ARMOR

A Howitzer Based on the M1?

PB 17-95-6

November-December 1995

Many people have asked me about the mysterious process for getting into print in this magazine. After a great deal of thought, and research into our past history divulging such inside secrets (both 1935 and 1973 saw "Editor reveals all: Stays off blotter report" columns on the subject), I offer you several suggestions on a course of action that just might get your article published in *ARMOR.* There is no real rank ordering, despite the numbering, and certainly the list doesn't represent all possible permutations.

Here then, straight from the home office in Fort Knox, Kentucky, is the list you've been waiting for.

ARMOR MAGAZINE'S TOP TEN WAYS TO HELP YOURSELF GET PUBLISHED

10. Send in pictures of soldiers, military equipment, and situations. Armored vehicles from anywhere and from any nation are okay and the most likely to get reproduced. Personal snapshots, old official photos, slides, wartime, peacetime, OOTWtime. You name it, we can and will use it. If you want the picture back, we will scan it into a computer and save it as an electronic picture for later use, and then mail your materials back to you. You'll get credit when we use the picture. *HINT: Don't write with a marker on the reverse side; it transfers to the front of the other photos, if you're sending more than one.*

9. Be an Allied soldier and offer insights on some aspect of your nation's armored force, as did Colonel Fiorentino, from the Italian Army, in the July/August 95 issue.

8. Send a computer disk containing the electronic document as well as a hard copy for us to look at. Turn to page two of this issue to see the electronic formats we can handle.

7. Research your article. No matter what the topic, our readers and the magazine staff do appreciate being able to see what sources you've considered. If your writing needs help, but your thinking is world-class, don't worry. We can help spit shine your article to a high gloss as long as the foundation is solid.

6. Report on foreign equipment that most of us haven't seen, such as SFC Miller did with the BMP-3 during a training mission to Kuwait in this issue's "Spot Report: Four BMPs in the Open."

5. Have a unique position that gets you in doors that other cavalrymen and tankers can't get in, and then write about what you've seen. For example, a U.S. officer at the French cavalry school has personally seen leadership training from atop a one horsepower vehicle which soon-to-be French platoon leaders still maneuver and clean up after. A neat story that you'll see in an issue or two.

4. Write a short piece about a better way to do a warfighting task. We always need short articles to finish cementing an issue together.

3. Stop watching "Fields of Armor" or "Weekday Wings" on the Discovery Channel (tape them), and write a letter to the editor about that article in the last *ARMOR* that ticked you off or caused you to think in new ways.

2. Volunteer to review books. Tell us what type of book interests you, and we'll add you to the list. Of course, you won't get paid for the review, but you do get to keep the book. If you like the book, this is a good deal, otherwise, you get a present for that uncle who is so hard to buy for.

1. And finally *(tongue firmly in cheek),* THE NUMBER ONE WAY TO GET INTO PRINT IN *ARMOR,*
In addition to your candidate article, enclose a #10 can of coffee or a neat doodad off that special list of national stock numbers that's in your day planner.

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LETTERS

Tanks Continue to Define the Future of Land Power

Dear Sir:

On December 1, 1862, in the midst of the greatest crisis the republic had ever faced, President Abraham Lincoln delivered a stirring second annual message to Congress. Embedded in that message was an insight about nationhood that modern leaders would do well to remember: "A nation may be said to consist of its territory, its people, and its laws; the territory is the only part which is of certain durability."

Lincoln knew that without secure territory no nation could exist, and that contests over land would largely determine the political and economic potential of a state. Any movement or force that could successfully occupy, control, and defend land had earned the right to call itself a nation, and Lincoln was determined to deny that right to the Confederacy.

Since Lincoln's time, every major conflict in which the United States has engaged has been, fundamentally, about the control of land. Whatever may have been the pretensions of the various imperialists, fascists and communists whom America has faced on the field of battle, in the end it was control of land, rather than ideas or aspirations, that decided who was victorious.

This is a lesson easily overlooked by a nation that, in John Spanier's phrase, is blessed with "nonthreatening neighbors to the north and south, and fish to the east and west." Having never (permanently) lost national territory to an aggressor, Americans are less aware than most people that war is mostly about land. But the historical record is remarkably clear, from Hitler's invasion of Poland to Stalin's occupation of Eastern Europe to Saddam Hussein's attempt to annex Kuwait.

Which brings me to the subject of tanks. Armored vehicles first emerged in World War I as a way of taking ground that seemed impenetrably well-defended. After the war, it became received wisdom that tanks were essential to the occupation and control of contested territory, a view reinforced by the rapidity with which German armor swept across Europe in the 1940s. Much of U.S. defense spending and planning during the Cold War was aimed at preventing the Soviet Union from using its massive tank armies to similar effect.

But after the Cold War the prevailing wisdom changed. It is now fashionable in intellectual circles to regard any weapon with heavy metal content as a dinosaur, an anachronism with little relevance to future security requirements. The assumption is that sophisticated sensors, smart munitions, and other high-tech spinoffs of the computer age will win future wars, rendering most traditional weapons impotent.

Would that it were so. The simple truth is that after nearly a century of refinements in the tools of land warfare, tanks remain the only practical method of seizing, securing and protecting territory against a capable adversary. Most of the high tech weapons in the Pentagon's R&D budget will be phenomenally effective at denying enemies the use of land, but are not designed for establishing positive control of the land.

When it comes to controlling land, there is no substitute for being there. But being there can be extremely dangerous unless one has adequate protection, reasonable mobility, and sufficient firepower to deal with rivals who don't want you there. And since they, too, are likely to have high tech weapons in the future, nothing less than a main battle tank will provide the requisite level of survivability and lethality.

The good news is that today, for the first time in history, America leads the world in heavy armored vehicle technology. The bad news is that the rest of the world has decided it, too, wants modern tanks, so, in the words of Lewis Carroll's hare, America will need to run as fast as it can just to stay where it is — in the lead.

That does not mean the nation needs a new tank. Not yet anyway. But it does mean that it needs to upgrade at least a fraction of the tanks it has already bought. In particular, it needs to modernize the M1 tanks purchased in the early 1980s that no longer are capable of matching the performance of foreign tanks. The nation has made a major investment in these vehicles, but without better guns, armor, communications, and defenses it would not be wise to field them against a capable adversary.

This requirement could wait if Russia and America's Cold War allies were the only countries building and operating modern tanks. But other countries are, too, and most of the producers of new tanks are also exporting them to non-producing countries. In addition, the proliferation of sophisticated dual-use technologies has enabled less affluent countries to incorporate the latest technologies into existing tanks for a fraction of the cost of buying new tanks.

A cursory review of recent history suggests that, sometime soon, the U.S. will again face a determined adversary somewhere in Eurasia. When that day comes, U.S. victory will probably require the occupation and control of hostile territory. Modernizing the current inventory of tanks at a reasonable rate is the most cost-effective way of assuring our capacity to prevail.

LTG DON PIHL, USA, Ret.

LTG Pihl is Vice President for Government Relations and Legislative Affairs for General Dynamics Land Systems

- Ed.

M113 Is the Logical Choice For Contingency Operations

Dear Sir:

Having only recently read Mike Sparks' excellent article from the January-February issue of *ARMOR,* "M113s Maximize Mechanized Infantry Mobility and Firepower in Contingency Ops," I felt compelled to write.

I am a tank company commander at Ft. Lewis, Wash. My company recently participated in a light-heavy rotation at the JRTC with a brigade of the 101st Airborne in which we simulated a task force that had been inserted between two sovereign nations in a peacekeeping/peacemaking (PKO/PMO) scenario. Similar scenarios have been run for several years at the CMTC, so many of my fellow armor officers are familiar with the challenges of PKO/PMO. However, relatively few armor officers are afforded the opportunity to train with light infantry, as opposed to mech infantry, in such a scenario, and I believe that the JRTC rotation and its associated train-up gives me a unique perspective on this aspect of joint operations. With that, I'd like to comment on some of Mr. Sparks' points.

First, Mr. Sparks makes a strong, objective case for retaining the M113A3 over the Bradley for use in contingency operations, covering almost every possible consideration for an armored vehicle, from strategic mobility to fuel consumption. I heartily agree with Mr. Sparks that the M113A3 is simply the better vehicle when employed in the peacekeeping/peacemaking role, and that whatever marginal advantage that the Bradley enjoys in the way of firepower and armor protection is overkill anyway. To Mr. Sparks' litany of advantages in using the M113A3, I would add ease of maintenance and accessibility of repair parts, given that the M113 is one of the most-produced and widely-used armored vehicles in the world. In a scenario involving large formations of armor, where the ability to keep up with the M1A1, fire on the move, and engage tanks and APCs at 3000+ meters is critical, the Bradley is no doubt the infantryman's weapon of choice. However, in the nonlinear peacekeeping/peacemaking operations in which we are most likely to be involved in the near future, where guerrillas and mines are the primary killers on the battlefield, the M113, with its maneuverability, large carrying capacity, and entirely adequate armor and armament, is the logical choice.

Second, Mr. Sparks recommends that mechanized infantrymen wear body armor during training. I couldn't agree more. We

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FOCUSED DISPATCH — Digitization of the Mounted Forces

by BG (P) Lon E. Maggart, Commanding General, U.S. Army Armor Center

The Army is moving rapidly to design the digitized fighting force of the 21st Century. Fort Knox is leading this effort at brigade and below through advanced warfighting experiments (AWE), where soldiers use advanced technology to conduct tactical operations. The driving factor in using digitization is the ability to move information around the battlefield quickly and accurately to increase the operational tempo and to make our combat systems more lethal and survivable during combat.

During August, 1995, the Mounted Battle Lab conducted its second live advanced warfighting experiment at the Western Kentucky Training Area, a Kentucky National Guard training site at Greenville, approximately one hundred miles west of Fort Knox. This experiment, Focused Dispatch, was a follow-on to AWE 94-07, Desert Hammer, the first such experiment, conducted at the NTC in April, 1994.

During Desert Hammer, a fully digitized battalion task force was fielded using information-age capabilities applied to an existing organization and current doctrine, training, tactics, techniques, and procedures against the Opposing Force (OPFOR). The results of this AWE gave the entire Army a glimpse of the future. It also indicated that digitized operations can enhance lethality, survivability, and tempo.

Desert Hammer established the baseline from which alternative combat functions could be developed and compared for all future mounted warfighting experiments. While Desert Hammer showed the great potential of digitization, the experiment also indicated that more work was necessary to show how digitization could enhance battlefield capabilities. Focused Dispatch was necessary to pursue further enhancements of the digitized force.

The ultimate goal of Focused Dispatch is to rewrite the digital tactics, techniques and procedures (TTP) for the future digital battlefield. This is needed to make the best use of digital technology. We believe that the analysis of the results from Focused Dispatch will show even greater enhancements in lethality, survivability, and tempo than were seen in Desert Hammer. While the final analysis has not been completed, observations during the experiment suggest that changes in organization, doctrine, and training allowed the experimental unit to capitalize on and maximize information age capabilities.

While Focused Dispatch concentrated on fires, intelligence, logistics, and battle command as the primary points of emphasis. Aviation, air defense, mobility, countermobility, and survivability issues were also included to ensure a combined arms approach.

The operational hypothesis for Focused Dispatch was simple: *"if procedural, functional, and organizational changes in fires, intelligence, logistics, and battle command are implemented as a result of digital connectivity, then even greater enhancements [than those observed in Desert Hammer] in lethality, survivability, and tempo will result."* If proven to be true, this hypothesis will provide critical training and operational insights necessary to refine the concepts of how future mounted forces should fight.

To gain insights into the key battlefield operating systems that must be integrated on the battlefield, Focused Dispatch keyed on changes in the organization, doctrine, and TTP necessary to optimize the potential of digital system connectivity, information flow, and improved communications. These experiments employed constructive, virtual, and live combat simulations to measure small unit effectiveness, digitized training support packages, and doctrine/TTP for digitized forces.

During Focused Dispatch, there were three constructive (JANUS) experiments, one virtual (SIMNET) experiment, and one, linked virtual/live field experiment. Prior to the virtual/live experiment, the results of the constructive and virtual experiments served to refine the alternative functions and processes to be used during the final operational field phase.

During all phases of the experiment, several technologies were explored to determine their impact on the digitized force. These included the Wide Area Munitions Intelligent Minefield, the Hand Launched Unmanned Aerial Vehicle, The Global Positioning System, the All Source Analysis System Workstation, and the Movement Tracking System. In retrospect, these technologies likely will change the TTP for the future mounted force because of the significant capabilities they will provide. Simply stated, these capabilities will enable commanders to make better decisions by providing them with better information.

Task Force 2-33 Armor was the experimental unit throughout Focused Dispatch. The unit received extensive training in both conventional and digital operations in live, virtual, and constructive simulations before beginning the live/virtual portion of the experiment at the Greenville training site.

The live portion of the experiment was conducted at Greenville by B Company, 2-33 Armor operating as the Blue Force and 1-123 Armor of the Kentucky Army National Guard as the OPFOR. The task force commander operated from a battle command vehi-

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

On The Horizon

Today, Tomorrow, and the 21st Century

Recently, while in Washington, D.C. for the Armor Functional Review at DSCPER, LTG Stroup asked me if I thought we needed to restructure our crews — based on fielding the M1A2, AGS, and the new scout UpArmored HMMWV. I replied that I didn't believe crew restructuring was necessary, but the way we recruit, train, and retain soldiers was something we might review and change. In this column, I want to briefly talk about where I see us headed as we make our way into the 21st Century. Because space is limited, I will only touch on subjects I feel directly have an impact on the Armored Force as we recruit, train, and retain.

It's not as easy to enter the combat arms today as it was twenty or thirty years ago. How well a person scores on the Armed Services Vocational Aptitude Battery (ASVAB) test will determine the recruit's Career Management Field (CMF). To qualify for Armor CMF19 requires a combat (CO) score of 90 or better. The CO score is composed of tests such as arithmetic reasoning, coding speed, and mechanical comprehension. Additionally, your Armed Forces Qualification Test (AFQT) will determine what mental category you fall in. The categories, from highest to lowest, are 1-3A, 3B, and 4F.

Statistics for fiscal year 1990 show there were 66 percent Category 1-3A soldiers in CMF19; of those, 93 percent were high school graduates. The data for fiscal year 1995 shows an increase to 95 percent of high school graduates. These statistics suggest that more of the brightest are opting for combat arms, where the technological challenges of the future are. It is as true today as it was yesterday — ***soldiers are the Army's most important asset and greatest weapon.*** The full power of technology is realized through quality soldiers. Technology enhances their power through advanced training using state-of-the-art simulations, simulators, and training devices. Because of these technological advances in our warfighting equipment, we're offering what I think are excellent packages to attract bright and motivated new soldiers. For instance, qualified recruits who enlist as 19K tankers receive a bonus of $4,000 for three years or $7,500 if they enlist for four years. If they sign up as 19D cavalry scouts and enlist for four years, they receive an enlistment bonus of $3,500. These packages also include the college fund and college student loan payback programs. These incentives, coupled with the high-tech opportunities available in armor, are attracting higher quality recruits into the Armor Corps.

Speaking of high-tech opportunities, tomorrow is rapidly becoming today in the armored force. Have you ever looked inside the Army's newest battle tank, the M1A2? If you have, then you've seen the on-board computers, screen monitors, and advanced communications hardware that make up the crew compartment. Every time I jump into an M1A2, I feel like I'm on the bridge of the *Starship Enterprise.* Looking through the optics of the M1A2 is like powering up the latest high-tech video game.

Another major advancement is the new, bullet-proof, air-conditioned, Improved Up-Armored scout HMMWV. This will enable scouts to detect threats faster at greater distances. Not only are scouts finally getting a vehicle that will enable them to do what they're trained for, they'll also receive deep-looking optics and enhanced acoustic listening systems.

The Armored Gun System, AGS, is the newest addition to the armored force. It is designed to be a rapidly deployed armored system. It will see duty with the 82d Airborne at Fort Bragg and the 2d Armored Cavalry Regiment at Fort Polk. It's a great design, has an automatic loader and features most of the advanced technology of the M1A2. It also cuts the number of crew members down to three, due to the addition of the automatic loader. What this also means is that airborne training will now open up to 19Ks. Historically,

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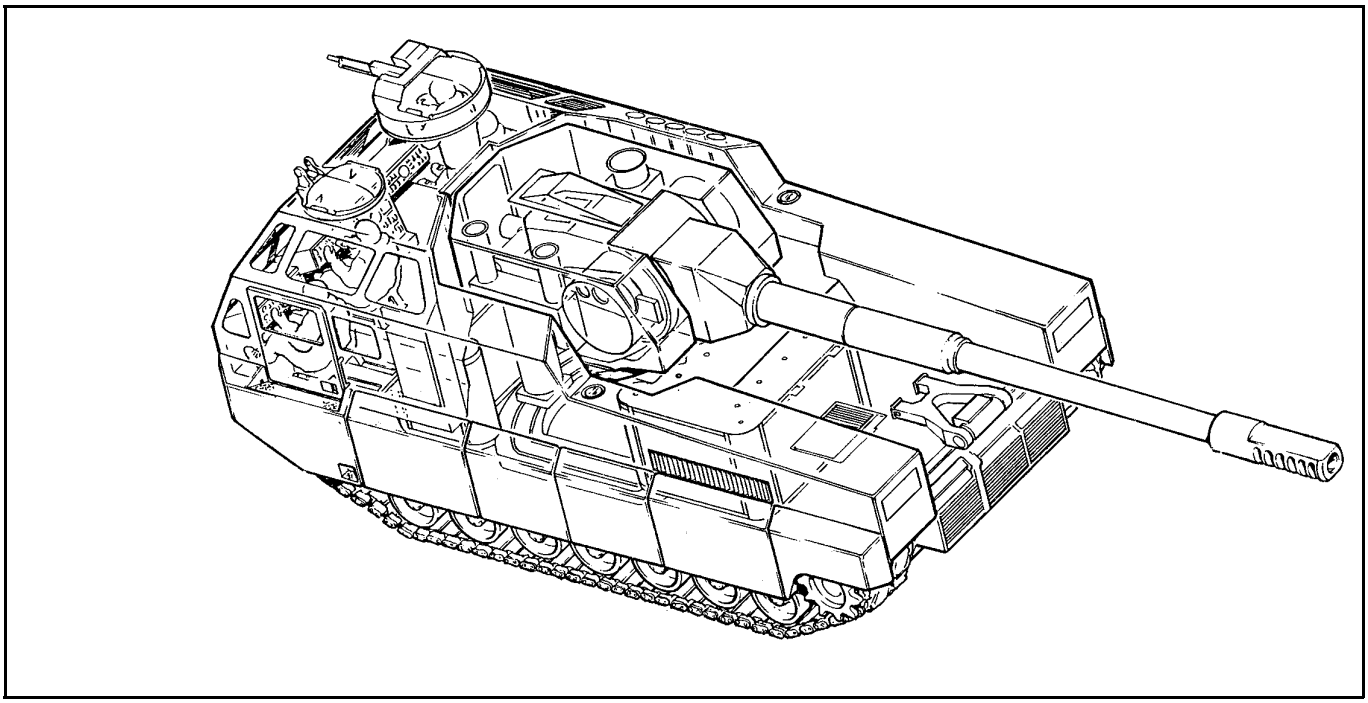


The Common Chassis Revisited:

Should the Next Howitzer Be Built on the M1 Tank Chassis?

by Dr. Asher H. Sharoni and Lawrence D. Bacon

At a recent armor conference at Ft. Knox, I was amazed to see that the principal topic of discussion was the Advanced Field Artillery System (AFAS), otherwise known as the Crusader program. Like any good tanker, I have a great appreciation for the value of accurate and timely fire support; however, I was somewhat bemused by its prominent role in this annual gathering of treadhead intelligentsia! Subsequently, I decided to explore alternatives to the Crusader that might truly benefit both the Artillery and Armor communities.

The quest for a modern self-propelled howitzer has captured the full attention and efforts of both the U.S. Army and industry, as the Crusader program is one of the very few "new starts" in combat vehicle development. Self-propelled howitzers are key players on the modern battlefield, and once equipped with an effective and autonomous command and control system, they are capable of expeditious deployment and rapid relocation of concentrated fire power. To accomplish the fire support mission under all weather and combat scenarios, a modern self-propelled howitzer must possess these *basic* characteristics:

- Autonomous rapid firing reaction
- High operational availability
- Optimum crew ballistic protection
- Significant reduction of manpower workload intensity.

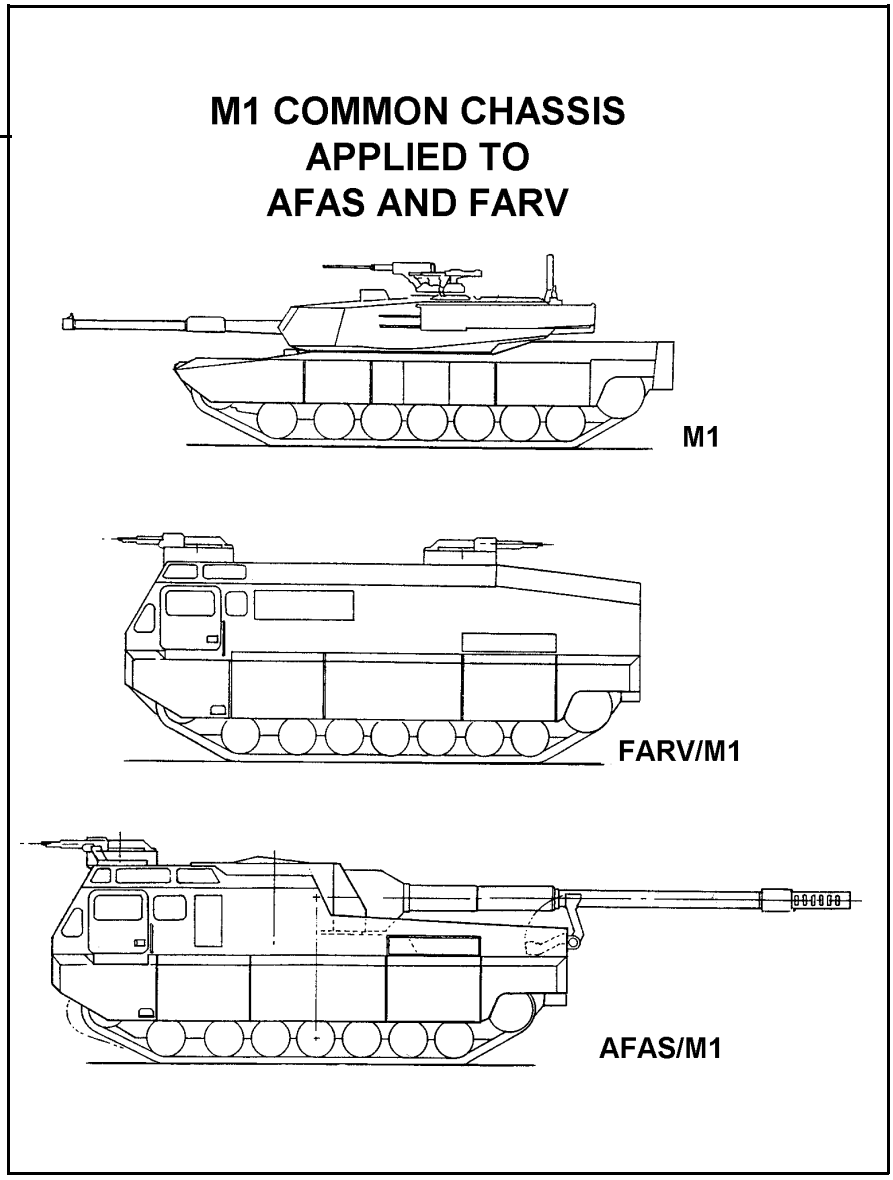
The current Paladin M109A6 howitzers are deficient in range, lethality, and survivability, and also lack the mobility to keep up with the rest of the maneuver force. These limitations, combined with a heavy crew workload, severely impede the Paladin's ability to engage in close support maneuvers and effectively demonstrate its full firepower potential.

The revised post-cold war U.S. Army mission calls for a new and revolutionary way of restructuring procurement and acquisition philosophies for modernization of armored vehicles. The ever changing global political situation is straining an invariably decreasing defense budget. It is, therefore, paramount that the U.S. consider new approaches in developing, implementing, and fielding an advanced field artillery system. The Crusader program was devised to fully comply with the Army's operational requirements while serving as a "technology carrier" for future combat vehicles. Nonetheless, due to persistent technical challenges, it is conceivable that Crusader will be reassessed and ultimately revised. Without editorializing, the reasons include:

- An adverse political environment reflected by congressional involvement and concern
- Significant R&D costs
- High technical risk associated with the Regenerative Liquid Propellant Gun (RLPG) technology
- Controversial selection of a water-cooled powerpack (ignoring the Army's investment in the Advanced Integrated Propulsion System (AIPS) technology)
- Significant costs of procurement & acquisition

The keystone technology of the Crusader program, and its overall weapon-system approach, is the revolutionary Regenerative Liquid Propellant Gun (RLPG). Technical problems (consistent performance, corrosion, and weight growth) continue to delay satisfactory demonstration of this weapon, and fur-

Scale drawing at right shows size relationship between current M1 tank and the proposed howitzer variant and its companion vehicle.



thermore, the U.S. is undertaking the RLPG development on its own, without a standardization agreement with NATO. One must consider that a comparable and equally potent weapon system may be devised by utilizing available systems and mature technologies effectively integrated and packaged to address operational requirements. For example, there is a gun presently available which demonstrates adequate long range performance (30/40 km) with sufficient "built-in" growth potential. This gun is designated as the *155mm L52* and was developed and produced in accordance with the Joint Ballistics Memorandum of Understanding (JBMOU) endorsed by France, Germany, Italy, the United Kingdom, and the United States. Coupled with the Modular Artillery Charge System (MACS), the U.S. Army can achieve most of the Crusader firepower goals while maintaining weapon/ammunition commonality within NATO.

The Thinking Tanker's Alternative Solution to Crusader

In the mid-1980s, MG Bob Sunnell's "think-tank" came up with a concept called "the Armored Family of Vehicles" (AFV). Although the AFV offered many interesting life-cycle and logistics savings, with its $30 billion procurement price tag, it was preordained to go by the wayside. Nonetheless, the concept of a common chassis for frontline armored fighting vehicles has great merit, and in today's environment, where we are struggling to maintain some semblance of a tank industrial base, we may have a perfect opportunity to achieve multiple kills with one sabot.

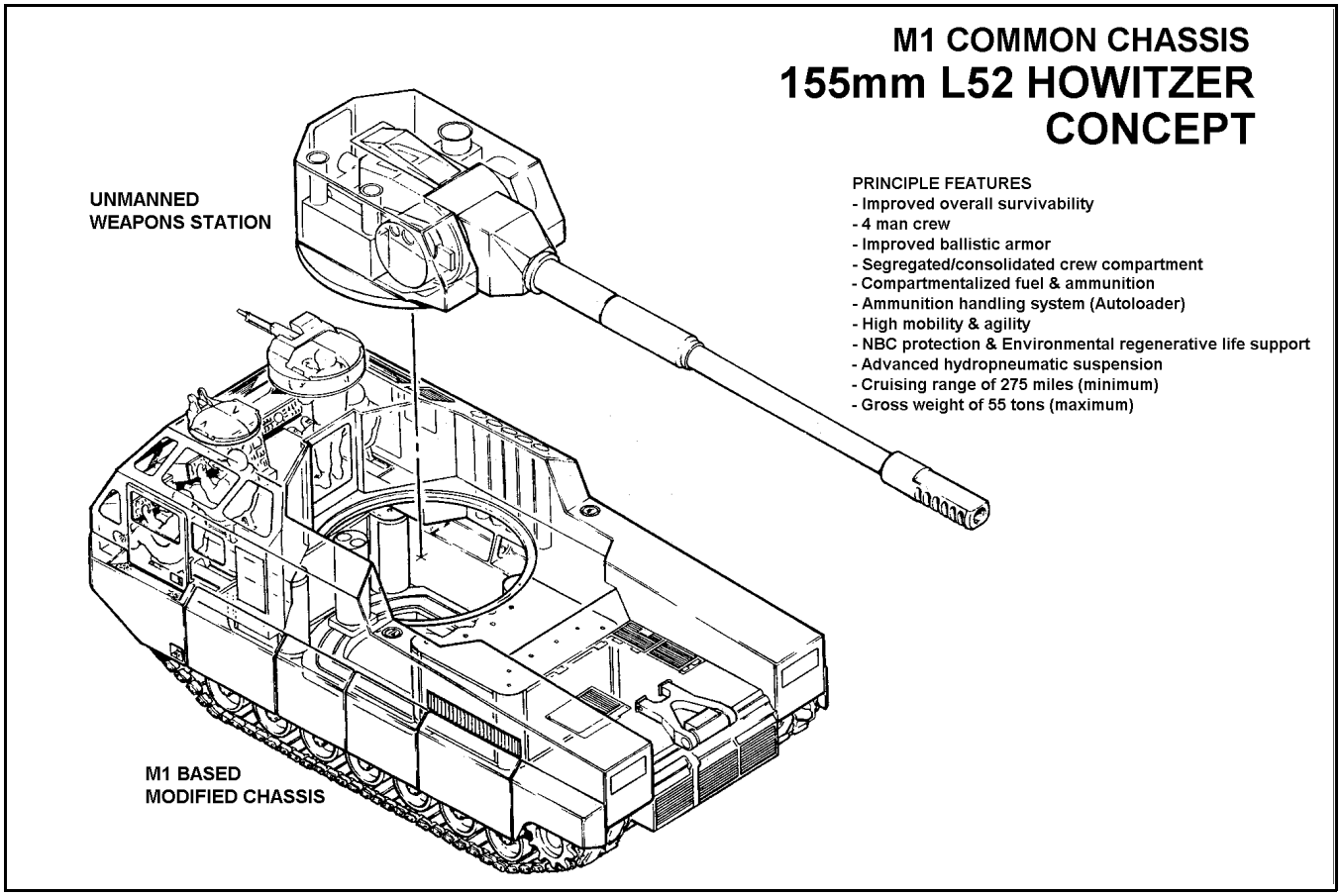
M1 Common Chassis

As a cost-effective and affordable alternative to the Crusader, the authors propose a "system of systems" comprised of an Advanced Field Artillery System and a companion Future Armored Resupply Vehicle, both commonly based on the readily available, battle proven and reliable M1 chassis, built by General Dynamics Land Systems. AFAS/M1 would be a self-propelled howitzer equipped with the 155mm L52 conventional gun, coupled with an automatic ammunition handling system to provide the required lethality, survivability, and range with a much less manpower-intensive gun. FARV/M1, the companion resupply vehicle, would provide ample storage space under armor, enhanced carrying capacity, excellent agility and survivability, and equivalent mobility to its counterpart. This system combination would have significantly increased capabilities over the current M109-series fleet. Further, any requirement potentially provided by the Crusader would be provided with higher confidence and less technical risk by the AFAS/FARV/M1 weapon system at a relatively cost-effective and affordable price. Though RLPG technology may possess an inherent potential for greater range, rate of fire and lethality, it is not readily available for near future implementation. Declining budgets, design immaturity, and enormous technical challenges place the RLPG outside the window of opportunity for the Crusader.

