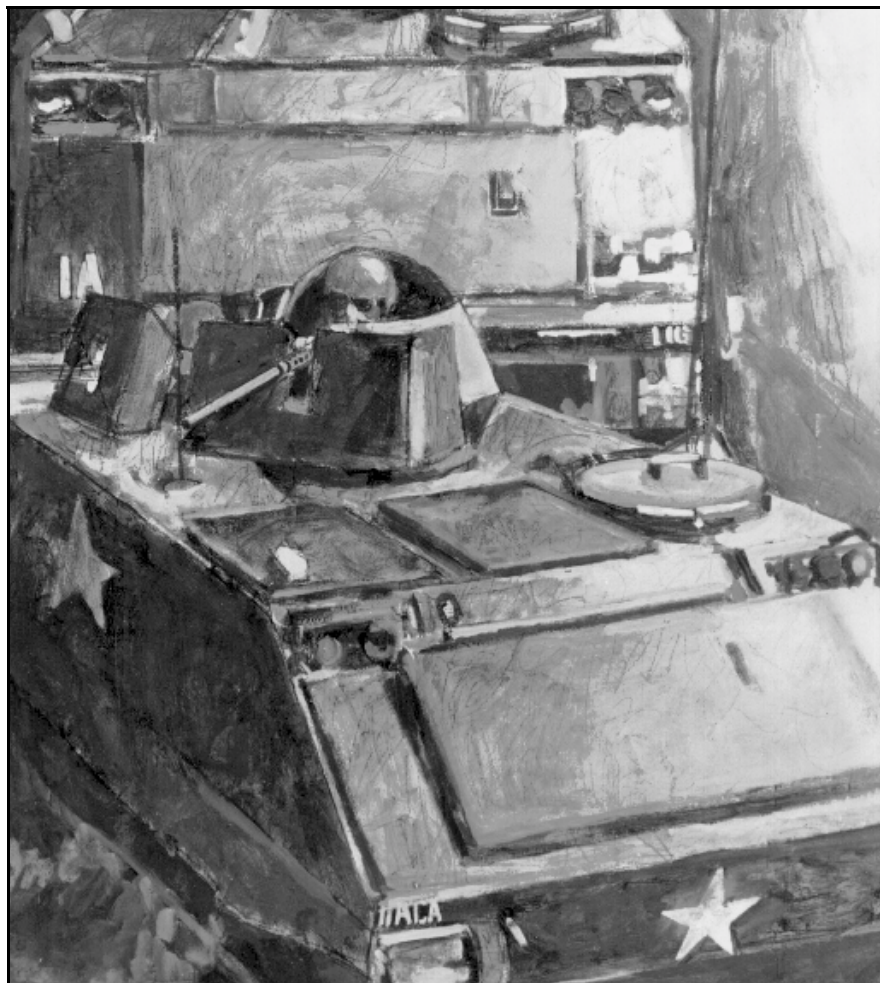
Troopers of the 11th Armored Cavalry mount a search operation in Vietnam using ACAV versions of the M113. These included armored gun shields for the .50-caliber heavy machine gun and the side-mounted medium machine guns. The painting, by contemporary soldier-artist PFC Philip W. Jones, was selected in a soldier-art competition at the time.

for air transport. Currently, there is not enough airlift to speed a large M2 force to a distant world trouble spot. In the Entebbe raid, the Israeli Defense Force used C-130s to airland M113s, an excellent example of this versatility.

MISSION FLEXIBILITY

The M113A3 can carry a complete 7-13 man infantry squad that can dismount to fight from the ground, while the M2 has space for only six dismounts. Units that convert to M2s will lose three dismounted fighters — the vehicle commander, driver, and gunner — robbing us of needed manpower to secure closed terrain adjacent to our own axis of movement.

Are our light infantry forces large and mobile enough to screen our own mechanized infantry's movements?

The M113A3 is spacious enough to carry wounded soldiers on stretchers, and is capable of extracting them under enemy fire; M113s did this in Panama. The Bradley is too cramped to accept litters.

The M113A3 has the legendary M2 Browning .50-caliber Heavy Machine Gun (HMG), which can be ground-mounted with its tripod and traverse and elevating mechanisms for accurate fire support, even indirect firing from defilade positions using gunnery tables. The M2 does not have a .50-caliber that can be ground mounted, only the less powerful and shorter range .30-caliber medium machine guns. The .50-caliber can kill enemy APCs and IFVs with Raufuss and SLAP ammunition. While the M2 can kill the same enemy vehicles with its 25-mm Chain Gun, it must maneuver the entire vehicle into position, exposing it to enemy fire. In some situations of terrain and vegetation, Bradley firepower will be unavailable because it cannot be detached from the vehicle for ground mounting. Units with M2s may actually have less organic firepower available than M113-equipped units.

The M113A3 can fight with its infantry standing upright from its rear troop hatches; this adds to the firepower hitting the enemy and gives the men a clear view of the battlefield before dismounting or fighting through mounted; the M2 does not have overhead hatches for soldiers to fight mounted, relying instead on narrow vision slots and firing point weapons. With the M2A2's improved armor, even these have been reduced to just two M231 firing port weapons in the rear for self-defense. The M2A2, for all practical purposes, is no longer capable of mounted combat by the infantry inside. Unless the Bradley's turret is facing the threat when it appears, there will be no suppressive fire to meet it. In contrast, the M113A3 has a man facing in every direction, ready to fire over 360-degrees, providing the all-around security vital to thwarting an ambush.

TACTICAL MOBILITY

The M113A3 (99 inches high, 208.5 inches long) is a smaller vehicle than the M2 (117 inches high, 254 inches long) and so it is harder to spot and hit. Given the improved power and suspension of the A3 model, the M113 has almost equivalent cross-country mobility and speed to the Bradley.

The M113A3 can easily swim across rivers and small bodies of water without preparation; the M2 requires a time-consuming delay to erect its swim skirt.

The M113A3 is more fuel-efficient and less costly to operate than the M2,

Soldiers carry a wounded man to the safety of an M113 ACAV during fighting in Saigon in 1968. The vehicle's armament includes a pintle-mounted .50-caliber machine gun firing over the right side and a recoilless rifle in the front ACAV turret.

easing logistics and keeping the M113A3 force combat effective longer than an M2 force. This is important in nonlinear warfare. Units with long and complex supply lines are vulnerable to enemy attack. Units that can operate with reduced supplies can operate without fear of their supply lines being threatened, and can more easily use air resupply if necessary.

SURVIVABILITY

The M113A3 with enhanced armor is survivable up to 14.5-mm HMGs, the Bradley is proof up to 30-mm light cannon. While the Bradley is much more armored, the M113A3's armor is adequate if care is taken to employ it correctly, dismounting troops early on in defilade. The M2 can stay in the open fighting alongside the heavier M1A1 Abrams main battle tank, but even this must be done carefully to prevent MBT large caliber cannon fire and ATGMs from destroying the Bradley and the men inside.

FIREPOWER

The M113A3 does not have the anti-tank firepower of the Bradley's TOW II, which can kill most of the world's main battle tanks to a range of 3,750 meters — beyond the effective range of most tank main guns. But the M175 mount will interface the M47 Dragon Medium Antitank Weapon (MAW) to the M113A3 so a single soldier can kill threatening enemy vehicles without having to wait for the entire dismount squad to debark and get into firing positions. The Dragon will fire more accurately from a vehicle mount than

from its rickety firing bipod out to at best 1,000 meters. One of the conclusions from the recent U.S. Marine Corps study of armored combat in Southwest Asia was the desirability of a vehicle-mounted M47 Dragon.

The Javelin ATGM, scheduled to replace the Dragon, will not have the M47's backblast problem, so it could be fired from the vehicle without need of a mount. Javelin will not require the gunner to track the missile to target; it will be "fire and forget," something even the Bradley cannot do. Bradleys have to stop and track their TOWs to target. The Javelin will have a 2,000-meter range — not as good as the TOW's range — but its shoot and scoot" capability makes the reduced range less of a factor. Because the Bradley has no top hatches to allow troops to stand and fire, they will have to leave the vehicle to fire Javelins.

Dismount TOW II ATGMs could be carried inside M113A3s, with Israeli-style manpack teams, to provide covering fires as other M113A3s/M2s maneuver. A well-emplaced, ground-mounted TOW — as proven at the NTC and by the Israelis in actual combat — can pick off enemy vehicles while friendly vehicles maneuver. These teams are more difficult to suppress than a vehicle-mounted TOW, which can only fire from more exposed positions accessible to the vehicle.

The M113A3 does not have the long-range infrared thermal night sights of the M2 Bradley, but AN/TAS-5 Dragon ATGM thermal sights are organic to all infantry units and could be carried for

use as a visibility aid for night driving, to detect ground disturbances that could reveal enemy mines, and to detect enemy heat signatures. The Dragon thermal sight is neglected because its weight, 22 pounds, makes it difficult to carry on foot, but this is not a problem if carried as a vehicle vision aid. M113A3 units could also benefit from the new family of uncooled, hand-held thermal sights that will be coming into Army service in 1995. These will provide improved thermal imaging at more reasonable carrying weights for M113A3 units.

While the M113A3's .50-caliber HMG, when vehicle mounted, is not as accurate or as powerful as the M2's stabilized 25-mm Bushmaster cannon, it does have a useful antiarmor capability with enhanced ammunition. The M2 Bradley does have advantages over the M113A3, especially in vehicle vs. vehicle combat where accurate firing-on-the-move is vital. The Bradley can also act as its own forward area air defense weapon, capable of shooting down helicopters and jets with its 25-mm high-rate-of-fire-cannon. But the M113A3's .50-caliber HMG, ground-mounted on an M3 air defense pedestal mount, can provide antiaircraft fire that does not originate from the vehicle, making enemy fire guiding on muzzles flashes or tracers less likely to destroy the vehicle.

The new U.S. Army Small Arms Common Module Fire Control System (SACMFCS) for the M60 MMG, MK 19, and M2 HMGs offers laser aiming for first-round impacts on target. Mounting these sights on the M113A3's .50-cal HMGs could lessen the Bradley's accuracy advantage.

The M113A3 has a clear advantage in mortar employment. With its overhead hatch, the M113A3 permits vehicle firing of 81-mm mortars (Carrier M125A1/A2), 107-mm mortars (4.2 inch-Carrier M106A1/A2), and 120-mm mortars (Carrier M121). The Bradley doesn't have a fully opening overhead hatch or space inside to mount mortars.

TRAINING

The M113A3 requires less time to train its crew and embarked soldiers than the complex M2. The M2 has elaborate storage plans which require much training and discipline to master. The M113A3 is spartan in its loading arrangements with much greater flexibility and potential. Unfortunately, this simplicity is often seen as a lack of sophistication and is abused to carry troop comfort items instead of mission-enhancing equipment. With IDF style external loading of troop rucksacks, field living gear, etc., the inside of the M113A3 can be freed to carry whatever mission gear is needed in a ready-to-go manner. In contrast, M2 Bradley crews require a keen knowledge of where everything is stowed.

EMPLOYMENT FLEXIBILITY

Because the number of infantry that can be carried in M2 Bradleys is so low, the infantry is only capable of supporting the survivability, security, and mobility of the vehicle itself. Seizing terrain and mobility corridors, or conducting dismounted infantry offensive operations in restrictive terrain, is no longer possible. M2 infantry will live or die close to its vehicles, surrendering difficult terrain to possible use by the enemy. This is evident time and time again at the National Training Center at Fort Irwin, California, where M2 Bradley units are decimated when they try to bypass infantry in ambush positions along restrictive terrain.

M2 units don't have enough dismounted infantry to clear mobility corridors of enemy foot infantry. As a result, M2 units must depend on indirect fire support and their own direct fire 25-mm and MMGs to suppress an infantry force, and at that, this force must be foolhardy enough to ambush from unprepared fighting positions along the forward slopes of nearby terrain rises. If the enemy infantry is well dug-in, or fights skillfully from the reverse slope, the men inside the Bradleys are semiblind; they cannot see or stand upright through open roof hatches. This is the old lesson from Afghanistan, where road-bound Soviet infantry in BMPs were easily ambushed by irregular light infantry using restrictive terrain to hide and break contact. We will face the same challenge in the mountains of Korea.

If there is any doubt about this, reflect on the following M2 Bradley description from the October 1991 *Army* magazine almanac edition, pages 295-296:

*"The characteristics of the IFV allow for **mounted** combat and provide the infantry a means to **protect tanks** and **consolidate gains in the offensive**.* The principal requirements for the Bradley were mobility equal to the most modern tanks, such as the M1, and main gun armament powerful enough to handle enemy light armor and support the infantry squad when dismounted..."

The emphasis is mine. Let's look at each underlined point. "Mounted" combat means fighting within the vehicle. With the side firing ports blocked, the only "fighting" that is going to take place is going to come from the Bradley cannon, machine gun, or missile armament. The infantry inside the Bradley are there then to "protect tanks" and "consolidate gains," which means the objectives the infantry is going to dismount for will have already been taken by the action of the vehicles, i.e., M1A1 main battle tanks and M2 Bradley IFVs. This is a classic description of armored infantry. So, will our handful of light infantry divisions be the only forces capable of infantry combat? Let's be intellectually and professionally honest here: M2 Bradley-equipped infantry is indeed armored infantry, which there is a need for, but we do need a vehicle-equipped force that supports infantry, not armor, missions. There are many times when infantry missions have nothing to do with facilitating the passage of armored fighting vehicles. In these missions — attacks, raids, ambushes...defenses where men on foot must do the job — the infantry must arrive in quantity and not be tied down defending its transport vehicles. Mechanized infantry is in-between armored infantry (few men, lots of vehicles) and light infantry (lots of men, few vehicles). Mechanized infantry should be a lot of men with a lot of vehicles.

In vehicle-vs.-vehicle combat, the M2 fares better, but this is armored warfare. What's happened is that we have turned the M2 Bradley into a light tank that can carry a few infantry scouts, or more accurately an armored infantry fighting vehicle.

One of the key dynamics of mechanized infantry is that it can truly fight as foot infantry and can prevail in restrictive, closed terrain if it doesn't get lazy in training from being transported by vehicles. This is a force-wide leadership problem that only gets worse with the M2's enhanced armor protection; the troops inside don't want to get out of their "armored cocoon" and fight. Now, with the latest Bradley A2 armor protection, the infantry itself can no longer fight mounted **from** the vehicle. M2/M3 Bradleys are actually infantry fire support scout/vehicles that fight the enemy with 25-mm cannon and TOW ATGM fires. To keep ar-

mored vehicles survivable in open terrain, the only real solution is the tank fighting vehicle (TFV) — a tank that can carry some infantry to screen its own movements, which is what the IDF does with its Merkava main battle tanks. They have space in the rear for infantry or extra ammunition. M113A3s are actually closer to being infantry fighting vehicles. Without infantry in M113A3s or a large number of M2s to carry an adequate dismount force for full-fledged infantry missions, M2-only units are indeed armored infantry.

In open terrain, fighting alongside main battle tanks (MBTs) like the M1A1 Abrams against a linear opponent, infantry is better off moving with armor protection than walking at three miles per hour. In DESERT STORM, soldiers stayed inside most of the time until after the vehicles had done the fighting. The Bradley's protection has lulled many active-duty units into letting their dismount infantry skills erode or never develop, which is very dangerous. Soldiers that use M113s often measure themselves by their vehicles, as civilians would compare a "sports car" to a "pick-up-truck," and wrongly conclude that they are inferior to M2 units. The truth is that a "pick-up-truck" like the M113 can perform some missions the M2 cannot; especially the mobile infantry mission currently referred to as "mechanized infantry." This unique mission is not centered around supporting the advance of armored fighting vehicles but the missions that must be done by men on foot due to restrictive terrain, enemy situation, etc. But until this mentality is corrected, it constitutes an eroding influence, or a "disease" to the fighting spirit. "If I can ride, why do I need to walk?" We must change this.

The Best of Both Worlds: Units with M2s and M113A3s

While it is true that M2 Bradley-only equipped units would be better termed "armored infantry," the 30th Infantry Brigade (Enhanced Readiness) (and other brigades facing the same problems) should have both armored infantry and mechanized infantry battalions — the ability to fight in the open or in closed terrain. This is not without precedent; the German Army has a mix of "Marder" IFVs and M113s in its force structure. Hopefully, this flexibility and balance could lead all mechanized infantry brigades in the regular

Army to follow suit and fully exploit the potential of the M113A3. "Enhanced readiness" would mean a proper balance of M2- and M113-equipped units; armored and mechanized infantry. Perhaps the National Guard could exchange **some** of its M113A3s for the M2 Bradleys it needs to get the needed balance, and vice versa for the active Army units. If foot-intensive infantry operations are needed, the M113A3 units will be available. Extra M113A3s, maintained by the U.S. Army National Guard nation-wide, would be available for expedient use by light infantry forces on a case-by-case basis.

If we plan on continuing to send M2 Bradleys into nonlinear conflicts like Somalia, we need to make it possible for the infantry inside to stand up and contribute their increased vigilance and firepower, instead of sitting blind and cooking like turkeys in an oven. Under the present setup, the only eyes looking for the enemy belong to the driver (who is busy looking at road conditions), the gunner (who sees through the narrow field of view of his sight, and only where the turret is facing), or the vehicle commander, who is very busy keeping his position in formation, land navigating, and communicating with other vehicles. This is a recipe for disaster on a nonlinear battlefield. Let's put these eyes to use. Keep the men from dehydrating, and the vehicle itself from being destroyed in ambush. The German Marder IFV has hatches from which the infantry can stand up and fight. In closed terrain, this is a survival imperative. Why not have the Bradley's rear cargo hatch open up and fold all the way down so at least two of the men in back can stand and fire their weapons?

Introducing the Super M113A3: The Gavin Airborne IFV

The following changes will require little or, in some cases, no money to execute. Hardware for the M113A3 is in the system, available for our use if we know enough to ask.

Harnessing a soldier's fighting spirit and enthusiasm for a dirty job like war by invoking U.S. Army history is the epitome of good leadership. When we are cynical and look down on the mechanized infantry, this only fuels the feeling in these units that they are "low-speed." We need these units to be "high-speed." The military is serious business, not some kind of existentialist

General James Gavin

First, Let's Name the 113 After a Fighting Hero

Why are we calling APCs M113s after all these years? The M113A3 is airdroppable and easily airlandable; why not name it the Gavin Airborne Infantry Fighting Vehicle or Airborne Infantry Personnel Carrier, after the legendary U.S. Army General James Gavin?

General Gavin was one of our greatest combat commanders, and should be honored with a fighting vehicle that has had a long record of service, just as he had during and after WWII. General Gavin cared deeply about the lives of his soldiers and always led from the front. I'm sure the thousands of soldiers and paratroopers who served with him would be in favor of naming the M113 in his honor. The designation "Airborne Infantry Fighting Vehicle" would redress the inferiority complex some feel about their M113A3s because they are not as complicated or as heavy as the M2. It would remind them that light weight is a virtue. It allows them to enter the battle early, while the initiative is on our side, by air-delivery. It allows them to actually swim across inland waters. Soldiers would be darn proud to put a "Gavin Airborne Infantry Fighting Vehicle" or an "I'm an Airborne Mechanized Infantryman" bumper sticker on their personally owned vehicle. The stroke of a pen can affect a name change; it will not cost us millions of dollars from the Army budget.

game where we gain exalted status (high-speed) for ourselves and deny others the chance to be as good. Someday, the battlefield situation will be desperate, and we will have wished that we were less snobbish during peacetime preparations. Can the 10-division Army afford to wait for a North Korean invasion to realize that we need each other?

Remember Chamberlain at Gettysburg? What would Chamberlain do today if his National Guardsmen in M113A3s faced the North Koreans? He'd make his men "high speed," and do whatever it takes to win and keep them alive. Today's soldier wants to be the best — let him. The Israeli Defense Force has learned this; all of their branches wear berets and are allowed to forge a unique fighting identity and spirit. "Elite" means being good, not "I'm good, and you're not." It is measured vertically, by the standards of reality, not horizontally, by what our peers are doing. In the U.S. military, we don't allow mechanized infantry units to be elite; they are seen as "cannon fodder" for conventional war. This narrow view of mechanized infantry overlooks the unique capabilities and amazing potential the M113 will have as new equipment, like the Javelin ATGM and lightweight hand-held thermal imagers, enters service. The modern battlefield will not allow a stereotyped battle approach; either what you are doing is **special**, i.e., unpredictable to the enemy — or you are going to be **dead**. Remember Chamberlain's bayonet charge when his men ran out of ammunition? It was the last thing the other side expected him to do. The sooner we start to let initiative and the human fighting spirit emerge in the mechanized infantry, the better off we will be. The official Russian doctrinal conclusion from our own DESERT STORM says it all: "The stereotypical employment of forces must be avoided at all costs."

Now, let's discuss some do-able, practical equipment and training upgrades for the M113:

Earth-tone brown paint scheme for better camouflage in all world terrains. Much time is lost painting vehicles in a mad rush to blend in with different areas before deployment. An earth-tone Army brown color on M113A3s would suit more of the world's regions, including arid deserts. Brown will also work in wooded areas where more moisture is present.

Better loading SOPs. We need to maximize ammunition, weapons carrying, and self-logistics support capability, as well as survivability and quality of life in the field. Most troop gear can be strapped to the top of the vehicle. There, it can act to support the arms of soldiers firing upright, while keeping the insides clutter-free for fast exits. The interior shelf space is tight between the spall liners. These must slide; if gear bulges out, the liners will not slide easily. Handles need to be added to the sliding spall liners.

Ammunition that isn't needed for immediate use, such as extra missiles, rockets, etc., should be placed as far to the rear and outside as possible to prevent cook-offs if the vehicle's interior is penetrated by enemy fire.

When infantry dismount, they need a survival evasion, resistance, escape kit as well as E-tools to construct shelters or fighting positions should their vehicles get destroyed. Without vehicles, they need to be fully functioning light infantry.

To perfect loading schemes, practice, and training, at least one M113A3 needs to be located at each Armory. Some units have their M113A3s in storage at a distant Army post, making them unavailable for training. Training in dismount drills, weapons employment/mounting, etc., can all take place at the Armory if at least one M113A3 is present.

Armament Upgrades. M60 medium machine gun universal mounts need to be mounted on the roof to allow firing from the vehicle. The Israeli Defense Force Armored Corps has long known that a single .50-caliber HMG is not enough to protect the M113. They have installed medium machine gun mounts on all of their M113s. In the defense, you do not want to waste your precious enhanced .50-caliber ammunition on targets that can be handled by your medium machine guns. The M60 MMG (or any pintle-equipped light, medium, or heavy machine gun) can be mounted on the roof to the right or left side of the troop hatch using the Arm, Assembly Gun Mounting or universal gun mount (NSN 2590-00-406-1493) that bolts directly into three antenna mount holes already in position on M113s, but usually covered.

The arm assembly allows an M60 MMG, or even an M2 .50-cal HMG, pintle to lock in for flexible weapons interface. When the interface for a pintle to attach to the M249 SAW be-

comes available, a light machine gun can be mounted. The arm is part of the M113A1 gun shield armor kit first used on M113A1 ACAVs in Vietnam. In nonlinear war, like what we experienced in Vietnam or recently in Somalia, your machine guns do you no good strapped inside your vehicle or facing in just one direction; they must face outward, ready to pour a high volume of fire at an enemy that can come from any direction. Without side-firing port weapons, or the ability of the infantry in the back to stand upright and fire through top hatches, the M2A2 is very vulnerable to side attack unless the turret happens to be facing in the enemy's direction when the ambush occurs. The universal mount on the M113A3 will support the weight of the M60 MMG and improve firing accuracy by reduced vibration. The M113A3 can have a machine gun facing in each cardinal direction for 360-degree coverage, the .50-caliber HMG facing front, the M60 MMG covering the right side and rear, and an M249 light machine gun covering the left side and rear.

Add M175 Dragon ATGM mounts for snap shooting at enemy vehicles. The advent of the M2 Bradley has surely made a lot of M175 Dragon mounts available for M113A3 use. Mounting just aft of the TC's HMG, these mounts allow the Dragon to be fired and tracked to targets from a briefly stopped M113A3. The mounts are probably in storage somewhere, awaiting a use.

The German panzer grenadiers have their M113A1Gs outfitted with mounts for their medium-range antitank weapon, the MILAN II.

We need gun shields for the track commander when he is upright and firing the M2 .50-caliber HMG. As recently as 1990, 24th Infantry Division (Mechanized) M113A2s were seen with TC gun shields. These shields are important — a smart enemy will concentrate fire on the exposed TCs to thwart an attack. The loss of M113 TCs was decisive as far back as 1963 in Vietnam, at the battle of Ap Bac. These lessons need not be relearned in 1994. In addition to old shields in the inventory, the M113A3 manufacturer, FMC, has a new shield available.

During training, bring along tripod traverse and elevation gear for HMGs and MMGs. Make it an SOP for all FTXs to include ground-mounted firing and employment. The ability to ground

mount the HMG will be lost if the mounting hardware is not taken into the field out of ignorance or laziness. Soldiers may be unaware that the .50 HMG has only 200 rounds immediately available when mounted on the M113A3. The vehicle will have to seek cover while the driver bends down and reloads. In contrast, a ground-mounted HMG can be loaded and fired continuously from a dug-in fighting position. The .50-cal HMG, firing hand-held from the pintle mount of an M113A3, is not nearly as accurate or controllable as it is when ground-mounted on the tripod/T&E. This is important for precise defensive fires and indirect fires behind defilade. Often, by moving the HMG to a ground mount, the team's firepower can continue while the M113A3 moves to a less exposed, more survivable position.

Let's stress indirect fire machine gunnery by teaching it and practicing it. In general, U.S. infantry is overly fond of forward slope defensive positions, allowing a skilled enemy, equipped with thermal imagers or image intensifiers, to spot us from a safe distance, then bombard our positions with impunity. One of the reasons for setting up a forward slope defense is to get maximum range from machine guns. This is not necessary if you are precise about using your ground mounts and use gunnery tables to control your fire from T&E readings. Indirect, plunging fire is possible from machine guns, allowing the guns to stay behind the masking terrain of a minimum defilade or reverse slope defensive position.

Obtain M60 Medium Machine Gun plastic assault packs for dismounted firing. When dismounting, the M60 gunner has a loose belt of 7.62-mm ammunition that can get dirty, have its links bent or twisted, or snag on clothing or equipment as he exits the M113A3. We know this from direct, personal experience. The issue cardboard box/canvas bandolier is too flimsy to be hung on the M60 to provide a stable carry of a full 100-round belt. One answer is to obtain a plastic assault pack commercially, as other units in the U.S. military have done. They are just $10 each from Capco Enterprises, 3250 Pollux Avenue, Las Vegas, Nevada 89102, (702) 362-3700, POC: Mr. Ross Capawana.

M3 .50-cal HMG antiaircraft mounts should be obtained and employed in the field as SOP. There is ample space in the M113A3 to carry the M3 antiaircraft mount for the .50-caliber HMG.

In areas where the enemy air threat is great, these mounts could bolster air defensive fires. I've yet to see these mounts used, so many are probably languishing in storage somewhere.

Buy enhanced lethality .50-caliber rounds now for wartime use. Saboted Light Armor Penetrator (SLAP) and explosive Raufoss .50-caliber ammunition is available to make the .50 HMG effective against BMPs from any angle, and improve the gun's destructive effect against aircraft and dug-in enemy positions. These rounds were used by snipers during DESERT STORM and are in the system.

Explore using the Small Arms Common Module Fire Control System (SACMFCS) for HMG first-round accuracy. The vibration and human error built into the M113A3 .50-cal HMG mount can be reduced by the Contraves SACMFCS laser sight. As soon as the Army buys SACMFCS in numbers, some units should be trialed on M113A3s for evaluation. If improvements in accuracy are possible, M113A3s should be fitted with these sights.

Make TOW II ATGM ground-mounting and employment SOP for all field exercises. Most of the TOW ground mount hardware is with M113 Improved TOW Vehicles (ITVs). Some extra guidance sets and launch tubes could make available a second launcher apart from the vehicle's TOW launcher. Dismount TOW "missilery" needs to be done from infantry-carrying M113A3s, and not just ITVs, because the tendency of ITV units is to use the TOW from the vehicle. By giving non-ITV infantry dismounted TOW training, we have the opportunity to double the number of TOW launchers at the infantry commander's disposal. A ground mount TOW set does us no good if it's stored in an ITV that gets hit and goes up in flames trying to shoot/track from open, vehicle-traversable terrain.

Javelin fielding should be a top priority for M113A3 units with contingency missions. At 49.5 pounds, the Javelin is not easily carried; but its day/night thermal imager launch capability is lighter than a Dragon ATGM using its 22-pound AN/TAS-5 thermal tracker

— 73.2 pounds. An excellent way to employ this heavy weapon system is from ambush positions a short distance from a vehicle so its weight doesn't have to be carried all the time by the antitank gunner. U.S. Army Rangers are slated to be the first to receive Javelins, but an M113A3 force could use them just as well. The Javelin's soft launch capability means it can be fired from vehicles like the M113A3 without need of a vehicle mount to point backblast away from friendly troops. As soon as possible, Javelin trainers

JAVELIN, the new "fire-and-forget" antitank missile.

should be issued to M113A3 units to give them an awesome fire-and-forget antitank capability not possible from dismount troops inside Bradleys. Unlike TOWs and Dragons, Javelins have no trailing wires, so they can be fired over water, and through vegetation.

Fit M40A2 106-mm Recoilless Rifles to designated M113A3s for shock firepower. The M113A3 can mount the 106-mm recoilless rifle to one of its roof side antenna mounts for shock firepower against dug-in enemy or enemy in buildings. This would be useful in situations like the Rangers faced in Somalia. In addition to a healthy antitank capability, the 106-mm antipersonnel round has thousands of wire flechettes that can stop the kind of massed infantry attacks we might expect in a North Korean invasion of the south. The M40A2 can also be used to economically reduce minefield and wire obstacles, breaching a pathway for vehicles to pass without risking men. There are over 250,000 rounds of 106-mm RR ammunition in stock, according to a spokesman for U.S. Army TRADOC. The recoilless rifle has proven itself as the shock weapon of choice in Southeast Asia, the Middle

East, and recently the former Yugoslavia. Hundreds of surplus M40A2s are available in U.S. Army storage, but need to be claimed before they are destroyed by demilitarization.

Maximizing Protection. We need ballistic protective CVC helmets or PASGT Kevlar helmets with communication links. Current CVC helmets offer no ballistic protection; drivers and TCs are the prime targets of an enemy trying to stop an armored vehicle attack. Ballistic CVC helmets capable of defeating most missile threats comparable to the current PASGT helmet should be fielded or we should develop a vehicle intercom/mike system that can be fitted to the PASGT Kevlar helmet. In the case of the latter, one helmet would do the job of two — drivers and TCs carry PASGT Kevlar helmets inside their vehicles in case they have to abandon their vehicle and fight dismounted, which takes up space inside the vehicle. With a Kevlar helmet/vehicle communication link, they need only disconnect the mike cord, grab their weapon, and leave the vehicle. Later, they could remove sound-dampening earphones from the helmet, etc.

Wearing body armor should be SOP for all FTXs. The whole point of transporting infantry in vehicles is so they can be rested to fight savagely as a shock force. If they leave the vehicle and immediately get wounded by enemy fire, this will be all for naught. Body armor needs to be worn during field training exercises, not collect dust in the supply room. I'd rather carry a PASGT flak jacket into the field for warmth than a M65 field jacket, the dreaded "Field Sponge," which offers no rain protection and little warmth soaking wet. The M65 field jacket is a hypothermia inducer. It almost killed me one FTX at Fort McCoy, Wisconsin, in 1982 with the ill-equipped U.S. Marine Corps.

We need Nomex BDUs for drivers, TCs, and embarked troops. The risk of fire is a fact of life in vehicle warfare; all persons inside should be wearing fire-resistant clothing. This is easily possible by providing the Nomex Battle Dress Uniforms now issued to aircrews (NSN 8415-01-328-8253, jacket; NSN 8415-01-328-8269, trousers) to military clothing sales stores for soldiers to purchase on their own. When name tapes, insignia, and patches are added, these woodland camouflage BDUs look just like current BDUs and could be reserved for actual field wear

when operating inside vehicles. A tan color Nomex BDU is available for desert operations. Nomex flight gloves are another necessity. These fire-resistant gloves, now issued to tankers/aircrews, need to be authorized for wear and made available in the MCSS at every Army post.

We should consider buying the AN/PVS-7B NVG mounts for the PASGT Kevlar helmet. Many soldiers fail to use current AN/PVS-7B night vision goggles because they find the head harness confusing and uncomfortable. A valuable U.S. battle advantage is lost when NVGs sit in their cases unused. A PASGT Kevlar helmet interface that allows the NVGs to be "flipped up" for unaided night vision is available from Litton. The U.S. Army is expected to buy these mounts en masse. If not, the Guard should take the initiative and buy their own. Helmet, Mount Assembly Flip-up, Part #240963-100, POC: Project Manager Night Vision, John Spadafore, Fort Belvoir, Virginia, (703) 806-3276 or Litton (602) 968-4471.

Dragon ATGM IR thermal sight use should be SOP during all FTXs. Until better thermal sights become available, Dragon AN/TAS-5s should be used by infantry on watch standing upright in moving M113A3s and from ground defensive OP/LPs. The U.S. Army paid for these systems, and they should be put to use.

M113A3s should be retrofitted with hatch pins that are easily removable and can be pulled by 550 cord. A problem noted at the NTC was that it is difficult to remove hatch pins and close hatches while the vehicle is moving. The TC can reach back and get his pin out, the troops in the rear can pull theirs out with great difficulty, but the driver cannot get his off unless he stops the vehicle and reaches back. Nor can the TC reach forward to remove the driver's pin. If indirect fire is received, and an M113A2 wants to button up, it's in trouble. I'm not sure the situation is any better with the M113A3. The problem is that the pins have a button that must be depressed to disengage two holding bulges at the end of the pin. Because of this, you can't use a pull cord to remove the pin. One solution might be a pin with a ring that works in reverse: pulling the ring out would depress the holding bulges for removal. With this kind of pin, a cord could be tied (Type III "550" parachute cord) to the driver's hatch pin so the

TC could remove it prior to "buttoning up."

We need to practice applique armor attachment. For fuel economy, M113A3s are not operated with their applique armor. At least once a year, M113A3 units need to go to their Mobilization and Training Evaluation Station and actually attach this armor to their vehicles. Then, in a combat zone, they will be capable of attaching their armor with little difficulty when much more pressing concerns will be at hand.

All soldiers should train to Light Infantry EIB standards. One of the reasons mechanized infantry soldiers get lazy is that they are not challenged to be the best, just to make minimums. Also, they have no "Hooaah" badges that they can work for and take pride in. By training them at weekend drills to pass the Expert Infantryman's test, they would have the hope of earning an EIB patch, a coveted and respected badge that could do wonders for morale, as well as improve infantry skills. The close proximity to Fort Bragg, where EIB testing is on-going, makes it very easy for 30th Brigade units to set up an EIB program. Soldiers who pass the EIB test administered by active duty soldiers know that they have skills that will work in the real world, bolstering confidence and a realization that the National Guard is on the "first string" with the active Army in the "Total Force." This training must include field living and survival skills so soldiers can be confident and able to operate light on their feet with minimum equipment.

Mixed Force Structure and Missions. M113A3s should be kept in the force structure for the many reasons previously stated. This is not without precedent — the IDF Airborne airdrops M113s for use by its paratroopers as "battle taxis." They can fight from the vehicle or dismount to fight on foot. The IDF has enhanced its "Zeldas," as they call the M113, with side medium machine gun mounts and improved armor. They know when to fight from them and when to dismount.

Every fourth company of a German Army Panzergrenadier Battalion within a Panzergrenadier Brigade is equipped with 11 M113A1Gs; most are set up to fire MILAN II ATGMs from simple mounts comparable to our own M113 Dragon mounts.

●At least one battalion in the 30th Brigade should remain as mechanized infantry with M113A3s, probably the

The Mobile Tactical Vehicle Light (MTVL), latest derivative of the M113 family, as seen in a United Defense brochure. The most recent improvements include a 350-hp turbocharged engine and an improved suspension that allows more than 15 inches of roadwheel travel. The M113 is probably the most common armored vehicle in the world.

119th. This battalion should be a round-out battalion for the XVIII Airborne Contingency Corps and be authorized to wear the maroon beret. Paratroopers leaving active duty from the airborne corps, but who plan to stay in the area, often chose to join the nearby 119th Infantry (Mechanized). These men are airborne-qualified and hold to high standards of professionalism. Being a part of the 119th should be seen as a way of continuing their military careers. Strategically, the battalion should be proficient at rapid deployment by air, rail, and sea to world trouble spots as the vanguard of the 30th Infantry Brigade (Mechanized). Operationally, their M113A3 trim vanes should be fully functioning for inland amphibious capability. The entire battalion should be able to secure a river crossing for the rest of the brigade. As the battalion holds the far and near sides of the crossing point, our combat engineers construct bridging for Abrams MBTs to cross and allow time for M2 Bradley IFVs to erect their swim skirts and swim across. Ft. Bragg has small lakes where this capability can be practiced.

●At least one company in this battalion should have on-call (18-hour notice) airborne-qualified TCs/drivers to act as an M113A3 airdrop detachment for the XVIII Airborne Contingency Corps. [Perhaps the much esteemed, Alpha Company of the 1/119th Infantry(M), located just 45 minutes away from Ft. Bragg in Smithfield, North Carolina. Alpha Company recently returned from the NTC decorated by the OPFOR with the Order of the Hamby, 1st Class, for devastating active-Army BLUEFOR units as OPFOR augmentees.] This detachment of volunteers would train with Dragon Corps COSCOM riggers so they would become proficient enough to prepare their own M113A3s for low-velocity airdrop/LAPES, requiring only rigger supervision. Members of the 82d Airborne currently provide the "muscle" when preparing their vehicles for airdrop, with riggers supervising. The airdrop detachment would jump with paratroopers of the 82d Airborne and operate their M113A3s for armored mobility and troop transport of a designated paratrooper force. The M113A3s would have M40A2 106-mm Recoilless Rifles and/or M175 Dragon ATGM mounts to provide shock firepower and anti-vehicle defensive fires for airborne forces. This force could be a mobile reserve to defend the drop/assault zone(s) or speed to secure assault objectives using M113A3 firepower and shock action. It could also provide infantry escort for the Airborne's Sheridans or M8 Armored Gun Systems.

●One platoon in this company should be designated to act as a mobile scout/reconnaissance detachment for the brigade, using the M113A3's cross-country mobility, especially its swimming capability. Trim vanes need to be fully functioning and used often to keep this skill viable. There are no other vehicles in the Army inventory that can swim. HMMWVs don't swim. These soldiers should be jump-qualified so they can airdrop their vehicles and themselves into a conflict early on. Slots for Pathfinder, Ranger, and Long Range Reconnaissance Schools should

M113 vs. Bradley M2

	M113	M2 Bradley
Cost:	$281,705	$1,056,845
Height:	99 in.	117 in.
Weight:	22,000 lbs	49,138 lbs (A1) 66,000 lbs (A2)
Airdrop Capability?	C-130, C-141, C5B, C-17	C-17 only
Dismounts Carried:	7-13 soldiers	6 soldiers
Stretcher Carry?	YES	NO
Swimmable?	YES, no preparation	YES, after erecting swim skirt
Ground-Mountable Machine Guns?	.50 cal, .30 cal	.30 cal only
Armor Protection:	Up to 14.5-mm HMG	Up to 30-mm cannon
Antitank Firepower	M-47 Dragon or Javelin TOW Manpack	Turret-mount TOW only
Fire on the Move?	NO	YES
Mortar Carry?	81mm, 107mm, 120mm	None
Fuel Consumption (OPTEMPO figures from TACOM)	2.4 mpg	1 mpg

be provided to enhance the unit's expertise. The Mech Recon Platoon (Airborne) would have its own scout vehicles, folding All/Extreme-Terrain Bicycles (A/ETB) that would be used to silently approach the enemy while the M113A3 sits in a full defilade "hide" position. The A/ETBs would be carried inside the M113A3s during airdrop and be strapped outside once on the ground.

●During monthly training drills at nearby Ft. Bragg, the remainder of this company would be trained to airland as mechanized infantry. The only personnel that would require jump status would be the airdrop detachment and the reconnaissance platoon. On a regular basis, they would practice short takeoff and landing (STOL) operations into and out of dirt strip assault zones, using 23d Air Force and Air National Guard C-130 Hercules aircraft.

●Extra M113A3s replaced by M2 Bradleys should be maintained as a mobility asset for joint training exercises with light infantry forces (29th Light Infantry, U.S. Army National Guard in Virginia) as an ad hoc mobility/firepower asset. The 30th Brigade would provide drivers/TCs for contingency operations where the M113's capabilities would be more appropriate, peacekeeping for example. Combat in the jungle is another.

Conclusion: Don't replace all of our M113A3s with M2s!; we need them both — "sports cars" and "pick-up trucks."

Notes

Instead of cluttering the main text with footnotes, I've placed the source documents below with the page numbers where the relevant pieces of information can be found.

FMC fact brochure on M2 Bradley.

FMC brochure on M113A3.

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Personal Interview, March 28, 1994, LTC Mauro, U.S. Army Airborne/Special Operations Test Board, Ft. Bragg, N.C.; M113A3 has been and can be airdropped using same procedures as A1/A2 models except different internal tie-downs are required for control wheel instead of levers. The center of gravity

is a few inches aft, due to the M113A3's external fuel cells, but is not significant.

Israel's Cutting Edge: Samuel M. Katz, Concord Publications, 1990; p. 12, C-130 Hercules LAPES Low Altitude Parachute Extraction System of M113; pp. 8, 10, M113 gun shields for track commander.

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NTC battle performance of M2 Bradley/M113A2 while OPFOR augmentee fighting against 1st Brigade of the 1st Cavalry Division, Fort Hood, Texas, during the March 1994 rotation.

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Soldier's Manual 11B Infantryman Skill Level 1, U.S. Army, July 1985; p. 2-542, "M175 vehicle or tripod mount" for M47 Dragon ATGM.

TM 9-1425-484-10 *Operator's Manual for Dragon Weapon Guided Missile System, Surface, Attack, M47.*

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FM 7-70, *The Light Infantry Platoon/Squad,* U.S. Army, September 1986; p. D-34, cooled Dragon thermal sight is good observation device.

USMC Research Center Research paper #92-0002, *Armor/Antiarmor Operations in Southwest Asia,* July 1991, Major John Kelly, Captain Douglas Seal, 1LT William Harrison, 1LT Robert Esposito, USMC; p. 33, "Develop a simple HMMWV mount for the Dragon. In many regions of the expeditionary environment, use of the TOW will be restricted and the Dragon will fill this void."

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Mike Sparks is the director of the Tactical Studies Group which specializes in Airborne operations/equipment for Ft. Bragg units. He is a 1988 graduate of Liberty University and is a former USMC infantry NCO and officer, now in the U.S. Army North Carolina National Guard. A graduate of the Israeli Defense Force Airborne School and Marine Security Forces Cadre Weapons Instructor Course, he recently served as OPFOR with A-1/119th Infantry (Mech), 30th Brigade during an NTC rotation which garnered the Order of the Hamby, 1st Class Award.

Light Armored Cavalry —
The Right Force at the Right Time

Captain David L. Nobles

Currently, the need to use light forces in contingency-type missions has become much more important. Our experiences in Somalia and Panama highlight the need for a rapidly deployable light armored cavalry force. Further, the HMMWV has proven to be inadequate as a combat vehicle in these missions. A readily obtainable "off-the-shelf" solution to harden this force would be the acquisition of an available wheeled armored vehicle family, like the LAV or Commando, to supplement the AGS.

This is an analysis of the various roles and missions of which a force of this nature is capable. This analysis also covers the capability of the light armored cavalry to effectively support infantry in LIC operations and the light armored cavalry's capability to transition to mid- and high-intensity missions.

How much light armored cavalry? This question is a very complex one, and one that the strategists of the Army will have to answer. I recommend that we maintain at least one light armored cavalry regiment for each theater in which we could expect to simultaneously conduct light force operations. If the structure of Army missions is such that we expect to fight two low-to-mid-intensity conflicts simultaneously, then we need at least two light armored cavalry regiments. I further recommend that each of the light/airborne/airmobile infantry divisions restructure their light cavalry squadrons into light armored cavalry squadrons for support. The light armored battalions already envisioned should be assigned to the corps organizations most likely to conduct light force operations. We should have two light armored cavalry regiments if we are constrained to only two regiments and both are CONUS-based. Without manpower constraints, we should have three regiments with two light regiments based in CONUS and the heavy regiment forward deployed. The forward deployment of the heavy regiment in the theater where it will most likely be used saves on deployment costs, while the more easily deployed, CONUS-based light regiments can react to any needed area. We could maintain our cavalry forces for less cost and the result would be highly flexible, deployable organizations. The current constraint of two regiments points to the need to maintain both as light armored cavalry regiments.

Equipment

We could provide adequate protection for any light armored force using wheeled armored vehicles. The cost to deploy these wheeled armored vehicles would be substantially less than their tracked counterparts, only a third as much to maintain and only half as much to operate as our heavy armored cavalry regiments. The AGS has already become a reality for the Armored Force, so I see no need to discuss the relative merits of this vehicle other than to say it will meet a critical need, although a wheeled system could have done the job at far less acquisition cost, lower deployment cost, and lower maintenance and operating cost.

Now, for the rest of the force. A system that could supply the needs of the entire force on a single chassis would appear to be the solution. The requirements indicate the selection of a wheeled armored system like the LAV or the V-300 Commando. The HMMWV just won't get it done. If I understand the initial reports from Somalia, the "armored" HMMWV failed to perform as advertised in even that security scenario. Why do we delude ourselves? The HMMWV is an excellent light utility truck, but it is unsuitable as a light armored combat vehicle. Any of the light armored systems that I recommended in my May-June 1990 *ARMOR* article, "The Light Armored Force: An Urgent Need, A Ready Solution," (LAV, V-300 Commando, V-150 Commando, or Dragoon 300), would only cost slightly more to operate and maintain than the armored HMMWV. I admit that the HMMWV would cost significantly less to acquire and perhaps less to deploy, but this does not overcome the fact that the HMMWV is not suitable for the role of light armored reconnaissance vehicle, in whatever configuration.

We are most likely to face poorly to moderately equipped enemies with primarily second-line materiel. Our capability to adequately arm our wheeled armored vehicles allows us to use them against these second-line tanks and AFVs. The added firepower of the newly acquired AGS also supports the opportunity to maximize the use of the economical wheeled AFVs. An added bonus is the ability to put all armored vehicles in the regiment (less the AGS) on the same chassis, saving on maintenance, operation, and driver training costs.

Any of the four systems above can provide this multi-configuration option. The V-300 Commando is the best choice, because of its ability to carry more troops than the LAV, but a good argument can be made for the LAV as a proven system already in the inventory (the Marines' inventory at least). I am convinced that it is imperative that we select a system of this type for our light cavalry, motorized, and light armored units. The V-300 Commando offers a full range of combat, combat support, and combat service support vehicles. Imagine APCs, mortar carriers, ambulances, recovery vehicles, cargo/ammunition carriers, command post vehicles, and air defense vehicles that are armored, can keep up with the combat vehicles, and share the same chassis. This is the direction we need to go with our light armored cavalry.

The AGS fills the position currently occupied by the M1 in our heavy armored cavalry. The wheeled armored vehicle family would then supply the Light Armored Reconnaissance Vehicle (LARV), APCs, command posts, ambulances, recovery vehicles, cargo/ammu-

nition carriers, mortar carriers, and air defense vehicles for the new organization. The use of the V-300 Commando would further allow light infantry to be attached and ride under armor in support of the light cavalry's operations, a contingency that can be easily imagined by anyone familiar with our recent operations in Grenada, Panama and the early stages of DESERT SHIELD/DESERT STORM. This added flexibility is worth the additional acquisition costs. Added protection is another key consideration, given the protection problems faced by our forces in Somalia.

We need to equip our light armored cavalry regiments with the AGS, the V-300 Commando family, and the current light utility and medium trucks. This well-equipped and flexible force would be a definite asset for the Army in executing its many varied missions in today's "new world order."

Organization

Now that we have dealt with the problem of equipping our light armored cavalry regiments, we can proceed to the organization of our new regiments. I wrote my earlier article as a response to the then-current plan (1988) to field a light armored cavalry regiment equipped with the AGS and HMMWV vehicles with a rather large, cumbersome organization maximizing the ability to take part in low-intensity operations. I believe the ability to take part in low-intensity operations is important, but the light armored cavalry regiment also needs to be able to fulfill missions in a mid- or high-intensity scenario. This was my primary reason for objecting to the HMMWV and for recommending an organization similar to our present armored cavalry regiments. I have given more consideration to the organization I recommended in 1990 and have concluded that some further refinements can be made.

My earlier position was that the same basic organization that we currently use for our armored cavalry could be applied to light armored cavalry and that equipment would be the major difference. However, upon further reflection, I feel that some modifications could be made to the organization of the light cavalry as well as the light cavalry-specific equipment. The light armored cavalry regiment's organization would remain substantially the same as I put forward in my earlier article, with the aviation squadron replaced by an avia-
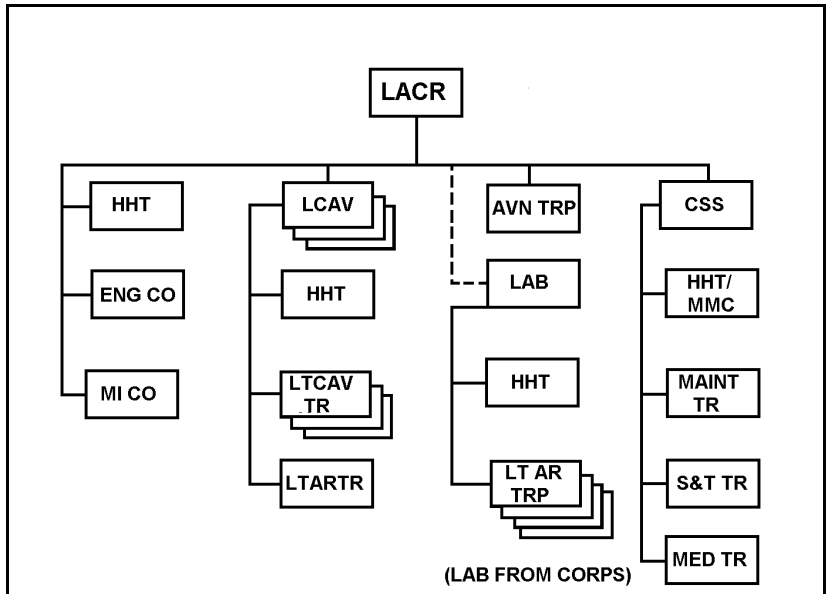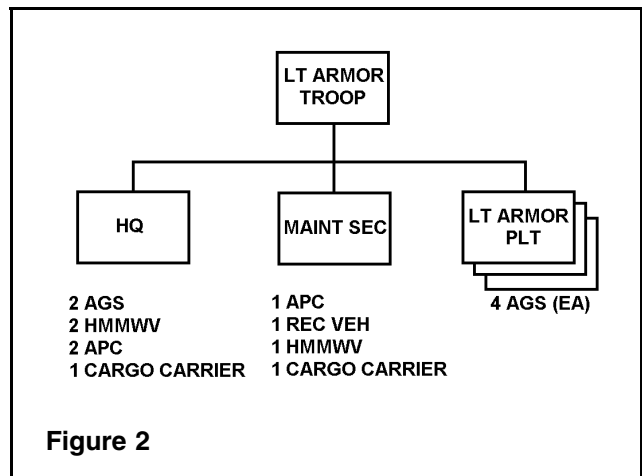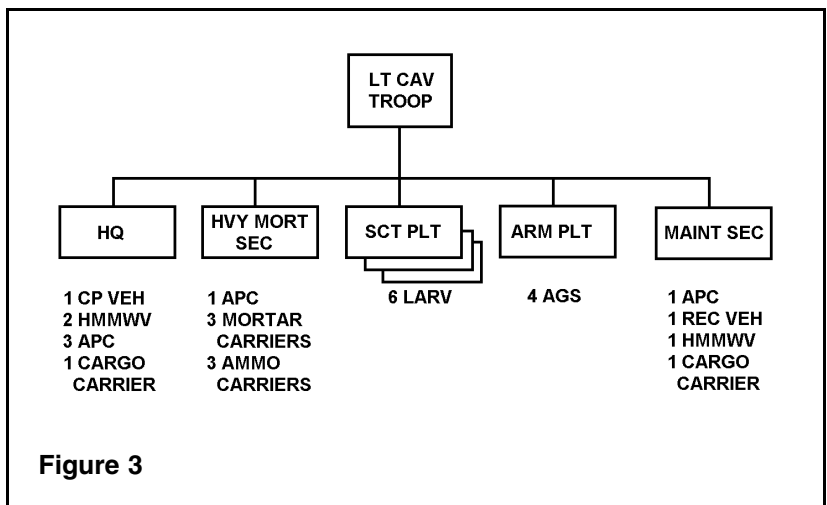

Figure 1

Figure 2

Figure 3

Figure 4

```
                          LT CAV
                          TROOP
         ┌───────────┬──────────────┬──────────────┐
       ┌───┐     ┌───────┐     ┌────────┐     ┌────────┐
       │HQ │     │ CAV   │     │HVY MORT│     │ MAINT  │
       └───┘     │ PLT   │     │  SEC   │     │  SEC   │
                 └───────┘     └────────┘     └────────┘
```

HQ
1 CP VEH
2 HMMWV
3 APC
1 CARGO
  CARRIER

CAV PLT
5 LARV
2 AGS

HVY MORT SEC
1 APC
3 MORTAR
  CARRIERS
3 AMMO
  CARRIERS

MAINT SEC
1 APC
1 REC VEH
1 HMMWV
1 CARGO
  CARRIER

Figure 4

Figure 5

```
                    AVN TRP
         ┌──────────┬──────────┐
     ┌────────┐ ┌────────┐ ┌────────┐
     │TRP HQ  │ │RECON   │ │ MAINT  │
     └────────┘ │ PLT    │ │  PLT   │
                └────────┘ └────────┘
```

TRP HQ
1 OH-58D

RECON PLT
6 OH-58D

(OH-58D ARMED VERSION)

Figure 5

Figure 6

```
                  DIV CAV
                  SQDN
       ┌────────────┬────────────┐
    ┌──────┐   ┌────────┐   ┌────────┐
    │ HHT  │   │ LT CAV │   │ AVN TR │
    └──────┘   │ TROOP  │   └────────┘
               └────────┘
```

HHT
2 APC

LT CAV TROOP
20 LARV
8 AGS
3 MORTARS

AVN TR
17 OH-58D

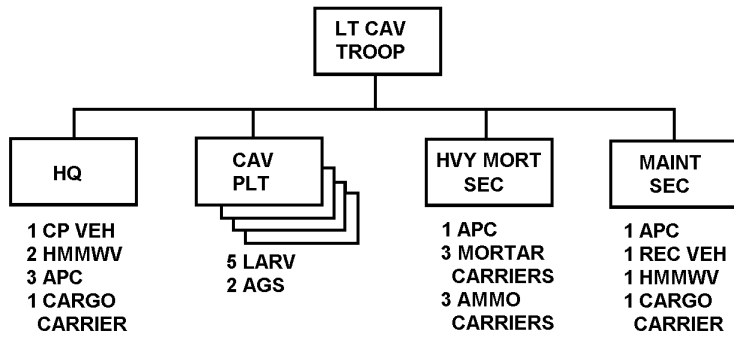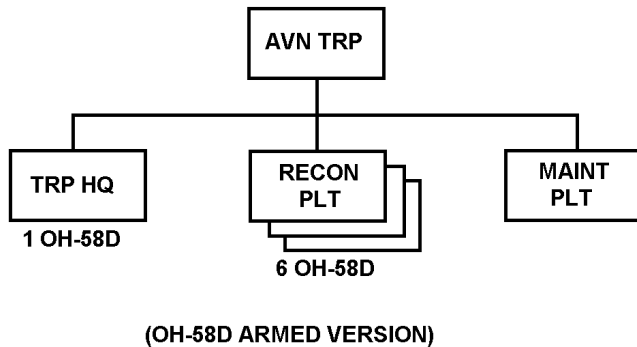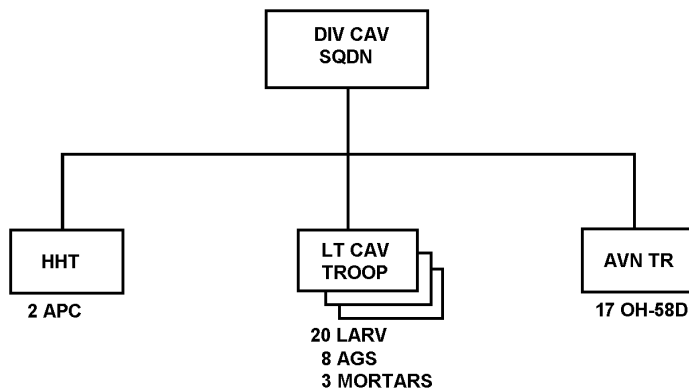**Figure 6**

tion reconnaissance troop and with a light armored battalion available from corps, if needed (see Figure 1). This organization is flexible and far more easily deployed than any of our heavy armored forces. The replacement of the aviation squadron with a reconnaissance troop is a result of an analysis of the most likely threat that the light armored cavalry regiment will face. If a light armored cavalry regiment is deployed to a high-intensity conflict, the regiment can be supported by attack aviation from the corps, if needed. This regiment is, I feel, uniquely suited to support light forces deployed in most of the light force scenarios that can be imagined by our strategic planners and can fulfill any number of combat missions in a high-intensity conflict.