Operational Capability Overview

AFAS/FARV/M1's performance characteristics combine to provide an affordable, cost-effective, low technical risk and extremely potent weapon system which constitutes a significant quantum leap in force effectiveness:

- The 155mm L52 Joint Ballistics Memorandum of Understanding can-

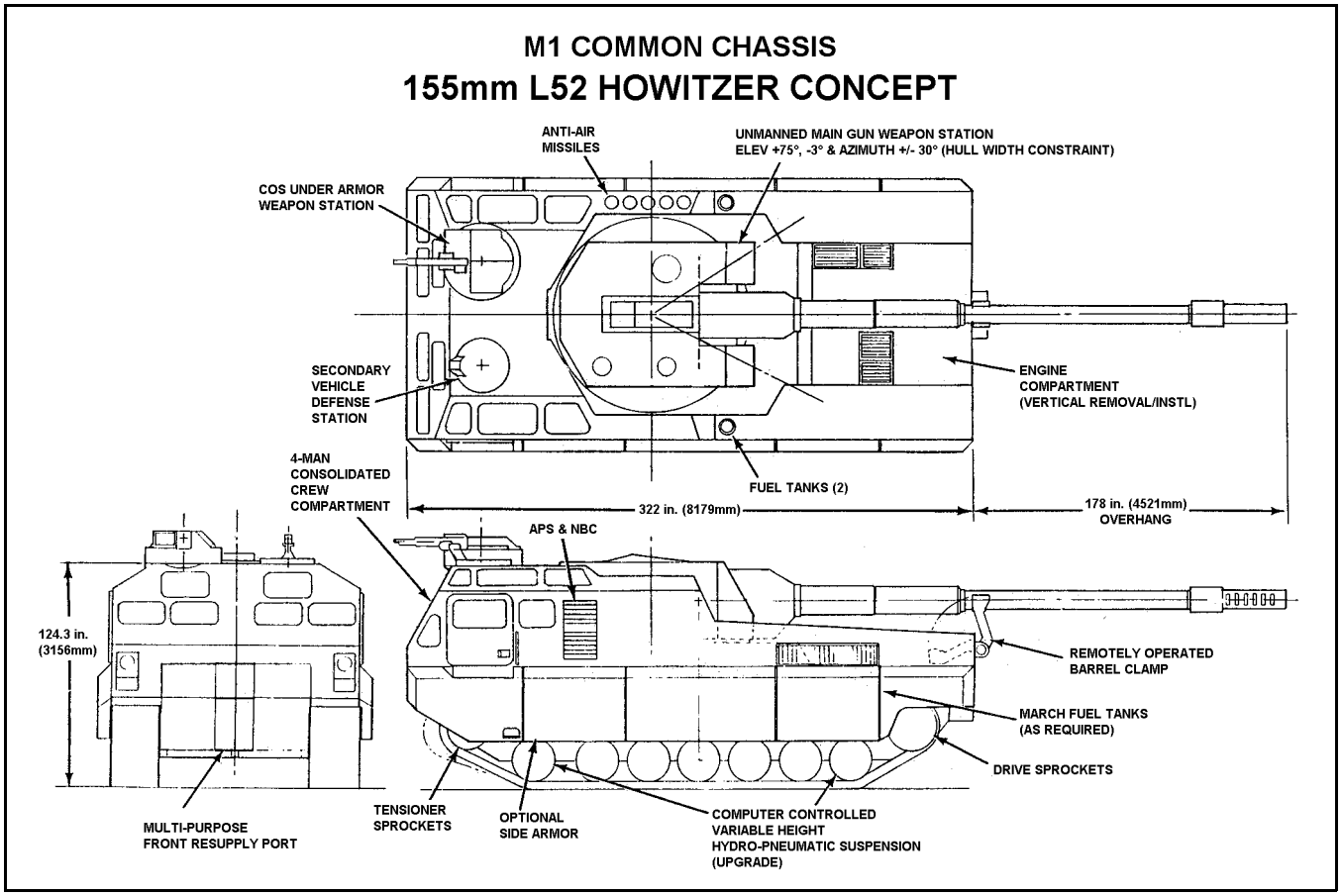


non, 52 calibers long, is currently installed in the German howitzer PzH2000. Effective range is 30km (unassisted)/40km (assisted) with growth potential. It can be upgraded with an integrated laser ignition system. Enhanced gun tube wear life is due to a chromium-plated barrel process.

- The "MACS" (Modular Artillery Charge System), XM231/XM232, is bar-coded, facilitates automation of propellant loading, handling, and storage. MACS provides increased tactical flexibility, improves gun performance, and is more cost-effective than standard conventional bag charges. It promotes faster action through improved logistics, is safer (more insensitive), autoloader compatible, non-toxic, lighter and cheaper, and environmentally safe. It requires lower operational and training costs, occupies less volume, and demands less transportation. MACS *does not* leave residue in the gun breech which can slow down the rate of fire. MACS is a low-risk, low-cost, viable, solid propellant backup and substitute to RLPG technology.
- Retains full operational and automatic replenishment capability under Nuclear, Biological and Chemical battlefield environments and sustainment through state-of-the-art resupply.
- The autoloader provides an increased rate of fire (burst rate: 3 rounds/9.2 seconds; sustained rate: 9 rounds/minute, thereafter), automation of ammunition loading, handling, and storing, and consequential reduction of manpower workload intensity.
- Autonomous Command and Control and Battle Management System provides for rapid firing reaction, independent tactical mission execution (self-location, self-computation of technical fire control, planning, embedded decision aid capability and fire support digital communications). Also provides target acquisition and prioritization, effective firepower on targets, and accurate damage assessments.
- The M1 modified chassis providing improved mobility, agility and maneuverability can keep up with the maneuver forces and provide optimum ballistic protection with ingrained 20-25 percent weight and combat-load growth potential.
- An extensive and highly-effective "survivability suite" includes the following sensors and subsystems: environmental control and life support; supplemental ballistic protection; detection avoidance materials (stealth); early warning; protection against directed energy and electromagnetic pulse; countermeasures; fire detection, prevention, and suppression; and highly potent defensive armament, equipment, and secondary weapons.
- Includes future Maintenance and Training Concepts (e.g. modularity, test-fix-test, embedded training and diagnostics and prognostics).

AFAS/M1 would fire 4 to 8 rounds in a Simultaneous Impact Mission (SIM) between 6-40 km. All rounds will impact within 4 seconds (first-to-last round). This requirement can be attained with an effective combination of a battle management system, fire control system, global positioning system (GPS) and an autoloader.

AFAS/M1 is required to perform survivability (250 to 750m) or tactical (4 km) moves after every mission to avoid enemy 'counter-battery' fire. To perform a fire mission, crew members *will not* be required to leave their protected and consolidated compartment. All operational activities will be remotely



executed, to include target identification and acquisition, ballistic computations, gun positioning and aiming, ammunition loading, and of course, firing.

Once the firing mission has been concluded, AFAS/M1 will move quickly to a new position to enhance its survivability and provide effective tactical flexibility.

AFAS/M1 will carry up to 80 fuzed (Multi-Option Fuze for Artillery-MOFA) and pre-coded rounds with corresponding 68 *XM231* and 178 *XM232*, stored in 41 magazine storage spaces (@ 6 MACS/space) for automated handling and loading. They are stored in two ready and accessible magazines located in the hull below the weapon station's bearing ring.

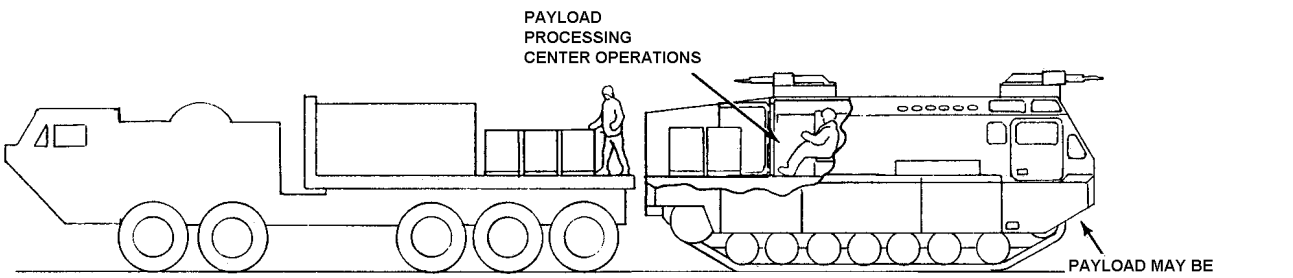
FARV/M1 will carry up to 180 (3 full complements of 60 rounds each) fuzed and pre-coded rounds with corresponding 153 *XM231* and 399 *XM232* in 92 storage spaces. They are stored in the primary transfer magazine, below the crew deck level, and in the secondary magazine above the crew level. Compartmentalized ammunition storage and "blow-off" panels will be provided in both vehicles to further enhance survivability.

Ammunition Handling System

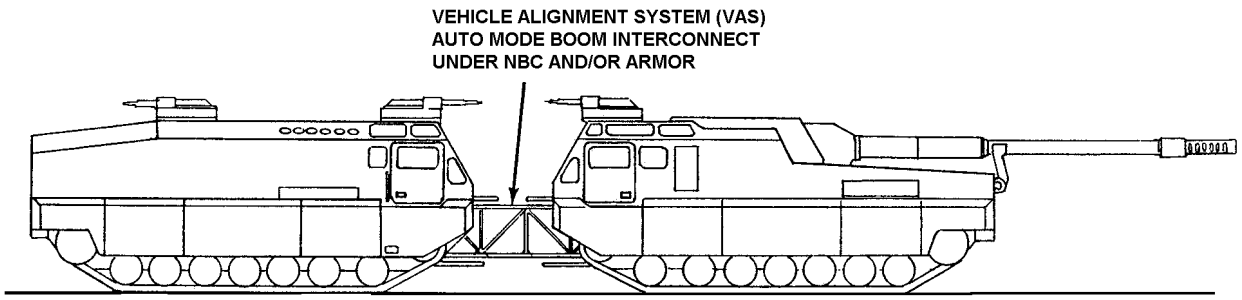
The autoloader will be compliant with the operational requirements to provide the rate of fire and ammunition handling safely and reliably. It will have the capability of determining ammunition type, lot, fuze, and weight. During resupply, the autoloader will verify the projectile/fuze combination. Throughout a firing mission, the autoloader will independently verify the projectile/fuze combination prior to ramming. There are a myriad of other beneficial features that an autoloader can provide that are not delineated here, and all requirements are attainable with proven technologies. The autoloader, though designed to fit a particular vehicle, includes generic characteristics that could be tailored to meet virtually any vehicle configuration. It will be capable of completely and automatically accepting ammunition from the FARV/M1 at a rate of 12 complete 155mm rounds per minute. The autoloader will also be capable of downloading 155mm ammunition and propellant (MACS) to FARV/M1 within 20 minutes, or to the ground within 30 minutes. Backup capabilities will be provided for manual upload and graceful degradation. The autoloader will encompass redundant actuators to increase reliability and functionality.

Consolidated Crew Compartment

AFAS/M1 will incorporate a consolidated, 4-man superstructure crew compartment. Chief of section and drivers (redundant controls) will be provided with 360-degree day/night visibility. Close-in vision will be within 10 feet of the vehicle due to the higher position of the crew compartment located at the front of the hull. It will also allow each crewman to directly view the remaining crewmen. There will be interior access and visibility between the crew and the weapon station. The crew will be entirely segregated and compartmentalized from the ammunition and the weapon station to increase survivability. The crew compartment will be adequately protected against top and direct attack, high-explosive fragmentation, small arms, and mines. Crew members will have provisions for rest, environmental control (including *NBC* protection), integral ration microwave heater, hygiene facility, and water stocks, all "built-in" and completely integrated into their consolidated compartment. Crew members will not be



HEMTT TO FARV/M1

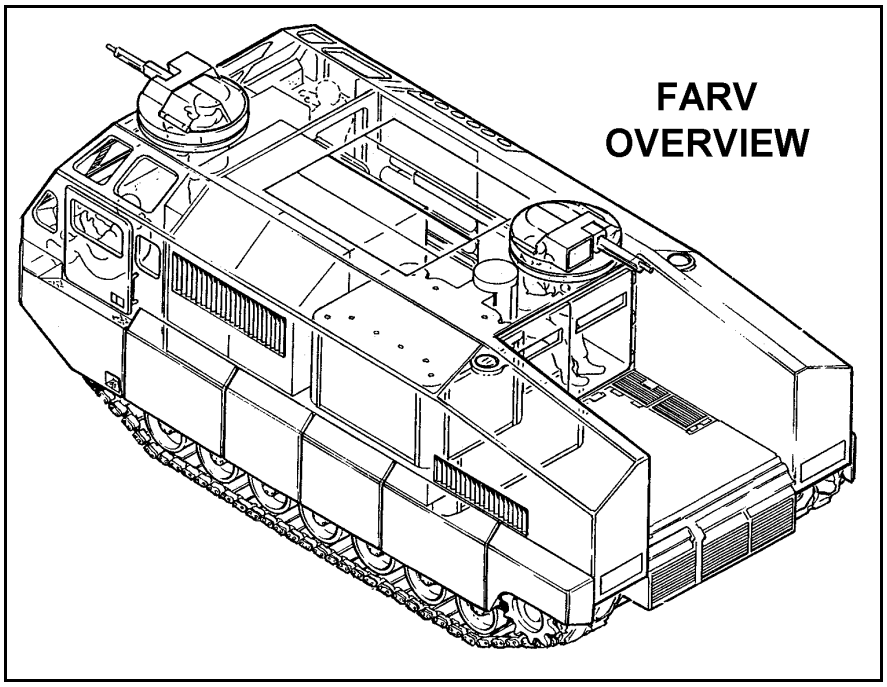


FARV/M1 TO AFAS/M1

required to leave their compartment to perform any operation short of an emergency/malfunction situation. The turretless, consolidated crew compartment simplifies installation and operation of environmental control, NBC and ballistic protection.

Performance Attributed to the M1 Chassis

AFAS/M1 must successfully keep up with the supported maneuver force. The M1 modified chassis (presently powered with a 1500 hp gas turbine) would grant the same level of *mobility* and *agility* as the M1 tank fleet. Self-propelled artillery capable of operating closer to main battle tanks will provide an unprecedented level of immediate support. AFAS/M1, as a minimum, would have a highway speed of 65 kph, and a sustained cross-country speed of 48 kph. This is readily achievable with M1 tanks weighing approximately 70 tons. If AFAS/FARV/M1's combat-loaded weight does not exceed 55 tons, its mobility and agility will surmount that of an M1 tank. M1 tanks will probably remain in active service until 2020-2025 before a new armored platform will be fielded. Implementation of a modified available tank chassis will substantially reduce development costs and technical risks, shorten the development cycle, greatly reduce the logistic burden and preserve the industrial base for production of M1 tanks and other armored vehicles. A common chassis concept for a *family* of armored vehicles is a valid approach and worth pursuing today more than ever before.



The M1 chassis is capable of mitigating the shock of firing and cross coun-

Continued on Page 46

Patton had planned to hunt on the day of his accident. He is seen here hunting birds with then-Brigadier General Robert Grow.

The End of the Ride:

An Eyewitness Account of George S. Patton's Fatal Accident

by Denver Fugate

It was a cold morning that second Sunday in December when Horace L. Woodring was roused from his quarters at 15th Army Headquarters, located at Bad Nauheim, not knowing that day his name would be etched in history.

Woodring, a 19-year-old private first class, was the chauffeur for General George S. Patton. The general had decided to go pheasant hunting in the vicinity of Mannheim on his last day in Germany.

The events that followed would make world headlines. The *New York Times* reported that Patton was seriously injured when his limousine hit an Army truck. With him was General Hobart Gay, his long-time chief of staff. General Gay and PFC Woodring were shaken up but not injured.

The morning of December 9, 1945, is one that "Woody" Woodring remembers well. In recent interviews with this writer, Woodring related his often-told account of the accident: "I was called out of bed and instructed to prepare the limousine for a hunting trip. Sergeant Joseph Spruce — with the guns and hunting dog — started out ahead of us in a jeep." Along the way, Woodring said, "The General wanted to check out a castle. He was leaving the next day to go home, so he wanted to make sure he saw this particular castle." In his diary, General Gay identified the castle as the Roman ruins located in Saalburg, near Bad Homburg. Woodring continued, "The General looked the castle over, and when he returned to the car, he got in the front seat with me, where the heater was, to dry his boots, which were wet from tramping around the snow-covered ruins. We stopped at the checkpoint north of Mannheim, where Sergeant Spruce was waiting. The dog was about to freeze, so it was put in the car with us. The General climbed out of the front seat into the back seat.

"The hunting party continued on route 38 toward Mannheim, through Kaefertal, passing a Polish displaced persons camp where Benjamin Franklin Village is now located. When we came to a railroad crossing, Sergeant Spruce got through, but the train caught us.

"After the train passed, there was no one in front of us or behind us; the only vehicle in sight was an Army truck moving in my direction.

"At that point, General Patton remarked: 'Look at all the derelict vehi-

The passenger compartment of Patton's Cadillac remained intact and no glass was broken in the accident that ultimately resulted in the death of the WWII hero. Neither the driver nor another passenger were hurt, but Patton's head struck the limousine's interior partition.

cles,' which were parked along both sides of the road. 'How awful war is; think of the waste.' "

Woodring was still eyeing the oncoming truck. "Approximately a quarter-mile from the railroad crossing, the truck — driven by Technical Sergeant Robert L. Thompson — suddenly turned left into the driveway entrance of a quartermaster unit."

The two vehicles collided at nearly a 90-degree angle. The right bumper of the big truck struck the right side of General Patton's Cadillac, smashing the radiator and the right fender. None of the windows were broken.

After a time, the Cadillac was repaired and returned to service. Today, it is on display at the Patton Museum at Fort Knox. The truck was not damaged. According to research by author Ladislas Farago, Thompson had been out joyriding after a night of drinking with some of his buddies and had no business nor authority being on the road that Sunday morning. There were three soldiers in the cab, an additional infraction of regulations. What later helped fuel conspiracy theories was that Thompson, according to Farago, was allowed to vanish to become the mystery man of the incident.

Gay, Woodring, and Thompson were shaken up a bit, but were otherwise unhurt. General Patton, riding on the right side of the front portion of the back seat, was thrown forward forcefully and then hurled back. His face had smashed into the upper part of the partition that separated the driver from the rear compartment. The impact broke his nose and his neck and split his scalp open. He was bleeding from wounds of the forehead and scalp.

"The first thing I saw," Woodring remembers, "Was the skull through the open wound, and he was lying over General Gay."

"His head was to the left and I was practically supporting him on my right shoulder in a semi-upright position," Gay remembers.

"I got out of the car and opened the back door and helped General Gay to get out from under General Patton, and then laid him down gently," recalls Woodring. "Help was quick to arrive. The first vehicle on the scene was an Army ambulance, which just happened to be passing by.... An Army sergeant medic proceeded to stop the bleeding and patch the General up, and I proceeded to direct traffic. By this time, others began to arrive. Military policemen came on the scene and a colonel arrived, who was a doctor. General Patton was placed on a stretcher and transferred to an ambulance."

That was the last time Woodring saw Patton alive. Although there was a military hospital in Mannheim, the apparent seriousness of Patton's injury led to the decision to transport him, with a military escort, to the more adequately equipped 130th U.S. Army Station Hospital in Heidelberg. Patton was conscious all the way to the hospital, although his condition was serious. He was paralyzed from the neck down, and his spine had been broken at the third cervical vertebra. The fourth cervical vertebra was dislocated.

The front of the Patton limousine was smashed in, yet it still appeared to be a minor accident. When the military police learned that neither vehicle was exceeding the speed limit, they placed no charges against Woodring or Thompson. Thompson's truck had been moving at 10 miles per hour, and estimates had Patton's Cadillac traveling at approximately 30 miles per hour. Both drivers were absolved of any fault, although Gay and Woodring stated that Thompson had never signaled his intentions to turn left. The official conclusion was that, although preventable, the accident had just happened.

Woodring was further absolved of any blame when General Patton directed that Woodring drive Mrs. Patton from the airport to the hospital upon her arrival in Germany. According to Robert Patton, the General's grandson, "It was the best way to assure the man that Patton didn't blame him for what happened." But Woodring would never again chauffeur his idol over the war-torn roads of Europe. The dream of a lifetime had only lasted about four months.

Woodring became General Patton's driver as the result of Patton's transfer from Third Army to Fifteenth Army, a paper army assigned the mission of recording the history of the European war. His new chauffeur came with glowing recommendations, and his life thus far had seemed to be wrapped up in automobiles and driving. A 19-year-old kid from Union County, Kentucky, Woodring tells of his employment at age 15 by a trucking company hauling coal and gravel. He admits it was necessary to adjust his birth date. After enlisting in the Army in 1944, he completed basic training and then attended chauffeur school at Fort McClellan, Alabama. After arriving in Europe, Woodring's assignment was to an infantry unit, but he suffered frostbitten feet and was hospitalized, then later transferred to the motor pool. He eventually became the chauffeur for General Leonard T. Gerow, who commanded Fifteenth Army. When General Patton replaced Gerow, his new driver appealed to him. Woodring was a dashing young fellow, a smart dresser, an eager beaver at everything he did, and not overawed by the biggest of brass. Patton boasted that Woodring was better than a Piper Cub to get you there ahead of time. He was referring to a recent trip they had made to Leige, Belgium, some 150 miles in less than two hours. Shortly before the end of their last ride together, and despite the propensity of both Patton and Woodring for high-speed driving, Patton commented on Woodring's sense of caring about the car he drove. Minor car trouble had resulted in two stops during their trip south. "This is a very careful driver," Patton noted to Gay, "He seems to sense when there is something wrong with the car."

The accident was reported worldwide. Woodring recalls being given permission to talk to the press the day after the accident. "I gave the story that day and never saw it in print the way I told it. The story was always changed around," he said.

Unfortunately, Patton's accident was poorly documented at the time and remains so to this day, although later investigations have clarified certain previously vague details.

For example, *After The Battle Magazine* investigated the accident and photographed the scene in 1975. The exact site of the accident was in front of the present-day Mannheim Sanitation Department on Kaefertaler Strasse, a few hundred yards from the city limits of Kaefertal, a suburb of Mannheim. At that point, the street's name changes to Mannheimer Strasse. In about 1960, the level crossing over the railroad tracks on Kaefertaler Strasse was removed and the track fenced in when Bundestrasse 38 was diverted west over an overpass about 300 yards away. So today, it is impossible to drive across the tracks following General Patton's route of December 9, 1945. However, after driving the diversion, if one continues along Kaefertaler Strasse on the far side of the railway line, some of the open spaces where the

Pallbearers carry Patton's body from a villa in Heidelberg prior to the funeral at Christ Church Cathedral.

derelict vehicles were heaped still remain.

As with the demise of other public figures, Patton's accident and subsequent death have spawned a myriad of myths, gossip, speculation, outright fabrication, and conspiracy theories. A film, *Brass Target*, and a novel, *The Algonquin Project*, both hypothesize that the accident was in fact a well-planned assassination. But both Gay and Woodring dispute any conspiracy theory. In 1978, MGM hired Woodring to promote the movie through a nationwide television tour, which included eight television shows, 13 radio shows, and several newspaper luncheons. Woodring, who traveled with Frederick Nolan, the author of *Algonquin Project*, recalls:

"He's one of those authors who sees a conspiracy under every stone. I was along to correct this. He would say Patton was assassinated, and that the truck pulled in front deliberately, and I would contradict him," said Woodring. From his home in El Paso, Texas, General Gay wrote Woodring: "You were great on TV concerning Patton's death. Of course, it was purely accidental. In fact, as you know, the trip was not planned until late that morning."

Those who suggest Patton was somehow murdered have failed to provide the slightest evidence of how anyone could have planned such a caper or ensured that Patton's Cadillac would be momentarily stopped for the passage of a train at the crossing just down the street from the scene of the accident. It was a freak accident, since neither Woodring nor the other passenger in the car, General Gay, were injured. Moreover, Gay and Patton were both in the back seat. But the conspiracy theories persisted. In 1987, a former soldier asserted that he was first on the scene of the accident, alleged to have occurred not in Mannheim-Kaefertal, but near Heidelberg, only a few scant miles from the hospital where Patton was taken, and that Eisenhower had shaken his hand at the funeral and commended him. But Eisenhower had returned to the U.S. and did not return to Germany to attend the funeral. Yet another theorist has ludicrously proclaimed that he was hired by the head of the Office of Strategic Service (OSS), William J. Donovan, to assassinate Patton, but that someone else did the job using a specially designed weapon that fired a piece of metal, making his injuries appear to have been caused by the accident. When Patton did not die, the assassin allegedly finished the job by slipping into the hospital and administering cyanide. The Army's perfunctory investigation and its failure to hold a full-scale formal inquiry opened the door to those who saw profit in conspiracies, lies, and half-truths.

The failure to thoroughly investigate the accident was incomprehensible and inexcusable. However, General Patton received the best available care. The Heidelberg hospital staff had been alerted, and when General Patton arrived, the chief of surgery, LTC Paul S. Hill, quickly dressed and sutured the head wound, then began a detailed examination, including X-rays. These confirmed his worst fear — Patton was paralyzed.

In the 12 days before his death, Patton was treated by some 14 physicians of varying specialties. Up to the afternoon of December 19, Patton had made what the bulletins described as very satisfactory progress. But then his condition began to deteriorate. The doctors did their best to halt the gradual deterioration caused by an embolism, but it became increasingly obvious that the General was facing his final battle. General Patton died while sleeping at 1750 December 21. Funeral services were held in Christ Church in Heidelberg on December 23.

Woodring, still in shock, was among the many mourners. The burial took place on Christmas Eve just outside Luxembourg City, at Hamm, where General Patton was laid to rest alongside the remains of 5,075 other Americans who had served under his command.

General Patton had asked Woodring to be his civilian chauffeur when he got out of the service. It was thought that the General would remain in uniform for one more year, so Woodring, nearing the end of his enlistment, extended his term for one more year, having accepted the job as civilian chauffer. The General had been attempting to promote Woodring, but at that time all ratings were frozen. Patton died before the restriction was lifted. Following a furlough home in January 1946, Woodring returned to Germany to complete his final year in the Army with an assignment to an artillery battalion in the 9th Division, located in Augsburg. Not surprisingly, he became the commander's driver.

Woodring finally got home to Kentucky in January 1947, where he pursued another dream — selling cars. Now 69, Woodring is an unassuming, outgoing, and successful consultant for auto dealers in the Detroit area. He married his hometown sweetheart in 1948, and they have three children and grandchildren. He plays golf in the summer and enjoys snowmobiling in the winter. When asked on the eve of the 50th anniversary of that fateful accident about how it affected his life, he freely stated that it has had no adverse effect. In fact, he has fond memories of being on the road every day with Gen-

eral Patton, constantly on the move, almost always without an MP escort.

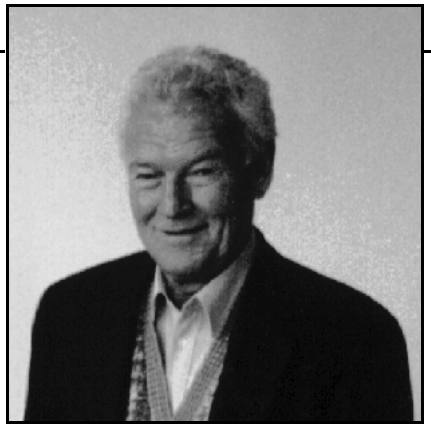
"He was my idol. Driving for him was the dream of a lifetime," Woodring says.

Along with the good memories, only one momento remains, and that is the four-star flag from the General's car. Woodring had also brought home the famous air horns from the fender of the Cadillac, but they were later destroyed in a fire. Perhaps the depth of respect that Woodring had for his idol is best measured in the fact that he named his only son John Patton Woodring.

Originally, I sought to tell the definitive story surrounding the Patton accident. But a maze of contradictions eliminates the possibility of a definitive ending. There is still widespread disagreement about many of the details of the Patton accident and subsequent death 50 years after the fact. The broader facts of an historical event are easier to pin down than verifying the smaller details because the human memory is faulty. As an example, military policemen had flocked to the accident scene, among them Lieutenant Joseph Shanahan, the 3rd Army Deputy Provost Marshal charged with reorganization of the Mannheim police. According to Shanahan, there was never an official report of the accident because, as he put it, the nature of the crash did not warrant one. By the time the MPs got there, there was nothing to report. They considered it a trivial accident at the time.

Others at the scene included Lieutenant Peter K. Babalas, assigned to the 818th Military Police in Mannheim, which had jurisdiction at the scene. Babalas knew the accident was trivial, to be sure, but that General Patton's injury was not. He allegedly made an investigation of the mishap, concluding that both drivers of the vehicles had been guilty of careless driving. Moreover, Babalas could not recall that Lt. Shanahan was present at the scene of the accident. In 1971, on two separate occasions, Babalas requested from the Department of the Army a copy of the report he had submitted at the time of the investigation. After some delay, he received a reply that the report of investigation could not be found. After his extensive research, Farago would write that all we still have about the probe is a deposition by Woodring. When asked who investigated the accident, Woodring's adamant reply was, "Lieutenant Van Landingham and Lieutenant Smith. There was very little interviewing done at the scene. Lt. Babalas was not around. I can't imagine how many times I've the told the story, but it seems everybody else had their own version." Perhaps the most official document corroborating what Woodring reported is a letter dated January 7, 1946, from Headquarters Company, 15th U.S. Army, which certified that "PFC Horace L. Woodring ASN 35820385, who was driving for General George Patton, Commanding General of the 15th U.S. Army at the time of the General's fateful accident on the 9th day of December 1945, was in no way responsible for the accident. All reports appearing in publication here on the continent and in the U.S. stated that PFC Woodring shared in the responsibility for the accident. This is absolutely contrary to the findings of the official accident reports. PFC Woodring was cleared completely of any responsibility by the official accident report which was prepared by the commanding officer of the 818th MP Battalion, located in Mannheim, Germany. Furthermore, it might be added that PFC Woodring was cleared verbally by both General Patton and General Gay, occupants of the car, at the scene of the accident. Reference may be made also to General Gay's personal diary, where he has made a certified statement which relieves PFC Woodring of all responsibility. PFC Woodring was at all times a very competent and efficient driver and I personally feel that this incident in no way should be considered a blur on his character or dependability." The letter was signed Lynn P. Smith 1st Lt., Infantry Motor Officer.

There is no question that some of these men were at the accident scene at one time or the other, but questions linger as to what their roles were, and whether their memories were consistent with facts.



Horace L. Woodring today

Horace L Woodring is now the lone survivor of the Patton accident. General Gay continued to serve and retired from the Army. He later successfully pursued a civilian career, and died August 20, 1963. The truck driver, Robert L. Thompson, returned home like thousands of other ex-soldiers to get his life in order. Sadly, he agonized for the remainder of his life over the guilt he accepted for the unfortunate collision. Thompson's widow, in a recent phone conversation, said: "He said he always felt like a murderer." Thompson died in June, 1994. For nearly half a century, Woodring has consistently repeated his eyewitness account of the events of that December morning from the beginning of the journey at Bad Nauheim to Mannheim, the end of the ride.

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Before his recent retirement, Denver Fugate was an Associate Professor of History at Elizabethtown Community College, Elizabethtown, Ky. He taught American History, Kentucky History, and American Government.

A REPORT FROM HAITI:

Cavalry in Peacekeeping Operations

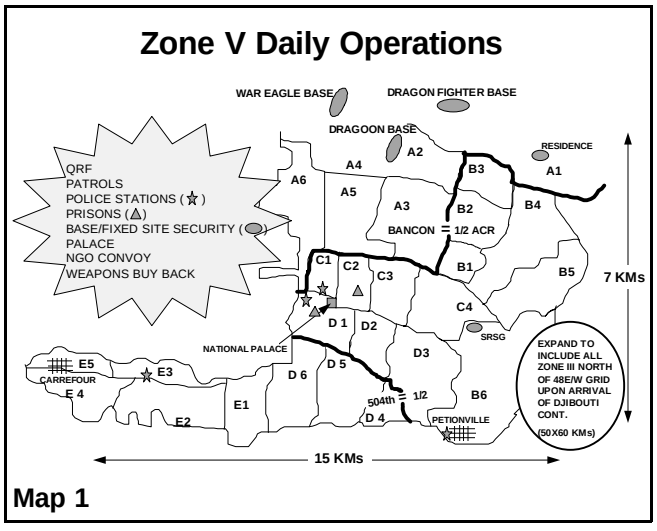
by Lieutenant Colonel Kevin C.M. Benson

The mounted patrol moves slowly down the streets of Port-au-Prince, Haiti. An hour earlier, the patrol had encountered a mob rather vigorously meting out vigilante justice to an alleged thief. The sergeant and his interpreter put a stop to this, although some rocks were thrown in their direction. Now the patrol is approaching a mound in the road. It is a dead body, an occasional sight in the city, and one the patrol had seen before. After one more report and coordination with the Haitian National Police, the patrol continues. In two more hours, the patrol will be over, and the unit will move back to War Eagle base, where debriefing would be followed by maintenance on the HMMWVs and weapons, a shower, then some sleep. They followed the old cavalry credo — take care of the horse, the weapon, the saddle, and then the men. Just as their horse-mounted predecessors rode the West keeping law and order, the 2d Armored Cavalry Regiment (2d ACR) patrols the streets of greater Port-au-Prince, Haiti, today, maintaining a secure and stable environment for the fledgling democracy here.

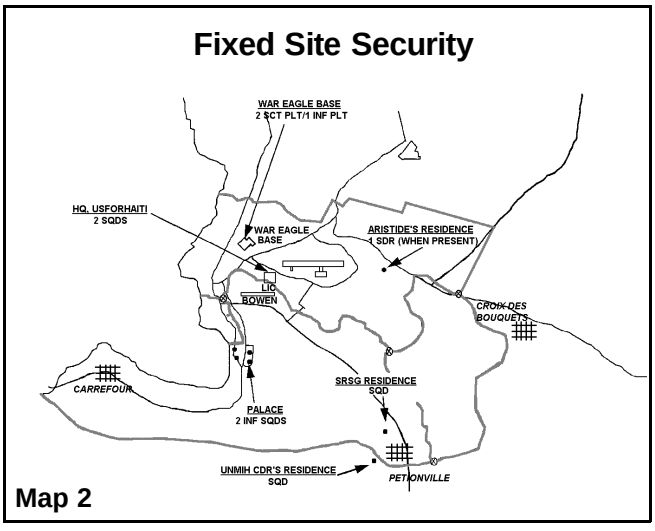
The 2d ACR's 1st Squadron, augmented by two rifle companies from the 82d Airborne Division's 325th Airborne Infantry Regiment and the 504th MP Battalion, currently provides an agile, mounted, patrolling force and the nucleus for the Quick Reaction Force for the UN Mission in Haiti (UNMIH). The 3d Squadron preceded the 1st in Haiti and the 2d Squadron will close the mission. The 2d ACR has the inherent agility and weapons mix to present a range of options for the UN Force commander. The 2d ACR, though bred for combat, is equally adept at Operations Other Than War (OOTW). The Haiti mission is a prime example of the type of mission many, if not all, U.S. Army units will face in the future.

Mr. Lahkdar Brahimi, the Special Representative of the Secretary General (SRSG) in Haiti, described the emerging new world order as a place where the military forces of the world would be employed not in conventional international combat, but in intra-national conflict to restore order. The 2d ACR is a unit that can respond all along the operational continuum, from combat to peacekeeping. The range of missions the regiment performs in Haiti stretches its operational capability and tests its subordinate unit leaders. On any given day, the squadrons of the regiment conduct day and night presence patrols on the streets of Port-au-Prince, maintain fixed-site security at key facilities across the city, and provide a Quick Reaction Force (QRF) for the Zone V commander and for employment by the UNMIH commander throughout the country. The squadron also protects Non-governmental Organization (NGO) convoys and guards the National Palace (see Map 1).

Patrolling is the basic mission of the regiment in Haiti. The patrols include day and night "presence missions," and day and night "saturation missions." The basic unit of the presence patrol is the cavalry section — two scout HMMWVs commanded by a SSG, SFC, or lieutenant. The day and night presence patrols cover a wider area of the city (see Map 2). The pattern of the patrol again harkens back to the frontier days of cavalry. The patrol rides for 45 minutes and walks for 15. The coverage of these patrols is such that the troopers range throughout the zone and maintain contact with the people, maintaining a vital link in the continuous information-gathering effort. The day and night saturation patrols mix infantry soldiers and cavalry troopers. The basic element of these patrols is a cavalry section in HMMWVs and an infantry squad riding in a troop-carrying HMMWV. These patrols cover a smaller area of the city, but more thoroughly. These patrols go to the start point of their route mounted; then the squad dismounts, patrolling through streets too narrow for the mounted section. The vehicles link up with the dismounted element at designated locations and then continue the patrol. The patrols perform the standard cavalry



Map 1



Map 2

mission of reconnaissance, to confirm or deny priority information requirements, and the standing mission of maintaining a secure and stable environment through presence. The mobility and agility of the cavalry troop allow the commander to collapse patrols into key areas of the city in order to quell disturbances or control crowds.

Fixed-site security is another important element of the regiment's peacekeeping mission in Haiti. There are key sites within the city (see Map 2), designated as such for their actual or symbolic value, including the National Palace, the Light Industrial Complex, and Dragoon Base, the headquarters of U.S. Forces Haiti. The requirements of fixed-site security demand manpower from the squadrons. The fixed-site security mission can provide somewhat of a break for the infantry soldiers who ordinarily perform this mission. For example, at Dragoon Base the security squad lives in one of the air-conditioned tents used for the night shift. This gives the soldiers a break for quality sleep. But challenges on this type of mission do arise. Recently, a Haitian approached the gate guards asking if the Americans paid money for weapons. The answer is yes, during scheduled weapons buy-back periods. The Haitian then asked how much he could get for the four fragmentation hand grenades and one pipe bomb he was carrying. An exciting few minutes passed before the bomb was destroyed by the explosive ordnance detachment. The incident broke up a relatively quiet day.

The National Palace is the key symbol of power in the country. Protection of the president is also key to maintaining the stability of the country. The rifle companies attached to the 1st Squadron provide a reaction force for the palace and a tactical command post that travels with the president wherever he goes in the country. This TAC CP provides a link to UN forces and the QRF. The cavalry force provides the outer ring security for presidential travels in the country. Cavalry and infantry troopers performed this mission inside the city during the recent legislative elections. These security missions are a part of the peace operations needed to ensure the success of the UN mission. The challenges of ensuring a secure and stable environment also require a broader view of the entire country.

The final major mission of the regiment is providing both the Zone V/ regimental commander and the UNMIH commander a Quick Reaction Force, ready for country-wide employment. The QRF maintains readiness through a series of internal Emergency Deployment Readiness Exercises (EDREs) conducted within and outside the city. The QRF is composed of two cavalry platoons and one infantry platoon. The command and control element is normally an infantry company (see Figure 1). The QRF deploys by either ground or air to crisis points, deployed by the UNMIH commander. Generally the QRF is preceded by a command and control helicopter that gets eyes on the scene. The squadron commander or his S3 usually rides in this helicopter. If required, a rifle or scout squad follow in a second helicopter. The remainder of the QRF follows in a CH-47D with the scout HMMWVs carried as sling loads. The QRF can reach any area on the island within 60 minutes by helicopter, a tremendous reinforcement to any zone commander. The cavalry allows the UNMIH commander to respond with overwhelming force to any situation. While the QRF gives the commander the means of responding with overwhelming force as necessary, the daily situations faced by the cavalry trooper on the street require great discipline while on patrols.

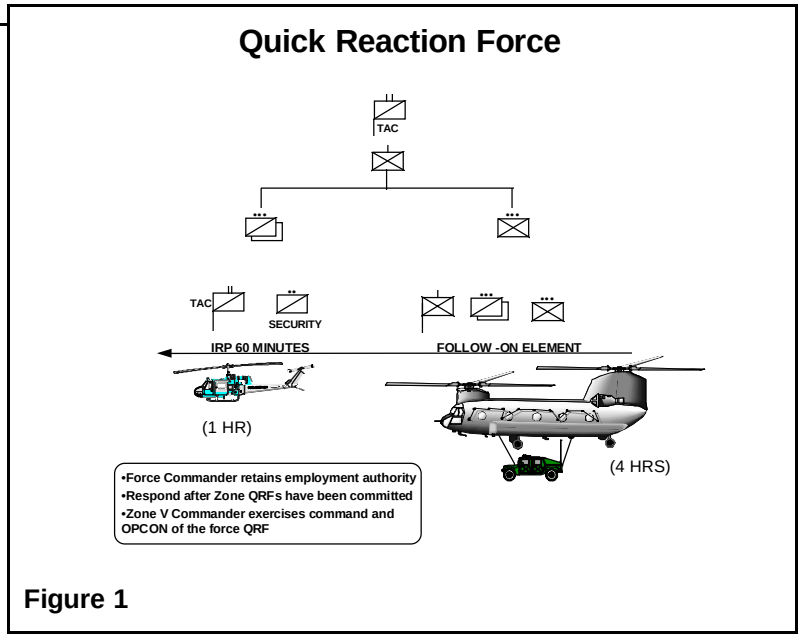


Figure 1

The inherent value of participating in OOTW is the experience gained by small unit leaders. An OOTW patrol is not like a combat or reconnaissance pa-

2d ACR "Blue Helmets" on the streets of Port-au-Prince.

Zone V Forces

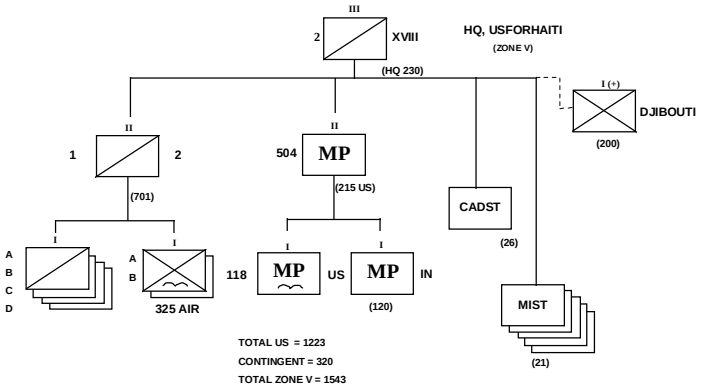


Figure 2

trol. In Haiti, the intent is for the patrol to be seen by the people. Patrol discipline remains the same. The patrol leader must ensure completion of everything from vehicle and weapons maintenance to individual equipment maintenance. He must also enforce the trooper readiness portion of the pre-combat checks. In the draining heat of Haiti, where the average daily temperature is 95 degrees, the patrol leader must ensure that everyone drinks water.

The potential for facing the unknown around any corner lends a sense of urgency to each patrol's pre-combat checks. The small unit leader must also write a patrol order and rehearse actions on contact with each member of the patrol. After mission completion, the patrol also goes through an extensive debriefing with the squadron S2. The mere fact that troopers mount up, load weapons, and head out of the secure compound onto the streets reminds troopers and their leaders to pay attention to detail.

After five months of patrolling under a variety of conditions, troopers and leaders of the 2d ACR return from Haiti as a seasoned force. The seasoning also extends to the staff experience which, although not as intense as a combat experience, still hones a fine edge.

The regimental staff provided the nucleus of a Joint Task Force (JTF) staff. The primary contribution is in the J3 and J2. The officers and troopers of the regiment perform the current operations function and planning function. The regimental S2 acts as the J2 Operations chief. In OOTW, the J2 provides the focus for operations. The J2 and J3 interact on a daily basis, thus ensuring cross-training and increasing familiarity with the capabilities of both sections. The simple truth is, the J3 writes fragmentary orders each day that have the potential of placing troopers in harm's way. The J2 develops priority information (intelligence is not gathered in peacekeeping) requirements and supporting information requirements that establish the focus of effort for patrols. The joint staff checks the conditions on the street by patrolling both day and night. This ensures that the staff maintains a perspective on the efforts made by the line troopers, and the line troopers see the joint staff officers and troopers sharing the burden. The constant repetition of the process of evaluating higher headquarters fragmentary orders, writing JTF fragos, and overseeing execution of missions hones these skills in the regimental staff. There are purely combat functions of staff work that are not relevant in OOTW, such as the synchronization of fires and maneuver. These skills must be addressed in retraining upon return to home station.

When the regimental staff returns, it will require an extensive training effort on the integration of combined arms fires, something not practiced during a peacekeeping operation. The regimental commander will require a series of CPXs and computer-assisted exercises. The fieldcraft required to operate in a field tactical site will need refreshing. But the OOTW experience will bind a staff through shared experience, and given that base, the staff will regain its combat edge in a matter of months. Constant use of the military decision-making process and the production of the adjunct products will give any staff a superb start point.

The squadrons of the regiment will also require retraining to attain the combat edge. The foundation of small unit discipline refined on the streets of Port-au-Prince gives the squadrons a great start point. Current retraining plans include mounted and dismounted gunnery, combat and reconnaissance patrolling, and integration of all arms into maneuver training at Fort Polk and Fort Chaffee. The focus of the main effort will be on regaining the skills necesssary to win in combat.

It is axiomatic that the toughest mission facing any unit is combat. The 2d ACR found that the discipline required for combat makes it easier to transition to the tasks and discipline required in OOTW. The military exists to fight the nation's wars. Since war is an extension of policy by other means, so too are OOTW an extension of policy through other means. Since January 1995 to the completion of the UN mission, the 2d ACR, a part of the military means of national power, extends national policy by placing disciplined, trained troopers on the streets of Port-au-Prince maintaining a secure and stable environment.

The inherent flexibility of light cavalry provides an ideal force of all arms that can operate in any situation along the operational continuum. In its present form of an all wheeled cavalry force, to the future form as a force equipped with the AGS, armored HMMWV, JAVELIN, and NLOS, the regiment will continue to provide a flexible, agile, and lethal force that can respond to OOTW or combat missions.

Lieutenant Colonel Kevin C.M. Benson currently serves as the Chief of Staff, U.S. Forces Haiti. He is also the executive officer of the 2d ACR, Fort Polk, La. He served in tank and cavalry units in the U.S. and Europe, and also served on the XVIII Airborne Corps staff, G3 Plans. He has been published in *Military Review, Infantry,* and *Special Operations* magazines. He was assisted in this effort by COL Walter Sharp, commander, 2d ACR; LTC Bill Weber, commander, 1/2 ACR; and CPT Chris Thrash, Chief of Plans, JTF Dragoon and 2d ACR.

Cold War Armor After Chechnya:

AN ASSESSMENT OF THE RUSSIAN T-80

by Major James M. Warford

The two-man vehicle inspection team had its hands full. Sergei Lebov and Yuri Medved would only be allowed a short visit to the combat zone prior to their return flight to Moscow and the bumpy drive back to the Russian Armor Development Center at Kubinka. The report they were to present had very quickly become one of the highest priorities in the Russian Army. Their mission was to inspect as many of the damaged and destroyed Russian armored vehicles in Chechnya as was physically possible. In addition to the large number of destroyed light armored vehicles, the two inspectors were able to examine 23 various T-72 main battle tanks (MBTs) and 10 T-80BV premium tanks (PTs). While not all the damage done to these tanks by the rebels was severe, some of it was indeed catastrophic. In one case, two Russian T-72A MBTs destroyed during the battle around the presidential palace in Groznyy looked like some strange monument to the fighting with their disembodied turrets arranged neatly on the street next to their destroyed hulls.

Lebov and Medved had the task of piecing together the cause of these decapitations. This type of work was not new to the inspectors. They had seen similar destruction on the battlefields of Desert Storm and in the former Yugoslavia. It was clear to both men that what ordnance scientists called a "munitions event" was the cause of the turret-hull separations. The ignition of the Russian tank's onboard ammunition following penetration of the armor, would frequently cause an explosion powerful enough to blow the doomed tank's turret off the hull and high into the air. In spite of what was being reported in the West, Lebov and Medved knew the problem was not the design of the tanks themselves. Since the beginning of tank warfare, tanks had been going into battle with ammunition stored in open, unprotected areas within their fighting compartments. It had to be something else. What was dooming Russian tank crews by turning a significant number of hit and damaged tanks into such catastrophic losses?

Located approximately 60 miles outside Moscow, the Kubinka military base is the home of what was a very secret armored vehicle development and test facility. According to published reports, a collection of vehicles maintained in a museum at Kubinka includes some armored vehicles that had never been seen before. Additionally, several fully operational Western armored vehicles are also on hand, including a U.S. M60A1 MBT, two U.S. M48 MBTs, one Israeli Patton 105 (M48A5) MBT, and one British Chieftain MK 5 MBT. It was here, on 20 February 1995, that the Russian Minister of Defense, General Pavel Grachev, spoke during a special armor conference. His comments may have a huge impact on the capabilities and development of Russian armor, but they may also encourage reactionaries in the West to mistakenly underestimate current and future Russian tanks.

Although a complete text of General Grachev's comments is apparently not available, it is possible to present an examination of the key points. The focus of his remarks was the reported poor performance of Russian armor during the fighting in Chechnya. According to General Grachev, the Russian Army deployed 2,221 armored vehicles into Chechnya starting on 14 December 1994. Of that total, 225-250 were total losses.[1] Western sources reported that Grachev was dissatisfied with the performance of Russian armor in general, and with the T-80 PT in particular. According to the *Boston Globe*, "The T-80 tank — the army's main fighting vehicle, which gave Pentagon chiefs nightmares in the last decade of the Cold War — has turned out to be a junk heap on the battlefields of Chechnya."[2] Published sources report that General Grachev specifically identified three areas as shortcomings of the T-80: insufficient armor protection; the gas turbine engine's thirst for fuel; and the automatic loading system's difficulty with semi-combustible ammunition cartridges. While General Grachev apparently did not criticize the T-80 as a whole, or say that it was an unsatisfactory tank, he made it clear that changes would have to be made.

Before we examine these reported deficiencies, we must determine the exact tank type and model in question. The Russian Army deployed a wide range of armored vehicles in Chechnya and, from the information available, it is not clear which tanks actually took part in the fighting. Video reports carried by network news services show various T-72 MBTs, with very little evidence of T-80s. The few T-80s that are known to have participated were photographed in Groznyy, and are in fact T-80BV PTs. This variant of the T-80 is based upon the T-80B PT that entered Soviet Army service in 1978. With the adoption of first-generation reactive armor, the T-80B became the T-80BV (V=Vzryvnoi,

or explosive) in 1984/85. It is important to point out that the T-80BV is only one of up to 12 different variants in the T-80 series. While some reports claim that the much more modern and improved T-80U PT variant was the target of General Grachev's comments, there is no solid evidence that any T-80Us took part in the fighting.

Diesel-powered T-80U parades in Red Square.

As previously reported in the pages of *ARMOR*, specific information concerning the armor protection of modern former Soviet and Russian tanks is very limited. It is known that the T-80BV is fitted with composite/laminate turret front and front-slope or glacis base armor. Referred to as "multi-element combination armor" by the Russians, it is of an advanced design and is certainly not a weak characteristic of the T-80B. With the addition of first-generation reactive armor, the T-80BV becomes a very tough tank to kill. The capabilities and influence of this "two-tier" frontal armor protection system (advanced composite/laminate base armor and first-generation reactive armor) are well documented and have already been discussed in the pages of *ARMOR* in some detail. According to *International Defense Review* 4/1995, "Chechen weapons failed to penetrate the T-80's armor in direct fire."[3] The one place where the T-80BV (and virtually all other modern tanks) was vulnerable to Chechen rebel fire was the top surface. In fact, fire from RPG-type antitank weapons from positions in the upper floors of buildings may have been the most dangerous threat to Russian armor.

Although not a revelation in any way, demonstrations of the Russian response to this battle damage assessment (BDA) was part of the agenda for the conference at Kubinka and will be discussed below.

The T-80BV is powered by the GTD-1000TF gas turbine engine, which provides 1100 hp, a maximum road speed of 70 kph, and an operating range of 370 kms. Reportedly, General Grachev was critical of both this engine's fuel consumption and the flammability of the fuel used in combat. While the fuel used by this multi-fuel engine is an easy fix, the *type* of engine is another matter. General Grachev apparently insisted that the tank's operating range be improved to allow for eight hours of operation between refuelings. To accomplish this, General Grachev announced that the Russian Armed Forces would move away from using gas turbine engines. "I say clearly to everyone, directors and constructors, [that] we are going to switch over to only using diesel. We are not going to work with gas turbine engines anymore."[4] This announcement is very interesting for a couple of different reasons. First, the Russians have been working with gas turbine engines since at least the mid-1960s. In fact, the T-80 Base Model PT was the first tank in the world to be fielded with a gas turbine engine when it was put into service in 1976. The GTD-1250 1250-hp gas turbine engine that powers the T-80U is by all Russian accounts a very efficient and successful engine. Although a newer model than that fitted to the T-80BV that fought in Chechnya, the GTD-1250 has been a very strong performer.

Secondly, the timing of this announcement seems very suspect. The March-April 1995 issue of *ARMOR* included an article describing the new Russian T-90/T-90S Hybrid Premium Tank (HPT). A series of competitive trials were held in June 1993 putting the new diesel-powered T-90/T-90S up against the gas turbine-powered T-80U. The goal of this competition was apparently the selection of a single "unified tank" for the Russian Army. Since the publication of that article, the Russians have confirmed that the T-90/T-90S was the winner. According to ***Voyennyye Znaniya*** #9 1994, the T-90/T-90S "has been selected as the (new) main tank for the Russian Armed Forces."[5] This means that the decision to go with a single, diesel-powered tank for the Russian Army was made sometime prior to September 1994. Based upon the available information, the first combat use of the T-80BV in Chechnya occurred around 31 December 1994. It appears that when General Grachev made his pro-diesel announcement, supposedly based upon the tank's performance against the Chechen rebels, the decision had actually been made before the outbreak of the fighting in Chechnya.

The T-80BV is armed with the well-known 2A46A1 125mm smoothbore main gun, firing HVAPFSDS, HEAT-FS, and FRAG-HE conventional ammunition, and the KOBRA Antitank Guided Missile (ATGM). This main gun-launched ATGM, known as the AT-8 SONGSTER by NATO, is radio frequency guided and has a maximum range of 4000 meters. The missile is fed to the main gun by a fully automatic loading system.

First fielded with the T-64 Base Model PT in 1967, the "Korzina," or basket autoloader, moves the tank's ammunition from the 28-round storage carousel located below the turret floor.

T-80U in first public appearance on parade in Red Square.

In operation, the autoloader carries both the separate-loading projectile and propellent charge up to and level with the breech and loads both with a single action of the rammer. This complicated design requires a unique ammunition arrangement, with the projectile placed horizontally (pointing toward the center of the circular carousel) and the propellent charge positioned vertically. While the Korzina autoloader is used by both the T-64 series and the T-80 series, the T-72 is fitted with a less complicated system, known as the "Cassette" autoloader, which first appeared in 1973 in the T-72 Base Model MBT. The primary differences between the two autoloaders are the arrangement of the ammunition and the operation of the system. In the T-72, the separate loading projectile and propellent charge are both stored horizontally, with the propellent charge attached to the top of the projectile. The autoloader lifts both both propellent charge and projectile up to and level with the breech, and then loads the projectile and propellent charge in two separate actions. Although the Cassette autoloader of the T-72 is a simpler design, the T-80BV and the T-80U are both equipped with the Korzina system.

Both the Korzina and Cassette autoloaders are very effective and reliable systems. They have been a part of Soviet and Russian tank design since the mid-1960s and have been proven in combat. The reported problems with these autoloaders apparently mentioned by General Grachev, covered in the defense-related press, and seen on battlefields ranging from 73 Easting to the streets of Groznyy, are not hardware-related. The problem is what the hardware is feeding into the main gun. The 125-mm separate-loading ammunition, fired by the T-64 series, the T-72 series, the T-80 series, and the T-90/T-90S, uses a semi-combustible cartridge case. When the main gun is fired, the cartridge case that holds the propellent charge is consumed, with the exception of the small metallic base plate. This is almost identical to the system used by the M1A1/M1A2 with its 120-mm fixed (one-piece), semi-combustible ammunition. With the Russian Korzina autoloader, the remaining base plate is returned to the now-vacant spot in the ammunition carousel. The Cassette autoloader, on the other hand, ejects the base plate out through a small circular hatch in the top of the turret.

To ensure that this semi-combustible cartridge case burns properly in the breech, it is designed to be very flammable and clean-burning. This is what has doomed the crews of so many Russian tanks. In the West, the development and adoption of semi-combustible ammunition has been accompanied by a supporting redesign of how tank main gun ammunition is stored aboard the tank. The result is the incorporation of an ammunition magazine separated from the tank crew by armored blast doors, and equipped with "blow-out panels" to direct the force of an ammunition explosion or fire away from the crew. This design philosophy has the additional benefit of virtually ensuring that the turret will not be separated from the hull by even a massive explosion of the main gun ammunition. In fact, the necessity of separating the new 120-mm semi-combustible ammunition from the crew and the fighting compartment may have been the key factor in the final design of the U.S. M1/M1A1 Abrams MBT. In Russia, the adoption of semi-combustible tank ammunition was not accompanied by the necessary separation of ammunition and crew. The Russians continued to field tanks designed along the same lines as older tanks that fired conventional (non-combustible) cartridge case ammunition. The significance of this outdated policy continues to mark battlefields around the world.

One of the first declassified pictures of the T-80U, seen on maneuvers in 1989.

As mentioned above, it's not possible to assess exactly what General Grachev said at the armor conference at Kubinka. Apparently, even what little is known about his remarks is being disputed. Colonel-General Aleksandr Galkin, chief of the Russian Federation Defense Ministry Main Motor Vehicle and Armor Directorate, insists General Grachev did not say some of the critical remarks he was alleged to have said. Some people may be fooled, but potential buyers of arms and military equipment, let alone rivals, are well aware of the merits of Russian equipment. And that includes the T-80 tank."[6] In an interview published in *Krasnaya Zvezda* on 25 March 1995, Colonel-General Galkin made some interesting comments concerning the T-80 and the fallout from the fighting in Chechnya. First, in response to critical remarks published concerning Russian tank autoloaders, he made the following statement in their defense: "The shells (in Western tanks) are kept separate from the crew. But this is only really a psychological advantage. In the event of a direct hit, the ammunition load would still be detonated and the crew would still die."[7] This is a very surprising comment in the light of the information available since the end of DESERT STORM. Colonel-General Galkin did admit, however, that the main gun-launched ATGMs used by modern Russian tanks are particularly vulnerable to enemy fire. The two-piece KOBRA ATGM fired by the T-80BV is stored in the Korzina's ammunition carousel just like a standard round of ammunition. "If a shaped-charge jet is fired at the T-80 on its poorly protected side and hits a (stored) missile, there may be an explosion; in fact, the entire ammunition load may be detonated. This has happened in a combat situation."[8] According to Colonel-General Galkin, this problem was brought to light during combat operations and it will be solved very soon.

In response to the destroyed Russian armored vehicles in Chechnya and the General Grachev's criticisms, the special armor conference held at Kubinka included demonstrations of new Russian armored vehicle technology and current capabilities. Vehicle defensive system demonstrations conducted on 20 February and 2 March 1995 included a BMP-3 IFV fitted with reactive armor being engaged by an antitank grenade launcher at a range of only 30 meters. The new armor fitted to this well-protected BMP-3 reportedly defeated multiple hits from RPG-type weapons. Additionally, a tank fitted with "built-in dynamic defense" (probably a T-80U fitted with standard KONTAKT-5 second-generation reactive armor) defeated attacks by both HVAPFSDS and HEAT-FS ammunition. Finally, a T-72 fitted with a "grill against shaped-charge shells" was engaged by KONKURS ATGMs from 100 meters and RPG-type weapons from 40 meters. None of the missiles or grenades fired hit the targeted T-72. The defensive system that was probably being demonstrated was the ARENA *active* Defensive Aids Suite (DAS). The joint Russian/Franco-German ARENA DAS consists of a mast-mounted multi-directional radar that detects incoming ATGMs and launches munitions against the attacking projectiles. The ATGMs are then destroyed in flight prior to hitting the targeted tank.[9] During this demonstration, all of the projectiles were destroyed 6-7 meters away from the target. According to Colonel-General Galkin, "No one else has this type of defense. We do, and it works."[10]

Certainly, the Russian T-80BV is not a "junk heap," and the reported poor performance demonstrated by the Russian Army in Chechnya was not due to the poor quality of the deployed Russian armor. Admitting that the ammunition carried by tanks like the T-80BV is potentially dangerous to the crews, the Russians also stated that the problem would be solved. This single shortcoming may in fact have already been solved since this information, like the T-80BV's vulnerability to attack from above, is unlikely to have come as a surprise to the Russians. As was demonstrated at Kubinka, Russian tank technology is very capable and is not only able to deal with whatever problems were actually encountered during the fighting, but also is continuing to advance. In some areas (the various DAS systems for example), they are far ahead of the tank developers in the West. While General Grachev targeted his armor force with his comments at Kubinka, its clear that the problems encountered in Chechnya were problems of leadership and not of hardware. Regardless of what was actually said, it appears that General Grachev's motivation for making comments critical of Russian armor was an attempt to deflect comments critical of Russian generalship.

As it currently stands, the threat presented by the Russian T-80 actually is a "three-pronged" threat, including three different tanks and three former Soviet Republics. The first tank in question is the Russian T-80U. Equipped with the AGAVA/BURAN PA thermal sight since 1992,[11] the T-80U is also fitted with KONTAKT-5 second generation reactive armor (capable of defeating both shaped-charge and kinetic energy ammunition) and fires the 3BM32 depleted uranium (DU) HVAPFSDS round and the 9K120/9M119 REFLECKS laser beam-riding ATGM. The T-80UK command variant shown at the IDEX 95 defense exhibition in Abu Dhabi was also equipped with the TSHU-1-7 SHTORA 1 DAS. Secondly, the Ukrainian T-84 PT is not only serious competition for the T-80U on the export market (it was also shown at IDEX 95), it also constitutes a serious threat to the West. Based upon the very similar diesel-powered T-80UD PT, the T-84 is equipped with the SHTORA 1 DAS, KONTAKT-5 reactive armor, and a new welded turret reported to provide up to 150 percent better armor protection than any Russian tank turret.[12] The third tank of this three-pronged threat is the one that actually fought against the Chechen rebels. In this case, however, the T-80B (T-80BV) is a product of the Republic of Belarus. Not previously available for export from Russia, the T-80B (T-80BV) is now being marketed by "BelTechExport" and represents the best of Russian Cold War tank technology.

These three tanks, along with the T-90/T-90S, represent the worst-case threat that Western armor could face on the next battlefield. They are all for sale, and are currently generating a lot of interest with potential buyers around the world. If the impressive capabilities of these three tanks are overlooked, and the threat that they present is naively reduced due to overreaction and the memory of burning Iraqi T-72s in DESERT STORM, our next fight could be far more dangerous than the last.

Notes

[1]Journal Staff, "Russian military assesses errors of Chechnya campaign," *International Defense Review,* April 1995, p. 5.

[2]Kaplan, Fred, "Russian T-80 tank found to be lacking," *Boston Globe*, February 25, 1995.

[3]Journal Staff, "Russian military assesses errors of Chechnya campaign," *International Defense Review,* April 1995, p. 5.

[4]Zhigulsky, Anton, "War Exposes Russian Tank Flaws," *Defense News,* February 27-March 5, 1995, p. 36.

[5]Zayets, A., "Comparative Analysis of T-80U, Leopard 2M," *Voyennyye Znaniya,* No. 9, (September) 1994, pp. 20-21.

[6]Yegorov, Aleksandr, "Galkin: Converting Everything to Diesel, Reorganization, T-80 Flaws," *Krasnaya Zvezda,* March 25, 1995, p. 3.

[7]*Ibid.*

[8]*Ibid.*

[9]Foss, Christopher F., "Russia to export tank anti-missile system," *Jane's Defence Weekly,* April 8, 1995, p. 4.