The light armored troop would also remain unchanged, retaining the current tank company organization with the M1 replaced by the new AGS system. The missions of the light armored troop would closely parallel those of the current tank companies of the heavy armored cavalry regiments (see Figure 2).

The light armored cavalry troops could have one of two possible organizations. The first has three scout platoons, one light armored platoon, a mortar section of three guns, and the usual support functions of the current heavy armored cavalry troop (see Figure 3). This change is a result of a careful review of the most likely threat and most likely missions. The troop commander can deploy a maximum of scouts and still retain a powerful reserve (the light armored platoon). This organization gives the troop commander maximum flexibility and allows his troop to undertake any number of missions in any intensity of conflict.

An alternate organization would have four cavalry platoons, a three gun mortar section, and the usual support (see Figure 4). This flexible organization allows the light cavalry troop to cover a larger sector and have the fire support necessary for most contingency missions available immediately to the troop's cavalry platoon leaders. This organization also has a great deal of utility in conflicts of any intensity level.

The aviation troop is maximized for reconnaissance and the massing of fires. Its three reconnaissance platoons have armed OH-58Ds with all of the associated capabilities of these aircraft. The inclusion of this troop allows the regimental commander to conduct rapid re-

connaissance and to more effectively mass the fires of the elements supplied by corps in support of the regiment (see Figure 5).

The elimination of the howitzer batteries is mainly due to the lack of a suitable platform and the reduced requirement for artillery in most light force scenarios. Again, the regiment receives its required indirect fire support from corps assets.

The divisional cavalry squadrons of the light/airborne divisions would be organized substantially the same, but would retain an aviation reconnaissance troop in lieu of the light armored troop (see Figure 6). This minor modification would facilitate completion of the squadron's reconnaissance missions over the larger division area of operations. The combat power of the ground troops, supported by the division's indirect fire assets and the corps' LAB, would be sufficient to conduct the necessary combat missions ordered by the division.

The organizations above would prove to be of the greatest utility in any contingency mission and would also allow the light cavalry to be very useful on a high-intensity battlefield. The loss of the aviation squadron is easily compen-

sated for by the fact that these cavalry units would be deployed with light units that have their own aviation, and on the high-intensity battlefield, the corps aviation elements can supply the necessary support. All of the equipment described above and, of course, the organizations are easily within reach if we make the proper decisions.

Missions

Once the light cavalry is organized (one, perhaps two regiments), the next question is what missions can the light cavalry perform? These new units can perform classic cavalry missions in deployments of forces to low-intensity conflicts world-wide. The 1993 Army Greenbook describes a new policy where the Army will be CONUS-based, globally-focused, and prepared for regional contingencies. Given this policy and the constraint of only two cavalry regiments, both should be light armored cavalry regiments. What force could be better suited to support this new strategic plan than light armored cavalry and light armored/motorized units?

The classic missions of reconnaissance, security, economy of force, move, attack, and defend could be performed by this light force in any low or mid-intensity conflict. Additional missions, such as, raid or break out from an encirclement would be given more importance. The flexibility of our light forces, as currently configured, is quite impressive, but heavily based on the use of aviation. In some cases, such as bad weather, intense resistance, or more advanced enemy forces, an ability to project force on the ground that is adequately protected will be of exceptional value. A light armored cavalry force equipped and organized as above will allow the commander to acquire intelligence (this force allows the scouts to fight more effectively for information than a HMMWV-equipped force), rapidly deploy the cavalry in all weather, project ground firepower as necessary, and move significant light infantry forces on demand. A more flexible force would be hard to imagine.

Internally, the squadrons, troops, and platoons would operate basically the same when conducting reconnaissance operations, security operations, economy-of-force operations, moving, attacking, defending, or sustaining. The alterations in organization require some minor changes in SOPs and tactical

drills, but the light cavalry would operate just as its heavier predecessor. The elevation of some supplemental missions to essential missions is indicated.

Since we don't use light armored/motorized forces, I don't think we fully realize their value. I am most impressed by the capability of light armored forces to make a contribution on all battlefields in any contingency. Imagine the result if a light armored cavalry regiment had been available to the commander in Somalia during the unpleasant occurrences of October 1993.

The missions of the cavalry force do not really change, but the environment in which these missions are performed can vary greatly. A light armored force, especially light armored cavalry, is a necessity, and ruminating over some new assortment of missions is not necessary. Organize the light armored cavalry, and let it do the missions that armored cavalry has always performed.

Conclusion

I would like to point out here that the development of doctrine or restructuring missions is not the primary problem we face. Rather, the fielding of the force is the key concern. We need to field the force and think carefully about the scenarios in which it will be used and the threat it will face. The political situation, world-wide, demands that we be prepared for intervention missions on a global scale. The adoption of the AGS goes a long way toward strengthening the multi-intensity capability of the light armored cavalry. The use of the HMMWV as a combat vehicle is a mistake. Apparently, the HMMWV was something of a failure in Somalia, in the combat role. Let's not make this mistake on a grand scale when adequate wheeled armored vehicles are currently in production, exported on a large scale, and can be acquired "off the shelf" to equip our light armored/ motorized forces. We do not have enough time to spend years developing a wheeled armored family, as we did with the AGS. The acquisition and operating costs of any new force is obviously a consideration, but should not override the protection requirements of the force. I fully endorse the creation of the light armored cavalry, but recommend that the force be properly equipped and organized for combat in today's turbulent times and that it be suited to the complete range of possible scenarios.

Captain David L. Nobles served as a tanker in the 82d Airborne Division from 1978-1981. He is a 1984 Distinguished Military Graduate of Seton Hall University. A graduate of AOBC, AOAC, Cavalry Leader's Course, and CAS[3], he has served as a platoon leader, assistant S3 and S3 Air of 4-64 Armor; S3 Air and commander of A Troop, 1/11th ACR, and regimental plans officer (assistant S3) of the 11th ACR. A graduate of the Georgia Institute of Technology (Master of Science), he is a member of the U.S. Military Academy faculty in the Department of Systems Engineering.

Author's Note: I would like to express my thanks to CPT Philip Decamp for proofreading this paper and for his thought-inspiring debate.

Imaginative lane training hones a scout section's skills in Texas Army National Guard cavalry squadron exercise

Low-flying aeroscout weapons team overwatches scout vehicles moving along training lane.

Scout Training Lanes

by First Lieutenant Robert W. Redding and First Lieutenant Edwin Starr

Under the BOLD SHIFT initiative, Reserve Component units are directed to conduct evaluated training for units no larger than platoon size. To comply with this FORSCOM directive without sacrificing challenging and realistic training, LTC C. Terry Granade, Commander of 1st Squadron, 124th Cavalry, Texas Army National Guard, directed that the squadron's annual training in June 1993 would culminate in a scout section live fire.

The scout sections, consisting of an M113 APC and an M901 ITV, would fire and maneuver, while an aeroscout weapons team, consisting of one OH-58 and two AH-1Fs would overwatch and provide supporting fires, all under the control of the scout section leader. This event would exercise the air/ground coordination critical to successful cavalry operations, and challenge the junior noncommissioned officers to an extent seldom practiced anywhere in the U.S. Army.

On 20 March 1993, the squadron operations officer, MAJ William Meehan, tasked us to plan and execute scout training lanes. These lanes would serve to prepare the scout sections for the live fire exercise, and validate that the sections were in fact ready to conduct such a difficult and complex operation.

Trooper engages infantry targets on the screen line.

In addition to the air/ground coordination and maneuver essential to the live fire phase, we identified several mission-essential tasks to be trained on the lanes. These included a bridge reconnaissance and assembly area operations.

After we determined which tasks would be included in the scout lanes, we looked up the tasks and subtasks associated with each one in the Scout Platoon Mission Training Plan. Because the elements negotiating these lanes would be sections, not platoons, and because we determined that each section would have only six hours to complete an evaluated run, we had to edit the subtasks each group would be required to accomplish. We consulted with MSG Jeffrey M. Kennedy, our advisor from the Fifth Army Readiness Group, and the scout platoon sergeants, to produce the list of subtasks the sections could be expected to complete. A complete list of the tasks and subtasks were distributed to the ground troops one month prior to annual training from which they could prepare their sections for the scout lanes.

The scout platoon sergeants were selected to serve as the lane experts. They would each ride with a scout section that was not from their own troop as the section negotiated the lane during the evaluation phase. The scout platoon sergeants were evaluated by officers from the squadron S3 section, and advised by MSG Kennedy, to ensure that they understood exactly what the standards were for successful completion of each task. The squadron commander then certified them as lane experts.

Six days were allotted for the entire scout section phase of annual training. The first two days were for the troop commanders to prepare their sections. During this training period, wire and mine obstacles and mock bridges were constructed in the training area so that the sections could rehearse their actions. During the next two days, the sections were evaluated on the lanes. The next day was devoted to rehearsals on the live fire range and maintenance. The final day was the live fire exercise.
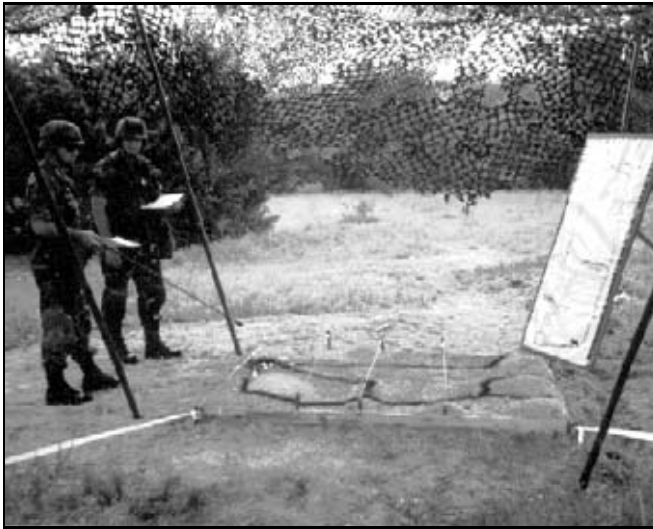
Above, section leader receives his order. He back-briefs lane expert in photo at right.

The squadron had all of Fort Hood Training Area 51 to use for the scout lanes. To make the distances traveled more realistic, the sections made a clockwise circuit around the boundaries of the training area. To evaluate eight sections in two days, we decided to run two at a time. One started in TAA Blue, in the northeast corner of the training area, the other started in TAA Green, in the southwest corner.

The section leader received the warning order twelve hours before his SP time. This warning order was included in a packet prepared for each section. The packet also contained the operation order, frag order, and map graphics; the tasks, conditions, and standards they encountered; and the lane expert's comments on their performance. The runs lasted six hours beginning at 0600 and 1200. At 1800, the sections received an order for a dismounted night patrol. Each section performed the same tasks, whether they began in TAA Blue or TAA Green; only the sequence of the tasks was different.

Throughout the scout lanes, sand table briefings and rock drill exercises were emphasized. Upon arriving in the TAAs, the section leaders received an order and instructions on the sand table from the lane expert. The rest of the section performed TAA procedures evaluated by a scout platoon leader. The section leader developed his plan and briefed it to the lane expert. He then briefed his section on the sand table and rehearsed them on the rock drill until all his soldiers understood what to do. This was an evaluated part of the lane evaluation and was graded intensely. AH-1F and OH-58 crews at-

tended the sand table briefing and participated in the rock drills.

As the scout sections negotiated the lanes, the lane experts directed them to repeat those portions of the lane where they needed significant improvement. When a section had completed the lane, we were certain they were ready to proceed to the live-fire phase. The section leader then led his section onto the range, where he would also control an aeroscout weapons team firing in support of his section.

From the lane experts' evaluations, we determined which scout section had performed the best. This section was awarded the privilege of conducting the only live-fire run at night, complete with 4.2 mortar-fired illumination. At the completion of the live fire, each section got to keep their packet as a record of their performance. Each troop commander also received a copy, minus the orders, as a report on how his sections had performed.

As mentioned earlier, the sand table briefings and rock drills were a critical, and evaluated, part of the scout lanes and the live-fire phase. We believe that these were essential to the success of the junior noncommissioned officers being able to maneuver their sections, aeroscouts, and attack helicopters through this complex series of tasks. Furthermore, by using this training model, now the 124 Cav model, we were able to get a better evaluation of our scout sections' abilities and make far more efficient use of our limited training time. The 124 Cavalry model will keep us in good stead for next year's platoon-level ARTEP and live fire exercise.

First Lieutenant Robert W. Redding holds a Bachelor of Science Degree in geography and a Master of Agriculture in Natural Resources Development from Texas A&M University. Commissioned through ROTC from Texas A&M, he is a graduate of the Chemical Officer Basic Course and the Armor Officer Advanced Course. Currently a scout platoon leader for B Troop, 1st Squadron, 124th Cavalry, TXARNG, he has previously served as squadron chemical officer, 1-124 Cavalry and as decontamination platoon leader, 340th Chemical Company, USAR. In his civilian occupation, he is a geographic information systems consultant with PlanGraphics, Inc.

First Lieutenant Edwin Starr is currently the XO of B Troop, 1-124 Cavalry, TXARNG. He is also a region OIC for the Texas National Guard Counter Drug Task Force. A 1988 graduate of the U.S. Military Academy, he served as a platoon leader with the 3d Battalion, 32d Armor, 1st Cavalry Division, during Operations DESERT SHIELD and DESERT STORM.

Achieving Digital Destruction:
Challenges for the M1A2 Task Force

by Major Dean A. Nowowiejski

In 1993, Task Force 3-8 Cavalry in the 3d Brigade, 1st Cavalry Division, underwent new equipment training, qualification gunnery, NTC Rotation 93-10, and an initial operational test and evaluation with 17 M1A2 tanks. Most of the capabilities of the M1A2, and results of this experience have been discussed in other articles.[1] The M1A2 brings the armor force digital command and control through its incorporation of the Intervehicular Information System (IVIS) and Position Navigation (POSNAV). These systems, in conjunction with the Commander's Independent Thermal Viewer (CITV) and onboard diagnostics, give the M1A2 task force significant advantages.[2] Battlefield awareness improves in terms of both friendly and enemy locations. So does positive control, even as operations increase in tempo and precision. The M1A2 task force can quickly disseminate information, reports, and graphics, consolidate on the move, and change missions. The M1A2 gives the task force the equivalent of automated task force fire planning, plus the ability to mass fires with less fratricide. Because of internal diagnostics and IVIS, combat service support status is more exact and more quickly reported. The literature on the M1A2 so far has emphasized what the tank can do. To be balanced, we need to consider not only the tank's potential for task force operations, but also what challenges professional soldiers face in reaching its full capability. This article will focus on some issues we must confront in take advantage of the M1A2 as the Army transitions to information warfare and the digitized battlefield.

IVIS Limitations. The Intervehicular Information System relies on a specific protocol for routing messages and overlays, based upon the user identifications within the net. (See Figure 1 for an example of an IVIS display.) Several limitations in this protocol and in IVIS symbology could be overcome with software revisions.

Some of the needed changes are beyond the user's control. The routing matrix is the first restriction which might be addressed. Only two of the IVIS overlays allow changes in graphics to flow **upward** through the chain of command. It is impossible for the company commander or battalion S3 to send refinements of operations overlays to the battalion commander.[3] The Task Force 3-8 commander had to assume the IVIS user ID of a company commander so that he could receive graphics from his company team commanders. Likewise, the TOC at times used the ID of the task force commander or S3, since there is not a user ID for the TOC. Most of the routing matrix limitations can be bypassed by creative use of alternate user IDs, but this makes for a slow, ungainly procedure. In the end, the matrix should be revised by means of a software change to parallel doctrinal procedures governing the exchange of information.

Similarly, the current military symbols in the IVIS protocol do not fully parallel those of Field Manual 101-5-1, *Operational Terms and Symbols.* The IVIS screen quickly becomes congested through overuse of the point symbol, whereas a standard military overlay should be kept uncluttered. (See Figure 2, Comparison of IVIS and Standard overlays.) Another thing that would help alleviate this IVIS clutter is to make the symbols smaller.[4] Ideally, the IVIS overlay will evolve into an easy to read, streamlined version of the operations overlay using standard military symbols.

The amount of time that it currently takes to load a complete task force operations

overlay into IVIS calls for further consideration. To be timely, the operator must begin input as soon as draft graphics are approved. Furthermore, it takes some time for an operator to develop the proficiency to quickly and accurately enter that data. In Task Force 3-8, two of the best sergeants in the operations section took this responsibility as a full-time job. Perhaps in the future there will be a tactical computer operator MOS for a soldier who is specially trained in information warfare devices like IVIS. Tactical computer training and input are an increasingly important operational concern.

Command, Control and Communications Net Demands. In 3-8 Cav, the IVIS net was the task force command net (the Alpha and Delta Team nets were also digital). During the NTC rotation, the task force commander, S3, all maneuver commanders, platoon leaders in Alpha and Delta teams, and the TOC all had IVIS. With this distri-
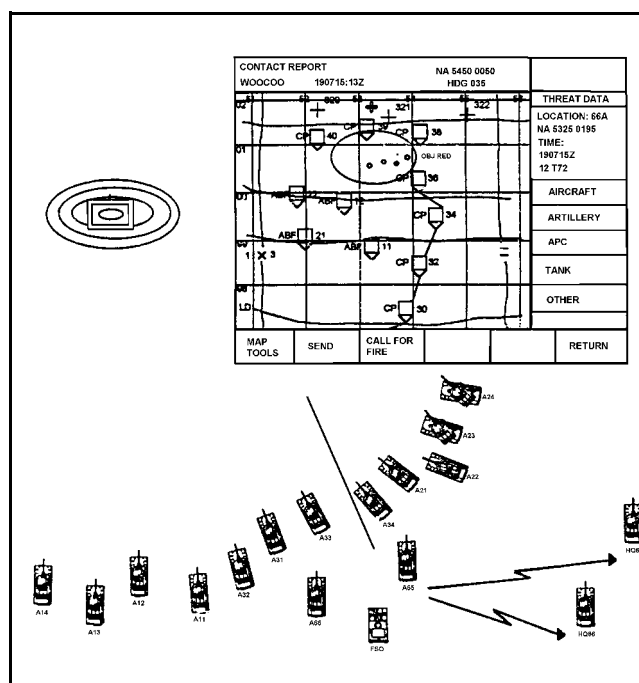

Figure 1. IVIS Display of a Tactical Situation. Note how net subscribers are depicted by open circles on screen.

bution of equipment, task force command and control could be exercised digitally.

While the M1A2 improves many aspects of command and control, it also imposes new demands. Strict adherence to standard operating procedures (SOPs) is a challenge of renewed importance. The time required to keep the IVIS system updated has already been mentioned. As with any new system with complex user requirements, IVIS depends upon soldiers who understand its protocols, standard reports, and overlay manipulation. Refined procedures must become matters of SOP. SOPs provide standards for managing reports and files, and suggest whether to send a digital or voice message in a given circumstance, a critical decision since both types of traffic currently share the same net. Standard operating procedures allow the task force to navigate through the complexities of IVIS.

One of the biggest problems that Task Force 3-8 experienced at the National Training Center was the difficulty of keeping all stations on the digital net due to linkup problems. The initial linkup procedures require a silent voice net for several minutes, until all subscribers are in the digital net. The same condition applies to users who must reestablish commo. Reentering the digital net is often difficult during active operations; there is too much traffic on the net. It is unrealistic in a tactical environment to expect the lengthy silence required during linkup.

This also means IVIS is not user-friendly in a hostile electronic countermeasures environment. If stations have difficulty linking up in a training environment, one can just imagine how few stations will remain digitally linked in a high-intensity, contact situation where the enemy frequently jams the task force net and forces frequency changes. This problem may best be remedied by a software change.

The addition of digital traffic to the task force command net, including digital calls for fire and medevac requests, makes the net an incredibly busy place. During maneuver operations, many digital messages will never get sent because messages wait in queue until they expire. There is an obvious need for strict command net discipline in M1A2 units.[5] But net discipline can only go so far. The best solution would be a separate digital net. Perhaps the hardware can be reconfigured to take advantage of SINCGARS' frequency-hopping capability and allow the same radios to fill the need for separate voice and digital task force command nets.

The current IVIS protocol calls for call signs to be used as station identifiers for digital messages, but one lesson learned by TF 3-8 was that it is easier to establish a set of standard identifiers, such as bumper or position numbers, in place of changing call signs, so that there is less confusion about the identity of subscribers or their locations (recall that the IVIS screen shows an icon for each net subscriber). Each user should always use a standard IVIS identifier, so that there is quick recognition on the IVIS screen.

Current tactics, techniques, and procedures also call for the command net to revert to voice when enemy contact is made.[6] This eases the burden of digital traffic on the already crowded net, but foregoes some of the unique advantages that the IVIS system brings to units in contact. Examples are far target designation to create initial contact reports, and the use of digital calls for fire and medevac requests. Some would argue that the policy should be reversed, giving primacy to digital rather than voice communications during contact.[7] The point is that, because of the concept of sharing a common net, voice-only transmissions during heavy contact miss some of the unique advantages, accuracy, and precision of digital communications.

Finally, there is the situation of the IVIS-equipped tank platoon leader in a non-IVIS-equipped Bradley mech team. As currently written, the TTP envisions the tank platoon leader as a kind of translation station, relaying information received digitally to his mech team commander.[8] Putting the subordinate in the position to screen key battlefield information for his superior is awkward; there is potential loss of information in the IVIS to voice transition; and there is risk of breaks in contact caused by battlefield dispersion. The long-term solution is the IVIS-equipped Bradley, which was provided in prototype during NTC rotation 93-10. Yet the challenge remains: in many units during the early fielding of the M1A2, there will be a need for innovative techniques to integrate IVIS-equipped elements into non-IVIS maneuver elements, and vice-versa.
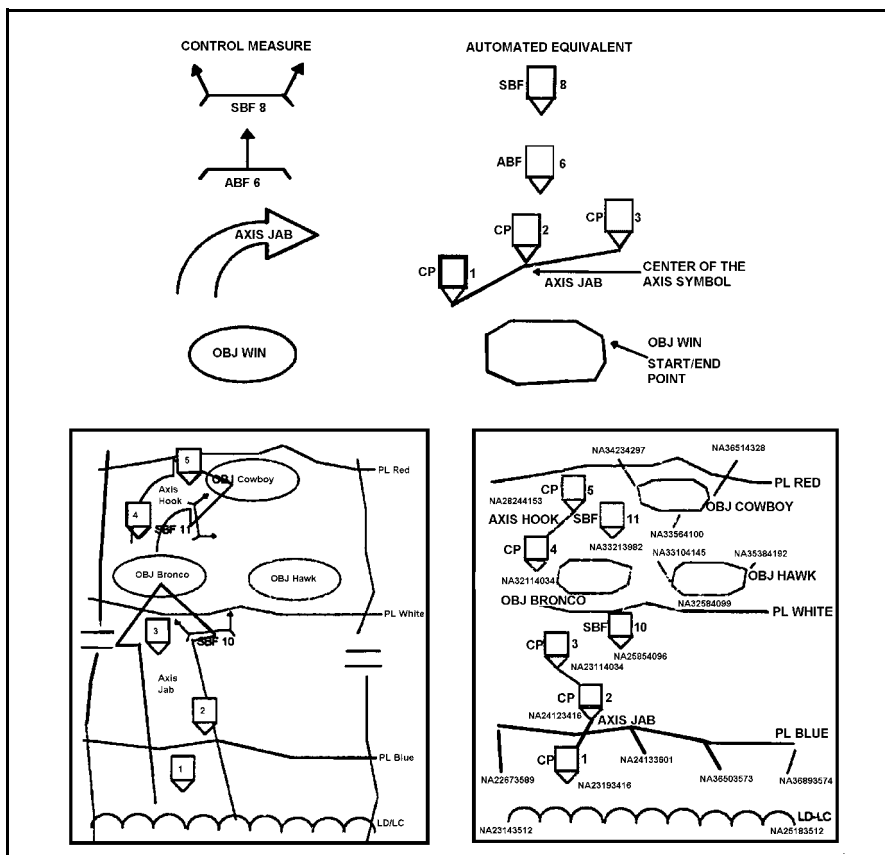

Figure 2. Comparison of standard graphic symbols and overlay to IVIS symbols and overlay.

Operational Impacts and Training Needs. Unique operational situations and training needs are already apparent for the M1A2. First, because of the wealth of information on the commander's integrated display (CID), there is a tendency for the tank commander to become focused on the CID, to the point of staring at the screen when he should be scanning the battlefield from the TC's hatch. This dilemma can be eased by training the loader to observe the CID from his crew position, and to alert the tank commander of any critical incoming reports. Even with that adjustment, the TC will have to develop an intuition about when to work the CID and when to command from above.

In the TOC particularly, there is a need for extensive cross-training in IVIS-related skills, both in handling the terminal and processing and relaying information from IVIS. IVIS capability is like a foreign language skill — it must be rehearsed and used to be maintained. Training for the NTC in TF 3-8 required multiple IVIS exercises focusing on the command group, TOC, and company team commanders, in order to develop and enforce standards of integration. IVIS employment is a consideration at task force rehearsals and during decision support template development. Decision points can be input into the IVIS overlay itself, using improvised symbology. The need for IVIS rehearsals of key parts of the operation, like breaching and the counterreconnaissance battle, became clearer over the course of the NTC rotation for 3-8 Cav.

Even with the advantages of modernization, there still remains the need to have a manual system to back up the digital information-processing one. In some respects, the ease of reporting and information processing afforded by IVIS carries with it the threat of over-reliance; we must keep in mind, for instance, that the whole complexion of task force command and control changes if the IVIS track in the TOC goes down.

Integration. IVIS tends to highlight already existing fault lines in task force operations — the lines of integration where the battlefield operating systems meet. Many of these seams will vanish as digital systems that communicate across operating system lines are fielded, but for now they call for careful consideration.

The basic issue now is, "Who has IVIS and who doesn't?" Task force scouts, mech infantry, mortars, engineers, air defense, support platoon, and field trains all presently miss out on the benefits of digital technology.[9] Until task force scouts can input their reconnaissance reports directly into IVIS, we essentially have a highly lethal task force main body with blind eyes. Mech infantry without IVIS Bradleys becomes the weak sister on the digital maneuver battlefield. Mortar fire power just can't keep up with the operational tempo of the M1A2 using old manual methods. The Enhanced Mortar Fire Control System (EMFCS) fixes this problem for the task force commanders by linking task force mortars to IVIS, and "returns the mortar to its place as the commander's initial indirect fire weapon of choice" on the digital battlefield.[10]

One of the most significant challenges for the M1A2 task force will be to create a digital link to field artillery fire direction systems. Digital calls for fire should enter the field artillery database directly, without being manually relayed inside the task force TOC. This will speed the process, improve synchronization with fire support, and eliminate potential inaccuracies created by manually relaying fire direction data.

Similarly, providing the task force engineer with an input terminal and GPS will facilitate speedy transmission of data from the work site directly to the obstacle overlay. These improvements fit into the general need to integrate digital hardware across the battlefield operating systems, with artillery and engineers being those that might offer the most immediate positive impact at the task force level.

In the CSS arena, there is no IVIS capability for company team combat trains, support platoon, or field trains, so the benefits of CSS digital reporting are not evenly spread throughout the task force. Let's use the company team to illustrate the current challenges of CSS integration. The executive officer has enormous responsibilities as the integrator of company team IVIS CSS reports. He collates the separate platoon reports, inputs manual facts from non-IVIS elements, and forwards the consolidated report to higher. There is little help for him from the first sergeant, who has no IVIS, and this job is in addition to his responsibilities as second in command. The company team combat trains and field trains have no IVIS input capability. This means that the benefits of digital CSS reporting are principally limited to the maneuvering line platoons. Giving the first sergeant IVIS capability would go a long way toward more complete task force CSS integration.

The issue of integration impacts the fielding of the M1A2. For instance, if only leaders to platoon level have the tank, and platoon sergeants and wing men retain the M1A1, then integration challenges are felt in tank elements of the task force as well. To the author, this situation parallels the dilemma faced by armor theorists between World War I and II. How were they going to integrate armor and mechanized forces on the battlefield to take advantage of their full potential? The French and Americans elected to integrate a little everywhere.[11] The Germans elected to create a combined arms force of rapid mobility and massed armor for the purpose of exploitation, the force used for blitzkrieg in Poland and France.

The parallel today is that digital technology possesses the same revolutionary impact that the tank did then. Let's not make this lethal warfighting machine a glorified digital communications platform by piecemeal fielding across the force. Wherever the M1A2 is fielded without a digital counterpart, there will be a seam in task force operations that requires reversion to old methods to accomplish synchronization. Task Force 3-8 had the requirement to conduct simultaneous planning and orders dissemination using both the old technique of paper copies and overlays and the digital capabilities of IVIS. In this respect, having only partial integration of M1A2 tanks created an increased burden. Though it will be some time before digital technology is totally integrated, this problem deserves special consideration. Digital weapons systems will have their greatest impact where they are used en masse.

Information Processing and Potential for Information Overload. While simplifying the mechanics of handling information, IVIS increases the burden of information processing. Using IVIS is like having to monitor an additional net in the TOC, while adding the requirement to capitalize on the unique capabilities which the system provides. TOC procedures now require handling information from standard FM nets, Maneuver Control System, and IVIS. As discussed earlier, this simultaneity makes standard procedures all the more important. An increased burden is placed on TOC information flow and overlay management.

There is a new sense of battlefield perception, on determining what the true picture is, because even though the reports are quicker and more accurate in detail, they increase the volume of information and pick up the pace of operations, while continuing the requirement for interpretation. In the M1A2 task force, instead of confusion on the battlefield being caused by absence of information, confusion can be caused by the sheer volume and clutter of data.

We are need leaders who are capable of managing and interpreting large volumes of information. We must be able to make sense out of all the detail. The effective leader in an M1A2-equipped task force must sort through a profusion of IVIS reports, quickly decide which to delete, forward as is, or consolidate into another report. There is a sorting process involved; data is not automatically retransmitted. Leaders in the M1A2 task force must be comfortable with enforced standards and exact procedures, of life according to SOP, in order to facilitate time and information management. Increasingly, they must be familiar with computers, the management of files and manipulation of software. The days of the computer illiterate armor leader are going the way of the horse cavalry soldier.

Though the demand for well trained leaders and soldiers remains constant; the nature of training changes, and so do the qualities needed in all personnel. We must train and rehearse in all aspects of information warfare, to include incorporating technology such as the CITV and POSNAV, which work hand in hand with IVIS. All soldiers of the task force must be involved. Noncommissioned officers and enlisted soldiers converted standard overlay symbols to IVIS icons and created the IVIS overlays for Task Force 3-8. Loaders helped to monitor the commander's integrated display. Training with information systems increasingly demands innate intelligence and computer literacy, so that soldiers can accommodate changes, so they can handle rapid operations, and think on their feet. The M1A2 task force will place continuing emphasis on quality training of quality soldiers.

Notes

[1] Experiences from 3-8 Cavalry were described in three other articles:

Clark, Wesley K., Major General, "Digitization: Key to Landpower Dominance," *Army,* November, 1993, pp. 28-33;

Del Carlo, George H., Lieutenant Colonel, "A Glimpse of the Digitized Battlefield at the National Training Center," *Landpower Essay 93-7,* AUSA Institute of Land Warfare, October 1993. LTC Del Carlo's article focuses on the capabilities and advantages of the M1A2 tank itself;

McVey, Wade L., Captain, "The M1A2, IVIS, and NTC — A Company Commander's Perspective," *ARMOR,* November-December 1993, pp. 35-37.

See also "Training on the Digitized Battlefield," *ARMOR,* January-February 1994, pp. 37-39.

Additionally, the following doctrinal literature has been used as a reference for this article:

Special Text 71-2-1 (Initial Draft), *Tactics, Techniques, and Procedures for the M1A2 Battalion Task Force,* U.S. Army Armor Center, Fort Knox, Ky., April 1993.

Special Text 71-1-1 (Final Draft), *Tactics, Techniques, and Procedures for the M1A2 Company Team,* U.S. Army Armor Center, Fort Knox, Ky., November 1992.

The author acknowledges the use of Figures 4-4, A-16, and A-20, ST 71-2-1, for the illustrations in this article. He also acknowledges the assistance of LTC James Forlenzo, Center for Army Tactics, Fort Leavenworth, who provided useful suggestions for editing this paper.

[2] A brief description of each of these systems follows:

The IVIS is a digital communications and display system that permits the transmission of reports and overlays over FM radio, to be displayed in each combat vehicle operating on a particular digital net. The system also permits the transmission of both voice and digital traffic over the same net, with voice taking precedence. While voice traffic is taking place, all digital transmissions are held for a temporary period in a queue, until there is a pause in voice communications. Then the digital burst is sent. If too much time passes, the digital message dies.

POSNAV is an inertially-updated position-locating system that initializes from a common start point obtained from a local global positioning system (GPS) receiver. POSNAV operates independently from GPS; it is a different system. The M1A2 tank driver uses POSNAV to set multiple waypoints in his driver's display panel and navigate from one to the next. The same system provides the tank commander an exact grid to his location on his commander's integrated display (CID).

With the CITV, the TC can independently scan the battlefield to acquire targets with an additional daylight or thermal sight, while the gunner engages targets on his own. The TC can independently range to the target using a choke sight included in his field of vision, and "target designate" his gunner on a target that was not even in his gunner's field of view by using a button on the TC's control handle.

There are three system-level diagnostic tests embedded in the M1A2's circuits; the self-test (ST), the built-in test (BIT), and fault isolation test (FIT). The ST is a non-intrusive test which runs continuously and displays a caution or warning message when a fault occurs or maintenance is needed. The BIT requires the crew to cease operations on the component which they are testing, but provides comprehensive diagnostics of that component and early notice of component problems. The fault isolation test is a unit maintenance level function that continues the same process of identification, but can render the tank immobile. (ST 71-2-1, p. 7-6)

[3] ST 71-2-1, pp. 2-16, 2-21.

[4] Del Carlo, p. 5.

[5] Further elaborated in "Training on the Digitized Battlefield," p. 39.

[6] ST 71-2-1, p. 2-19.

[7] Funk, Paul E., Major General, "The Right Technology at the Right Time," *ARMOR,* May-June 1993, pp. 5, 35. The quietness of a digital net during the Advanced Warfighting Demonstration of Battlefield Synchronization stood in direct contrast to the noise and confusion of a typical voice command net, yet the current M1A2 TTP calls for voice communications to take precedence.

[8] ST 71-2-1, pp. 1-2, 1-5.

[9] The exceptions of EMFCS and IVIS Bradleys have already been mentioned.

[10] Funk, p. 35.

[11] In 1932, Chief of Staff Douglas MacArthur directed that all branches continue to study the subject of mechanization, a piecemeal approach that avoided the decision whether the tank should be the primary responsibility of the infantry or cavalry.

Major Dean A. Nowowiejski was commissioned as an armor officer following graduation from the U.S. Military Academy in 1978. He has subsequently received an MA Degree from Princeton University and graduated from CGSC. He served as a cavalry platoon leader and troop XO in 2d Squadron, 3d ACR, and commanded a tank company in Germany in 2-32 Armor, 3d AD. He taught American history at West Point and served on the division staff of 1st Cavalry Division, including G3 plans during DESERT SHIELD/ STORM. He was the S3, 3-8 Cavalry during M1A2 NET and NTC 93-10. He is currently a student in the Advanced Military Studies Program at Fort Leavenworth.

Forrest's Last Raid

The cavalry raider planned a combined land and water campaign against the Union's vulnerable, river-borne logistical system

by Brigadier General Philip L. Bolté, USA, Ret.

Cavalry raids have been a part of military operations since the dawn of cavalry and have survived the demise of the horse. Never, though, have they been a more important and integral part of a military strategy than in the American Civil War. To the Confederate Army in the western theater, cavalry raids were critical to the limited success the South enjoyed there. Usually outnumbered and outgeneraled, at least at the most senior levels, Confederate forces experienced more losses than victories on major western battlefields. Without the successes of cavalry raids, defeat in the west would have come sooner.

Confederate cavalry raids in the western theater wreaked havoc on Union lines of supply and communication. Generals John Hunt Morgan and Nathan Bedford Forrest operated throughout Tennessee and Kentucky with such effectiveness that a significant portion of Union forces was committed to the defense of rear areas.

Confederate raids on Union supply depots had a decided impact on Union operations. In December of 1862, Forrest had helped bring Grant's 1862 offensive against Vicksburg to at least a temporary halt. Shortly after Van Dorn destroyed Grant's supplies at Holly Springs, Mississippi, Forrest took a cavalry force far into Tennessee, where he "gobbled up one Federal base after another," cut the railroad in several places, and destroyed courier routes and telegraph lines. Grant wrote of these two raids that they "cut me off
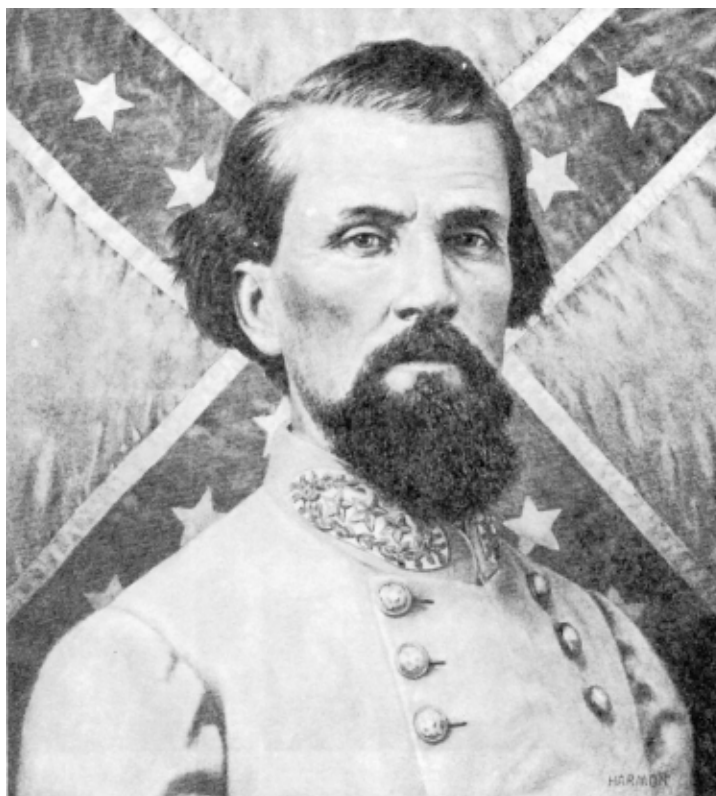
from all communication with the north for more than a week, and it was more than two weeks before rations or forage could be issued from stores obtained in the regular way."

General Joseph E. Johnston, desperately trying to stop Sherman in 1864 as he advanced to Atlanta, saw the benefit of cavalry raids on Sherman's supply line. Johnston wrote after the war, "It can scarcely be doubted that five thousand cavalry directed by Forrest's sagacity, courage, and enterprise, against the Federal railroad communications... would have compelled General Sherman to the desperate resource of battle on our terms." His successor in command of the Army of Tennessee, Gen-

eral John B. Hood, requested that General Maury, Forrest's superior at the time, order "General Forrest ... with the whole of his available force into Tennessee." General Robert E. Lee himself, in a letter to President Davis in July, recommended that all the cavalry in Mississippi and Tennessee be concentrated on Sherman's communications.

It was Forrest's own understanding of the value of striking Sherman's communications that caused him to write directly to President Davis in September 1864 asking permission to move into Tennessee with a strong force of cavalry to cut the railroads and interfere with Sherman's supplies. President Davis supported Forrest's request in a letter to Forrest's new commander, Lieutenant General Richard Taylor, who promptly issued the orders. It was from this raid that Forrest had just returned when he was called on again to attack Sherman's line of supply. It would be his last raid.

Forrest stated his intent in a communication to General Taylor: "It is my present design to take possession of Fort Heiman, on the Tennessee River, below Johnsonville, and thus prevent all communication with Johnsonville by transports." He had determined that Sherman had "received most of his supplies at Atlanta" by that route. The supply line that connected Sherman with his depot in Louisville included supply bases at Nashville and Chattanooga, as well as the new depot at Johnsonville on the Tennessee River. There, supplies brought in by river

were transferred for rail shipment to Nashville and on to Chattanooga and then Atlanta.

Forrest's Cavalry Corps included two divisions, each led by a bold and aggressive commander. Buford's Division, made up mostly of men from Kentucky and Tennessee, was commanded by Brigadier General Abraham Buford, a cousin of the better-known Gettysburg hero, Union cavalryman John Buford. (Another cousin, Napoleon Buford, also served as a Union general.) Buford had became a division commander in Forrest's Cavalry Corps in early 1864 and served in that capacity at Brice's Crossroads and on several raids. (While not the best known Confederate general, at 320 pounds he was undoubtedly the heaviest.)

Chalmers' Division was commanded by Brigadier General James R. Chalmers, a man sometimes at odds with Forrest, but one of unquestioned ability and gallantry. Rising from captain to brigadier general commanding an infantry brigade, he was severely wounded at Murfreesboro. After recovering, he led a cavalry brigade and division, joining Forrest's command in 1864.

By October 21, Forrest had his headquarters in Jackson, Tennessee, and his two divisions in the vicinity. Buford's was the stronger division as Chalmers had only one brigade and about 550 men from two others. The total force numbered about 3,000.

Having determined that there was no Federal force that might threaten him from the east or west, Forrest sent Buford's division north to Fort Heiman, an abandoned former Confederate post directly across the river from the better-known Fort Henry. Buford carried with him, besides his field artillery, two 20-pounder rifled Parrot guns sent up from the fortifications at Mobile. They had been moved by rail to Corinth and dragged over wretched roads since then.

Buford placed the brigade of Colonel H. B. Lyon, along with the two Parrot cannons, inside the abandoned works of Fort Heiman. Farther upstream he stationed the brigade of Colonel T. H. Bell. He directed his men to stay hidden so as not to discourage approaching vessels. Only laden transports heading south were to be fired on, and those

only after they had passed Fort Heiman. Buford also stationed dismounted troopers along the river bank to discourage fire from any armed vessels that could challenge the artillery.

Forrest had once again moved so rapidly and covered his approach so successfully that the Federals were completely unaware of his presence. On the 28th, Buford managed to hold his soldiers in check as four steamers sailed downstream from Johnsonville. Early on the 29th, though, the Federal transport *Mazeppa* steamed into sight on her way up the river. The Confederates allowed her to pass a two-gun section north of Fort Heiman, but as she came abeam of the middle section, Buford gave the order to fire. The heavy Parrots joined the light artillery and after

three accurate rounds had struck her, the ship became unmanageable and drifted ashore on the opposite bank, where her crew abandoned her.

A volunteer made his way across the river and took possession of the *Mazeppa*. Soon after a hawser was attached to her, the *Mazeppa* was on the west bank. The vessel carried a large supply of flour, footwear, blankets, hardtack, and other goods of much value to her captors. A demijohn of brandy, confiscated by General Buford from the trooper who found it, was apparently claimed by Buford as "just enough whiskey for the general."

While the cargo was being unloaded, three gunboats made their appearance and began to shell the unloading detail. Although the Confederate batteries
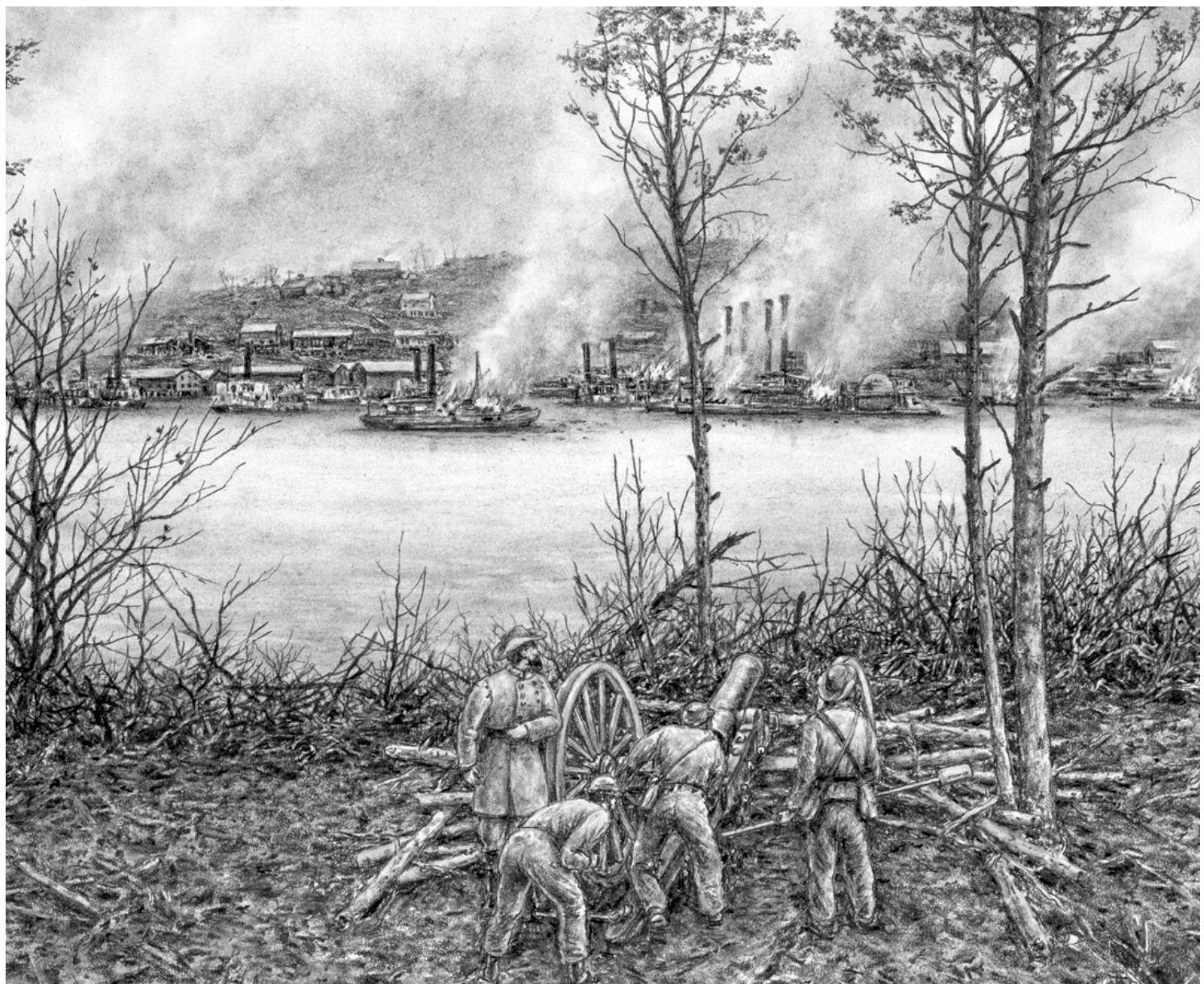
drove them off, Buford, afraid the Federals might return in force, ordered the *Mazeppa* to be burned.

The next day, October 30, was a busy day for Buford's troopers. First, the steamer *Anna* arrived, bound downstream. Hoping to capture her, Buford undertook to hail her into the bank under an understanding that his fire would be withheld. Promising to land at a downstream landing, the pilot instead steamed at full speed past the lower batteries. Although the lower batteries were able to inflict some damage on the vessel, they fired too late to prevent escape.

Meanwhile, the crew of the *Undine*, a gunboat that mounted eight 24-pounder brass cannon and had escorted the *Anna* to a point a few miles upstream,

heard the firing, cleared for action, and steamed to the sound of firing. She first came under fire from two field pieces at Paris Landing. After an hour-long battle, with his vessel badly damaged and four crew members dead, the captain withdrew to a point between the Confederate positions at Paris Landing and Fort Heiman where he could not be reached by the cannon at either location. There, he started repairs on his boat and used his guns, loaded with shrapnel, against the Confederate musket fire on the shore.

While the *Undine* was anchored, she saw the transport *Venus* approaching from upstream and signaled her to keep out of danger. Failing to heed the signals, the *Venus* came into the range of the upper battery. She was able to pass

by with minimal damage, although her captain was killed, and came to anchor under protection of the *Undine*.

Several minutes later, another transport, the *J. W. Cheeseman*, approached, also ignoring the *Undine*'s signals. She came under heavy fire and limped to the west bank, where some of Buford's men boarded her and captured the crew.

While the battle continued, one of Buford's regiments, the Second Tennessee Cavalry, was sent to a point about eight hundred yards below Paris Landing, where it could attack the *Undine*. There, the regimental executive officer improvised an order for his troopers: "Dismount, and prepare, on foot, to fight — a gunboat."

Colonel Edward W. Rucker, commanding a brigade of Chalmers' division, which had just arrived that day, found a way to move two field pieces through the tangled brush along the river so that they could be brought to bear on the *Undine* and the *Venus*. By late afternoon, the gunboat had been disabled by artillery fire and abandoned on the east bank of the river. The *Venus* surrendered to rifle fire and was boarded by troopers of Chalmer's division. The cavalrymen then crossed the river on the *Venus* and took possession of the *Undine*.

Meanwhile, another gunboat, the *Tawah*, arrived from Johnsonville and dropped anchor a mile and a half from the nearest Confederate guns. After she had fired a few salvos at the upper battery, though, Chalmer's gunners got her range and she steamed away upstream.

So far, it had been a winning operation for Forrest's Confederates. At a cost of one man severely wounded, they had inflicted on the enemy losses of eight killed, 11 wounded, and 43 captured. Of the prisoners, all were ship's crew except for one officer and ten men of the infantry. The captured *Undine* and the *Venus* were both repairable. The *Mazeppa* had already been burned and the *Cheeseman* was too badly damaged for further service.

Consistent with his oft-demonstrated operational flexibility, Forrest now conceived a plan for a cooperative land and water operation against Johnsonville and the Federal flotilla there. Lieutenant Colonel Dawson of the Fifteenth Tennessee was appointed fleet commodore, a position he accepted with considerable reluctance, and captain of the *Venus*. Artillery Captain Frank P. Gracey, a former steamboat captain on the Cumberland River, was appointed captain of the *Undine*. Teams of volunteer cavalrymen made up the crews and a few hours practice in seamanship was conducted between the artillery positions along the river. The two Parrot cannons were mounted on the *Undine*.

Forrest's plan called for parallel movement of his land and water forces. Movement began on November 1, with Chalmers' troops and artillery paralleling the ships to provide protection if they encountered Federal gunboats from
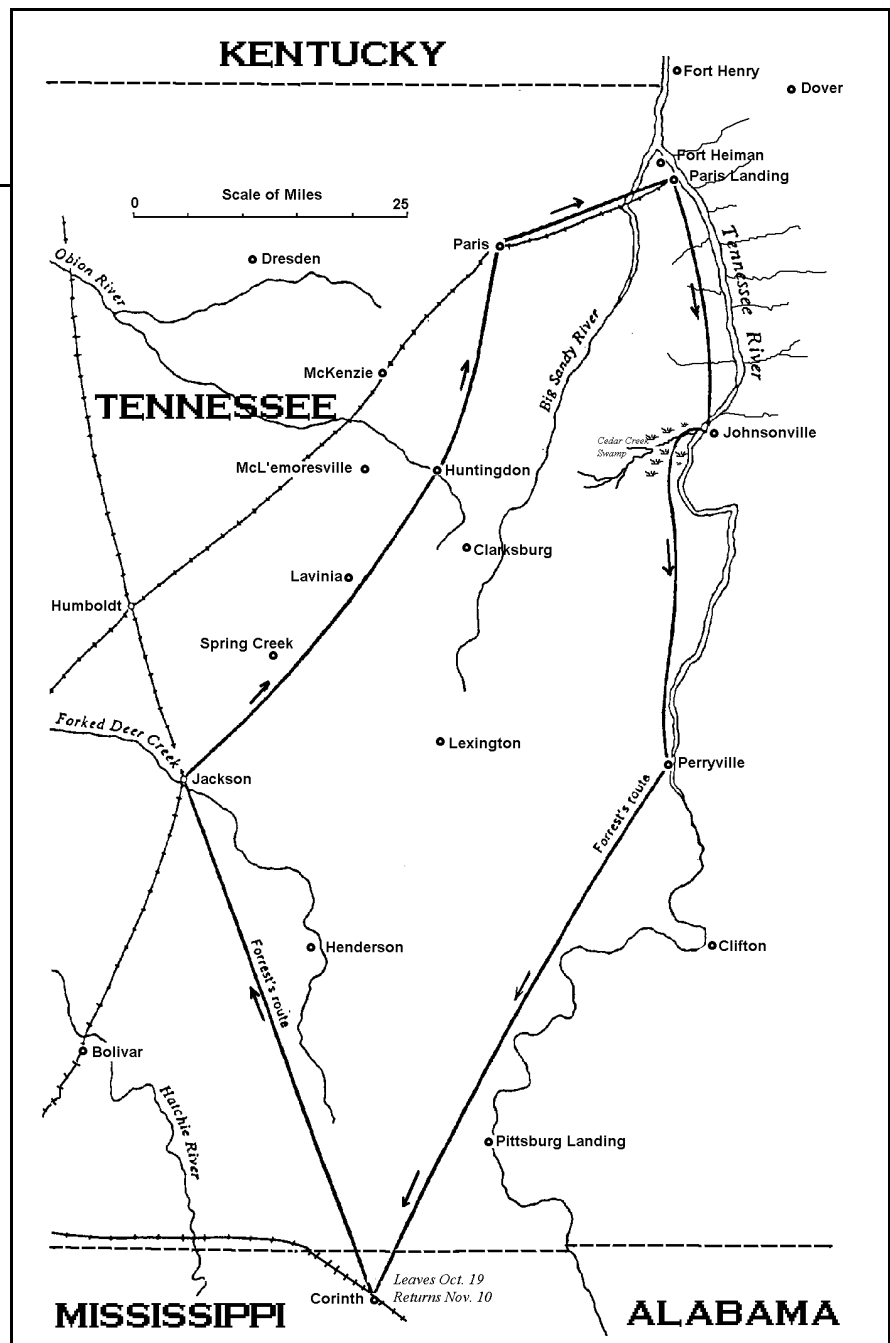
Johnsonville. Buford followed, prepared to do the same if gunboats from Paducah approached. On the afternoon of November 2, after a quiet advance of almost two days, the *Venus* was well in advance of the *Undine*, as well as the supporting troops. Suddenly she found herself confronted by two gunboats, *Tawah* and *Key West*, just rounding a bend in the river about five miles north of Johnsonville. Engaging the *Venus* immediately, the trained U.S. Navy gunners made short work of Forrest's sailors. Soon after the firing began, the *Venus* crew ran her aground, abandoned ship, and set fire to her. The *Undine* crew, witnessing the disaster,

quickly withdrew to protection of the artillery on the shore.