[10]Yegorov, Aleksandr, "Galkin: Converting Everything to Diesel, Reorganization, T-80 Flaws," *Krasnaya Zvezda,* March 25, 1995, p. 3.

[11]Geuckler, Andreas, "The T-80U Main Battle Tank," *Military Technology,* April 1995, p. 41.

[12]Zaloga, Steven, "Stepping Out of Russia's Shadow," *Armed Forces Journal International,* May 1995, p. 31.

Major James M. Warford was commissioned in Armor in 1979 as a Distinguished Military Graduate from the University of Santa Clara California. His recent assignments include being an AOAC small group instructor at Fort Knox and attending CGSC, where he earned an MMAS degree in 1992. Since CGSC, he was assigned to the 24th Infantry Division where he served as the S3 of the 2d Squadron, 4th Cavalry, and the S3 of the division's 2d Brigade. He is currently a tactics instructor at the Center for Army Tactics, CGSC, Fort Leavenworth, Kansas.

A Hands-On Evaluation of the BMP-3

"Spot Report!... ...Four BMPs in the open..."

by Sergeant First Class Monty A. Miller

On 9 and 10 April 1995, the scout platoon of Task Force 2-68 Armor had the unique opportunity to study the newest Russian BMP, the BMP-3. During the two days, we observed the BMP-3 firing all weapons systems, moving cross country, and sitting on static display.

Task Force 2-68 Armor deployed to Kuwait from Baumholder, Germany, for Intrinsic Action 95-2. At the same time, the Kuwaiti Army was receiving new equipment training on the BMP-3 from Russian Army trainers and civilian factory technicians.

On the morning of 9 April 1995, the task force scouts moved to the Udairi Range Complex, in the center of the Kuwaiti Desert, to link up with the Kuwaiti Army, the Russian cadre, and the BMP-3.

The first impression of the BMP-3 is that it has a relatively low silhouette for such a heavily-armed vehicle. The 100-mm main gun and the 30-mm autocannon coax present an imposing picture. After we linked up with the Kuwaitis and the Russians, we moved in for a more detailed study.

Approaching the BMP-3, we smelled the fresh paint and that brand new armored vehicle smell a soldier is lucky to experience once in a career. The Kuwaitis and Russians looked rightfully proud of their new BMP-3.

When the BMP-3s moved to their firing positions five kilometers away, the task force scouts accompanied them on the left flank. The BMP-3 has impressive pickup and excellent speed, with very little exhaust signature. The Kuwaiti forward machine gunners were sitting out of their hatches and seemed to enjoy a rather smooth ride across the desert, even at speeds of 45 mph and over.

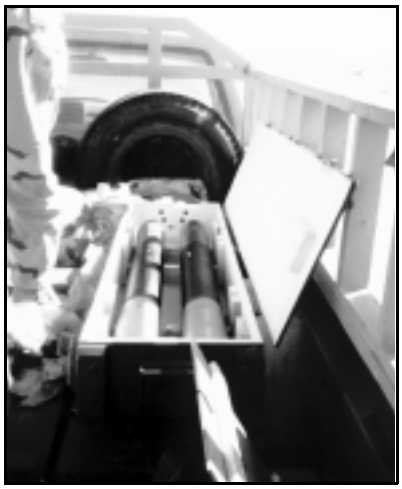
Left side view of the BMP-3. Note laser rangefinder over main gun mantlet.

At the firing positions, we received a briefing on the capabilities of the BMP-3 from the Russian trainers, while the Kuwaitis were doing their prep-to-fire checks. The interior of the BMP-3 is basically open and not compartmentalized. The left front machine gunner, the driver in his central position, and the right front machine gunner are all within arm's reach of each other. The commander's and gunner's positions in the turret are somewhat more cramped because of the main gun, coax, and autoloader, but were not uncomfortable. There is at least as much turret room as in the M2/M3 Bradley.

There is no turret shield, and crewmembers, depending on turret position, can see into and enter the turret. The dismount soldiers sit to the rear of the turret, and they are in more cramped conditions. The crew, consisting of driver, gunner, commander, and dismounts, totals nine on a fully-manned vehicle. The dismounts can stay mounted and fight under armor protection by using the firing ports on the flanks and rear door. The firing ports on the Kuwaiti BMP-3s have been modified by the Russian factory to accommodate the M16A2 rifle used by the Kuwaiti Army (see photo).

The firing of the weapons systems was most impressive. The 100-mm AT-10 laser beam-riding missile was the first round down range. Throughout the two days of firing, with 12 to 15 missiles fired, the AT-10 achieved a 100 percent hit rate. The basic load of AT-10 missiles is eight. Although it is doubtful that the warhead would be of sufficient size to take out the M1A1, it will be able to defeat the M2/M3 Bradley and the M8 Armored Gun System (AGS). The AT-10 also has a standoff advantage over the TOW II (4000m vs. 3750m) and a time of flight to maximum range advantage (12 sec/4000m vs. 16.5 sec/3750m).

The conventional main gun round is a high explosive fragmentation round and it had impressive down-range effects. This would be highly effective in



BMP-3 Details

At left, the exhaust outlet at the right rear of the BMP-3. Above left, the firing ports have been adapted to the M-16-series rifles used by Kuwait.
Above, note how the main gun, the 30-mm coax, and the laser rangefinder are mounted.
At upper right, two AT-10 laser-guided missiles that can be fired through the 100-mm main gun.
At right, two of the HE-FRAG main gun rounds.

an urban environment, as well as on the conventional battlefield, for use against soft targets and dug-in fighting positions, e.g., Bosnia-type warfare.

The 30-mm autocannon coax was also fired at targets out to 1800 meters. The rate of fire and sound of the 30mm are very similar to that of the Bradley 25mm. The only 30-mm rounds that we observed being fired were the HEI-T (High Explosive Incendiary-Tracer). The Russians seemed to be training the Kuwaitis to fire in a four-round burst with no sensing round. The Kuwaitis were achieving a 40 to 50 percent hit rate on targets at 1800 meters per burst.

There is stabilization for the turret armament and a laser rangefinder located over the main gun. A separate laser at the gunner's station is used to guide the AT-10 missile. During the two days spent observing the BMP-3, we did not see it fire on the move, so we made no conclusions on its accuracy while moving. The Kuwaiti Army is going to install the French Athos thermal sight, which will greatly increase the capabilities of the BMP-3.

The BMP-3 is amphibious, using two hydrojets in the rear and a trim vane in the front. Small skirts over the top of the track and a short snorkel to the right rear are the only other aids to amphibious operations. This is a distinct advantage over the cumbersome and bulky preparations needed for the M2/M3 Bradley. The engine mounts very low in the rear of the vehicle and the exhaust is to the right rear of the side. This will give the BMP-3 a lower heat signature across the frontal arc (see photo).

Conclusion

The low silhouette and heavy armament of the BMP-3 make it a very formidable opponent for the M2/M3 Bradley and the M8 AGS. The addition of an APFSDS-T round could further increase its lethality. A well-trained BMP-3 crew could fight extremely well with this vehicle.

As a D3-qualified scout, I would be wary of the BMP-3 on a future battlefield; however, I still feel confident that the Bradley currently can defeat it.

Just as the Russians led the world with the first infantry fighting vehicle, the BMP-1, they again lead the way in IFV thought and design with the BMP-3.

The next leap forward for infantry fighting vehicles has been taken. It's our move.

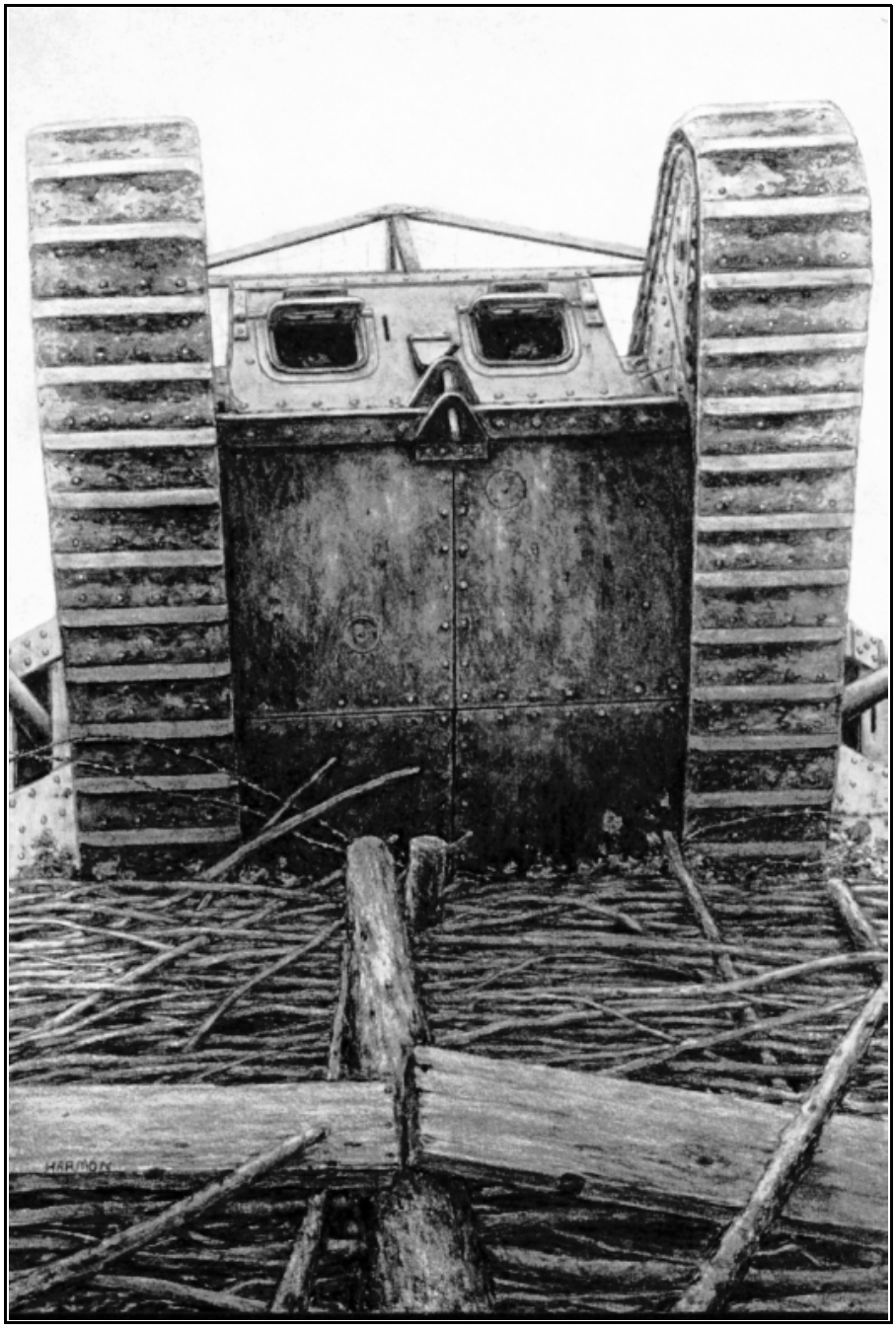
"Scouts Out!"

Sergeant First Class Monty A. Miller joined the Army in January 1981 and attended OSUT at Fort Knox, Ky. He has served in every position in scout platoons at the task force, divisional cavalry, and regimental cavalry levels. He served with B Troop, 2-1 Cavalry, 2AD, during Operation DESERT STORM and is a graduate of PNCOC, BNCOC, SPLC, ANCOC, and the Air Assault Course.

The Premature Debut:

The Introduction of Armored Fighting Vehicles and Tactics By the British Army During the September 1916 Somme Offensive

by Major David P. Cavaleri



"From a mockery, the tanks have become a terrible weapon. Armoured they come rolling on in long lines, more than anything else [they] embody for us the horror of war."

-Erich Maria Remarque
All Quiet On The Western Front

A soldier's ability to maneuver on the World War I battlefield was limited by a number of factors — the trafficability of terrain, the extent of protective cover, the distance between start point and objective, the complexity of obstacles, and the strength of enemy opposition.

By the end of 1914, strategic maneuver had succumbed to the "battlefield stalemate," defined as the maneuver deadlock resulting from the effective use of the machine gun, the creative emplacement of barbed-wire and trench obstacles, and the accurate employment of high-explosive artillery fire.[1]

Most military historians agree that the British introduction of tanks represented an adaptation of traditional tactics in response to this stalemate. Whatever controversy surrounds this topic centers on the timing of the decision to commit this new weapon. British Expeditionary Force Commander General Sir Douglas Haig knowingly sacrificed the elements of surprise and secrecy surrounding the tanks in pursuit of an operational breakthrough on the Western Front. Haig's decision to employ tanks in September 1916 on the Somme front was correct despite opposition from key military and government officials.

There were opposing contemporary views on this issue. Conservative tank proponents led by Ernest D. Swinton and Winston Churchill advocated delaying the employment of tanks until field testing was completed and ade-

quate numbers of vehicles were available. This camp found itself in direct opposition to Haig, who orchestrated what some called a premature disclosure of this secret weapon. While advocates and adversaries differed on their analysis of this tank debut, mechanized proponents such as J.F.C. Fuller incorporated many of the lessons learned in subsequent operations, particularly the 1917 Cambrai breakthrough.

This story begins in early December 1915 when Allied military representatives met to decide strategy for the following year.[2] They decided to deliver a series of offensives as simultaneously as possible to prevent the enemy from shifting reserves. Following that recommendation, the British War Committee directed the BEF to concentrate its efforts in late 1916 or early 1917 on the Western Front. Minister of Munitions David Lloyd George was adamant that any British or combined offensive be delayed "until we are at full strength, which they say will not be until well into the summer."[3] Lloyd George's caution was mitigated, however, by the German offensive against Verdun that commenced in February 1916.

The decision to defend the historic fortress, made by General Joseph Joffre, chief of the French General Staff, proved costly. Churchill estimated the total number of French casualties at Verdun to be approximately 460,000 men.[4] This pyrrhic defense affected preparations for the upcoming Allied offensives and the ability of the French to participate in those operations. Haig believed the French capable of maintaining a defensive posture long enough to allow the BEF time to build combat strength, but the actual French military situation was significantly different. On May 24, Haig received a letter from Joffre which stated that, "owing to the hard fighting at Verdun [the French] had not the number of divisions available for a combined attack ...."[5] Joffre wanted an Allied offensive by the beginning of July 1916, and exhibited French pride by stating they "would prefer to lose their casualties in an offensive attack rather than to melt away while sitting still."[6] Pressured by French losses, the War Committee authorized Haig to begin offensive operations in July in the vicinity of the Somme River.

Haig and his planning staff selected the Somme area for several reasons. This sector had seen little activity since late 1914. The ground was generally composed of chalky sub-soil covered with loam, which would provide good maneuverability if the weather stayed dry. The area was fairly flat, contained few major dominating terrain features or built-up areas, and *most importantly for Haig, was open enough to allow for the employment of cavalry once the infantry achieved a breakthrough.*[7] "The most striking characteristic of the Somme battlefield," wrote Douglas Johnson, "[was] its monotonous succession of low rolling plain."[8]

Haig realized that the topography of this sector favored the defenders.[9] The Germans had enjoyed ample time to reinforce and extend their positions. The "outpost" and "battle" zones consisted of multiple trench systems, ten feet deep and inter-connected with numerous communications trenches. Beneath the trenches the Germans constructed dugouts of reinforced barrier material, down to depths of thirty feet, designed to protect the defenders from artillery barrages. Each zone was protected with two belts of barbed wire obstacles, each forty yards deep and held in place with stakes. Machine guns were sighted in on "No Man's Land" and on the trenches themselves.

Haig said the defensive network formed "...in short, not merely a series of successive lines, but one composite system of enormous depth and strength."[10] Churchill wrote that the complexity of the defensive network was as much a factor in the selection of the area as was the sector's suitability for maneuver. "All these conditions," he wrote, "clearly indicated to the staffs a suitable field for our offensive, and it was certain that if the enemy were defeated here, he would be more disheartened than by being overcome upon some easier battleground."[11]

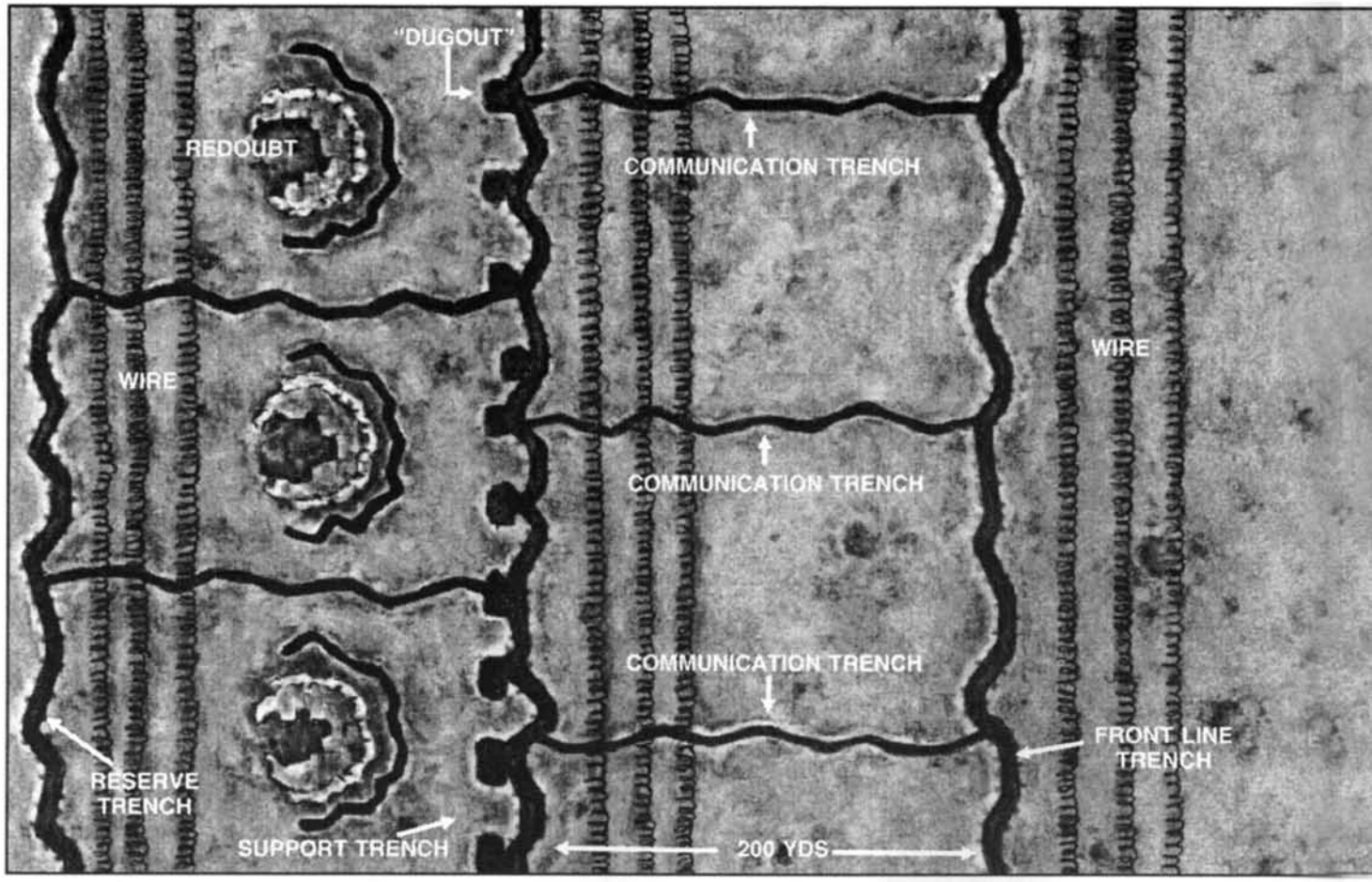
Haig's scheme of maneuver called for an assault on a wide front that would ultimately result in a penetration. As units stabilized the penetration and rolled up the exposed flanks, British and French cavalry divisions would break through and conduct operations in the "rearward" zone.[12] Haig assigned the main effort of the attack to the Fourth Army under General Sir Henry Rawlinson, with orders to penetrate the "outpost" and "battle" zones. North of his sector, another corps was to seize the German trenches on a three-mile front and conduct diversionary operations.[13] The boldness of the plan required that Rawlinson secure multiple breaches in the "outpost" and "battle" zones.

In contrast to Haig's expectations, Rawlinson's plan was less assuming. He proposed to capture initially only the "outpost" zone trench positions. Only after he accomplished this objective would he advance and attack the "battle" zone. Where Haig planned to capture all three defensive networks in rapid succession, Rawlinson planned for the orderly reduction of obstacles and was skeptical of the potential for cavalry exploitation.[14] Rawlinson was of the traditional school; expressing confidence in the preparatory barrage which fired approximately 1,000,000 shrapnel shells, Rawlinson told his subordinate corps commanders that "nothing could exist at the conclusion of the bombardment in the area covered by it."[15]

On July 1, 14 British divisions faced eight German divisions across "No Man's Land." As the British troops climbed over their parapets, they discovered that the artillery had failed. Defenders rebuilt wire obstacles only minimally damaged by the shrapnel shells and manned their positions before the British assault troops reached the first obstacles; in the first 30 minutes alone, the British experienced 30,000 casualties.[16] The British first-day losses totalled 60,000, and later Churchill rightfully called July 1, 1916, "the greatest loss and slaughter sustained in a single day in the whole history of the British Army."[17]

Haig's initial reaction to British losses was one of acceptance: "AG [Adjutant-General] reported today that the total casualties are estimated at over 40,000 to date. This cannot be considered severe in view of the numbers engaged and the length of the front attacked."[18] His attitude was tempered, however, by the British failure to achieve their initial tactical objectives. On a 15-mile front, they controlled a stretch three miles wide but only one mile deep. The British captured only three of the 13 villages considered crucial to the offensive. At no point were the British even close to the "battle" zone positions, nor did they control any higher ground.[19] Haig's reaction indicates his intent to achieve a breakthrough; the loss of 40,000 men was acceptable given his ultimate goal of regaining operational mobility.

The real tragedy lay in Haig's failure to end the operation and cut his losses.



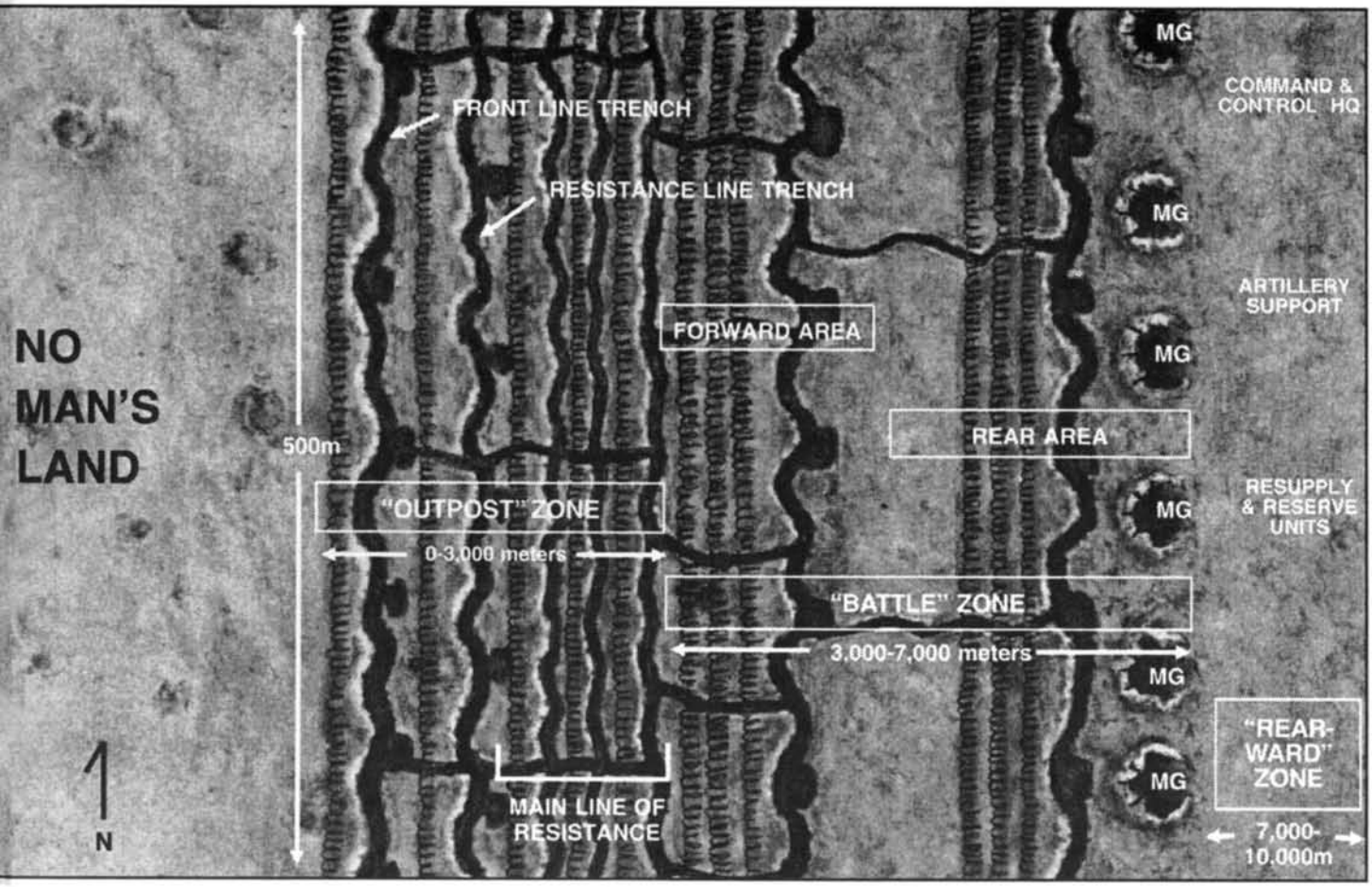
He had accomplished two limited goals, relieving pressure on Verdun and preventing German diversion of troops, but had failed to breach the enemy line and loose his cavalry divisions. The failure to achieve this third goal is attributable to the BEF's inability to overcome the battlefield stalemate via traditional tactics. His actions with regard to the newly-developed "machine gun destroyer" underscored his willingness to employ innovative measures in spite of political and military opposition.

Ernest Swinton, generally acknowledged as the inventor of the tank, had met Haig in April 1916 where they discussed operational recommendations for the tanks. In response to Swinton's statement that August was the earliest that tanks would be available in large numbers, Haig replied that was too late — he said fifty were urgently required by the first of June.[20] Swinton mistook Haig's interest as general agreement with his principle of employing tanks in mass: "I was much relieved that the two senior officers in France...were in accord with my ideas. It implied that they approved the policy of not employing tanks in driblets...."[21]

After the July disaster, Haig felt pressure to regain momentum. "Even if I do not get as many [tanks] as I hope," he wrote to General F.N. Robertson, Chief Inspector General of the BEF, "I shall use what I have got, as I cannot wait any longer for them...."[22] An August letter from the Ministry of Munitions advised him that accessories for the tanks [weapons] would not be delivered until September 1: "This is disappointing," he wrote, "as I have been looking forward to obtaining decisive results from the use of these tanks at an early date."[23] By early September, 59 tanks arrived in France and Haig assigned them to Rawlinson.

On September 11, Haig visited Rawlinson, and among the things they discussed was the "necessity for advancing quickly so as to take full advantage" of the tanks.[24] Rawlinson expected the tanks to assist in capturing tactically important villages, reduce the overall number of casualties, and maintain the momentum of the assault.[25] His plan to have the tanks precede the infantry resulted in an immediate conflict between the infantry and the artillery. The experiences of July and August demonstrated that the traditional creeping barrage advanced too rapidly and was of insufficient density to suppress the defense. To correct this problem, Rawlinson's artillery commanders slowed the rate of advance to fifty yards per minute while increasing the rate of fire to three rounds per gun per minute.[26] However, this revision resulted in a series of maneuver problems.

Put simply, the artillery could not fire the creeping barrage in support of the infantry assault without hitting the tanks. Without the barrage, the infantry would be exposed to defenders. Rawlinson's solution was to group the vehicles and create assault corridors through the barrage; however, these movement corridors compounded the problems. Since the tanks could engage targets only within range of their weapons, any strongpoint beyond that range but still within the corridor would engage the infantry. The tanks' relatively slow speed (less than four miles per hour) made it likely that the infantry would outrun the tanks. Rawlinson's plan denied several infantry units the established support of the creeping barrage and replaced it "with a vulnerable substitute of doubtful efficacy."[27]



The reduced artillery protection was just one of several concerns cited by tank advocates. Churchill protested the "exposure [of] this tremendous secret to the enemy upon such a petty scale and as a mere makeweight to what I was sure could only be an indecisive operation...."[28] Lloyd George disagreed with Haig's decision to throw "a few specimen machines into the fight without waiting until a sufficient number had been manufactured...."[29] Swinton opposed the tanks' employment on the grounds that: Haig had too few tanks available; the shell-torn battlefield would hinder tank movement; Rawlinson's piecemeal allocation negated the tanks' mass assault capability; and the premature disclosure of the tanks would result in the overall loss of surprise.

Despite these valid objections, Haig stood firm. He needed to regain operational mobility, and traditional tactics had proven incapable of achieving that goal.

On September 12, the British began a preparatory barrage. The artillery fired 828,000 shells [weighing over 30,000,000 pounds], with emphasis on the destruction of the trenches in the "outpost" and "battle" zones.[30] Three days later, the assault kicked off, and by the end of the first day's maneuver the British had achieved several minor tactical objectives. The "outpost" zone line was captured on a front of 9,000 yards, while the "battle" zone line was in British hands for a distance of 4,000 yards. Several German strongpoints were finally neutralized after two months of fighting, and British troops held positions affording good observation of the "rearward" zone.

Despite these gains, the introduction of the tank on September 15 did not have a significant impact on the strategic situation. Out of the 59 tanks that arrived in France before the battle, 49 reached the staging areas. Of that number, only 35 reached their assigned starting points; the rest were lost to mechanical difficulties. Thirty-one tanks actually assaulted into "No Man's Land," but only nine maintained momentum and crossed over the "outpost" zone.[31] The remainder fell victim to Swinton's fears: poor crew training, inadequate logistical support, unsuitable terrain, mechanical breakdowns, and combat losses.[32] The principal contribution made by the tanks was to raise considerably the morale of the British troops. One soldier recounted his impression of one of the tanks, designated D16:

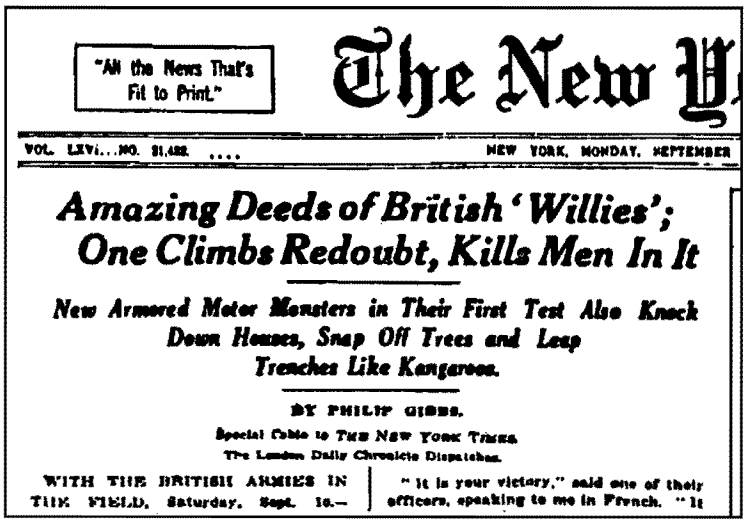
Wounded? Who cares about being wounded? There was that old D16, groaning and grumbling along, poking her big nose here and there. She stopped now and then as if unsure of the road, then plunged on over everything. I can still see her great big head, coughing like a hippo. But the best of it was how the Tommies went on, following her — actually cheering! There hasn't been anything like her in this bloody war before. Let's have more of them, I say.[33]

Lieutenant Frederick Palmer wrote: "No more thrilling message was ever brought than that which said that a tank was 'walking' up the main street of Flers, surrounded by cheering British soldiers, who were in possession of the village."[34] He summarized the infantry's attitude by saying:

"Leave it to me!" was the unspoken message communicated to the infantry by the sight of that careening, dipping, clambering, steel body as it rumbled towards a [machine gun post]. *And the*

infantry, as it saw the tanks' machine guns blazing, left it to the tank... confident that no enemy would be left behind to fire into their backs.[35]

Churchill recalled conversations with soldiers who related that, whenever a tank approached a strongpoint, "the sight of it was enough, and the astounded Germans forthwith fled or yielded."[36] He and Palmer were convinced that the tanks saved British lives. Palmer, in particular, estimated that they saved twenty-five thousand casualties, which would have been the additional cost of gaining the ground by unassisted infantry action.[37]



"All the News That's Fit to Print."