The next day, Gracey, about two miles north of Johnsonville in the *Undine*, attempted without success to decoy the Federal gunboats under Lieutenant E. M. King into range of the artillery on shore.

On the night of November 3, Forrest quietly moved his artillery into position on the west bank of the river to attack Johnsonville. He also placed guns above and below to cut off reinforcing gunboats. Forrest ordered Brigadier General Lyon to place a battery opposite the south face of the Johnsonville land-

ing and in easy range of it. After a night of enthusiastic work by the men, the battery was in place and completely out of sight from the landing. Other guns were dug in, as well, while still others were free to move about. Finally, two guns were moved through a swampy area and over fallen timbers so that they could bear directly on Johnsonville. All was ready by two o'clock in the afternoon.

Earlier, at about 8:00 in the morning, action had started downstream when gunboats dispatched from Paducah arrived. The six-boat fleet of Lieutenant Commander Le Roy Fitch — *Moose*, *Brilliant*, *Victory*, *Paw Paw*, *Fairy*, and *Curlew* — mounted a total of 79 guns. The *Key West*, *Tawah*, and *Elfin*, under command of Lieutenant King, also approached the area from Johnsonville. The three carried 25 additional guns. Arrayed against them were the *Undine*, with her eight guns, and four field guns on shore. There was little Gracey could do against such odds except destroy and abandon his ship. The crew quickly tore up mattresses and piled the shavings from them in the magazine and cabins, soaked them in oil, and abandoned ship, with Gracey applying the torch before he waded ashore. It was the end of Forrest's navy.

The field guns, though outnumbered, had the advantage of position. They badly damaged the gunboats, causing the upstream fleet to withdraw to Johnsonville and preventing the six ships from Paducah from participating in the later action at Johnsonville.

Forrest and the cannon he emplaced opposite Johnsonville remained undetected while the unsuspecting garrison, ship's crews, and laborers at Johnsonville carried on their normal activities. There were acres of supplies on the ground and three gunboats, eight transports, and some 18 barges at the landing. Barges were being unloaded, crews were scrubbing decks and washing clothes, and all was serene.

Suddenly, Forrest unleashed his gunners, with ten guns hurling their shells toward the river, first at two gunboats lashed together leaving the dock. One of the gunboats and the fort returned fire, but little damage was done to the protected Confederate batteries. After an hour, two of the gunboats were on fire and the third was abandoned by its crew. The burning gunboats drifted into

the transports and set them on fire as well. Two packets with barges, somewhat separated from the rest, became targets for one battery and were soon set afire. Forrest next turned his attention to the redoubt, the warehouses, and the supplies on the ground. A few rounds striking a large mass of hay set fire to it and the fire spread to heaps of corn and bacon. Forrest, suspecting that the contents of a large number of barrels might be liquor, ordered the rifled guns to take them under fire. Soon a blue flame shot into the sky and burning liquid flowed in a stream toward the river. The Confederates across the river could savor the odor of burning bacon, liquors, sugar, and coffee. Within two hours, Johnsonville was almost a solid sheet of flame, and for a mile along the river, buildings and ships blazed out of control. The destruction ensured that the supply base would never again be in commission.

By late afternoon, when the destruction was complete and Confederate cannon had silenced counter-battery fire, Forrest ordered his artillerymen to cease firing. He then collected his troops and withdrew from the river bank. Leaving one brigade to cover his withdrawal, he marched south six miles by the light of the flames. The next morning, the rear guard brigade had a skirmish with Federals at the fort south of Johnsonville, but by November 10 the entire force was back in Mississippi.

The commander at Johnsonville estimated Forrest's force as 13,000 men, with 26 guns, 20 of them twenty-pounder Parrots. According to the official report of the U.S. Army Assistant Inspector General, Forrest had done $2,200,000 worth of damage. Forrest himself reported that he had "captured or destroyed four gunboats, 14 transports, 20 barges, 26 pieces of artillery, and $6,700,000 worth of property, and captured 150 prisoners." He also reported that he had turned over about

U.S. Grant

GRANT ON FORREST: "The most remarkable man our civil war produced on either side.... He had a genius which to me was incomprehensible.... He always seemed to know what I was doing or intended to do, while I am free to confess I could never tell or form any satisfactory idea of what he was trying to accomplish."

9,000 pairs of shoes and 1,000 blankets to his chief quartermaster. His own loss had been two killed and nine wounded.

It had certainly been a successful raid. However, it was too late to be of great significance. Atlanta had fallen to Sherman on September 2. At the end of September, Hood had implemented his plan to move into Sherman's rear area, hoping to draw Sherman out of Atlanta and perhaps divide his Army, allowing it to be defeated it in detail. For two weeks, Sherman, with a corps left to hold Atlanta, pursued Hood as he moved through northwest Georgia. But Sherman was frustrated with this type of warfare and the problem with maintaining his supply line.

Consequently, Sherman proposed to Grant that he leave Thomas with his 60,000 men to handle Hood and his 40,000, while he cut loose from his supply line and march to the sea, living off the land, with his army of 62,000. His plan approved, the next week Sherman returned to Atlanta and prepared to launch his march to the sea on November 15. By the time Forrest had done his damage at Johnsonville, Sherman had already decided to cut his reliance on the long Louisville-Johnsonville-Nashville-Chattanooga-Atlanta supply line.

Thus, while the Johnsonville raid did not have the major impact on Union operations of earlier raids by Forrest, it was yet another example of Forrest's mastery of cavalry raid tactics.

Sherman himself reportedly considered Forrest "the most remarkable man our civil war produced on either side.... He had a genius which to me was incomprehensible.... He always seemed to know what I was doing or intended to do, while I am free to confess I could never tell or form any satisfactory idea of what he was trying to accomplish."

For the remainder of the war, Forrest's role was one of more mundane cavalry actions, first in support of Hood's offensive into Tennessee and then in defensive operations in Alabama as the war wound down. Throughout the war, Forrest participated in a wide variety of operations, most of them successful. Many were more important, harder fought, and more demanding than the Johnsonville raid — but none was more unique.

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Old Jack Hinson

His steel-gray eyes could stare a hole right through a man, and the mere mention of his name terrified Union soldiers and sailors traveling the Tennessee River. While that could certainly be said of General Nathan Bedford Forrest, it also described one of Forrest's most unlikely allies in his attack against the Federal Depot at Johnsonville, Tennessee. Old Jack Hinson, a Stewart County farmer and miller, had been opposed to secession and had every intention of sitting out the war. But that was before Col. W.W. Lowe, commander of the 5th Iowa Cavalry, took two of his sons prisoner while squirrel hunting, accused them of bushwacking, and executed them without trial. A third son, enraged by his brothers' murders was captured in a Federal uniform and hanged by Lowe, who then ordered the Hinson boy's body tied to a horse's tail and drug around Fort Donelson from daylight until dark — a warning to guerrillas who would bushwack Federal soldiers.

Old Jack Hinson could stand no more, He took up his rifle and swore a blood oath against any man wearing a blue uniform. For the next three years, he shadowed the banks along the Tennessee River, hiding in brush blinds, and picking off Union officers from the decks of passing gunboats. He took such a toll that the government levied a reward for his capture — DEAD OR ALIVE. But pursuit of Hinson was futile, for the 52-year-old farmer knew every cowpath and backtrail for miles on both sides of the river.

When Forrest's Cavalry approached Johnsonville in October of 1864, they discovered the creeks had been swollen by recent rains. General Forrest's chief of artillery, John Morton, would have been unable to maneuver his guns through the Cypress Creek Swamp if a

Old Jack Hinson

vengeance-crazed Jack Hinson had not appeared at the general's headquarters. He introduced himself to Major Charles Anderson, Forrest's adjutant, and told of his blood feud with the Yankees. Then he showed Anderson his rifle, which revealed 36 notches along the barrel.

"They murdered my boys, and may yet kill me, but the marks on the barrel of my gun will show that I am a long ways ahead in the game now," Old Jack Hinson told Anderson, "and I am not done yet."

With Hinson showing the way, Morton got the artillery through the swamp and brought it to bear upon Johnsonville, wreaking terrific destruction on the Federals. Hinson disappeared into the wilderness again, and spent the rest of the war sniping at Federal soldiers. Though desperately pursued, Hinson was never caught. *The Nashville Union and American,* 3 March 1873, claims that Hinson died on the operating table of appendicitis; but the *Dover Record* a few weeks later indicates Hinson was still alive and hiding out in the White Oak Swamp. Who knows? Perhaps the ghost of Old Jack is still drifting along the banks of the Tennessee in search of vengeance.

A Routine Mission

by John Edward Armstrong

This is about Sam and me. But really about Sam. He and I were born in one of the many, ordinary small towns in the Midwest. We grew up together — had the same teachers. We joined the Scouts and went to Scout Camp. We were big in high school plays, clubs, sports (proudly played together on two championship football teams — Sam was captain), sang together in a miserable quartet — all the usual stuff. We finished our college education at the same college, frequently getting together. When we served in different units in Europe during World War II, we managed to get together, finally, in Germany.

The story is as authentic as I can make it. I wasn't there. Sam was. Only recently, by mere chance and mainly by my asking a lot of questions, did I learn how Sam literally and matter-of-factly saved several lives. Like very few others I know, he's a bit reticent in talking about his army exploits, particularly in the war. I just about had to drag it out of him.

When President Roosevelt called most of the National Guard into active service in October 1940, Sam was "mobilized" with his local Guard unit. The call was announced to be for one year of active duty. As yet there was no war, and the draft had hardly gotten underway. Although far from pleased with this unceremonious uprooting, Sam took it pretty much in stride. Many of the National Guardsmen who were called to duty at that time did not take it so calmly. In fact, they took it quite personally. As the year wore on, complaints from the troops reached an all-time high and morale reached an all-time low. A saying current in the Guard in the summer of 1941 was "O.H.I.O" which meant "Over the Hill in October." Put more in context, it meant that their one-year hitch would be completed, and they could return to their "normal" lives.

O.H.I.O. soon became moot. December 7, 1941, the "day that will live in infamy," was just around the corner.

Early in 1942, Sam was transferred as an officer candidate to the Field Artillery School at Fort Sill, Oklahoma. In June 1942, he was commissioned a second lieutenant and ordered to report to the 93d Armored Field Artillery Battalion at Camp Chaffee, Arkansas. Later that year, the 93d was relieved from its parent division, the 6th Armored, and in January 1943 assigned to the Field Artillery School as school troops. School troops provided the artillery fire training for officer candidates. It was an elite assignment because the training was invaluable. In the performance of school requirements, a great deal of firing was done and service battery was not excluded; all personnel developed into fast and accurate gunners.

Sam was married in the post chapel of Fort Sill in June 1943, and I was honored to attend as best man.

In September 1943, the 93d arrived in North Africa. The battalion won five Battle Participation Bronze Stars for combat achievements in campaigns in Naples-Foggia, Rome-Arno, Southern France, Rhineland, Ardennes-Alsace and Central Europe. They got tough assignments because of their well-deserved reputation for combat competence. Also, their status was unusual — the 93d was one of few unattached armored field artillery battalions in the U.S. Army.

The event I've been leading up to took place in Germany in early April 1945, maybe the 9th or 10th. Some

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might think that since this date was getting close to May 8th, the date usually given as VE (Victory in Europe) Day, that there would have been little organized or significant enemy resistance. That would be far from accurate. Clashes with stubborn SS panzergrenadiers were growing more widespread at this time. American attempts to seize tiny bridgeheads over seemingly insignificant rivers were met with uncommonly ferocious resistance, including Tiger tanks, 88s, and Volkssturm units under revitalized German Army Corps
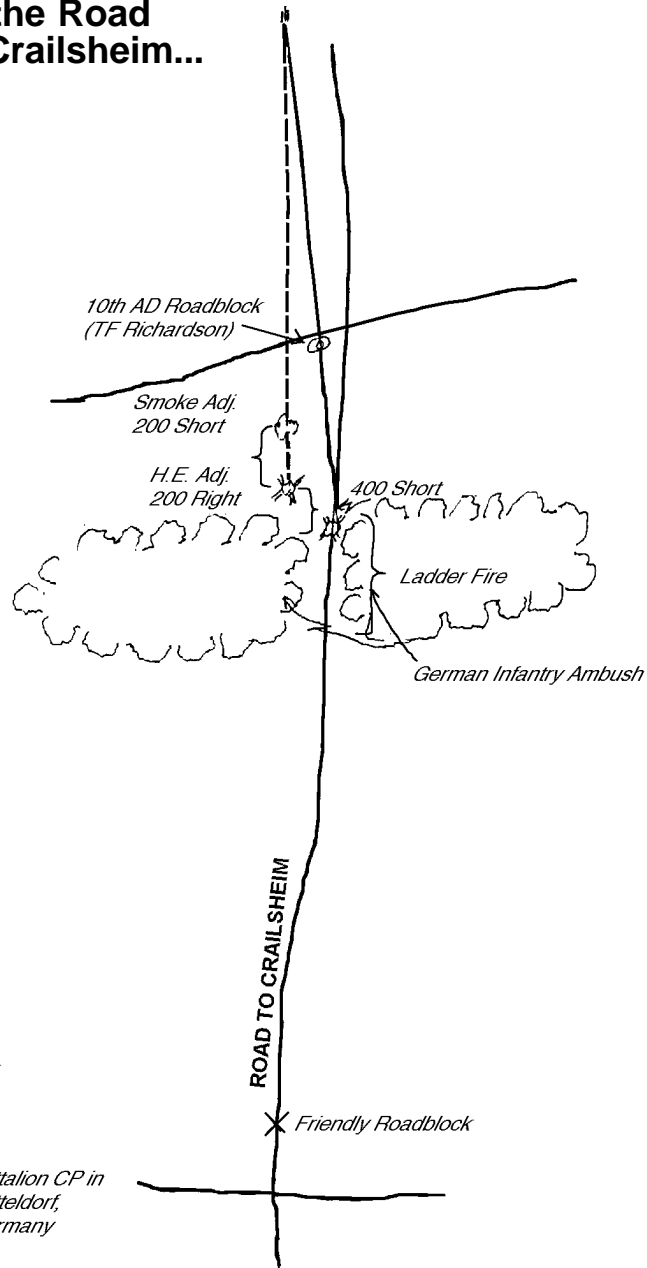
control. American armored units were moving so rapidly that the infantry couldn't keep pace. Pockets of Germans left behind made supply roads dangerous, and it was frequently as risky to go to the rear as to lead the point of attack.

As usual, Sam's armored artillery battalion was attached to an armored division or large regimental-sized unit. In this case it was the 10th Armored Division that had split into several task forces. Sam's unit was part of Task Force Richardson, named after its commander, a lieutenant colonel from 10th Armored. Their objective was Crailsheim, a small town on the Jagst River in southwest Germany. It is about 60 kilometers east of the wine city of Heilbronn and some 100 kilometers southeast of the university town of Heidelberg. The task force was approaching Crailsheim from the north. Sam's battalion had established its command post rather far forward in Satteldorf, a small town about four kilometers north of Crailsheim.

Sam's artillery career had included a variety of assignments and he had attained the rank of captain. He commanded the battalion's service battery and was also the battalion S4. His mission was to keep in close communication with the battalion headquarters as well as all the batteries of the battalion to see or anticipate what ammunition, rations, gasoline, and other supplies might be needed to keep up with the situation.

Sam and his jeep driver were on their way to make a routine check on these matters at battalion headquarters. They were proceeding south on the main road to Crailsheim when they came upon a roadblock maintained by a medium tank company of the 10th Armored. Sam dismounted to find out what was going on. He heard the company commander telling a sergeant that he had just been down the road some 600 yards south and that his jeep had been attacked by bazooka and small arms fire from the woods on both sides of the road. The captain, looking pretty excited, said that he and his driver narrowly escaped. Then the captain told the sergeant that his mission was to clear this road with his tank machine

On the Road To Crailsheim...

10th AD Roadblock
(TF Richardson)

Smoke Adj.
200 Short

H.E. Adj.
200 Right

400 Short

Ladder Fire

German Infantry Ambush

ROAD TO CRAILSHEIM

Friendly Roadblock

Battalion CP in
Satteldorf,
Germany

gun. The sergeant protested that this would be sheer suicide because of the cover afforded the enemy by the woods. Sam managed to ease his way up to the side of the tank captain. Although there was no doubt in his mind that he was capable of delivering the artillery support the tankers needed, he intervened almost tentatively, saying, "If you want, I can put some artillery fire on those woods."

The tankers didn't know who Sam was, or what unit he was from, except they assumed he was part of Task Force Richardson. For a long moment nobody

said anything. The tankers, acting puzzled, just stood there staring at this mild-mannered, boyish-looking artillery officer whose serious brown eyes were squinting steadily at them.

The tank captain was probably pondering if it was worth taking a chance on this hotshot artillery kid who might accidentally succeed in having a couple rounds dropped right where nobody would want them — on their own position. Instead, with a touch of Patton bravado, he said to Sam, "Sure, Captain, give us your best shot!"

At right, the destruction at Crailsheim after the battle in April, 1945.

2LT Herbert Samuel Roth
Fort Chaffee, Arkansas, 1942

Sam got on the radio in the sergeant's tank. To prevent his fire falling on friendly troops who might be attempting to use the road from the south, he called in an order for a roadblock. He then described the enemy ambush situation with grid coordinates from his map and called for artillery fire. In almost no time, the rounds were "on their way" and whistling over the heads of the startled tankers. Sam's adjustment was by a single gun. He observed that the initial "smoke" round had landed exactly as ordered, that is, 200 yards short of the target. The next two rounds were high explosive and were also as ordered, 200 yards right, then 400 yards short. He then ordered "fire for effect" and a six-gun artillery battery began pounding the targeted woods with "ladder fire," a rolling barrage. ["Not bad! Just like at Fort Sill!," Sam thought to himself].

The tankers, especially their captain, had watched all this with amazement. Never before had any of them seen first-hand how artillery fire could so quickly and effectively be called in to assist them — personally. They had seen many artillery barrages before but never one quite so made-to-order.

So, when this weird quirk of friendly fate began to dawn on these combat-hardened men, they looked at Sam as though he were a kind of magician. Especially appreciative and respectful was the expression on the face of the sergeant — the one who moments before was being ordered to take his tank down the road to clear those woods — where he was sure destructive fire awaited him and his men.

The enemy bazookas and small arms were silenced now. The road was cleared again for friendly traffic. Sam wore a pretty big grin as he waved "so long" to the tankers and he and his driver went on with their mission. Their routine mission. There was nothing tremendously heroic about what Sam did that day, although the tank sergeant may have felt otherwise. Sam recognized a job to be done and he did it.

For him it was a routine mission — he was only too glad to be able to do it. While great acts of heroism easily capture our imagination, it's these small, **routine** acts that ultimately win our wars and deserve our admiration.

How appropriate it is that the motto of the 93d Armored Field Artillery Battalion is: SUSCEPTUM PERFICE MUNUS — "Perform the Mission at Hand"!

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Colonel (Ret.) John E. Armstrong, USAR, was commissioned as a second lieutenant of Infantry in 1942 from the Reserve Officer Training Corps at the University of Wisconsin, and served in the European Theater of Operations as the assistant G1 of the 30th Infantry Division. Discharged into the Reserves, he attended law school at the University of Wisconsin, graduating in 1948. Recalled to active duty for Korea in 1950, he served as a staff officer in Headquarters, Eighth U.S. Army, Korea (EUSAK), then returned to reserve status and his practice of law. He is a graduate of the Command and General Staff College at Fort Leavenworth, Kan., and completed several advanced courses at the Judge Advocate General's School at Charlottesville, Va. He eventually became the State Judge Advocate for the Wisconsin National Guard, and retired as an Assistant Attorney General, State of Wisconsin, in 1981.

The Battle of Oom Chalouba
17 June 2008

by Lieutenant Colonel Mark P. Hertling

1537 hrs. Somewhere between N'Djamena and Chalouba.

"A stroll in the park," LTC Steve *Cash muttered under his breath as he gazed at the IVIS-2A in the turret of his M1A3. All the vehicles and aircraft of his small strike force were moving toward Chalouba, and the display showed his unit spread out on a frontage of over 30 kilometers and a depth nearing 50 kilometers.*

"Never ceases to amaze me," Cash said aloud to his crew over the intercom. "When I was a young buck, we moved in a desert wedge. We could see our wingman — hell, we could see everyone in the whole battalion. There was a safety in numbers; having everyone within sight was like wrappin' a big blanket around you and goin' to meet the bad guys. But there's somethin' about this, too. Distance, the ability to mass and then spread out again, never providing a target. Especially knowing where everyone is — little chance of fratricide."

"Yessir, I like this just fine," interrupted SPC Jim Ross from his loader's position. "I can see all I want just by glancin' over to ole' Mac."

"Ole Mac" was what soldiers had affectionately nicknamed the device that had revolutionized the Army of the 21st Century. Doctrine, tactics, leader development — even unit organizations — had all changed because of the user-friendly computer officially known as the IVIS-2A. And while LTC Steve Cash had predicted much of what was happening now, he still found himself amazed at being the beneficiary of all the advantages this small device provided. Eighteen years earlier, Cash had reported to his first unit straight out of the Armor Officer Basic Course. He was cocky, anxious to taste some of the famous German beer he had always heard so much about, and ready to learn how to be a tanker. Exactly three days after reporting, his learn-

ing curve became very steep indeed. His battalion would deploy from the rolling hills of Bavaria to the flat desert of Southwest Asia.

Cash did fine as a platoon leader. Prior to combat, he developed a strong sense of teamwork in his platoon. His soldiers saw him as a strict but fair leader, and his NCOs willingly taught him all they could in the short period they had before crossing the berm. His superiors saw in him a tactical and leadership savvy that few of the more experienced lieutenants had. Then in battle, he also performed well. He kept his cool on the radio and even personally knocked off two T-72s and a BMP during one of the night fights. He wound up doing more in his first three months of active duty than many Armor officers do in a lifetime. In the summer of 1994, Cash headed to the Armor Officer Advance Course.

He knew the profession of arms was for him, and he knew he wanted to be the best tank company commander in the Army. He also reported with some strong prejudices about training, organizing for combat, and commanding soldiers on the modern battlefield.

Cash met his duplex neighbor, CPT Frank Rice, the day he signed for quarters. Rice worked at a place called the Battlespace Battle Lab, and over beer together on a hot July afternoon, Cash first heard the terms "digitized battlefield" and "information age."

Both became fast friends. They kidded each other that as a team they would go far because Rice had the vision, Cash had the battlefield experience. They spent many late summer afternoons in the back yard, watching their small children in the rubber wading pool, drinking Coronas, and exchanging ideas about the potential nature of warfare in the 21st Century. Life was good. As part of an Advance Course assignment, Cash used his conversations with Rice to piece together a thought piece. In that paper, Cash used

three battles — Hastings, Gettysburg, and 73 Easting — as a means of forwarding a hypothesis — that throughout history, regimental-level commanders primarily needed to focus on three major areas when preparing for combat. They must train themselves on how to properly maneuver compact forces on the battlefield, they must train their soldiers to engage and destroy the enemy with the weapons at their disposal, and they must determine the best ways to protect their force before and during the battle. While the historical portion of their study was interesting, it was the conclusions about the demands of the future that received attention by the Advance Course Instructor and the rest of the Armor community.

The article posited that in information age warfare, regimental (re: battalion) commanders would be faced with many demands for which they might not be ready. Specifically, forces on future battlefields would no longer be in formation; rather, individual vehicles and soldiers would be dispersed and would act independently. Battalion commanders would need to control all four dimensions of the battlefield like never before; this would require a much stronger combined arms force at the lower echelons. Additionally, to understand the microchip technology inherent to their equipment, soldier training would necessarily be grounded in concepts; it was more technical and extremely intense. Finally, the commander would need to ensure all members of the force had a common view of the battlefield. Cash made it clear that this meant more than the regurgitation of the specifics found in the five paragraphs of an operations order. Hard information and generated data had to be passed to and understood by every soldier, as well as every subordinate leader in the force.

It appeared to the young author that the information age would require monumental changes in the training, leader development, organizational and doc-

trinal realms of the Army before the advanced technologies — corporations of the day were already using many of them — were fully incorporated into the fighting force. In the years between 1995 and 2008, that is exactly what happened.

1615 hrs. The Support Cell.

Major Mike Lloyd watched from the s*teps of the C^{2}V as SGT Leon Moss brought the Pegasus back behind his head, then threw it forward like a child throwing a paper airplane. When it was eight feet above the ground, the engine of the UAV kicked in and a small red light appeared behind the tail, indicating the daylight TV camera was on. It headed northeast toward the objective.*

"That's one small launch for me, one giant launch for the strike force," SGT Moss said as he gave the thumbs up sign to his support cell chief. Lloyd didn't even try to suppress his laughter as he turned and headed back into the vehicle.

Inside, Lloyd continued to grin as he watched the soldiers in the vehicle work their magic.

SSG Mike Smith was on duty as the T.O. (tactical operator) in the first chair. In front of him were two monitors, the Digital Terrain Analyzer (DTA), which was turned off, and the large IVIS-2B monitor, showing each of the vehicles and aircraft in the strike force. Lloyd found the icon which represented LTC Cash's vehicle before he turned away; it was one of those things soldiers do for luck... it meant the ole man is still out there, leading the way.

In the second chair was SFC Aaron Pierce, SGT Moss's partner on the intel gathering team. In front of this position was a computer monitor that was currently processing some information just received from the J-STARS downlink. Pierce was temporarily ignoring that roll-up while he did the initial pre-aerial tests on Pegasus, pushing a trigger on the flight joystick, ensuring the grid targeting device on both the daylight and thermal cameras was working.

SFC Brimmage was working a request that had just come into his LM (logistics management) station at the last chair. One of the aviators needed a new Nomex suit at the next fuel rendezvous point. "Yeah, okay," Brimmage muttered to the monitor as he transferred

the request to the vehicle that would deliver, *"L.L. Brimmage never lets you down."* Lloyd always called Brimmage the LM, but all others in the cell continued to use the old Army term of *"loggie"* when referring to this extremely professional and competent NCO. Brimmage knew his business, and he never let a request or monitorred *(the term used to describe a sensor detecting a shortcoming in one of the forces' vehicles) go unnoticed. It didn't matter what they called him, he knew his job.*

The C^{2}V was relatively quiet — no incoming calls right now. The support cell crew would only use the voice cellular radio when they needed to receive the true emotions that accompanied reports or requests. The rest of the time they relied on data-burst technology. The habitual exception was Lloyd's periodic chat with LTC Cash... Lloyd admitted it was unnecessary, but he needed to hear someone say everything was going okay out there.

"SSG Smith, do a terrain analysis of the area just west of the objective," Lloyd said to the T.O. *"I got a feeling we'll be sending someone into that rocky area."*

The support cell was the brain behind the strike force's brawn. With the support cell staff making up only a small percentage of the force, the chief could do all the things — and more — that much larger staffs had done from the time of Napoleon until the late 1990s. While the other half of the cell slept, this four-soldier team gathered, evaluated, and disseminated the intelligence, helped the commander control the maneuver of the force, and kept a watch-

ful eye on, as well as predicted, the logistical demands of the unit.

Major Lloyd was the only other field grade officer in the strike force besides LTC Cash, and he had the important job of managing the people, hardware, and software that helped the commander make decisions. He liked his job, he especially liked the team he had put together, and he was constantly fascinated by all the equipment that was part of this command and control vehicle.

For example, the IVIS-2B, like its counterpart IVIS-2A found on all tactical and support vehicles, helped the commander control the maneuver of the strike force. On its screen were greenish-blue icons representing all the vehicles and aircraft under LTC Cash's command. When hard intel on enemy vehicles or capabilities became known, red icons or graphics were also superimposed. Lloyd's and the T.O.'s watchful eyes on the -2B provided backup for what either the commander or any other vehicle might not see on their individual IVIS screen.

Then there was the DTA. Growing up, Lloyd had been a Nintendo junky, but even the best video game could never have prepared him for his first introduction to the Digital Terrain Analyzer. That small piece of equipment and its accompanying weightless headset gave the T.O. (and Lloyd, when necessary) the ability to "see" battlegrounds before the strike force rolled over or onto them.

SSG Smith loved it when the chief gave him the task of doing a "T.A." of a potential maneuver area. Smith

would give up command of the boring IVIS screen to Lloyd, place the DTA headset over his eyes, dial up the mapped area from the most recent satellite geographic scan, and then conduct a virtual reality search of the maneuver tract. From that probe, the T.O. could "see" the terrain — and the dangers that might be presented by an enemy force occupying that terrain — formed from a digitized three-dimensional representation of a recent satellite photo. As a young captain, Lloyd had worked on the testing of the DTA project at the National Training Center. It had provided a unique advantage over the OPFOR.

The tactical operator relied on the intel gatherer (I.G.) at station two to help synchronize the maneuver of the strike force. The I.G. received direct feeds from myriad sources — from tactical Air Force platforms to strategic satellites — and relevant video and scripted information. He immediately examined them on the primary monitor and shared the information with the T.O. Additionally, the secondary screen at the I.G.'s station provided the link to Pegasus. While the images from the UAV were the primary source of video intelligence, on occasion SFC Pierce would bring up gun camera views from the force's helicopters. Cross-talk was continual, and the ops-intel interface could not have been better.

At the far end of the C^{2}V, at station three, sat the L.M. The uniqueness of the U.S. Army's approach to logistics in the information age could be found in the equipment located at this position of the support cell. With the goal of total asset visibility, the combat service support community had developed an exotic and brilliant system of proactive supply management in the waning days of the 20th Century which it was now putting to good use.

Strategically emplaced sensors on each piece of tactical equipment made the concept work. Several small microchips repeatedly transferred information, ranging from fuel and onboard ammo status to the condition of various internal engine components, for every vehicle in the unit. Using the single monitor at his position, SFC Brimmage could oversee the logistical health of the command. When a "monitor-red" condition occurred — that is, when a part was wearing out of tolerance or a vehicle reached a certain fuel or lubri-

cation level — the L.M. would dispatch support to the element in need.

In addition to the onboard sensors, every soldier's ID card — fed through the sensor scan at the bottom of the IVIS when the soldier was assigned to and deployed with a particular vehicle — provided needed personal information to the L.M. Whether it was the size of a new Nomex needed by an aviator or a pint of the right type of blood for a driver on the AFAS artillery piece in Strike Team Alpha, the logistics manager could deliver it based on the information feed he received directly to his monitor from each soldier and vehicle in the force.

The soldiers of the small support cell were a proud lot. Fighters were important in any army, but in the information age those who worked the data and contributed to the commander's wisdom from the support cell were critical members of the team.

1727 hrs. In the cab of L-21 (a Fuel-Pallatized Load System HEMTT)

SPC Kellie Reese was daydreaming as she rolled across the grassy plain. She was remembering her father's visit back before the deployment. CSM (retired) Daniel Reese had always been very proud of his daughter, but he seemed especially so as she showed him around and introduced him to all her friends. She was in a high-speed, high-tech unit, and the old sergeant major was duly impressed.

"I can't believe how much electronic gear is in a fuel truck," CSM Reese had commented the day SPC Reese had snuck him into the motor pool and showed him the HEMTT, her name proudly stenciled on the windshield.

"You take care of this stuff; Kellie," her father advised. "It might save your ass some day."

The "electronic gear," as her father had called the tactical displays and the telepresence package in the cab of her vehicle, had already done just that on several occasions. During one particular episode, Reese was on her way to deliver fuel to a Comanche in Strike Team Bravo when she received a warning from the T.O. There were annoyance mines and an unconfirmed enemy rocket team along the path she was taking to the helicopter, said the message across the bottom of her IVIS-2A

screen. On the map above the message, the support cell had conveniently plotted new way points for her to follow so she could accomplish her mission. As she circumvented the location, she saw friendly artillery striking the area she had been heading for, eliminating the hazards identified just a few minutes earlier.

The incorporation of all this advanced technology in support vehicles had occurred as a matter of necessity over the previous decade. In the evolving operational doctrine — the latest version of FM 100-5 was published in 2005 — combat service and service supporters were told they needed to operate as independently and with as much agility as their sister combat forces. Long, lumbering fuel convoys and time-consuming LOGPACs could not be tolerated in the controlled-tempo operations of the information age.

As a result, emerging technologies were fielded in service and service support units. With those fieldings, Army leadership discovered spin-off economies and efficiencies. For example, by sending direct data-burst messages to independent vehicles that knew their precise cargo inventories and locations at all times, the Army had eliminated excessive stockage of the various classes of supplies once thought necessary to sustain extended combat operations. Articles were cross-leveled and classified on the various supply vehicles moving throughout the large strike force area of operations. When a specific part or supply item was needed by a particular vehicle, the LM could direct the logistics vehicle to a pinpoint position. With an electronic running status of the number and location of each stock on the individual supply vehicle, and a roll-up of the status of each vehicle at the LM, waste and excessive loads were precluded.

An interesting story surrounded the fielding of the other piece of "electronic gear" found on several of the re-supply vehicles. The telepresence robotic arm that was now such a fixture in refueling operations was actually developed way back in 1994 for use by army cardiac surgeons. Early experimentation showed combining video imagery with microchips embedded in distant and near robotic arms would allow doctors to view and even operate on patients that were far removed from the medical team. Environmental engineers latched onto this technology and

applied the same techniques and equipment to fuel-handling procedures. In training, the result was fewer POL spills and a cleaner environment. In combat, the speed with which a HEMTT could now provide needed fuel to a thirsty tank equalled the best Indianapolis 500 pit stop. All due to some forward thinking and the application of information age technology found telepresence robotics.

1855 hrs. The turret of A-23 (an M1A3 tank in the northwestern sector)

Irredentism. SFC Terry Brailsford had looked up the word in the dictionary right after he first saw it on a light show presentation at PLDC in 1997. The instructor had predicted it would be one of the many types of conflicts facing the Army in the 21st Century. Brailsford didn't know what it meant at the time, but now his force was deeply involved in that type of conflict. The current situation was somewhat confusing, but it all seemed to come down to helping a democratic nation retain newly found freedom against a group of thugs.

The battle that was raging less than ten kilometers from his location was the result of these irredentist conflicts. Brailsford watched it evolve on the small screen mounted in his cupola. He closely followed the artillery crosshair as it centered on each of the enemy vehicle icons that appeared on his screen. Pegasus was probably seeing the enemy and reporting pinpoint location to the support cell. He wasn't sure which strike force element was hitting the targets — the air or the field artillery — but one thing was certain: Some bad guys and some good guys were going to be left in that small urban area west of the objective. And eventually, since he and his crew were close, they were going to be sent there by their commander.

The ability to "see" the enemy prior to an engagement was probably the most interesting result of the information age battlefield. Determining and then confirming where an enemy was and what he was doing — sometimes with video images transferred into icons, other times with virtual reality displays — was the primary advantage of being on the leading edge of information age technology.

Battles fought in this manner didn't last long. Once the enemy was found, it was relatively simple to bring a variety of lethal platforms into acquisition range and then present the enemy with a multitude of distasteful options. This had quickly become the hallmark maneuver of the U.S. Army. It was a new twist on the old targeting methodology: Detect, then decide, then deliver, then assess. Instead of the commander allocating intelligence resources which would attempt to detect enemy targets after he decided what he wanted to strike (as it was in the 20th Century fire support process), the commander could now make his decisions based on the knowledge of all that had already been detected. The switch was more than just a change in procedure, it was a difference in how the commander approached the demands of the battlefield.

Many reporters, who in nanoseconds were able to file their stories and photographs thousands of miles over the airwaves with cellular faxes and transponders, would often declare this type of fighting unfair. It was certainly that. But the political masters who gave the strike force the mission of calming the upheaval in this foreign land would only reply: "The competent and sound application of tactics — and new technologies — always results in an unfair fight. That is how we will continue to conduct our operations, for it allows us to save our soldiers' lives and win our wars."

2231 hrs. On the objective, near the town of Chalouba

LTC Steve Cash leaned against the front slope of his tank as he talked on the cellular to MAJ Mike Lloyd back at the support cell. They had already discussed the success of the strike force and the potential follow-on missions. But Cash was still concerned about the western passages into their area of operations. If more of the enemy was foolish enough to enter the area across the plains, he wanted to be ready for them. The commander and his chief chatted for a few more minutes about the maneuver, and then Cash touched the "off" key and put the phone in its holder on his web vest.

In the 15 years since his attendance at the advance course, Cash had seen the Army go through an incredible change.

Many of the old black boot soldiers would even say it was a greater change than that which had transpired between the Vietnam War and Operation DESERT STORM. Cash didn't know about all that; he was just thankful there had been some leaders in this great Army who were visionaries and forward thinkers. Without them, the members of his small force would certainly not be the beneficiaries of this decisive battlefield victory on this hot, African day.

The impact of the information age was not just the technology found all around him. The microchip had influenced everything that was a part of this army. Doctrine, training, leader development, organizations, and the way soldiers approached each battlefield task were all altered by the power of the small post-industrial miracle. It had even begun to influence age-old warfighting theory. The smart guys were now looking out over the next 15 years to determine what to call the blend of offensive and defensive operations that this information age had allowed them to create. Yes, it certainly was a revolution in military theory — but the smart guys at SAMS would have to figure all that out for the Army of 2020.

Cash looked up at his loader, manning the machine gun and looking toward the northwest. Old habits never die, he thought to himself. "Imagine," thought Cash, "SPC Ross is actually thinking he might not get warning of an inbound enemy aircraft." Cash smiled and shook his head as he climbed back onto his vehicle. It had been a long day.

Lieutenant Colonel Mark P. Hertling was commissioned from the U.S. Military Academy in 1975, and has since served in Cavalry and Armor units in the U.S., Germany, and Southwest Asia. He has earned a Masters Degree from both Indiana University and the School of Advanced Military Studies, and his articles have appeared in numerous military and civilian professional journals. He currently commands the 1st Squadron, 16th Cavalry at Ft. Knox, Ky.

Tactics Training in Virtual Reality

(The Future of the Officer Advanced Course)

by Major Louis DiMarco

The company commander looked ahead and saw the Bravo section of his 1st platoon break the wood line as they began bounding forward. Turning to the right, he could see the small group of houses where the Alpha section was waiting. A glance at his commander's display told him that 2d and 3d platoons were moving along their designated axis.

At that moment, there was a sudden roar, and then the concussion of incoming artillery. He looked up in time to see the streak of antitank missiles; he watched both of the bounding Bravo vehicles take hits and explode. Missiles were also coming at him, but his vehicle defense system was faster than the enemy gunners: it launched smoke, chaff, and electronic countermeasures. As his helmet-mounted thermal goggles automatically came on, his driver was already moving back into the deep cover of the forest and out of the line of fire.

Now personally safe, the commander set to work to make sense of the situation using his vehicle commander's display, which was lit up like a Christmas tree. A quick review of status reports and a scan of his map and icons told him the bad news: 1st platoon had been cleverly ambushed by enemy forces camouflaged under thermal shrouds; his other two platoons, unable to move, were taking heavy fire from a combination of conventional and smart munitions. He was tired after ten hours of planning and execution, but now it was time to make the decisions and give the orders that would either save the situation or confirm the failure of his mission. Sweat and stress both showed on his face as he peered intently at his map looking for the answer to what was obviously a complex and vexing tactical problem.

So intent was the commander that he barely heard the chime ringing in his headphones indicating class was over for the day. He could log off the Ad- vanced Course virtual reality training equipment and exit the tactical training matrix. After a moment's hesitation, he decided that his wife would understand if he stayed another hour: he just needed to issue a FRAGO and take out that enemy AT platoon.

The Army is just beginning to tap the power of virtual reality simulation. The exercise described here is an indication of the direction this type of training may take in the future. The key to getting there is establishing a vision of how to train for Force 21 now. This paper presents one view of how we may transform Advance Course students into the leaders of Force 21.

The focus of Force 21 officer training must be on creating leaders who are tactics experts. Future battles will be short, violent, and decisive. The defeat of a company or platoon may have national strategic consequences. There will no longer be latitude to allow leaders to learn "on the job." Institutional training will have to produce expert leaders who, in turn, can conduct unit training to achieve the standards required.

How will we train these experts? One adage holds that tacticians are grown, not trained. In other words, tactical ability is a function of hard-earned, expensive, and time-consuming field training and experience. Only the basics can be taught in the classroom. This view has always been substantially correct, borne out through hundreds of years of battlefield engagements. As we approach the end of the 20th Century, however, we know it is no longer entirely accurate; by the turn of the century it will be rendered totally erroneous. Technology, both current applications and those that are coming in the near future, will permit us to teach tactics to a degree of resolution undreamed of in the past. This will be accomplished primarily through simulation immersion in the Officer Advanced Course. It will surpass, in cumulative effect on the individual leader, the extraordinarily realis- tic field training now available at the Army's combined arms training centers.

Simulation immersion is the process of placing the individual student in a virtual reality matrix designed to assist him in learning and practicing specific tactical skills. This tactical training matrix (TTM) is very similar to the UCOFT gunnery matrix concept. Differences do exist, however: progress through the matrix is seamless; the skills on which the matrix focuses are cognitive, as opposed to mechanical; and the "immersion" is a daily event practiced over an extended period of time. The tactical matrix will be augmented by more conventional platform and small group instruction (accomplished using advanced automated techniques) and by specialized simulation designed to train special skills as a supplement to the tactical instruction.

As the "immersion" concept is implemented, however, other aspects of the advanced officer training curriculum will require adjustment. For example, some key skills required of military leaders do not lend themselves to instruction through simulation. At the Advanced Course level, these include personnel management, maintenance forms and records, introduction to other arms of service, and the Army writing program. These subjects are generally taught in a large-group platform instruction format. An inefficient instruction technique with relatively low learning value, this method monopolizes a disproportionate share of the student's resident course time training subjects that may contribute only peripherally to warfighting.

The most efficient way to teach these subjects as technology improves is through distributed training (DT). In the past, DT has been both ineffective from a learning point of view and difficult to manage and evaluate administratively. Current and near-future technology is changing this. Distributed training has the capability to become completely

automated, requiring only access to a base level of computer hardware. Though it will not be mandatory, in the near future virtually every commissioned officer will own at least a moderately powerful PC. The few who do not will have access to PCs through their unit or through public facilities such as libraries, education centers, and the local DOIM.

DT materials will be given to the student in the form of compressed floppy disks or, more likely, in CD-ROM format. Each CD will carry one or more classes, including practical exercises and tests. The classes will be multimedia presentations, employing graphics, text, animation, digitized voice, and video to present each subject. Lessons will be coded so that students must observe demonstrations and complete exercises before tests are open to them. Once the student takes a test, which will also make sophisticated use of the presentation media, he will transmit the answers using a modem to an electronic address at an administration center. All tests will be graded electronically and the results transmitted digitally back to the student. As with some current Army instruction, resident course attendance and promotions can be tied to DT completion. The DT package will probably be issued immediately, following the Officer Basic Course, with completion required before the officer attends the Advanced Course.

DT will not completely eliminate the need for some in-residence platform instruction, but it will significantly decrease the time devoted to it. Like DT, resident instruction will be almost completely automated and, therefore, will be in many ways far superior to the current system of a platform instructor armed only with a VGT. Further, automated instruction (resident and DT) will include on-line assistance, either by telephone from a TRADOC school instructor or, more likely, via modem through a DT bulletin board or an instructor's E-mail. Resident students, of course, can also get help directly from their assigned instructors.

Having used DT to complete a good deal of his education in important, but not essential, subjects, the company-grade officer will be ready for resident-phase education focused almost exclusively on warfighting. This will be accomplished by simulation immersion. Soon after arriving for resident advanced training, the officer will be introduced to the TTM. The matrix will contain dozens, if not hundreds, of tactical missions arranged and grouped according to mission type, difficulty, and unit size. Officers will be expected to start with simple company missions that stress tactical fundamentals before moving to more complex missions under extreme conditions. Eventually they will graduate to battalion- and then brigade-level missions.

The TTM will be designed as a continuous, seamless artificial reality. Beginning in the role of a new company commander, the student will receive missions, conduct planning and preparation, issue orders, and then execute the required operations. At the conclusion of each mission, he will take part in an after-action review (AAR). If the student demonstrates proficiency in the tasks tested by the mission, his next assignment will take him to a new level of the matrix, with a comparable increase in complexity. If the mission is less than successful, he will receive additional training and then execute the same mission requirements again in a different situation. This sequence will be repeated as necessary until the student masters the learning goals of the mission.

To the student, transition through the matrix will be seamless, with each new missions, logically related to the previous one. Advancement, occurring when the student has demonstrated mastery of the required skills at each level, will be disguised in a number of ways. Portions of the matrix will not be more difficult, merely different, and early learning-type missions may be run again later in the matrix to reinforce training objectives. Through role playing, the student will undergo attachment to other units and reassignment to new duty positions. These actions will not only provide a logical way to transition between missions and situations, but also will reinforce the consistency of the virtual world. The objective is to simulate an experience analogous to that of a World War II officer who lands at Normandy as an inexperienced company commander and, by April 1945, ends the war as a very experienced battalion commander.

Given the goals of the TTM, software and hardware design will be critical. It must accomplish several complementary tasks: create a realistic warfighting environment, permit the student to interface with the environment in a realistic manner, allow instructors to monitor the student's achievement of learning objectives, and facilitate through realistic AARs.

The warfighting environment will require effective automated forces, controlled by a sophisticated artificial intelligence (AI), that can perform all missions and related tasks as directed by the student. The AI must also produce realistic, flexible enemy forces of various sizes and at various levels of intensity and competence, and it must be able to simulate a variety of terrain and weather conditions. Finally, the environment must provide other realistic details such as subordinate personalities (including images and voices) and important maintenance and administrative tasks to make the environment more believable.

The interface with students needs to be simple, yet realistic, and capable of imparting all the information needed during the training. Hardware will include a modified CVC helmet for sound effects and receiving oral orders and reports, an integrated microphone for passing voice instructions and orders, a computer screen display to provide a first-person point of view for the purpose of situational awareness and reconnaissance, and either an actual commander's display unit or screen replica of the display. This interface will replicate the actual C^2 software of the vehicle and, supplemented by the digitized voice and video inputs of key leaders, will allow the student to fight the battle in essentially the same way he would in real life. Most important, the tactical decisions he makes will be based on the same stimuli (voice reports, digitized information, first-person view) that will influence him in battle.

Scenario design will be another key to the learning experience. The scenarios must go beyond the fundamentals of tactics. They must force the student to view tactics in an analytical manner and teach him how to make sound tactical decisions. Designers will have to pay special attention to both the scenarios and the accompanying instruction to avoid "school solutions" at the expense of the analytical process.

Each scenario will be designed and developed to make the student think. "Winning" as a concept will be irrelevant, bearing little relationship to the student's progress through the matrix. Rather, planning and judgment will be the mark of success. Some matrix scenarios will be structured so the mission is likely to fail; in these cases, the

learning objectives will be keyed to the student's performance in analyzing the adverse conditions that led to mission failure. The cumulative goal of the matrix is to employ realism and repetition to make sound tactical analysis and imaginative decision-making each student's unconscious, automatic reaction to battlefield stimuli. This will ensure not only that every leader can make good decisions, but also that he can keep pace with the information flow and tempo of the Force 21 environment.

Although the tactical matrix will be the centerpiece of the Officer Advanced Course, two other types of instruction will supplement and complement the tactical matrix: small group tactical instruction and specialized simulation.

The small group sessions will be somewhat similar to current conventional small group instruction but will focus on an exchange of ideas based largely on the student's matrix experiences. Students will periodically get together in small groups to discuss a variety of tactical problems, techniques, and solutions with an instructor. The goal of these discussions will be to allow the students to benefit from the analysis and experience of their peers. It will also force each individual to reflect upon and analyze his own tactical experiences, thus reinforcing the concept of a student-centered learning environment emphasizing individualized instruction and student responsibility.

Specialized simulations will be used to teach the student additional skills that he may require when executing the advanced portions of the matrix. These skills include fire planning, employing fire support assets, piloting remote reconnaissance platforms, coordinating with close air support, and performing specialized staff functions. For example, rather than telling a student how a logistics officer does his job, the simulation will assign the duties of a battalion logistics officer to the student and require him to plan and support a battle. Specialized simulation will also include larger, more conventional tactical simulators similar to the close combat tactical trainer (CCTT). Scenarios in these simulators will give the student additional practice on his tactical skills and introduce such concepts as leadership, "the fog of war," and the coordination challenges caused by large numbers of human players. CCTT simulators can also be networked to include a wide variety of branches, services, and other nations so that the student gains

an understanding of joint and unified operations.

Most of the technology described here (graphics, tactically smart artificial intelligence, instructional software, digitized voice and video, and voice recognition) is currently available. What is required, then, is a concerted effort to harness the technology and shape it to meet the training needs of Force 21. This effort must begin soon and be maintained parallel to the doctrinal and organizational reshaping of the Army. The goal must be that when Force 21 is a reality, leaders will already be trained to maximize its effectiveness.

In the short term, much can be done to increase the use of simulation in company officer training. Currently, SIMNET, ARTBASS and JANUS simulators are being used to the maximum extent possible. Designed as unit trainers, they are very expensive to operate. Although they provide good training, the training is of limited duration, and cannot always be specifically tailored to what is happening in the classroom. What is needed is a simulation that can be operated in the small group class room, that provides an accurate representation of tactical operations at brigade and below, that is inexpensive, that is available every day of the course, and that can be programmed and modified by the instructor to meet the individual learning requirements of his students.

Commercial computer war games can do almost all of this and more now. These games offer a range of readily available capabilities: accurate unit modeling of U.S. forces at brigade level and below, combined with very capable enemy AI; quick scenario-building and customizing; accurate weather, morale, supply, and terrain effects; digitized 1:50,000 DMA map graphics combined with unit symbols and graphics; replay capability; and modem and networking capability. Integrating this technology fully into leader training will represent the first small step toward the simulation immersion required to create expert tacticians.

One of the central requirements of simulation immersion is a system that is simple, cost-effective, and versatile. Once such a system is designed, it will have applications well beyond officer advanced training. For example, software package could be used as part of distributed training to help officers who are serving in assignments away from

troops in maintaining their tactical proficiency and professional currency. The software would also have obvious advantages in courses other than the Advanced Courses (Basic Course, ANCOC, CGSC) and could be adapted as a home station trainer for small units. With some modifications, a company or battalion commander could use the system to interface directly with the actual C^2 software of their vehicles and conduct unit CPXs. Finally, the simulation software could be used during actual operations to test COAs, wargame, and rehearse plans in the field.

The goal of the Force 21 Advance Course will be to produce a company-grade officer who is an expert tactician, capable of intuitively seeing and analyzing the battlefield, after only five months of resident training. These intuitive skills must be trained prior to the officer taking command of his unit if he is to have any hope of managing the information and operations tempo of the Force 21 battlefield. This will be possible only through rigorous immersion in tactical simulation. The technology used in institutional training will also have applicability in the field for small unit training. Simulation immersion training has the potential of not only producing expert leaders, but also expert units with the skills and capabilities they need to face the awesome challenges of the Force 21 battlefield.

Major Louis A. DiMarco was commissioned in Armor in 1981 from the U.S. Military Academy. A graduate of Airborne School, AOBC, BMOC, and the Infantry Officer Advanced Course, he is currently attending the Command and General Staff College at Fort Leavenworth. He served as a cavalry platoon leader, troop XO, and assistant S3, 1-1 Cavalry, 1AD, Germany; as squadron S1 and troop commander, 2-1 Cavalry, 2d AD, Fort Hood, Texas; and most recently as Cavalry Leader Course instructor, OIC Scout Platoon Leader Course, and Chief, Platoon Doctrine, U.S. Army Armor School, Fort Knox.

Armor Center Breach Laboratory

by Captain Dan McIntosh and Captain Scott D. King

The United States Army Armor Center is using an innovative approach to establish challenging training with less money. One such example is the Armor Center Breach Laboratory. This article deals with the Breach Lab, its development, and its potential applications.

Background Information

Prior to 1992, the Armor School conducted a live complex obstacle breach demonstration four times a year for Armor Officer Advanced Course (AOAC) students. However, the demonstrations, at a cost of $1,200,000 per year, were too expensive. In 1992, the Armor School initiated the Armor Center Breach Lab to offset the training value lost when the live demonstration was eliminated from training.

Initial plans called for the creation of four terrain models: Irvington, Kentucky; Fort Irwin (NTC), California; Hohenfels (CMTC), Germany; and Rodriguez Range (MPRC), South Korea.

These four terrain models enable students to train on various types of terrain in Asia, Europe, South America, and the Middle East. Each terrain model set, located in McPheeters Hall, consists of a small group scenario room, the approach march boards, the breach boards, and six training walls. Plans also call for the development of a mine warfare room.

Breach Lab Resources

The small group scenario room (classroom) is set up similar to the AOAC small group classroom. This classroom is equipped with a color television, VCR, overhead projector, mobile dry erase board, and three video tapes (a breach assault from the National Training Center, a live breach demonstration from Fort Knox, and a video on the effects of mines on tanks). Students can use the classroom as their planning cell while conducting troop-leading procedures.

The approach march board is a 1:2,000 scale board depicting the terrain from an assembly area (AA) to the objective. The approach board (12 Km x 40 Km) is divided into 27 numbered sections. The approach march board is large enough to conduct a brigade-size movement. Each section is capable of being separated from the others, allowing students to walk between sections for access to a given area. The primary design of the approach board is to train movement from the AA to the breach location, actions in the AA, rehearsals, and passage of lines.

The breach board, a 1:1,000 scale board, is an enlargement of a task force-size sector within the approach board breach area. The breach board focuses on the area in which a task force will conduct its deliberate breach. It is divided into nine separate numbered sections, enabling the students greater access to all areas of the terrain.