The New Y

VOL. LXVI...NO. 21,482 .... NEW YORK, MONDAY, SEPTEMBER

Amazing Deeds of British 'Willies'; One Climbs Redoubt, Kills Men In It

New Armored Motor Monsters in Their First Test Also Knock Down Houses, Snap Off Trees and Leap Trenches Like Kangaroos.

BY PHILIP GIBBS.

Special Cable to THE NEW YORK TIMES.
The London Daily Chronicle Dispatches.

WITH THE BRITISH ARMIES IN THE FIELD, Saturday, Sept. 15.— "It is your victory," said one of their officers, speaking to me in French. "It

N.Y. Times coverage of the first attack — "Willies" was a slang term for tanks.

Higher level opinions varied. Haig wrote: "Certainly, some of the tanks have done marvels and have enabled our attack to progress at a surprisingly fast pace."[38] He told Swinton, "Though the tanks had not achieved all that had been hoped, they had saved many lives and had fully justified themselves...."[39] Conversely, Lloyd George considered the decision to launch "the first handful of these machines on a comparatively local operation...to have been a foolish blunder."[40] He believed the premature introduction of the tank contrary to the views of those "who had first realized the need and had conceived it, fought for its adoption, designed it, produced it, and carried out the crew training."[41] Brigadier General Sir James Edmonds stated that "To divulge our new methods whilst attacking with insufficient means was to squander possibilities of surprise,... and the first effect of the tanks was thrown away on the Somme...."[42]

Churchill's assessment was blunt: "To achieve this miniature success...," he wrote, "a secret of war which, well used, would have procured a world-shaking victory in 1917 had been recklessly revealed to the enemy."[43] Swinton considered the operation an "error of judgment by reason of the gulf which lay between the utmost that could have been achieved then and what might have been gained by waiting."[44] Despite these criticisms, the fact remains that Haig was faced with an operational problem and employed tanks in the effort to regain momentum.

For the next 14 months, the BEF employed tanks strictly as infantry assault weapons. Only a few tank advocates, like J.F.C. Fuller, worked towards expanding their tactical role. Major Fuller began a comprehensive study of tanks and their employment as part of his duties as the primary staff officer of the BEF Tank Detachment. In February 1917, he published a training manual designed to standardize training practices in the detachment.[45] Calling the tanks "a mobile fortress, which could escort the infantry into the enemy's defenses, and from behind which they could sally forth and clean up his trenches,"[46] Fuller believed that tanks were capable of more than infantry support actions.

Fuller expanded Swinton's theoretical concepts, and "...soon became the leading advocate," wrote Basil Liddell Hart, "of the tank's wider potentialities — as a means to revive mobile warfare, instead of merely as a modernized 'battering ram' for breaking into entrenched defenses."[47] Early in 1917, Fuller proposed a limited raid operation to test his ideas; after several revisions, GHQ approved the plans for the November 1917 Cambrai operation. This operational test represented a transition in the BEF's position concerning battlefield mobility. By relying on the tanks to execute the initial penetration and conduct machine-gun suppression, Fuller acknowledged Swinton's principles and the tanks' limited successes on the Somme. But by recognizing the potential for the tanks to penetrate to the "rearward" zone and set up a breakthrough, Fuller advocated a more offense-oriented role for the tanks. This increased role was mitigated by constraints on maneuverability, operational readiness, and the actual number of tanks available; Fuller recognized these constraints, and his final Cambrai plan relied on the cavalry to break through the "rearward" zone in the hopes of setting up a breakout.

On November 20, 1917, the British artillery commenced a suppressive barrage along a six-mile wide front near Cambrai. Unlike previous preparatory barrages, this 45-minute barrage was predominantly smoke and high explosive. The obstacle reduction mission was given to the tanks, while the artillery concentrated on suppressing the defenders' artillery and masking the advance. After less than one hour, the artillery began the creeping barrage and 476 tanks led six infantry divisions forward. The absence of a traditional preparatory bombardment contributed to the defenders' surprise and to the success of the tanks in breaching the first defensive lines.

The opening stages of the attack were successful. Masked by smoke and the creeping barrage, the tanks tore holes through the wire obstacles and filled in ditches with wood fascines. Less than two hours after the attack began, the British captured the Hindenburg Main Line along a six-mile front. By 1130, the Hindenburg Support Line, with the exception of the ridge at Flesquieres, was in British hands as well. Completely outdone by the rapidity of the operation, the Germans were unable to reinforce the line and the defense cracked. By the end of the day, the British had penetrated to a depth of four miles and captured over 5,000 prisoners, all gained at the relatively low cost of just over 4,000 casualties.[48] The first day's operation demonstrated the effects of coordinated tank, infantry, and artillery tactics over suitable terrain; it also outlined the need for the BEF to plan for success and incorporate rear-area exploitation missions in future battle analyses.

Several contemporaries marked November 20, 1917, as a landmark in the history of warfare. Lloyd George later said that the battle "will go down to

history as one of the epoch-making events of the war, marking the beginning of a new era in mechanized warfare."[49] Haig credited the use of tanks at Cambrai with making it possible "to dispense with artillery preparation, and so to conceal our intentions from the enemy up to the actual moment of attack."[50] He later credited the tanks' penetration of the Hindenburg Line with having "a most inspiring moral effect on the armies I command... the great value of the tanks in the offensive has been conclusively proved."[51] And Swinton, not surprisingly, claimed some credit for the success of November 20th. "It has an added interest," he wrote, "in that it was upon the lines here laid down [reference made to his February 1916 'Notes on the Employment of Tanks.'] that the epoch-making Battle of Cambrai was fought...."[52]

Of course, Haig is responsible for the lack of orchestration of power to exploit the initial success of November 20, 1917. He took what Fuller had designed as a raid and made the operation into much more. By the same token, much of the credit for the success of the Cambrai operation must also go to Haig and his decision to commit the tanks earlier in 1916. The tanks' performance at Cambrai proved their value as an infantry support weapon and machine gun destroyer. The Somme tank operation provided invaluable information regarding tank potential, employment restrictions, practical mechanical operating procedures, and doctrinal considerations. Subsequent developments in British WWI tactics were based not only on increased tank production but also on revisions in the traditional mentality with regard to the relationship between the infantry, cavalry, artillery, and tanks. Without the experience gained as a result of Haig's decision to employ tanks in September 1916, it is highly unlikely that the Cambrai operation would have produced such dramatic tactical results.

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[48]Boraston, p. 157; see also Wilson, p. 490.

[49]D. Lloyd George, p. 102.

[50]Boraston, p. 157.

[51]*Ibid.*, p. 173.

[52]Swinton, *Eyewitness...*, pp. 171-172.

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Ignorance about the MILES system
Denies many good crews
The reward of a kill...

Making MILES Work For You

by Captain James W. Schirmer

After days of careful preparation and planning, the moment of truth finally arrives. The OPFOR enters the engagement area; the gunner carefully lays the reticle on center mass and squeezes off a round. Nothing happens. He reengages, and again, nothing happens. Within seconds, his own belt is hit, and the battle for his crew has ended. Contrary to popular belief, stories like this one are usually not the result of faulty equipment, but the result of a crew that does not understand how the Multiple Integrated Laser Engagement System (MILES) works, and how to make it work for them. Every tank commander and gunner who has ever trained with MILES can tell you a similar story about frustration during a simulated battle.

Making soldiers understand MILES and how to use it is important for three reasons. First, it is important that armor soldiers trust their equipment. Second, in order to maximize the value of training, leaders must level the playing field. If both OPFOR and BLUEFOR utilize the system equally well, the side with the best planning, preparation, and execution will usually win. This helps to reinforce the lessons at the after-action review. Soldiers who undergo an experience like the one described above, are likely to tune out the OC and blame their defeat on MILES. Lastly, many units, and even the U.S. Army as a whole, take data from battles using MILES and at least partially base important decisions on them. For example — switching to the 10-Humvee scout platoon was a decision based heavily on data collected from force-on-force battles at the NTC.[1] Improper use of MILES gear can skew the results of battles and generate misleading data and false lessons.

The purpose of this article is to examine seven major sources of error that specifically affect first-round kill probability with MILES and to suggest techniques for eliminating or reducing those sources:

- System parallax
- Boresight confirmation
- Gunner's parallax during boresighting
- Transmitter movement after boresighting
- Dirty lenses/gun tube obstructions
- Transmitter output
- Transmitter/telescope alignment

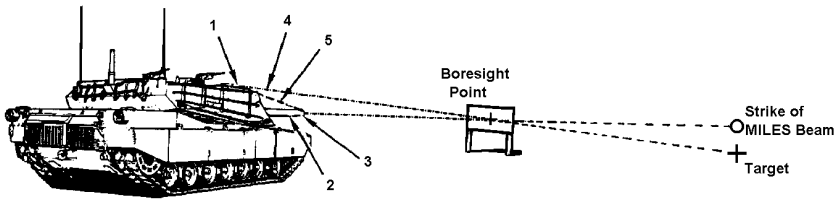
System Parallax. The most important error is the fixed bias known as parallax. This results from the difference between the line from the sight to the target and the Gun-Target line. If the gun is boresighted at 1,000 meters and the reticle is laid on a target at 2,000 meters, the gun is no longer pointing at exactly the same point. The greater the difference between boresight range and engagement range, the more pronounced the error. The following table shows the significant errors that occur based upon different boresighting and engagement ranges. The numbers in the boxes are the distances (in meters up, left, right, or down) from where the reticle is laid to where the MILES beam will strike.[2] The sketch should help you to visualize system parallax.

Most units use one of two methods to correct for system parallax. Many units (to include the OPFOR) boresight at the maximum effective range of the transmitter. The chart below shows that boresighting at longer ranges reduces the amount of error when engaging at close range, and since there is no point in engaging beyond the range of the weapon, there is very little error when shooting long-range targets.

The problem with boresighting at long ranges is that it is very difficult to see the boresight point through the 4X Bushnell rifle sight that is mounted on the M82 tank transmitter.[3] It is very easy to be a couple of mils off in any direction, an error that translates to four meters at maximum range and becomes greater when engaging closer targets. (Most units correct this error with boresight confirmation, which will be discussed below).

Boresight range/ Target range	500m	1000m	2000m
500m	0	.73L/.53D	2.19L/1.59D
1000m	.36R/.26U	0	.73L/.53D
2000m	.49R/.35U	.36R/.26U	0

Figure 1



The second method units employ (a method outlined in *ARMOR* in June 1992)[4] involves boresighting three sights (GPS, GAS, TIS) at three different ranges (usually 500, 1,000, and 2,000) and using whichever sight is closest to the engagement range. This system is not only time-consuming, it can also be difficult to use since the gunner must quickly estimate the range to the target and then remember which sight is closest to that range and rapidly perform the switchology. Furthermore, if a gunner prefers TIS, which he should since it is his primary sight, he must live without it during two of the three engagement ranges. This goes against our train-as-you-fight doctrine.

Both methods are based on the myth that MILES completely bypasses the tank's computer. In fact, with Ammo Subdes 59 entered into the computer control panel (CCP), the ballistic computer will compensate for system parallax, even though it ignores the automatic inputs, manual inputs, and the firing tables. To prove it to unbelievers, boresight at 300 meters with 59 entered into the CCP. Place your hand on the breech and index 2,000 meters.[5] You'll feel the gun move noticeably. This capability gives the M1 tanker a noticeable advantage over his Krasnovian counterpart. He can boresight at 300m where he can see better through the transmitter and ensure an accurate boresight. During an engagement, all he has to do is enter the proper range to the target and let the computer do the math.

With an Eyesafe Laser Filter (ELF) installed, the gunner can utilize the LRF to obtain a correct range to the target. This is the preferred method because it allows the gunner to train using procedures that more closely approximate live fire. If an ELF is unavailable, the platoon leader or platoon sergeant should conduct his own IPB to determine the most likely ranges at which they will encounter the enemy. For example, the platoon leader determines that he will most likely encounter the enemy at 2,000 meters. His platoon crosses the LD with this range indexed. In the event that they must react to an ambush at close ranges, he directs that 500m be entered as the battlesight range for sabot. Looking at the situational template, he realizes that he may be engaged by a Command Surveillance Observation Post (CSOP) at 900 meters as his platoon enters a chokepoint. He directs that 900m be the battlesight range for HEAT and adds a point into coordinating instructions. If ambushed at close range, his TCs simply hit the battlesight button and return fire. As the platoon's tanks approach the chokepoint, the gunners automatically enter battlesight for HEAT and are ready for the CSOP.

Boresight Confirmation. As mentioned above, most units confirm their boresights by firing at the belts of another vehicle to confirm that they can kill it. The problem is that a MILES kill does not necessarily indicate that the boresight was accurate. To understand why, you must know a little more about how MILES works. The MILES laser beam is emitted in a cone that gradually spreads out. The cone is somewhat elliptical (wider than it is tall). As the laser spreads out, there is less laser energy per square inch. When it hits the transmitters on another vehicle, several things happen. First of all, each sensor requires a minimum threshold of energy to set it off. Since all of the sensors on a belt are hooked up in series, if enough total energy hits the sensors, it has the same effect as enough energy striking only one sensor. Getting enough energy to hit the sensors determines a hit.

An easy way to think about the transmitter energy is to imagine it as a number of "words." When the tank transmitter fires, it sends out three pulses of energy. In the first burst, it sends out eight kill words. For each two kill words that strike the target's sensor belt, a hit has been scored. For each hit, the control console in the target vehicle will "roll the dice" to determine whether or not it has been "killed." If all eight kill words hit, the target will roll four times. If only one kill word strikes the sensors, the console will record a near-miss and the Combat Vehicle Kill Indicator (CVKI) light will blink once.

In the second burst, it sends out 120 — "vehicle near-miss." The near-miss pulse has over 17 times more energy than the first pulse. If any one of those "words" strikes the sensor belt, the console will record a near-miss and blink the light. The third pulse contains "man-kill" words that are intended to set off the individual MILES harnesses of exposed crewmen. The obvious conclusion is that it is very easy to get a near-miss, but very difficult to kill.[6]

At three thousand meters, the beam's footprint is intended to be approximately the size of a standard threat tank turret.[7] For ease of calculation, we can say that the cone is approximately one half mil wide. Since the tank has multiple sensors, the last sensor might be hit by the outer edge of the laser cone while the gunner lays center mass. If a company confirms their boresight on a stationary M1 with its flank exposed at 1,000 meters, it is possible to score a kill *even if the boresight is off by two mils*. This error becomes much more pronounced at greater ranges because, although the laser cone gets wider, the center of that cone, where the energy density is great enough to score a kill, gets smaller.

One way to reduce this error is to have the confirmation tank cover all but one sensor, possibly placing a

"...Another common source of error is transmitter movement. Because the transmitter does not always seat tightly in the breech, traveling over rough terrain often causes it to move, and the tank loses boresight...."

white sheet of paper behind the uncovered sensor to give the gunner a better target. While still not perfect, a hit at least guarantees that the boresight is within the footprint of the killing part of the laser beam. To come closer to perfection, a unit could construct a wooden boresight panel with Velcro placed at each of the four corners and one in the center. Using five LTIDS, which could be borrowed from TASC, one sensor from each belt is placed on each of the Velcro patches. The master gunner then monitors the "thumpers" and relays via radio to the gunner which portion of the panel he has hit. When only the center sensor is set off, then the boresight is truly confirmed. Another method might be to simply mount the sensors in the same pattern on a HMMWV. Then the company commander would possess a mobile boresight panel with built-in radio communications.

The best method is to use one of the boresight panels actually produced by LORAL. This boresight panel will generate data on a laser hit that will indicate where the gunner needs to adjust in order to center the beam on the panel. However, these panels are limited in number and are currently available only at the CTCs.

Gunner's Parallax. Unlike system parallax, gunner's parallax is not a fixed bias that can be compensated for by the computer. It occurs during boresighting when looking down the telescopic sight on the MILES transmitter. If the gunner's eye is not aligned exactly on the transmitter-target axis, the gun may not be properly aligned and an inaccurate boresight will be entered into the computer. For example, suppose the telescope is roughly 15cm (6 inches) long and, because of its location in the breech, it is difficult to get one's eye closer than 10cm (4 inches) to the near side. If a gunner boresights on a target at 1,000 meters and his pupil is just one millimeter (1/25 inch) above the reticle-target axis, the image of the target will appear four meters lower than it really is, causing him to elevate the gun well above the target.

Boresighting at closer ranges does not reduce the magnitude of the effect because it is based on angle — if the above example were conducted at 300m instead of 1,000, the error would be only 1.2m, but it would still be 4 mils at any range. Boresight confirmation as discussed in the paragraph above will eliminate the problem altogether. Another possible solution would be to construct a parallax shield for the transmitter similar to the one some tank gunners used during Canadian Army Trophy gunnery competitions in the 1980s. The parallax shield is simply a metal plate that fits over the GPS eyepiece (it looks like a small aft-cap) with a pinhole in the center of the plate. Because of the pinhole, the gunner can only see the reticle if he looks dead center down the reticle axis. Modified for the MILES transmitter, this would be a sort of extension tube that would fit tightly over the telescope with a pinhole placed dead center on the face. Only when looking straight down the reticle-target axis would enough light be present to allow boresighting.

Transmitter Movement. Another common source of error is transmitter movement. Because the transmitter does not always seat tightly in the breech, traveling over rough terrain often causes it to move, and the tank loses boresight. To combat this, crews need to make every effort to ensure that the transmitter fits snugly into the breech. Some crews wedge pieces of cardboard between the transmitter and the breech. SSG Barner of the Special Forces developed a means of mounting the transmitter on a 120-mm aft cap that fits very snugly into the gun tube.[8] The commander should also attempt to reboresight his company as close as possible to the actual point of expected contact. In the defense, tanks should boresight during the last available light prior to defending and attempt to minimize movement. If there is sufficient time between BMNT and first contact, the company should begin reboresighting. In the offense, it is more difficult since the attack position is often twenty or more kilometers away from the objective and movement usually begins before light. In either case, the crew can check their boresight by laying the reticle on a close target and indexing the range. Since closer targets are easier to see, it is easier to confirm the lay of the transmitter when looking through the telescopic sight. **Caution** — Never boresight or check boresight at less than two hundred meters because the computer does not compensate for parallax inside this range (or beyond 4,000).[9]

Dirty lenses/gun tube obstructions. Many tankers fail to destroy their targets because their laser beam does not reach the enemy's sensor belt with enough power to set off the detector. The number one cause of this is dirty transmitter lenses. A good crew should clean its lenses before each boresighting to take care of particles that came in through the breech and down the tube. It is also wise to take a look through the transmitter scope just before contact is expected. It is a good way to tell if the transmitter has moved since the last boresight, or if mud or leaves entered the barrel.

Transmitter output. As time and rough handling accumulate, some transmitters will inevitably go bad. In many cases, the transmitter will still function, but only at a reduced power output that greatly reduces its effective range. This is a difficult situation because such a transmitter will pass simple tests like holding a man-harness at the end of the barrel to see if it can kill. It may even kill at 400 meters and thus deceive the crew into believing that it is fully functional. Each LORAL (the contractor that manages maintenance of the MILES) site has a calibrated radiometer that they can use to test the output of the transmitter. If it does not meet the minimum standard (which translates roughly to killing at 3,000-3,500 meters) then it is repaired or replaced. Unfortunately, not every site regularly performs such services on its equipment. This test is normally initiated if a crew reports trouble with the transmitter in the field.

"...A unit that knows how to use MILES to its fullest potential will benefit from more realistic training. Any tank crew that reaches a point in the battle where they have a clean shot at an enemy vehicle should be rewarded with a kill...."

This brings up an interesting point, especially when one considers that the MILES I equipment exceeded its projected lifetime five years ago and that there is probably no MILES in the Army inventory that is as beat up as the sets at Fort Irwin and other CTCs. (It's also safe to say that the worst ones are not mounted on Sheridans!) One brigade from Fort Stewart that rotated through the NTC in the early '90s paid to bring its home station LORAL contact team with them to test MILES transmitters in the Dust Bowl to ensure that they could kill OPFOR vehicles. In one of the two task force draws, the team identified and repaired 16 vehicle sets (an astonishing 25 percent of combat power) that otherwise would have rolled into the training area unarmed.[10] This demonstrates that command emphasis on the MILES draw can be helpful to units going to the CTCs. Not every unit can afford to pay for civilian TDY, but they can take steps to protect themselves. After carefully boresighting newly drawn equipment, the unit should ensure that each transmitter can kill at extended ranges and swap out those transmitters that do not meet the standard. If resources permit, a unit could also bring MILES from its homestation warehouse (tested for free by their own contact team at home) to replace or supplement equipment drawn at the training site.

Additionally, during MILES draw, each crew should determine at what range their particular transmitter can kill. This can be done by sending a vehicle out with a green key and having the company fire at it on line at progressively greater ranges until no one can kill the vehicle. Each crew then records its maximum range (preferably on a laminated card in the gunner's station). Each leader in the chain of command should know what these ranges are because, more than likely, they will vary enough that they may affect fire planning and position selection in the defense.

Transmitter/telescope alignment. The telescope that is part of the M82 tank transmitter is a standard Bushnell 4X rifle sight. Like most rifle sights, it has two covered knobs to allow the user to adjust the reticle in azimuth and elevation during zeroing. LORAL places each transmitter on a special alignment device and adjusts the knobs so that the axis of the reticle and the center of the laser beam are aligned to be perfectly parallel. This is crucial for boresighting. Mr. Steven Dickert, the LORAL site manager at Fort Knox, stated that the number one cause of "defective" transmitters turned in to him were ignorant crews using the knobs to adjust the reticle. After realignment, the knobs are sealed back on with RTV rubber. Whenever drawing MILES, leaders should immediately check to make certain that this seal is not broken and ensure that all of their soldiers know not to tamper with the knobs.

A unit that knows how to use MILES to its fullest potential will benefit from more realistic training. Any tank crew that reaches a point in the battle where they have a clean shot at an enemy vehicle should be rewarded with a kill. Similarly, any crew that exposes themselves to the enemy for too long should suffer the agony of defeat. We cannot allow MILES ignorance to skew the outcome of our training exercises. Like many problems in the Army, the answer to this one is also training. Too often, MILES training begins and ends with mounting the equipment. Commanders who ensure that their troops know the details will reap great benefits.

Notes

[1]"Applying the National Training Center Experience: Tactical Reconnaissance." Rand Corporation Study, 1987. Data collected by the Rand Corporation over the course of several rotations and published in this study pointed to the need for a stealthier scout platoon with more platforms.

[2]The problem can best be visualized by drawing sets of right triangles, the hypotenuse being the gun-target line, the base being the distance between the gun and the sight, and the third side the line of sight from the doghouse to the target. The sight is .73m right and .53m higher than the gun bore.

[3]TM 9-1265-373-10-1, *Operator's Manual for MILES Simulator System, Firing, Laser: M82 for M1/M1A1 Abrams Tank.*

[4]"MILES Rules the Battlefield," by SFC Richard S. Francis, *ARMOR*, May-June 1992, pp. 42-43.

[5]Much of this data is based on experiments conducted in an LTA by A/2-64 Armor in the summer of 1992.

[6]Information concerning sensor threshold, kill words, and control box probability calculation came from a phone interview with Mr. Larry Tiller, manager of the LORAL engineering site at Pomona, Calif.

[7]From an interview with Mr. Steven J. Dickert, Ft. Knox LORAL Site Manager, 24 April 1995.

[8]"MILES Warfare with the Yugoslavian M84 Tank and the Russian BMP-2," SSG Earl Barner and CW2 Bryan Hinkel, *ARMOR*, Nov-Dec 1994.

[9]TM 9-2350-264-10-1, p. 2-292.

[10]*The Determinants of Effective Performance of Combat Units at the National Training Center*, Army Research Institute, MDA903-86-R-0705, June 1992, p. 2-34.

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The Need for Long-Range Gunnery

- PHOTO: Spec. Charlie Meador

During the Gulf War, many gunners did what they were never trained to do, successfully engaging targets at ranges 50 percent greater than they encountered in training.

In fact, half of all KE shots were at ranges exceeding the typical maximum encountered in training.

Isn't it time to train for this?

by Major Paul D. Smith

One of the many lessons learned from DESERT STORM was our ability to engage and hit targets at ranges well beyond what is currently in our gunnery tables. The purpose of this article is to raise the long-range gunnery issue and to determine if we need to begin to train long-range gunnery.

Crews frequently engaged at ranges greater than 3,000 meters. "After-action reviews disclosed the median range of kinetic energy (KE) engagements was 2,170 meters. Additionally, 50 percent of all KE shots were between 2,000 and 3,000 meters. Currently most training engagements are 2,000 meters or less."[1]

These facts highlight the need to correct a gap in our current training ammunition, as compared to our service ammunition. They also highlight a training deficiency — currently, we do not train any long-range gunnery skills to any of our crews, let alone our best crews. This deficiency needs to be corrected if we are to train as we fight. Long-range gunnery is an art we need to practice and perfect before we go to war.

On 29 June 1994, Albert H. Pomey (ORSA), 5/16 Cav at Ft. Knox published a study that reveals some very interesting facts about long-range gunnery. The principal conclusions of the study were:

- The upper limit for a stationary M1A1 firing M865PIP against stationary frontal tank targets is 2,000 meters.
- The upper limit for a stationary M1A1 firing M865PIP against constant-velocity, full-size, moving targets is 2,500 meters.
- Firing stationary engagements with the fire control system in emergency mode does not improve accuracy, compared to firing in normal mode.
- The 1/2-target-form adjustment improves accuracy only slightly using M865PIP ammunition at 2,680 meters.
- A more accurate training round, with an improved tracer, is needed to train long-range gunnery. As the study indicates, before we can begin to train in long-range gunnery, we need a round that will support this.

Even the U.S. Army Armor School (USAARMS) pamphlet, *Long-Range Gunnery*, which was developed for our forces deployed in South West Asia (SWA), cited a need for a long-range shooter. In the pamphlet two important points were raised.

- A "sniper tank" concept for firing at extended ranges, meaning 3,000 meters and beyond.
- A firing tank with a dedicated sensing tank can improve accuracy at extended ranges by using 1/2-target adjustments following a miss. If the USAARMS can establish a need for a long-range shooter during a time of war, why don't we train for this now?

Our current gunnery doctrine also needs to change to support the long-range gunnery concept. Currently it supports engagements at closer ranges because we have greater chance of success at ranges of 1,500 to 2,000 meters, depending on the tactical situation. However, there may be situations where a crew can engage at extended ranges of 3,000 to 4,000 meters in support of a tactical situation. If we haven't trained some "sniper" crews to accomplish this difficult task, we are asking for failure.

As we know, commanders will have to carefully select the sniper tanks. Here are some criteria on which to measure selection of crews:

- Past gunnery performance, along with the crew's gunnery accuracy.
- The crew's ability to thoroughly understand the fire control system and its operation.
- The crew must have the knowledge and discipline to perform meticulous prepare-to-fire checks, as well as boresighting.

Because the kinetic training energy round (M865PIP) was designed to lose its velocity quickly, and velocity loss degrades accuracy, we are unable to train on long-range gunnery with our current rounds.

A successful long-range gunnery will mainly depend on three items:

- Reticle lay
- Sight-to-target relationship
- Sensing.

Sensings are critical to a successful long-range engagement. Members of the firing crew may be able to sense their own rounds. However, there will be times when this is not possible because of battlefield obscuration and weather, when long-range gunnery sensings will have to come from the wingman or another sensing tank. "Because of the effects of shimmer and refraction, elements conducting long-range engagements should seek an elevated firing position. Usually, ten meters of elevation will negate the effects of refraction and help reduce the amount of heat shimmer."[2]

The tank crewmen on the sensing tank must understand the fire plan to ensure they are sensing the correct target. They must be disciplined and trained to look at the target without being influenced by other rounds and tracers in the target area. Most importantly, the sensing tank must be able to give a quick, clear, and precise sensing. As we know, sensings are not easily performed, and require a great deal of training to be performed correctly. They are difficult for the sensing tank, let alone the firing tank. The time to practice these tasks is not when we are issued service ammunition and rolling out the gate.

The sight picture the gunner takes up must be meticulously center of mass. Once the round is fired, the gunner must maintain the sight picture, attempting to sense his own round and making a mental note of the strike of the round. "At extended ranges, it may require more than one hit to achieve the desired effect on the target. In case of a first-round hit, the crew should reengage using the same sight picture."[3] The laser rangefinder return is also critical at extended ranges, where "either all, or a large portion, of the target will be inside the GPS one-mil aiming circle. At those ranges, LRF beam divergence will spill over the target, giving incorrect returns. If the line of sight of the firing vehicle is obstructed, first return logic should be used."[4] If the gunner has laid on the target correctly and missed, he could make a 1/2-target-form adjustment based on the sensing received. However, the Fort Knox study cited in the notes has indicated that there may be no benefit to making sight adjustments after a sensed miss. This is because most misses are due to round-to-round dispersion, and sight corrections will not correct this problem.

Because the kinetic training energy round (M865PIP) was designed to lose its velocity quickly, and velocity loss degrades accuracy, we are unable to train on long-range gunnery with our current rounds. I feel we need to modify an existing round to enable our crews to engage a target at 3,000 meters with a probability of hit of 50 percent or greater.

Let's talk about three of the methods of calibration that can be used — fleet zero, one-time zero, and multi-occasion zero. In Ft. Knox's *Long Range Gunnery Test Results*, dated 29 June 1994, the zeroing methods were evaluated with the following results using 865PIP:

- The fleet zero method only had a hit ratio of .35 at 2,680 meters and a even worse hit ratio of .02 at 3,450 meters. As one can tell, the fleet zero method is very ineffective for long-range gunnery, considering that the training goal is to give the crew at least a 70 percent chance of hitting a target with up to two rounds. With this in mind, the probability of hit must be about .50.
- The one-time zero performed better, with a hit ratio of .73 at 2,670 meters, but dropped off dramatically at 3,450 meters to .08. The Ft. Knox study indicates that the large drop-off could be attributed to the limited number of tanks and rounds fired: "If we fired more tanks and more rounds, it is probable the 2,680 meter hit ratio would have decreased, while the 3,450 meter hit ratio would have increased."[5]
- The multi-occasion zero was by far the best of the methods tested. The results show an increase in the hit ratios at both 2,680 meters with a hit ratio of .57, and 3,450 meters, with a hit ratio of .43. The drawback to the multi-occasion zero is that it requires a great deal more ammunition and range time. In the Ft. Knox test, the zero required five days on the range and 25 rounds per tank.