The approach and breach boards are surrounded by six training walls, illustrating task organization, breach tenets, a 1:50,000 map of the terrain, doctrinal template, pictures of breaching equipment organic to a heavy division engineer battalion, and breaching techniques. These six training walls serve as a stimulus and reminder to the students of assets available and techniques used in breaching obstacles.
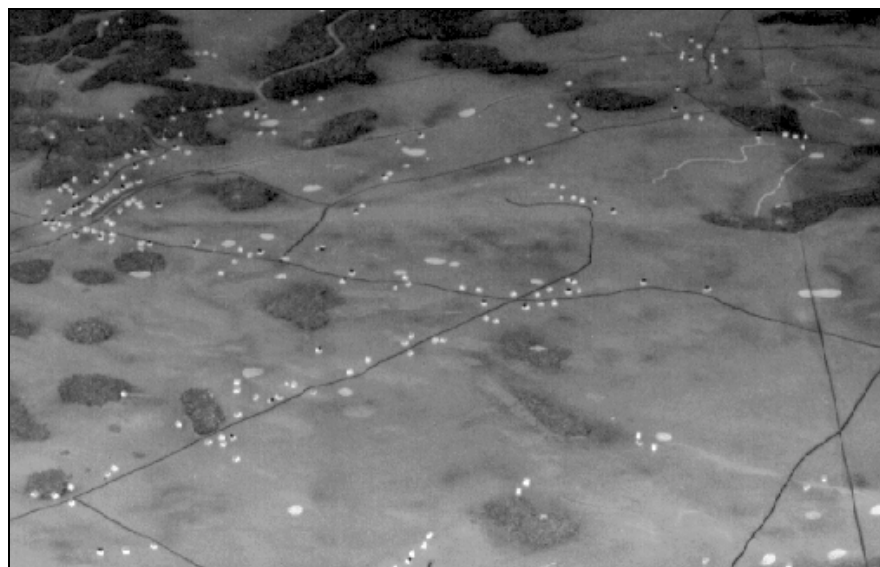
The mine warfare room, approximately 75 percent complete, will display current U.S. and threat mines including the Family of Scatterable Mines (FASCAM) and explosive submunitions. The purpose of the mine warfare room is to give students a general overview and familiarization.

Estimates of the cost for each terrain model were $37,500. The actual cost of the Irvington boards was $30,554.62. The actual cost of the NTC boards was $44,855.57. The cost of both scenario boards is well under the cost of one live demonstration. The boards provide students with more hands-on training.

Currently, the breach and approach boards for the Irvington scenario are complete. Plans call for completion of the Fort Irwin scenario this winter. The Irvington and NTC terrain boards will replicate the Korean and German training scenarios. On 1 April 1994, the breach lab officially opened for instruction.

Typical Scenario

The typical training sequence involves a two-hour block of instruction in an AOAC large group by the engi-

Approach March Board

Breach Board

Training Walls

Example of Mines in the Mine Warfare Room

dents use the mine warfare room to get a better understanding of the various types of mines and to take advantage of the video tapes available in the classroom. The classroom becomes a planning cell for conducting troop-leading procedures based on an operations order given by the SGI.

The commanders conduct their initial terrain reconnaissance on the approach board while the staff conducts mission analysis. The approach board allows the students to conduct a thorough recon of the terrain and to conduct initial templating of possible enemy locations and obstacles. Following the commanders' reconnaissance, the company commanders and battalion staff then return to the approach board and conduct a detailed rehearsal using micro armor models (1:285 scale). The SGI and commanders then discuss in detail how they would conduct a deliberate breach, based on the staff's template of enemy locations and obstacles.

The mission is executed on JANUS following the terrain rehearsal. JANUS has the Irvington and NTC terrain data bases installed with the same dimensions as the terrain models. This allows the small group to make further refinements to its plan, based on terrain considerations and templated OPFOR actions.

After executing the mission on JANUS, the small group is prepared to conduct the mission against a defending enemy. The exercise begins on the approach board with movement from the AA through the line of departure (LD). The attacking element first encounters the defender's security obstacles, and later the tactical obstacles. Once contact is made with the tactical obstacles, the students transition to the breach board for a more detailed view of the obstacle location.

On the breach board, the students are able to see the doctrinal layout of the obstacles and the defender's positions. The SGI leads the students in a discussion on how they would apply the basic engineer breaching tenets of suppression, obscuration, security, and reduction (SOSR) in successfully breaching the obstacle. The students must then tactically deploy the TF and employ engineer assets to successfully breach the obstacle system. The students continue their mission by breaching the obstacle and assaulting onto their objective. The students would then have to perform either a hasty or in-stride breach of the defender's protective obstacles. The SGI conducts an

neer instructor. This class gives a basic overview of the capabilities of the engineer company and battalion and also teaches the proper utilization of engineer assets. The small group instructor (SGI) reinforces the class with more detailed instruction on the engineer company/battalion, the equipment organic to the tank battalion, and how it is properly employed on the battlefield.

Students are prepared to execute "hands-on" training at McPheeters Hall following large group and small group classroom instruction. The SGI is responsible for assigning battalion staff and company commander positions to the students. He must also assign an OPFOR commander and ensure that a doctrinal OPFOR obstacle plan is in place. During this initial phase, stu-

Breach Site

after-action review with the students once the mission is complete.

Future Applications

The breach lab trains students on how to conduct a breach with a reconnaissance, terrain rehearsal, JANUS exercise, and execution on the terrain board. This process gives students a thorough hands-on experience of breaching operations without the high cost of a live breaching demonstration. In the future, PCC, AOBC, ANCOC and BNCOC may also use the Armor Center Breach Lab to train breaching operations. The Armor School can incorporate the breach lab into CPX missions through the terrain models and JANUS. Though the actual breach on the ground cannot be replaced, the breach lab offers a viable alternative at a lower cost.

Captain Dan McIntosh is currently assistant S3, Warrior Brigade, Ft. Polk, La. His previous assignments include tank platoon leader, tank company XO, and battalion S4, in 2-70 Armor, Erlangen, Germany, and 2-72 Armor, Camp Casey, Korea. He is a graduate of AOBC, BMOC, Airborne School, NBC Officer Course, Scout Commanders Certification Course, AOAC, and Cav Leader's Course.

Captain Scott D. King is a 1988 graduate of the U.S. Military Academy. A graduate of AOBC, Infantry Mortar Platoon Officer Course, and AOAC, he served as a tank platoon leader, mortar platoon leader (DESERT STORM), HHC XO, and battalion S4 with 1-34 Armor, Ft. Riley, Kan. He is currently an Armor Officer Basic Course instructor with 2-16 Cavalry at Ft. Knox, Ky.

The Advanced Warfighting Working Group, Exploring the Future

**by Major Christopher A. Mitchell,
Co-facilitator**

The Advanced Warfighting Working Group (AWWG) was formed in March of this year by the Deputy Commanding General, Brigadier General Maggart. Modeled after virtual management principles, the group has explored various subjects relevant to mounted warfare in a unique fashion. The group is unique in that it is non-hierarchical, and the structure or organization can change with each meeting and topic. Membership is voluntary, with the only prerequisite being a natural curiosity to explore issues that apply to the transition of the Mounted Force to the twenty-first century. Members work on their own time, researching and studying topics in an effort to bring new ideas and fresh perspectives to conventional thinking. Members range in experience from non-commissioned officers to movie producers to Army nurses, and even include scientists, computer modelers, company commanders, and doctrine writers. The AWWG meets every Wednesday for about two hours. Members select a topic and, based on interest and experience, one or two members will lead or facilitate a discussion on the selected topic. As a group, the members decide what form the product of the discussion will take, be it a paper, research proposal, or simply a briefing. To date, some of the topics have included a research proposal on "Seeing the Battlefield" and the development of a future reader which included a précis of major future works. The group has also produced a number of papers on leadership in the information age, information as the fifth element of combat power, and higher order insights on the Advanced Warfighting Experiment 94-07. Many of the products are influencing the development of future doctrine and are appearing in different papers and manuals that are shaping the focus of the Army of the twenty-first century.

The AWWG has an extended membership which draws from expertise in the private sector; we're also active in the Internet, and have tapped into sources of information across the country. The Chief of Staff of the Army, General Gordon R. Sullivan, fully supports the concept and has established a direct link with the group through a computer his office provided. General Sullivan said this about the AWWG in May of this year, "What impressed me most is your language and the fact that you are in being. What you represent is the future — what can and will be Force XXI. Think and grow. Help us change and grow without a loss of effectiveness." The fact that the group exists is a credit to the USAARMC chain of command, and their willingness to lead the Army in Force XXI initiatives and contributions. It's no accident that Fort Knox is credited with making the most significant strides toward the twenty-first century and the Information Age.

An old idea from "back on the farm...":

Improving Class III Scout Resupply

by First Lieutenant Michael L. Yaeger

Providing logistical support for the task force scout platoon, especially the problem of resupplying it with fuel, has continued to spark an often-heated debate. Usually, the controversy centers on who should take the responsibility. Personally, I feel it should be someone who will give it the attention it deserves — after all, the scouts are the eyes and ears of the TF commander. But my focus here is on how this support is provided, not who does it.

I discovered the problem while on active duty with 3-66 Armor of the 2d Armored Division during an NTC rotation in 1993. I was an augmentee assigned as assistant HHC executive officer, where I learned first-hand what works and doesn't work when resupplying scouts.

While it was fairly easy to get water, food, parts, and mail to the scouts, problems arose when it come to delivering fuel. The HEMTT fueler is a superb transport vehicle, but not always practical for these reasons:

● It is often hard to keep HEMTTs forward long enough to rotate all of the scouts back from their positions for fueling. Problems occur because the HEMTT needs to get back to refuel its tank.

● It is impossible to travel around the battlefield unnoticed with a fuel HEMTT following your HMMWV.

● Obviously, I found that service station or tailgate resupply, in their pure forms, are usually impossible for the scouts.

● The scouts require much more flexibility, considering that they may be in multiple locations at once, or forward of the LD and unable to rally for a true LOGPAC.

This got me to thinking, why not refuel the vehicles from a small fuel tank, like we did back on the farm? When doing field work on our family farm in Montana, we always had enough fuel for the tractor or other equipment because we had a small fuel storage and pumping unit in the back of our pickup truck. I applied this principle to the scouts. The idea is not to make the scouts carry their own fuel, but rather to make the job easier and more tacti-

cally sound for whomever is responsible for their resupply.

I figured out how much weight the standard M998 HMMWV (no overload springs) could carry, and where a fuel tank could fit. The result was a 2 ft x 2 ft x 6 ft tank that fits where the back seats are. The design provides for 21 cubic feet of fuel storage, space for other POL storage, and a manual hand pump (no wiring). Most of the materials for the prototype tank are available through our current LOG system, but the tank itself would probably have to be fabricated from locally purchased sheet metal. It would just be a matter of assembling the parts on the tank and painting the whole thing green. I can only estimate the empty weight of the assembled fuel tank, but I would think about 250 to 300 lbs. This would still leave about 800 lbs for other cargo and gear, assuming no alteration is made to the HMMWV suspension. In addition to its compact size and simplicity, four people could easily remove the empty tank. Thus, the vehicle would be available for other duties. Just drain the last little bit of fuel into the HMMWV that is carrying the tank.

Situation: TF 1-10 is preparing to go on the offense. Scouts are screening 3km forward of LD/PL SNOW in two sections of five. They topped off with CLASS I, III, and V before moving out, but now need water and fuel. The scout resupply OIC/NCOIC coordinated with the scout platoon sergeant for two logistics resupply packages, one behind each of the two sections. The designated HMMWV is loaded with water jugs, extra MREs, new batteries, chemlights, parts for one of the scout HMMWVs, and a fuel tank filled with 155 gallons of diesel fuel. While this is not enough to fill every vehicle, it does give the LOGPAC enough to top off each HMMWV with 15 gallons.

Mission: The supply HMMWV will move forward of LD/PL SNOW to LRPs 1 and 2 to conduct LOGPAC for the TF scout platoon. It will then move back to AA RIVER in preparation for future LOGPAC operations.
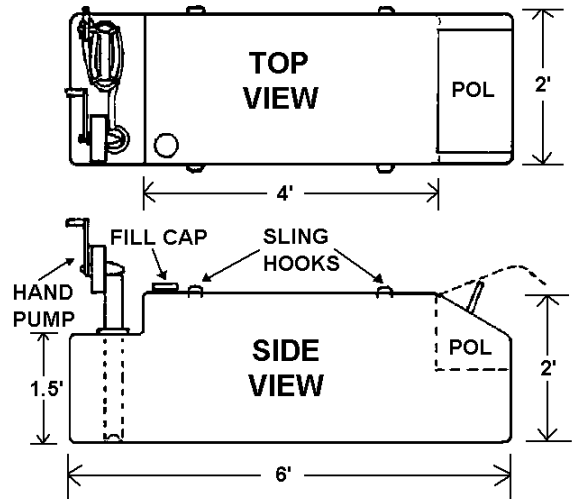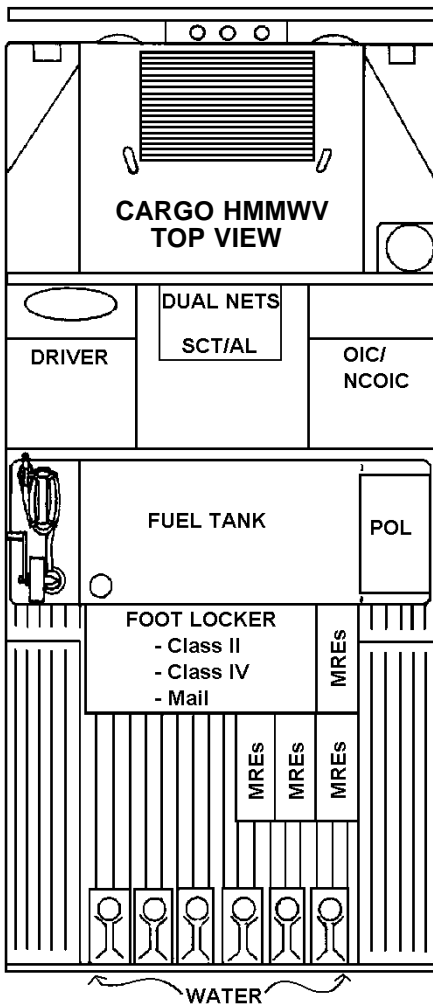
Execution: The supply HMMWV moves forward and crosses the LD, enroute to LRP 1. Once there, it fuels each vehicle in Alpha section as they

rotate back from their area of operation. When complete, the fuel HMMWV moves to LRP 2 and does the same with Bravo section. In addition to fueling, they exchange water cans, distribute parts, issue needed POL, issue MREs, and deliver other needed supplies. The HMMWV then returns to the AA, refuels, and prepares for future operations.

AAR: The scouts are now up on all classes of supply, without them having to return behind the LD. The HMMWV was able to get to them and back, unobserved by the enemy, which would have been impossible with a HEMTT fueler. The refueling operation did not require 5-gallon cans (30 cans would have been needed, space better used for other things). The fuel tank was emptied using a manual hand pump, which required no additional vehicle wiring, and the POL compartment allowed for clean storage of a standard POL basic load. The fuel was handled in bulk so there was less chance of contamination. Not using fuel cans saved time.

While this approach is not the only way to fuel scouts, I believe it does allow for greater flexibility for the TF commander when scouts are forward. If possible, the preferred method is to use the HEMTT, but it became apparent to me that, more often than not, the scouts are not around for normal LOGPAC and would use the smaller tank if it was available.

First Lieutenant Michael L. Yaeger is a 1989 graduate of the University of Montana ROTC program. A graduate of AOBC, CVTTT, RCTCC, and AOAC, he has served as a platoon leader and XO in Bravo Company, 2-163 Armor. He is currently the Small Arms Readiness Training Officer for the Montana Army National Guard State Area Command. He also works for the National Guard full time in the U.S. Property and Fiscal Office (USPFO) for Montana as a supervisory supply systems analyst.

CARGO HMMWV TOP VIEW

| | DUAL NETS | |
| DRIVER | SCT/AL | OIC/ NCOIC |

FUEL TANK — POL

FOOT LOCKER
- Class II
- Class IV
- Mail

MREs MREs MREs MREs

WATER

TOP VIEW — POL — 2'

4'

FILL CAP — SLING HOOKS

HAND PUMP — **SIDE VIEW** — POL — 2'

1.5'

6'

Figures

1. 1 gal of fuel = 8 lbs. (approx)
2. 1 cu. ft. = 7.48 gal.
3. 21 cu. ft. x 7.48 gal. = 157.08 gal.
4. 157.08 gal. x 8 lbs. = 1256.64 lbs. (fuel)

Capacities

1. HMMWV weight (empty) = 5326.31 lbs.
2. HMMWV weight (max) = 7700.66 lbs.
3. Cargo weight (max) = 2374.35 lbs.
4. 155 gal. usable fuel (15 gal. for each scout vehicle).
5. 1.5 cu. ft. of POL storage space in end of tank.
6. Tank weight (empty) = 250 - 300 lbs. (approx).

Parts

1. Fuel hose . . . . 15 feet
2. Fuel pump (manual) . . . . hand crank
3. Nozzle . . . . hand squeeze
4. Grounding cable . . . . standard
5. Filler cap . . . . 3 inch
6. Latches . . . . buckle
7. Sheet metal . . . . 16 gauge

Technicians install a new gun mount within the tight confines of the Abrams turret. Below, crane lowers new mount into place.

Abrams Gun Mounts Being Replaced To Accommodate More Powerful Ammo

Rock Island Arsenal, Illinois, teams have been strengthening the mountings of M1A1 Abrams tank guns to handle newer, more powerful ammunition.

About a third of the 1,600 M1A1s have been converted already, and the remainder are to be completed by 1996 as part of a multimillion dollar conversion program. It involves modification of the gun mount and cradle. Teams remove the 2,000-pound gun mounts, pull out the old recoil mechanisms, insert new recoil mechanisms, and reassemble the parts. The old recoil mechanism is then rebuilt and modified at Rock Island.

Four arsenal teams of three machinists each have been traveling to military bases and National Guard sites in the U.S. and overseas to make the changes. Working 10 hours a day, six days a week, each team usually manages to upgrade a tank a day.
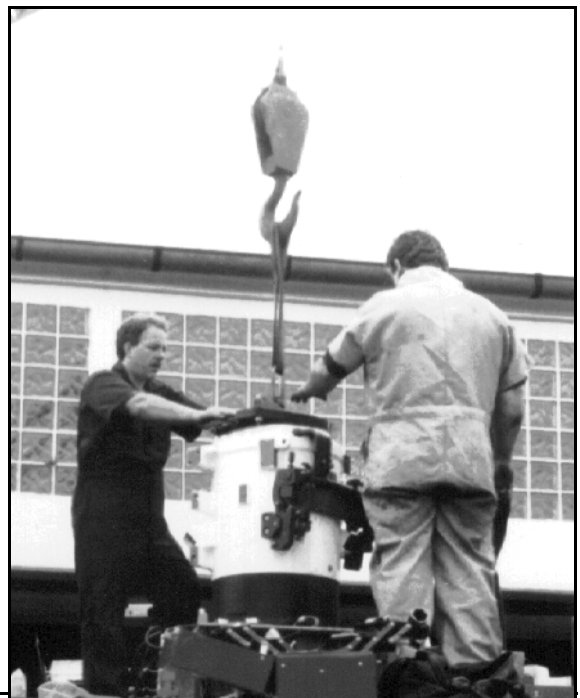
Armor Center Announces:

The General Frederick M. Franks, Jr. Award

The annual Frederick M. Franks, Jr. Award has been established by the U.S. Army Armor Center to recognize individuals who make long-term contributions to the ground warfighting capabilities of the U.S. Army. Eligible for the award will be Active Duty or Reserve officers, noncommissioned officers, Department of the Army civilians, or leaders of business/industry. Additionally, this individual should possess two or more of the following characteristics of duty performance during the year or years preceding the award:

- Offered a vision for the future of the Mounted Warfighting Force that significantly improved combat survivability, lethality, maneuverability, or mobility.

- Developed an innovation in equipment, materiel, or doctrine that significantly enhanced the effectiveness of mounted elements of the combat arms.

- Exemplified professional excellence in demeanor, correspondence, and leadership on issues relevant to mounted warfare.

- Revealed a love of soldiering through leadership skills, recognition of the sacrifice and achievements of subordinates, and attention to the intent and directions of higher commanders.

In keeping with the example demonstrated so well by the award's namesake, any individual can recommend another individual for the award through brigade-level or equivalent military or civilian organizations. Commanders, program managers, or directors may nominate an individual for the award; division-level or equivalent commanders/executives must endorse and forward it to USAARMC.

Each major headquarters, e.g., TRADOC, FORSCOM, Cadet Command, etc., may also nominate one individual for the award. Although only one nominee can be submitted to the selection panel, each unit/command must develop a process by which you allow nominations from the lowest level that fulfill the requirements listed above. Nominations will be made in the form of a letter to the president of the panel, detailing the achievements of the nominee according to the criteria listed above. The period of eligibility is the calendar year.

Nominations must be submitted to the U.S. Army Armor School, ATTN: ATSB-DAS, Fort Knox, KY 40121 between 1 January and 31 March 1995.

Recommendation of an awardee will be made by the Franks Award Panel and forwarded to the Chief of Armor for final approval. The winner will be presented his/her award at the annual Armor Conference. Cost of TDY will be paid by the U.S. Army Armor School.

If you have any questions concerning the award, please contact the Armor School. The phone numbers are DSN 464-8878 or commercial (502)624-8878. POC is CPT(P) J.B. Iddins.

1995 Armor Conference Slated for 1-4 May 1995 at Fort Knox

THEME: *Victory Then - Victory Now - Victory Tomorrow: Mounted Forces 1945-2005*

Dates: 1-4 May 1995 at Fort Knox, Kentucky

Synopsis: The U.S. Army, specifically the mounted force, has undergone significant changes in training and equipment since victory was achieved in World War II. Today, we face the challenge of developing a mounted force for the 21st Century — Force XXI.

Focus: The 1995 Armor Conference, as well as the 1995 Armor Trainer Update (ATU), will focus primarily on training and doctrine evolving from our digitization efforts and updates on current and future programs. We are also going to provide a look into the past and future of mounted warfare and training from 1945-2005 with a special emphasis being the 50th anniversary of the ending of World War II, and the role mounted forces played in that victory. We will also have state of the art displays by the country's leading defense contractors, designed to enhance Armor's move into the 21st Century. Additionally, we will also say "good-bye" to the Chief of Staff of the Army, General Gordon Sullivan, who is retiring.

For more information, contact:

Armor Trainer Update: MAJ Leppert, DSN 464-3214/2886

Armor Conference: CPT(P) Iddins, DSN 464-1065/8878

VIP Billeting/Coordination: Mr. Eubanks, Protocol Office, DSN 464-2744/6951

Commercial calls can be placed to (502)624- followed by extensions listed above.

with a hands-on, technically-oriented block of vehicle instruction that focuses of Skill Level 1 crew tasks. We teach them about operating the M240C, the 25-mm Automatic Gun and the TOW; performing PMCS on and driving the BFV and the HMMWV; emergency procedures; BFV fording operations; and accident avoidance. During Week 13 of the POI, 19D soldiers live-fire both the M240C and the 25-mm, drive the BFV for eight hours and the HMMWV for four hours under cross-country and hard-surface conditions, and conduct a STX wherein they learn the basics of land navigation and reconnaissance techniques. The goal of this entire block of instruction is to familiarize the soldiers with the equipment, not to make them experts on it, and throughout OSUT we determine their proficiency through a series of successive gate tests.

Within the 13 week 19K POI, we also begin M1/M1A1 Tank training in Week 3. Our primary focus in this block is to properly instruct the 19K soldiers on how to be proficient drivers and loaders. We give the 19K soldier 16 miles of cross-country and hard-surface driving and 12 additional hours in the Tank Driver Trainer. We show them how to load and unload the 105-mm/120-mm main gun as well as how to clean and service it. During Week 11, we take them to the gunnery range and let them fire both the main gun and the M240 machine gun. In addition, their maintenance training is appropriately structured to include instruction on how to remove and install track and how to perform a proper PMCS on the M1/M1A1 tank.

Some of our soldiers do receive additional training. Through a rigorous evaluation and selection process, OSUT units choose soldiers who have distinguished themselves during training and subsequently enroll them in the Excellence in Armor (EIA) or the Excellence in Cavalry (EIC) Program. These exceptional soldiers have demonstrated the competency, commitment, motivation, and physical fitness that demands special development. They receive an additional 50 hours of in-depth reinforcement training on selected maintenance, COFT, live fire gunnery, navigation, and common skills. Gaining unit commanders should identify and challenge incoming EIA/EIC soldiers by assigning them to positions that are MOS specific. Leaders should expect more from EIA/EIC soldiers because they possess the drive, ability, and potential to quickly integrate and assume responsibilities beyond those normally expected of Skill Level 1 soldiers.

As mentioned earlier, our primary goal within the 1st Armor Training Brigade is soldierization — how to look, walk, talk, and perform like an Army soldier. During the three months that we train these 19D and 19K soldiers, it is our responsibility to introduce these new recruits to all tasks associated with being an Armor Crewman or a Cavalry Scout. We give them a consolidated and intense introduction on how to shoot, maintain, and fight their vehicles. Once these soldiers graduate and leave Disney Barracks, we have provided them a basic set of skills that will need reinforcement and, depending on the qualities of the individual soldier, retraining. Keep in mind that these soldiers have just

come from a highly-structured training environment. As a result, it is crucial that an effective "battle hand-off" occurs. Although these soldiers are MOS qualified, their level of knowledge is entry level specific and unrefined. These soldiers need a level of devoted and attentive leadership that will provide a positive training transition into the Army.

Within the 1st Armor Training Brigade, we are continually searching for ways to improve our training. If you have suggestions about OSUT training improvements or want input into our training methodology, I encourage you to contact us. Within the 1st Armor Training Brigade, we have already conducted and will continue to conduct Video Teleconferences (VTCs) with units in the field to receive feedback on the quality of our IET product. If your battalion or brigade would like to schedule a VTC with the 1st ATB, please contact S3, 1st ATB at DSN 464-4810/5840 or commercial (502) 624-4810/5840. Your input is valued and will be given the highest level of attention.

TRADOC System Manager
For Abrams and the AGS
Comments on "Assault Gun Battalion 96"

In response to Major Martin N. Stanton's article on the XM8 Armored Gun System (September-October 94), we would like to correct and clarify several topics concerning the Army's concepts for employment of the AGS and its capabilities and limitations.

The Army has no plans for fielding the AGS to assault gun battalions. 3-73 Light Armor Battalion of the 82d Airborne Division is the first unit designated to receive the AGS with subsequent fielding to the 2d Armored Cavalry Regiment. The term Assault Gun Battalion has its genesis in Army programs of the 1980s designed to field a Mobile Protected Gun system to the 9th Infantry Division (Motorized) and other light infantry divisions. These plans and programs were superseded by the AGS Program.

New Army doctrine for the employment of the AGS is not required. Doctrinal tenets are found in the current version of FM 17-18, *Light Armor Operations,* and in FM 17-95, *Cavalry Operations.* Additionally, the AGS replaces the M551A1 (TTS) Sheridan in 3-73 Armor, whose crews, sections, and platoons already train on a habitual basis in close support of light infantry forces. In the case of the 2d Armored Cavalry Regiment, the AGS will serve in the traditional role of armor support for reconnaissance elements. It performs the same role as do Abrams tanks in the existing heavy ACRs with obvious METT-T distinctions — survivability considerations etc., as is the case of employing HMMWV vice M3s.

Major Stanton's contention that the AGS is more vulnerable to shoulder fired anti-tank weapons than a main battle tank is only partially correct. AGS Level III Armor was specifically designed to defeat such a threat and has successfully completed initial live fire tests. Additionally, technical testing has revealed that the AGS is fully capable of traversing difficult terrain in much the same fashion as the Abrams. Requirements call for the AGS to ford up to 40 inches of water as compared to the Abrams capability to negotiate 48 inches. In short, the AGS is capable of operations in difficult and demanding terrain. And by the way, AGS is equipped with an infantry phone system similar to the M60-series tanks.

We appreciate and applaud the thought-provoking contributions of authors such as Major Stanton to get the AGS story out, and encourage others to do the same. Professional dialogue is healthy and is a hallmark of our branch. We stand ready to assist writers in their research efforts...

The AGS is currently undergoing technical testing at Aberdeen Proving Grounds and enters operational testing at Fort Pickett, Virginia, starting in January of 1995. Current plans call for light infantry support missions as a test basis at Fort Pickett transitioning to a cavalry focus during IOT&E slated for January 1996.

O.T. EDWARDS III
Major, Armor

(Major Edwards is Light Systems Development Officer for the TRADOC Systems Manager for Abrams And AGS, Fort Knox.)

Don't Tie AGS to Infantry Pace

Dear Sir,

I read with interest Major Martin N. Stanton's article in the September-October 1994 issue of Armor entitled "Assault Gun Battalion 96." When I reached the sentence in the third paragraph of the article where

At left, the AGS is seen with Level III add-on armor package. Employment concept calls for three levels of armor protection, tailorable in theater to the local threat.
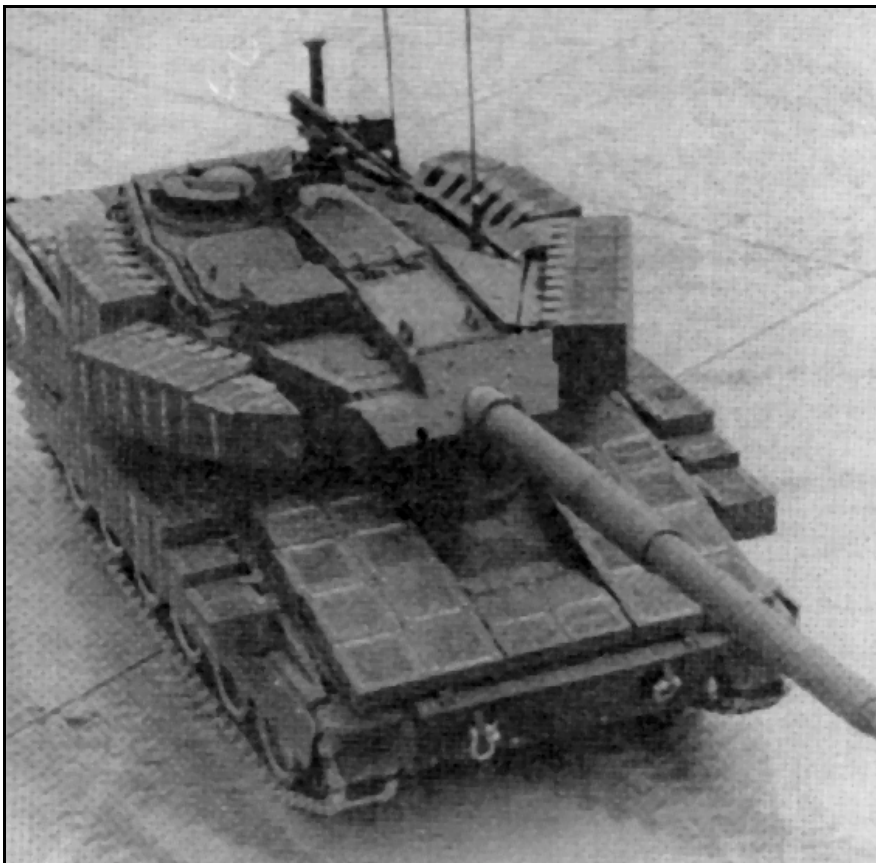
MAJ Stanton states that "...the battalion would cross-attach its companies to support light infantry units, one company per brigade, my alarm induced me to race to the end of the article and check the author's branch, which was, as expected, of the infantry variety.

As an armor officer graduate of the Infantry Officer Advanced Course at Fort Benning, I have the utmost respect for the infantry branch and the doctrines associated with light infantry warfare. However, the doctrinal focus of this article seems to take us back to the early WWI days of treating tanks as mobile pillboxes. Under MAJ Stanton's suggested task organization, an assault gun battalion commander could look forward to having his companies cross-attached to brigades, who might then cross-attach the platoons to infantry battalions, who could then cross-attach individual tanks to infantry companies. The author further supports this view with his "jungle trail combat team" example, and his statement that battle runs should be accomplished at a "walking pace." I think that many experienced armor NCOs might further anticipate taskings from his cross-attached unit 1SG, such as moving water, ammunition, and other materiel around the battlefield in his M8 AGS.

There may be occasions for such task organizations, but certainly this should not be used to form the primary set of METL tasks of any armored force. Armor is best suited as a mobile force designed to close with and destroy enemy forces using fire, maneuver, and shock effect. Armored forces are most lethal when employed decisively in maneuver scenarios, preferably massed and supported **BY** infantry.

They are also ideal for cavalry missions, giving cavalry units a greater ability to conduct all classes of security (screen, guard, and cover), economy of force (hasty/supporting attack/defense), and pursuit missions.

The article's strategic deployment scenario involving light infantry division AG Battalions and the 2d ACR (L) supports my point.

In this scenario, the U.S. enters a theater of operation by deploying all LID/Airborne AG Battalions and the 2d ACR (L) under the auspices of XVIII Airborne Corps. Such a force would thus be far more capable than was the case in DESERT SHIELD to deter/fight an enemy force while the U.S. moves more forces into the region. In my opinion, such an operation would most optimally be accomplished by designating the 2d ACR (L) commander as the maneuver commander of this "Dragoon Battle Group," and focusing corps-level attention on the joint service support of his operations. Cavalry-style operations conducted in this scenario by AG Battalions will not mirror the doctrine, training, or logistics practiced at home station as envisioned by MAJ Stanton. AG Battalions would have to conduct security and economy-of-force missions like other armor and cavalry units in the Army are trained to accomplish.

The armor community should rally to retain proponency for armor doctrine and training as it related to the AG battalion. The XM-8 Armored Gun System looks like a tank, moves like a tank, and kills or dies like a tank; therefore, it probably is a tank, so let's treat it like one. To MAJ Stanton's credit, he has laid out an articulate justification for fielding AG battalions in the Army, and he has set out a baseline set of assumptions and recommendations about their organization, training, and employment. It is up to the armor community to refine these ideas, and explore alternatives. My own inclination is that there is a great deal of doctrinal richness to be mined from MAJ Stanton's unexplored idea to cross-attach the AG battalion to the light/airborne division's fourth (aviation) brigade. Perhaps this brigade should organically control both the AG battalion and the reconnaisance squadron. Such a combat team could routinely work as a cross-attached armor-cavalry-aviation force that, if combined with a battalion of air assault infantry, would rival the lethality and effectivess of much heavier forces.

MICHAEL F. STOLLENWERK
Captain, Cavalry
Sloan School of Management, MIT

LETTERS (Continued from Page 3)

The early 1970s R&D scout vehicle program had been terminated, the 1/4-ton was not the solution, the M551 Sheridan was a failure, and the M113 family as a platform for the mortar carrier and infantry squad was projected to be obsolete for the future. The hard fact, in both analytical studies and real world comparisons, was that the platoon's poor mobility, firepower, and materiel reliability doomed it as a unit on the M1 and M2 battlefield and, thus, even risked ground cavalry's existence in the future division and corps organizations. There were no R&D or procurement dollars available to develop, procure, or optimize vehicles for the combined arms type platoon. Monies available to armor and infantry were dedicated to the high priority XM1 and XM2 program, a correct decision at that time.

The quick and, I consider, interim term fix was to buy into the XM1 and XM2 programs for future armored cavalry platoon equipment. The result was the M1 tank and the cavalry version of the M2, the M3. The trade-offs in greatly increased platoon materiel costs vs. enhanced mobility, firepower, survivability, and reliability resulted in the current organization of scouts and tanks or scouts alone, but with a reduced cavalry missions capability.

I completely agree with General Bolte's statement that new equipment available today has much to offer if viewed in the 1950s-1960s combined arms type cavalry platoon organization. To list a few: The M1109 HMMWV, the close combat vehicle light, the M2 infantry vehicle, and the M2 mortar carrier version.

The quick fix of the late 1970s has been overcome by available modern vehicles and greatly enhanced weaponry and vision devices. Don't re-invent the wheel, just re-examine an old and proven spoke — the combined arms structure.

JIM PIGG
COL (Ret.), Armor
Shalimar, Fla.

Light Cav LTs Need TOW Training

Dear Sir:

There is a very interesting phenomenon occurring within the armor community. Down in the steamy bayous and soupy forests of western Louisiana, armor lieutenants are being placed in charge of TOW platoons without any real training on the TOW weapon system. I am referring to the Army's only full light cavalry regiment, the Second Armored Cavalry Regiment at Fort Polk. The 2d ACR uses only HMMWVs for its combat platforms. The scout platoons are mounted in HMMWVs instead of Bradleys, and in place of the tank platoons of the heavy regiment, light cavalry uses a platoon of four HMMWV-mounted TOWs. Traditionally, the HMMWV-mounted TOW system has been a weapon system used in infantry units as an overwatch measure against an armored threat. But now that this weapon system is being used in a cavalry organization, the platoon leader for the TOW platoon is not an infantry lieutenant, but rather an armor lieutenant.

The idea of placing an armor lieutenant in the position of TOW platoon leader is by no means a bad one. Cavalry tactics are still at the heart of the light cavalry organization, however a certain adjustment is necessary, both philosophically and technically. There should be some formal fine tuning for a lieutenant who has come from Ft. Knox and has been studying the tactics

and techniques of an audacious steel beast when he must suddenly readjust to a new platform and a new weapon system. What is the solution?

Army-wide, the only institution for TOW system instruction geared specifically for platoon leaders exists at the Infantry School at Fort Benning. The Infantry School has a course which they call the TOW Platoon Leader's Course (TPLC). This course is aimed at the TOW platoon leader within infantry TOW companies, but is still excellent training for TOW platoon leaders in the new light cavalry organizations such as the 2d Armored Cavalry at Fort Polk. The course covers the workings of the TOW system, TOW maintenance programs, TOW training management, TOW training aids, TOW gunnery, and most importantly, TOW tactics.

Recently I went to Fort Benning to take this course, but regrettably it was cancelled after only one day of training due to the low attendance (I was one of four lieutenants who showed up). The instructors there told me that the classes for this course have been growing steadily smaller. It seems as though the infantry is relying less and less on this weapon system while, ironically, the armor community is now embracing the system as part of its light cavalry concept. In speaking with the instructors, reviewing the texts, and looking at the training schedule for this two-week course, it struck me as the ideal transition course that armor lieutenants need to more effectively lead a TOW platoon. In some situations, however, units find it difficult to send lieutenants all the way to Fort Benning for this course because of ever-shrinking budgets and the high cost of TDY pay.

The Infantry School does offer a solution to cash-strapped commands who perceive the need for this training yet can't afford the TDY expense of sending lieutenants to Fort Benning. The Infantry School is able to provide the course in its entirety in a mobile training team (MTT) format. The TPLC instructors could set up the course on your post and thereby save money. The course can instruct up to 28 lieutenants. All that the host unit needs is a range that can support TOW gunnery (no live missiles need be used), two classrooms for classes and for tests, and all the TOW equipment needed. The cost to the unit is simply the TDY costs associated with the ten members of the instructional team and any support costs such as fuel, ammo, range support and any equipment.

Whether the MTT is the answer or whether there is an even smarter answer, I do not know for sure. But one thing that I am fairly certain of is that, before taking over a TOW platoon in this new light cavalry, an armor lieutenant needs TOW-specific training. With such training, an armor lieutenant is the ideal platoon leader for the light cavalry TOW platoon.

2LT PATRICK J. GRIEBEL
A Trp, 1/2 ACR
Ft. Polk, La.

Sleep Management Revisited

Dear Sir:

I was interested in Captain Patrick J. Chaisson's comments on sleep management in combat in his article, "Rest for the Weary," (*ARMOR,* Sep-Oct 94). As a tank platoon commander, it took me a while to develop my own sleeping patterns and effective sleep for my soldiers while on operations.

I found that I needed three hours of sleep a night in order to operate effectively. Any less than three hours continuous seemed to leave me extremely drained. In developing a sleep program that kept in mind the need for local security and radio/listening watch, I found that three hours sleep plus 15 minutes for waking up and going back to sleep to be the most effective. If a soldier had a middle of the night security shift, I tried to get him two hours before and after to make up for the disruption. Additionally, to even the workload, tank commanders would serve on radio watch and crewmembers would provide security or runners as necessary.

I also found that after five to six days, depending on the phase of war being exercised and intensity of operations, that two sustained six-hour periods of sleep were needed. This usually coincided with the need for company-level maintenance day.

My hat off to CPT Chaisson for putting to words what I found through two and a half years of trial and error.

2LT BRADLEY T. SHOEBOTTOM
Royal Canadian Armoured Corps
Canadian Armed Forces

Fixing the Scout Platoon

Dear Sir:

LTC Woznick's article in the September-October 1994 issue of *ARMOR* is right on the mark in identifying the requirements of the perfect scout steed. But, he has overlooked an interim fix to overcome the HMMWV's shortfalls while we wait for the FSV. With the correct mix of the scout platoon's organization we can overcome the shortfalls of the HMMWV and play to the strengths of the M3 and the HMMWV.

In my experience in scout operations, I have encountered missions that required both the stealth of the HMMWV and the firepower, survivability, and observation capabilities of the M3. To overcome this dichotomy, I suggest a platoon mix of six HMMWVs and four M3s. Under this task organization, the scout platoon can array these assets, adjusting to METT-T, to capitalize on the strengths of each of the systems.

By leading the HMMWVs in a two- or three-section configuration, the platoon

puts its most stealthy and quickest eyes forward. They can be closely followed by the M3s, which can provide overwatching thermal observation and, if the need arises, fires. In a screen mission the lower silhouette and noise signature of the HMMWV can be used to hide in forward positions that the M3 cannot fit, while the M3s cover.

This organization also overcomes some of the shortfalls in the platoon's combat load problem of the current 10-HMMWV configuration. The added storage provided by the M3 for both equipment and personnel adds to the platoon's capability for special missions (e.g., carrying sappers for prebreaching or additional dismounts for patrols).

Track-mounted attachments the platoon may receive also fit nicely into this mix. Often, a COLT or GSR team mounted in 113s spoil the stealth of an all-HMMWV platoon. In a mixed organization, these mounted elements can still travel under the control of the M3 scouts and be employed with the same constraints for tracked vehicles. Another appropriate and highly useful addition to this organization is two motorcycles. Utilized for messenger/courier transport or flank coordination, this vehicle can be very valuable.

Let's not wait for the long-range development of a FSV or settle for an upgrade of a vehicle not designed or entirely suited for all scout missions. The stealth, survivability, and combat power of a mixed M3/HMMWV scout platoon provide a versatility needed now. A good football coach would not put a player built like a corner back on the offensive line. Different roles, missions, and capabilities call for a mixed platoon.

CPT LOUIS J. LARTIGUE
1st Cav Division
Ft. Hood, Texas

Seeks Members of 4-66 Armor

Dear Sir:

I am a former M1A1 tank platoon leader of 4-66 Armor, 3d Brigade, 3d ID (stationed at the time in Aschaffenburg, Germany), who is writing a book portraying my unit's actions before, during, and after deployment to Southwest Asia during Operations DESERT SHIELD/DESERT STORM.

I need information from unit members I have not already interviewed as well as updated addresses for those I did. I can be contacted at the address and phone number below.

1LT MICHAEL KELLEY
1411 Norwalk #105
Austin, TX 78703

Phone: (512) 479-4160

BOOKS

Broken Lives by Colonel Bob Stewart, Harper Collins, London, 1993. $14.95.

With American infantrymen patrolling the borders of Macedonia to prevent the spread of civil war in the former Yugoslavia, and 20,000 soldiers still on call to police the peace agreement recently vetoed by the Bosnian Serbs, it is hard to imagine a more timely book than Colonel Bob Stewart's *Broken Lives.* The story of 1st Battalion the Cheshire Regiment's deployment to Bosnia from 29 October 1992 through 11 May 1993, *Broken Lives* provides a painfully clear picture of the political, logistical, and military challenges one battalion overcame while it provided a degree of peace and security in one of the most difficult pieces of political and geographic terrain in the former Yugoslavia.

Colonel Bob Stewart, the commander of 1st Battalion the Cheshire Regiment since March 1991, pulls no punches in this riveting first-person account of the period from 22 August 1992, when his unit was alerted that it was "on call" to deploy, through the day he turned over the mission to another battalion. Extremely honest about the difficulties he faced working within the framework of a United Nations command, and about the troubled political situation on the ground while he was deployed, Stewart was embroiled in controversy throughout the deployment: The publication of this book will not endear him to the United Nations high command. It is his bluntness that makes Stewart's *Broken Lives* a must-read primer for any unit that may deploy, not just to Bosnia, but on any United Nations peacekeeping mission.

From the first chapter, "A Rush to Wait," which depicts the initial alert and the preparation of the Cheshire Regiment to deploy, *Broken Lives* is filled with practical tactical, operational, and strategic lessons well worth review. The battalion deployed with Warrior infantry fighting vehicles that were new to the soldiers — almost no one in the battalion had fired one prior to deployment notification. An intensive gunnery program coincided with tactical training focused on convoy escort, anti-ambush drills, route clearance, "picketing" routes by stationing outposts at intervals along MSRs, refugee relief, anti-sniper operations, and dealing with the media. Stewart is particularly interesting on the last subject, believing that getting the media "on your side" is among the most important functions of commanders in peacekeeping operations. He later details how he used friendly relations with the press to pressure warring factions: When operating under restrictive rules of engagement, the television camera is often the most potent weapon of a peacekeeper.

Unlike traditional military operations, usually controlled through firm mission statements and divisible into discrete phases, peacekeeping operations are harder to pin down and subject to "mission creep," which created a number of problems for the American mission in Somalia. Stewart recounts his personal mission analysis, from the broad guidance he received at the Ministry of Defence in London through the refinement he performed while on a commander's reconnaissance in an attempt to reach Tuzla. The British area of operations was centered on this city in Northern Bosnia. Its mission was to assist in the provision of humanitarian assistance in support of the United Nations High Commissioner for Refugees (UNHCR). Stewart interpreted this mission quite broadly, stepping in himself as a negotiator between warring faction leaders on numerous occasions. Stewart's bravery and his personal relationships with faction leaders created a succession of cease-fires that, for a short time, brought a measure of peace to the troubled area for which his men were responsible.

Broken Lives is the rarest of all military books: a combination of a first-person account of a conflict that is currently raging and a primer on peacekeeping operations from the strategic to the tactical levels of war. Filled with practical instruction on peacekeeping tasks, from the importance of Rules of Engagement (ROE) instruction and cards carried by every soldier, to checkpoint negotiations, to the fact that most bridges in the Tuzla area strained to support the 32-ton Warriors and could not possibly support main battle tanks, *Broken Lives* should be read by every soldier and officer who may be sent to support peacekeeping operations in the former Yugoslavia.

Unfortunately, it may be hard to find. I hope that it is already available in libraries and American bookstores, but this is a book worth owning yourself, and soon. It is available from Harper Collins Publishers, 77-85 Fulham Palace Road, Hammersmith, London W6 8JB. A good paperback edition, including the author's photographs and some useful maps, can be purchased for $14.95. It is worth the investment. This book may save American lives in the former Yugoslavia.

CPT JOHN A. NAGL
A Trp, 1-1 Cav
Germany

Standard Guide to U.S. World War II Tanks and Artillery by Konrad F. Schreier Jr., Krause Publications, 700 East State Street, Iola, Wis. 54990. $24.95.

In the last few years, several authors have published guides to the tanks and artillery fielded by the United States during World War II. Konrad F. Schreier Jr. has written what is probably the best guide available, *Standard Guide to U.S. World War II Tanks and Artillery.* The book is exhaustive, listing every tank, half track, artillery piece, air defense gun, and armored car used in World War II by the U.S., either in combat or in training.

The book has 255 pages of text, an incredible amount of information. Nearly forgotten systems such as the 105-mm M-3 towed howitzer and the tank-mounted multiple rocket launcher are covered. One sequence of photographs covers the process used to move and emplace the 36-inch "Little David" mortar. That is not a misprint — it had a bore of 36-inches! It was developed to destroy fixed fortifications and was not deployed with any combat troops.

If the book had only described the weapons, it would be useful. What makes it invaluable is the discussion of artillery fire control and ammunition. While U.S. artillery systems were comparable with any other country's, the U.S. system of fire control was the best. American artillerymen had mastered the methods of delivering fire on the target in a very short time. The effectiveness of U.S. artillery during World War II was appreciated by U.S. soldiers, envied by our allies, and admired by our enemies, even as they sought cover.

Included in the book is a short section on ammunition, a subject normally overlooked by those who discuss armor and artillery. The concentration is on the systems, but falls short in recognizing that, aside from the shock power of movement, tanks and artillery normally kill targets with delivered ammunition.

The only real criticism of the book is the failure to include armor thickness and penetration capabilities of all the armor systems, either as part of the vehicle description or in a comprehensive chart. Failure to include this information makes it difficult to understand why U.S. soldiers felt undergunned and underarmored. The author's statement about the ability of the 76-mm HVAP projectile to kill Panther and Tiger tanks overstates the round's ability to actually kill those tanks. While the HVAP projectile could penetrate their side armor at a long range, the Shermans had a serious range disadvantage when engaging the Panther and Tiger tanks over the frontal arc.

If you are interested in World War II tanks and artillery, you should purchase Schreier's book. The book is very readable and the price is reasonable.

GERALD A. HALBERT
545 Willwood Drive
Earlysville, Va.

Jane's Armour & Artillery Available on CD-ROM

by Vivian Thompson, ARMOR Staff

For those of you who are new to the world of CD-ROM, like we are, the first venture into Jane's CD-ROM can be a little intimidating. But after a couple of test runs through the example searches, it all starts to make sense. With a powerful search tool like *Jane's Armour & Artillery,* the possibilities seem endless. Results of research that once would have taken hours are now available in seconds, all at your fingertips.

The CD-ROM includes three interfaces — Jane's Interface, ROMWARE Interface, and a Windows Interface. It includes the capability to do multi-level searches; limit the fields displayed; sort by country, model, etc.; and even modify previous searches. Additionally, the ROMWARE Interface includes the ability to create Hypersets. For instance, when viewing a record on screen, you might cross a word or topic of interest. By pointing to that word, you create a new set of records that can be displayed by simply pressing the F2 key. You can create up to nine Hyperset searches at a time.

There are also photos and line drawings of the equipment, retrievable by model number or name. The photo files are stored in an easy-to-locate numbering system (in PCX format).

And if you're tired of dragging out that 6-pound hardcopy volume of *Jane's* to verify a spelling or acronym, you'll really appreciate the *Jane's Defence Glossary* (also included on the CD-ROM). With just a few keystrokes, the information is yours. By using the Glossary and a two- or three-word search, we were able to find and verify many an acronym. For example: You want to find HEMTT, the correct terminology and acronym spelling, but you don't know either. You know that it contains the words HEAVY and TRUCK. By using a two-word search with the **AND** Boolean operator, you narrow the possibilities down to just a few records. Then with a quick flip through those records, you find "Heavy Expanded Mobility Tactical Truck," the whole process taking only a few seconds. Actually, this is underuse of such a powerful database, but for those tasked with verifying data, a handy capability to have.

The glossary also contains other information including: officer ranks for NATO countries, U.S. military aircraft designations, U.S. missile and RPV designations, NATO reporting names for former Soviet aircraft and missiles, body armor threat levels, units of measurement, conversion factors, periodic table, international phonetic alphabet, company types and abbreviations, membership of international organizations, and country information (population, area, defense spending, and GNP).

There's also a Master Index that cross-references other *Jane's* yearbooks, including title, edition, page, country, equipment type, model, and manufacturer.

While the CD-ROM is probably a bit pricey for the occasional writer/researcher, it would be an asset for prolific military and technical writers, and a worthwhile addition for any library.

The *Jane's Armour & Artillery, 1993-94* CD-ROM offers a wealth of pictorial information. Here, three different views of the Swedish Bandkanon 1A Self-Propelled Gun, including a line drawing of the vehicle. The database text contains photo captions.

Additional Jane's Titles Available on CD-ROM

Naval Weapon Systems
Fighting Ships
High-Speed Marine Craft
Underwater Warfare Systems
AFV Retrofit Systems
Infantry Weapons
Ammunition Handbook
Military Training Systems
NBC Protection Equipment
Security & Counter-Insurgency Equipment
Land-Based Air Defence
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C³I Systems
International Defense Directory
Strategic Weapon Systems
Air-Launched Weapons
All the World's Aircraft
Civil & Military Aircraft Upgrades
Avionics
Space Directory
Airport & ATC Equipment
International ABC Aerospace Directory
Military Vehicles and Logistics

FIRING SEQUENCE BEGINS: Initial propelling charge burns for only a tenth of a second, so there is no backblast. Weapon can be fired from cover, from rooms, and from vehicles. Once the missile is fired, gunners can move to cover, safe from counter-fire.

MAIN ROCKET MOTOR IGNITES when missile is a safe distance from launching crew. Day/thermal sight, used only to acquire target and fire, is reusable. Missile can be programmed to attack directly or to follow a high arc and attack target from top.

MAIN ROCKET REACHES FULL BURN safely downrange from launch crew. With no trailing wire to carry guidance commands, the missile can fly over trees and water, reaching a maximum range of 2,000 meters. Tandem warhead can defeat ER armor.

Introducing JAVELIN:
The "Fire and Forget" AT Missile
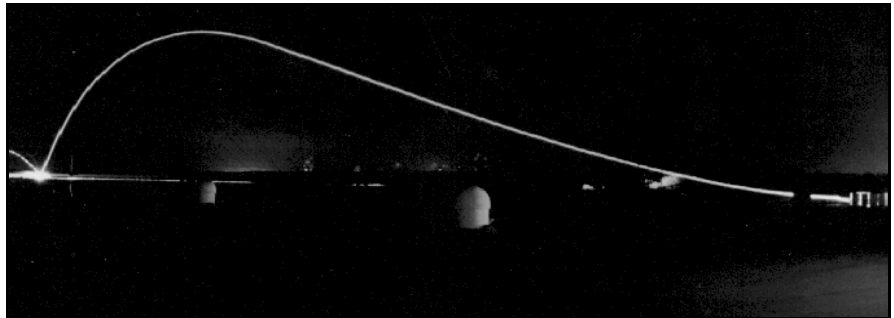
At left, gunner with 14-pound command launch unit. Above, a time-exposure of night engagement clearly shows initial launch motor's burn, ignition of main engine, and top-attack profile. Gunner can also select a direct-engagement flight profile to hit bunkers or targets under cover.

SEEKER   GUIDANCE   WARHEAD   PROPULSION   CONTROL
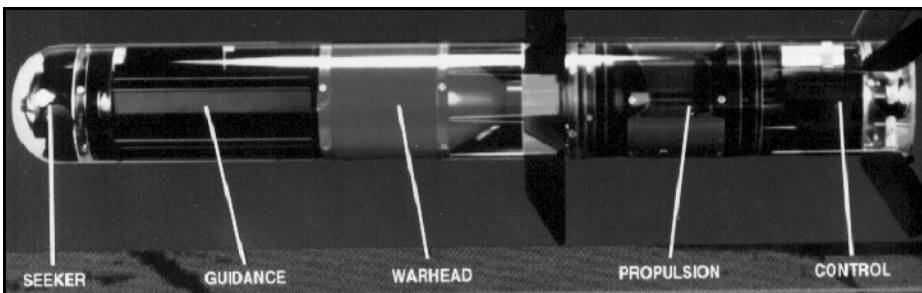
Imaging infrared seeker can defeat smoke and fog, and takes only 10 seconds to cool down before launch. Gunner places cursor box over target in his eyepiece and missile locks on before launch. Arching, top-attack flight path improves seeker's visibility and impacts target on thinly armored top side. At right, round impacts on a T-55. JAVELIN is now in low-rate initial production.