Long-range gunnery is an opportunity we are missing. It is a skill that needs to be trained in order to be mastered in a time of war. With the increase in the range of all other weapon systems, it is imperative that we expand the training envelope to improve the lethality of our tank system, as well as build our soldiers' confidence in the system. A greater stand-off range is critical to force protection. We all have used the sniper tank in that key hole position at the CTC; now we need to incorporate it in our gunnery program and formally recognize it.

Notes

[1]*Long-Range Gunnery Test Results*, by Albert Pomey, 29 June 1994, p. 2.

[2]*Long-Range Gunnery*, Ft. Knox, Ky., 29 Jan 1991, p. 2.

[3]Ibid.

[4]Ibid.

[5]Pomey, p. 8.

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Is It Time to Change Our Scoring System?

by Staff Sergeant Michael C. Tierney

Current gunnery scoring doctrine is based on a threat's ability to initiate a killing burst/shot at a BLUEFOR vehicle. This standard was adopted for tank crews in the early 1980s and for Bradley crews in 1994. It provides a like standard to score gunnery in the form of Point Calculation Worksheets (PCWs). This methodology proved to be an invaluable tool in training crews to defeat a threat, since it was based on estimates of a threat crew's ability to fully utilize its equipment. At the time it was devised, it was the most realistic way to score gunnery.

Since the standard's introduction, however, the U.S. Army has developed equipment and training methods that are far superior to that of the threat. With our vast array of simulation training, improved optics, and near-term digitization of the battlefield, which will provide near-real-time situational awareness, maybe it is time to look again at how we score gunnery.

This new methodology would be based on our equipment and our crews' ability to fully utilize the Abrams and Bradley platforms.

Since we have the best trained soldiers and best equipment in the world, it is time to see how we measure up. In order to level the playing field (scoring), we must include several factors for analysis.

We must eliminate what is known to master gunners as the "Bowling Alley Effect" or "Stacking Engagements." A prime example of the bowling alley effect occurs on Range 117 at Grafenwoehr. An example of stacking would be placing targets at minimum allowable ranges and with minimal lateral dispersion.

The data used for this analysis would come from 900 qualifying tank and Bradley engagement times for each of the ten tasks on the current Abrams and Bradley Table VIII. The sample could contain data from the major armor installations: 100 each from Korea, Fort Stewart, and Fort Carson; 300 from Fort Hood; 150 from USAREUR; and 50 each from Forts Riley, Lewis, and Benning. This size sample would take into account average current qualifying engagement times for each task found on Table VIII, thus maintaining the ability to defeat the threat as a minimal acceptable standard.

The 100 fastest engagement times would be eliminated from our sample of times. This will reduce the effect of unrealistic acquisition times caused by stacking presentations, i.e., targets presented directly in front of a crew, or the bowling alley effect. The current threat-based 70-point line would be used as the base of the scoring pyramid.

The remainder of the times would be placed into five groups (similar to a Physical Training Test). Each group would have a value of 5 points; this would establish a 95 point line based on actual crew performance. Under this system the most points a crew could earn for "pure" gunnery would be 95 points.

The final part of this system would be points awarded to crews that have achieved a minimum of 70 points on an engagement for properly performing the following:

- One point for crew duties, or safety violations.
- One point using proper engagement techniques (most dangerous first, Z-pattern on machine gun engagements, etc.).
- Three points for adhering to conditions of the firing task.

A crew could thus earn a maximum of 100 points for a flawless gunnery performance, which is the same as the current gunnery scoring system. The distinguished, superior, and qualified rating system for crews would remain unchanged.

The theory behind the current scoring system is to be able to defeat the threat. Currently, a crew can earn 70 points for killing the threat within the time standard, but could fail the engagement by using an improper fire command and being assessed a 5 point crew cut. The crew would have a resulting failing score of 65. On the battlefield, the crew would have won; on the range, it would lose. The crew might have to fire the engagement again if it is necessary to obtain qualification. This results in additional range time and ammunition expenditure. Soldiers can be trained on fire commands in the UCOFT, a classroom, or another simulation or training event.

The Army has to train smart. The proposed scoring system would allow the Army to train soldiers to:

- Defeat the threat
- Concentrate on battle focus (steel on target) vs. crew duties
- Give commanders a tool to evaluate their crews against the top crews in the Army.

This system will not administratively fail a crew on an engagement, and will allow a higher percentage of crews to qualify Q1, while maintaining our current standard, and while still evaluating all gunnery areas. As an added benefit, we could realize a cost savings on ammunition, range operations, and OPTEMPO.

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Master Gunners — 20 Years Later

by Master Sergeant Wakeland K. Kuamoo

"Hey there, super tankers, how did you shoot last night?"

"We had all kinds of problems: Rangefinder went out, couldn't identify all the targets, machine guns kept stopping, forgot some of our crew duties.... Looks like we'll have to make another run. Just call us the tough-luck kids."

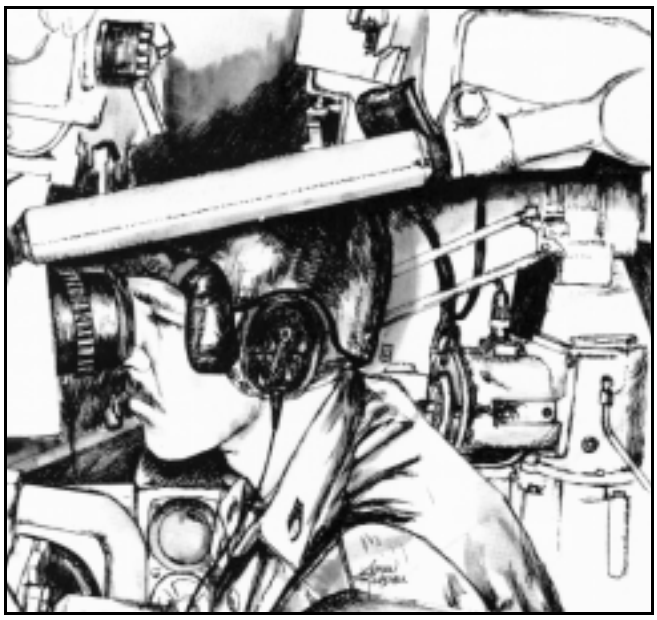
Conversations like this have taken place for many years, everywhere tankers train. At the end of many of these conversations, the commander yells, "Find the master gunner. Now!"

Who is this super tanker that people refer to as the master gunner? Where did he come from, and what is he all about?

To answer this question, we take you back to early 1974 and the beginning of the Master Gunner Course. At this time, many of the Army's leaders were looking over some of the lessons learned from the Middle East wars. An overview of these lessons showed that armor played a decisive role in many battles. Firing fast with deadly accuracy determined life instead of death for tankers and victory instead of defeat for the Army. Our Army's leaders decided that armor crewmen must possess a high degree of gunnery skills if we were to be victorious in future tank battles. A team of senior staff officers from the United States Army Armor School (USAARMS) worked to develop the master gunner concept.

Once this concept was developed, it was briefed to commanders in the field, who were then asked for their opinions. The response was very positive. The United States Army Training and Doctrine Command (TRADOC) then tasked USAARMS to develop a program of instruction (POI) for a Master Gunner Course. This POI used a three-prong approach, focusing on turret maintenance training, advanced gunnery training, and gunnery training management.

In April 1974, the U.S. Army Chief of Staff approved the concept for the master gunner program. The Armor School was directed to conduct a Master Gunner Course for the M60A1, M60A2, and the M551 Sheridan. In 1975, the first pilot Master Gunner Course was successfully conducted. In February 1976, based largely on comments from unit commanders and the successful conduct of the pilot courses, Department of the Army approved the Master Gunner Course for full-resident training.



Over the years, as our tank systems and gunnery doctrine evolved, the Master Gunner Course, and ultimately the master gunner, also evolved. Everyone thought the M60A2 was the hottest tank on the market until the M60A3 appeared. Then the real gift from above came to the tanker in the early '80s with the introduction of the M1 Abrams tank. Familiar terms such as infrared (IR), ballistic computers, and ballistic drives changed to RAM (random access memory) and ROM (read-only memory). The Abrams tank is lethal and very quick, and the firing accuracy of the M1 and M1A1 is incredible.

In the early days, master gunners complained about the infrared M36 sight not working properly. With the M60A3 came the tank thermal sight (TTS) and the laser rangefinder (LRF). Crewmen shooting the M60A1 on a tank range next to M60A3s were always jealous, especially during bad weather. The M60A1 guys had to wait until they could see through the bad weather; the M60A3 guys just kept shooting. By the time M60A1 crewmen were finished shooting, the M60A3 guys were long gone to the rear. Yeah, we hated them.

The M73 and M219 coaxial machine guns were probably worse than the M36 sight. Many a master gunner prayed to the big "tanker in the sky" to give him a machine gun that would shoot at least a couple of rounds before experiencing a stoppage. At times, a master gunner cheered so loudly you believed he had won a big lottery. But if you listened more closely, you realized he was cheering about a crew who completed a machine gun engagement without a stoppage.

The M85 caliber .50 machine gun for the tank commander on the M60-series

Twenty Years of Master Gunner Training — 1975-1995

1975-1988	1975-1979	1975-1978	1982-Present	1982-Present	1988-Present	1994 -Present
M60A1	M60A2	M551	M60A3	M1	M1A1	M1A2

tank was a fairly decent firing weapon. But every now and then you could hear a master gunner working on the weapon yell, "Jesus"! You might have believed a major disaster had just taken place. Once again, closer observation revealed that the master gunner just dropped the bolt retaining pin, commonly called the ***Jesus*** pin, because it could take forever to find. The M2 heavy barrel (HB) machine gun, used on the M1-series tanks, has a bolt retaining pin that is not so easily lost.

The electrical system in the turret on the M60A2 and the M551 caused nightmares. I recall a time when the mechanics could not get the fire control system on an M60A2 to work, even after working the better part of the afternoon. The crew needed to shoot their day run before it got too dark. They searched for a master gunner to help. The master gunner hopped into the tank, opened the white box containing firing circuit boards, beat the boards down a couple of times, said a few choice words, and closed the cover. Once finished, he told the crew they were ***ready to rock.*** A test of the system proved it was indeed ready to go. You have to wonder: was it just dumb luck or one great troubleshooting system that this guy had? But when it came to master gunners, no one was really sure how they fixed some of the faults they found.

The new Abrams tank brought new maintenance test equipment (the simplified test equipment or STE). Master gunners had to become experts with this equipment. The many cables (known as the octopus cables) and connectors made many of us relish the old M60A1 days. If you ask an M1A2 (additional skill identifer [ASI] K8) master gunner what he really likes about the turret maintenance system, you'll probably hear that he has finally won the battle with the octopus cables. What this really means is that there is no requirement to use the STE on the M1A2 tank. Hoooo-Waaaaa!

The Master Gunner Course continues to evolve and provide the master gunner with the latest in tank technology training. The master gunner students on the M60A1s considered the M60A3 guys the ***master gunner elite.*** Old-time M60 master gunners were eager to go through the transition course and become the super M1 (ASI A8) master gunner. M1 master gunners were soon referred to as Star Wars Troopers. We now train qualified M1 and M1A1 master gunners on the M1A2 Abrams tank system, the latest version of the Abrams tank.

The Master Gunner Course continues to evolve and provide the master gunner with the latest in tank technology training.

Not content to rest on past achievements, the Master Gunner Course is still improving. Some improvements include:

- An overall reduction of the course attrition rate.
- Increased communication with the field on the prerequisites, progress of the student, and standards of the course.
- Assigned faculty advisors.
- Production of videotapes on gunnery-related tasks students must perform during the course.
- Realignment of the Tank Crew Gunnery Skills Test (TCGST). (The TCGST is now administered as a diagnostic test at the beginning of the course, with emphasis on training. Soldiers who have difficulty with the diagnostic TCGST are reevaluated periodically throughout the course.)

All of these improvements have focused on training and sending better trained master gunners back to the field. Master gunners in the future must continue to provide expertise that commanders in the field can rely upon.

Twenty years have passed since the first soldiers graduated from this course to become the first master gunners. During those 20 years, several thousand soldiers have completed the course. Has the master gunner made a difference and improved the gunnery training of our tankers, as our Armor leaders originally intended? The success of armor crewmen in DESERT STORM indicates superb gunnery training was the norm. If that training can, in some part, be attributed to the Master Gunner Course, the answer is a resounding YES! Over the past 20 years, commanders in the field have always stood behind the master gunner program by sending their best soldiers to the course. The success of the Armor master gunner program has also been recognized by our brothers in the infantry. The Infantry Center at Fort Benning now conducts a tough, top-notch Master Gunner Course for Bradley soldiers.

What does the future hold for the master gunner? No one knows, except perhaps Old Bill. But this we know — when a tank crew experiences gunnery problems or a fire control system fault, when a live-fire range ceases operations, or when any other problem hinders gunnery training, you can be assured that you will hear that old familiar yell, "SOMEONE GET A MASTER GUNNER, AND GET HIM NOW!"

Master Sergeant Wakeland K. Kuamoo received his Armor training at Ft. Knox, Ky., in 1974. His previous assignment was as a platoon sergeant, first sergeant, and division master gunner with the 4th ID, Ft. Carson, Colo. Other assignments include the U.S. Embassy, Republic of Yemen; 2d ID, Korea; 25th ID, Hawaii; 9th ID, Ft. Lewis; and 1st AD and Berlin Brigade, Germany, as well as the Armor Center. He is currently serving as the Chief of the Master Gunner Branch, 5th Squadron, 16th Cavalry Regiment, U.S. Army Armor Center.

Improving Light Force Firepower With HMMWV-Mounted Recoilless Rifles

WE'VE ALREADY BOUGHT THEM...WHY NOT USE THEM?

by Mike Sparks

Light U.S. Army Contingency Forces (CFs) — numbered Special Forces groups, Rangers, airborne units, Air Assault, and light infantry divisions — do not have tanks, except for the 56 M551 Sheridans of 3/73d Armor attached to the 82d Airborne Division. As 1LT John Williamson's article in the November-December 1994 *ARMOR* points out, the light wheeled vehicles (HMMWVs) of these units will play an increasingly important role on the modern, early-entry battlefield because these vehicles will be the only way heavy weapons can be positioned rapidly where needed. The HMMWVs of A Troop, 3-17 Cavalry, 10th Mountain Division were adequately equipped to perform road block/checkpoint missions, but did not have a superior, organic, direct-fire, shock weapon to defeat enemies encountered later in close, urban combat.

HMMWVs with machine guns and TOW Antitank Guided Missiles (ATGMs) are tragically inadequate against large numbers of enemy infantry hiding behind urban structures. Current Army programs to increase contingency force lethality, like the Enhanced Fiber-Optic Guided Missile (EFOG), remote fired howitzer, mines, and sensors are oriented toward open, rural combat against tanks, not the eyeball-to-eyeball fighting of urban combat, where the enemy resistance is usually centered. Building masking and target visibility factors make these new weapons impractical to use and not responsive enough to meet the on-the-spot firepower needs of CFs maneuvering through cities to destroy the enemy's center of cohesion. As the former Army general in charge of attack aviation said, "We don't want to fight the enemy **equal**....We want to win hands down." Currently, we are often fighting with severe handicaps; for example, let's survey recent land combat operations.

Recent combat in the former Yugoslavia, Grenada, Southeast Asia, Panama, and Somalia demonstrate the necessity for **organic,** on-the-ground, direct-fire support. In Grenada, when U.S. Navy SEALs were inserted to rescue Sir Paul

Scoon, they were surrounded by enemy infantry and BTR armored cars, but lacked the firepower to break out. In Panama, the 82d Airborne had M551 Sheridan 152mm main guns for shock effect, but when the SEALs got caught in the open at Punta Paitilla airport, it took a long firefight with heavy casualties to finish blocking the runway and disabling Noriega's escape jet. SEAL small arms fires were ineffective against concrete-filled metal drums and steel hangar doors. It took precious seconds to get M203 grenade launchers into firing position to reach the enemy shielded behind these fortifications, and even then, indirect fire trajectories had to be used. One courageous SEAL was killed while maneuvering to get his M203 into firing range. In Somalia, when our helicopters began to get shot down, our soft-skin unarmored vehicle column got blocked, and our Rangers (who had previously fast-roped in from helicopters to capture key enemy leadership by surprise) had no shock weapon to regain fire superiority over an enemy with more men, unlimited ammunition, cover, concealment, and terrain familiarity. Combining forces and weapons is a desirable goal, but there has to be an in-hand fire support capability **at ground level** if distantly located fire support — AC-130 gunships, CAS fighters, helicopters, artillery, armored vehicles, battleship naval guns — cannot bring their weapons to bear due to poor communications, enemy action, weather, inadequate airlift, closed terrain, cities, political constraints on civilian casualties, or a situation where the asset is no longer available due to budget cuts. Contingency forces can force their way **in**, but it's unwise to expect surprise to last long enough to get out without a fight. We must be able to blast our way out with **organic shock weapons** to quickly disengage and/or proceed with follow-on missions.

The world is rapidly urbanizing. The enemy's key leadership will often be hiding behind the population and inside buildings like "the Commandancia" in Panama. The current M203 grenade launcher attached underneath M4/M16 carbines/assault rifles lacks the range to be fired from a safe stand-off, and only designated men carry M203s, so in a fluid battlefield situation, a grenade launcher may not be within range or in position to hit the threat. M203-equipped men may have to move themselves into a close firing position, exposing themselves to a wall of enemy small arms fire, like what befell the SEALs at Punta Paitilla. The palm-sized M203 40mm round lacks explosive power, and has to be lobbed behind and into windows/doorways to achieve effect. Its explosive charge is too minuscule to blast through masonry walls. The ongoing SEAL debate over whether raids should be "multi-platoon" or less in the aftermath of Paitilla misses a major battlefield reality: adding more shooters (quantity) doesn't always translate into more effective firepower or the creation of shock action if their weapons are the same and just as ineffective as the original small force's small arms.

On today's battlefield, if you want to destroy something, you need shock action to do it. Proof that the world is urbanizing at a rapid rate can be seen in DESERT STORM. It was one of the reasons an amphibious assault was called off in Kuwait — SEAL reconnaissance showed dense, built-up areas close to the planned beach landing sites. Fortunately, plenty of maneuver room existed to the west for an Army envelopment as the Navy/Marines demonstrated to deceive the Iraqis into staying massed at the beaches of Kuwait. In DESERT STORM, an Iowa-class battleship was available for naval gunfire support; today, all four U.S. battleships are in mothballs, leaving the only naval gunfire available coming from a few 5-inch guns on a rapidly declining number of ships, whose positioning in order to fire must be in range. This opens them to destruction by coastal defenses such as truck-mounted mobile antiship missiles. In future conflicts, we might not be so lucky as to have room to maneuver around enemy defenses; we might have to land near buildings. Rangers and/or SEALs acting as the spearhead for the main body will have to neutralize difficult enemy positions. Rather than destroy them with bloody close-in assault, contingency forces need a decisively larger and more powerful stand-off weapon than the enemy has.

Current hand-held infantry antitank assault weapons, like the M136 AT4 84mm, M72A3 66mm LAWs, M67 90mm recoilless rifles, M3 84mm RAAW Carl Gustavs, MK 153 SMAWs, etc., are not always effective for pinned-down forces because overloaded soldiers must expose themselves to get into close-range firing position and their High Explosive Antitank (HEAT) rounds are not designed to penetrate walls and level bunkers as a high ex-

Recoilless Rifles: Forgotten Weapons?

Recoilless rifles solve the problem of weapon weight, but at a price.

We know that for every action, there's an equal and opposite reaction, and that is crucially important when designing a weapon. The force propelling the projectile through the muzzle and on to the target creates an equal force rearward when the weapon fires. In recoil, the weight of the gun tube and breech assembly absorb some of that energy, as does the recuperator, but in a high-pressure tank cannon or a self-propelled artillery piece, the remaining rearward force is absorbed through the gun trunnions by the vehicle's weight. More force requires a heavier vehicle.

In a recoilless rifle, the pressure of the burning powder charge is not confined to the bore by the breechblock assembly. The case of the round is perforated so that some of the propellant gases can be vented rearward through a constricting orifice, enough to lower the recoil force so that the weapon can be mounted on very light vehicles, like jeeps and HMMWVs.

The down side, of course, is that these gases, venting to the rear at very high velocity, create a horrendous signature - bushes and trees move; a cloud of dust marks the firing point; and the gun crew is vulnerable to counterfire. In addition, soldiers can't be behind the weapon because of the rearward venting gases, nor can the weapon be fired from inside an enclosure. At the ballistic level, another disadvantage is that some of the propellant's energy is lost in providing the energy that vents to the rear. So recoilless rifle ammunition has to be bulkier and heavier for the same payload, compared to a closed-breech system.

Recoilless rifles are still in the inventory of many armies, and the U.S. Army used them widely in Korea and Vietnam, but lightweight portable missile systems and rocket-propelled launchers have stolen their thunder in modern "bunker-busting."

-**ARMOR** Staff

plosive round (HEP) can. At best, soldiers under the combat stress of enemy fire, struggling to get hand-held shock weapons into effective range (300 meters maximum, 150 meters probable), with a clear back-blast area, are likely to miss their targets. The Carl Gustav's extended range can't be exploited if it doesn't have a clear shot for its gunner to the target. Due to small warhead size, soldiers using these weapons will have to repeatedly expose themselves to withering close range enemy fire (less than 300 meters) in order to hit enemy targets several times before destroying them. It is Army SOP to "volley fire" LAWs to attempt to get destructive effect. At worst, enemy fire will suppress or kill our soldiers with hand-held shock weapons as they try to get multiple firings at the enemy's most dominant gun positions. In contrast, a vehicle-mounted shock weapon is always in a more stable, accurate, ready-to-fire mode than a hand-held weapon, and can hit and obliterate the target the first time it is encountered, reducing friendly exposure time and quickly ending the threat. A vehicle has the cargo capacity to easily carry a number of powerful, large-warhead special purpose rounds, to include HEP, which can be used decisively against the first building firing at us, regaining our fire dominance. In combat against well constructed urban buildings, the bigger the warhead, the better.

A large shock weapon can be used to put on a "show of force" to convince the enemy to surrender, thus saving lives and collateral damage, as was done in Panama. Ensuring that the enemy has a way to flee encourages a "backdoor reaction" to our shock attack, instead of trapping the enemy and forcing him to fight as a cornered animal. Currently, our light wheeled vehicles are armed only with heavy machine guns that lack simultaneous shock effect; they must be fired continuously over time to saturate a target. A HMG will not convince an enemy similarly equipped to surrender. To have the psychological edge over an enemy, our weapons must be visibly more powerful than his. If we are using small arms against his small arms, we will be, at best, even. We need a shock weapon that is drastically superior to what a Third World enemy can muster. The M220A2 TOW antitank guided missile will not work at close ranges (it needs at least 65 meters to arm) and even more distance for the gunner to track, and it isn't economical to reduce buildings, bunkers, or enemy infantry because the tracking time exposes the crew to counterfire. We need a weapon that is less than a missile but more than a heavy machine gun.

Can we wait until 1997 for the Armored Gun System (AGS) to replace our aging M551s? AGS will only help the airborne. Special Forces operating deep behind enemy lines do not have TOW HMMWVs or M551 Sheridans in their TO&E. Army SFs do not regularly integrate conventional armor units into their operations. Even light tanks organic to airborne forces are limited; in Panama, M551s were free to provide direct shock fire support to the airborne infantry because there were few PDF armor threats. In a pinch, Line-of-Sight Antitank (LOSAT) kinetic energy missiles and the M8's 105mm gun could provide shock acion for infantry, but this is unlikely. In future contingency operations, the M8 AGS will be needed to counter enemy armor and thus be unable to support the infantry. What if the enemy doesn't play fair" and attacks CF units with armored vehicles? The battlefield is no respecter of service branch. The enemy will use whatever is at his disposal to defeat us — women and children with bombs strapped to their bodies, Molotov cocktails, rocks and bottles. These kinds of things could happen if we don't establish fire dominance on the battlefield. Just because contingency forces don't have armored vehicles doesn't mean the enemy has to play by the same rules. Can we wait 10 years for a "High-tech" SOF hand-emplaced stand-off shock weapon system to be developed, a weapon that's not even off the drawing board? What happens if the funding runs out in Year 6? What do we do until then? Good men are going to die needlessly if we do not field an interim solution now.

"A number of our allies already use the 106mm recoilless rifle — Australia, Israel, Taiwan, Japan, Egypt, and Honduras, for example."

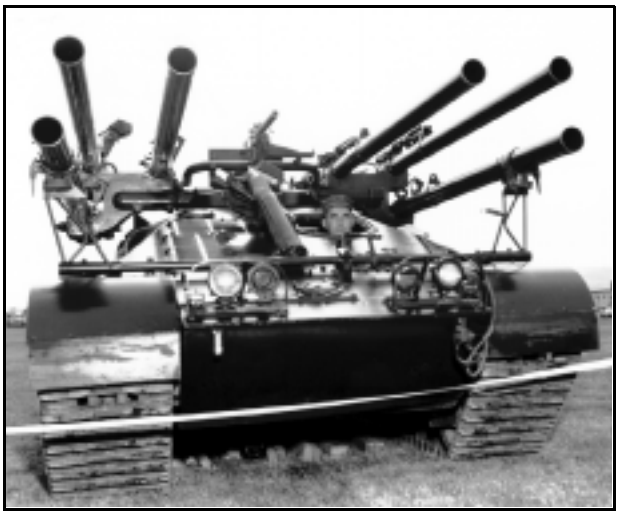
Nor can we afford to wait for massive air/sealift to deliver heavy M1A1/M2 armored fighting vehicles. Our C-141B fleet is suffering severe structural cracks, and the C-17 is being procured in handfuls, leaving only a few C-5Bs and a large fleet of C-130s as the most available airlift asset. Even if heavy fighting vehicles could be airlanded, waiting to mass them would ruin the possibility for surgical surprise since these vehicles are large, noisy and have massive dust and infared signatures. Heavy shock firepower without the negatives of heavy vehicles is what we need to retain the initiative on the early-entry battlefield.

The Secretary of Defense, William Perry, recently said that all major programs were subject to cancellation and that alternative weapons programs need to be ready. The defense of freedom and the lives of our men are too important to be without an alternative in hand, an off-the-shelf, vehicle-sized shock weapon system.

At the small unit level, we need a "fire-and-forget" shock weapon that will be there on organic vehicles when we need it. As the freedom fighters of the former Yugoslavia have discovered, it's the large-caliber recoilless rifle (RCLR). The currently in-stock, bought-and-paid-for M40A2 106mm Recoilless Rifle has been devastatingly effective in the past, mounted on U.S. Army MULEs, M151 jeeps, and on the USMC's M50 Ontos, which mounted six of them. Unfortunately, when we got rid of these obsolete vehicles, the superb M40A2 was lost. When the recoilless rifles on U.S. Navy SEAL *Nasty*-class fast patrol boats were fired at North Vietnamese shore positions, the enemy thought they were being bombarded by 5-inch naval guns from a destroyer! Heli-lifted elite Israeli Defense Force paratroops using 106mm jeeps have mauled large enemy forces on numerous special operations. The IDF also used 106mm RCLRs to blast enemy MIG fighters on the runway at Entebbe; world SF units don't have a stigma over what weapons they use to get the job done; if it works, they use it, regardless if it seems too "heavy" to fit into a pre-conceived notion like, "Special Forces is 'light,' and only uses weapons it can hand-carry, etc."

The "Special" in special forces implies the open-mindedness to acquire whatever it takes to win, and not worrying about how "fashionable" it may look. For example, the Dutch Royal Marines will plow through a wall with an M113 APC to rescue hostages. IDF paratroops will airland or airdrop M113s and ride into an Entebbe-type situation without any fear that their im-

The 106-mm RCLR in Action



In 1967 photo above, a 1st Cavalry Division trooper protects his ears as a 106-mm recoilless rifle engages an enemy position near An Khe, Vietnam. Note the flying debris caused by the backblast. At left, a Marine ONTOS vehicle, which mounted six 106-mm RCLRs. The weapon's huge, perforated round is on the front slope.

At left, the 106-mm recoilless rifle mounted on the right rear deck of an M113 APC in Vietnam. Pedestal mounts for jeeps and a wheeled tripod ground mount were other options.

age as elite fighters will be threatened. A tool is a tool.

A number of our allies already use the 106mm recoilless rifle — Australia, Israel, Taiwan, Japan, Egypt, and Honduras, for example. Fortunately, 106mm RCLRs are still in use by U.S. Army Special Forces for foreign weapons training. All we need to do is to buy the gun mounts, like some of our allies have done. Taiwan and Honduras both use 106mm HMMWVs! The Moroccan Army recently bought 56 HMMWV 106mm RCLR systems; they appear to be applying the lessons of modern war. The desert is also the mission area for the U.S. Army 5th Special Forces Group (Airborne), U.S. Navy SEAL Team 3, and could be for Army Rangers or any other contingency force. Man-made obstacles and strongpoints are linchpins of a defense in the desert. How are we going to destroy bunkers, ancient fortifications, belts of wire, etc., if we have no stand-off ground vehicle shock weapon? Are we going to expose our men to both long- and close-range enemy fire as they cross open areas on foot in order to get their hand-held shock weapon into range and a suitable line-of-sight firing position?

Are we going to be outgunned on the ground by a Third World country in the next conflict? A vehicle-mounted shock weapon has a more stable firing platform than cumbersome hand-held shock weapons, so it is more likely to hit and destroy its target with the first round, reducing exposure time and getting the job done efficiently. It's easier to see and avoid a HMMWV's 106mm RR backblast than a foot-soldier in front of you with a hand-held recoilless weapon that you don't see. Soldiers usually do not walk directly behind motor vehicles. The 106mm RCLR has a 1,100-meter range, beyond the effective small arms range of most former Communist block weapons. HMMWVs with heavy machine guns would suppress enemy HMG/RPG fires as 106mm HMMWVs methodically destroy enemy gun positions, shooting and moving to evade counterfire on their firing signatures. Our men on foot do not have to be pinned down trying to maneuver under intense enemy fire, but would be free to move at will across the battlefield to accomplish their missions.

Originally, the 106mm recoilless rifle was equipped with a spotting rifle using a special .50 caliber spotting round that matched the ballistics of the main round. We don't need to do this anymore. The new U.S. Army SACMFCS (Small Arms Common Module Fire Control System) or "SACUMS" laser day/night sighting system is adaptable to the 106mm RR for aiming without the spotting rifle. SACUMs is an integrated day/night sighting system with a full ballistic solution for first-round accuracy. The ambient temperature, barometric pressure, and even weapons cant are factored into the 386 microproces-

sor for a corrected aimpoint, resulting in accuracy rivaling a tank. All that is needed is for the 106mm RCLR's gunnery tables to be downloaded into the microprocessor, and M40A2-specific mounting hardware that would offset the SACUMs when the weapon is super-elevated to ensure continuous field-of-view. What's amazing is that, by day, it's an optical sight, but with the flip of a switch, it's a third-generation image intensifier for night target acquisition and aiming. With one integrated sight system, there is no time-consuming need to change sights from day to night, which might result in loss of weapon sight alignment zero; the SACUMS stays firmly mounted to the gun at all times. Unlike the traverse and elevating mechanisms on the .50 cal M2 and Mk-19 heavy machine guns, the M40A2 has large traversing wheels so moving targets can be smoothly and easily tracked with SACUMs, then hit and demolished with the first round. The principal engineer of SACUMs, Mr. Phil Downen, a civilian, was able to hit six out of six targets at a range of 1200 meters with a 106mm RCLR using MUGS, the laser-aiming-only forerunner of SACUMS. The system runs on 24 volt DC power from the HMMWV, or separate batteries. The spotting rifle can be replaced entirely by SACUMS, be used in conjunction with SACUMs, or used only when we want to signal to an enemy that "we know where they are and can hit them at our discretion" for a firepower demonstration. The gun crew can use hand-held thermal sights (AN/TAS-5 Dragon night trackers, the new AN/PAS-13, etc.) and night vision goggles for night driving (thermals have the advantage that they can spot ground disturbances where mines are placed), making the 106mm-HMMWV "state-of-the-art."

Unlike Abrams and Bradley AFVs, 106mm HMMWVs can be easily air-delivered by our most available airlift means, the C-130 aircraft. Three 106mm HMMWVs can be airlanded from a MC-130 Combat Talon, or two can be airdropped on a pair of 16-foot platforms using low-velocity air-drop (LVAD) and G-11B cargo parachutes, followed by two Special Forces A-teams (or paratrooper squads) to man them. If North Korea overruns the South's ports and airfields, airborne and other contingency forces will be vital to stopping their advance and decapitating their logistics and command and control. Slow-to-deploy ship-mobile Marine forces loaded with unarmored, unarmed soft-skin vehicles could also use the 106mm HMMWV to provide shock action. There is even a lightweight vehicle countermine armor system that can be fitted to 106mm HMMWVs. Two 106mm HMMWVs can be driven on and off MH-47 Chinook helicopters without having to dismantle the weapon mounts...it is combat ready when it leaves the rear ramp. Ship-based 106mm HMMWVs can be flown to shore in MH-47s or sling-loaded beneath UH-60 Blackhawks or CH-53E Super Stallions.

Certainly, we must have some generic soft-top cargo variant M998 HMMWVs available for mounting 106mm RCLRs. They could also possibly mount onto Army/Navy Fast Attack or Desert Patrol Vehicles (FAVs/DPVs) or the new Ranger Special Operations Vehicle (RSOV). The RSOV is a Land Rover; half the world's 106mm RCLRs are mounted on them. Once the mounting modifications are made, the HMMWVs can continue to be used for daily transport; the M40A2 need only be mounted when it is desired as a weapons platform. When qualification firings take place, firings from the HMMWV would be included, in addition to tripod ground-mount firing. Army/Navy contingency forces would have a vehicle-mounted shock-firepower capability in readiness for direct action missions requiring heavy firepower without the weight penalty of an armored vehicle.

Finally, Special Forces advisors need to be fluent in 106mm vehicular firing skills for Foreign Internal Defense/Coalition Warfare missions because the allied forces they are advising have HMMWV-mounted 106mm RCLRs. How can you advise someone on something you have not done yourself?

The 106mm HMMWVs could be quickly introduced into contingency forces in any of the following ways:

- Army Special Forces groups could mount their own M40A2s to designated M998 HMMWVs using local funds to buy the gun mount kits. Their personnel are already skilled in 106mm gunnery.

- Army light, airborne, and air assault divisions could obtain M40A2s from Anniston Army Depot, mount them onto designated M998 HMMWVs using local funds for the gun mount kits. Army Special Forces personnel would initially train the gun cadre, but this isn't a problem; their mission is to train others and Special Forces groups are co-located at Forts Bragg and Campbell to qualify airborne/air assault units. Part of the 10th Mountain Division and 75th Ranger Regiment is located at Fort Lewis, alongside the 1st SFG.

Organization options

- Two M998 HMMWVs operated by the platoon leader and platoon sergeant of one of the five HMMWV antiarmor platoons would be equipped to fire the 106mm RCLR. This platoon would be the antiarmor/assault platoon and the actual two-vehicle element the platoon headquarters/assault section. The entire antiarmor company would be redesignated as the antiarmor/assault company. The two extra soldiers needed to act as ammo bearers would be the armorer and NBC NCO. Light infantry battalions have only one antiarmor platoon, which would be redesignated as the antiarmor/assault platoon, with the sole headquarters element receiving the 106mm RCLRs, as above.

- Another option would be to put two 106mm RCLRs onto the M998 HMMWVs of the antiarmor company commander and executive officer, renaming their element the company headquarters/assault section. As before, the entire unit would be redesignated the antiarmor/assault company to reflect the new capabilities. In this case, the NBC NCO and communications chief would act as the ammo bearers. The advantages of having the designated platoon headquarters and/or company headquarters fire the recoilless rifles is that leaders will know best how to employ them and will be leading by example. Furthermore, leader vehicles will now be significantly armed, yet will not appear obvious as command vehicles.

- A third option would be to take two 106mm-armed M998 HMMWVs of the battalion transportation section and let the battalion commander use them as he sees fit. He could assign one or a pair to a designated rifle company with assault/spearhead missions, and let that unit assign a driver, gunner, and ammo bearer for each vehicle. In this option, it's vital that the battalion commander take an active interest to ensure 106mm gunnery skills do not deteriorate.

- Army USSOCOM Rangers (75th Ranger Regiment) and special mission units (SFOD-Delta) assigned to Joint

Special Operations Command (JSOC) could attach M40A2s to designated HMMWVs or RSOVs. They would have to get their M40A2s from Anniston Army Depot, and if RSOVs are used, obtain the Land Rover gun mounts used by our NATO/SEATO allies.

The 106mm recoilless rifle HMMWVs can be organic down to the small unit level. They can tow a trailer to carry 1,638 pounds of ammunition, MREs, and water cans, in addition to extra 106mm rounds, and thus will still be able to act as the unit resupply vehicle. Organic direct shock fire support could be organic to the airborne/contingency force community — it will be there when it is needed. The 106mm recoilless rifle's ability to put on a convincing show of force to compel an enemy to surrender is awe-inspiring. Its HEP round will demolish a small building, and in large buildings, open a gaping hole for infantry to pass through.

In the inventory, there is a large quantity of 106mm rounds (250,000+, according to TRADOC), and M40A2s, but we must claim them immediately, before they are destroyed as obsolete. We wouldn't be selling so many 106mm RRs through Foreign Military Sales (FMS) if there was not a large supply of ammo for the taking. Bofors of Sweden (originators of our M136 AT4 antitank rockets) makes improved-lethality 106mm rounds. Antipersonnel flechette (beehive) rounds are in stock in U.S. ammo depots. Beehive rounds would be vital to stop waves of infiltrating North Korean infantry or fanatical Iranian Revolutionary Guards. High explosive rounds (HEP) can reduce/blast through wire, mines, and obstacles economically. The 106mm RR can even be fired in an indirect fire mode, bombarding enemy positions under defilade cover, suppressing so that troops can maneuver to perform their assault missions. The weapons would also be useful in mobile raids behind enemy lines, in hostage rescue, and in missions to "snatch" enemy leaders.

SF personnel already know how to fire M40A2s, so the weapon is proven, already paid-for, and could be operational in a matter of days with receipt of the gun mount kits. This doesn't need to be a line item on the budget to Congress; for about the price of a pair of night vision goggles, the $6,900 gun mount kit can be bought with local unit funds, donations, or end-of-the-year funds. Do-it-yourself instructions are available for local units to attach the gun mount kits to their HMMWVs. All we need is for an airborne or contingency force unit commander to state an interest for this to take place. The 220-pound kit drops into the aft cargo bed of the HMMWV and is bolted down. A new, reinforced hood, windshield holder, and tailgate step for reloading the gun from the vehicle can be added in about two days of work.

Points of Contact

- LTC Brad Washabaugh, of the USSOCOM CINC's Initiatives Group (AC (813) 828-2646) is helping to coordinate concept briefings to field users.
- MSG Walter Minton, a weapons expert at the JFK Special Warfare Center, Directorate of Combat Developments, is fully briefed on the 106mm HMMWV concept (AC (910) 432-8326).
- The U.S. Army Light Wheeled Vehicle program manager, Mr. John Weaver (AC (810) 574-6710) is willing to work with an interested unit on the concept.
- The AM General's engineer who designed the gun mount kit is Mr. John Ritter (AC (313) 523-8067, FAX: 8077). The company can supply photos, specifications, and mounting instructions.
- Anniston Army Depot has a large number of 106mm RCLRs they are in the process of destroying that need to be saved. Contact is Mr. Glen Freeman (AC (203) 235-6479).
- Contraves makes SACUMs for M2 and Mk 19 heavy machine guns that are easily adaptable to the 106mm. Contact is Mr. Philip Pryor (AC (412) 967-7700).

Mike Sparks is director of the International Tactical Studies Group, a non-profit study group of former veterans. He is also a member of the National Guard.

Hatch

(Continued from Page 4)

cle (BCV) in concert with a command and control vehicle (C^2V) which served as the tactical operations center. The live forces at Greenville were linked by sophisticated communication devices to the other three organic company teams operating from SIMNET simulators at Fort Knox. Thus, the entire battalion task force could be fought at once even though only one company team was operating in an actual field environment.

In addition, an air defense artillery platoon from Fort Bliss, Texas and an Apache attack helicopter battalion from Fort Rucker, Alabama were integrated into the fight through virtual simulation. This virtual/live linkage was made possible by the Army Space Command Vehicular Data Communication and Positional Awareness Demonstration System which allowed live forces to interact with simulated forces in a near-seamless way.

This construct allowed the Mounted Battle Lab to experiment with digital TTP across the battlefield operating systems without the cost associated with placing an entire battalion task force in the field.

If Desert Hammer gave the Army a glimpse of the future, Focused Dispatch provided a picture window. Focused Dispatch was the critical next step along the path toward digital operations in the 21st Century.

Although the final analysis is not yet completed, emerging insights suggest that existing digital TTP can be revised for use by the EXFOR during the TF XXI brigade level AWE at the NTC in Feb 97. In addition, Focused Dispatch may provide important information on how to improve digital fire support, intelligence, and combat service support.

Clearly, Focused Dispatch was a successful experiment. It established the criteria for effectively integrating technologies, processes, organizations, and systems for all future warfighting experiments. In that regard, Focused Dispatch helped set the conditions for the success of the EXFOR. More importantly, Focused Dispatch may have set the conditions necessary to ensure that future American soldiers will be able to fight and win on any battlefield against any enemy and under any condition. ON THE WAY!

Driver's Seat

(Continued from Page 5)

only scouts flew in helicopters and wore jump wings. Now 19Ks will get the opportunity to jump out of perfectly well built airplanes that are capable of landing.

Enough about vehicles. Have you heard that we also have digitized warriors?

These are the guys that have been trained to use all the advanced technology I just mentioned, including individualized systems. There isn't enough space here to go into great detail about the individualized high-tech systems, but suffice to say, you'll be impressed. Soon, we'll have whole digitized divisions. It's only a matter of time before you'll be digitized as well. These things are real, not concepts or dreams anymore. They're here. Not a day goes by that some technological advancement doesn't change the way we do business. Speaking of training, today's Army trains in three environments — virtual, constructive, and live. The ***virtual*** training environment offers simulations that are electronic clones of real weapons systems. Tank gunnery simulators, such as Unit Conduct of Fire Trainer (UCOFT) and Simulator Network (SIMNET), are ideal examples of virtual simulations. The ***constructive*** environment replicates warfare in the form of interactive computer modeled simulation war games. In some constructive simulations, the computer presents soldiers with a situation and allows them to make decisions that influence the battle. Examples of constructive simulations are Janus and Brigade/Battalion Battle Simulation (BBS).

Live simulations are conducted using real equipment and real soldiers in an actual training environment that replicates combat conditions.

Our rotations at the National Training Center, Ft. Irwin, California, and the Combat Maneuver Training Center, Hohenfels, Germany, are classic examples of training areas used for live simulations.

As you can see, it's going to take highly motivated and dynamic individuals to be warfighters in the 21st century. Only bright, physically fit, and self-starting soldiers will be able to use this advanced technology to its full potential.

Maintenance Training at BNCOC

by Robert Fulkerson, SFC Michael Harrington, and SSG David Lies

Commanders, are you using all your assets to keep your vehicles 100-percent operational? You need to be aware of the extensive training your turret and hull organizational maintenance personnel are receiving at their Basic Noncommissioned Officers Courses (BNCOC). Although maintenance generally falls under Ordnance, all maintenance in itself is the responsibility of each unit commander. The M1 Abrams and M2/M3 Bradley Fighting Vehicle maintenance personnel are two separate military occupational specialties; still, their jobs and responsibilities are very similar. Their main job is to help keep your vehicles shooting, moving, and communicating.

The CMF 63 Series Basic Noncommissioned Officer Courses provides students with common leader skills, vehicle maintenance, recovery procedures, and other training that helps keep our Army combat ready. The Basic Noncommissioned Officer's Academy at Fort Knox, Ky., provides this training and ensures the training goals of each BNCOC student are met. This is the same academy that trains your armor and cavalry noncommissioned officers to be leaders in today's Army.

The instructors of the 1st Battalion, 81st Armor Regiment, at Fort Knox provide some of the best and most intensive technical maintenance training in the Army. During the 17 weeks of training at the Armor School, 6 to 8 weeks are dedicated to the troubleshooting and maintenance of the M1 Abrams and M2/M3 Bradley turrets and weapons systems. This training is geared toward quick and accurate diagnosis of system faults using the technical manuals and experience gained through hands-on training. The equipment used in troubleshooting includes the Simplified Test Equipment, M1 and M2/M3 series vehicles (STE-M1/FVS); the Advanced Built In Test Equipment (ABIT); and the Breakout Box (BOB) with a multimeter. This equipment is used for two types of troubleshooting — Primary Troubleshooting Procedures (PTP) and Alternate Troubleshooting Procedures (ATP). The PTP entails the use of the STE-M1/FVS and ABIT, along with the technical manuals. Soldiers follow flow charts in the technical manuals and hook up the test sets to help in isolating malfunctions. The test set determines which component is faulty and refers the soldier to the correct technical manual for replacement. This method is very accurate, but time-consuming. The ATP method allows soldiers with knowledge of how the systems operate to use the BOB and a multimeter to make quick checks. This, along with detailed schematics, allow the soldier to quickly diagnose problems, based on his knowledge of the systems. This method does not require the use of any additional test equipment, so it takes less time to get the vehicles operational under any condition. Both methods are extremely effective when used properly.

You can expect your maintenance BNCOC graduates to arrive at your unit with detailed schematics on your Abrams Main Battle Tank and Bradley Fighting Vehicles. During instruction on ATP, each BNCOC student is provided his own copy of schematics relative to his MOS. These schematics are used as note-taking guides and as training aids. The BNCOC student gets an opportunity to troubleshoot malfunctions on the actual vehicles, using schematics. This training will allow soldiers to make very quick and accurate battle damage assessment and repair because of their advanced and in-depth knowledge.

BNCOC students also learn maintenance management, recovery operations, maintenance supervision, training management, theory of automotive materials, theory of turret operation, vehicle inspection/testing/repairing, and unit maintenance on the M113 family of vehicles, M88-series recovery vehicles, and the M998 HMMWV at Skill Level 3.

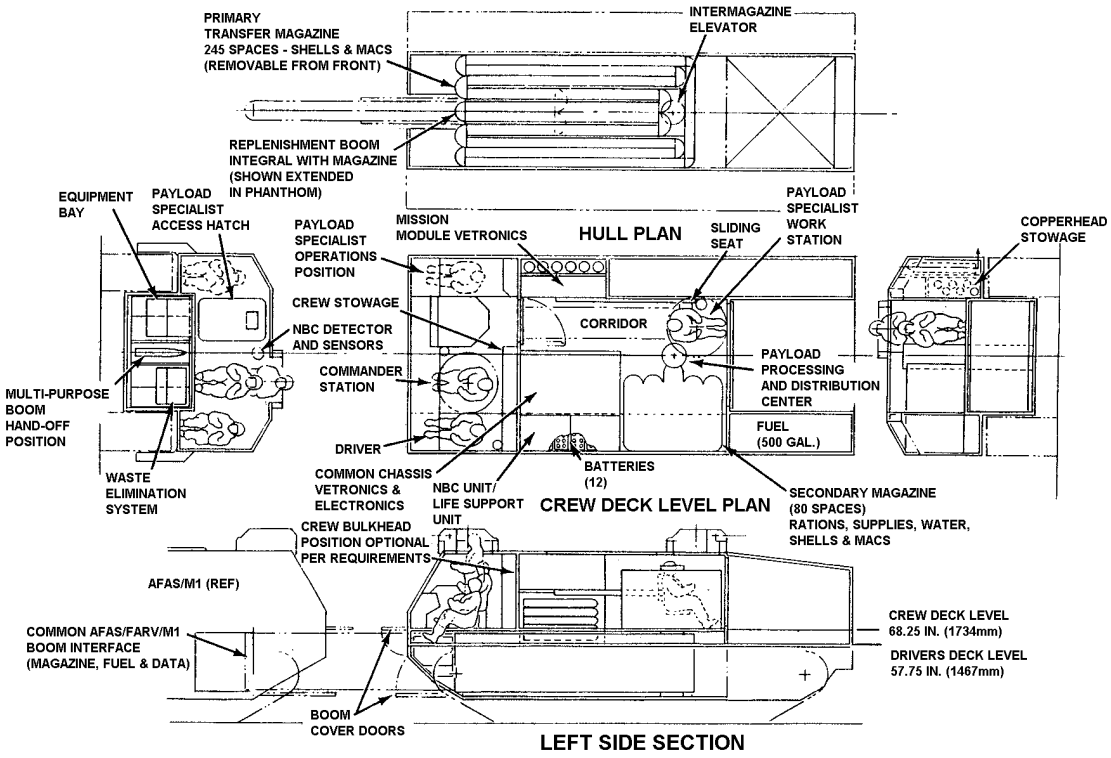
Your sergeants and staff sergeants stay busy with various administrative and operational functions; however, they can be counted on when you have specific vehicle problems. If your unit has an excessively low operational readiness rate, take the time to see if your recent BNCOC graduates have had the opportunity to help their mechanics correct any problem areas. This might be a problem that you can overcome with just a little background information on the training available to your soldiers. If you have any questions or comments concerning the technical training your soldiers have received, you can address them to; Commander, 1st Battalion, 81st Armor Regiment, 1st Armor Training Brigade, Fort Knox, Kentucky 40121.

SSG David D. Lies enlisted in the Army in 1983 as a Bradley system mechanic. He is currently assigned to A Company, 1-81 Armor Regiment as a BNCOC instructor/writer for the U.S. Army Armor Center at Fort Knox, Ky. He holds an associate degree in general studies and is working toward a B.A. in computer science.

SFC Michael P. Harrington enlisted in the Army in May 1977. He served as a track vehicle mechanic during two tours in Germany and one tour in Fort Stewart, Ga. He is currently assigned to A Company, 1-81 Armor Regiment as a BNCOC Senior Instructor/writer.

Mr. Robert A. Fulkerson started his civil service career as a maintenance instructor at the Armor School in 1976. He began his current assignment as Chief of the Cavalry Section for A Company, 1st Battalion, 81st Armor Regiment in 1983.

The Common Chassis Revisited - *Continued from Page 10*



try speeds due to its advanced torsion bar suspension system (Hydropneumatic suspension will be discussed later). AFAS/M1 would have a cruising range of at least 465 km, while that of the M1 tank is 440 km. To preserve fuel and extend engine life, AFAS/M1 will be equipped with an on-board Auxiliary Power System (APS).

Standardization, interoperability, and commonality between AFAS/FARV/M1 and with the M1 tank fleet, would be significantly enhanced due to the employment of a common chassis. Selection of the M1 chassis as the preferred alternative for the Crusader is further invigorated by the fact that two years after terminating the next-generation Armored System Modernization (ASM), Block-III Tank program, the U.S. Army decided to predicate its future ground armored combat strength on the M1 Abrams (M1A2 and "Tank 1080" programs).

The ASM program, if it had been successfully concluded, would have developed a "common chassis" for a new generation of combat vehicles.

Replenishment Operation

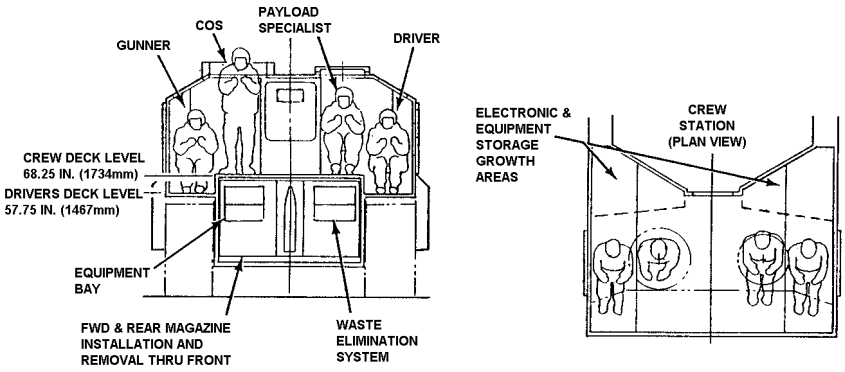
AFAS/M1's crew will remotely and concurrently conduct refueling, resupplying and 155mm ammunition replenishment without leaving their compartment or resorting to any manual operation. A preferable "resupply interface" for projectiles, propellants, fuel, food, and other supplies is at the front end of the vehicle. FARV/M1's resupply interface is also favorably located at the front-end of the vehicle if it is to implement a multi-purpose replenishing "boom." The frontal location of the crew compartments in both vehicles substantially enhances the viewing and monitoring of the replenishment operation, facilitating vehicle maneuvers for a quick connect. The transfer of food, water and small arms munitions, etc., will be performed via the main ammunition resupply path by using standard cylindrical containers that emulate the shell diameter and length. The rations will be transferred to the crew by the autoloader next to their double hatch access for subsequent pick-up and storage.

Hydropneumatic Suspension

A hydropneumatic suspension may be installed as an "add-on" system with only very minor changes made to the M1's chassis. This advanced suspension is currently under development by TACOM, Cadillac Gage, and Teledyne, and has gone through extensive and vigorous testing. The hydropneumatic suspension provides a high degree of tactical mobility and allows operation over all terrain and in all weather conditions. The revolutionary "in-arm" suspension system can save well over a ton in weight, as compared to the conventional torsion bar system, and will free valuable hull space under armor for ammunition storage. A variable-height, dynamic hydropneumatic suspension with active damping would be computer controlled (as in the MBT-70). It would simplify docking and connecting AFAS/M1 and FARV/M1 in the replenishment mode. The implementation of *Vehicle Alignment System Technology* (*VAST*), is in essence, an integration of available and mature computer, variable suspension, and mi-

crowave transmission technologies to permit a true "hands-off" adjustment operation. Under adverse conditions and varied terrain, the hydropneumatic suspension will permit replenishment with cumulative slopes of up to 10° resultant angle between vehicles in any direction (pitch and roll controlled by variable-height suspension, yaw controlled by steering). When installed in both mating vehicles, it will permit a relatively uncomplicated, less costly, and less articulated multi-purpose replenishment "boom" mechanism. The hydropneumatic suspension will also allow for hydrostatic lockup during firing to enhance chassis stabilization and consequently improve fire rate and accuracy.

CREW COMPARTMENT LOCATIONS

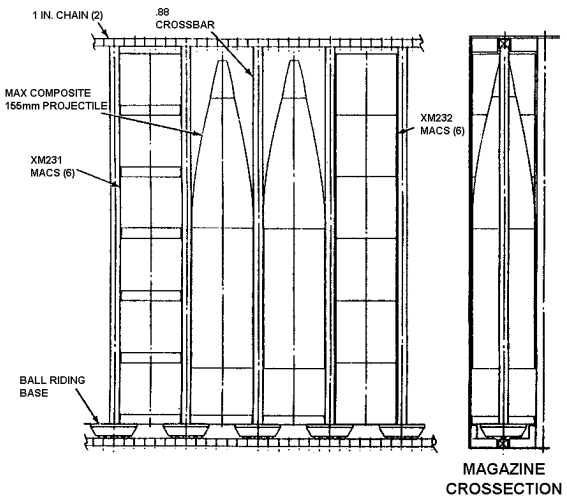


Concluding Remarks

This article is written with the aim of capturing the attention and imagination of the *ARMOR* reader and to trigger a creative thought process. There are lower-risk, more cost-effective alternatives for the Crusader that fully meet — and in some aspects exceed — AFAS operational requirements. With manpower, time, and budget constraints, the authors could not perform a full-scale detailed analysis and optimization of all aspects involved in undertaking such a tremendous endeavor. Nevertheless, in principle, the concepts presented here offer feasible alternatives that should be of interest to all parties in the defense community. Notwithstanding, two essential ingredients must be preserved to serve as the fundamental bedrock for Crusader evolution — The JBMOU 155mm L52 gun, and the MACS Charge System.

We believe the M1 common chassis concept has great merit, and that the practice of continued evolution of existing fielded systems will considerably abridge the prolonged design and development process typical to the acquisition of modern weapon systems. In times of declining defense budgets, affordability considerations must play a decisive role in major weapon systems procurement and acquisition, as well in fleet maintenance costs of existing systems. Furthermore, the potential sales of a particular weapon system internationally should be a paramount economic consideration in the development process. Foreign sales preserve the industrial base, keep production lines alive, and reduce the cost of procurement. An AFAS/FARV/M1 weapon system, as described herein, is more likely to be procured in substantial quantities by those foreign countries that operate the M1 tank and have the logistic infrastructure already in place. Any solution that excludes the RLPG has a greater likelihood of both technical and economic success.

155mm PROJECTILE / MACS CHAIN LADDER STORAGE CONCEPT



Western Design HOWDEN (WDH), a small defense company in Irvine, California, specializes in the design, development and production of ammunition and material handling systems for the U.S. and international military markets. WDH's track record includes a variety of air, land, and seaborne weapon systems which require automated feed, resupply, and optimized ammunition packaging.

Mr. Lawrence D. Bacon is the Director of Graphic Arts at WDH where, for the past 16 years, he has been responsible for creating numerous concepts for automatic ammunition handling, loading and storage systems.

Dr. Asher H. Sharoni is the Director of Engineering at WDH. He holds a Sc.D. in Mechanical Engineering from MIT and a M.Sc. from the Technion, Israel Institute of Technology. Dr. Sharoni is a former colonel in the Israeli Defense Forces, in which he was involved in various major armored weapons developments.

must force our infantrymen to use the assets they will have while in combat. Some will say that the use of body armor causes heat injuries and joint stress. I believe that attention to water consumption and common sense will prevent the former, and the latter is simply a cost of doing business. Body armor is heavy, bulky, and irritating to wear, but it is an asset we should train with.

Third, Mr. Sparks spends no small amount of type lamenting the 'laziness' of mechanized infantry soldiers. While I hesitate to use the word 'lazy,' I have to agree with his point. During my training and rotation with the two Bradley-mounted mech infantry platoons that were attached to my company, I found that the infantry soldiers generally considered themselves to be mini-tankers, with all the associated reluctance to get off of their vehicles. I noticed two quirks in particular: First, the crews of the Bradleys and the dismounts that ride in them are two separate entities, with essentially separate chains of command within the platoon. I found that the dismounts regarded the Bradley as little more than a big taxi and gear-carrying platform, while the crews considered the dismounts to be a nuisance that must be tolerated while stalking the big payoff of enemy vehicles. Second, I found that for some reason, mech infantry platoon leaders generally refused to dismount with their squads, electing to stay mounted while the dismounts ran out to do their thing. Perhaps they believed that their place was with the greatest firepower, and perhaps in the European/desert scenarios for which we've all been training the last forty years, that's true. It is certainly *not* true in a PKO/PMO scenario, though, where the men in the back of the Bradley are more important than the weapons on the vehicle. At the JRTC, my company was repeatedly praised because the mech infantrymen actually dismounted and did 'infantry things.' That this could be a compliment, instead of an expectation, indicates the skewed thinking of some Bradley-mounted mech infantrymen.

Also, Mr. Sparks advocates that all infantrymen, mech infantrymen included, be trained to the same standard and be afforded their share of 'Hooah' badges. He also talks of allowing units to develop their own 'high-speed' identities, to use his terminology. He insinuates that the philosophy in our Army that we are all the same, and that displays of elitism are dangerous is foolish, at best. Again, I have to agree with him. Outside of the few units where elitism is encouraged — 82d, 101st, Special Forces — my experience is that soldiers believe that one unit is just like the next. I can't imagine that allowing mechanized infantry units to develop elite identities, complete with accoutrements like berets and badges, could be anything but good.

Mr. Sparks' article was apparently intended to champion the cause of a weapon system. I support wholeheartedly his assessment that the M113A3 is superior to the Bradley in a PKO/PMO scenario. The article struck chords with me in several other areas, though, and I think that we as tankers should be intimately familiar with the soldiers with whom we will fight should we be sent to Bosnia, Somalia, or any number of other places where dismounted infantry reigns supreme. In such places, we tankers are more likely to man a checkpoint or support a house-clearing operation than kill T72s at 3200 meters, and the training and capabilities of the infantrymen is more critical to our success than our own.

On one point, however, I have to disagree with Mr. Sparks. The M113 will always be the '113' or the 'PC.' We can rename it the *Gavin IFV* if we want, but the soldiers won't call it that any more than they call an M577 an 'Armored Command Post.' Let's not waste our time.

KENNETH C. BLAKELY
CPT, Armor
Ft. Lewis, Wash.

CD ROMs Could Improve Vehicle Identification Skills

Dear Sir:

I enjoyed nearly every article in the May-June issue of *ARMOR*, especially "The Armored Fighting Vehicle Identification Trainer," written by Captains Mark Lee and Jeffrey Schamburg. The ability to distinguish friend from foe on the battlefield is absolutely critical, so critical that it demands from those who have responsibilities of training and leading tank units attention to improve or find new ways to train fighting vehicle identification.

In my opinion, an armored fighting vehicle identification trainer should have two different stages:

1) To reinforce the soldier's basic identification skills, such as "recognizing turret shapes, the location of the bore evacuator, and whether the vehicle's track is supported or non-supported." As the authors suggested, this could be done by using vehicles which are presented exactly as they are presented in current lessons plans and training manuals. But we should add another important matter, learning to identify a vehicle through its heat sources. Most of the target acquisitions are made by using thermal sights, so soldiers need to reinforce these specific skills. The other viable future extensions the authors presented for this trainer, for instance a black box that would conceal portions of the present vehicle, could also be used to train this specific skill.

2) To evaluate the level of each soldier through realistic situations. Here is where people should pay attention. All the situations (pictures, drawings, images made by computer) should be as close as possible to the situation seen through the tank optical sights. All the vehicles should appear in battle situations in distances above 900 meters. This stage also should include thermal images.

All this information and much more could be stored on a CD-ROM. Many images and pictures taken during DESERT STORM, or others from contemporary wars saved in many other files, could fit the available space of a CD-ROM. To get an idea of how powerful a CD-ROM can be, take a look inside a *Jane's* CD-ROM.

We live in a multimedia era where we can learn through an interactive way. The CD-ROM is the right tool. This way, we would have not only high quality pictures but also images to train to distinguish friend from foe. To reduce the number of fratricide victims is a good enough reason to invest in a new and high quality trainer.

1LT MIGUEL FREIRE
GCC/Regimento de Cavalaria n^{o}4
Brigada Mecanizada Independente
Portugal

Author Seeks Hispanic Memoirs

Dear Sir:

I am seeking to correspond with Cuban-American veterans of the Vietnam War for a book on Hispanics who served in the war. The book will be based on first-person oral histories.

GIL DOMINGUEZ
P.O. Box 35472
San Antonio, TX 78235
(210) 308-9188

River Crossing Doctrine?

Dear Sir:

I am a retired engineer officer who used to teach river crossing operations in the 'old' days. That was when the Engineer School was at Fort Belvoir. So, I read with interest the article "River Crossings" by CPT DeCarlo in the May-June 1995 issue. He pleads for the need for training for a deliberate river crossing. I cannot argue with the need for training. I do find, however, the doctrine in FM 90-13 somewhat archaic (the article has a typo on the FM number).

Both FM 90-13 and CPT DeCarlo describe a doctrine that ignores the deep battle aspect of AirLand Operations. The four phases describe a sequential and constrained land approach to battle dating back to the Active Defense doctrine. Since

when does the U.S. Army only attack the near shore, then the river, then the far shore, and finally the bridgehead line? The term "bridgehead line" symbolizes a concept that focuses on deliberately stopping the attack rather than exploiting success.

I think the problem stems from the definition of a deliberate attack. The article omits that a deliberate attack "...is generally conducted against a well-organized defense..." I contend that if you follow AirLand Operations, the enemy will no longer be well organized by the time you reach the river. The FM states that forces can use air assault infantry during phase 2 to seize the far bank. The FM introduces deep fires only in phase 3 when securing the far shore. AirLand Operations begins with deep fires and will always divert the enemy's attention from the proposed crossing sites. If commanders do not use air assault forces at the start, then some other maneuver diversion or a very successful air war will soften the area.

I contend that AirLand Operations will normally cross tanks over the river with a bridge, not rafts. Rafting is only a rarely-used, alternate option when plans go drastically astray. I believe the Army can still learn from WWII history. However, today's M1 tank can ford the Volturno River that CPT DeCarlo references without the help of engineer bridges.

DOUGLAS K. LEHMANN
LTC, AUS (Ret.)
Falls Church, Va.

Train CCFs Long Distance With Video Teleconferencing

Dear Sir:

By the time this letter is printed, 1st Bde/2AD will be in the throes of conducting digital NET training. The infancy of digital warfighting is actually upon us.

That brings to mind training our "communicate" mission (as I alluded to in a letter printed in the May-June 1995 issue of *ARMOR*). After reading LTC Martin's article in that same issue, I believe commanders and their staffs need to train and retrain the Critical Combat Functions (CCFs) of the orders process, Troop Leading Procedures (TLPs), and battle/logistics tracking. Let me say it again...train and retrain, possibly as if a staff was in perpetual green cycle.

So, the question becomes how to train/retrain CCFs without the expense of putting an actual force in the field each time? Here is a possible solution with several additional benefits: long distance training between Ft. Hood units and Ft. Knox with the use of a twin task force [(T)TF]. It would work something like what is shown in Table 1 above.

Event	1 Bde/2AD Actions	1 Bde TF Actions	Ft. Knox Actions
1	1 Bde/2AD Orders Process	One Ft. Hood TF selected to CMD a (T)TF on a rotating basis	Ft. Knox (T)TF formation (from AOAC, AOBC, ANCOC, BNCOC & AIT)
2	1 Bde/2AD issues OPORD	All 1 Bde TFs receive mission	(T)TF conducts necessary training not previously completed
3		All 1 Bde TFs' orders process	(T)TF continues training/orients on simulator
4		Select TF OPORD brief to TF Cdrs [Ft. Hood] and (T)TF Cdrs [Ft. Knox via Video Tele Conf (VTC)]	(T)TF Cdrs (AOAC small group on a rotating basis) receives mission/(T)TF training cont
5			(T)TF Cdrs' orders process/training cont
6			(T)TF OPORD briefs to AOBC Plt Ldrs
7			(T)TF Plt TLPs/Plt OPORD brief to ANCOC PSGs and BNCOC TCs
8	1 Bde/2AD battle tracking	Select TF fights battle via VTC and remote digital links between Ft. Hood and Ft. Knox	(T)TF fights simulated battle with info feed from Ft. Knox and Ft. Hood

Table 1 - LDT Option

There are both advantages and disadvantages at work here. First the disadvantages:

1) Establishment of remote digital links. (VTC capability is already up.)

2) Some possible artificiality due to systems that are not fully operational (i.e., a constant VTC view of the SIMNET's AAR screen may have to suffice for battle tracking, and the SIMNET's Stealth machine for remotely piloted vehicles).

3) The short time frame. (Staffs need to train now and IVIS-capable simulators in SIMNET (D) are still not quite out of the developmental stage.)

4) We must undertake a complete overhaul of Ft. Knox AOAC, AOBC, ANCOC, BNCOC, and AIT training schedules to synchronize a "digital warrior week."

I believe the advantages, however, outweigh the disadvantages. Listed below, we can categorize them into three main training payoffs — CCF training, digital "warfighting" experience, and hands-on leaders' training:

1) Multiple iterations of staff training for 1 Bde/2AD units.

2) The cost trade-off of establishing VTC and remote digital links, versus putting units in the field.

3) Staff training has less of an impact on unit training schedules.

4) The digital warfighting experience (and TTPs) are spread throughout the Armor community.

5) AOAC officers have to stare new lieutenants in the eye and deliver company (team) OPORDs.

6) AOBC lieutenants have to stare ANCOC and BNCOC NCOs in the eye and deliver platoon OPORDs.

7) ANCOC/BNCOC NCOs have to command AIT EMs on their tank (simulator).

8) If BCVs/C^2Vs are available at Ft. Knox, a (T)TF staff linked to the TF commander at Ft. Hood can fight the battle at Ft. Knox, providing for commander's CCF training. (This can interface with the Pre-Command Course also.)

9) With some extra work, a similar system could be established at Ft. Benning for the brigade's mechanized infantry TF.

This long-distance training option provides three main training benefits. First, it is cost effective, repetitive CCF training for digital staffs that does not make subordinate units in the field mere training aids for the staff. Second, and of prime importance, is the spreading of digital TTPs and experience throughout the Armor community. And last, this option provides vital, hands-on leader training for company grade officers and upper echelon NCOs. It is not a simple leap, but digital infancy is not a simple time.

CPT MICHAEL L. PRYOR
Co C, 1-156 Armor
LAARNG

Autoloaders, Crew Size, and Ammunition Lethality

Dear Sir:

I have been a reader of *ARMOR* for almost a quarter of a century and have never been moved to write a letter, until I received the July-August 1995 issue. 1LT Todd R. Brannon's letter entitled "Autoloaders — Thanks, But No Thanks" made me an offer that I cannot refuse.

I wish to bring to the forefront the ongoing debate regarding the application of technology to the Armor Force. Neither the Threat, nor technology, are standing still. The technology debates and decisions of today will affect events for the next two decades. My discussion will focus upon lethality in general, and specifically guns, autoloaders, and ammunition.

The following comments refer to lethality in general. While serving in the 11th ACR in USAREUR throughout the late seventies, "they" said that our Sheridan and M60A1 weapon systems would defeat the threat across the border. They lied. Upon leaving active duty, and for the last 14 years as a member of the acquisition community, and now Corps, I have been intimately involved in tank lethality, helping to correct the lie. The ongoing debate, of which the autoloader is part, needs to address two dynamic issues: the Threat and the application of evolving technology to counter that Threat. The task is to decide what is necessary and possible, not just what would be "neat to have." In any technology discussion, there will be those that resist change, as happened with repeating carbines and mechanization.

In the area of guns, the current debate has narrowed down to 120mm vs. 140mm, if one accepts the fact that electric armaments will not mature in time for M1A3. The bore size has relatively small importance compared to the chamber volume. The last such debate took place regarding the 105mm and 120mm. The upgun to 120mm was, as it should have been, Threat-driven. There were those that opposed 120mm for a number of reasons, primarily stowed load. Notice that I did not say stowed kills; there is a difference. My stowed load on the M60A1 was 63 rounds, but my stowed kills against a frontal tank at a reasonable range was zero. One may ask how the results of DESERT STORM would have been different if we stayed with the 105mm.

The development of a 140mm armament system, (XM291 Gun, XM91 Autoloader, XM964 APFSDS-T, XM965 MP-T, and Modified M1A1 Fire Control System), began in 1985. This effort, even then, was Theat-driven. Upon suspension of the 140mm work for political reasons in 1992, (120mm XM291 continues), the feasibility of the system was proven. An operational demonstrator vehicle remains at the Aberdeen Test Site as an asset for further testing. As a result of this technology leap, a quadrilateral agreement was reached between the U.S., United Kingdom, France, and Germany, which harmonizes the technical parameters of such a system. One of the parameters is the 140mm ammunition, which leads to a discussion of autoloaders.

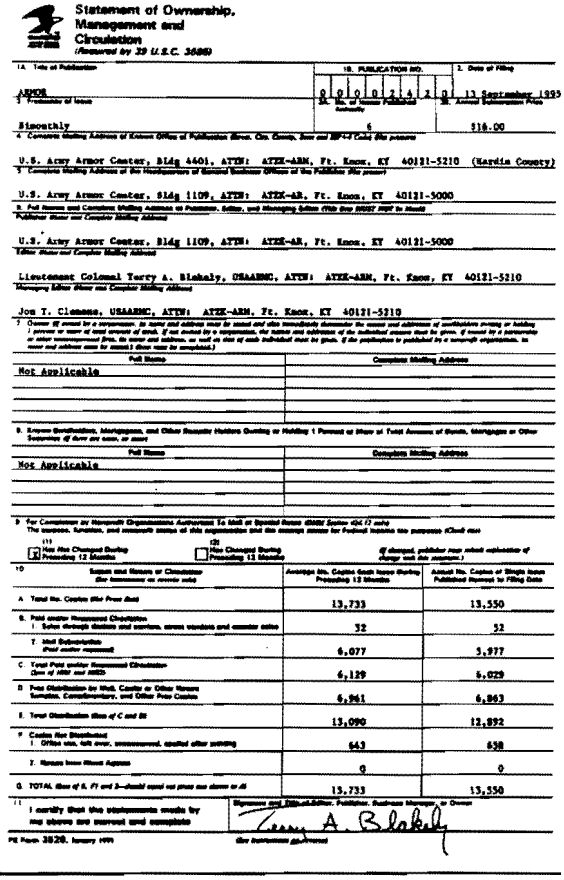
Since the beginning of time, man has continuously developed tools and machines to either make work easier, or to do more work in the same amount of time. An autoloader is such a device. Contrary to 1LT Brannon's opinion, technologists/engineers like Western Design and myself are not going to take away the fourth crewman. If the tank crew is reduced, it will be chiefly for two other reasons. The first reason would be the requirement to maintain force structure in light of manpower reductions. An autoloader would enable the same number of tanks to be operated with fewer crewmen. On the other hand, the fourth crewman could be removed from an autoloader-equipped vehicle and utilized to man additional tanks. The second, and to me more pressing reason, is a Catch 22 for the tank designer; "How can I meet my requirement to increase armor protection and reduce vehicle weight?" The most direct route to meet this requirement is to reduce the volume which must be protected by armor. If a crewman is removed from the turret, the crew compartment volume may be reduced. Drop down into the LeClerc turret; it's like a cockpit. Nice, it reminds me of my Toyota MR2 — no wasted space, just a clean, high-performance design. An autoloader for the 120mm system represents a way for the tank designer to meet his protection and weight requirements. If the 140mm system is required to defeat the Threat, then an autoloader is also required. The reason is extremely simple; the XM964 APFSDS-T Cartridge is almost five feet long, weighs approximately 85 pounds, and will probably be a two-piece munition. I know that I, as a loader, would have difficulty passing the Tank Crew Gunnery Skills Test. Regardless of the caliber decision, I would propose keeping the fourth crewman, if physically possible from a vehicle design standpoint (someone is going to have to operate the vehicle computer system).

Finally, I would like to address ammunition. Along the lines of doing more with less, we wish to engage targets at the longest possible ranges. We are able to detect, classify, and identify targets at longer ranges, under varied conditions, with improved target acquisition systems and situation awareness. What has not kept pace is the ability to hit and kill targets at those extended ranges. What we need is a smaller, more lethal, armored force with the capability of "One Shot-One Kill." The state of the art in gun-launched electronics is such that what was not possible a few years ago can be done today. Smart munitions are coming, (*ARMOR*, March-April 1995). Their use is proliferating, and they may be the only life extension for the 120mm system. Smart munitions have applications in mortars and artillery; why not tanks?

In summary, these are interesting times, with interesting opportunities. Once again, the Threat and technology are dynamic, and must be addressed. Let's debate freely and choose wisely, because it will be our brothers, sons, and grandsons manning the M1A3 and the FMBT. Whatever is decided, let's not lie to them.

"Steel On (And Thru) Target!"

BRUCE W. POTTER
LTC, Armor, USAR



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Know Your Combat Jets

A software review by Major David M. Dodge

Know Your Combat Jets is a CD-ROM-based learning system for visual aircraft recognition. This CD-ROM is not a flight simulator, or video game, but a true training/educational product. But don't let that fool you. You can be entertained while you learn. The product is well put together and will not disappoint you when it is installed. I just wish learning math was this much fun. The program covers all the major combat jets currently flying throughout the world. They are broken down by major region, such as U.S., NATO, Russian and close affiliations of those.

I installed the program and immediately launched into "Challenge" mode. I have a weakness in some of the newer Russian aircraft, and picked the swing wing category. I was not only challenged, I was "sucked-in" for 90 minutes, learning the specific recognition features of each similar type of aircraft. The program doesn't give the answers away. You must select the correct response. It does lead you through the process of self-discovery, which is more interesting and one which I prefer. When you answer incorrectly, a firm male voice tells you that you have made an error and then displays the selection you made next to the one you are trying to identify. This continues until you give up, learn the differences, or guess the right answer. You can't help but learn the material, and it truly is a challenge.

You first start Axia Jets from the program group which has four entries: Axia Jets, Axia Air Show, How to use Axia, and a read.me file. I highly recommend starting out running through the "How to use Axia" program first. This is essentially a tutorial on how to use the learning system, and it is an excellent demonstration of the features and how to use them. I wished I had started there, instead of launching into the challenge mode, though this is not bad either. Discovery is another form of learning too. Axia knows that as well, and calls that feature "Explore" mode. The interface is pretty intuitive, which leads one to configure the screen the way you want, depending on your preferences.

The main program, Axia Jets, is detail rich. The program is broken down into four categories: Structural, Combat Role, Red Alert, and Affiliation. These are further divided into sub-categories that break out the key recognition features. Red Alert, for example, is broken down into Missiles, Action, Multivariants, and Scramble, each with a different learning focus. There are even video clips of some of the missiles.

The dominant focus of the interface is that you can display jets in side-by-side view or arrange another view of a different jet or the same jet. There are plan views as well as silhouette views. This takes flashcards to a whole new dimension. The pictures are full color, and there are some video clips that you must recognize. There are at least three or four different versions of photos for every aircraft, which helps break the rote memory drills and really reinforces the knowledge and key recognition points. There are other neat details too. You can zoom a picture to get a better view. The Labels button activates visual flags on the image that point out key recognition features. Each aircraft has a summarized history and technical data feature. Performance charts are included that differ from the usual charts by combining performance characteristics into one "quick glance" format.

For those stubborn training challenges, you can build subsets which allow you to build customized lists of the larger groups, so as to focus on those aircraft. The incremental learning feature allows you to step through a set of five (default) aircraft. When you gain proficiency on one, it drops out and is replaced by another. It dynamically configures the list to your proficiency. The Axia Jet icon is probably the one you will use the most.

Axia Airshow is the aficionado's dream. This is a slide show of all the aircraft images on the disk in ground or aerial shots. I would guess there are over several hundred, including video clips. There is coverage of over 85 variants of more than 60 major airframes, so this collection is extensive, including the new Taiwanese and Spanish aircraft. If you like Mirages, there are plenty of them as well. If you wanted an impressive screen saver, this would be a good choice, but you would always have a crowd gathered around your desk looking at the changing images.

I have found myself losing track of time whenever I start the program. It is like an artichoke. You peel back a layer and find another, except Axia Jets lets you go back to the start and try again. I truly wish this technology had been available when I was training soldiers in aircraft recognition. My job would have been to manage the time with the computer instead of keeping people awake. Even today, with high-tech graphics and video, this program will hold your attention longer than the usual class period. I felt I should be smart enough to beat the computer, but even when you lose, you still learn, because the program is structured to keep you from becoming discouraged. Even if you do become discouraged with your own progress, there is still enough on this CD-ROM to entertain.

What about hardware? Axia recommends a 486SX or compatible CPU with 8 megabytes of RAM, a double speed CD-ROM drive (MPC compliant), 16-bit SVGA card, MCI compatible sound card (e.g., Soundblaster or other), and 4 megabytes of available hard drive space for program installation. The program runs under Windows 3.1. I had no problems using the program, but I had to wait a bit for screen redraws from the CD-ROM. The double speed drive would be an absolute minimum I would recommend, and you may want to consider a quad speed drive. A video card with more than 1 megabyte of video memory would also help.

Is Axia's *Know your Combat Jets* for everyone? If you want thrills from air combat simulation, like *F16 Falcon,* probably not. If you want to learn more about the world's combat jets, this is just the program, and it also makes a very good quick reference as well. If you have a need for REAL aircraft recognition training, then this program is exactly what you are looking for. Axia's *Know Your Combat Jets* is a very well structured learning tool that is professionally put together to give you education and entertainment in a new perspective.

Know Your Combat Jets by Axia International Inc., Suite 900, 10201 Southport Road S.W., Calgary, Alberta, Canada T2W 4X9; Tel 1-800-969-2942, Coml (403) 258-5870, Fax: (403) 258-5871. $29.95.

David M. Dodge is an active duty U.S. Army officer, and a computer user who occasionally writes about personal computer software and hardware.

BOOKS

The Longest Day by Cornelius Ryan, Touchstone Books, 338 pages, $11.00.

It is most fitting that the Touchstone Books Division of Simon and Schuster reissued the late Cornelius Ryan's classic account of D-Day, *The Longest Day,* to mark the 50th anniversary of the Normandy invasion. First published in 1959, *The Longest Day* was reissued on 6 June 1994.

For those unfamiliar with the book, *The Longest Day* tells the story of D-Day through the eyes of the participants on both sides. Since it was written relatively soon after the end of the war, most of the actors were alive, with the events of the day still fresh in their memories. Using his considerable skills as a war correspondent and news reporter, Ryan assembled an impressive number of first person interviews and, crafting them with extensive research in documents, operations logs, and diaries, produced a highly readable and dramatic account of one of the turning point battles of World War II.

In his forward, Ryan stated that his book was not a "military history," but rather "the story of people." And perhaps those looking for an in-depth, operational analysis of the entire Normandy campaign will be disappointed. History, however, is intended to be the story of real people, and *The Longest Day* succeeds admirably in that. Other more recent books may relate in exhausting detail the operational or strategic story, but Ryan set for himself a different task: to provide the reader an appreciation for the confusion and terror, the courage, humor, pathos, and irony of that day's battle on and behind the beaches, through the telling of personal accounts. Ryan's mastery of this genre ensures the timelessness of *The Longest Day* and makes it a must read for anyone who wants to feel vicariously what combat is like, and experience 50 years later a crucial event in modern history.

LTC STEVEN C. GRAVLIN
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A History of Warfare by John Keegan, Random House, Inc., New York, 1994. 392 pages, $14.00.

John Keegan's latest book, *A History of Warfare,* opens with the somewhat bold statement that Clausewitz was wrong; war is not an extension of politics. Those familiar with the author's previous works, such as *The Face of Battle* and *The Mask of Command,* will probably not find it surprising that he rejects what many have treated as gospel. They will also not find it surprising that he argues his point convincingly.

John Keegan argues that while nations use war as a political tool, this does not necessarily mean war is political in nature. War has its own nature, a terrible nature that often leads not to political gain, but to ruin. Clausewitz confused a use of war with war's true character.

To show the "error" of Clausewitz' way of thinking, the author demonstrates what happens when war is used for political means but gets out of control; it destroys the masters who sought to use it. The point he is driving at is that war's nature is to serve war; when left to its own devices, war will grow out of control. He cites as an example the Easter Islanders, who were one of the first cultures to invent total war. They began warring for political purposes — their rules for selecting their 'king for a year' required men to fight to find the egg of a sooty tern, a bird that lived on the island. This fighting eventually grew out of control; the warrior or ruling class became known as *tangata rima toto,* "the men with the bloodied hands." These men succeeded in destroying their own culture and nearly exterminating their own people. The island suffered a complete societal breakdown and became an armed camp. The population was decimated with "primitive" weapons and starvation. Far from achieving any perceptible political benefit, war brought the opposite of political order: chaos.

Keegan then embarks on a detailed tour of warrior cultures and styles of warmaking through history. He starts with "primitive" warfare. This is the frequently stylized form of fighting practiced by primitive peoples such as the Aztecs, Maoris, and modern Yanomano (a tribal people who live along the Brazilian-Venezuelan border). It is often highly ritualized and regulated, and may involve sham fights and displays of mockery or ferocity. Such warfare may turn quite violent in extreme conditions, but generally showed much restraint. There is discussion of other styles of fighting which added various levels of "sophistication" to the primitive formula. The nomadic chariot and horse peoples, the Greeks with their phalanx, and the Arabs with rapid, standing (mercenary) armies, all added new facets to the concept of warfare.

The author pays much attention to those military cultures that were initially very successful, but failed to adapt to changing conditions, and were crushed or simply disappeared into the societies they conquered. Examples are the Mongols, Mamlukes, and Zulus.

Significantly, these last two, like all other cultures that encountered it, fell to the "Western" style of warfare. The three basic tenets of Western warmaking were not new, but in combination proved unstoppable. These tenents were the combination of ideology, the acceptance of any new technology, and the willingness, when necessary, to fight face-to-face, to the death. The Western style spread European (and American) imperialism across the planet, sweeping all before it. The problem for those who used the Western style of fighting (us, for example) was that sometimes both sides in a conflict used it. In these cases, especially when the adversaries were evenly matched, the results were devastating for all concerned. This was demonstrated repeatedly from the American Civil War through the present conflict in the Balkans.

Having shown this destructive trend in warfare, John Keegan offers the warning that "Politics must continue, war cannot." By saying this, the author argues not for an end to armies; instead he cites professional, standing armies as the only feasible means to contain and limit war. They (we) must be used to protect civilization, to prevent its destruction. This does not necessarily entail a drastic change in our way of doing business. We must still train and fight to defend our Nation's interests against any and all enemies. Perhaps the change needs to be in the process of defining what is truly in our Nation's best interest. Significantly, the author cites Operation DESERT STORM as the best (he goes to the extreme of calling it the only) example of a truly just war. To him, DESERT STORM, should be the pattern for the future use of armies... the restoration of order and resistance of aggression.

A History of Warfare holds a twofold warning for the U.S. military in general and the Armor Force in particular.

First of all, due to the drawdown and decreasing procurement budgets, we face the danger of becoming a hollow force. We must guard against this eventuality. We also must avoid complacency — we cannot become too confident in the technology that won our battles of yesterday. We must accept that someday the tank (as we know it) may be as obsolete as the Zulu assegai or the steppe pony. We owe it to our country to recognize that day and adapt to the changing face of warfare.

Secondly, and more importantly, as nations and as members of the international community, the United States and its allies must learn from the intellectual restraint and, to some extent, from the symbolic ritual of alternate military cultures. These ideas are alien to us today, but they limited violence in the past. If we follow Keegan's advice, we need not reject our military culture, but we may need to expand our horizons. In a multi-polar, nuclear-armed world system, the potential for catastrophe is too great to be closed-minded about ways to limit violence and maintain order and democracy.

Weapons technology has come a long way since the ironwood clubs with which the Easter Islanders destroyed themselves. The modern proliferation of every type of weapon from automatic rifles through nuclear-tipped ballistic missiles has given the

human race of the late 20th Century an unmatched capacity to eradicate itself. Perhaps the most important lesson a reader can take away from *A History of Warfare* is the necessity of learning from the past to find ways to limit violence in the future. It is often said that the most ardent pacifists are those who fight the wars, and as professional soldiers, we must lead the fight against aggressive, total warfare. For civilization's sake, we cannot afford to allow the fate of our species to be decided by "the men with the bloodied hands."

ROBERT S. KRENZEL, JR.
1LT, Armor
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The Pacific War Atlas, 1941-1945 by David Smurthwaite, Facts On File, 1995. 141 pages, $15.95.

The 50th anniversary of VJ-Day has increased the public's awareness of the complex and arduous Pacific campaign. Along with numerous unit reunions and commemorations are a large number of new books that analyze and describe the Allied campaigns in the Pacific and Far East. David Smurthwaite's *The Pacific War Atlas* is a good effort that reviews the war in the Pacific and Far East. The author, an assistant director of the National Army Museum in London, has previously written on operations in the Far East. His knowledge of the Pacific campaign is apparent in the book's comprehensive review of the operations in the Pacific. Smurthwaite succinctly describes the successes and failures on both sides and, where appropriate, he provides solid criticism or praise for each side's conduct of the battle.

The book contains over 50 photographs and 60 maps aiding in the illustration of Smurthwaite's well-written text. Unfortunately, the value of the photographs is diminished by their small size. Numerous maps in the book suffer from inaccuracies, most notably in their representation of naval forces. For example, the map illustrating the attack on Pearl Harbor has cruisers represented as destroyers and battleships. Also, many of the maps illustrating invasions and ground combat lack the basic details of unit name and size. Overall, the below-average quality and accuracy of the maps hinders the reader's understanding of the text.

David Smurthwaite's book provides a fine overview of the operations in the Pacific, but does not present any new material. *The Pacific War Atlas* is good for the casual reader who is interested in what happened 50 years ago and why it happened. Once the maps are edited for accuracy and clarity, this volume will provide a handy reference for the general reader.

CPT CARL J. HORN
Ft. Knox, Ky.

WORTH A LOOK:

A Useful Canadian Military Journal

Review of Canadian Army Newsletter, *Dispatches,* Vol. 1/1, November 1994.

The Canadian Liaison Officer at Fort Knox, Major R. Dill, came by the office and dropped off a copy of *Dispatches.* This is a newsletter that the Canadian Army publishes quarterly and disseminates to soldiers in the field. It is mainly a lessons-learned manual that discusses new tactics, techniques, and procedures that are currently being tried and tested in a theater of operation. This is a powerful way for the Canadian Army to disseminate new information and ideas that have saved them lives as well as materiel.

The information in this newsletter originates from PORs, lessons-learned publications, and post-operational interviews. It collects experiences and recommendations on ways their army can improve on individual and collective tasks. This issue concentrates on convoy escort and related operations in support of Operations Other Than War (OOTW). In particular, over the last three years, the Canadian Army has participated in United Nations (UN) operations in Africa, the Far East, and the Balkans. These operations centered around the delivery of humanitarian aid using convoys.

The newsletter begins by discussing the different size convoys used — the small convoy of 10 vehicles or less and the large convoy of 30 vehicles or more. However, no matter how big or small the convoy, it is the Canadian Army experience that each convoy needs to have an Advance Group, a Close Protective Group, and a Reserve Group.

Advance Group. This group is the leading element of the escort. It proves the safety of the route and attemps to warn of trouble before the arrival of the vehicle column. It might be required to reconnoiter detours and to establish pickets. Helicopter support greatly increases its effectiveness, particularly in detecting ambushes.

The Close Protective Group. This group provides the immediate close protection of the vehicle column. The escort commander is located within this group.

Reserve Group. This element provides the rear guard/reserve, medical, and recovery resources of the convoy.

The newsletter attributes convoy success or failure to the junior leaders: the lieutenants, warrant officers, sergeants, and master corporals. Each convoy was packaged to support that junior leader and his mission. The newsletter stresses not changing doctrine to support missions. Use of standard troop-leading procedures and planning procedures are essential. This ensures consideration of all mission areas, from the threat to the logistical requirements. Also, a liaison needs to be developed between the force and local community agencies. This will provide the convoy commander with much-needed information about his route. The liaison provides valuable information on the local protocols and, in most cases, early warning of trouble brewing in the area of operation.

The most interesting of the new methods and concepts was the "tunnel concept," which originated as a British tactic for convoy protection above the platoon level. It was successfully employed several times along 'hot' routes in Bosnia. In essence, the concept employs the following organizations, usually working at the battle group level: the security element, the convoy(s), and the reserve. The security element or 'tunnel force' is the first group, often a mechanized company. This element moves first, with the mission of physically dominating the route from the convoy start point to the release point. Once the 'tunnel' is in place, the second force, a well defended convoy(s), commences. The tunnel force only engages indigenous forces if the convoy or themselves are engaged (critical chokepoints and checkpoints are actually under observation and, if necessary, engaged by direct fire). The tunnel reserve is the third element and is normally waiting in a hide or base camp outside the tunnel. C^2 is therefore a battle group responsibility. The newsletter includes an actual operation in which the tunnel concept was used.

The doctrine used by the Canadian Army to conduct convoy operations is basically the same as ours, the difference being that the Canadians have established a set method of TT&Ps for every operation. A convoy mission in Somalia mirrors one being conducted in Bosnia, in terms of organization. Of course, each operation requires a different package, but each convoy has the same three groups. Each convoy may be infantry-heavy or armor-heavy, but the execution still remains the same. The main difference for each operation is the Rules of Engagement (ROE). These need to be clearly defined for each separate theater and trained before the soldier enters the AO.

The newsletter continues to discuss different aspects of their convoy experience like combat service support, the training used to prepare for deployment, and the equipment needed that was not part of their original TO&E. This provided for interesting reading and provoked thought on our current unit structure.

MICHAEL L. SCHOLES, SR.
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Ft. Knox, Ky.

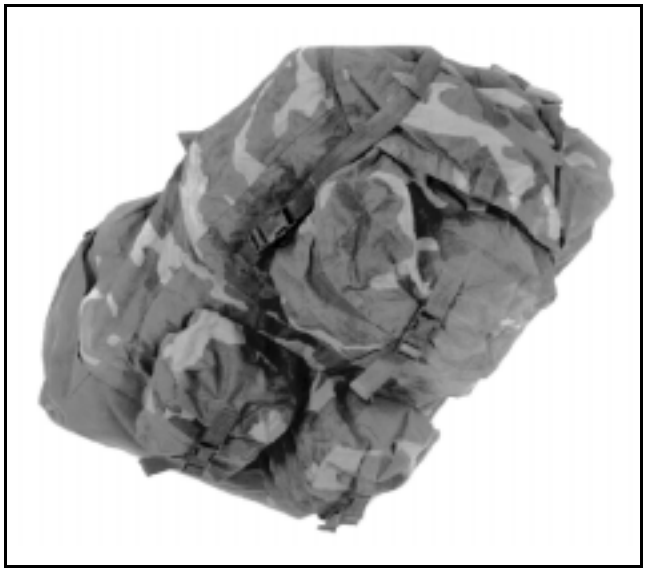
A Better Way to Store Your “Stuff”

As you know, the standard Army duffel bag and the large ALICE rucksack are inadequate to store all the items needed by the combat vehicle crewman while in the field. The ALICE pack is too small; the duffel bag does not have built-in pockets; and items stored in the middle or bottom of the bag are not easily accessible. Because of these problems, the Soldier Support Branch of the Directorate of Combat Developments, at Fort Knox, came up with a superior alternative.

The mounted crewman compartmented equipment bag (MCCEB) was developed and soon will be fielded through your Central Issue Facility (CIF). The MCCEB is designed with three separate interior compartments and three large exterior pockets that allow easy access to gear, no matter where it is located in the bag.

The MCCEB is water resistant, constructed of cordura nylon in woodland camouflage pattern. The bag is meant to be carried to and from your vehicle by the padded shoulder straps or top handle.

The top section is covered by a flap, similar to the rucksack; the middle and bottom sections are accessed through a zippered opening. The three exerior pockets are closed with a fastener, similar to the rucksack. These pockets allow for convenient storage of smaller often-used items.



The days of dumping the entire contents of your duffel bag to get to an item located on the bottom are finally over. With the MCCEB, you will have easy access to your gear and be able to keep it organized throughout your entire stay in the field. After the initial fielding, the MCCEB will become a CTA 50-900 item with NSN 8465-01-393-5183 assigned.

We want to ask you for any new ideas you may have that would make your job easier, your field stay more comfortable, or increase your overall capabilities as a combat vehicle crewman. We here at the Soldier Support Branch will initiate the actions needed to make your idea a reality. Please give us a call or drop us a line. You can contact us by phone DSN 464-3662/4794 or commercial (502) 624-3662/4794. Our mailing address is:

Commander
U.S. Army Armor Center
ATTN: ATZK-CDS
Fort Knox, KY 40121-5000

To keep you informed of new mounted crewman items being fielded, we will continue with these *ARMOR* magazine articles.

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